HRGreen

HRGREEN.COM

GIECK RANCH MAIN STEM TRIBUTARY 1 & 2
FINAL DRAINAGE REPORT
for DESIGN AND CONSTRUCTION

August 2, 2024

HR Green Project No: 201662.03

PCD File No. CDR228

Prepared By:
HR Green Development, LLC
Contact: Greg Panza, PE
gpanza@hrgreen.com
720-602-4999

Design Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____ _____
[Greg Panza, P.E. #37081] Date

Owner/Developer's Statement:

I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

_____ _____
[Riley Hillen, P.E./Owner-Developer] Date
[D.R. Horton]
[9555 S. Kingston Court, Englewood, CO 80112]

El Paso County:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

_____ _____
County Engineer / ECM Administrator Date

Conditions:

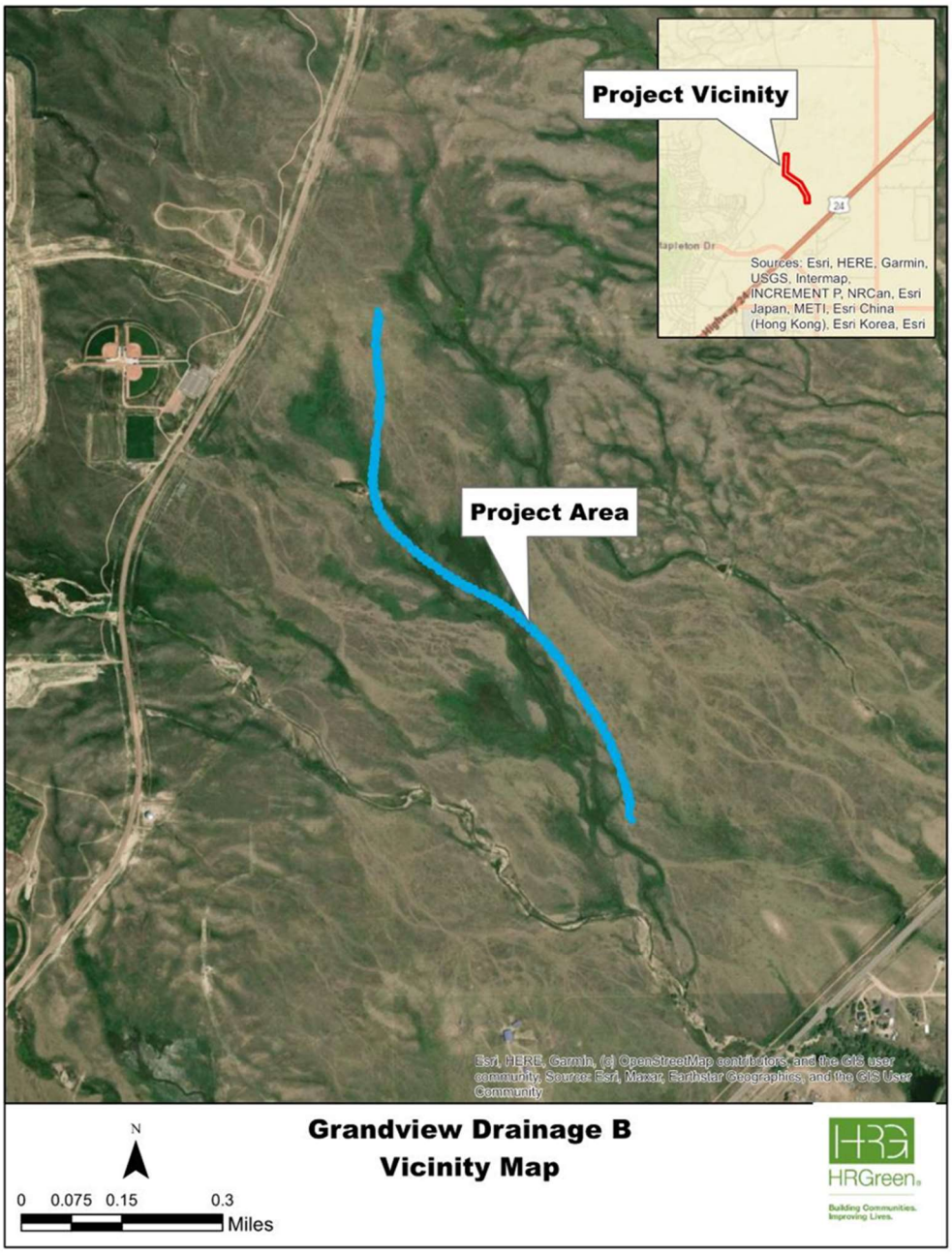
Table of Contents

Grandview Reserve Final Channel 'B' Drainage Report

Introduction

This report was prepared by HR Green to support the submission of El Paso County forms and documents in a request for channel improvements along Geick Ranch Tributary 2. Figure 1 shows the location of the project.

Figure 1 – Vicinity Map



Grandview Reserve is located in Falcon, Colorado within El Paso County and contains approximately 776 acres within the south half of section 21 and 22 and the north half of section 27 and 28, Township 12 South, and Range 66 West of the Sixth Principal Meridian in El Paso County, Colorado. Grandview Reserve is bordered to the north and west by Eastonville Road and to the south by State Highway 24. The surrounding are is undeveloped at this time.

Grandview Reserve (GVR) falls within the Gieck Ranch Drainage Basin which covers approximately 22 square miles. This drainage basin is tributary to Black Squirrel Creek and joins said creek just to the south of Ellicott, CO about 18 miles to the south. Black Squirrel Creek eventually drains to the Arkansas River in Pueblo Colorado. Much of the Gieck Ranch Drainage basin is undeveloped and consists of rural farmland. The Gieck Ranch Drainage basin lies north of the Haegler Ranch drainage basin. The channels through the Grandview property can all be described as gently sloping drainages that roll through the site towards the creeks to which they are tributary. There is currently no irrigation on this site.

Per the NRCS web soil survey, the site is made up entirely of Type A and B soils. The majority of which are Type B soils. The vegetation found within Grandview Reserve consists of wetland communities in the floodplain with a transitional area to shortgrass prairie communities that dominate the site. The primary species found in the shortgrass prairie regions include little bluestem, blue grama, and buffalograss. The transitional area between the wetlands and shortgrass prairie includes patches of snowberry, and wood's rose. There are a few Plains Cottonwoods along the main channels. The area has historically been heavily grazed and there are weeds throughout the site. Weeds found onsite include Canada thistle, Russian thistle, common mullein and yellow toadflax spp.

This creek is a FEMA regulated floodplain Zone A. There is currently a Conditional Letter of Map Revision (CLOMR) into FEMA to obtain their opinion on the floodplain impacts from this project. Once this project is complete a Letter of Map Revision based on As-Built conditions will be submitted to FEMA and the floodplain will become a model backed Zone AE with established Base Flood Elevations. There are currently no insurable structures within the vicinity of the reach to be revised by this project.

Unresolved: Provide copy of [current] floodplain map in appendix.

Observations of the existing channels suggest that they are at equilibrium with their watershed flows; evidence including relatively stable bank full channels, adequate floodplain (above bank full channel elevations) and in-tact plant communities that would be expected in this type of reach support the notion that the reach is in equilibrium.

At present, the preliminary analysis and design of Geick Ranch Tributary 2 (GRT2) has been completed. Proposed improvements for Geick Ranch Tributary 2 include refinement of the existing channel alignment and a stabilizing natural stream design that will allow a more predictable floodplain. There is to be a dedicated 100' wide corridor in which the channel valley will meander. The valley is the area needed to fully contain the 100-year event. Preliminary analysis indicates the valley will have an average width of approximately 63'; initial sizing approximates the bank full width to be 8.8' – 13.8'. The valley and channel thalweg will generally follow the same profile, with some deviation as the bank full channel meanders through the valley in turn decreasing the low flow channels average slope. The average valley profile is to be approximately 0.9% with a series of grade control structures to both decrease elevation and dissipate energy to meet natural channel criteria as outlined in El Paso County criteria.

Hydrology

El Paso County criteria states that all developments are required to detain storm flows down to their historic peaks. For this reason GRT2 has been designed using the flows that drain to it in the existing conditions.

HEC-HMS 4.11 was used to determine the existing flows. The regulatory floodplains from the Federal Emergency Management Agency (FEMA) are Zone A floodplains without model backing; therefore there are no established regulatory flows for these streams. The terrain used to delineate basins was obtained from the Colorado Water Conservation Board LiDAR library on November 3, 2023. See Appendix A for a delineation of the drainage basins and for the HEC-HMS output report. Table shows the characteristics of the drainage basins.

Table 2 –DRAINAGE BASIN CHARACTERISTICS

Basin ID	Area [sq mi]	Curve Number	10-year peak	100-year peak
Offsite	0.33	78.64	125.2	241.65
Meridian	0.3	80.16	137.2	261.88
Subbasin-4	0.04	70.32	23.9	47.38
Subbasin-3	0.05	72.81	32.1	62.65
Subbasin-2	0.12	73.76	52.7	103.28
Subbasin-1	0.05	79.41	35.5	67.11

The land cover data was obtained from United States Geological Survey Land Cover Data Download site, also on November 3. Upstream of this proposed project a development in in construction. This development, Meridian Ranch, will increase the imperviousness of the contributing basin to GRT2, therefore the imperviousness of the portion of the basin that will be developed has been updated based on this development. Appropriate excerpts from the Meridian Ranch drainage report can be found in Appendix J. While the Meridian Ranch development will utilize stormwater detention to attenuate flows, this analysis assumed that all stormwater runoff would drain to Geick Tributary 2 without detention.

The soil hydric classification was determined using a downloaded GIS raster file from the Natural Resources Conservation Service. The land cover and soil hydric classification were combined to create a Curve Number grid as outlined in *Creating SCS Curve Number Grid using Land Cover and Soil Data*, by Dr. Venkatesh Merwade in February 2019. Currently the United States Army Corps of Engineers website containing guidelines on using HEC-HMS 4.11 to create a Curve Number grid is offline with no known date for when it will again be active.

The hydrologic method used was the SCS Unit Hydrograph method using a Frequency Storm Meteorologic Model with inputs taken from the National Oceanic and Atmospheric Administration's Atlas 14 Point Precipitation Estimates for Colorado, and more specifically at this site. These inputs can be found in Appendix J. The loss method used was the SCS Curve Number method and the Curve Number was derived using the procedure outlined previously on this page. The Reach Routing method used was the Muskingum-Cunge method due to the inputs for this method being readily available.

See Table 1 for summaries of flows discharged to the existing GRT2 at specific design points. See Table 2 for summaries of flows discharged to the proposed GRT2 at the equivalent design points. Flows in the HEC-RAS model are rounded up to the nearest whole integer from the HEC-HMS results for simplicity.

Table 2 –FLOWS FOR THE EXISTING GEICK RANCH TRIBUTARY 2

STATION	CUMULATIVE 100-YR STORM (CFS)	INPUT DESCRIPTION AND FLOW (CFS)
70+29.02	262	Upstream end of Existing Model
48+58.05	536	Equivalent location for Rex Road
33+61.62	621	Equivalent location for Dawlish Road
6+13.67	649	Equivalent location for Low Water Crossing

Table 3- FLOWS FOR PROPOSED GEICK RANCH TRIBUTARY 2

STATION	CUMULATIVE 100-YR STORM (CFS)	INPUT DESCRIPTION AND FLOW (CFS)
9426.04	262	Upstream end of Existing Model
71+60.32	536	Immediately downstream of Rex Road
57+28.67	621	Immediately downstream of Dawlish Road
17+47.66	649	Immediately downstream of Low Water Crossing

There exist no historic flood elevations high water marks to use for calibration of this model and the nearest stream gage is downstream enough to make the ratio of contributing watersheds different in size by orders of magnitude. Therefore there was no available data to use to calibrate this model, so no calibration was performed.

Replace top part of table. If previously approved deviation request needs to be updated, resubmit after discussing with staff.

Hydraulics

Design criteria were developed to guide a preliminary layout of channel dimension, planform, and profile for the realigned segment of GRT2. Published criteria from the Urban Stormwater Drainage Criteria Manual, Volume 1 (USDCM; Urb
County DCM and various other reports cu
completed for GVR drainages were used f
and minimum bank full geometry is summ

T

Design Paramet	
Roughness value	
Design Channel Type	C4
Entrenchment Ratio	2.7-31.65 (x=5.26)
Width to depth ratio	13.5-75.0 (x=29.28)
Sinuosity	1.43-2.80 (x=1.92)
Slope	0.0001-0.0184 (x=0.0045)
D_{50}	12-14mm (~0.5 in)
d_{84}	32-48mm (~1.6in)
Meander Length[2]	34-92 (x=56)
Belt Width[2]	18-55 (x=32)
Radius of Curvature[2]	7-28 (x=11)
Minimum Floodplain Terrace	6 ft
Maximum overbank side slope	4(H):1(V)
Maximum bank full side slope	2.5(H):1(V)
Maximum bank full side slope	2.5(H):1(V)
Minimum bottom width[3]	4.8 ft
Freeboard	1.5 ft

Maximum 5-year velocity, main channel (within bank full channel width) (ft/s)	EPC: 2.5 ft/s MHFD: 5 ft/s*
Maximum 100-year velocity, main channel (within bank full channel width) (ft/s)	EPC: 2.5 ft/s MHFD: 7 ft/s*
Froude No., 5-year, main channel (within bank full channel width)	0.7
Froude No., 100-year, main channel (within bank full channel width)	0.85 0.8
Maximum shear stress, 100-year, main channel (within bank full channel width)	1.2 lb./sf
Minimum bank full capacity of bank full channel (based on future development conditions)	2-year, 19 - 33.5 cfs
Minimum bank full channel geometry[1]	

[1] These values were derived from empirical data and will be used as guidelines for design and will be used in conjunction with hydraulic regime equations as outlined in "Spreadsheet Tools for River Evaluation, Assessment, and Monitoring: The STREAM Diagnostic Modules"
[2] These values are derived from "Spreadsheet Tools for River Evaluation, Assessment, and Monitoring: The STREAM Diagnostic Modules"
[3] Minimum bottom width shown is for the low flow channel only. The main channel will be ~41 ft wide

The future 2-year flow (19-33.5 cfs) was used to size the low flow channel. This resulted in a channel with a minimum bottom width varying from 4.8 feet - 9.8 feet, 0.8 feet deep with 2.5:1 side slopes for a bank full width varying from 8.8 feet to 13.8 feet, assuming a mean channel longitudinal slope of 0.9%. Equations as shown in the spreadsheet should produce low shear values within the channel section. However, further analysis using HEC-RAS was completed to determine the final geometry of said channel. The effective discharge channel is highly correlated to the “bank full” channel (Leopold 1994) as several channel geometrics are derived from bank full channel width, depth, cross sectional area and sinuosity, and that USDCM and the OSP report design criteria parameters relate to bank full width, we have chosen bank full width to serve as the foundation of design.

To determine an appropriate bank full width, Leopold’s generalized width estimate was first calculated (1994, as presented in USDCM Vol 1):

$W = aQ^{0.5}$

Where:

From SW: Unresolved - Please add back in the Four Step Process. It was included in your first submittal of the FDR in May 2022. Gilbert had comments on that section, none of which were asking you to remove the section from the FDR altogether. Please revise that section per his comments before copy/pasting it back into this report. Be sure to address WQ treatment exclusions.

w = bank full width of channel (top width when conveying bank full discharge)
Q = bank full discharge (10.5 cfs)
a = 2.7 (wide bank full channel)
2.1 (average bank full channel width)
1.5 (narrow bank full channel)
Assuming an average bank full width, the equation would estimate a 6.8-ft bank full width. It is important to note that the Leopold equation lumps all channel types of varying width-to-depth rations. The resulting channel, then, has the following general dimensions:

- Bottom width = 4.8 ft – 9.8 ft
- Top Width = 8.8 ft – 13.8 ft
- Average Depth $_{Riffle}$ = 0.8 ft
- Width: Depth (W/D) Ratio = 11.3
- Cross Sectional Area = 5.44 ft^2 - 9.44 ft^2

The resulting channel dimensions listed above were then used to do the initial site grading of GRT2. The channel was then modeled in HEC- RAS and the geometry was further refined to reduce velocities, shear stresses, and the Froude number to fall within acceptable ranges.
The proposed design has reasonably low velocities with the bankfull and minor-storm flows, however the 100-year flows have higher velocities resulting in the need to riprap line the bankfull channel. The channel lining calculations can be found in Appendix D.

GRT1 (Geick Tributary 1)

The reach of this creek that will be regraded is not delineated in the effective FIRM map. For this project the existing berm that creates a "farmer's pond" along the creek will be removed. Hydraulic analysis of the section that will be regraded shows velocities and Froude numbers that are high enough to require riprap protection along the channel bottom.

Table 4 – GRT1 Hydraulic Output

River Sta	Profile	Q Total (cfs)	Max Chl Dpth (ft)	Vel Chnl (ft/s)	Froude # Chl	Invert Slope	Riprap Req.	Rock Type
27+49	100-YR	413	0.9	5.1	1.01	0.0216	2.0	VL
25+92	100-YR	413	1.92	7.39	0.98	0.0295	3.1	VL
25+27	100-YR	413	1.89	7.25	0.95	0.0294	3.0	VL
24+79	100-YR	413	2.4	7.84	0.92	0.0192	3.1	VL

GRT2 (Geick Tributary 2) – Chute at approximate station 8+50

To protect against shear scouring along the chute at approximate station 8+50, riprap lining will be placed at the bottom of the channel and along the bank of the outside of the bend. Table 5 below shows the hydraulic analysis outputs used to design the riprap protection.

Table 5 – GRT2 Hydraulic Output

Model Station	River Station	Q Total (cfs)	Max Chl Dpth (ft)	Vel Chnl (ft/s)	Froude # Chl	Invert Slope	Riprap Req.	Rock Type
8310.02	65+15	262	0.98	4.82	0.9	0.02	1.9	VL
8096	63+79	262	1.03	4.91	0.92	0.04	2.2	VL
8005	62+23	262	1.48	5.98	0.96	0.02	2.4	VL
7849	60+67	262	1.19	5.99	0.98	0.02	2.4	VL

These are not per approved deviation parameters or criteria

GRT2 (Geick Tributary 2) – Bend at approximate station 58+75

To protect against lateral scouring along the bend at approximate station 58+75, riprap lining will be placed at the bottom of the channel and along the bank of the outside of the bend. Table 6 below shows the hydraulic analysis outputs used to design the riprap protection.

Table 6 – GRT2 Hydraulic Output

Model Station	River Station	Q Total (cfs)	Max Chl Dpth (ft)	Vel Chnl (ft/s)	Froude # Chl	Invert Slope	Riprap Req.	Rock Type
7849	60+67	262	1.19	5.99	0.98	0.02	2.4	VL
7712	59+31	262	1.21	6.02	0.98	0.02	2.4	VL
7583	58+03	262	1.21	6.05	0.98	0.03	2.5	VL
7482	57+01	262	2.56	3.1	0.37	0.02	1.2	--
7395	56+29	262	3.69	1.72	0.16	0.02	0.7	--

Culvert Design

The design of the culverts for Geick Tributary 2 was performed iteratively in HEC-RAS. The goal of this design was to find culvert sizes that passed the 1% design storm event flows without overtopping the roadways. The low water crossing was designed using a manufacturer's standard detail and was not considered for overtopping; rather the design intent was to continue the regional pedestrian trail.

provide details including calculations and modeling

Drainage Fees

There are no drainage fees associated with the Geick Ranch Tributary basins.

Deviation Request (Update if necessary)

The are two deviations from criteria that are being requested for this project.

- **Section 10.5.3 Bottom Width**: The majority of channel B (Gieck Ranch Main Stem Tributary), is to see flows of less than 400 cfs and would not require a variance from section 10.5.3 as it would not be applicable. The final 700 feet of the channel are expected to see flow rates up to approximately 550 cfs during the 100-year flow events. It was requested that a channel less than 8 feet be permitted to facilitate a design that accounts for the wide range of expected flows through that stretch of the channel being designed. The final design considered the higher flow

rate and used a lower slope and armoring to prevent any negative degradation of the channel. The final design targeted a channel that is both stable and minimized required maintenance.

entire 2-year flow per above (no deviation)?

- **Section 10.5.4 Low Flow Channels**: It was requested that a low flow channel with a capacity of approximately 70% of the 2-year flow be permitted. By designing the low flow channel to convey 70% of the 2-year event, flows in excess would be able to overflow into the floodplain. By spreading these flows out, the overall flow depth was decreased which decreased the shears and velocities across the channel and allowed for a more natural stream to be created. Areas of riffles and pools were armored to prevent any degradation to the channel. Modeling and calculations indicated the channel width at the 100-year water surface elevation + freeboard would need to be 62.76' wide. The additional ~40' width to the overall corridor allows for maintenance access and for significant room to allow for flexibility in the naturalized channel design approach. Within the 62.76' valley the low flow channel is to meander in a fashion similar to what would be expected in an unaltered, stable reach based on the geomorphology of the project site.

Maintenance Considerations

Natural stream design approaches take into consideration short- and long-term maintenance needs by providing a high functioning low maintenance stream (HFLMS). By spreading more frequent storm events into the floodplain terrace, water is introduced into the upland species of the riparian corridor to provide irrigation flows. Maintenance is limited to mainly trash removal and noxious weed control; however, site inspections should still be performed after large storm events. As outlined above, the design takes into consideration various flow regimes in order to analyze proposed stream corridor stresses and apply low maintenance stabilization measures to help stabilize and control sediment degradation and aggradation within the channel.

State that a maintenance agreement and O&M Manual addressing all types of maintenance will be provided.

Conclusion

After evaluating the impacts of the proposed channel improvements to the segment of GRT2 between Eastonville Road to the northwest (upstream) and the south-central project boundary (downstream) it is anticipated that the BFE will not change outside of the project. The reevaluation of the 1% chance annual exceedance (100-year storm) event limits has been delineated and has a footprint for GRT2 that does not fall entirely within the boundary delineated in the FIRM effective 2018; this is largely due to the realignment of the channel, improved topography within the Zone A area and the overall footprint of the 100-year flood is significantly narrower than the previous delineation. BFEs at the location of tie in at the boundary of the site is not shown to rise more than 0.00' in the modeling completed in this assessment. This project will lead to a healthy stream corridor that will contain the 100-year storm and has the potential for self-regeneration after large storm events. Additionally, when future development does occur, this stream corridor will provide a pleasant outdoor area for local residents to recreate. The overall cost estimate for this project is approximately $5.1 million. See Appendix F for a breakdown of the costs.

6.3?

References

1. El Paso County Drainage Criteria Manual, 2018.
2. Drainage Criteria Manual, Volume 2, City of Colorado Springs, 2021.

3. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, January 2016 (with current revisions).
4. Grandview Reserve Master Development Drainage Plan (MDDP), HR Green, November 2020.

REVISION TO:
MASTER DEVELOPMENT
DRAINAGE PLAN
MERIDIAN RANCH
EL PASO COUNTY, COLORADO

AN RANCH

ATIONAL COMMUNITY

July 2021

Appendix A
Proposed Hydrology Calculations and Reference Materials

NOAA Atlas 14, Volume 8, Version 2
Location name: Peyton, Colorado, USA*
Latitude: 38.9859°, Longitude: -104.5647°
Elevation: 6982 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.239** (0.189-0.303)	**0.291** (0.231-0.370)	**0.381** (0.301-0.486)	**0.461** (0.361-0.589)	**0.576** (0.440-0.768)	**0.671** (0.499-0.904)	**0.770** (0.554-1.06)	**0.875** (0.604-1.24)	**1.02** (0.678-1.48)	**1.14** (0.733-1.67)
10-min	**0.350** (0.277-0.444)	**0.426** (0.338-0.542)	**0.558** (0.441-0.711)	**0.674** (0.529-0.863)	**0.844** (0.644-1.12)	**0.982** (0.731-1.32)	**1.13** (0.811-1.56)	**1.28** (0.884-1.81)	**1.49** (0.992-2.17)	**1.66** (1.07-2.44)
15-min	**0.426** (0.338-0.541)	**0.520** (0.412-0.660)	**0.681** (0.537-0.867)	**0.823** (0.645-1.05)	**1.03** (0.785-1.37)	**1.20** (0.891-1.62)	**1.37** (0.988-1.90)	**1.56** (1.08-2.21)	**1.82** (1.21-2.65)	**2.03** (1.31-2.98)
30-min	**0.608** (0.482-0.771)	**0.740** (0.586-0.940)	**0.968** (0.764-1.23)	**1.17** (0.916-1.49)	**1.46** (1.11-1.94)	**1.70** (1.26-2.28)	**1.94** (1.40-2.68)	**2.20** (1.52-3.12)	**2.57** (1.71-3.73)	**2.86** (1.84-4.19)
60-min	**0.775** (0.615-0.984)	**0.933** (0.739-1.18)	**1.21** (0.956-1.54)	**1.46** (1.15-1.87)	**1.84** (1.41-2.47)	**2.16** (1.61-2.92)	**2.49** (1.80-3.45)	**2.85** (1.97-4.05)	**3.37** (2.24-4.90)	**3.78** (2.44-5.54)
2-hr	**0.943** (0.754-1.19)	**1.12** (0.898-1.42)	**1.46** (1.16-1.84)	**1.76** (1.39-2.23)	**2.22** (1.72-2.97)	**2.62** (1.97-3.52)	**3.04** (2.21-4.19)	**3.50** (2.45-4.95)	**4.16** (2.80-6.03)	**4.70** (3.06-6.85)
3-hr	**1.03** (0.829-1.29)	**1.22** (0.978-1.53)	**1.57** (1.25-1.97)	**1.90** (1.51-2.40)	**2.41** (1.88-3.22)	**2.86** (2.17-3.84)	**3.34** (2.45-4.60)	**3.88** (2.73-5.48)	**4.66** (3.15-6.74)	**5.29** (3.46-7.69)
6-hr	**1.20** (0.968-1.48)	**1.40** (1.13-1.74)	**1.78** (1.44-2.22)	**2.16** (1.73-2.70)	**2.76** (2.18-3.66)	**3.28** (2.52-4.39)	**3.86** (2.86-5.29)	**4.51** (3.20-6.34)	**5.46** (3.73-7.86)	**6.24** (4.12-9.01)
12-hr	**1.38** (1.13-1.70)	**1.61** (1.31-1.98)	**2.05** (1.66-2.53)	**2.48** (2.00-3.07)	**3.15** (2.51-4.15)	**3.74** (2.89-4.96)	**4.39** (3.28-5.96)	**5.12** (3.66-7.13)	**6.17** (4.25-8.82)	**7.04** (4.69-10.1)
24-hr	**1.60** (1.31-1.95)	**1.87** (1.54-2.28)	**2.38** (1.94-2.91)	**2.85** (2.32-3.51)	**3.60** (2.88-4.67)	**4.24** (3.29-5.56)	**4.94** (3.71-6.63)	**5.71** (4.12-7.87)	**6.82** (4.73-9.66)	**7.73** (5.20-11.0)
2-day	**1.85** (1.54-2.24)	**2.18** (1.80-2.63)	**2.76** (2.28-3.34)	**3.29** (2.70-4.01)	**4.11** (3.30-5.27)	**4.80** (3.76-6.22)	**5.54** (4.19-7.36)	**6.35** (4.62-8.68)	**7.50** (5.25-10.5)	**8.44** (5.73-11.9)
3-day	**2.03** (1.69-2.44)	**2.39** (1.98-2.87)	**3.02** (2.50-3.64)	**3.60** (2.97-4.36)	**4.47** (3.60-5.69)	**5.20** (4.08-6.70)	**5.98** (4.55-7.90)	**6.83** (4.99-9.28)	**8.03** (5.65-11.2)	**9.00** (6.15-12.7)
4-day	**2.18** (1.82-2.61)	**2.56** (2.13-3.06)	**3.22** (2.68-3.87)	**3.82** (3.16-4.62)	**4.73** (3.83-6.00)	**5.49** (4.33-7.04)	**6.30** (4.81-8.30)	**7.18** (5.26-9.72)	**8.43** (5.94-11.7)	**9.43** (6.46-13.3)
7-day	**2.58** (2.17-3.07)	**2.98** (2.50-3.54)	**3.68** (3.08-4.39)	**4.32** (3.60-5.18)	**5.29** (4.30-6.65)	**6.09** (4.84-7.76)	**6.96** (5.34-9.09)	**7.89** (5.82-10.6)	**9.21** (6.55-12.8)	**10.3** (7.10-14.4)
10-day	**2.93** (2.48-3.47)	**3.36** (2.84-3.98)	**4.13** (3.47-4.90)	**4.81** (4.02-5.74)	**5.83** (4.76-7.28)	**6.68** (5.32-8.45)	**7.58** (5.85-9.86)	**8.55** (6.34-11.4)	**9.92** (7.08-13.7)	**11.0** (7.65-15.4)
20-day	**3.91** (3.33-4.58)	**4.51** (3.84-5.29)	**5.52** (4.68-6.50)	**6.39** (5.39-7.55)	**7.63** (6.25-9.37)	**8.62** (6.90-10.8)	**9.64** (7.47-12.4)	**10.7** (7.98-14.1)	**12.2** (8.74-16.6)	**13.3** (9.31-18.4)
30-day	**4.70** (4.02-5.47)	**5.44** (4.65-6.34)	**6.65** (5.66-7.78)	**7.66** (6.49-9.00)	**9.06** (7.44-11.0)	**10.1** (8.15-12.5)	**11.2** (8.74-14.3)	**12.3** (9.24-16.2)	**13.8** (9.98-18.7)	**15.0** (10.5-20.6)
45-day	**5.67** (4.88-6.57)	**6.55** (5.63-7.60)	**7.97** (6.82-9.27)	**9.12** (7.77-10.7)	**10.7** (8.79-12.9)	**11.9** (9.56-14.5)	**13.0** (10.2-16.4)	**14.2** (10.6-18.4)	**15.6** (11.3-21.0)	**16.7** (11.9-23.0)
60-day	**6.48** (5.60-7.48)	**7.46** (6.43-8.62)	**9.01** (7.74-10.4)	**10.3** (8.77-11.9)	**11.9** (9.82-14.3)	**13.1** (10.6-16.0)	**14.3** (11.2-18.0)	**15.5** (11.7-20.0)	**16.9** (12.3-22.6)	**18.0** (12.8-24.6)

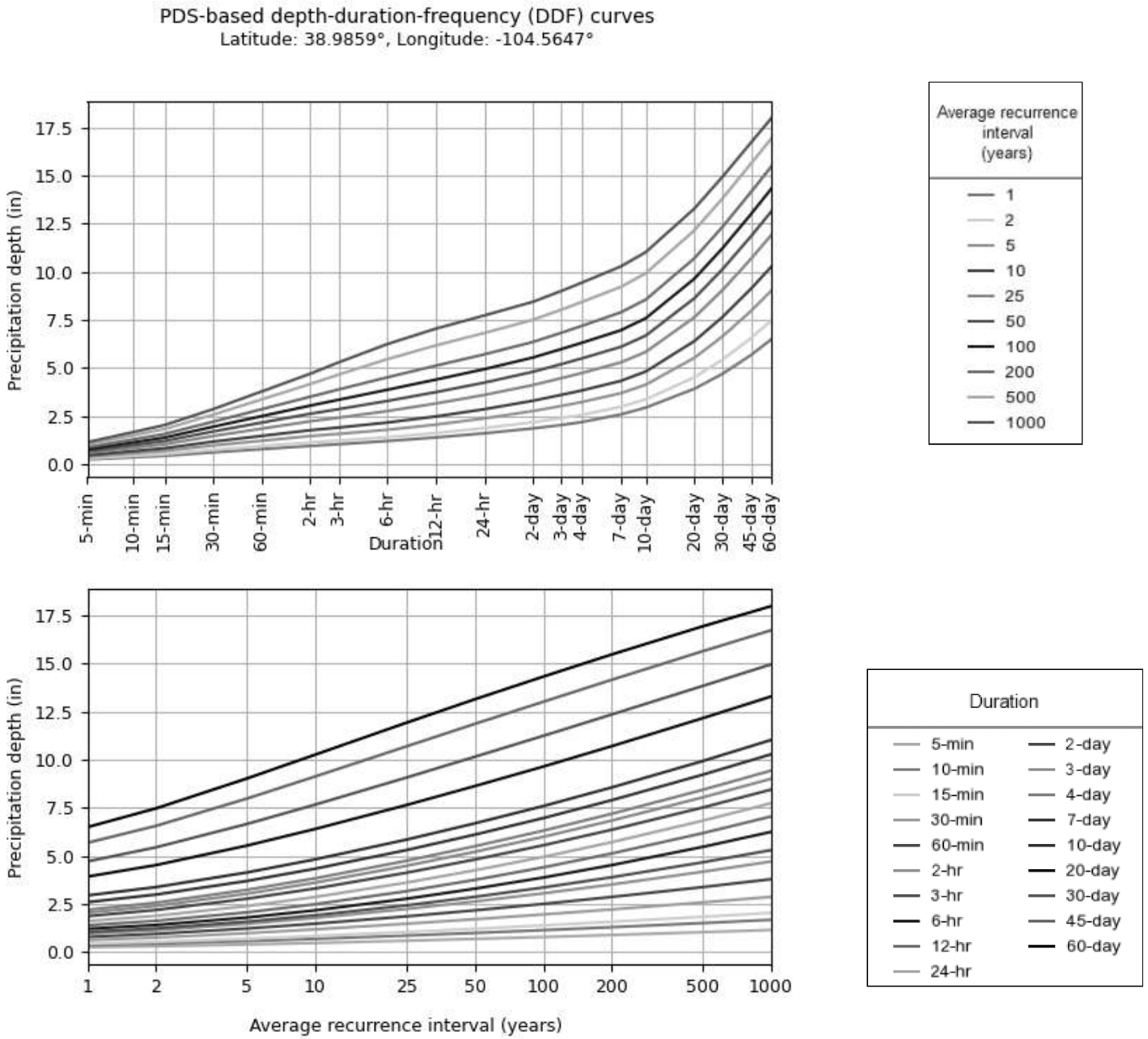
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



NOAA Atlas 14, Volume 8, Version 2

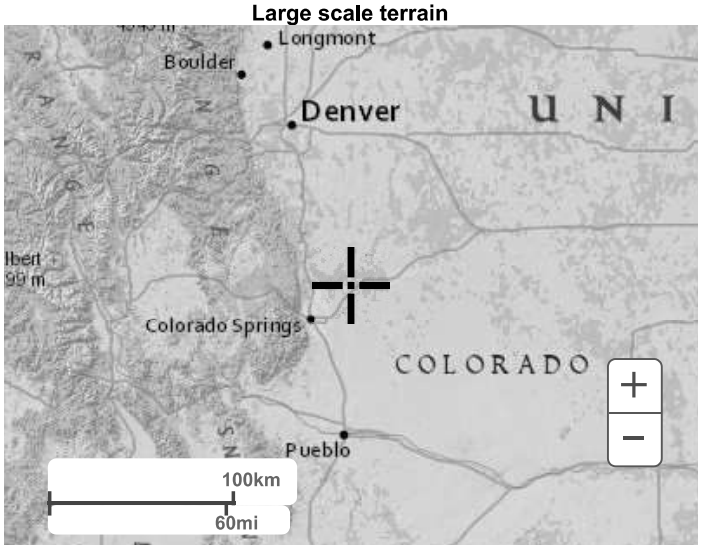
Created (GMT): Mon Nov 6 00:36:21 2023

Back to Top

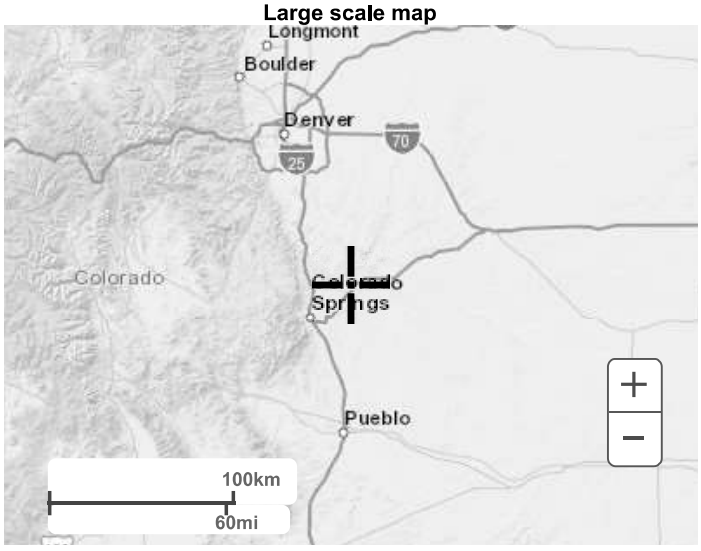
Maps & aerials

Small scale terrain

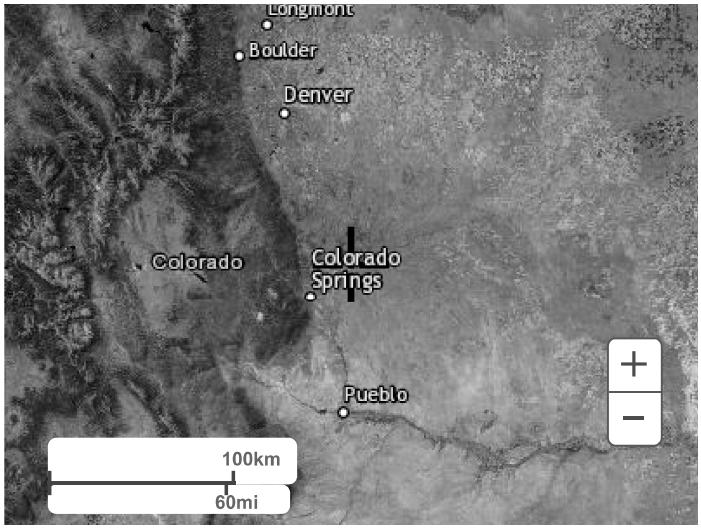
Large scale terrain



Large scale map



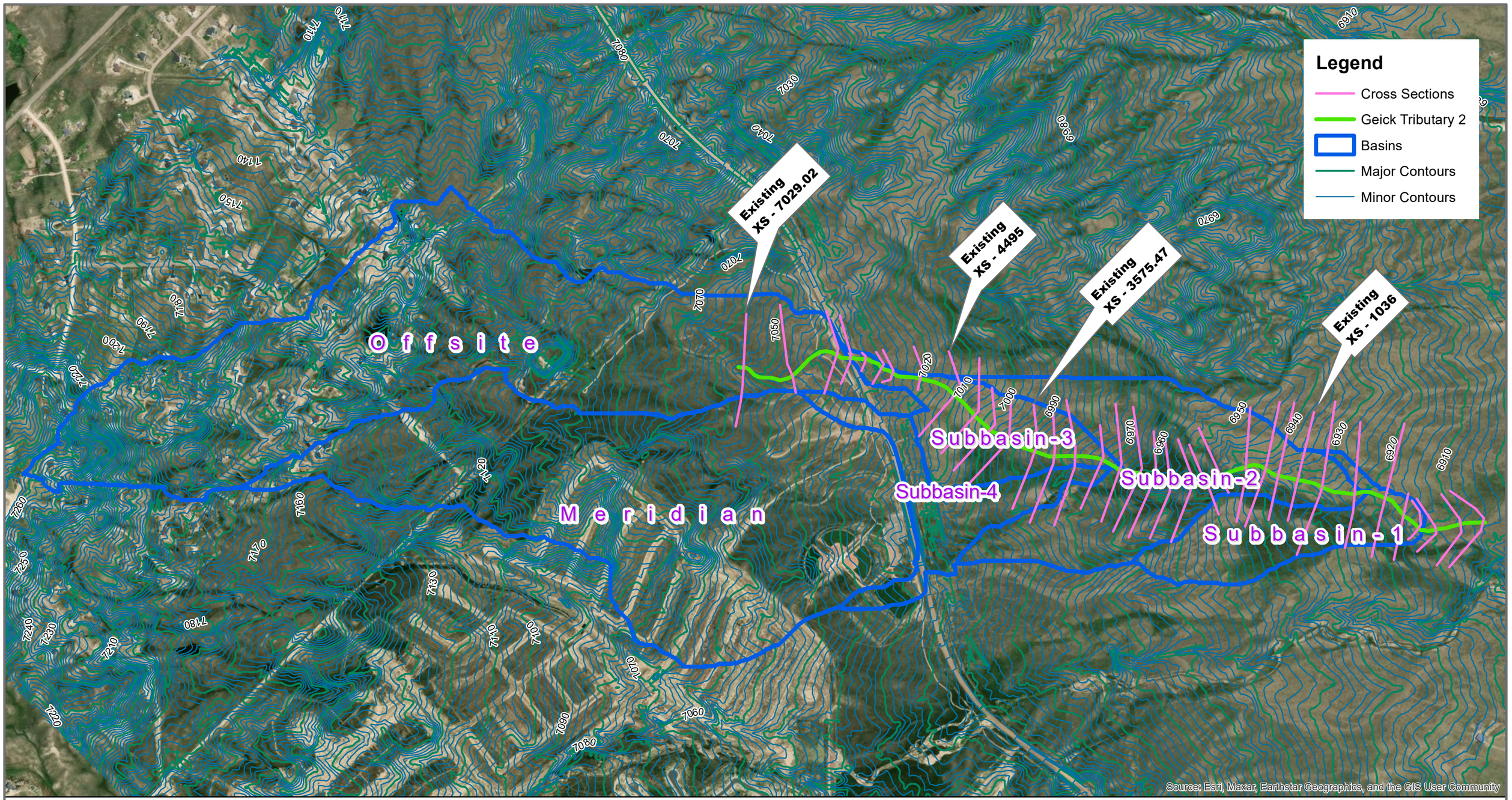
Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer



Grandview Tributary 2
Topographic Hydrologic Work Map

Datum = NAVD88

N

0 0.1 0.2 0.4 Miles

HRGreen®

Building Communities. Improving Lives.

REVISION TO:
MASTER DEVELOPMENT
DRAINAGE PLAN
MERIDIAN RANCH
EL PASO COUNTY, COLORADO

MERIDIAN RANCH

A GOLF & RECREATIONAL COMMUNITY

July 2021

Prepared For:

GTL DEVELOPMENT, INC.
P.O. Box 80036
San Diego, CA 92138

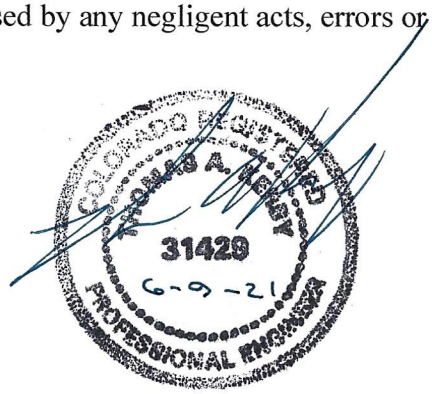
Prepared By:
Tech Contractors
11886 Stapleton Drive
Falcon, CO 80831
719.495.7444

PCD Project No. SKP-21003

CERTIFICATIONS

Design Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.



Thomas A. Kerby, P.E.
#31429

Owner/Developer's Statement:

I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

Raul Guzman, Vice President
GTL Development, Inc.
P.O. Box 80036
San Diego, CA 92138

July 8, 2021
Date

El Paso County:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 & 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

Jennifer Irvine, P.E.
County Engineer / ECM Administrator

APPROVED
Engineering Department
07/15/2021 8:53:01 AM
dsdnijkamp
EPC Planning & Community Development Department

The land cover assumptions for the portion of the GRT2 drainage basin that is being developed were altered to be consistent with these parameters

EXECUTIVE SUMMARY

The purpose of the revision to the following Master Development Drainage Plan is to present updated conceptual drainage improvements for the remaining undeveloped portions of the Meridian Ranch Development based upon the proposed sketch plan amendment and to update data from within the development tributary to area of interest. Runoff quantities and proposed facilities have been calculated using the current City of Colorado Springs/El Paso County Drainage Criteria Manual (DCM) (1994 version) and portions of the City of Colorado Springs Drainage Criteria Manual, Volume 1 (DCM-1) ((2014 version). Concepts presented in this report will be refined and specific improvements addressed during the Final Plat process.

The revisions included within this report include the density increase as proposed with this sketch plan amendment. The previous revision to the MDDP (2017) included the removal of the 40-acre business park near the northwest corner of Stapleton Dr. and Eastonville Rd. and repurposing it to residential land use. The developed calculations reflect the density increase sought in this revision.

The hydrologic calculations within this report follow method outlined in Chapter 6 of the 2014 version of the City of Colorado Springs Drainage Criteria Manual (COSDCM) as adopted by the El Paso County Board of County Commissioners by Resolution 15-042. Chapter 6 addresses the hydrologic calculation methods and includes an updated hydrograph to be used with storm drainage runoff. The Board adopted by the same resolution, Section 3.2.1 of Chapter 13 of the COSDCM referencing Full Spectrum Detention; the concept "provides better control of the full range of runoff rates that pass-through detention facilities than the convention multi-stage concept. This section of the COSDCM identifies the necessity to provide full spectrum detention but does not prescribe a methodology to reach such the detention requirements. This report includes hydrologic models from HEC-HMS for the historic and future conditions for the 2-yr, 5-yr, 10-yr, 50-yr, and 100-yr design storm frequencies. The future conditions include detention facilities sized and modeled such that *"frequent and infrequent inflows are released at rates approximating undeveloped conditions."*

On November 16, 2000 the El Paso County Board of County Commissioners approved the rezoning of the Meridian Ranch project (PUD-00-010) from A-35 to PUD with several conditions. Condition number seven stated in part that "drainage plans shall release and/or retain at approximately eighty percent (80%) of historic rates." The previous report (2017 MDDP) removed this condition and allow the project to release developed flow at historic rates as outlined in the current City of Colorado Springs/El Paso County Drainage Criteria Manual (DCM) (1994 version) and those portions of the City of Colorado Springs Drainage Criteria Manual, Volume 1 (DCM-1) ((2014 version) adopted by the El Paso County Board of County Commissioners by Resolution No. 15-042.

The original boundary limits of Meridian Ranch encompassed 2620 acre proposed development and is located approximately 12 miles northeast of the City of Colorado Springs, 2.5 miles north of the town of Falcon and immediately north of the Woodmen Hills development.

The Sketch Plan amendment includes all the remaining 197 acres of the undeveloped portion of Meridian Ranch. Of the undeveloped land it is proposed to have 110 acres of residential development, 49 acres of open space, drainage/detention facilities and park sites, and 38 acres of R.O.W.

The calculated developed flow rates greater than the historic discharge flow rates will be mitigated with the use of full spectrum detention facilities to be located within the project and along eastern boundary of the project. The Meridian Ranch Development will not adversely impact the downstream properties.

Subbasin	CN	L [mi]	L [ft]	Y	Y[%]	S	Tc [hr]	Tc [min]	Lag [hr]	Lag [min]
1	79.41	0.52	2727.6	0.023	2.31	2.59	0.79	47.52	0.4752	28.51
2	73.76	0.75	3954.4	0.022	2.21	3.56	1.29	77.24	0.7724	46.35
3	72.81	0.34	1782.5	0.023	2.34	3.73	0.68	40.76	0.4076	24.46
4	70.32	0.42	2238.8	0.027	2.66	4.22	0.82	49.10	0.491	29.46
Meridian	80.16	1.37	7254.6	0.024	2.37	2.48	1.67	100.17	1.0017	60.10
Offsite	78.64	1.76	9293.3	0.027	2.68	2.72	2.01	120.52	1.2052	72.31

Time of Concentration (Tc)

Time taken by a rainfall drop to travel from the farthest point in the watershed to the outlet.

$$T_c = \frac{\ell^{0.8}(S+1)^{0.7}}{1{,}140 Y^{0.5}} \qquad \text{Lag} = 0.6T_c$$

where:

L = lag, h
T_c = time of concentration, h
ℓ = flow length, ft
Y = average watershed land slope, %
S = maximum potential retention, in

$$S = \frac{1000}{CN} - 10$$

(American Units; $0 < CN < 100$)

Project: M G
Simulation Run: 100-year
Simulation Start: 1 January 2023, 01:00
Simulation End: 2 January 2023, 01:00

HMS Version: 4.11
Executed: 26 March 2024, 16:21

Global Parameter Summary - Subbasin

Location

Element Name	Longitude Degrees	Latitude Degrees
Offsite	-104.57	39
Meridian	-104.57	38.99
Subbasin - 3	-104.56	38.99
Subbasin - 4	-104.57	38.99
Subbasin - 2	-104.56	38.99
Subbasin - 1	-104.56	38.98

Area (MI2)

Element Name	Area (MI2)
Offsite	0.33
Meridian	0.3
Subbasin - 3	0.05
Subbasin - 4	0.04
Subbasin - 2	0.12
Subbasin - 1	0.05

Downstream

Element Name	Downstream
Offsite	Reach - 3
Meridian	Reach - 4
Subbasin - 3	Reach - 2
Subbasin - 4	Reach - 2
Subbasin - 2	Reach - 1
Subbasin - 1	Sink - 1

Loss Rate: Scs

Element Name	Percent Impervious Area	Curve Number	Initial Abstraction
Offsite	0	78.64	0
Meridian	0	80.16	0
Subbasin - 3	0	72.81	0
Subbasin - 4	0	70.32	0
Subbasin - 2	0	73.76	0
Subbasin - 1	0	79.41	0

Transform: Scs

Element Name	Lag	Unitgraph Type
Offsite	72.31	Standard
Meridian	60.1	Standard
Subbasin - 3	24.46	Standard
Subbasin - 4	29.46	Standard
Subbasin - 2	46.35	Standard
Subbasin - 1	28.51	Standard

Global Parameter Summary - Reach

Downstream

Element Name	Downstream
Reach - 3	Reach - 2
Reach - 4	Reach - 2
Reach - 2	Reach - 1
Reach - 1	Sink - 1

Route: Muskingum Cunge

Element Name	Method	Channel	Length (FT)	Energy Slope (FT/FT)	Mannings n	Bottom Width (FT)	Side Slope (FT/FT)	Initial Variable	Space - Time Method	Index Parameter Type	Index Celerity	Nu Sub
Reach - 3	Muskingum Cunge	Trapezoid	1865.37	0.03	0.04	38.76	4	Combined Inflow	Automatic DX and DT	Index Celerity	1.33	
Reach - 4	Muskingum Cunge	Trapezoid	1902.61	0.02	0.04	38.76	4	Combined Inflow	Automatic DX and DT	Index Celerity	1.33	
Reach - 2	Muskingum Cunge	Trapezoid	2337.51	0.02	0.04	38.76	4	Combined Inflow	Automatic DX and DT	Index Celerity	1.33	
Reach - 1	Muskingum Cunge	Trapezoid	849.59	0.01	0.04	38.76	4	Combined Inflow	Automatic DX and DT	Index Celerity	1.33	

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Offsite	0.33	241.65	01Jan2023, 14:20	3.14
Reach - 3	0.33	241.33	01Jan2023, 14:25	3.12
Meridian	0.3	261.88	01Jan2023, 14:05	3.25
Reach - 4	0.3	261.88	01Jan2023, 14:10	3.24
Subbasin - 3	0.05	62.65	01Jan2023, 13:30	2.8
Subbasin - 4	0.04	47.38	01Jan2023, 13:35	2.65
Reach - 2	0.72	536.09	01Jan2023, 14:15	3.11
Subbasin - 2	0.12	103.28	01Jan2023, 13:50	2.84
Reach - 1	0.84	621.27	01Jan2023, 14:10	3.07
Subbasin - 1	0.05	67.11	01Jan2023, 13:35	3.22
Sink - 1	0.89	649.23	01Jan2023, 14:10	3.08

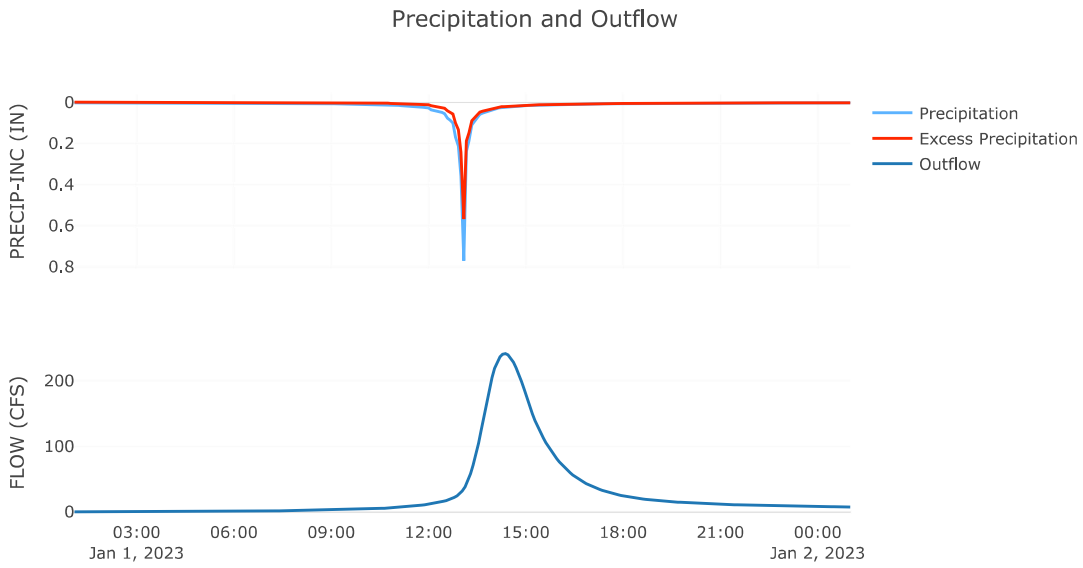
Subbasin: Offsite

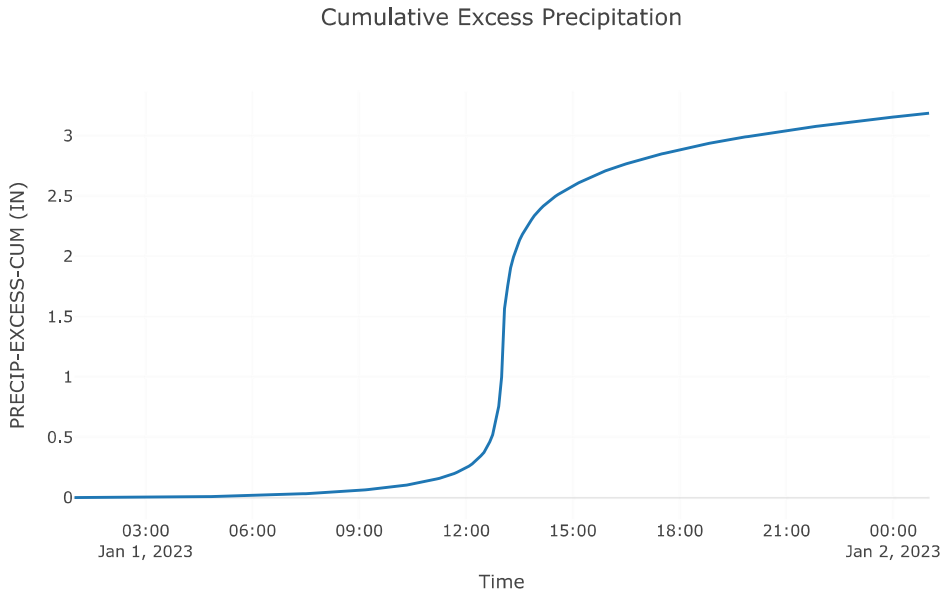
Area (MI2) : 0.33
Latitude Degrees : 39
Longitude Degrees : -104.57
Downstream : Reach - 3

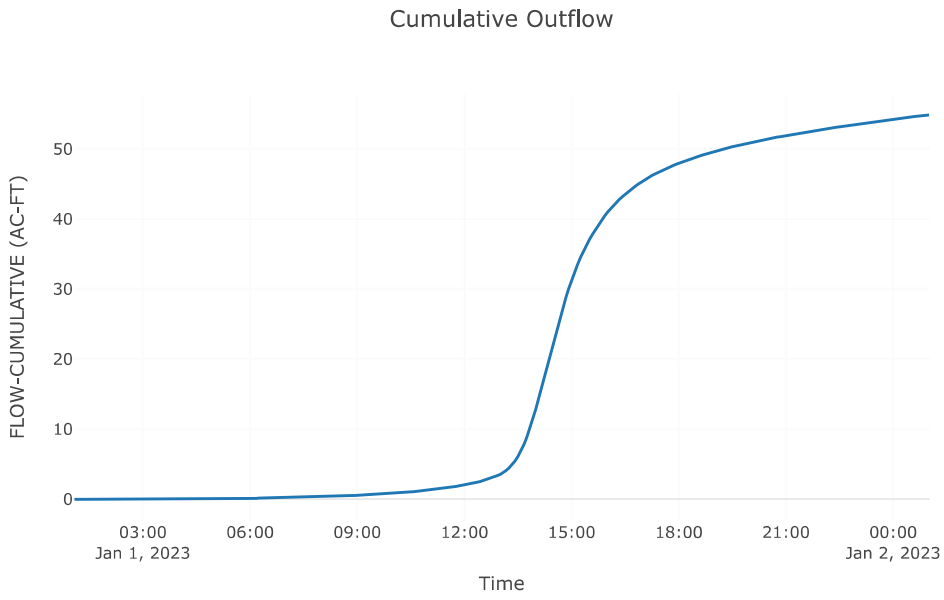
Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	78.64
Initial Abstraction	0

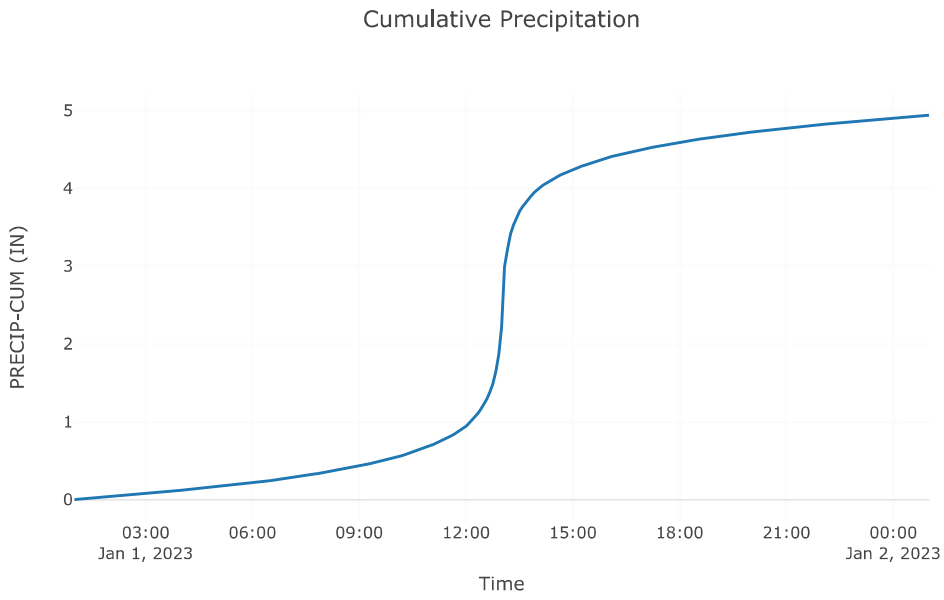
Transform: Scs	
Lag	72.31
Unitgraph Type	Standard

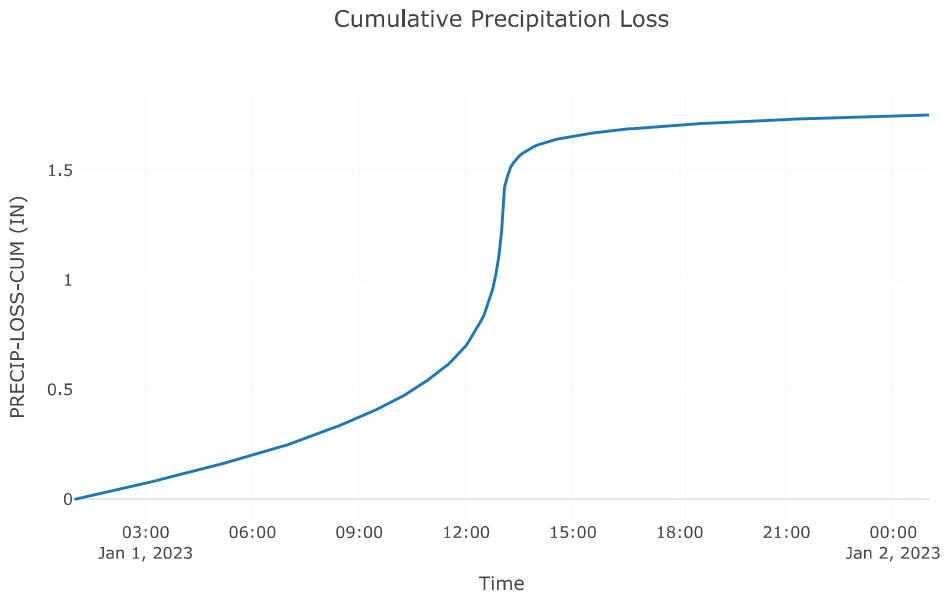
Results: Offsite	
Peak Discharge (CFS)	241.65
Time of Peak Discharge	01Jan2023, 14:20
Volume (IN)	3.14
Precipitation Volume (AC - FT)	86.48
Loss Volume (AC - FT)	30.69
Excess Volume (AC - FT)	55.8
Direct Runoff Volume (AC - FT)	54.89
Baseflow Volume (AC - FT)	0

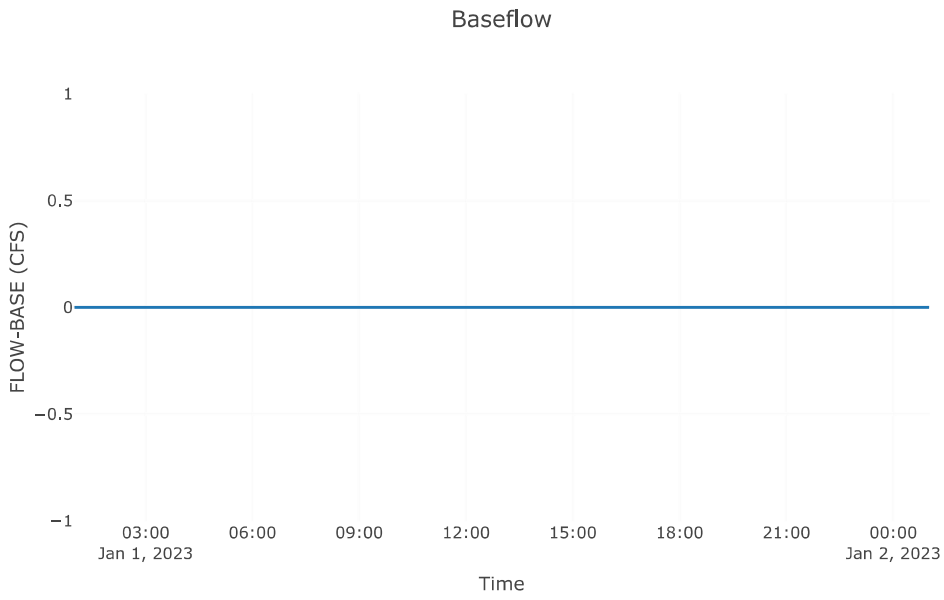

Precipitation and Outflow
PRECIP-INC (IN)
0
0.2
0.4
0.6
0.8
Precipitation
Excess Precipitation
Outflow
FLOW (CFS)
200
100
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023

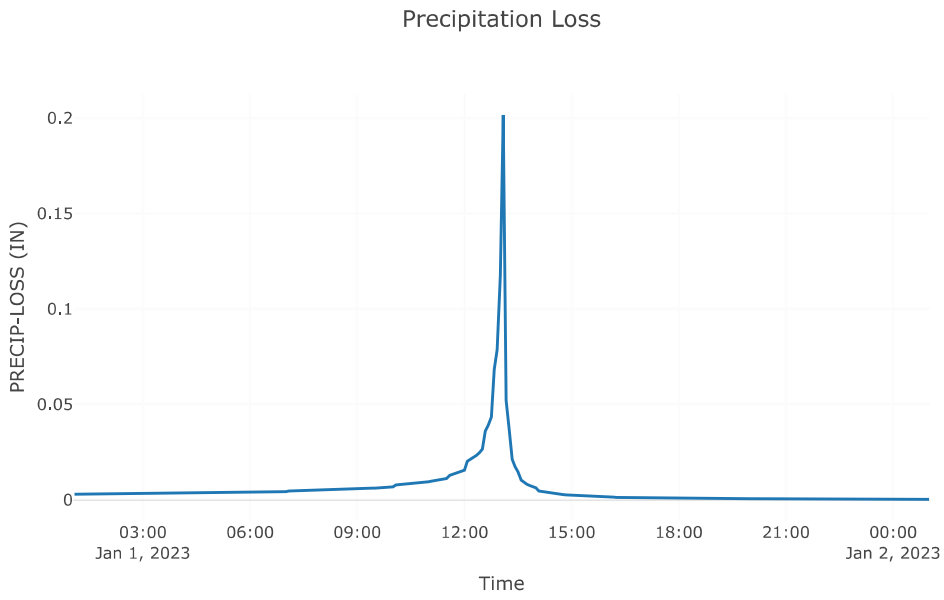

Cumulative Excess Precipitation
PRECIP-EXCESS-CUM (IN)
3
2.5
2
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

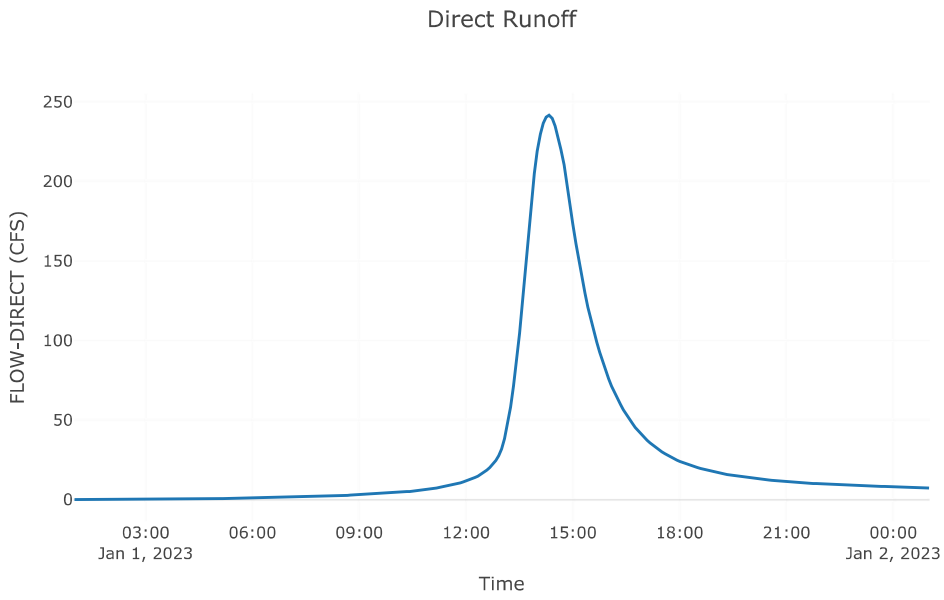

Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
50
40
30
20
10
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

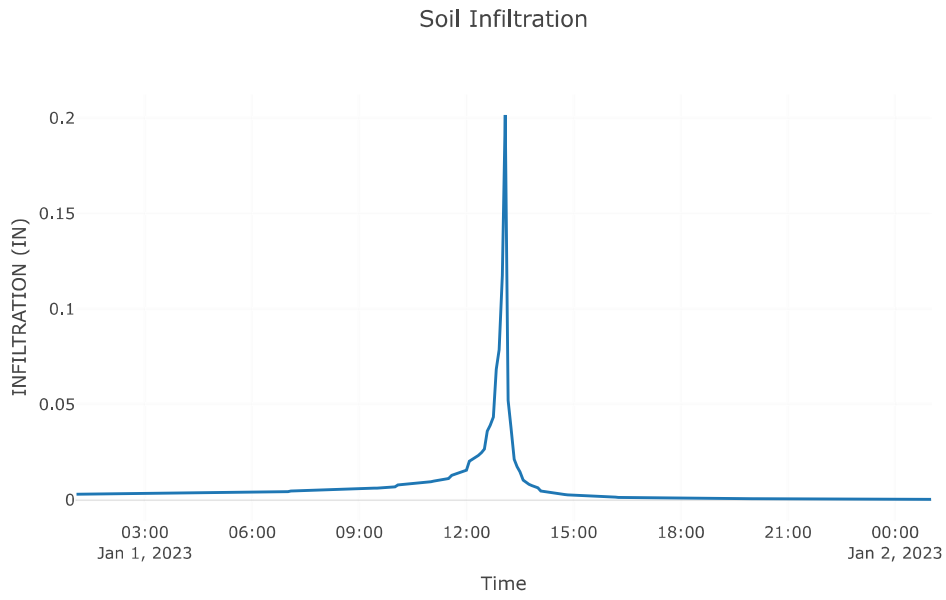

Cumulative Precipitation
PRECIP-CUM (IN)
5
4
3
2
1
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Precipitation Loss
PRECIP-LOSS-CUM (IN)
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Baseflow
FLOW-BASE (CFS)
1
0.5
0
−0.5
−1
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Precipitation Loss
PRECIP-LOSS (IN)
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Direct Runoff
FLOW-DIRECT (CFS)
250
200
150
100
50
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

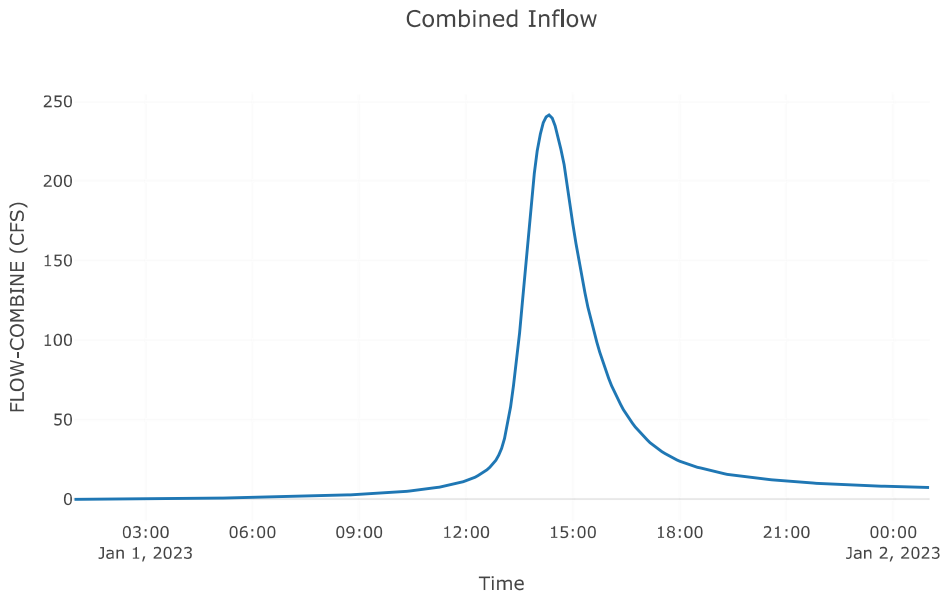

Soil Infiltration
INFILTRATION (IN)
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

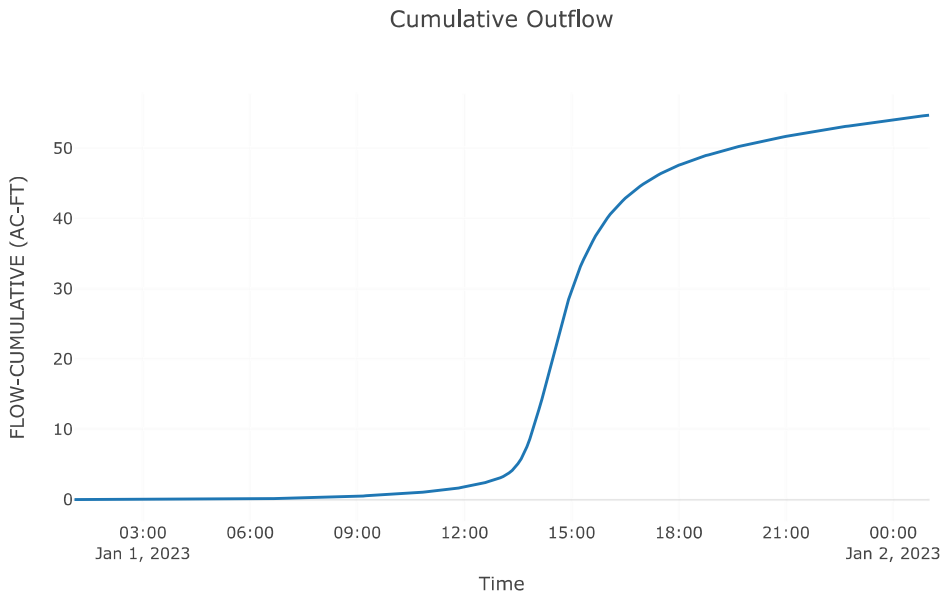
Reach: Reach-3

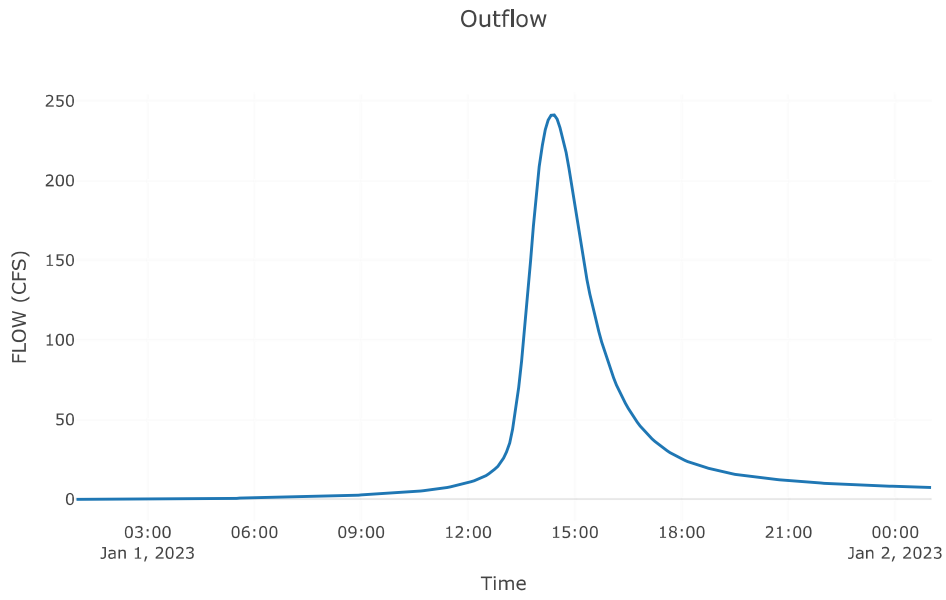
Downstream : Reach - 2

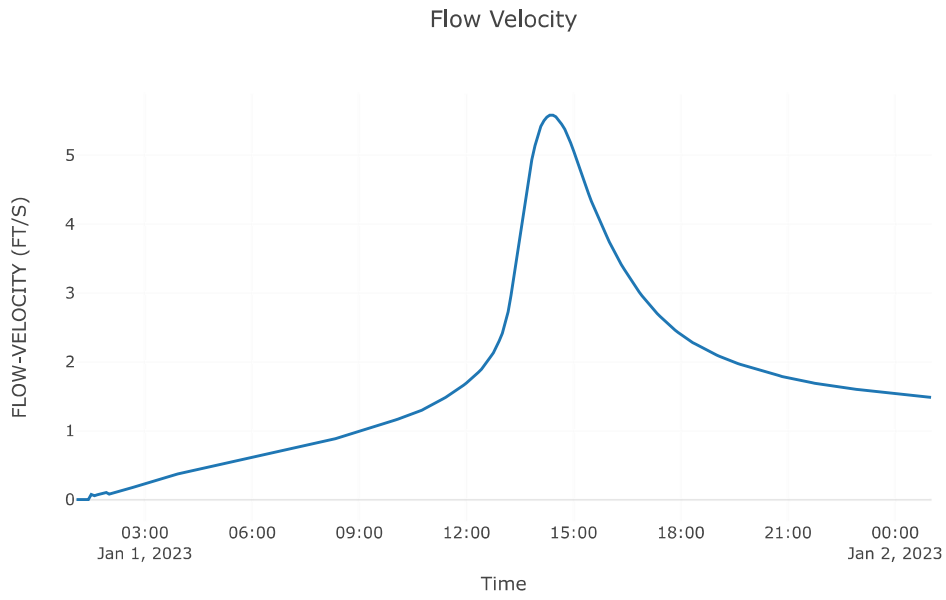
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Trapezoid
Length (FT)	1865.37
Energy Slope (FT/FT)	0.03
Mannings n	0.04
Bottom Width (FT)	38.76
Side Slope (FT/FT)	4
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Celerity
Index Celerity	1.33
Number Subreaches	1
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-3	
Peak Discharge (CFS)	241.33
Time of Peak Discharge	01Jan2023, 14:25
Volume (IN)	3.12
Peak Inflow (CFS)	241.65
Inflow Volume (AC - FT)	54.89


Combined Inflow
FLOW-COMBINE (CFS)
250
200
150
100
50
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
50
40
30
20
10
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Outflow
250
200
150
100
50
0
FLOW (CFS)
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Flow Velocity
5
4
3
2
1
0
FLOW-VELOCITY (FT/S)
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

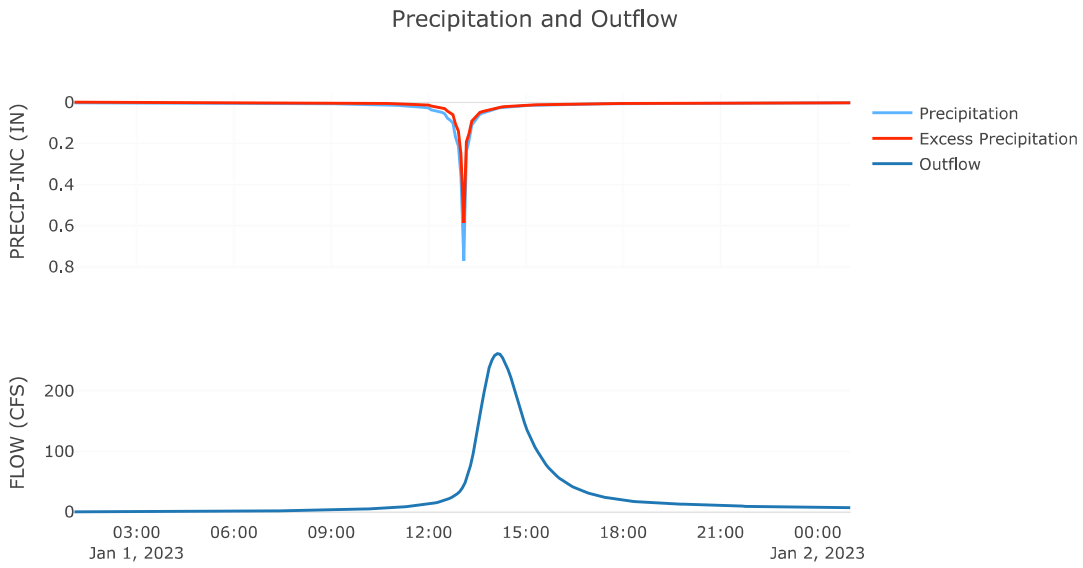
Subbasin: Meridian

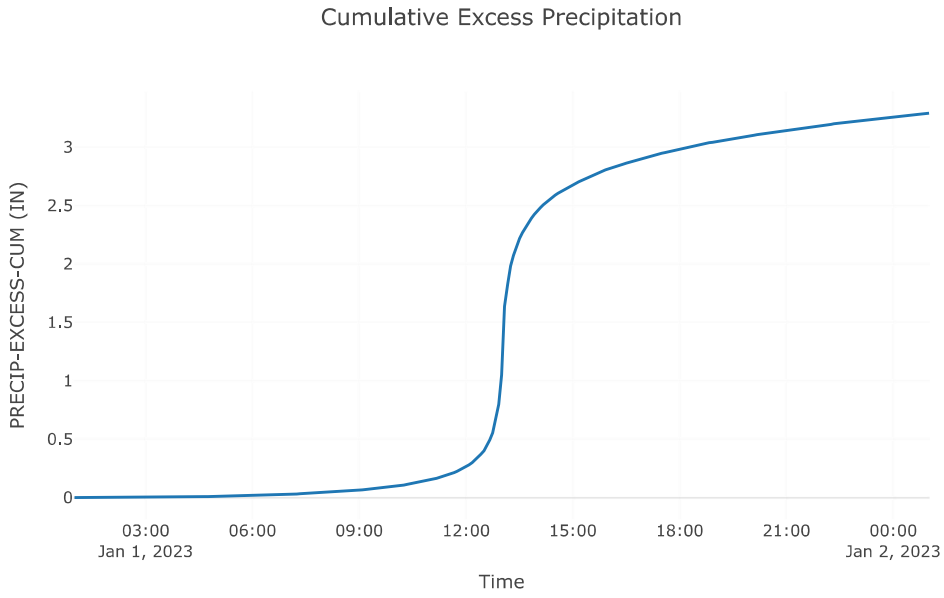
Area (MI2) : 0.3
Latitude Degrees : 38.99
Longitude Degrees : -104.57
Downstream : Reach - 4

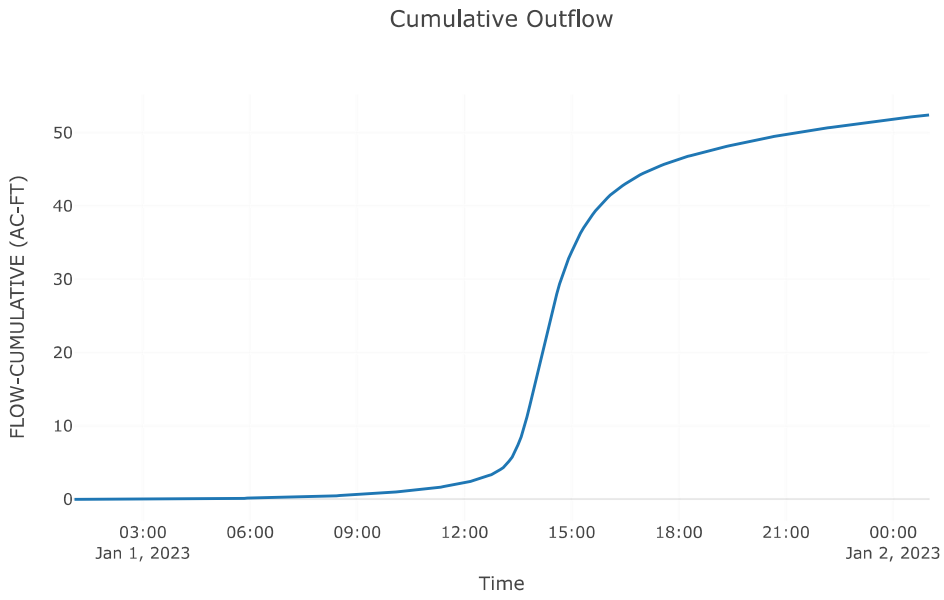
Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	80.16
Initial Abstraction	0

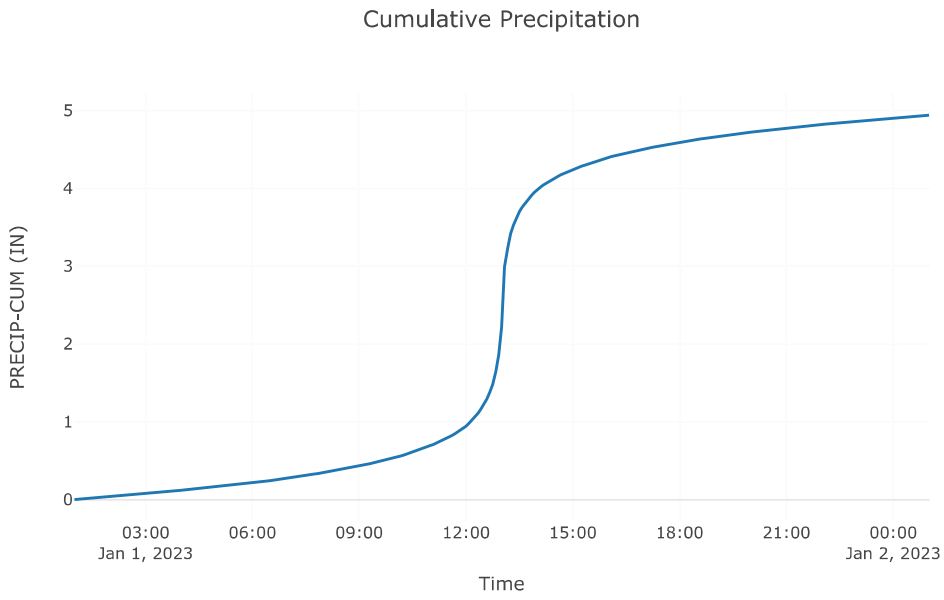
Transform: Scs	
Lag	60.1
Unitgraph Type	Standard

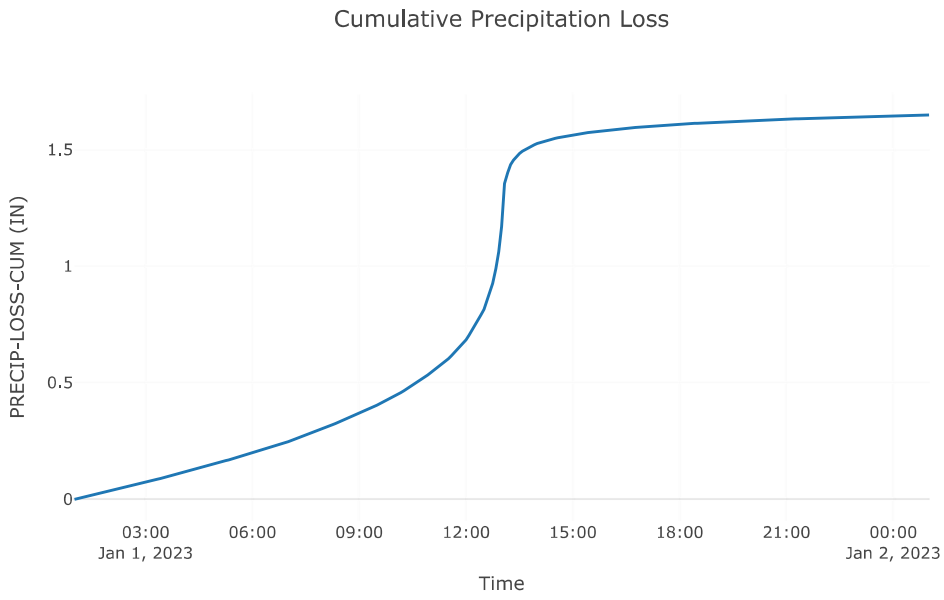
Results: Meridian	
Peak Discharge (CFS)	261.88
Time of Peak Discharge	01Jan2023, 14:05
Volume (IN)	3.25
Precipitation Volume (AC - FT)	79.77
Loss Volume (AC - FT)	26.63
Excess Volume (AC - FT)	53.14
Direct Runoff Volume (AC - FT)	52.44
Baseflow Volume (AC - FT)	0

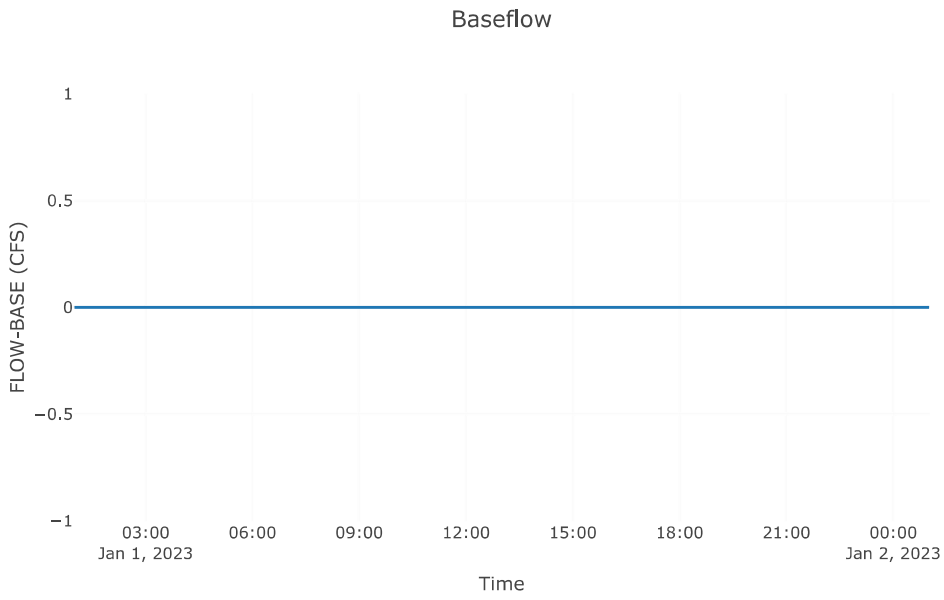

Precipitation and Outflow
PRECIP-INC (IN)
0
0.2
0.4
0.6
0.8
Precipitation
Excess Precipitation
Outflow
FLOW (CFS)
200
100
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023

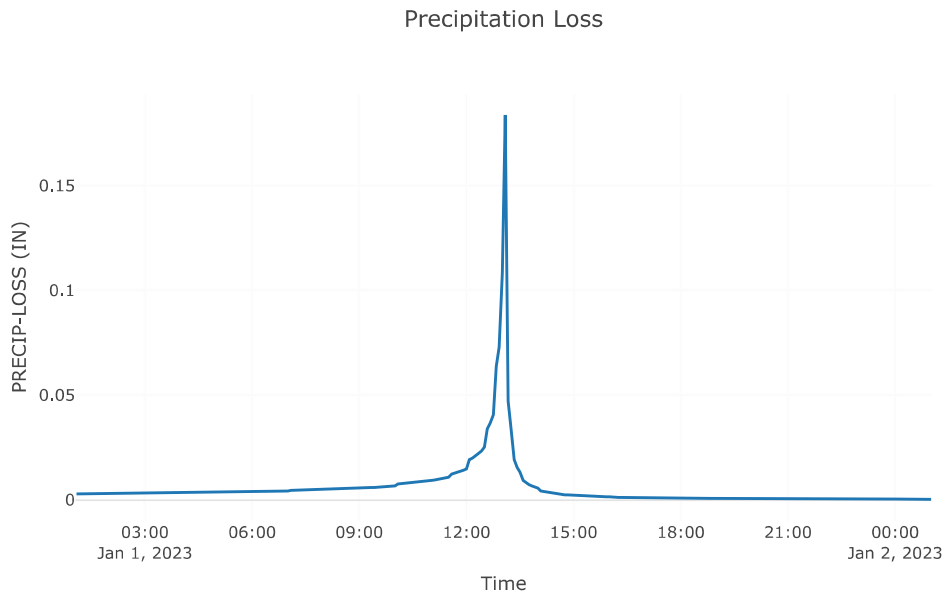

Cumulative Excess Precipitation
PRECIP-EXCESS-CUM (IN)
3
2.5
2
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

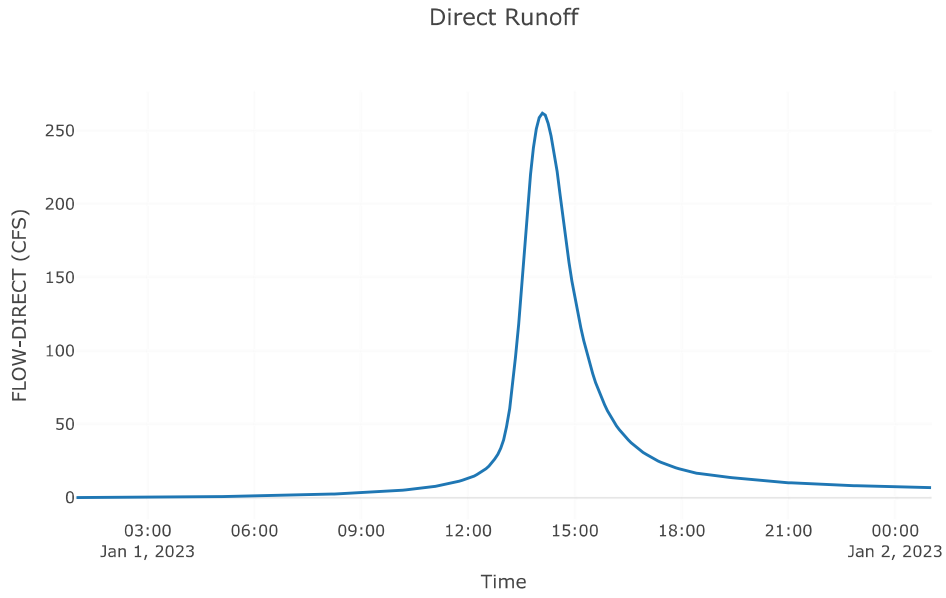

Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
50
40
30
20
10
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

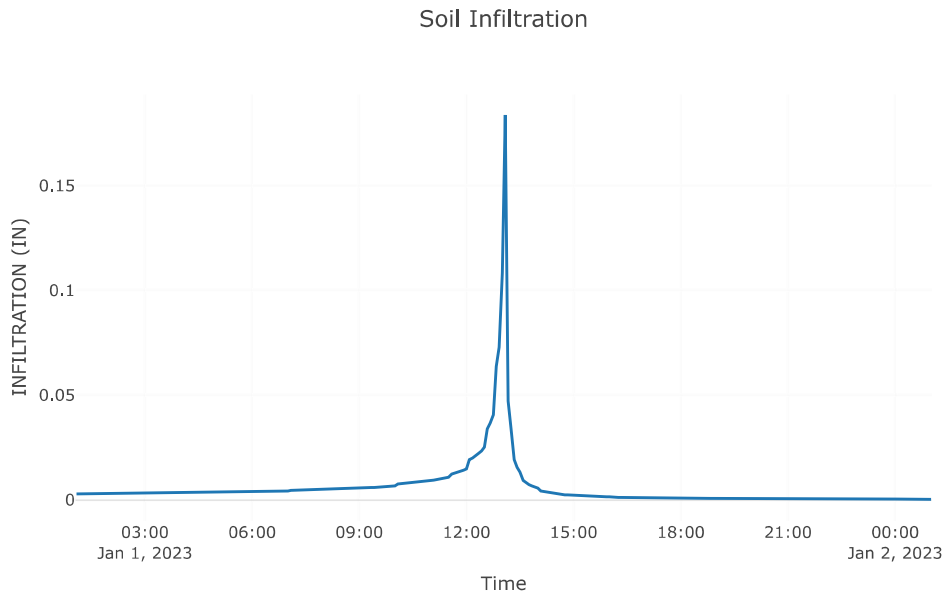

Cumulative Precipitation
PRECIP-CUM (IN)
5
4
3
2
1
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Precipitation Loss
PRECIP-LOSS-CUM (IN)
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Baseflow
FLOW-BASE (CFS)
1
0.5
0
−0.5
−1
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Precipitation Loss
PRECIP-LOSS (IN)
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Direct Runoff
FLOW-DIRECT (CFS)
250
200
150
100
50
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

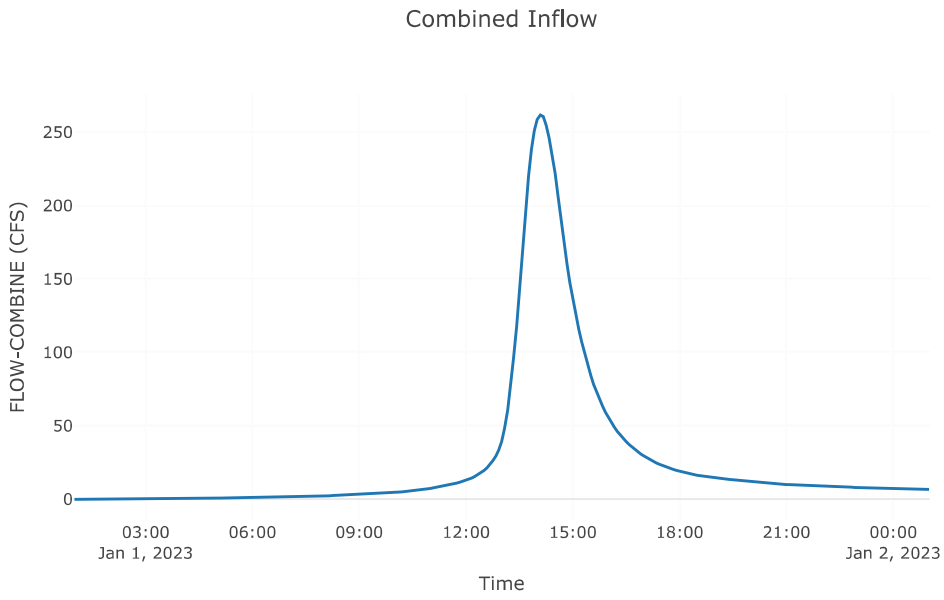

Soil Infiltration
INFILTRATION (IN)
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

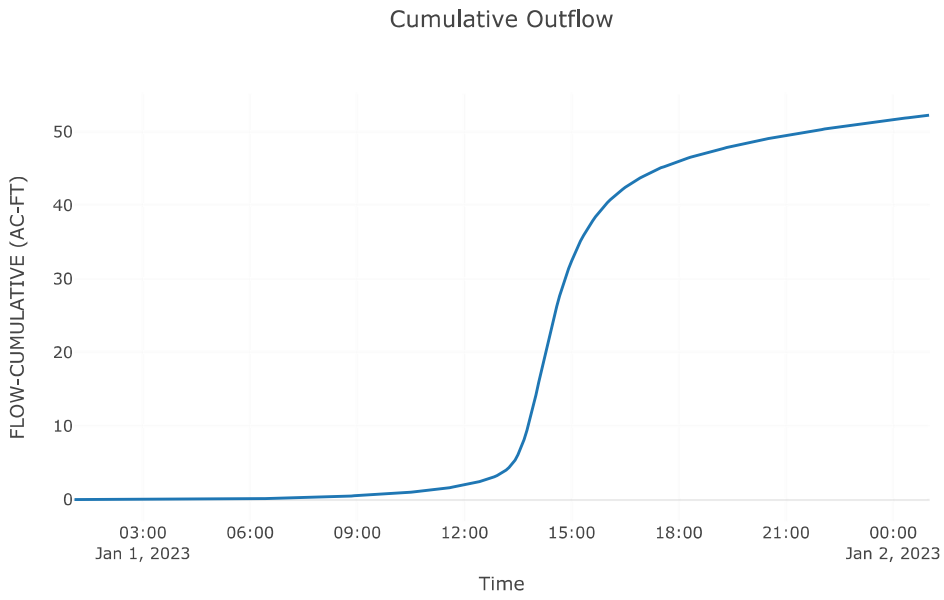
Reach: Reach-4

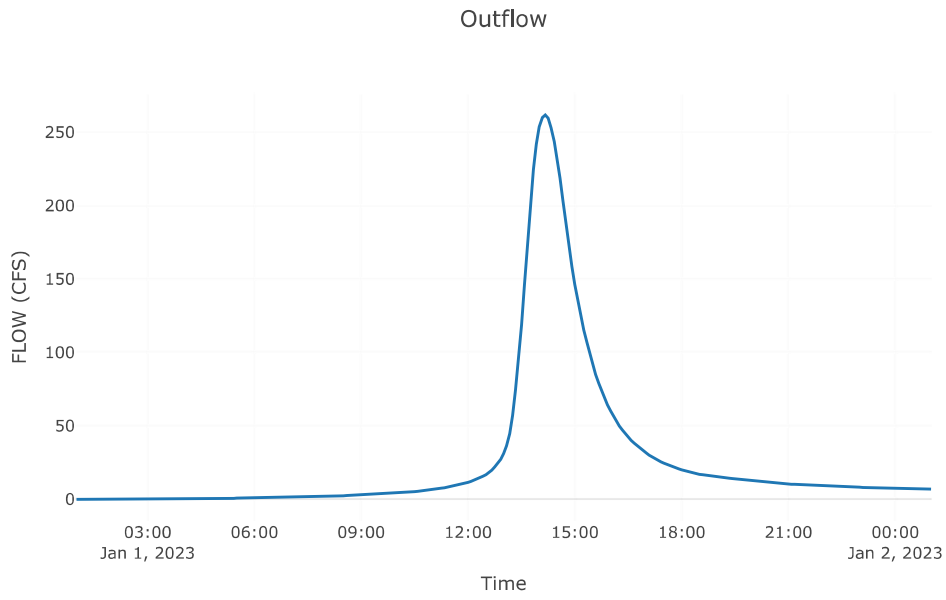
Downstream : Reach - 2

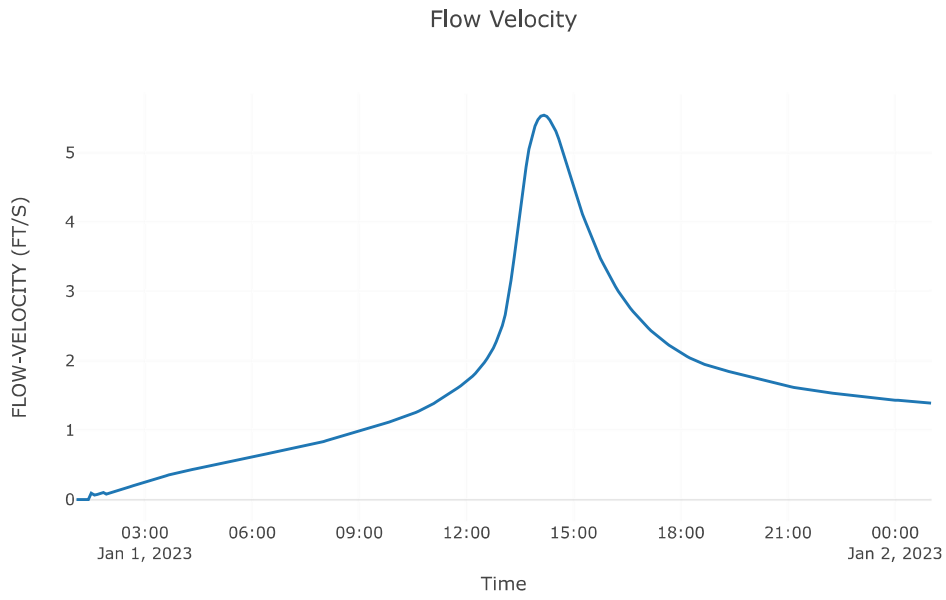
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Trapezoid
Length (FT)	1902.61
Energy Slope (FT/FT)	0.02
Mannings n	0.04
Bottom Width (FT)	38.76
Side Slope (FT/FT)	4
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Celerity
Index Celerity	1.33
Number Subreaches	1
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-4	
Peak Discharge (CFS)	261.88
Time of Peak Discharge	01Jan2023, 14:10
Volume (IN)	3.24
Peak Inflow (CFS)	261.88
Inflow Volume (AC - FT)	52.44


Combined Inflow
FLOW-COMBINE (CFS)
250
200
150
100
50
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
50
40
30
20
10
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Outflow
250
200
150
100
50
0
FLOW (CFS)
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Flow Velocity
5
4
3
2
1
0
FLOW-VELOCITY (FT/S)
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

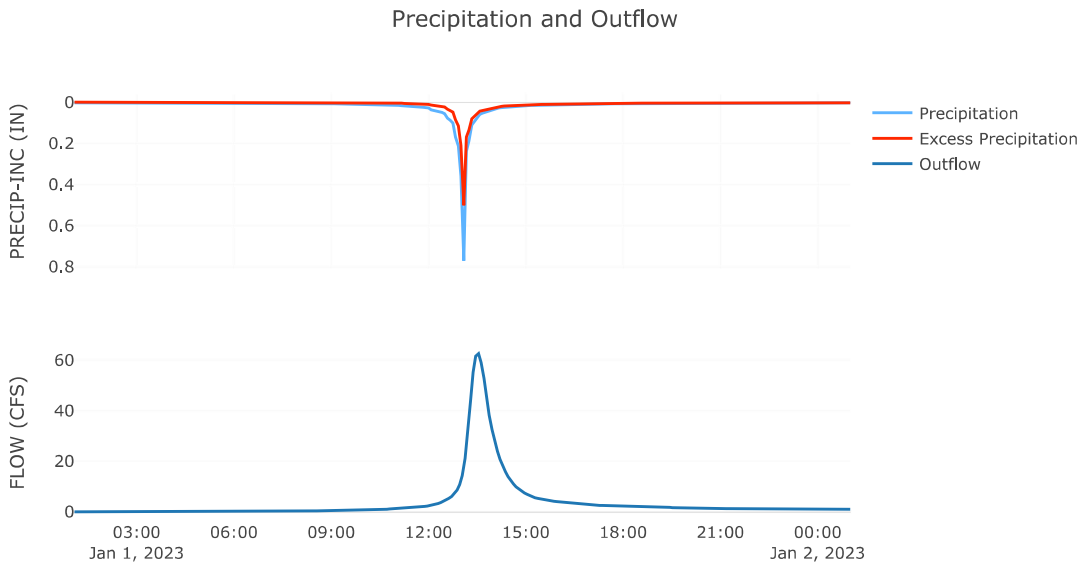
Subbasin: Subbasin-3

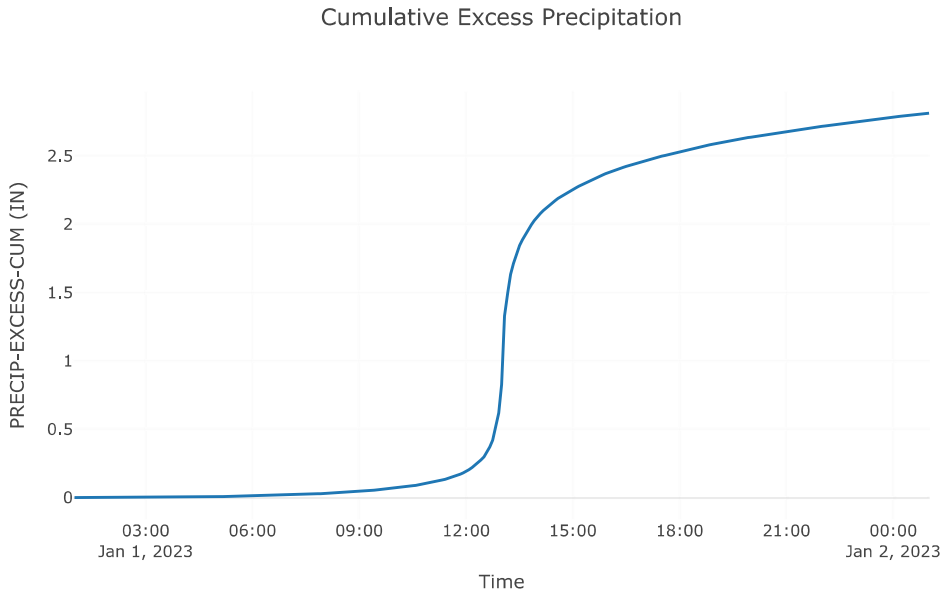
Area (MI2) : 0.05
Latitude Degrees : 38.99
Longitude Degrees : -104.56
Downstream : Reach - 2

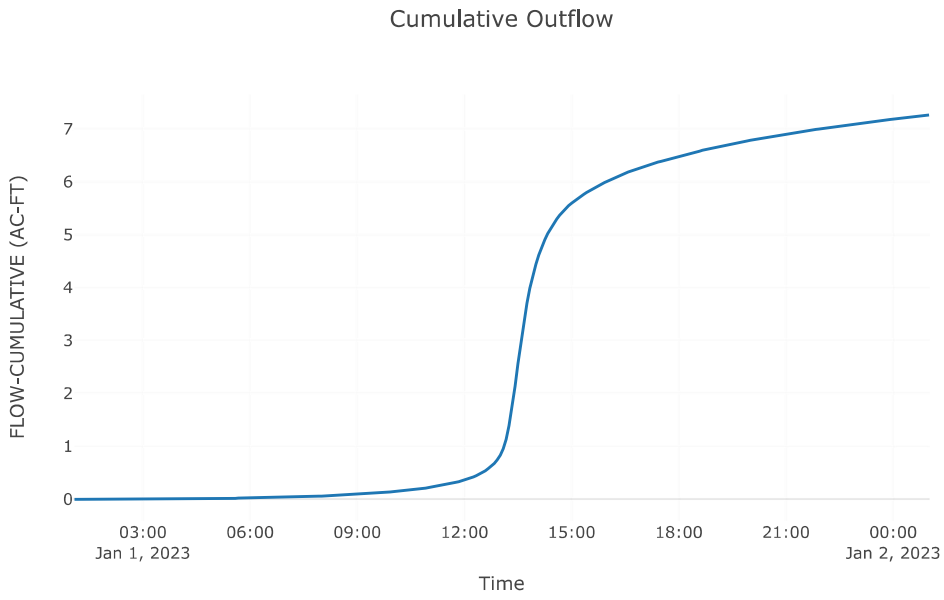
Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	72.81
Initial Abstraction	0

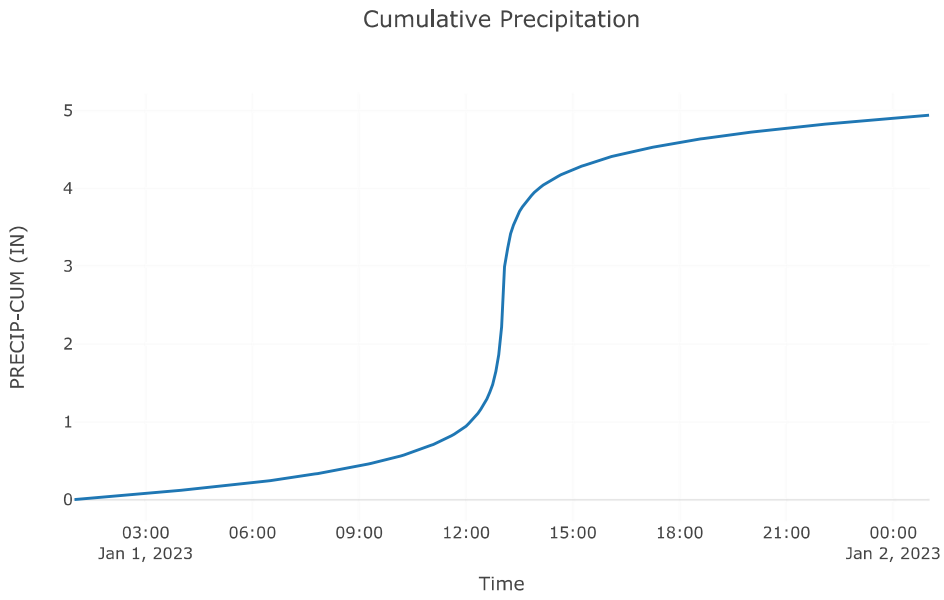
Transform: Scs	
Lag	24.46
Unitgraph Type	Standard

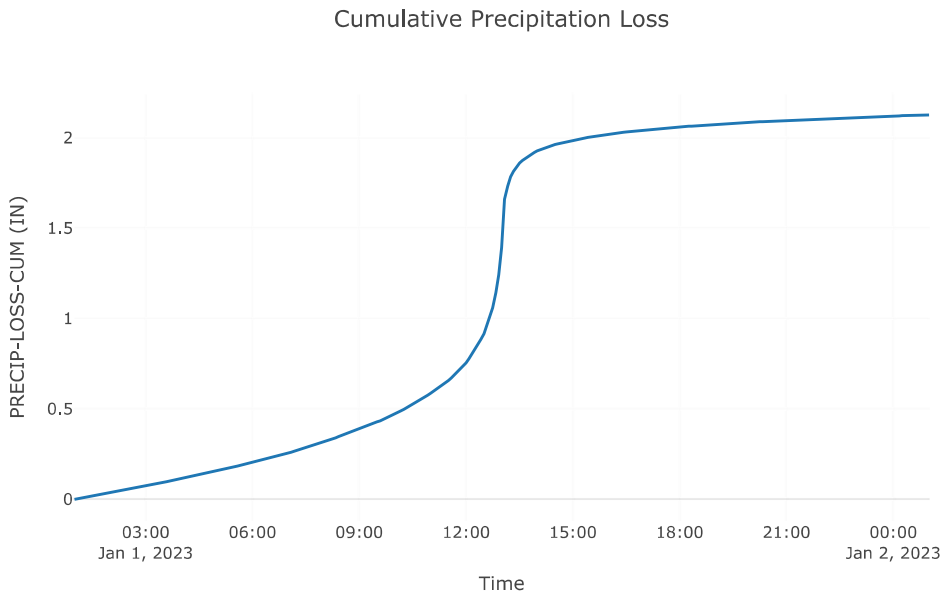
Results: Subbasin-3	
Peak Discharge (CFS)	62.65
Time of Peak Discharge	01Jan2023, 13:30
Volume (IN)	2.8
Precipitation Volume (AC - FT)	12.83
Loss Volume (AC - FT)	5.52
Excess Volume (AC - FT)	7.31
Direct Runoff Volume (AC - FT)	7.27
Baseflow Volume (AC - FT)	0

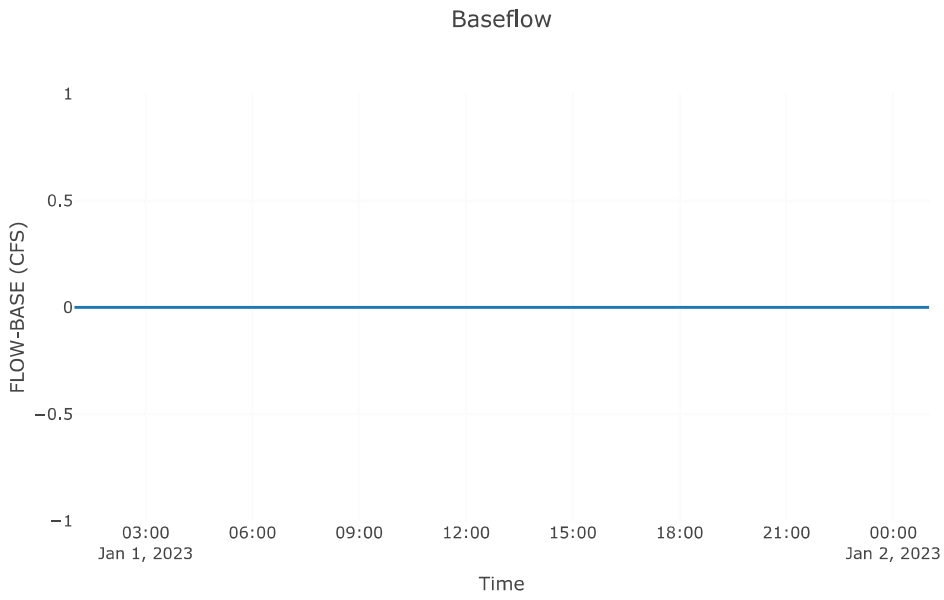

Precipitation and Outflow
PRECIP-INC (IN)
0
0.2
0.4
0.6
0.8
Precipitation
Excess Precipitation
Outflow
FLOW (CFS)
60
40
20
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023

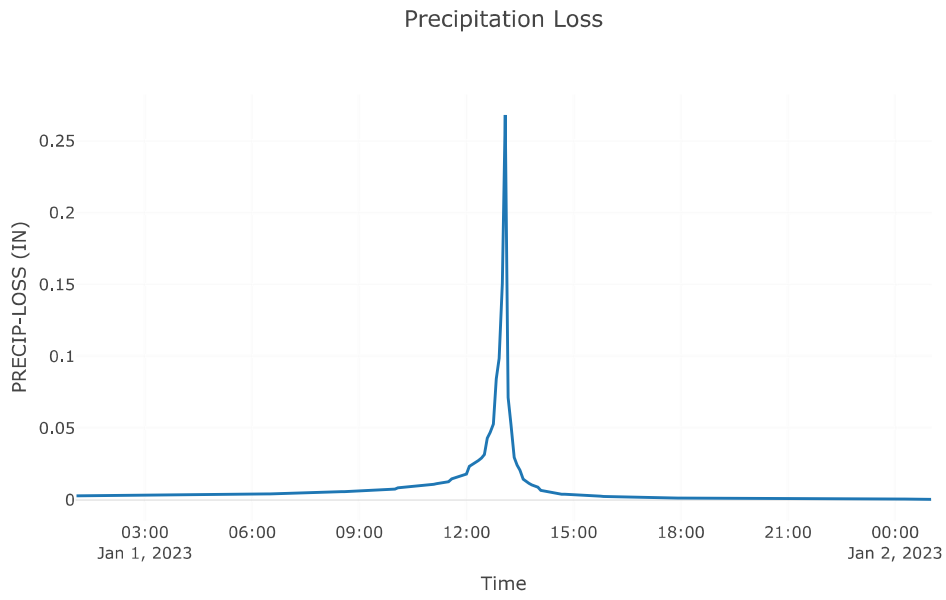

Cumulative Excess Precipitation
PRECIP-EXCESS-CUM (IN)
2.5
2
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

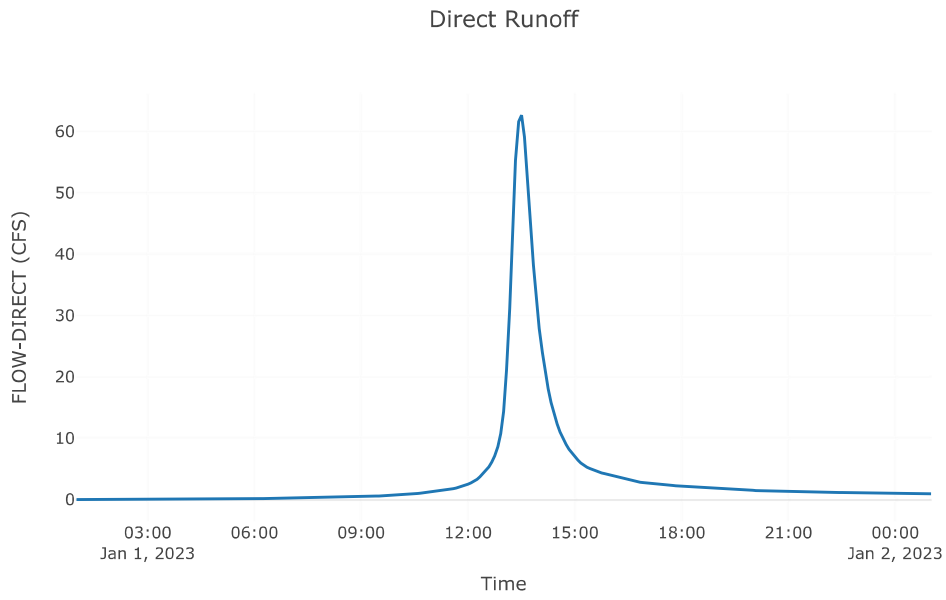

Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
0
1
2
3
4
5
6
7
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

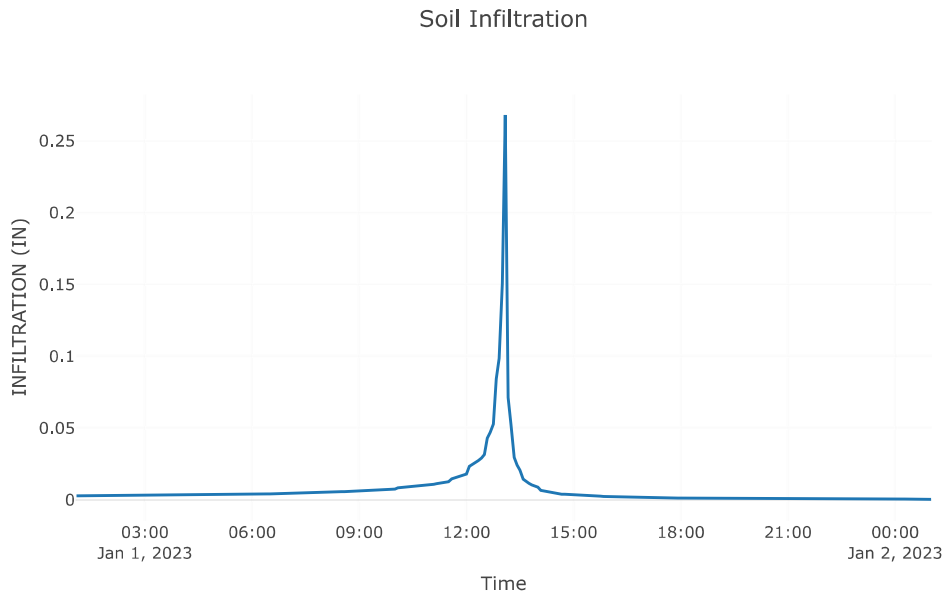

Cumulative Precipitation
PRECIP-CUM (IN)
0
1
2
3
4
5
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Precipitation Loss
PRECIP-LOSS-CUM (IN)
2
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Baseflow
FLOW-BASE (CFS)
1
0.5
0
−0.5
−1
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Precipitation Loss
PRECIP-LOSS (IN)
0.25
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Direct Runoff
FLOW-DIRECT (CFS)
60
50
40
30
20
10
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Soil Infiltration
INFILTRATION (IN)
0.25
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

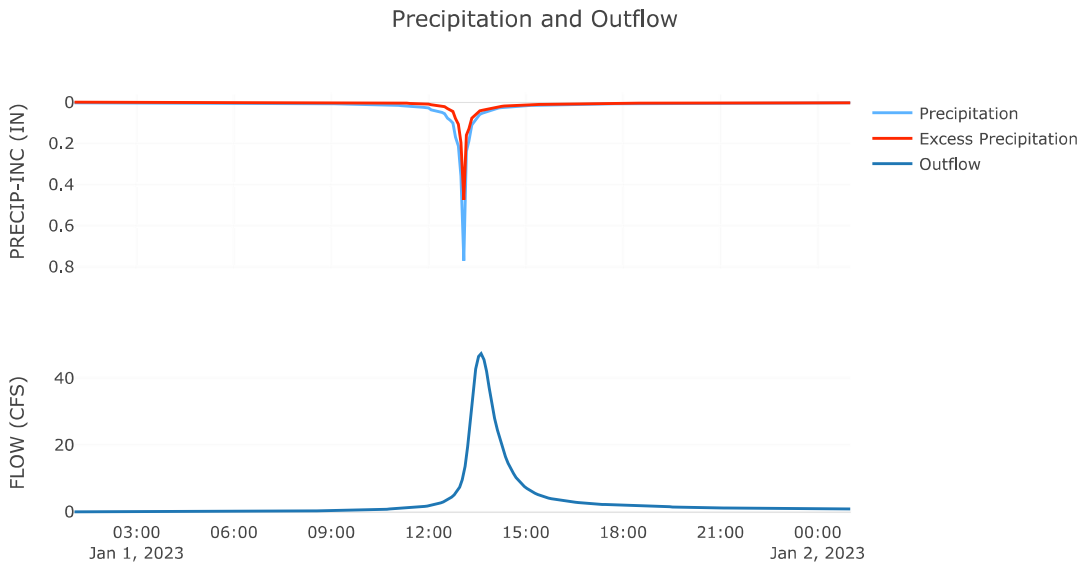
Subbasin: Subbasin-4

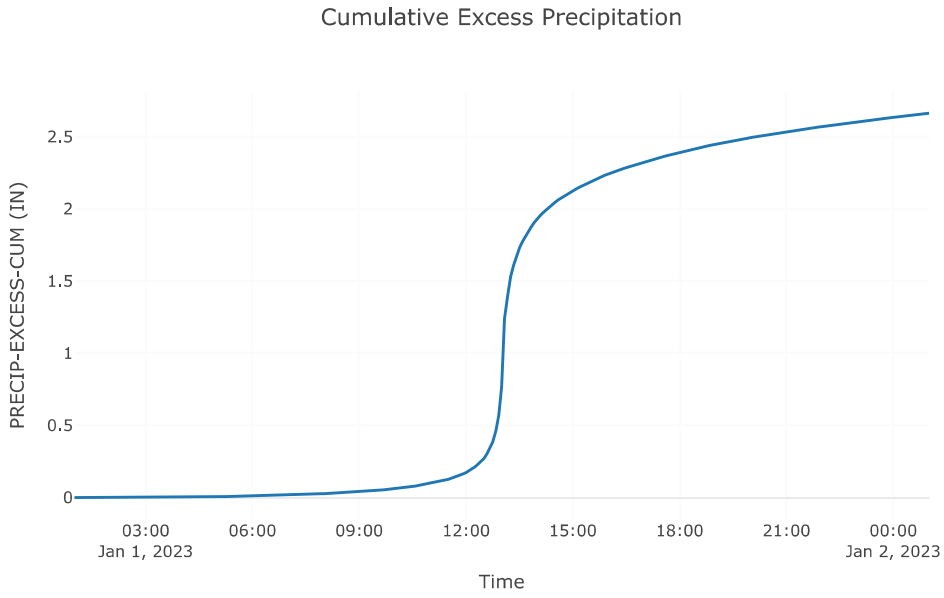
Area (MI2) : 0.04
Latitude Degrees : 38.99
Longitude Degrees : -104.57
Downstream : Reach - 2

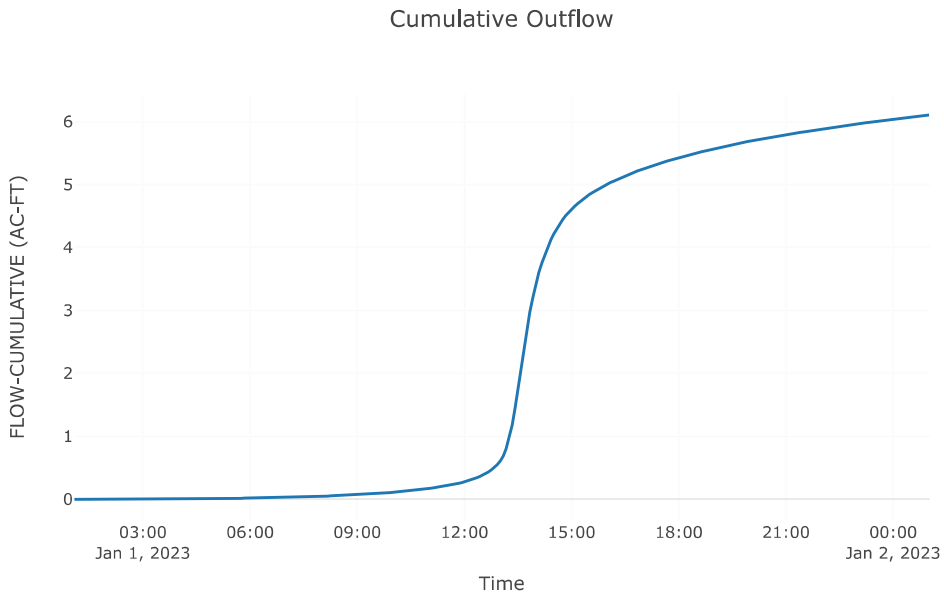
Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	70.32
Initial Abstraction	0

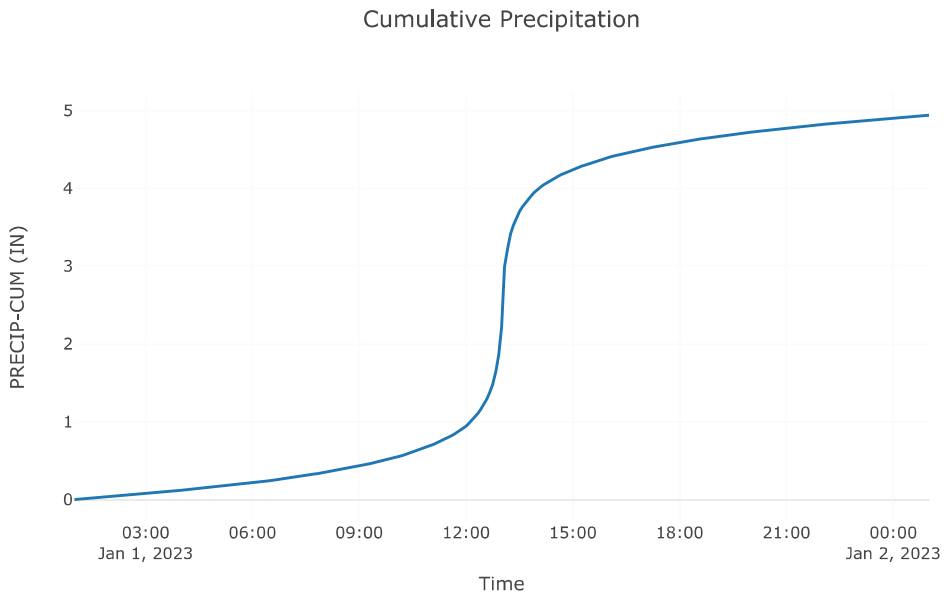
Transform: Scs	
Lag	29.46
Unitgraph Type	Standard

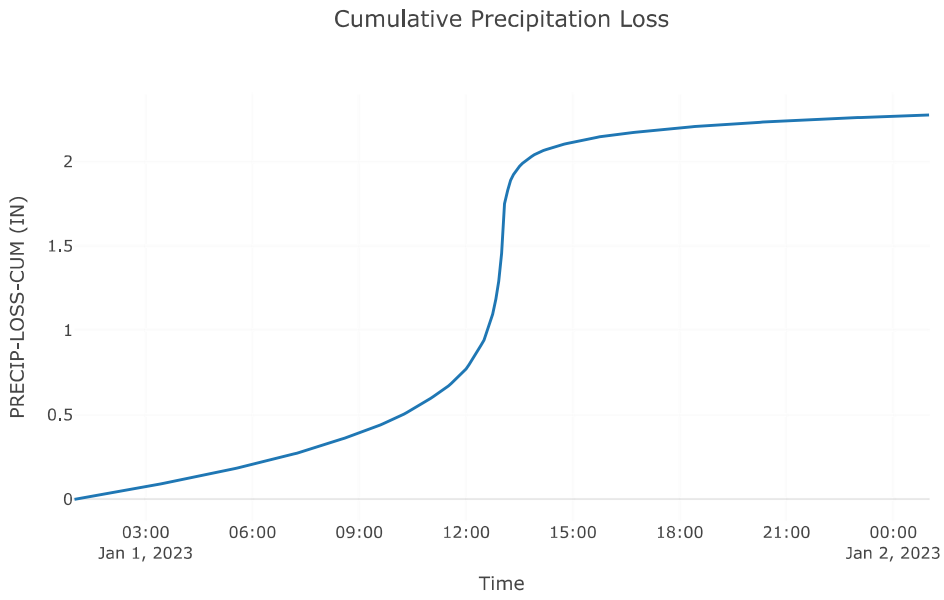
Results: Subbasin-4	
Peak Discharge (CFS)	47.38
Time of Peak Discharge	01Jan2023, 13:35
Volume (IN)	2.65
Precipitation Volume (AC - FT)	11.41
Loss Volume (AC - FT)	5.26
Excess Volume (AC - FT)	6.15
Direct Runoff Volume (AC - FT)	6.11
Baseflow Volume (AC - FT)	0

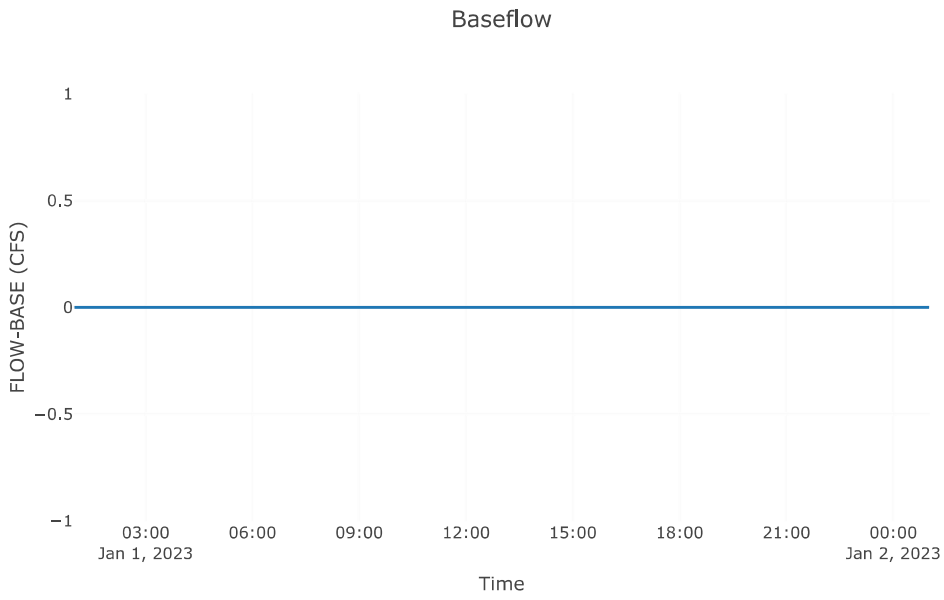

Precipitation and Outflow
PRECIP-INC (IN)
0
0.2
0.4
0.6
0.8
Precipitation
Excess Precipitation
Outflow
FLOW (CFS)
40
20
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023

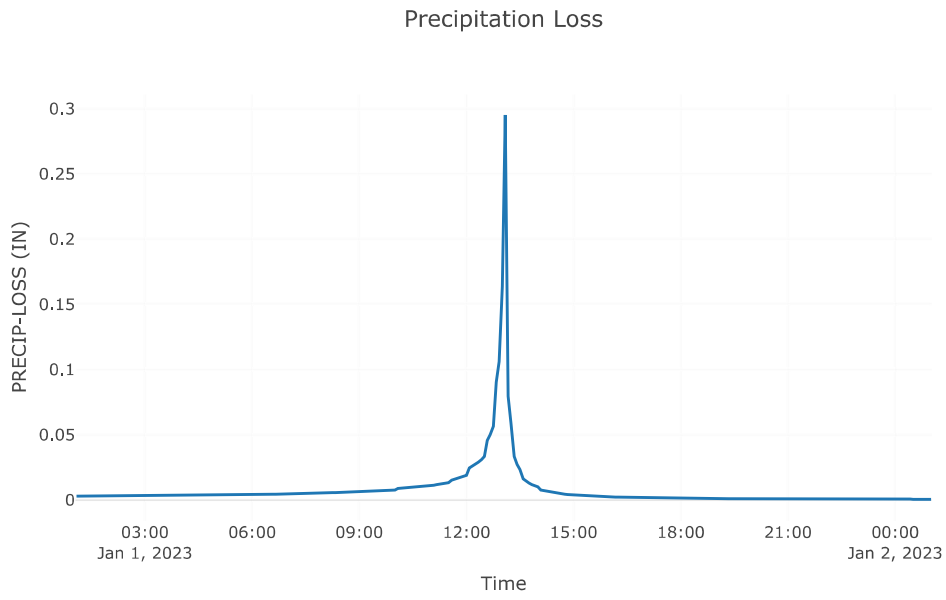

Cumulative Excess Precipitation
PRECIP-EXCESS-CUM (IN)
2.5
2
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

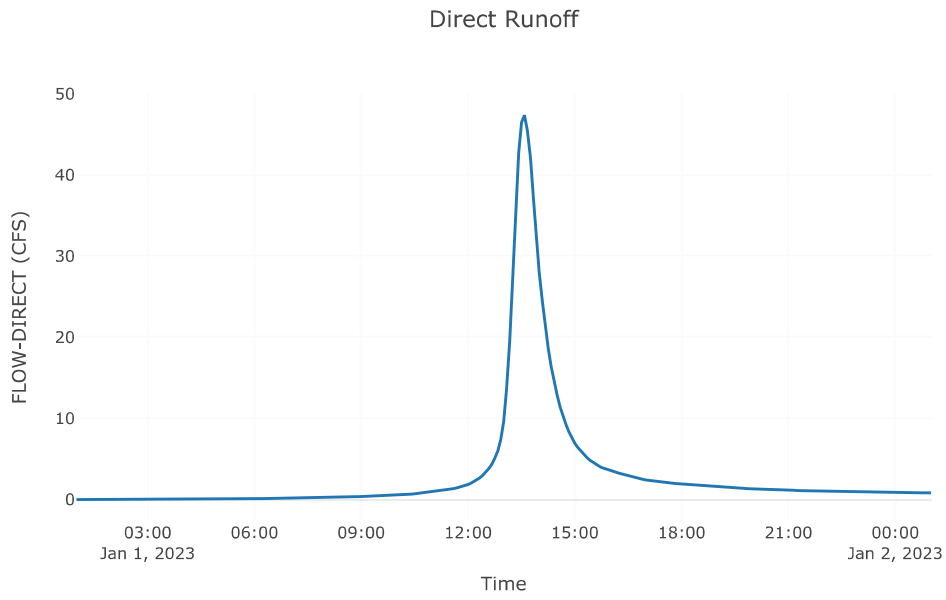

Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
0
1
2
3
4
5
6
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

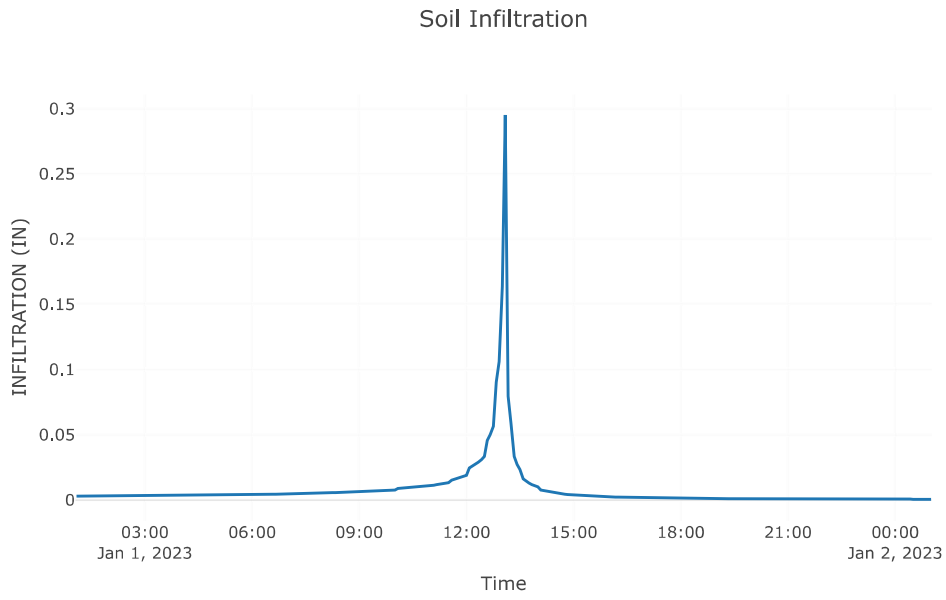

Cumulative Precipitation
PRECIP-CUM (IN)
0
1
2
3
4
5
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Precipitation Loss
PRECIP-LOSS-CUM (IN)
2
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Baseflow
FLOW-BASE (CFS)
1
0.5
0
−0.5
−1
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Precipitation Loss
PRECIP-LOSS (IN)
0.3
0.25
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Direct Runoff
FLOW-DIRECT (CFS)
50
40
30
20
10
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

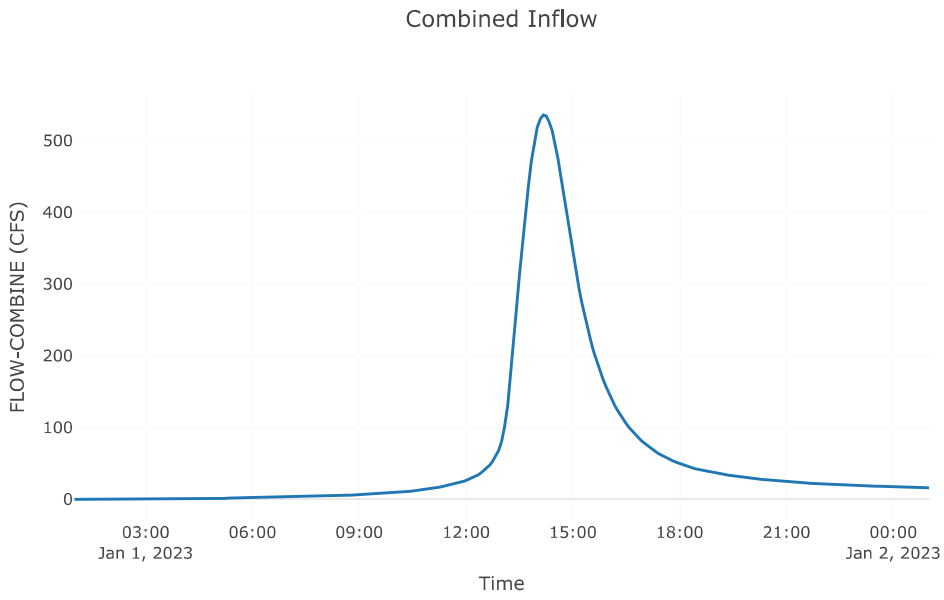

Soil Infiltration
INFILTRATION (IN)
0.3
0.25
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

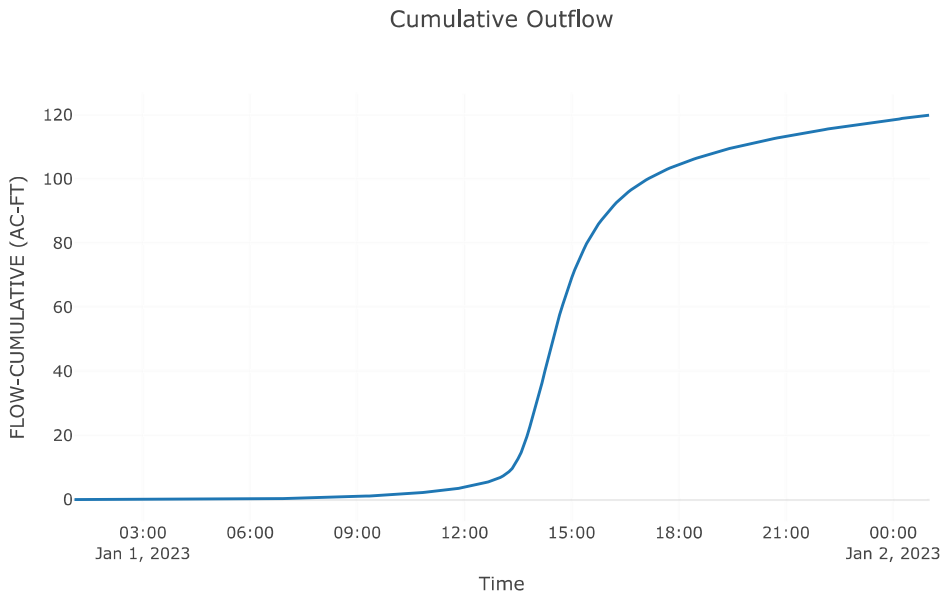
Reach: Reach-2

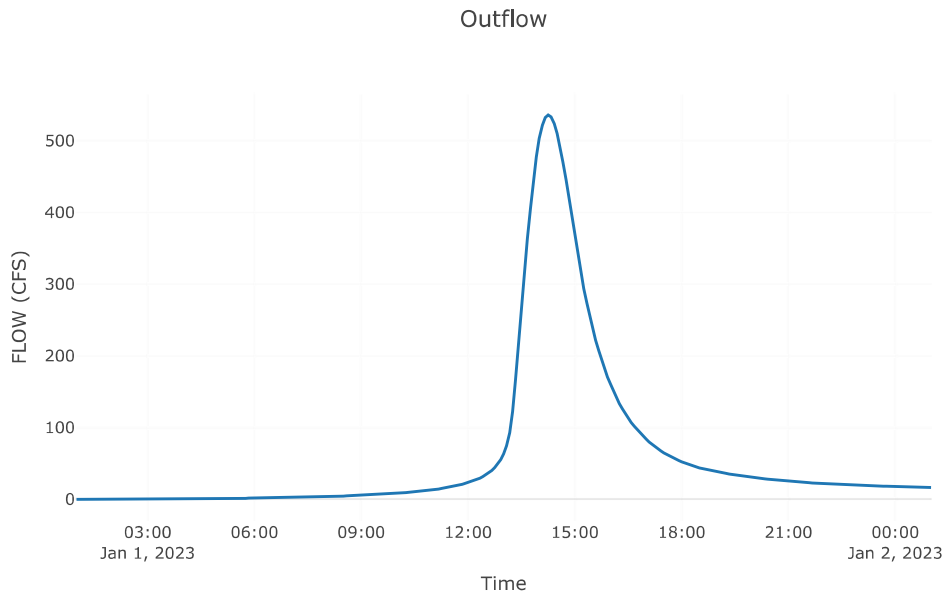
Downstream : Reach - 1

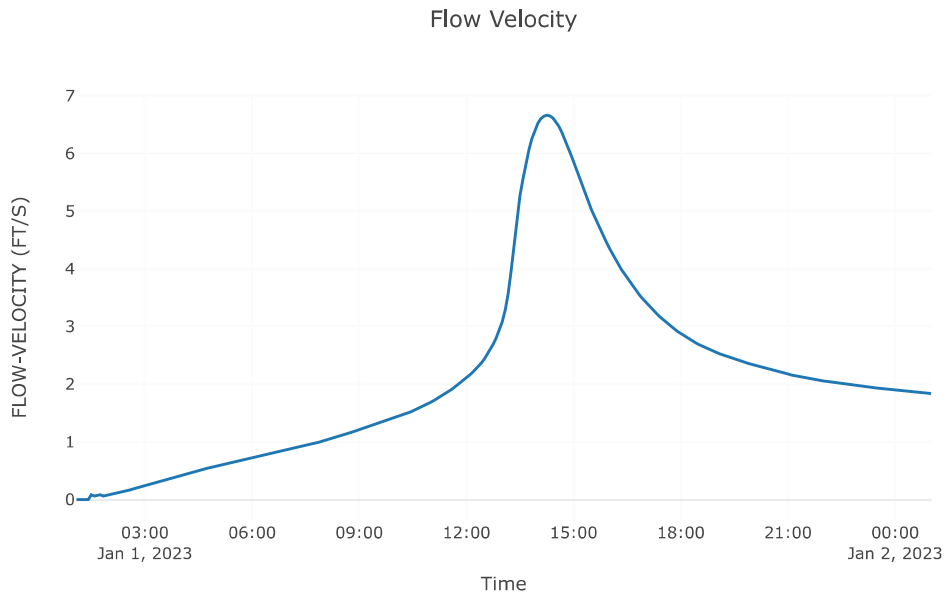
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Trapezoid
Length (FT)	2337.51
Energy Slope (FT/FT)	0.02
Mannings n	0.04
Bottom Width (FT)	38.76
Side Slope (FT/FT)	4
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Celerity
Index Celerity	1.33
Number Subreaches	1
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-2	
Peak Discharge (CFS)	536.09
Time of Peak Discharge	01Jan2023, 14:15
Volume (IN)	3.11
Peak Inflow (CFS)	535.98
Inflow Volume (AC - FT)	120.33


Combined Inflow
FLOW-COMBINE (CFS)
500
400
300
200
100
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
120
100
80
60
40
20
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Outflow
FLOW (CFS)
500
400
300
200
100
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Flow Velocity
FLOW-VELOCITY (FT/S)
7
6
5
4
3
2
1
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

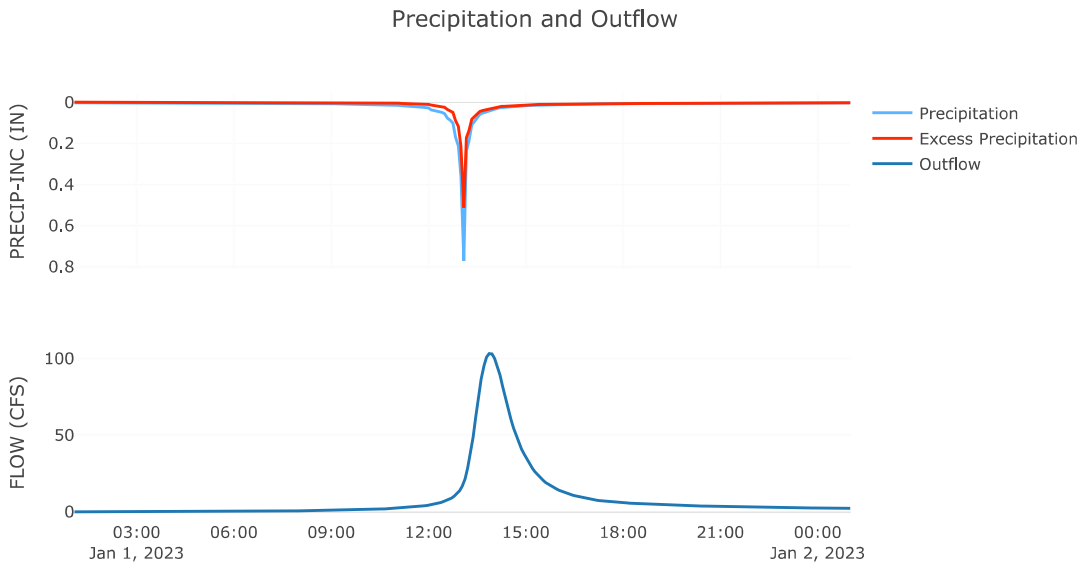
Subbasin: Subbasin-2

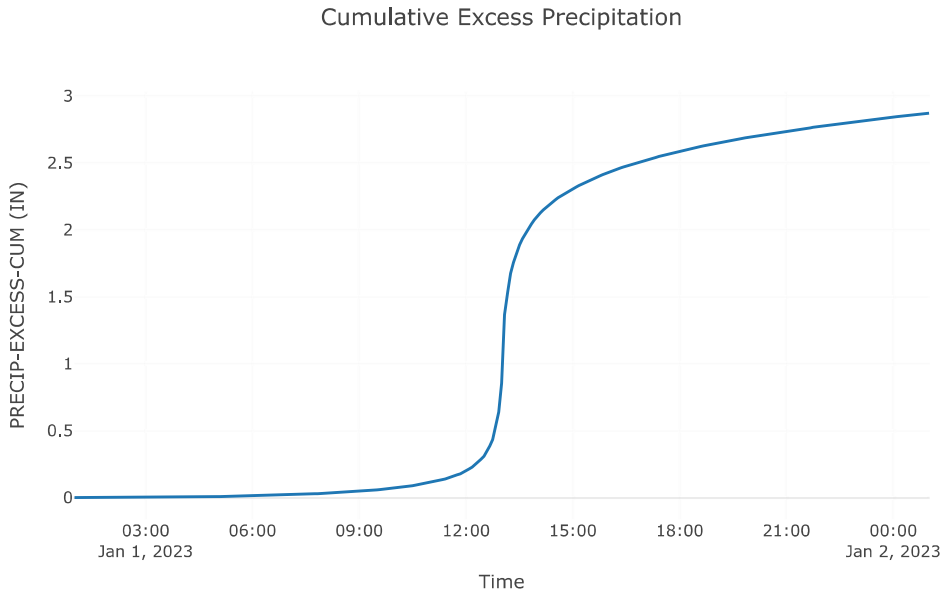
Area (MI2) : 0.12
Latitude Degrees : 38.99
Longitude Degrees : -104.56
Downstream : Reach - 1

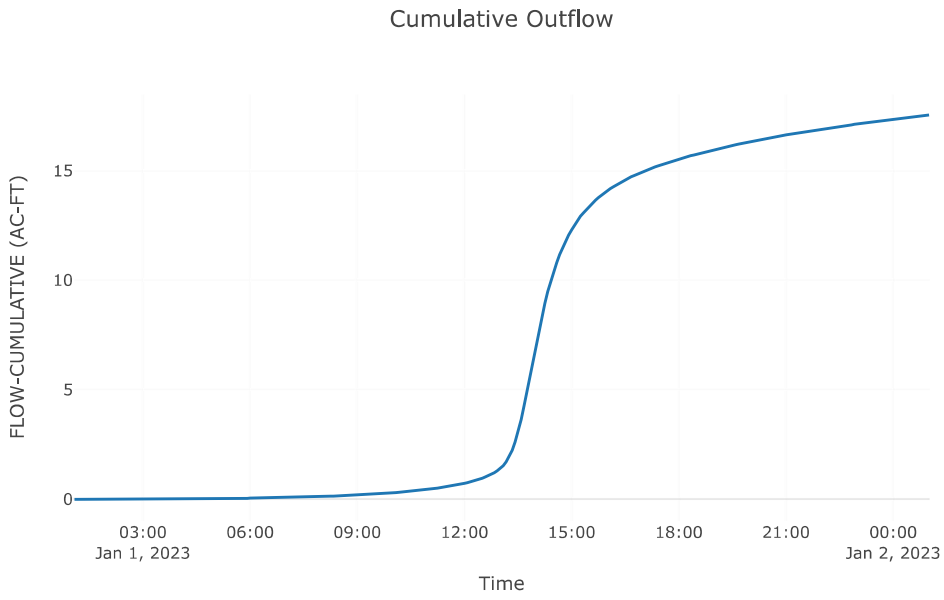
Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	73.76
Initial Abstraction	0

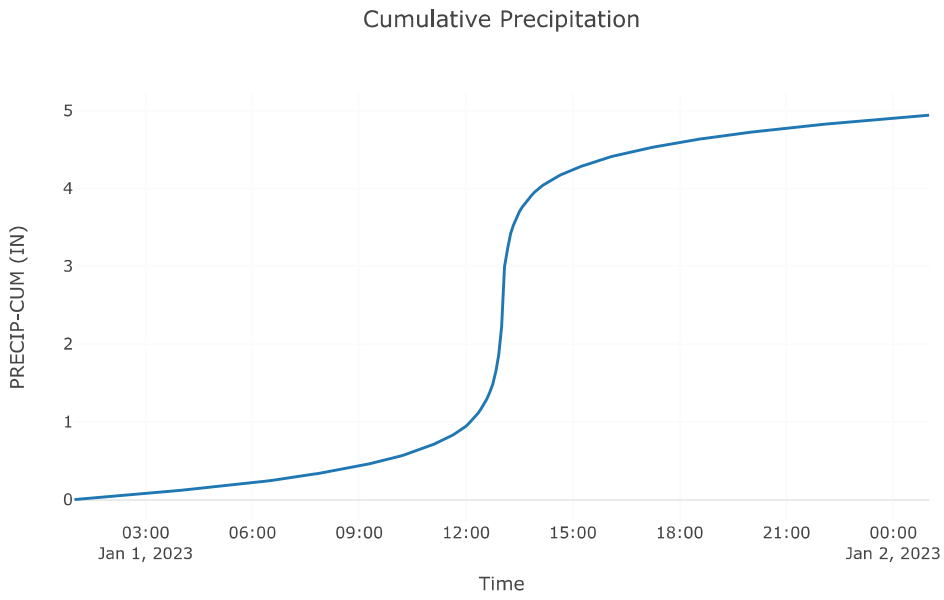
Transform: Scs	
Lag	46.35
Unitgraph Type	Standard

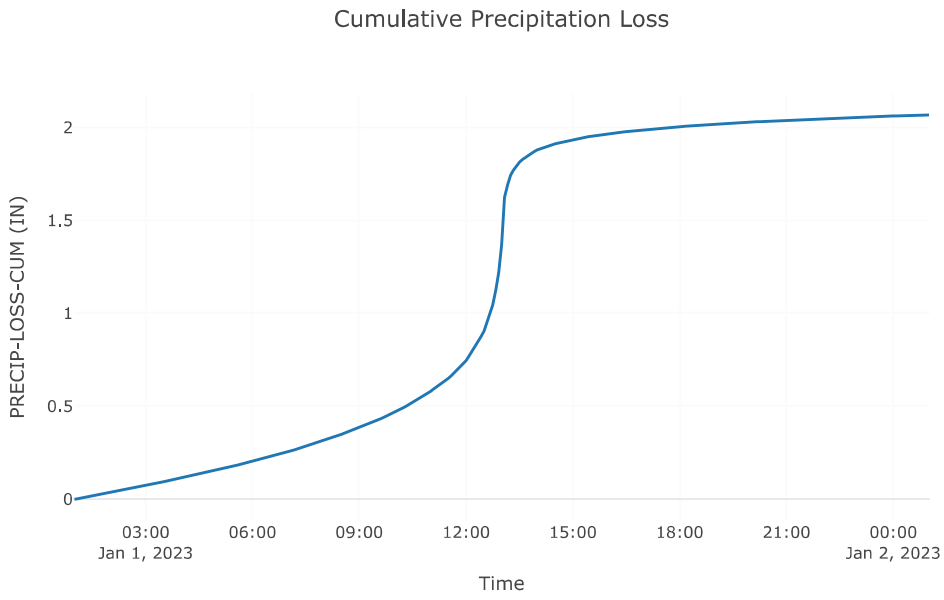
Results: Subbasin-2	
Peak Discharge (CFS)	103.28
Time of Peak Discharge	01Jan2023, 13:50
Volume (IN)	2.84
Precipitation Volume (AC - FT)	30.52
Loss Volume (AC - FT)	12.78
Excess Volume (AC - FT)	17.74
Direct Runoff Volume (AC - FT)	17.55
Baseflow Volume (AC - FT)	0

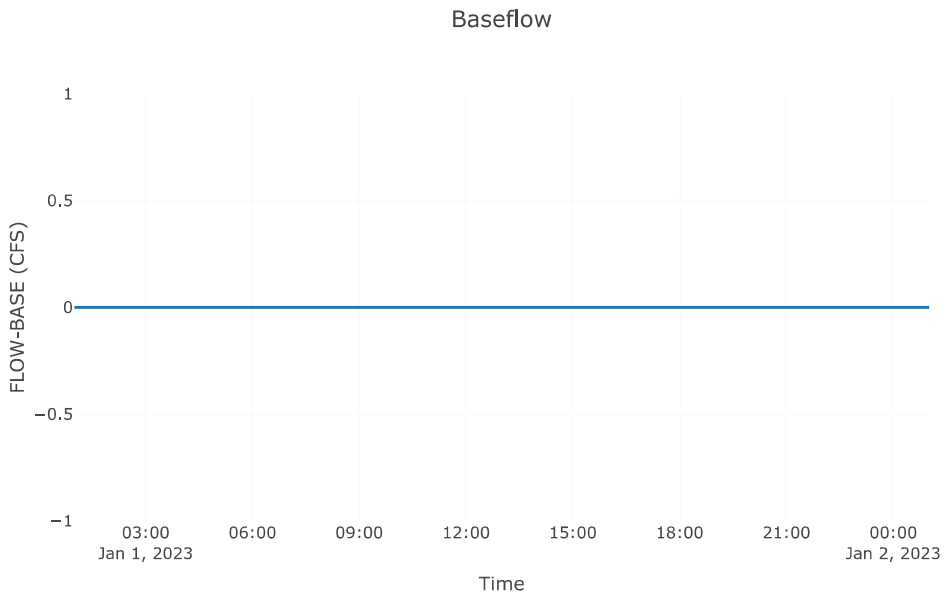

Precipitation and Outflow
PRECIP-INC (IN)
0
0.2
0.4
0.6
0.8
Precipitation
Excess Precipitation
Outflow
FLOW (CFS)
100
50
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023

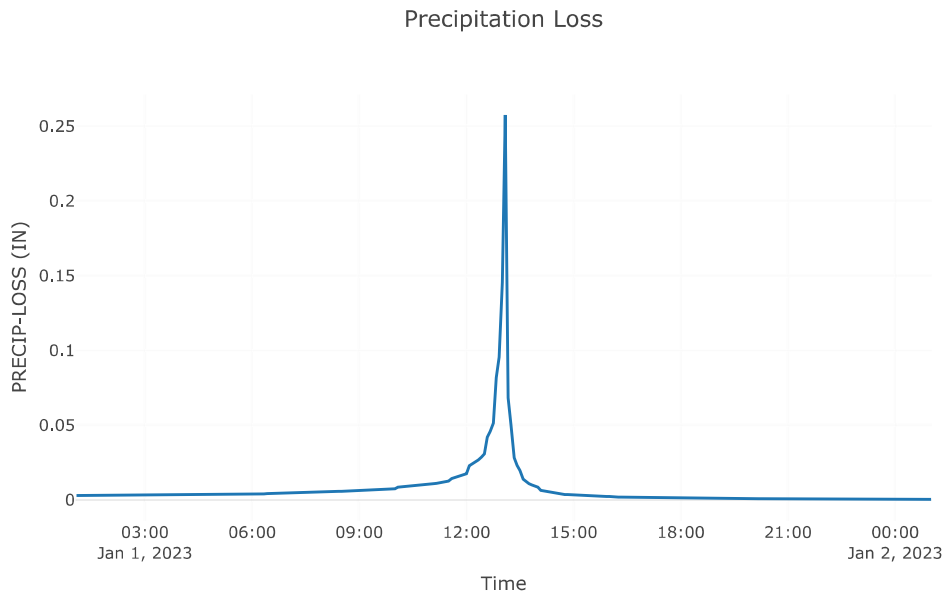

Cumulative Excess Precipitation
PRECIP-EXCESS-CUM (IN)
3
2.5
2
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

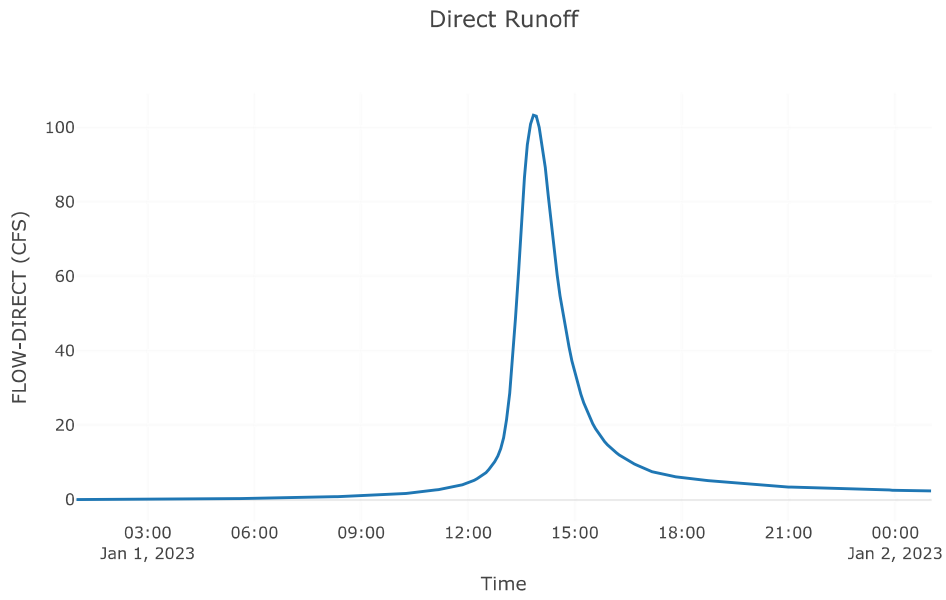

Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
15
10
5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

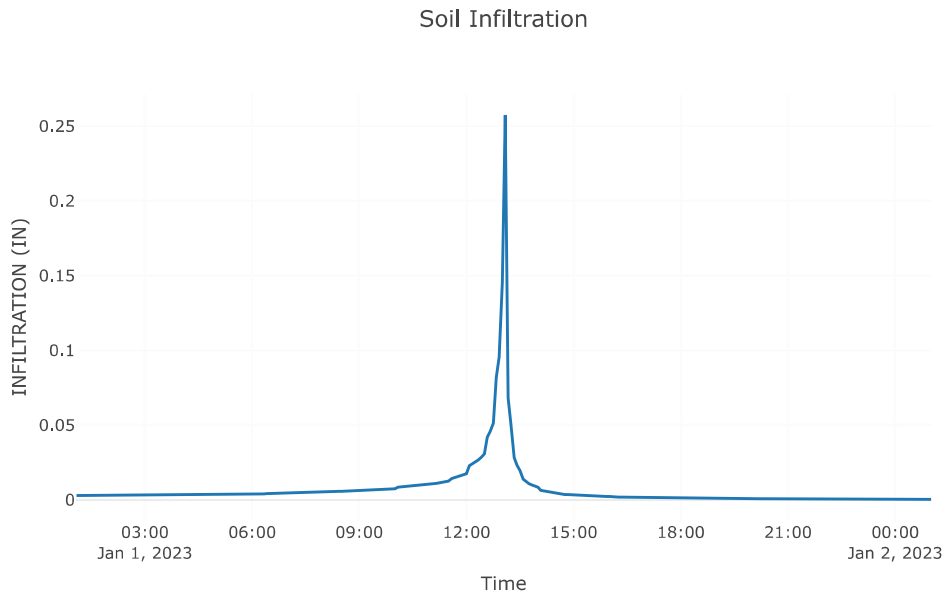

Cumulative Precipitation
PRECIP-CUM (IN)
5
4
3
2
1
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Precipitation Loss
PRECIP-LOSS-CUM (IN)
2
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Baseflow
FLOW-BASE (CFS)
1
0.5
0
−0.5
−1
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Precipitation Loss
PRECIP-LOSS (IN)
0.25
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Direct Runoff
FLOW-DIRECT (CFS)
100
80
60
40
20
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

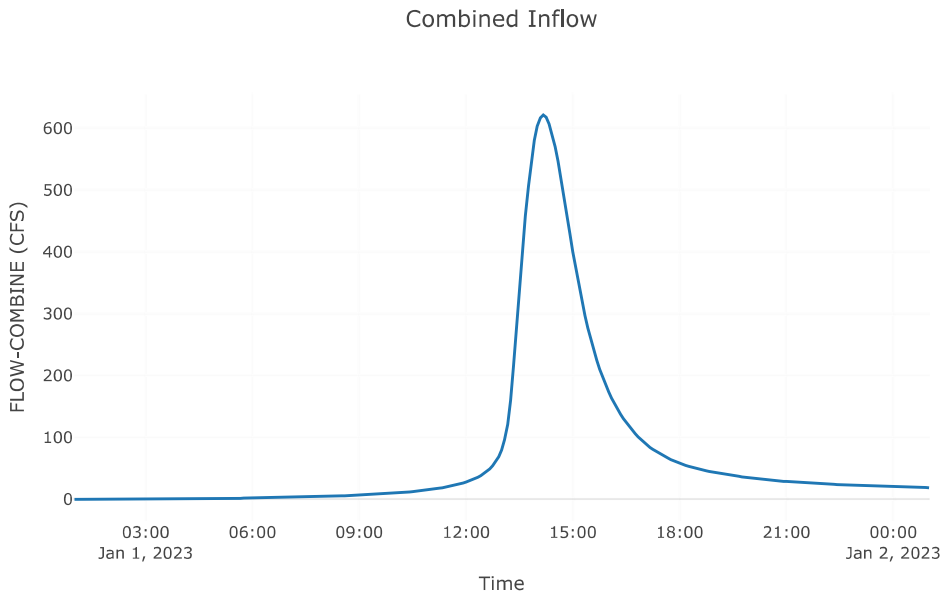

Soil Infiltration
INFILTRATION (IN)
0.25
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

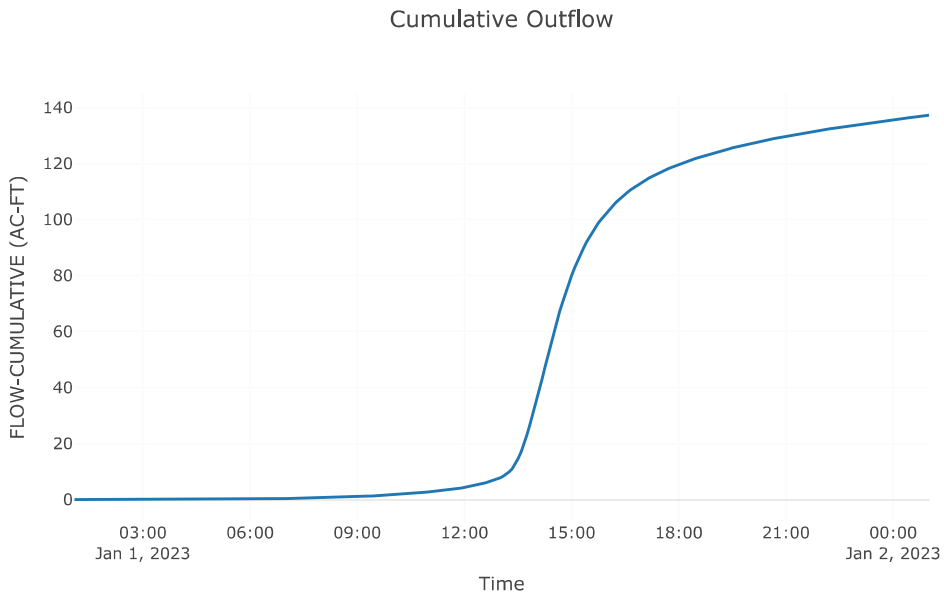
Reach: Reach-1

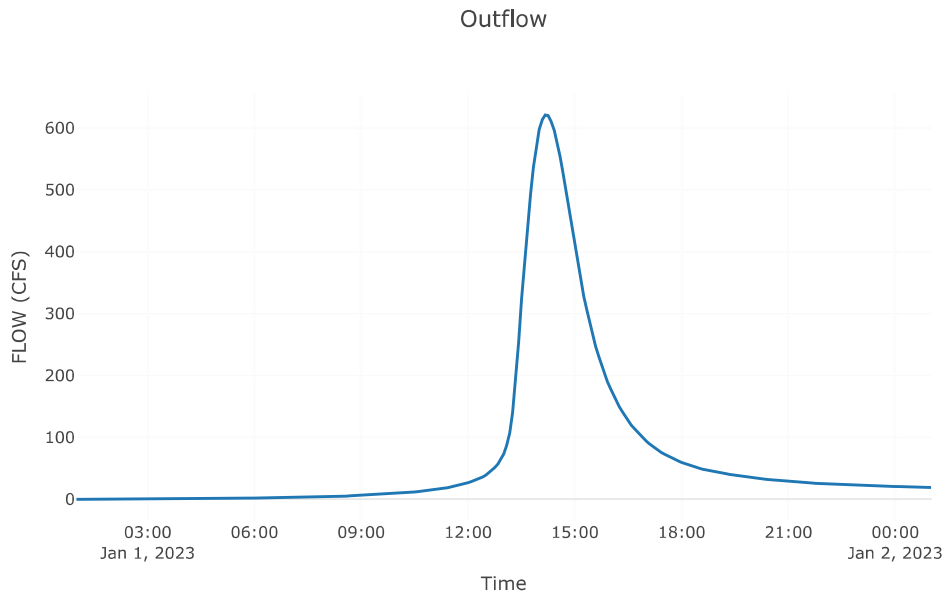
Downstream : Sink - 1

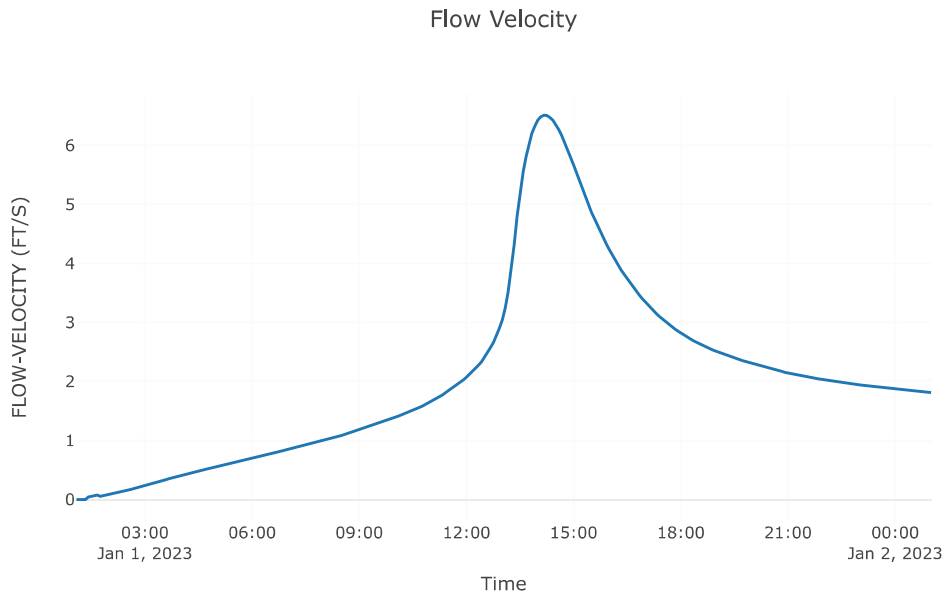
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Trapezoid
Length (FT)	849.59
Energy Slope (FT/FT)	0.01
Mannings n	0.04
Bottom Width (FT)	38.76
Side Slope (FT/FT)	4
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Celerity
Index Celerity	1.33
Number Subreaches	1
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-1	
Peak Discharge (CFS)	621.27
Time of Peak Discharge	01Jan2023, 14:10
Volume (IN)	3.07
Peak Inflow (CFS)	621.77
Inflow Volume (AC - FT)	137.46


Combined Inflow
FLOW-COMBINE (CFS)
600
500
400
300
200
100
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
140
120
100
80
60
40
20
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Outflow
600
500
400
300
200
100
0
FLOW (CFS)
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Flow Velocity
6
5
4
3
2
1
0
FLOW-VELOCITY (FT/S)
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

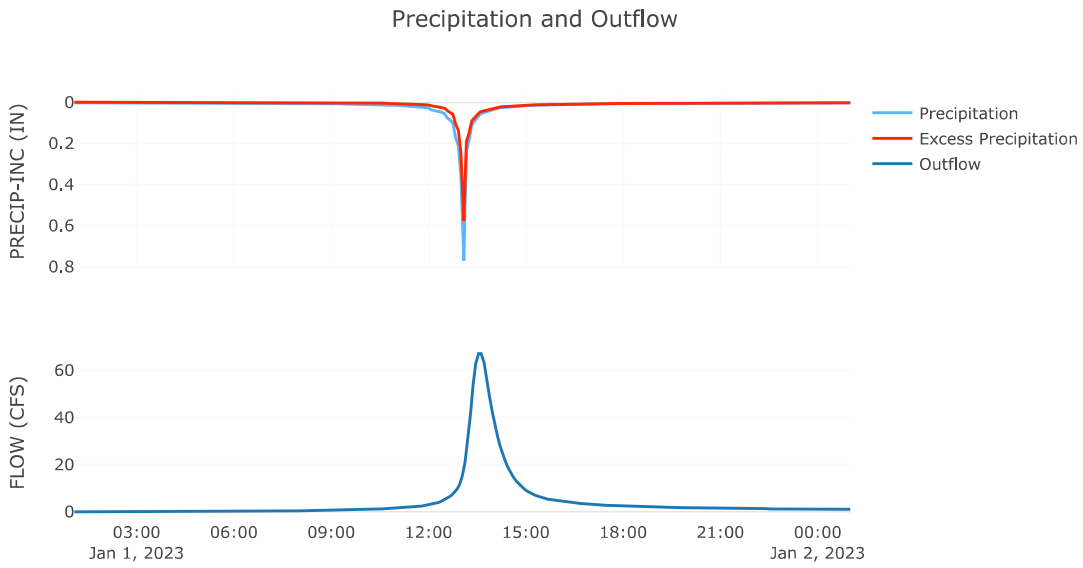
Subbasin: Subbasin-1

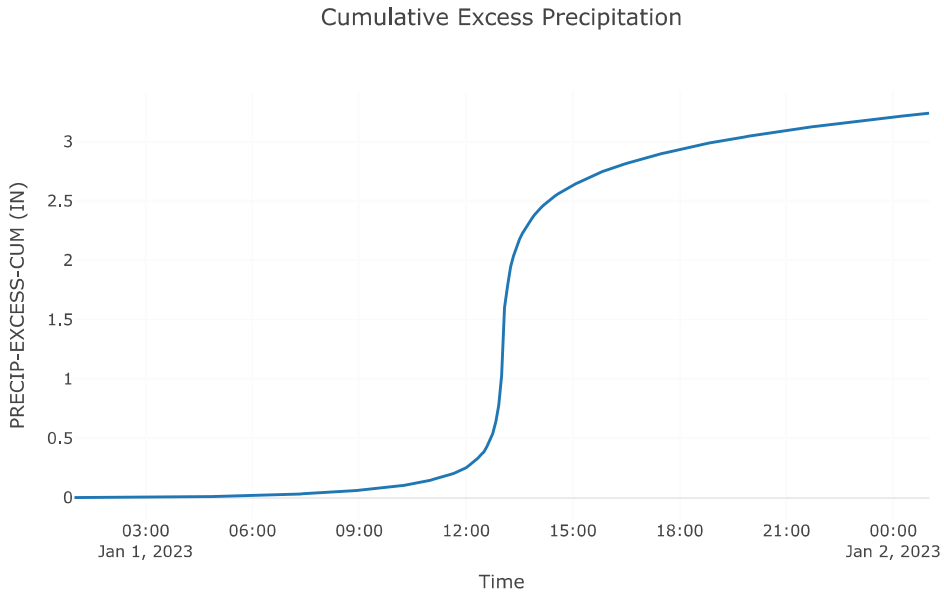
Area (MI2) : 0.05
Latitude Degrees : 38.98
Longitude Degrees : -104.56
Downstream : Sink - 1

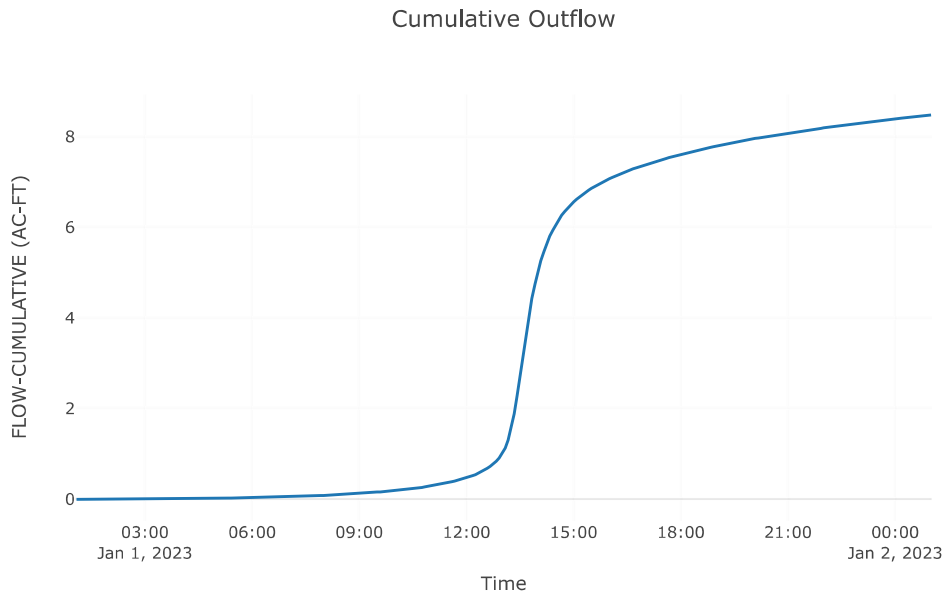
Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	79.41
Initial Abstraction	0

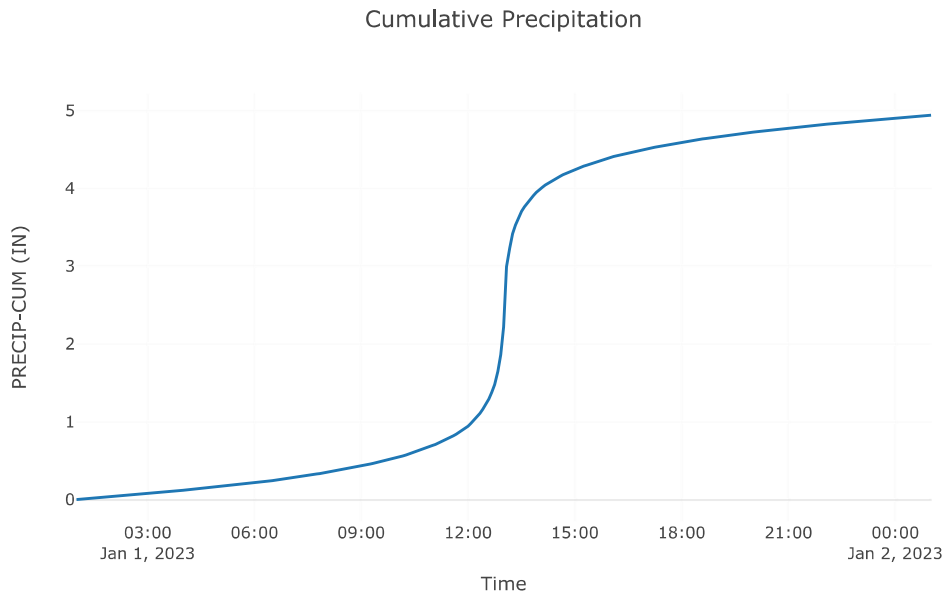
Transform: Scs	
Lag	28.51
Unitgraph Type	Standard

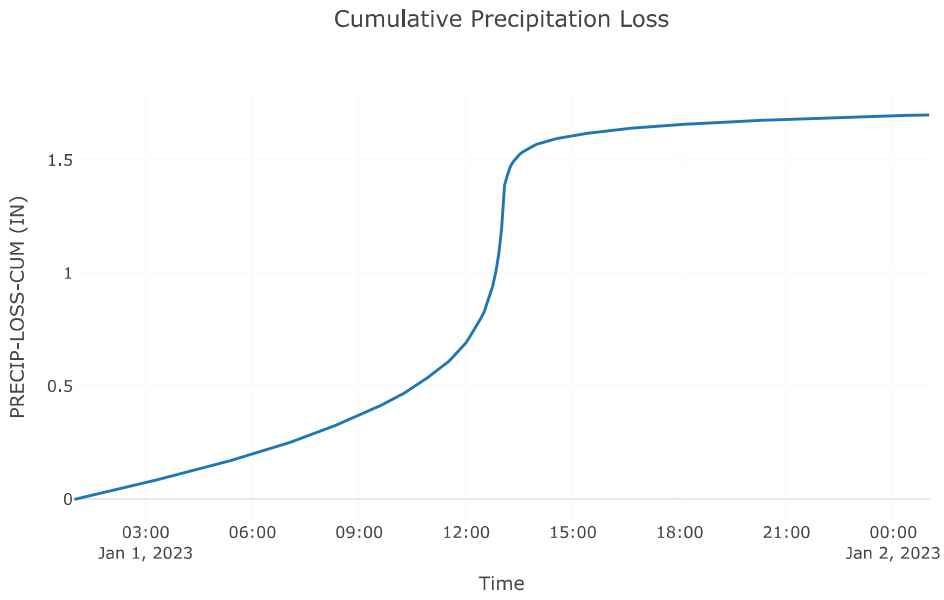
Results: Subbasin-1	
Peak Discharge (CFS)	67.11
Time of Peak Discharge	01Jan2023, 13:35
Volume (IN)	3.22
Precipitation Volume (AC - FT)	13.01
Loss Volume (AC - FT)	4.48
Excess Volume (AC - FT)	8.53
Direct Runoff Volume (AC - FT)	8.48
Baseflow Volume (AC - FT)	0

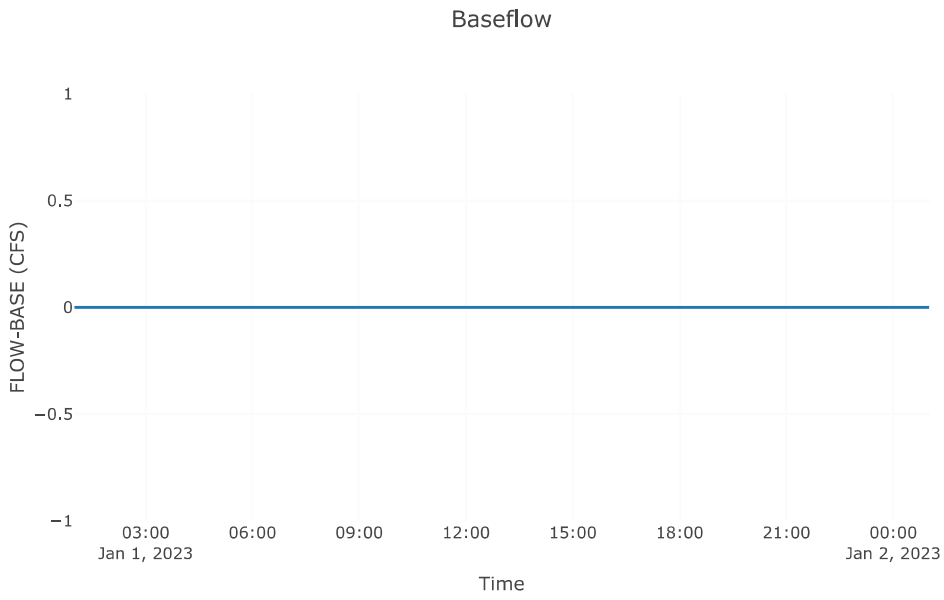

Precipitation and Outflow
PRECIP-INC (IN)
0
0.2
0.4
0.6
0.8
Precipitation
Excess Precipitation
Outflow
FLOW (CFS)
60
40
20
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023

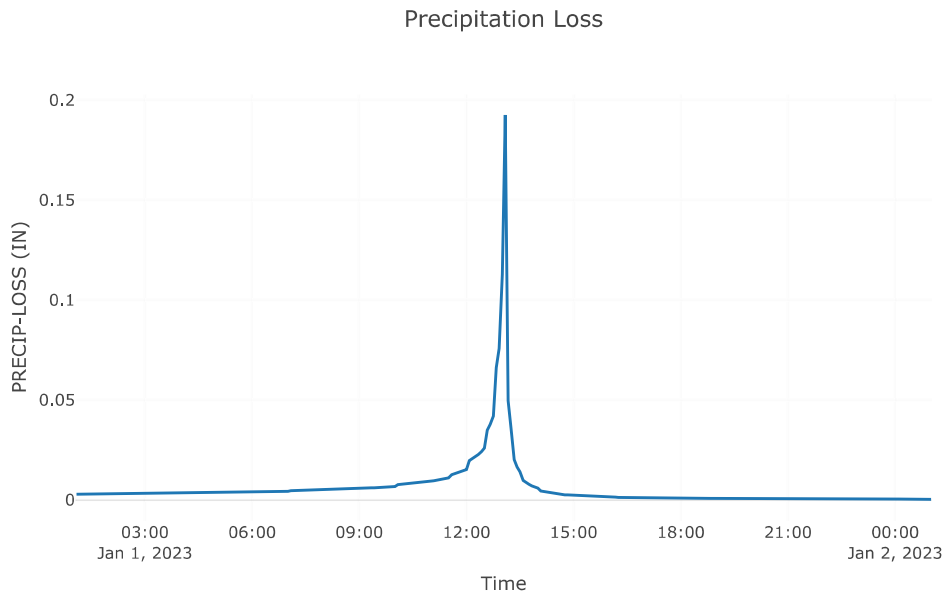

Cumulative Excess Precipitation
PRECIP-EXCESS-CUM (IN)
3
2.5
2
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

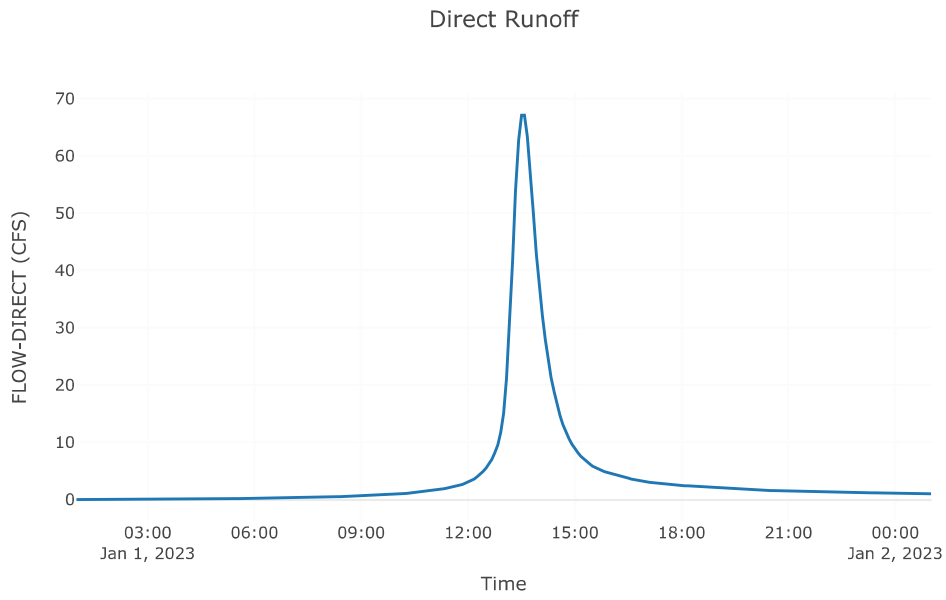

Cumulative Outflow
FLOW-CUMULATIVE (AC-FT)
0
2
4
6
8
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

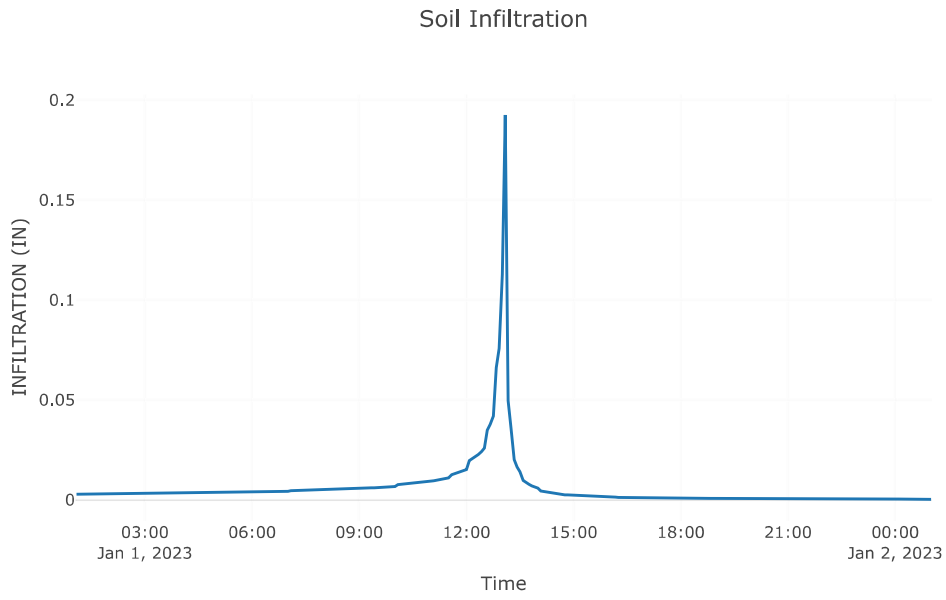

Cumulative Precipitation
PRECIP-CUM (IN)
0
1
2
3
4
5
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Cumulative Precipitation Loss
PRECIP-LOSS-CUM (IN)
1.5
1
0.5
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time


Baseflow
FLOW-BASE (CFS)
1
0.5
0
−0.5
−1
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

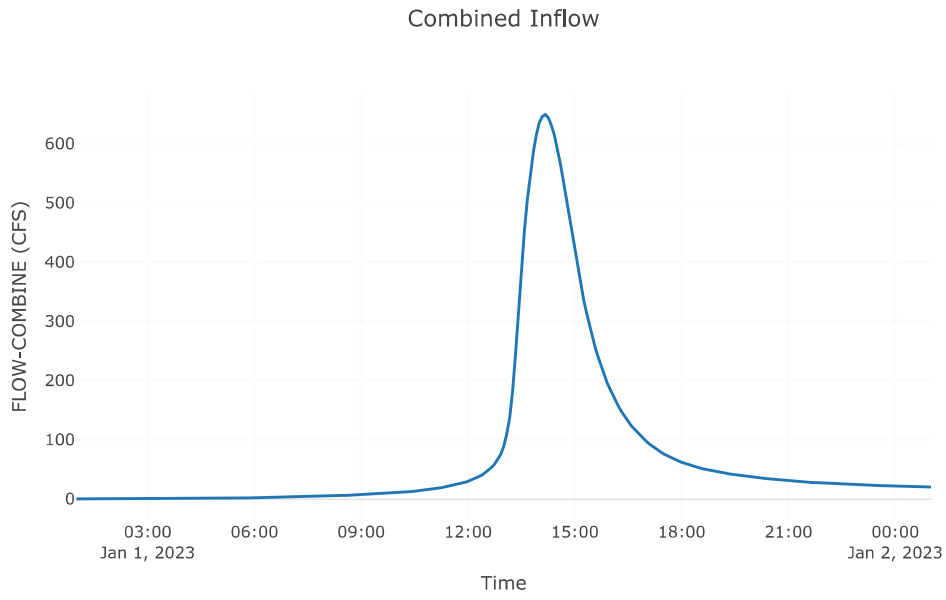

Precipitation Loss
PRECIP-LOSS (IN)
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

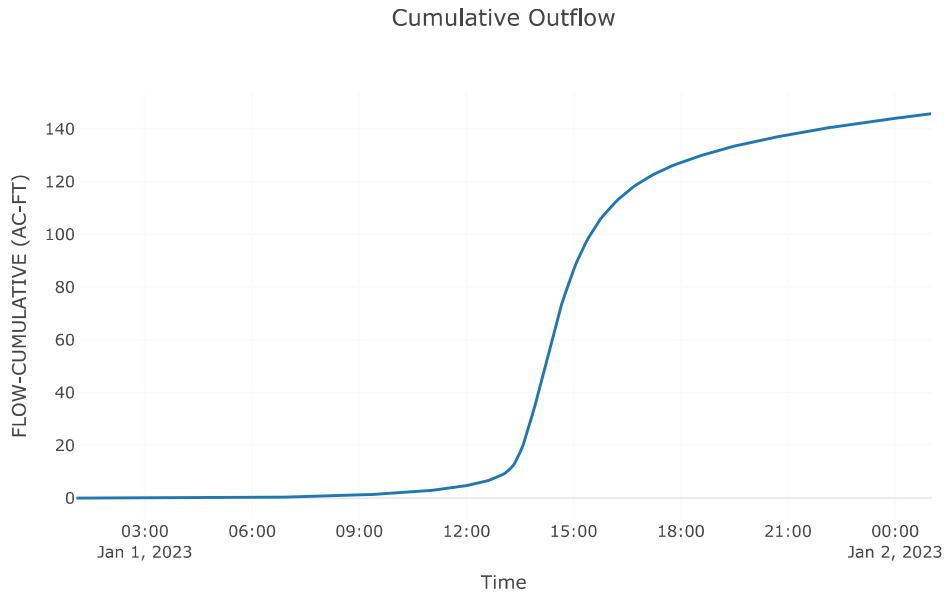

Direct Runoff
FLOW-DIRECT (CFS)
70
60
50
40
30
20
10
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

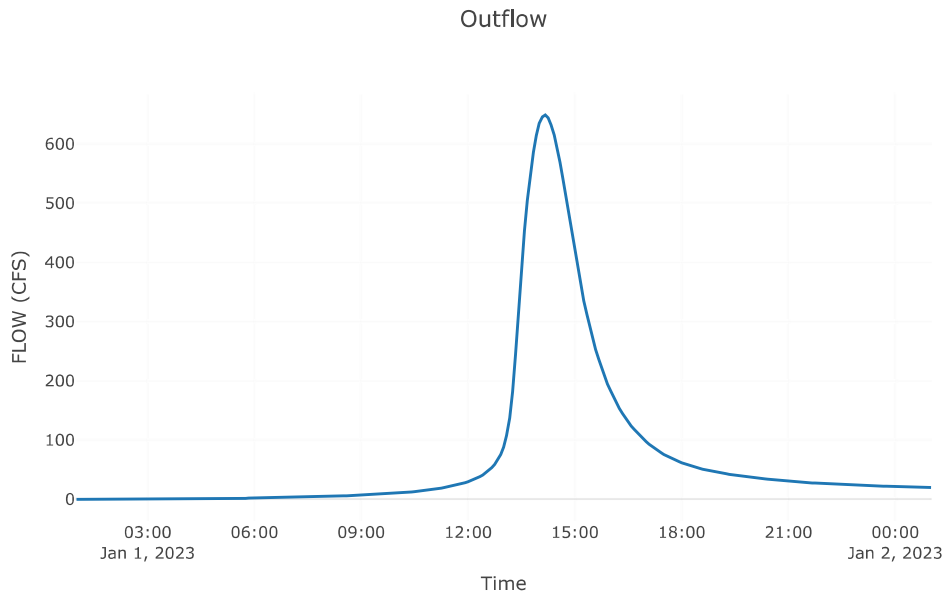

Soil Infiltration
INFILTRATION (IN)
0.2
0.15
0.1
0.05
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

Sink: Sink-1

Results: Sink-1	
Peak Discharge (CFS)	649.23
Time of Peak Discharge	01Jan2023, 14:10
Volume (IN)	3.08






Outflow
FLOW (CFS)
600
500
400
300
200
100
0
03:00
Jan 1, 2023
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2023
Time

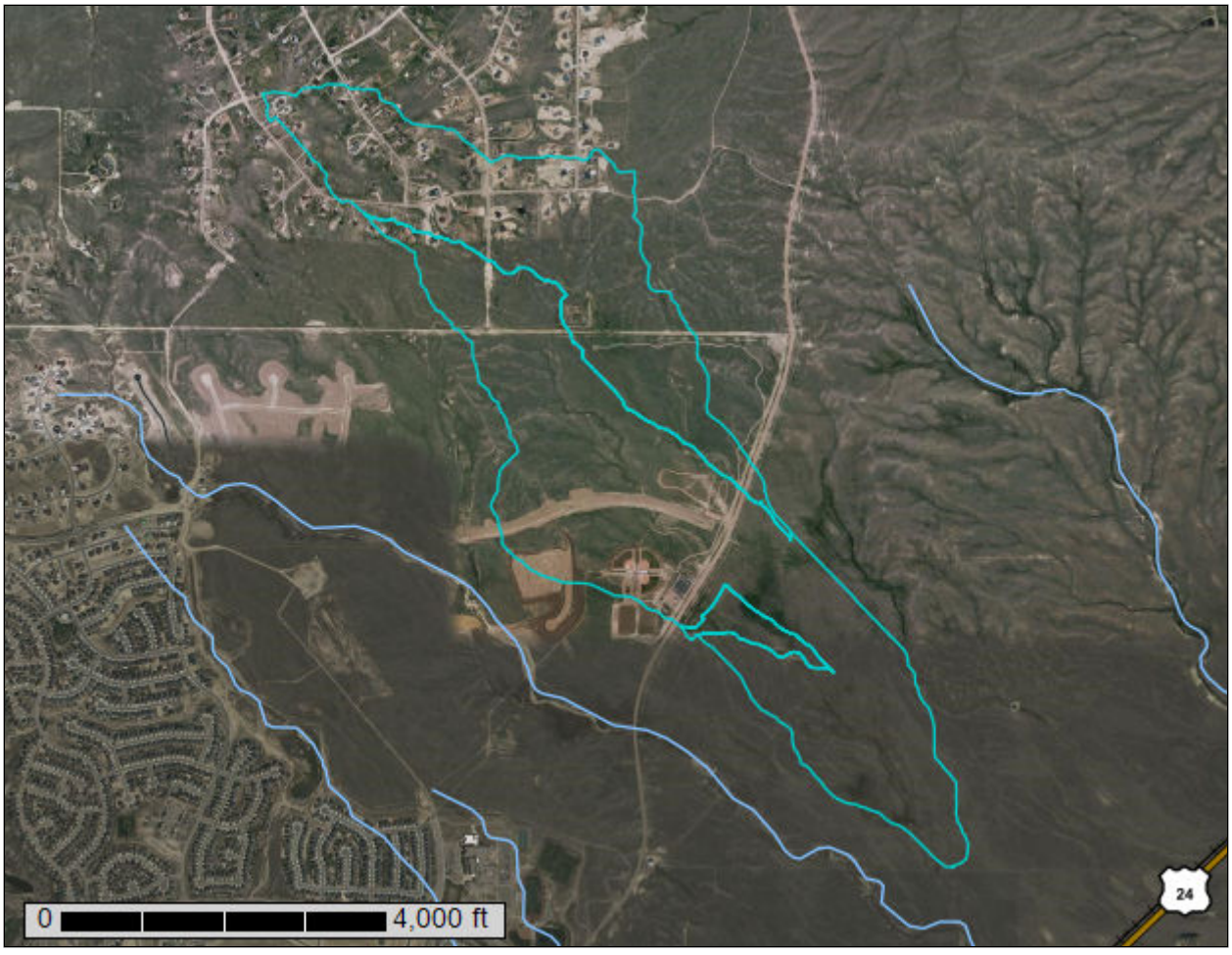
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for El Paso County Area, Colorado



November 9, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

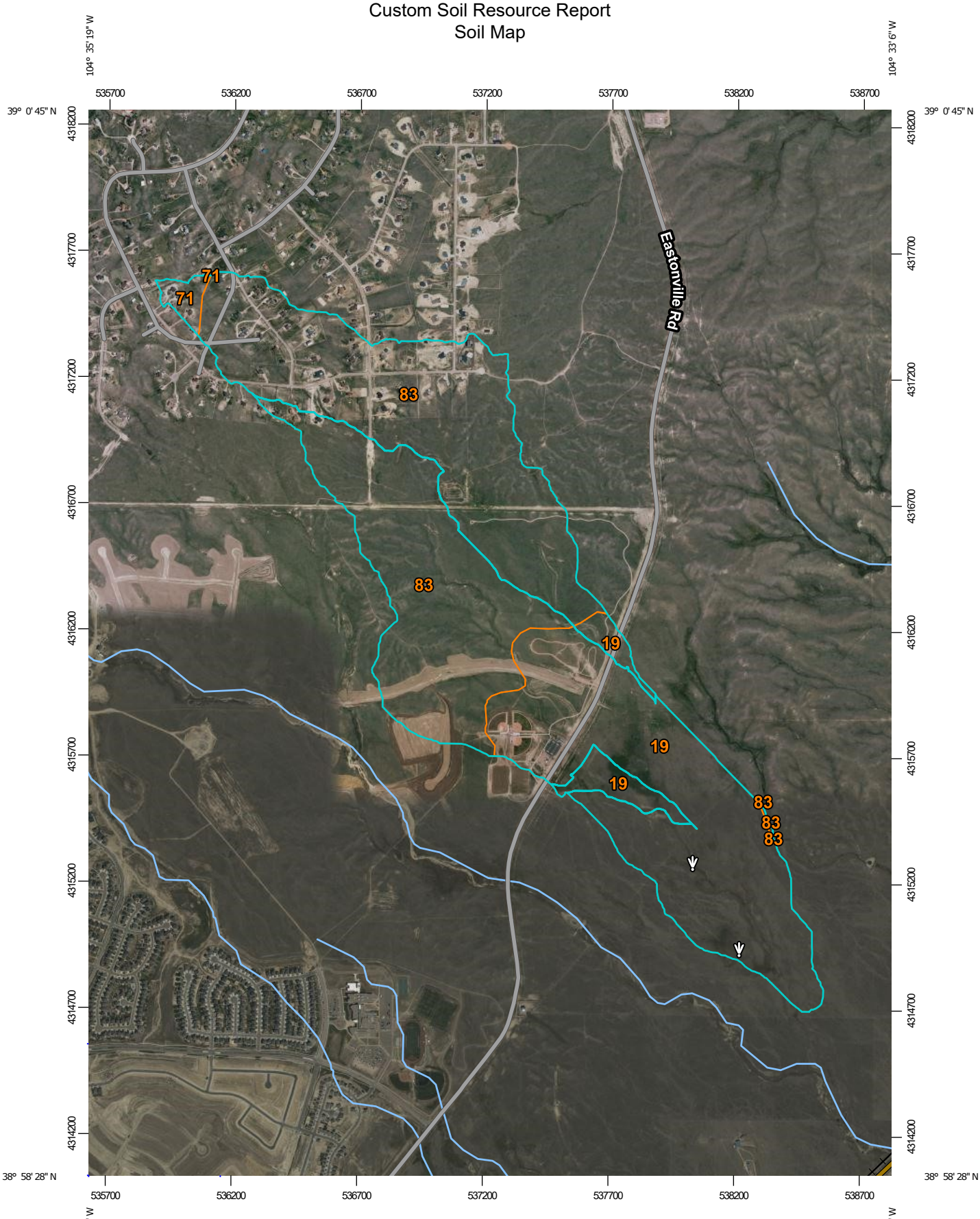
alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:20,600 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 300 600 1200 1800

Feet
0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 11, 2018—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	211.4	38.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	6.5	1.2%
83	Stapleton sandy loam, 3 to 8 percent slopes	338.4	60.8%
Totals for Area of Interest		**556.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Flood plains, fan terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Pring and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

83—Stapleton sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369z
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Stapleton and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stapleton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 11 inches: sandy loam
Bw - 11 to 17 inches: gravelly sandy loam
C - 17 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Other soils

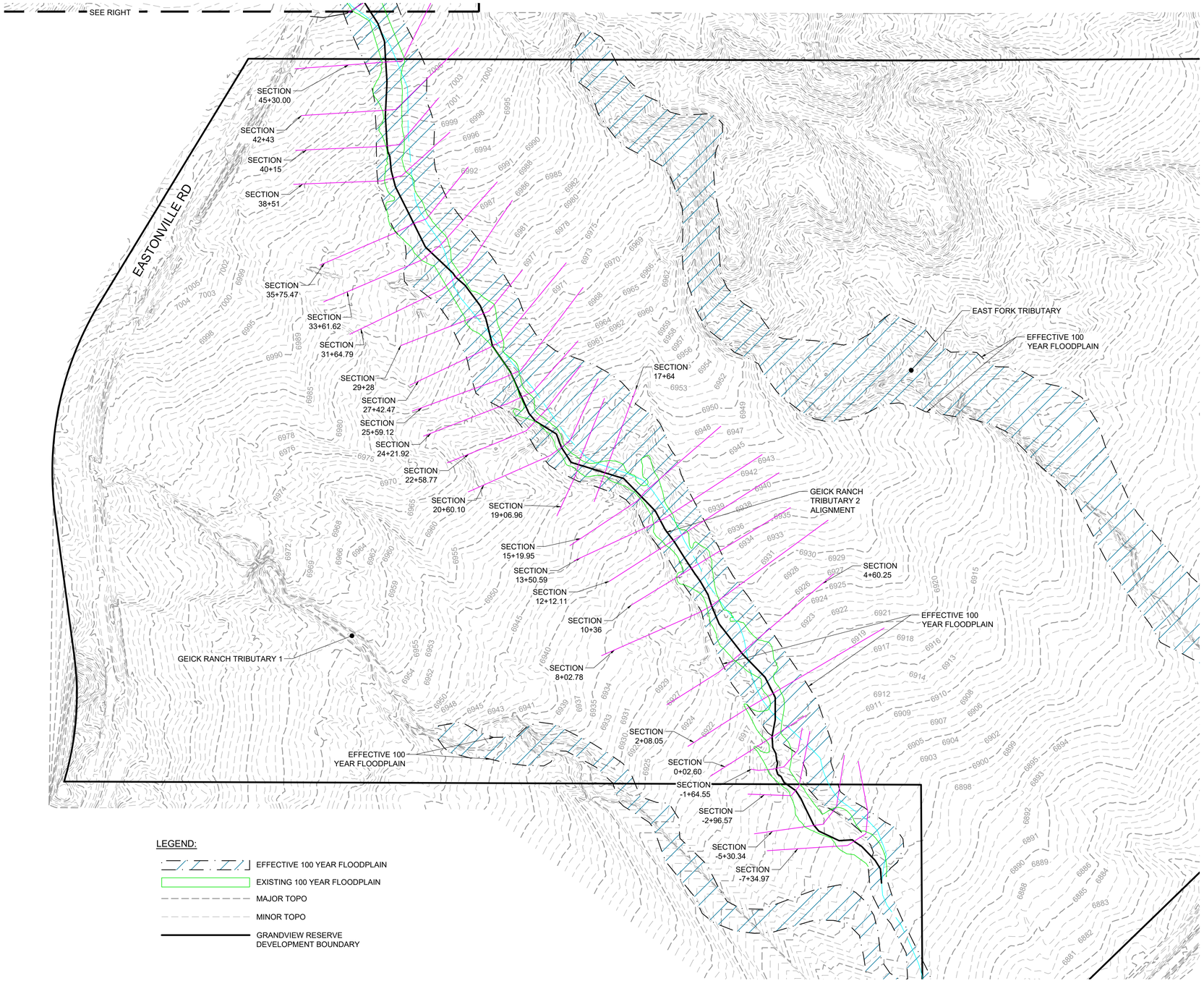
Percent of map unit: 1 percent
Hydric soil rating: No

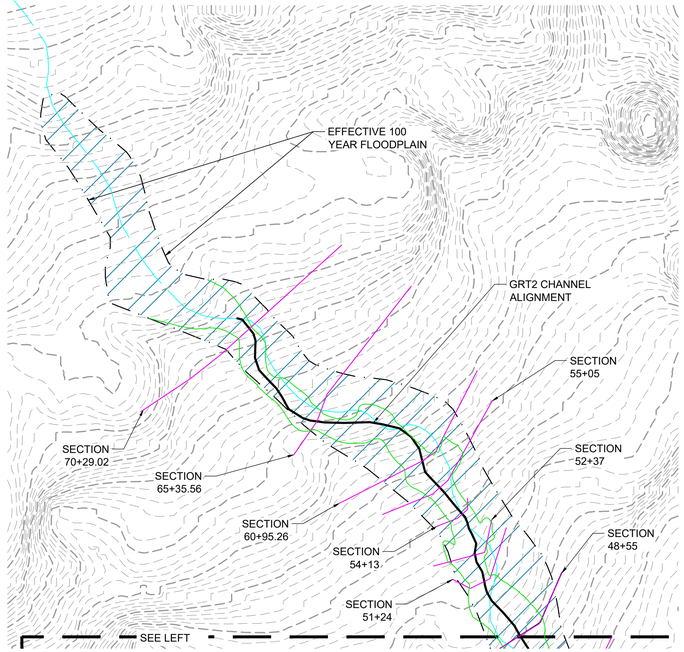
Pleasant

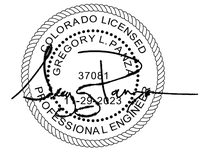
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Provide copy of current floodplain map in Appendix A.

Appendix B
Topographic Map







NOTES:

1. BASIS OF BEARINGS: THE EAST LINE OF SECTION 21, BEING MONUMENTED AT THE SOUTHEAST CORNER BY A 3-1/4" ALUMINUM SURVEYOR'S CAP STAMPED "PS INC PLS 30087 1996", BEING APPROPRIATELY MARKED, AND BEING MONUMENTED AT THE NORTHEAST CORNER BY A 3-1/4" ALUMINUM SURVEYOR'S CAP STAMPED "PS INC PLS 30087 1996", BEING APPROPRIATELY MARKED, BEING ASSUMED TO BEAR NORTH 00 DEGREES 52 MINUTES 26 SECONDS WEST, A DISTANCE OF 5290.17 FEET.

   NAVD88 6866.33

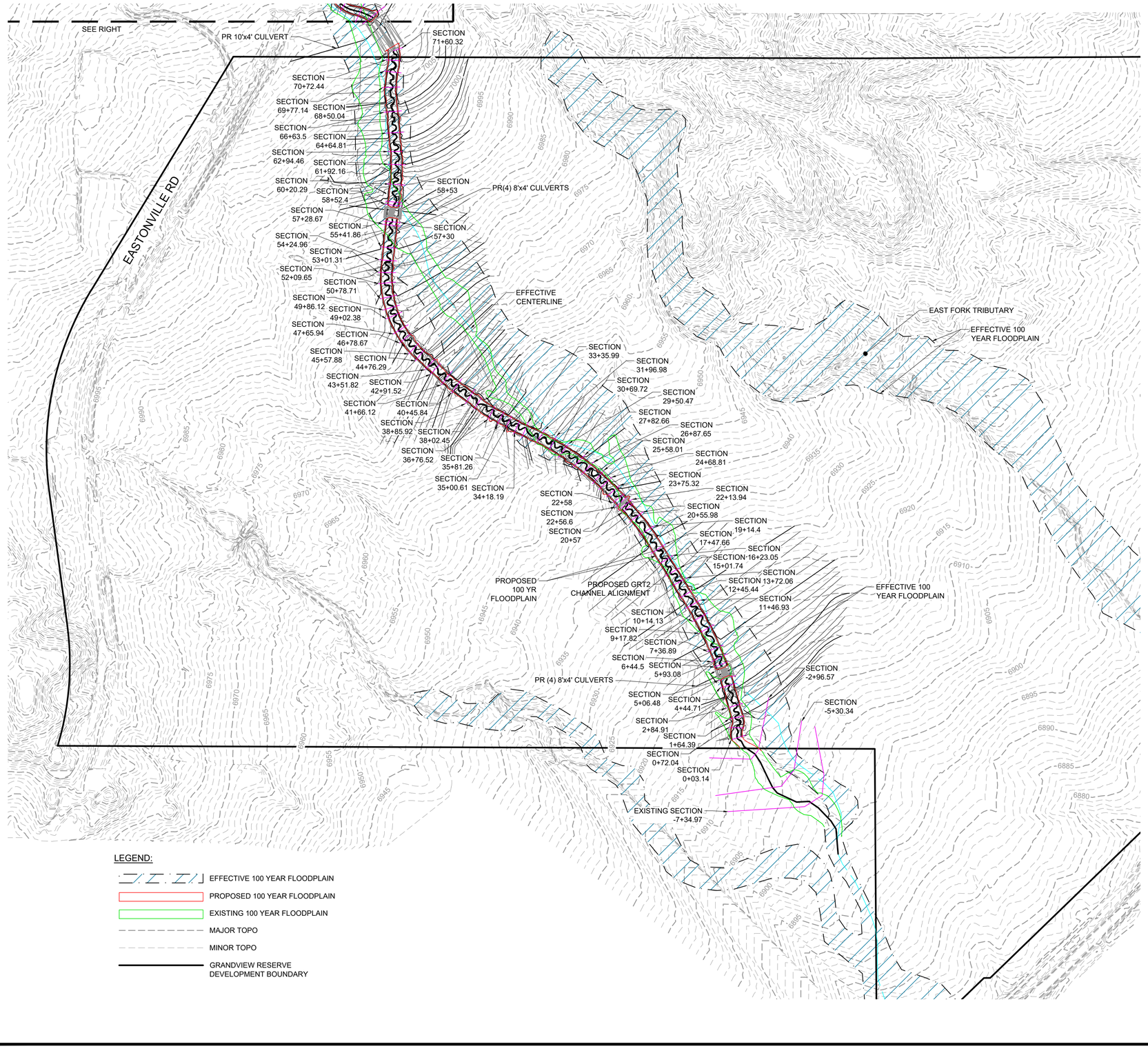
NORTH
0 300
150

HRGreen

Job No.:	201662
Prepared By:	SJF
Date:	4/8/2024

EXISTING FLOODPLAIN EXHIBIT

FIG.1



LEGEND:

- EFFECTIVE 100 YEAR FLOODPLAIN
- PROPOSED 100 YEAR FLOODPLAIN
- EXISTING 100 YEAR FLOODPLAIN
- MAJOR TOPO
- MINOR TOPO
- GRANDVIEW RESERVE DEVELOPMENT BOUNDARY

COLORADO LICENSED
GREGORY L. PAYNE
37081
4-8-2024
PROFESSIONAL ENGINEER

NOTES:

1. BASIS OF BEARINGS: THE EAST LINE OF SECTION 21, BEING MONUMENTED AT THE SOUTHEAST CORNER BY A 3-1/4" ALUMINUM SURVEYOR'S CAP STAMPED "PS INC PLS 30087 1996", BEING APPROPRIATELY MARKED, AND BEING MONUMENTED AT THE NORTHEAST CORNER BY A 3-1/4" ALUMINUM SURVEYOR'S CAP STAMPED "PS INC PLS 30087 1996", BEING APPROPRIATELY MARKED, BEING ASSUMED TO BEAR NORTH 00 DEGREES 52 MINUTES 26 SECONDS WEST, A DISTANCE OF 5290.17 FEET.

   NAVD88

NORTH
0 300
150

HRGreen

Job No.:	201662
Prepared By:	SJF
Date:	4/8/2024

PROPOSED FLOODPLAIN EXHIBIT

FIG.2

to flooding, particularly from local drainage
map repository should be consulted for
d information.

eas where **Base Flood Elevations** (BFEs)
ouraged to consult the Flood
Elevations tables contained
mpanies this FIRM. Users
present rounded whole-foot
e rating purposes only and
n information. Accordingly,
e utilized in conjunction with
anagement.

y only landward of 0.0° North
this FIRM should be aware
mary of Stillwater Elevations
on. Elevations shown in the
ied for construction and/or
han the elevations shown on

s sections and interpolated
ydraulic considerations with
Program. Floodway widths
d Insurance Study report for

protected by **flood control**
ures" of the Flood Insurance
this jurisdiction.

was Universal Transverse
NAD83, GRS80 spheroid.
zones zones used in the
result in slight positional
s. These differences do not

American Vertical Datum
compared to structure and
n. For information regarding
tum of 1929 and the North
Geodetic Survey website at
etic Survey at the following

nformation for **bench marks**
vices Branch of the National
http://www.ngs.noaa.gov/.

d in digital format by El Paso
ureau of Land Management,
d States Geological Survey,
current as of 2006.

hannel configurations and
us FIRM for this jurisdiction.
om the previous FIRM may
hannel configurations. As a
the Flood Insurance Study
nay reflect stream channel
he profile baselines depicted
that match the flood profiles
ort. As a result, the profile
map channel representation

st data available at the time
r de-annexations may have
should contact appropriate
ns.

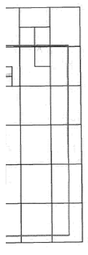
overview map of the county
epository addresses; and a
nsurance Program dates for
which each community is

Map Information eXchange
oducts associated with this
d Letters of Map Change, a
f this map. The MSC may
) and its website at

ncerning the National Flood
MAP (1-877-336-2627) or
nfip.

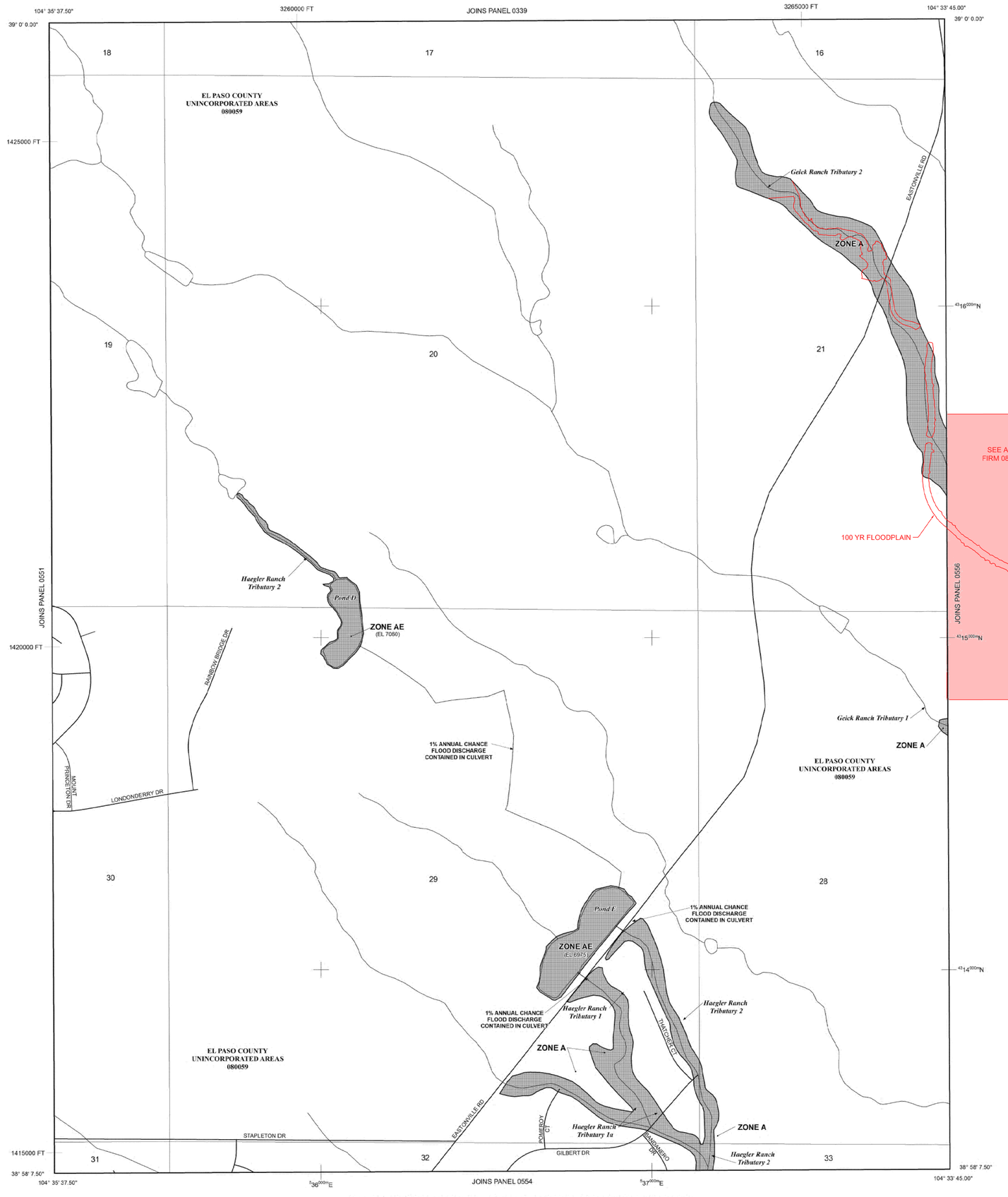
et Table

Vertical Datum Offset (ft)
OD INSURANCE STUDY
RSION INFORMATION



was produced through a
reen the State of Colorado
Emergency Management

formation and resources are
munities and the Colorado



INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line
23 — 23 — Transect line
97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4175000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0552G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 552 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0552	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0552G

MAP REVISED
DECEMBER 7, 2018

ubject to flooding, particularly from local drainage
munity map repository should be consulted for
l hazard information.

n in areas where **Base Flood Elevations** (BFEs)
couraged to consult the Flood
f Elevations tables contained
ompanies this FIRM. Users
present rounded whole-foot
ice rating purposes only and
on information. Accordingly,
be utilized in conjunction with
nanagement.

apply only landward of 0.0'
sers of this FIRM should be
n the Summary of Stillwater
r this jurisdiction. Elevations
ould be used for construction
e higher than the elevations

is sections and interpolated
hydraulic considerations with
Program. Floodway widths
Flood Insurance Study report

e protected by **flood control**
sures" of the Flood Insurance
r this jurisdiction.

was Universal Transverse
s NAD83, GRS80 spheroid.
zones zones used in the
result in slight positional
es. These differences do not

h American Vertical Datum
compared to structure and
m. For information regarding
ıtum of 1929 and the North
Geodetic Survey website at
detic Survey at the following

information for **bench marks**
vices Branch of the National
http://www.ngs.noaa.gov/.

d in digital format by El Paso
ulting Engineers, Inc. These

channel configurations and
ous FIRM for this jurisdiction.
rom the previous FIRM may
hannel configurations. As a
the Flood Insurance Study
may reflect stream channel
he profile baselines depicted
that match the flood profiles
ort. As a result, the profile
map channel representation

est data available at the time
or de-annexations may have
should contact appropriate
ons.

overview map of the county
epository addresses; and a
Insurance Program dates for
n which each community is

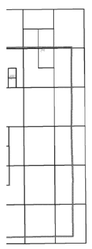
A Map Information eXchange
roducts associated with this
d Letters of Map Change, a
of this map. The MSC may
0 and its website at

oncerning the National Flood
A MAP (1-877-336-2627) or
nfip.

set Table

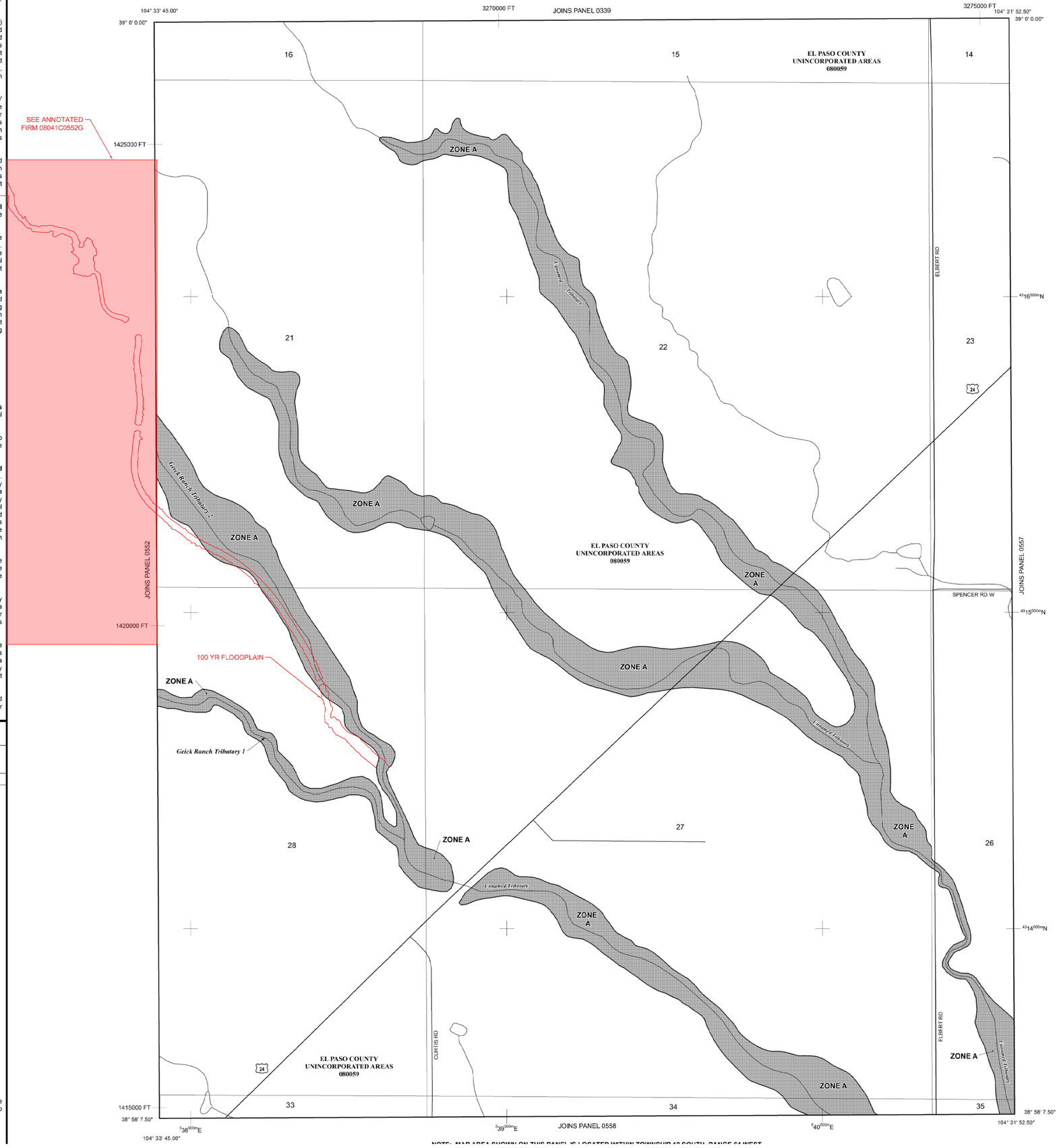
Vertical Datum Offset (ft)

OD INSURANCE STUDY
ERSION INFORMATION



was produced through a
ween the State of Colorado
l Emergency Management

nformation and resources are
nmunities and the Colorado
d.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 64 WEST

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D Boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 — 23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

PANEL 0556G

MAP REVISED TO REFLECT LOMR(S) AND/OR PROFILE CHANGE(S)

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 556 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0556	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

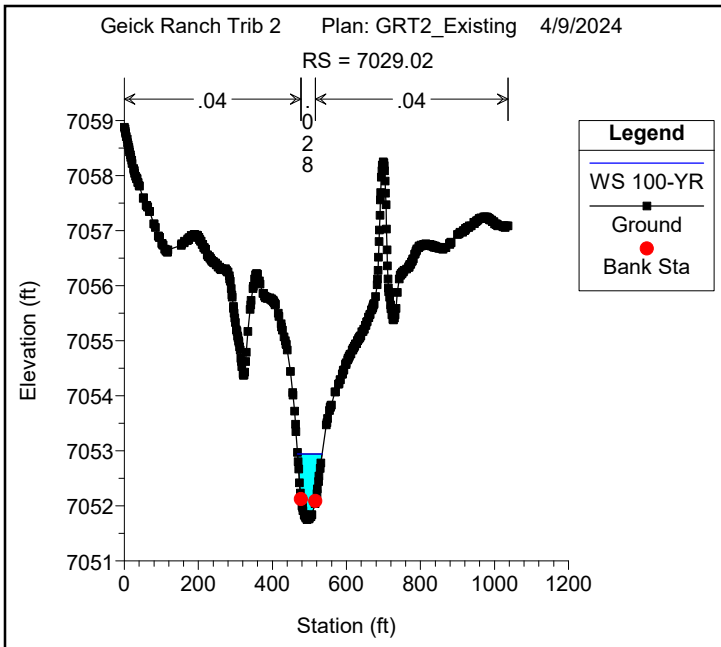
MAP NUMBER
08041C0556G

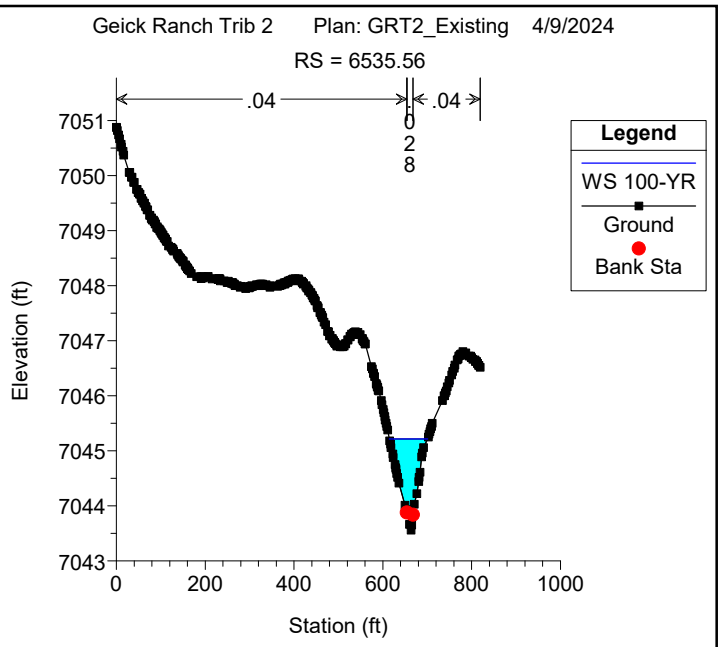
MAP REVISED
DECEMBER 7, 2018

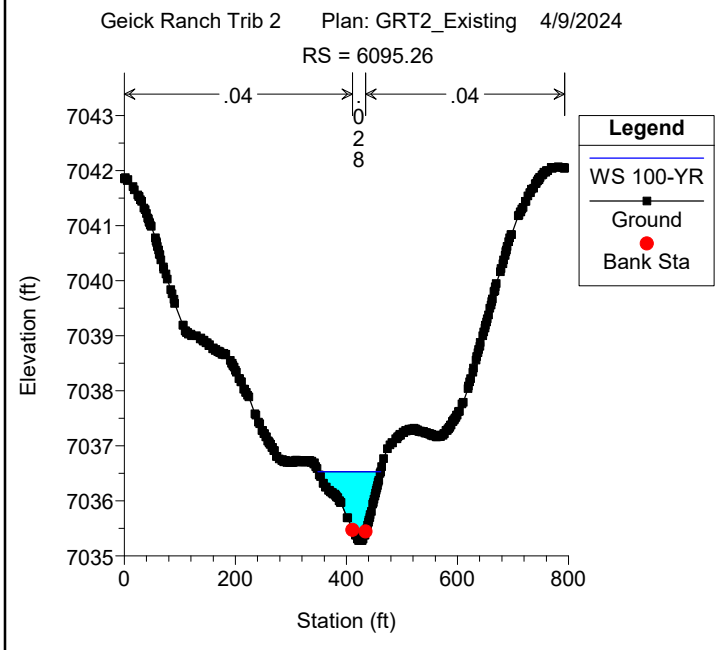
Appendix C
Existing Conditions Cross Sections

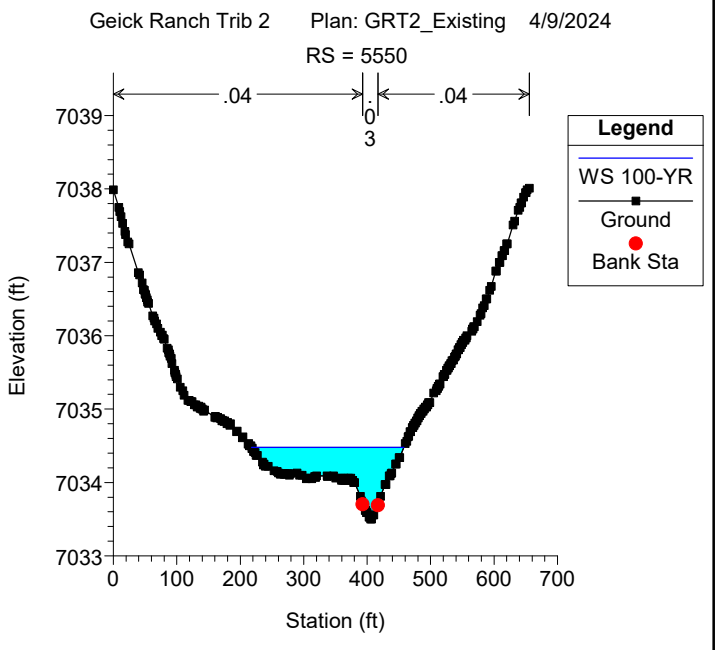
HEC-RAS Plan: Existing River: Geick Ranch Trib Reach: Existing Profile: 100-YR

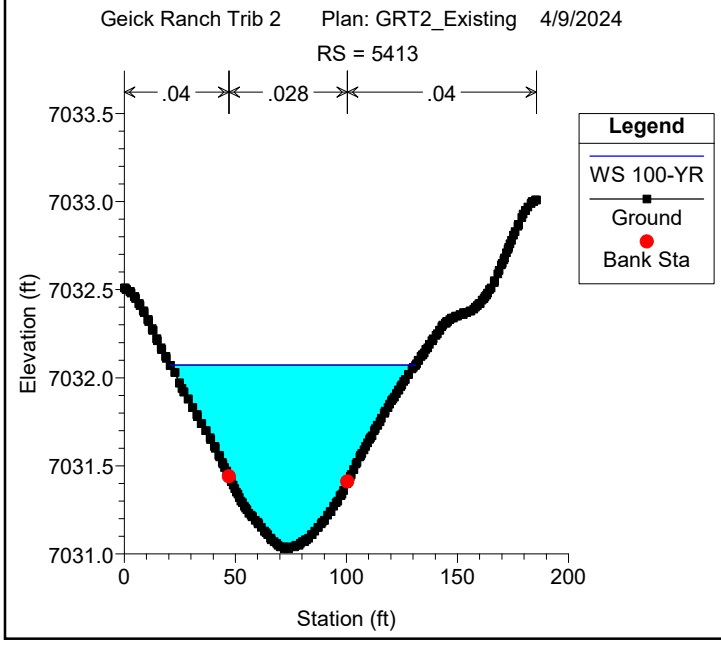
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Existing	7029.02	100-YR	262.00	7051.75	7052.94	7052.94	7053.39	0.010081	5.59	54.13	65.93	0.95
Existing	6535.56	100-YR	262.00	7043.56	7045.22	7045.22	7045.63	0.009209	6.69	67.67	86.30	0.96
Existing	6095.26	100-YR	262.00	7035.28	7036.53	7036.53	7036.87	0.009121	5.67	73.49	112.77	0.92
Existing	5550	100-YR	262.00	7033.50	7034.48	7034.48	7034.66	0.011136	4.83	100.58	240.04	0.90
Existing	5413	100-YR	262.00	7031.03	7032.07	7032.07	7032.40	0.009781	4.87	65.39	110.54	0.91
Existing	5237	100-YR	262.00	7028.83	7029.84	7029.84	7029.99	0.010073	4.05	106.13	277.65	0.88
Existing	5124	100-YR	262.00	7026.14	7027.08	7027.08	7027.37	0.012735	4.30	61.10	107.26	0.97
Existing	4855	100-YR	262.00	7020.15	7020.80	7020.80	7020.99	0.013829	3.79	79.67	201.93	0.97
Existing	4495	100-YR	536.00	7010.15	7011.28	7011.28	7011.65	0.011813	4.88	113.01	171.72	0.98
Existing	4243	100-YR	536.00	7002.09	7003.34	7003.34	7003.73	0.011797	5.05	108.79	154.34	0.98
Existing	4015	100-YR	536.00	6997.08	6998.32	6998.32	6998.71	0.011300	5.04	110.50	160.73	0.97
Existing	3851	100-YR	536.00	6991.46	6992.64	6992.64	6993.04	0.010640	5.23	112.82	153.86	0.95
Existing	3575.47	100-YR	621.00	6984.32	6985.50	6985.50	6985.87	0.010708	5.04	138.08	202.24	0.95
Existing	3361.62	100-YR	621.00	6980.90	6982.00	6982.00	6982.36	0.012054	4.84	130.18	188.10	0.98
Existing	3164.79	100-YR	621.00	6975.30	6976.37	6976.37	6976.72	0.010555	4.83	137.69	197.74	0.93
Existing	2928	100-YR	621.00	6971.11	6972.22	6972.22	6972.59	0.012484	4.85	130.01	193.19	0.99
Existing	2742.47	100-YR	621.00	6965.00	6966.54	6966.54	6967.04	0.009167	5.68	117.61	148.26	0.92
Existing	2559.12	100-YR	621.00	6957.93	6960.30	6960.30	6961.16	0.007891	7.60	90.71	61.39	0.93
Existing	2421.92	100-YR	621.00	6954.85	6956.79	6956.79	6957.49	0.009703	6.75	93.87	71.40	0.98
Existing	2258.77	100-YR	621.00	6950.91	6952.90	6952.90	6953.61	0.009437	6.81	94.14	72.89	0.97
Existing	2060.1	100-YR	621.00	6945.95	6948.30	6948.30	6949.04	0.009630	6.90	91.69	70.41	0.98
Existing	1906.96	100-YR	621.00	6942.93	6945.22	6945.22	6945.78	0.008074	6.22	115.74	111.50	0.90
Existing	1764	100-YR	621.00	6940.99	6942.96	6942.96	6943.59	0.009775	6.39	101.45	91.75	0.97
Existing	1519.95	100-YR	621.00	6936.99	6938.54	6938.54	6938.91	0.009685	6.04	151.56	180.35	0.95
Existing	1350.59	100-YR	621.00	6933.90	6935.32		6935.66	0.006056	4.77	143.76	147.12	0.75
Existing	1221	100-YR	621.00	6932.65	6934.13	6934.13	6934.57	0.011897	5.33	117.43	144.85	1.00
Existing	1036	100-YR	649.00	6929.64	6930.88	6930.88	6931.22	0.013098	4.65	140.56	218.13	1.00
Existing	802.78	100-YR	649.00	6925.60	6926.82	6926.82	6927.23	0.012292	5.16	126.25	158.15	1.00
Existing	460.25	100-YR	649.00	6921.40	6922.68	6922.68	6923.08	0.011297	5.13	130.31	177.43	0.97
Existing	208.05	100-YR	649.00	6917.96	6918.61	6918.61	6918.88	0.013643	4.21	159.36	399.93	0.99
Existing	2.6	100-YR	649.00	6912.97	6915.00	6915.00	6915.51	0.010275	6.22	133.19	213.29	0.98
Existing	-164.55	100-YR	649.00	6909.88	6911.20	6911.20	6911.73	0.010630	5.83	113.61	115.94	0.98
Existing	-296.57	100-YR	649.00	6907.23	6909.25	6909.25	6909.86	0.008634	6.48	113.17	106.09	0.93
Existing	-530.34	100-YR	649.00	6905.98	6907.20	6907.20	6907.55	0.009816	5.42	161.42	224.58	0.93
Existing	-734.97	100-YR	649.00	6902.27	6903.80	6903.80	6904.20	0.008556	5.95	158.64	195.26	0.91

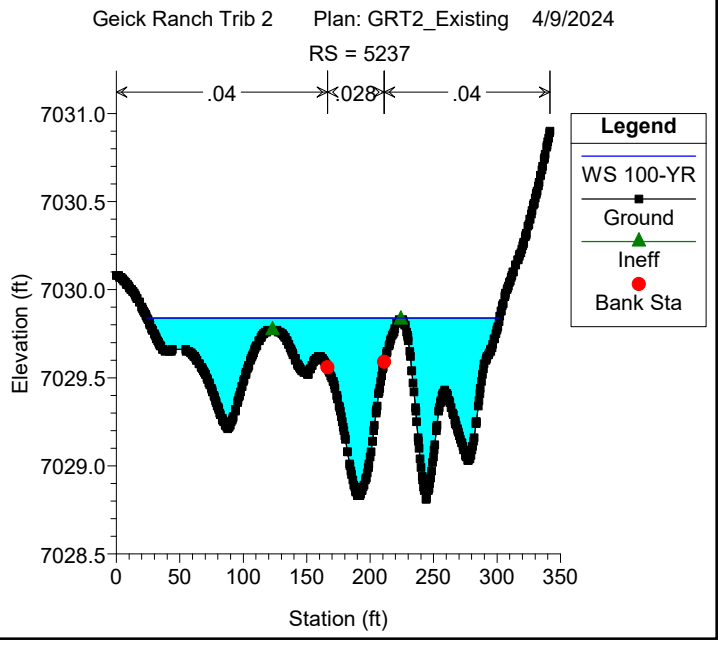

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 7029.02
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

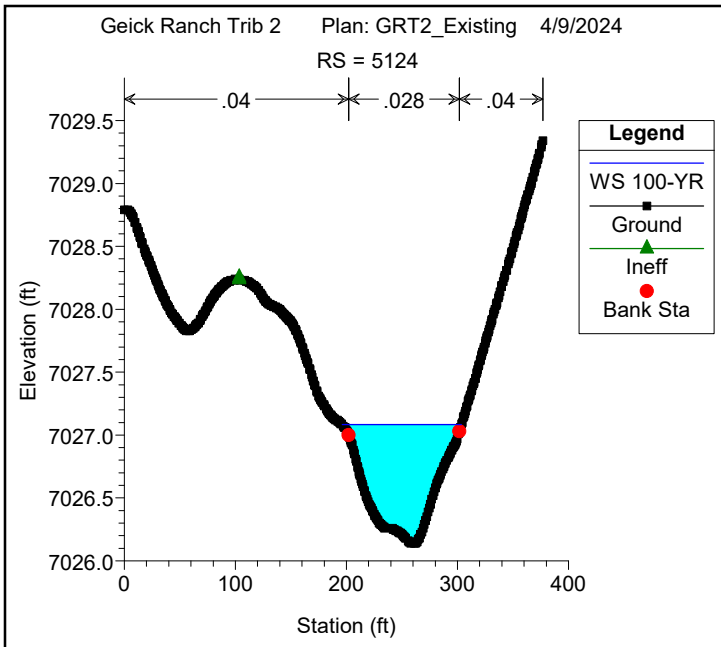

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 6535.56
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

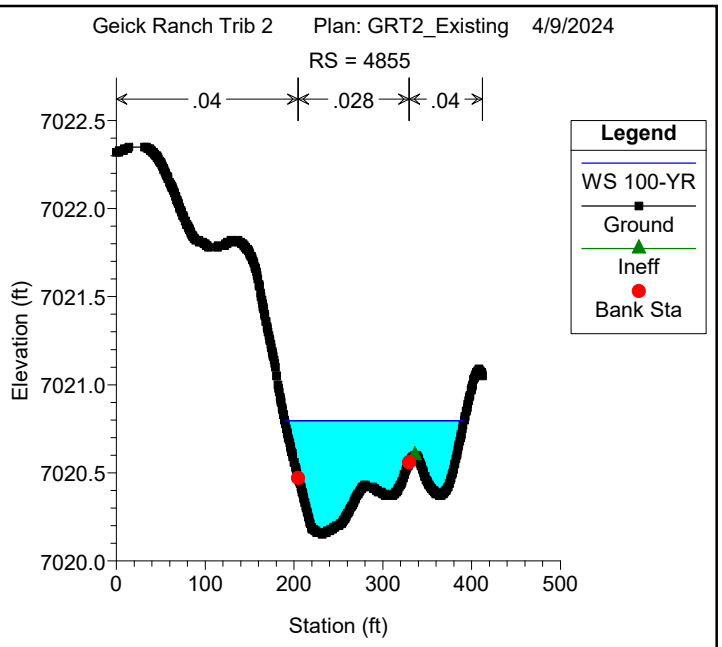

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 6095.26
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

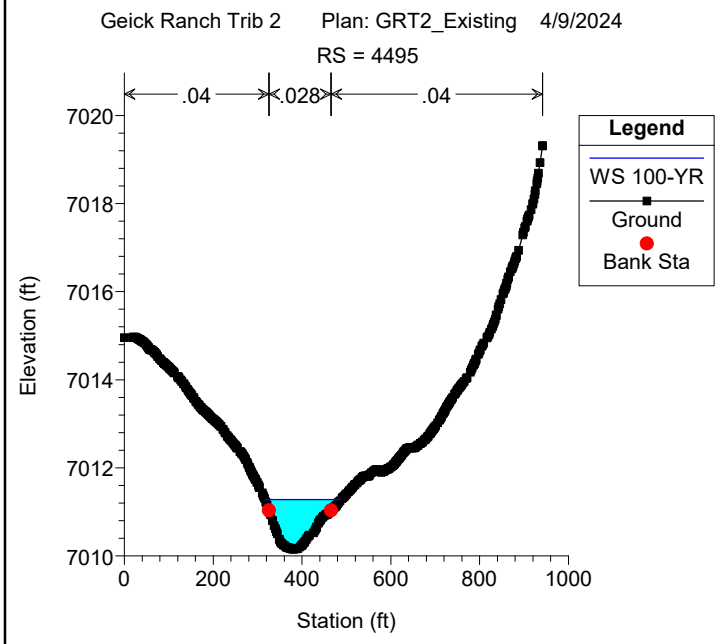

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 5550
.04
.03
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

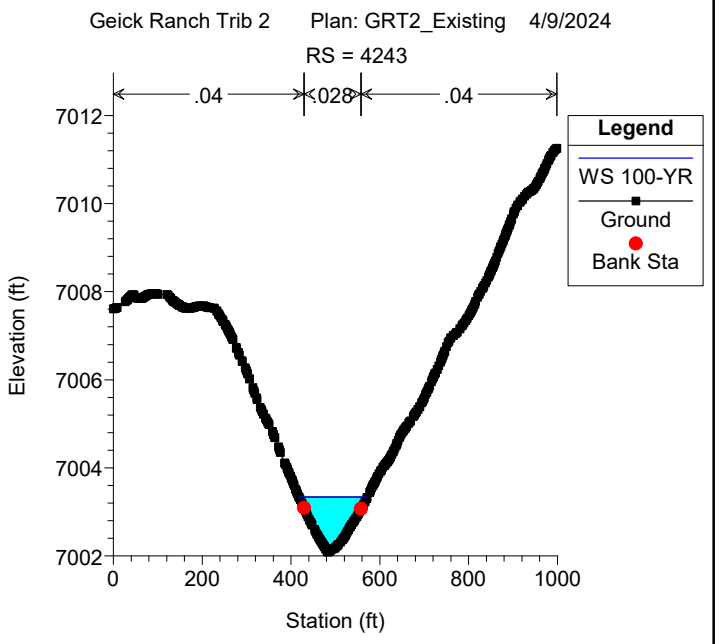

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 5413
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

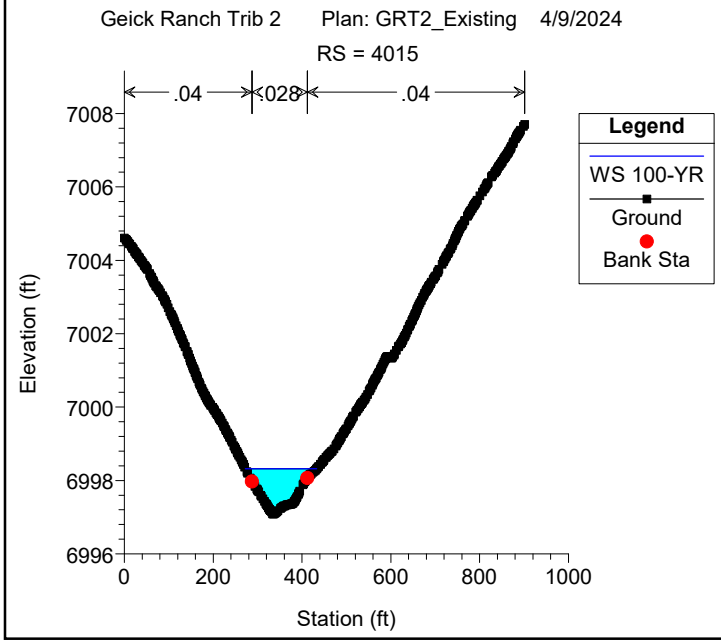

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 5237
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

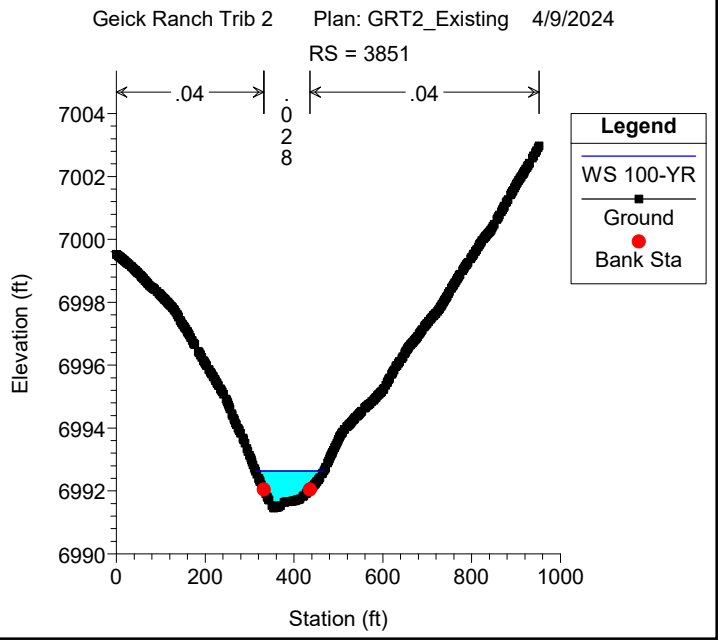

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 5124
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

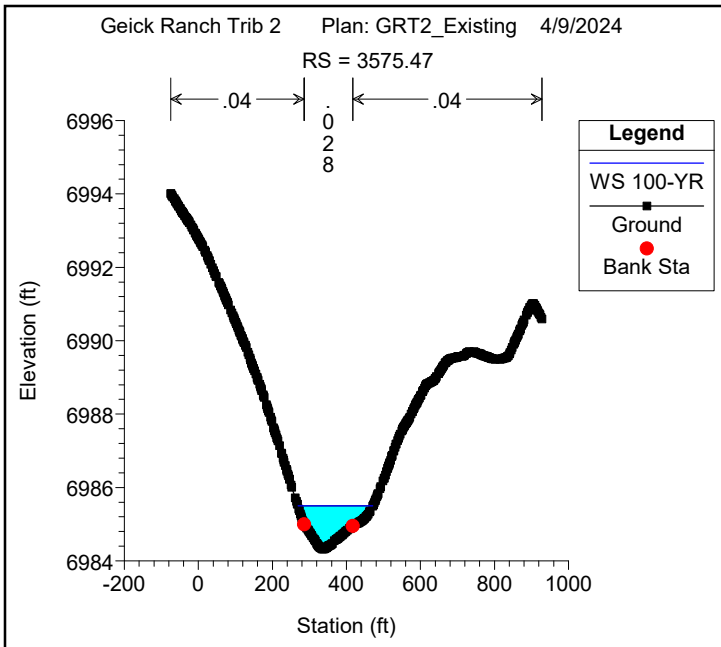

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 4855
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

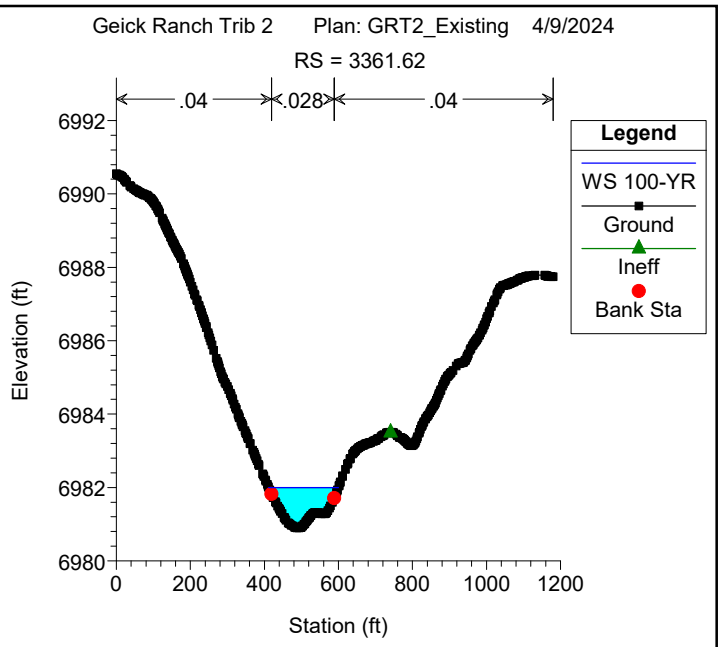

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 4495
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

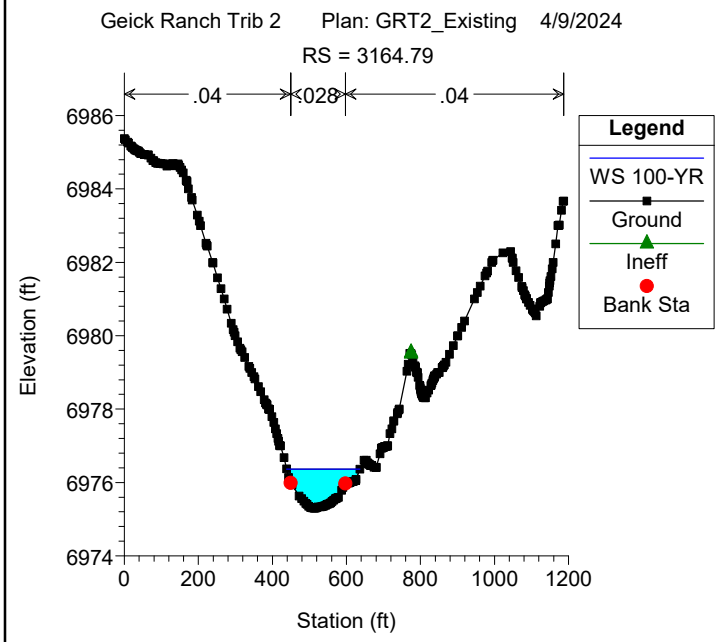

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 4243
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

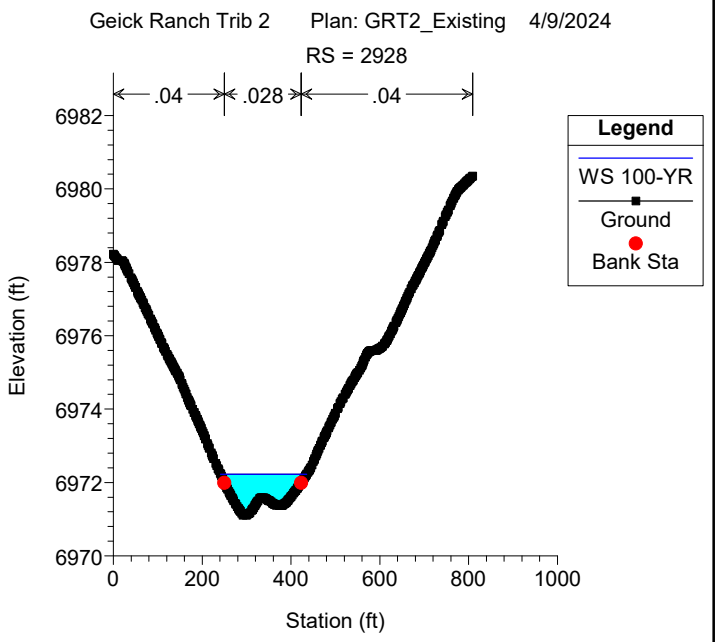

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 4015
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

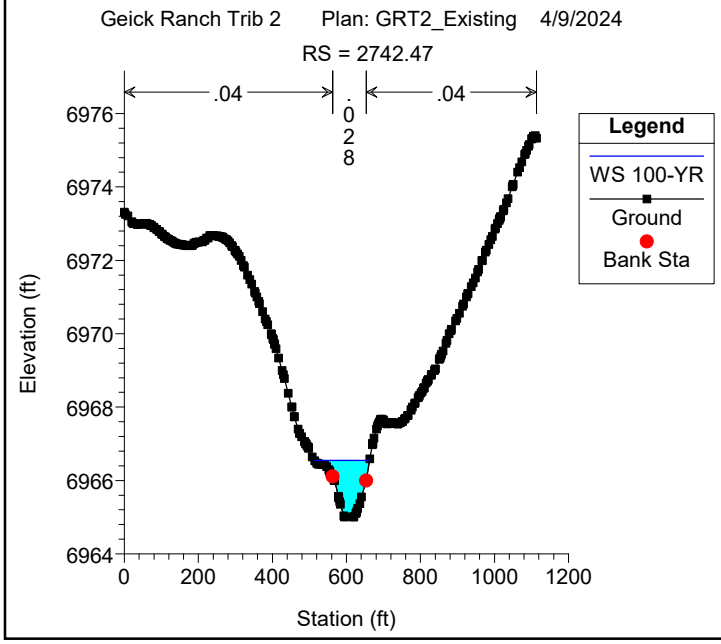

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 3851
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

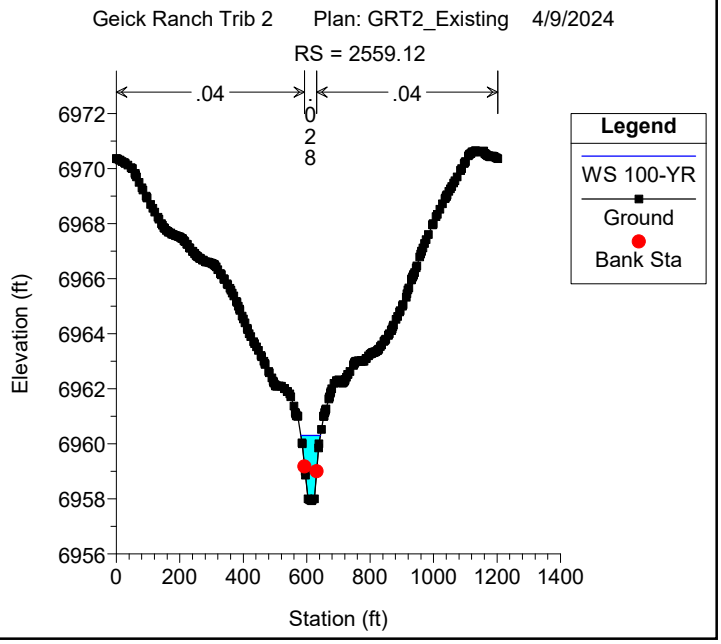

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 3575.47
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

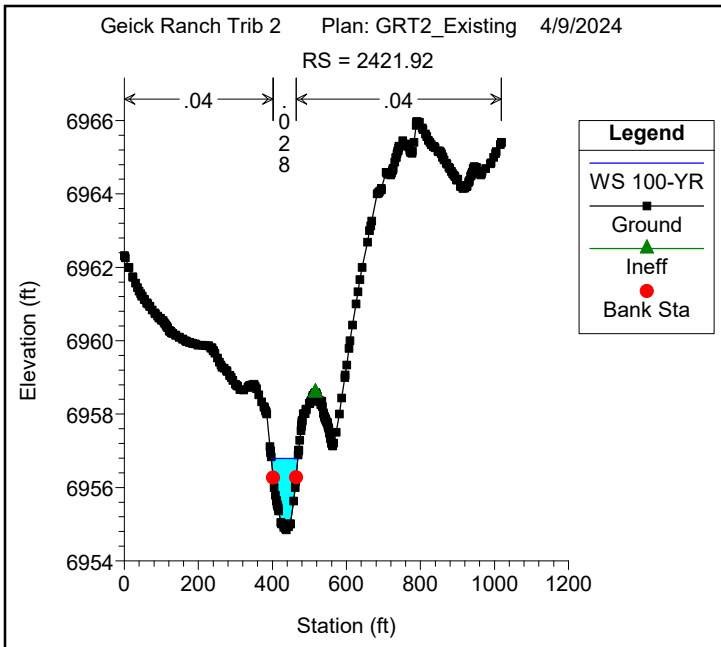

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 3361.62
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

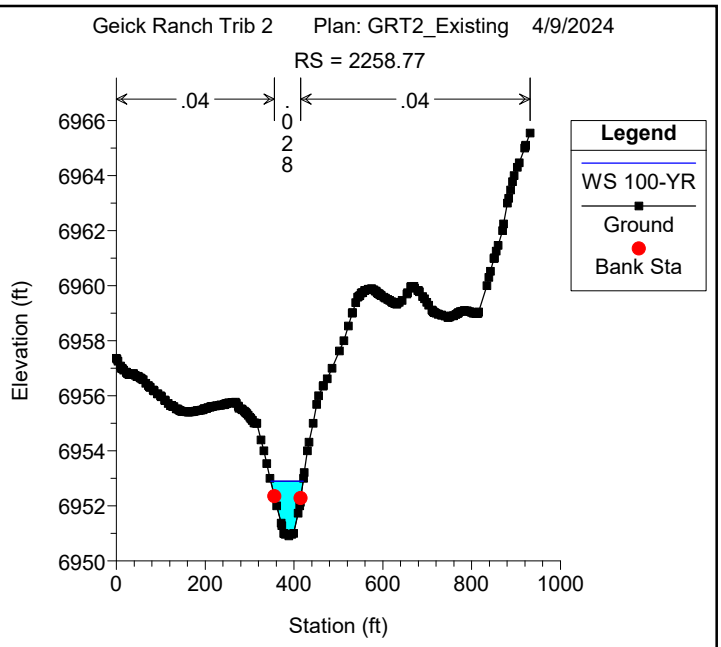

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 3164.79
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

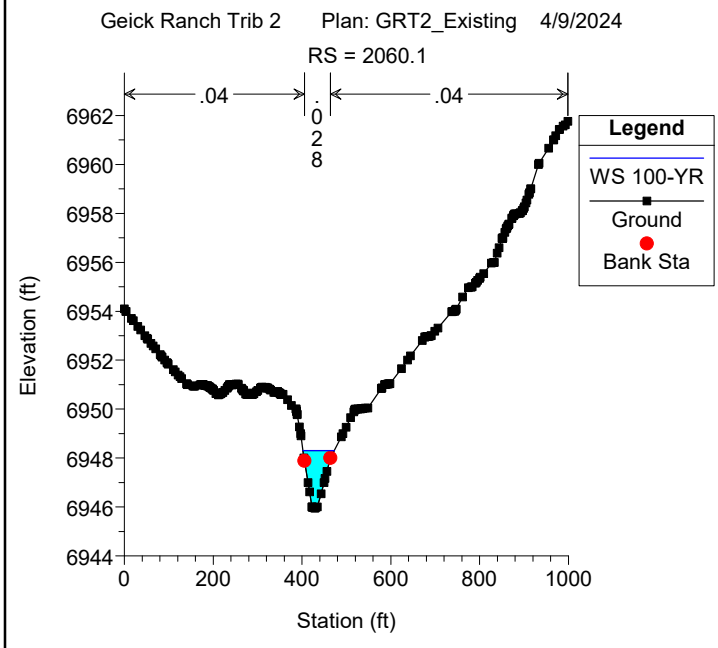

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 2928
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

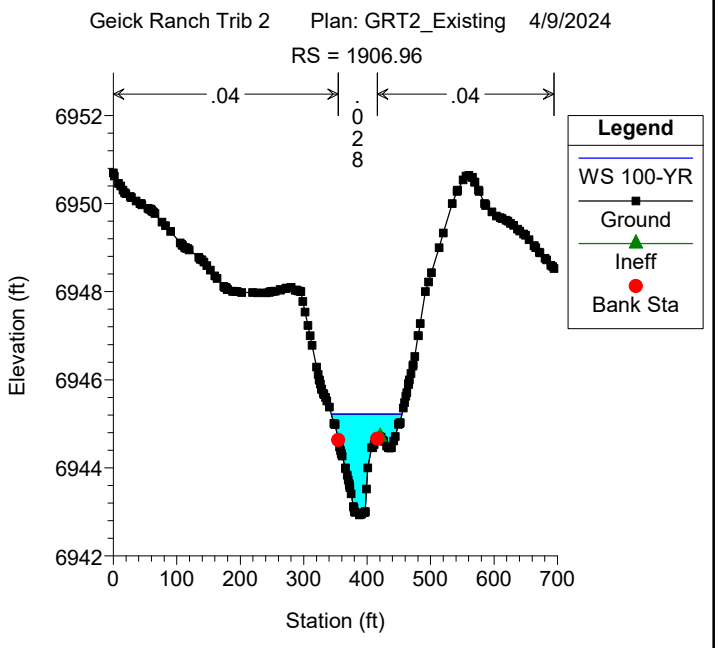

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 2742.47
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

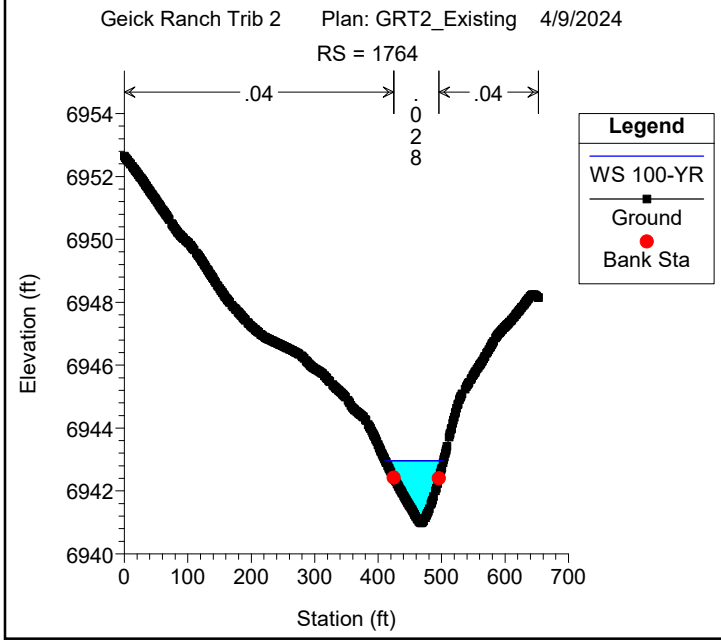

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 2559.12
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

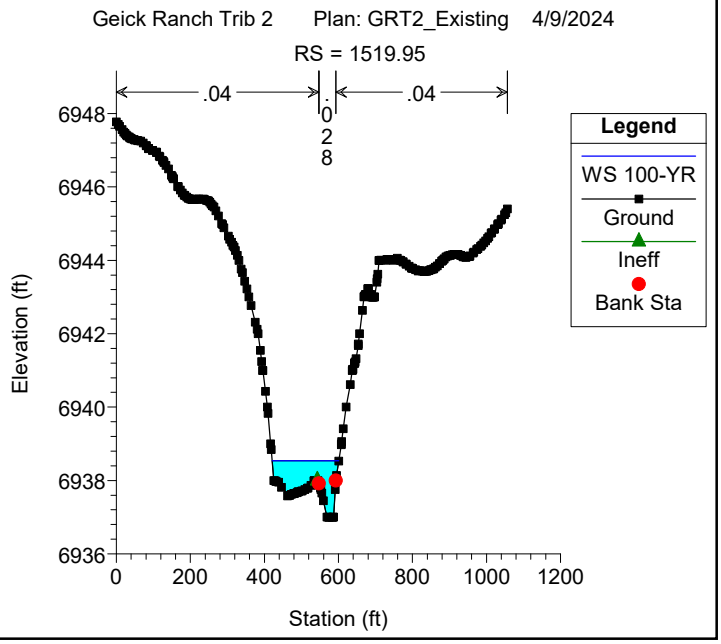

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 2421.92
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

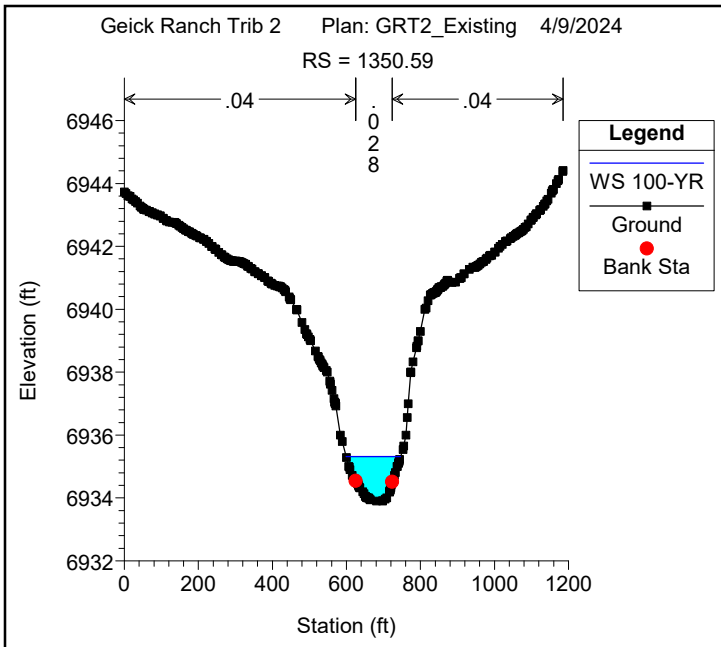

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 2258.77
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

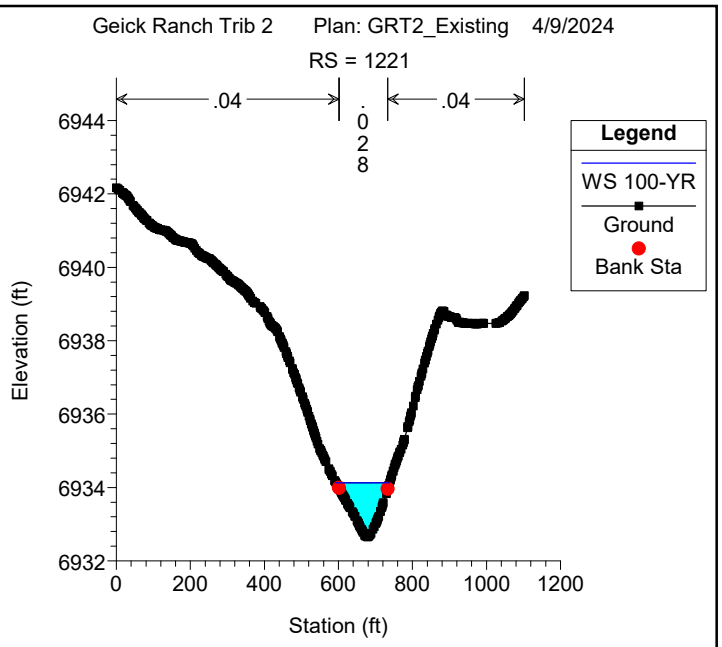

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 2060.1
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

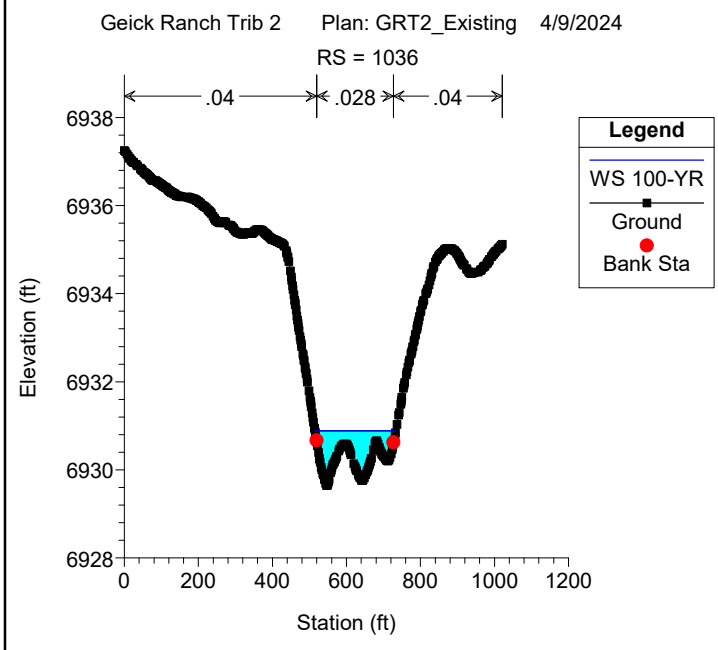

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 1906.96
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

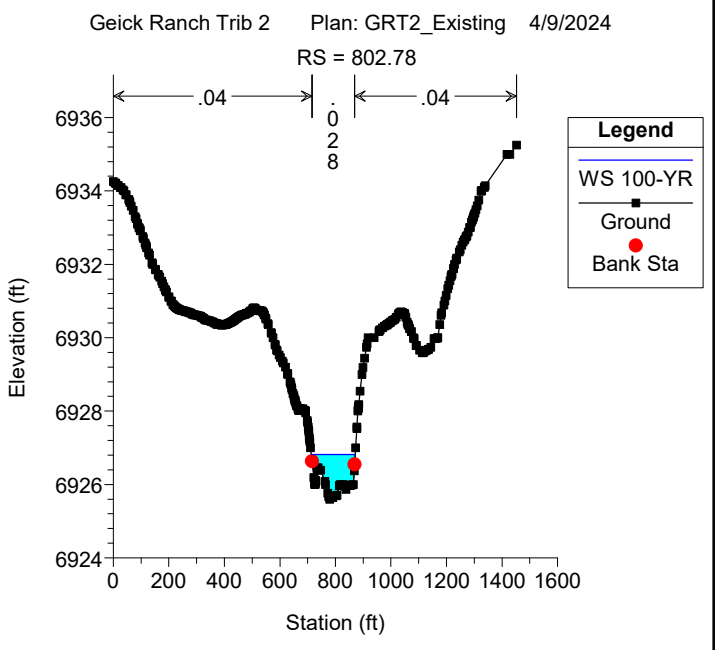

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 1764
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

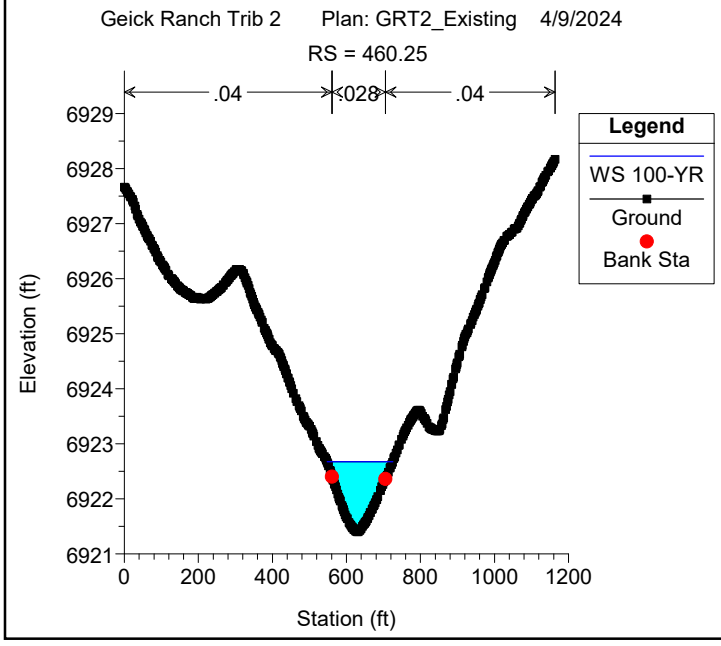

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 1519.95
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

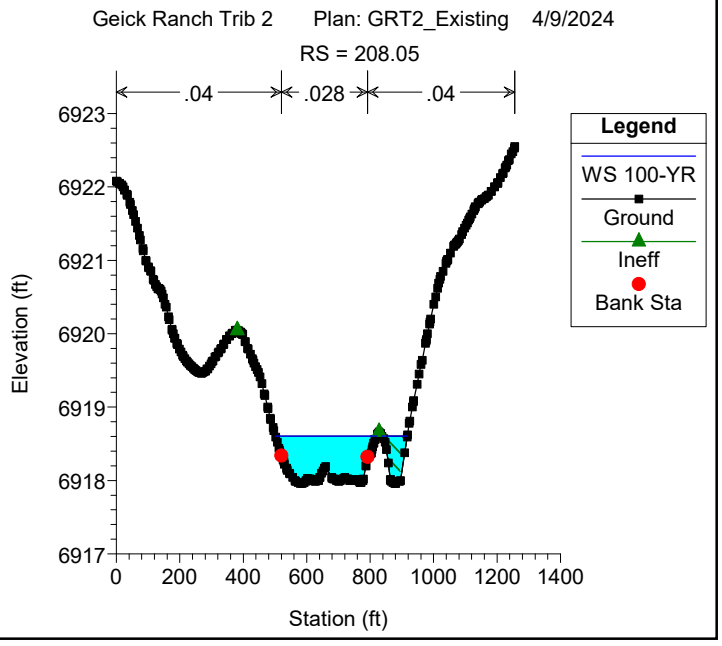

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 1350.59
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

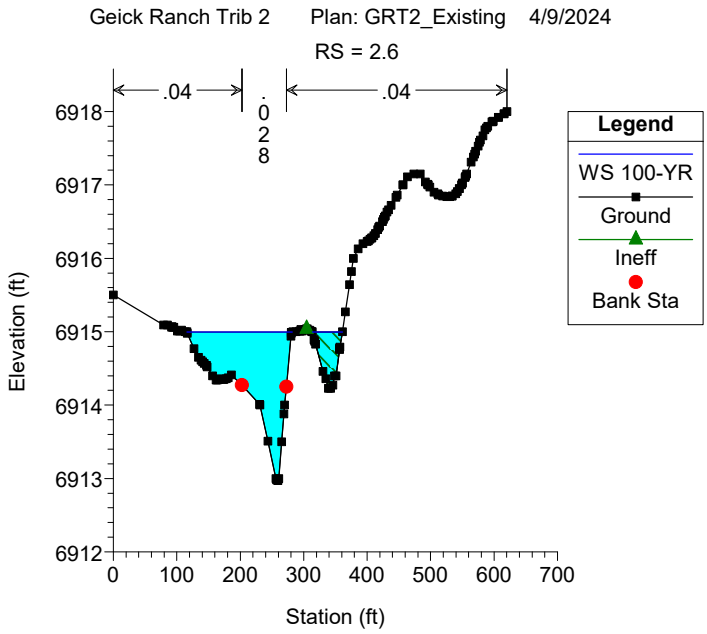

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 1221
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

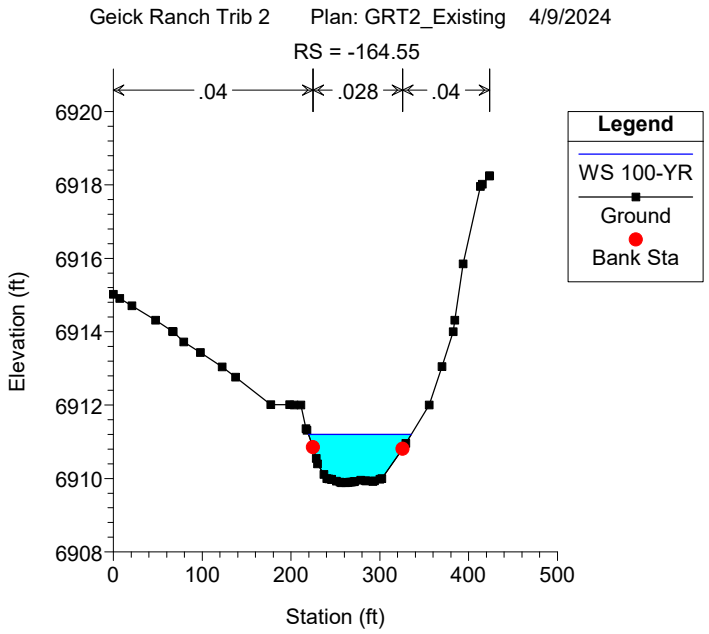

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 1036
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

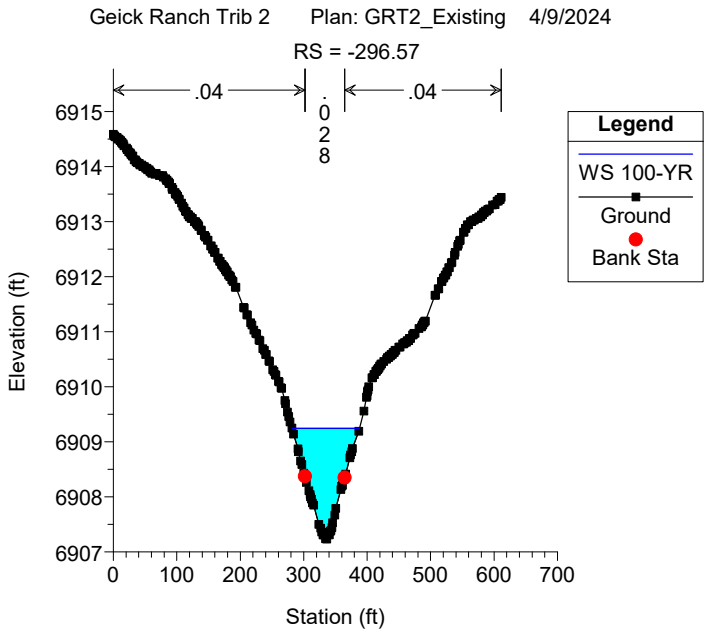

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 802.78
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

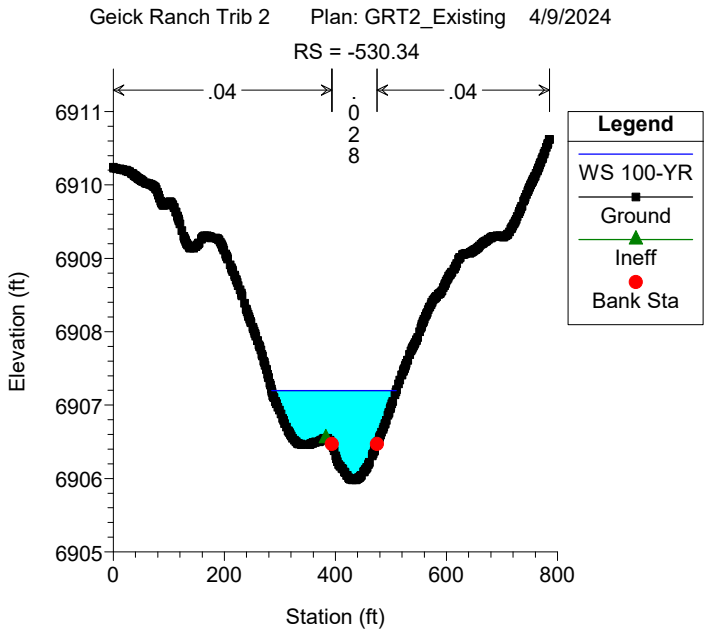

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 460.25
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)

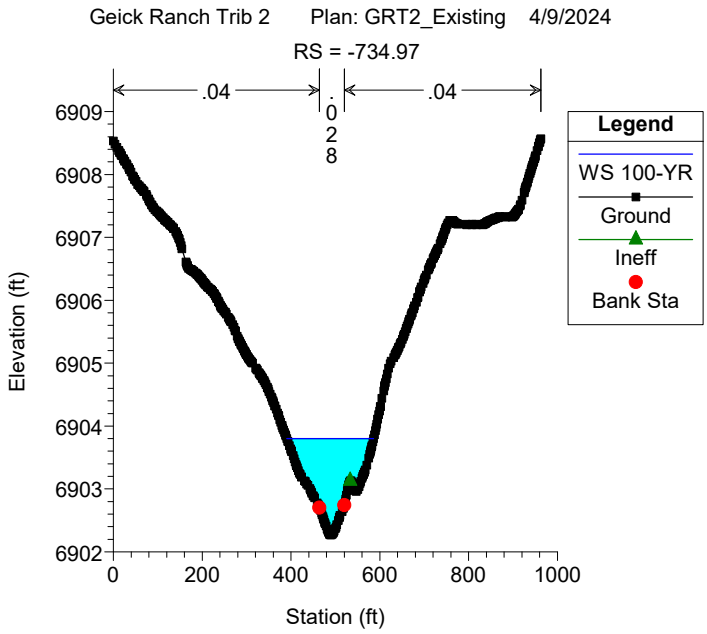

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 208.05
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

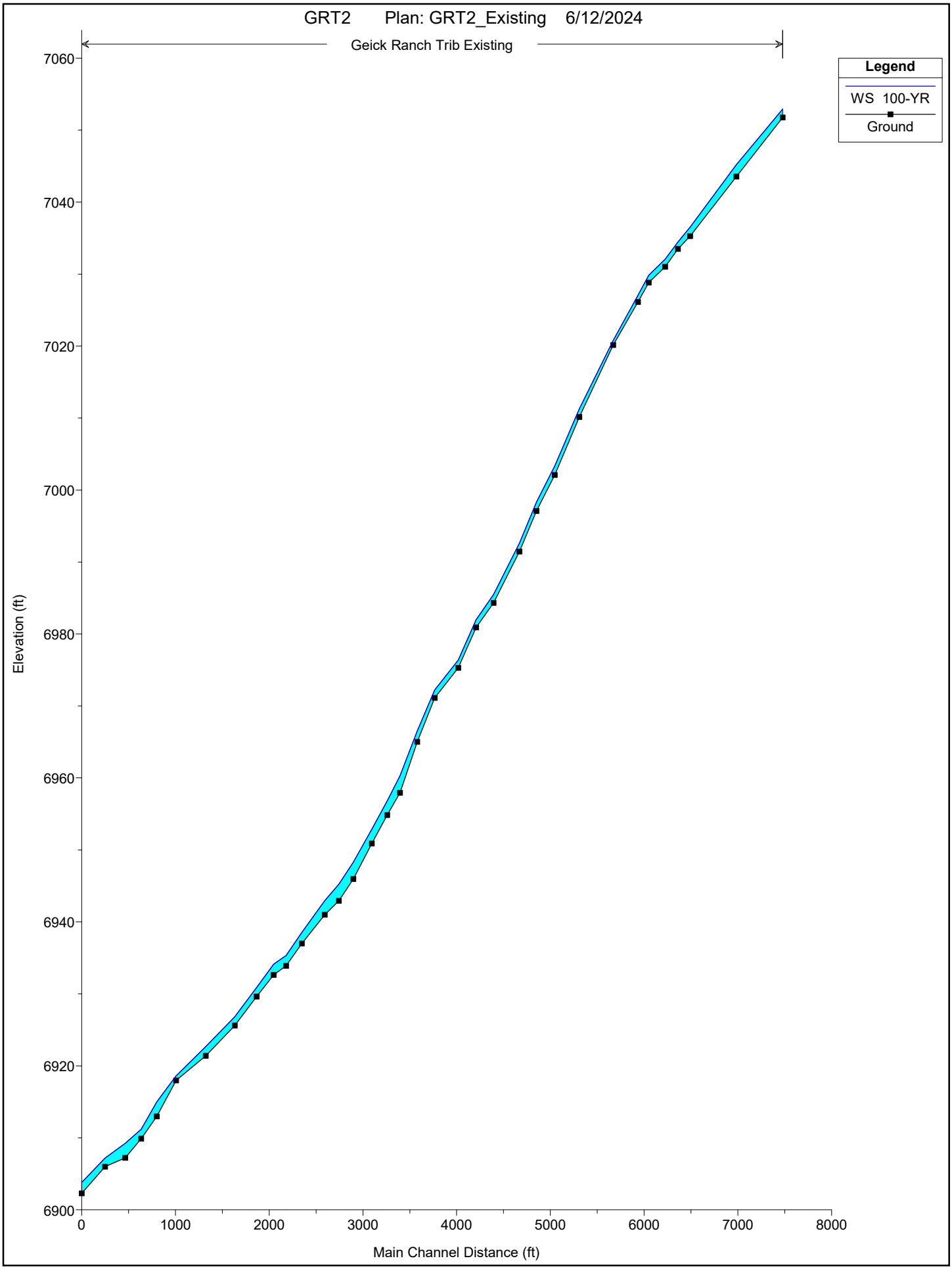

Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = 2.6
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = -164.55
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)


Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = -296.57
.04
.028
.04
Legend
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)


Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = -530.34
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Geick Ranch Trib 2 Plan: GRT2_Existing 4/9/2024
RS = -734.97
.04
.028
.04
Legend
WS 100-YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


GRT2 Plan: GRT2_Existing 6/12/2024
Geick Ranch Trib Existing
Legend
WS 100-YR
Ground
Elevation (ft)
7060
7040
7020
7000
6980
6960
6940
6920
6900
0
1000
2000
3000
4000
5000
6000
7000
8000
Main Channel Distance (ft)

Appendix D
Proposed Conditions Cross Sections

HEC-RAS Plan: Proposed River: ChannelB Reach: Combined PR Chan

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)	
Combined PR Chan	9426.04	100-yr	262.00	7051.75	7052.93	7052.93	7053.38	0.011758	5.61	53.55	65.66	0.96
Combined PR Chan	9426.04	10-yr	137.00	7051.75	7052.58	7052.58	7052.90	0.013720	4.63	32.18	55.17	0.97
Combined PR Chan	9426.04	Bankfull	19.00	7051.75	7052.05	7052.05	7052.16	0.023723	2.60	7.32	36.88	1.03
Combined PR Chan	8932.93	100-yr	262.00	7043.56	7045.16	7045.16	7045.60	0.011814	6.88	62.59	81.30	1.01
Combined PR Chan	8932.93	10-yr	137.00	7043.56	7044.79	7044.79	7045.11	0.011589	5.60	37.12	59.46	0.95
Combined PR Chan	8932.93	Bankfull	19.00	7043.56	7044.11	7044.11	7044.26	0.014155	3.22	7.00	27.26	0.89
Combined PR Chan	8439.38	100-yr	262.00	7035.28	7036.53	7036.53	7036.85	0.009943	5.53	73.38	112.72	0.90
Combined PR Chan	8439.38	10-yr	137.00	7035.28	7036.23	7036.23	7036.48	0.010478	4.66	42.53	89.26	0.88
Combined PR Chan	8439.38	Bankfull	19.00	7035.28	7035.66	7035.62	7035.74	0.011050	2.40	8.81	36.93	0.76
Combined PR Chan	8310.02	100-yr	262.00	7033.50	7034.48	7034.48	7034.66	0.011063	4.82	100.81	240.12	0.90
Combined PR Chan	8310.02	10-yr	137.00	7033.50	7034.32	7034.32	7034.46	0.009419	3.92	65.50	218.44	0.81
Combined PR Chan	8310.02	Bankfull	19.00	7033.50	7033.86	7033.86	7033.98	0.017346	2.75	7.59	36.67	0.93
Combined PR Chan	8096	100-yr	262.00	7031.03	7032.06	7032.06	7032.40	0.010062	4.91	64.64	109.49	0.92
Combined PR Chan	8096	10-yr	137.00	7031.03	7031.78	7031.78	7032.03	0.011680	4.08	37.10	83.07	0.93
Combined PR Chan	8096	Bankfull	19.00	7031.03	7031.32	7031.32	7031.41	0.020487	2.39	7.94	44.86	1.00
Combined PR Chan	8005	100-yr	262.00	7024.27	7025.75	7025.75	7026.29	0.009830	5.98	45.91	42.50	0.96
Combined PR Chan	8005	10-yr	137.00	7024.27	7025.33	7025.33	7025.70	0.011826	4.91	28.50	39.07	0.98
Combined PR Chan	8005	Bankfull	19.00	7024.27	7024.69	7024.69	7024.82	0.017947	2.88	6.59	25.51	1.00
Combined PR Chan	7849	100-yr	262.00	7021.00	7022.19	7022.19	7022.74	0.010473	5.99	45.15	42.84	0.98
Combined PR Chan	7849	10-yr	137.00	7021.00	7021.78	7021.78	7022.15	0.012686	4.92	28.14	39.52	1.00
Combined PR Chan	7849	Bankfull	19.00	7021.00	7021.22	7021.22	7021.32	0.019372	2.60	7.31	35.00	1.00
Combined PR Chan	7712	100-yr	262.00	7017.86	7019.07	7019.07	7019.62	0.010396	6.02	45.44	43.01	0.98
Combined PR Chan	7712	10-yr	137.00	7017.86	7018.65	7018.65	7019.03	0.012388	4.93	28.38	39.72	0.99
Combined PR Chan	7712	Bankfull	19.00	7017.86	7018.09	7018.09	7018.20	0.020312	2.63	7.22	35.19	1.02
Combined PR Chan	7583	100-yr	262.00	7014.94	7016.15	7016.15	7016.70	0.010460	6.05	45.70	43.41	0.98
Combined PR Chan	7583	10-yr	137.00	7014.94	7015.74	7015.74	7016.11	0.012394	4.95	28.54	40.08	1.00
Combined PR Chan	7583	Bankfull	19.00	7014.94	7015.18	7015.18	7015.28	0.020213	2.62	7.26	35.56	1.02
Combined PR Chan	7482	100-yr	262.00	7012.11	7014.67		7014.81	0.001179	3.10	93.53	51.06	0.37
Combined PR Chan	7482	10-yr	137.00	7012.11	7013.22	7013.22	7013.60	0.012427	4.97	28.07	39.33	1.00
Combined PR Chan	7482	Bankfull	19.00	7012.11	7012.57	7012.57	7012.71	0.018277	2.99	6.36	23.62	1.02
Combined PR Chan	7395	100-yr	262.00	7011.00	7014.69	7012.14	7014.74	0.000185	1.72	161.63	75.13	0.16
Combined PR Chan	7395	10-yr	137.00	7011.00	7013.04	7011.75	7013.08	0.000385	1.67	86.99	53.40	0.21
Combined PR Chan	7395	Bankfull	19.00	7011.00	7011.20	7011.20	7011.30	0.019529	2.54	7.53	38.27	1.00
Combined PR Chan	7290		Culvert									
Combined PR Chan	7160.32	100-yr	536.00	7005.60	7008.77	7008.77	7010.03	0.010692	10.44	63.12	69.52	1.07
Combined PR Chan	7160.32	10-yr	277.00	7005.60	7007.84	7007.84	7008.66	0.011419	8.42	41.20	61.98	1.04
Combined PR Chan	7160.32	Bankfull	31.72	7005.60	7006.54	7006.54	7006.75	0.009467	3.92	10.24	41.53	0.80
Combined PR Chan	7072.44	100-yr	536.00	7004.86	7007.44	7007.16	7007.91	0.008036	7.78	105.98	62.56	0.88
Combined PR Chan	7072.44	10-yr	277.00	7004.86	7006.81	7006.62	7007.13	0.008328	6.46	67.74	58.09	0.85
Combined PR Chan	7072.44	Bankfull	31.72	7004.86	7005.86	7005.86	7005.99	0.006815	3.52	15.93	51.41	0.68
Combined PR Chan	6977.14	100-yr	536.00	7004.12	7006.78		7007.19	0.006646	7.22	113.68	64.67	0.81
Combined PR Chan	6977.14	10-yr	277.00	7004.12	7006.16		7006.42	0.006225	5.77	74.97	59.88	0.75
Combined PR Chan	6977.14	Bankfull	31.72	7004.12	7005.10	7005.10	7005.22	0.006987	3.48	15.91	51.70	0.69
Combined PR Chan	6850.04	100-yr	536.00	7003.14	7005.29	7005.29	7005.95	0.014787	9.25	90.01	65.81	1.16
Combined PR Chan	6850.04	10-yr	277.00	7003.14	7004.79	7004.79	7005.24	0.014811	7.64	58.35	61.90	1.11
Combined PR Chan	6850.04	Bankfull	31.72	7003.14	7004.09	7004.09	7004.20	0.007055	3.43	16.70	56.16	0.69
Combined PR Chan	6663.5	100-yr	536.00	6999.28	7001.57	7001.57	7002.26	0.014092	9.47	88.62	61.65	1.15
Combined PR Chan	6663.5	10-yr	277.00	6999.28	7001.06	7001.06	7001.52	0.013423	7.68	58.12	57.76	1.07
Combined PR Chan	6663.5	Bankfull	31.72	6999.28	7000.28	7000.28	7000.41	0.007151	3.59	15.43	51.63	0.70
Combined PR Chan	6464.81	100-yr	536.00	6996.40	6998.65	6998.65	6999.34	0.014508	9.46	88.10	61.88	1.16
Combined PR Chan	6464.81	10-yr	277.00	6996.40	6998.14	6998.14	6998.60	0.013947	7.70	57.70	57.96	1.08
Combined PR Chan	6464.81	Bankfull	31.72	6996.40	6997.38	6997.38	6997.51	0.007209	3.56	15.82	52.07	0.70
Combined PR Chan	6294.46	100-yr	536.00	6993.77	6996.12	6996.12	6996.80	0.013444	9.38	89.28	60.64	1.12
Combined PR Chan	6294.46	10-yr	277.00	6993.77	6995.59	6995.59	6996.06	0.013431	7.77	57.79	57.27	1.07
Combined PR Chan	6294.46	Bankfull	31.72	6993.77	6994.78	6994.78	6994.93	0.007839	3.77	14.29	46.48	0.73
Combined PR Chan	6192.16	100-yr	536.00	6991.76	6993.96	6993.96	6994.64	0.014392	9.31	89.28	63.88	1.15
Combined PR Chan	6192.16	10-yr	277.00	6991.76	6993.46	6993.46	6993.92	0.013884	7.58	58.43	60.13	1.08
Combined PR Chan	6192.16	Bankfull	31.72	6991.76	6992.71	6992.71	6992.84	0.007584	3.56	15.25	51.62	0.71
Combined PR Chan	6020.29	100-yr	536.00	6988.02	6990.18	6990.18	6990.83	0.014818	9.27	90.30	66.49	1.16
Combined PR Chan	6020.29	10-yr	277.00	6988.02	6989.70	6989.70	6990.14	0.014455	7.61	59.17	63.12	1.09

HEC-RAS Plan: Proposed River: ChannelB Reach: Combined PR Chan (Continued)

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)	
Combined PR Chan	6020.29	Bankfull	31.72	6988.02	6989.00	6989.00	6989.11	0.006902	3.46	16.74	57.79	0.68
Combined PR Chan	5853	100-yr	536.00	6984.80	6987.49	6987.22	6987.95	0.007433	7.75	108.64	63.90	0.86
Combined PR Chan	5853	10-yr	277.00	6984.80	6986.94	6986.68	6987.22	0.006012	5.92	74.99	59.69	0.74
Combined PR Chan	5853	Bankfull	31.72	6984.80	6985.87	6985.81	6986.00	0.005638	3.39	15.71	48.06	0.63
Combined PR Chan	5852.4	100-yr	536.00	6984.59	6987.24	6987.05	6987.77	0.008777	8.27	101.86	63.57	0.93
Combined PR Chan	5852.4	10-yr	277.00	6984.59	6986.56	6986.56	6987.00	0.011088	7.50	61.04	58.13	0.99
Combined PR Chan	5852.4	Bankfull	31.72	6984.59	6985.66	6985.66	6985.85	0.007774	3.95	12.71	41.30	0.74
Combined PR Chan	5800		Culvert									
Combined PR Chan	5730	100-yr	536.00	6983.79	6986.56	6986.13	6987.03	0.006230	7.27	103.96	65.48	0.79
Combined PR Chan	5730	10-yr	277.00	6983.79	6985.90	6985.59	6986.18	0.005764	5.74	70.90	59.92	0.73
Combined PR Chan	5730	Bankfull	31.72	6983.79	6984.77	6984.74	6984.88	0.006081	3.29	15.89	49.69	0.64
Combined PR Chan	5728.67	100-yr	621.00	6983.48	6985.98	6985.98	6986.72	0.013073	9.70	98.62	63.82	1.12
Combined PR Chan	5728.67	10-yr	319.00	6983.48	6985.43	6985.43	6985.90	0.012102	7.81	65.89	59.81	1.03
Combined PR Chan	5728.67	Bankfull	33.53	6983.48	6984.54	6984.54	6984.70	0.007185	3.78	15.47	51.46	0.71
Combined PR Chan	5541.86	100-yr	621.00	6980.68	6983.47		6983.94	0.007272	7.81	122.08	65.77	0.85
Combined PR Chan	5541.86	10-yr	319.00	6980.68	6982.80		6983.10	0.006945	6.26	79.57	60.51	0.79
Combined PR Chan	5541.86	Bankfull	33.53	6980.68	6981.66	6981.66	6981.80	0.007937	3.72	15.79	51.65	0.73
Combined PR Chan	5424.96	100-yr	621.00	6979.61	6982.01	6982.01	6982.76	0.014064	9.76	97.51	62.37	1.15
Combined PR Chan	5424.96	10-yr	319.00	6979.61	6981.43	6981.43	6981.94	0.014472	8.09	62.31	58.07	1.11
Combined PR Chan	5424.96	Bankfull	33.53	6979.61	6980.59	6980.59	6980.73	0.007883	3.70	16.03	51.89	0.73
Combined PR Chan	5301.31	100-yr	621.00	6977.39	6980.03	6979.80	6980.60	0.009445	8.56	111.25	63.75	0.96
Combined PR Chan	5301.31	10-yr	319.00	6977.39	6979.38		6979.77	0.009713	7.06	70.99	59.03	0.93
Combined PR Chan	5301.31	Bankfull	33.53	6977.39	6978.39	6978.39	6978.53	0.007627	3.69	16.06	51.91	0.72
Combined PR Chan	5209.65	100-yr	621.00	6976.56	6979.27		6979.78	0.008121	8.09	117.04	64.40	0.90
Combined PR Chan	5209.65	10-yr	319.00	6976.56	6978.61		6978.94	0.007985	6.55	75.78	59.59	0.84
Combined PR Chan	5209.65	Bankfull	33.53	6976.56	6977.54	6977.54	6977.67	0.007513	3.63	16.31	51.90	0.71
Combined PR Chan	5078.71	100-yr	621.00	6975.36	6978.03	6977.83	6978.62	0.009662	8.72	110.31	63.94	0.97
Combined PR Chan	5078.71	10-yr	319.00	6975.36	6977.38		6977.79	0.009826	7.20	70.54	59.10	0.93
Combined PR Chan	5078.71	Bankfull	33.53	6975.36	6976.39	6976.39	6976.54	0.007301	3.72	15.79	50.75	0.71
Combined PR Chan	4986.12	100-yr	621.00	6974.51	6977.17	6976.94	6977.73	0.009324	8.53	111.76	64.13	0.96
Combined PR Chan	4986.12	10-yr	319.00	6974.51	6976.53		6976.91	0.009001	6.89	72.74	59.36	0.89
Combined PR Chan	4986.12	Bankfull	33.53	6974.51	6975.52	6975.52	6975.65	0.007006	3.58	16.53	51.71	0.69
Combined PR Chan	4902.38	100-yr	621.00	6973.75	6976.41	6976.17	6976.96	0.009068	8.43	113.49	65.20	0.94
Combined PR Chan	4902.38	10-yr	319.00	6973.75	6975.74		6976.13	0.009642	7.05	71.48	59.86	0.92
Combined PR Chan	4902.38	Bankfull	33.53	6973.75	6974.76	6974.76	6974.89	0.006919	3.56	16.70	52.06	0.69
Combined PR Chan	4765.94	100-yr	621.00	6972.50	6975.20	6974.93	6975.74	0.008801	8.39	113.82	63.92	0.93
Combined PR Chan	4765.94	10-yr	319.00	6972.50	6974.57	6974.35	6974.92	0.008056	6.65	75.44	59.48	0.85
Combined PR Chan	4765.94	Bankfull	33.53	6972.50	6973.52	6973.52	6973.65	0.006971	3.60	16.53	51.97	0.69
Combined PR Chan	4678.67	100-yr	621.00	6971.70	6974.04	6974.04	6974.76	0.014325	9.65	99.31	65.62	1.16
Combined PR Chan	4678.67	10-yr	319.00	6971.70	6973.48	6973.48	6973.97	0.014582	8.00	63.90	61.88	1.11
Combined PR Chan	4678.67	Bankfull	33.53	6971.70	6972.67	6972.67	6972.81	0.007733	3.65	16.49	55.11	0.72
Combined PR Chan	4557.88	100-yr	621.00	6969.52	6972.34		6972.79	0.006819	7.62	124.66	66.06	0.83
Combined PR Chan	4557.88	10-yr	319.00	6969.52	6971.65		6971.94	0.006564	6.12	81.11	60.72	0.77
Combined PR Chan	4557.88	Bankfull	33.53	6969.52	6970.50	6970.50	6970.63	0.007640	3.65	16.26	51.77	0.72
Combined PR Chan	4476.29	100-yr	621.00	6968.79	6971.22	6971.22	6971.98	0.014198	9.91	97.51	62.86	1.16
Combined PR Chan	4476.29	10-yr	319.00	6968.79	6970.66	6970.66	6971.16	0.013917	8.09	63.12	58.47	1.10
Combined PR Chan	4476.29	Bankfull	33.53	6968.79	6969.82	6969.82	6969.94	0.006611	3.54	16.80	51.97	0.67
Combined PR Chan	4351.82	100-yr	621.00	6966.57	6968.89	6968.89	6969.63	0.014780	9.76	98.43	65.84	1.17
Combined PR Chan	4351.82	10-yr	319.00	6966.57	6968.35	6968.35	6968.84	0.014393	7.94	64.07	61.66	1.10
Combined PR Chan	4351.82	Bankfull	33.53	6966.57	6967.55	6967.55	6967.68	0.007308	3.57	16.93	55.81	0.70
Combined PR Chan	4291.52	100-yr	621.00	6964.93	6967.53	6967.53	6968.29	0.013124	9.97	98.66	61.74	1.13
Combined PR Chan	4291.52	10-yr	319.00	6964.93	6966.96	6966.96	6967.47	0.012181	8.04	64.81	57.77	1.04
Combined PR Chan	4291.52	Bankfull	33.53	6964.93	6966.03	6966.03	6966.20	0.006846	3.79	14.56	44.54	0.70
Combined PR Chan	4166.12	100-yr	621.00	6961.61	6964.38	6964.33	6965.14	0.011703	9.85	99.95	58.86	1.08
Combined PR Chan	4166.12	10-yr	319.00	6961.61	6963.77	6963.72	6964.27	0.010795	7.90	65.27	53.87	0.99
Combined PR Chan	4166.12	Bankfull	33.53	6961.61	6962.67	6962.67	6962.86	0.008295	4.04	12.96	35.23	0.76
Combined PR Chan	4045.84	100-yr	621.00	6960.53	6962.83	6962.83	6963.56	0.014681	9.68	98.93	66.29	1.17
Combined PR Chan	4045.84	10-yr	319.00	6960.53	6962.31	6962.31	6962.78	0.014185	7.87	64.84	62.76	1.10
Combined PR Chan	4045.84	Bankfull	33.53	6960.53	6961.51	6961.51	6961.64	0.007075	3.53	17.27	57.13	0.69

HEC-RAS Plan: Proposed River: ChannelB Reach: Combined PR Chan (Continued)

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)	
Combined PR Chan	3885.92	100-yr	621.00	6958.00	6960.50	6960.50	6961.25	0.013517	9.87	98.64	62.80	1.14
Combined PR Chan	3885.92	10-yr	319.00	6958.00	6959.92	6959.92	6960.44	0.013224	8.07	63.68	58.26	1.08
Combined PR Chan	3885.92	Bankfull	33.53	6958.00	6959.04	6959.04	6959.20	0.007445	3.78	15.10	49.14	0.72
Combined PR Chan	3802.45	100-yr	621.00	6956.15	6958.55	6958.55	6959.29	0.014357	9.83	98.58	64.87	1.16
Combined PR Chan	3802.45	10-yr	319.00	6956.15	6957.99	6957.99	6958.49	0.014050	8.03	63.91	60.58	1.10
Combined PR Chan	3802.45	Bankfull	33.53	6956.15	6957.18	6957.18	6957.30	0.006633	3.52	17.03	54.25	0.67
Combined PR Chan	3676.52	100-yr	621.00	6954.01	6956.29	6956.29	6957.01	0.014967	9.68	99.30	67.92	1.18
Combined PR Chan	3676.52	10-yr	319.00	6954.01	6955.76	6955.76	6956.23	0.014518	7.87	64.81	63.63	1.11
Combined PR Chan	3676.52	Bankfull	33.53	6954.01	6954.97	6954.97	6955.10	0.007863	3.63	16.84	57.31	0.72
Combined PR Chan	3581.26	100-yr	621.00	6952.06	6954.33	6954.33	6955.03	0.014785	9.58	99.90	68.17	1.17
Combined PR Chan	3581.26	10-yr	319.00	6952.06	6953.80	6953.80	6954.27	0.014752	7.87	64.82	64.37	1.11
Combined PR Chan	3581.26	Bankfull	33.53	6952.06	6953.01	6953.01	6953.14	0.008502	3.72	16.44	57.70	0.75
Combined PR Chan	3500.61	100-yr	621.00	6950.24	6952.58	6952.58	6953.34	0.014739	9.80	96.47	62.41	1.17
Combined PR Chan	3500.61	10-yr	319.00	6950.24	6952.03	6952.03	6952.52	0.014422	7.96	62.85	58.72	1.11
Combined PR Chan	3500.61	Bankfull	33.53	6950.24	6951.19	6951.19	6951.32	0.007958	3.64	16.25	53.18	0.73
Combined PR Chan	3418.19	100-yr	621.00	6948.40	6951.20		6951.62	0.006243	7.25	128.92	67.16	0.79
Combined PR Chan	3418.19	10-yr	319.00	6948.40	6950.50		6950.77	0.006114	5.84	83.67	61.92	0.74
Combined PR Chan	3418.19	Bankfull	33.53	6948.40	6949.33	6949.33	6949.46	0.008557	3.68	16.11	52.96	0.75
Combined PR Chan	3335.99	100-yr	621.00	6947.66	6950.08	6950.08	6950.84	0.014314	9.87	97.01	62.49	1.16
Combined PR Chan	3335.99	10-yr	319.00	6947.66	6949.51	6949.51	6950.02	0.014047	8.05	62.88	58.24	1.10
Combined PR Chan	3335.99	Bankfull	33.53	6947.66	6948.66	6948.66	6948.80	0.007525	3.67	16.11	51.86	0.71
Combined PR Chan	3196.98	100-yr	621.00	6945.32	6947.96		6948.51	0.008957	8.34	113.46	64.26	0.94
Combined PR Chan	3196.98	10-yr	319.00	6945.32	6947.29		6947.67	0.009386	6.91	71.94	59.31	0.91
Combined PR Chan	3196.98	Bankfull	33.53	6945.32	6946.29	6946.29	6946.42	0.007823	3.65	16.12	51.90	0.72
Combined PR Chan	3069.72	100-yr	621.00	6944.17	6946.98		6947.46	0.007261	7.86	121.62	65.76	0.85
Combined PR Chan	3069.72	10-yr	319.00	6944.17	6946.31		6946.62	0.007014	6.35	79.08	60.61	0.80
Combined PR Chan	3069.72	Bankfull	33.53	6944.17	6945.19	6945.19	6945.33	0.007519	3.74	15.77	51.20	0.72
Combined PR Chan	2950.47	100-yr	621.00	6943.10	6945.51	6945.51	6946.26	0.014197	9.83	97.65	62.88	1.16
Combined PR Chan	2950.47	10-yr	319.00	6943.10	6944.94	6944.94	6945.45	0.014310	8.09	62.67	58.44	1.11
Combined PR Chan	2950.47	Bankfull	33.53	6943.10	6944.10	6944.10	6944.23	0.007225	3.60	16.44	51.97	0.70
Combined PR Chan	2782.66	100-yr	621.00	6940.49	6943.12	6942.91	6943.70	0.009780	8.67	110.46	64.30	0.98
Combined PR Chan	2782.66	10-yr	319.00	6940.49	6942.48		6942.87	0.009826	7.11	70.92	59.50	0.93
Combined PR Chan	2782.66	Bankfull	33.53	6940.49	6941.50	6941.50	6941.64	0.006992	3.59	16.53	52.16	0.69
Combined PR Chan	2687.65	100-yr	621.00	6939.64	6942.32		6942.83	0.008263	8.09	117.25	65.57	0.90
Combined PR Chan	2687.65	10-yr	319.00	6939.64	6941.63		6941.98	0.008697	6.70	74.12	60.23	0.88
Combined PR Chan	2687.65	Bankfull	33.53	6939.64	6940.61	6940.61	6940.73	0.007425	3.56	16.51	52.25	0.71
Combined PR Chan	2558.01	100-yr	621.00	6938.47	6941.23	6940.93	6941.76	0.008146	8.21	116.03	63.60	0.90
Combined PR Chan	2558.01	10-yr	319.00	6938.47	6940.59		6940.92	0.007697	6.58	76.21	59.23	0.83
Combined PR Chan	2558.01	Bankfull	33.53	6938.47	6939.50	6939.50	6939.65	0.007327	3.71	15.83	50.65	0.71
Combined PR Chan	2468.81	100-yr	621.00	6937.67	6940.06	6940.06	6940.80	0.014226	9.79	98.59	64.52	1.16
Combined PR Chan	2468.81	10-yr	319.00	6937.67	6939.50	6939.50	6940.00	0.014149	8.04	63.68	60.26	1.10
Combined PR Chan	2468.81	Bankfull	33.53	6937.67	6938.67	6938.67	6938.81	0.007218	3.63	16.58	53.96	0.70
Combined PR Chan	2375.32	100-yr	621.00	6935.73	6938.47		6938.93	0.007239	7.69	123.13	66.83	0.85
Combined PR Chan	2375.32	10-yr	319.00	6935.73	6937.75		6938.07	0.007819	6.43	77.30	61.41	0.83
Combined PR Chan	2375.32	Bankfull	33.53	6935.73	6936.69	6936.69	6936.82	0.007601	3.60	16.57	53.39	0.71
Combined PR Chan	2258	100-yr	621.00	6935.10	6937.99		6938.41	0.005882	7.33	130.16	66.54	0.78
Combined PR Chan	2258	10-yr	319.00	6935.10	6937.23		6937.52	0.006410	6.15	81.26	60.75	0.77
Combined PR Chan	2258	Bankfull	33.53	6935.10	6936.06	6936.06	6936.20	0.007437	3.68	15.62	48.72	0.72
Combined PR Chan	2256.6	100-yr	621.00	6934.66	6937.82	6937.12	6938.17	0.004438	6.67	143.11	67.36	0.68
Combined PR Chan	2256.6	10-yr	319.00	6934.66	6937.05	6936.54	6937.27	0.004189	5.31	93.49	61.68	0.63
Combined PR Chan	2256.6	Bankfull	33.53	6934.66	6935.85	6935.70	6935.90	0.002394	2.38	24.56	52.77	0.42
Combined PR Chan	2238		Culvert									
Combined PR Chan	2213.94	100-yr	621.00	6934.28	6937.09		6937.53	0.006641	7.49	125.68	66.34	0.81
Combined PR Chan	2213.94	10-yr	319.00	6934.28	6936.39		6936.68	0.006504	6.04	81.44	60.99	0.77
Combined PR Chan	2213.94	Bankfull	33.53	6934.28	6935.24	6935.23	6935.37	0.007523	3.57	16.61	52.11	0.71
Combined PR Chan	2057	100-yr	621.00	6933.91	6936.54	6936.34	6937.13	0.009755	8.75	109.42	62.96	0.98
Combined PR Chan	2057	10-yr	319.00	6933.91	6935.88	6935.76	6936.29	0.010307	7.29	69.21	58.33	0.96
Combined PR Chan	2057	Bankfull	33.53	6933.91	6934.91	6934.91	6935.05	0.007438	3.69	16.03	51.18	0.72
Combined PR Chan	2055.98	100-yr	621.00	6932.86	6935.60		6936.12	0.008152	8.16	116.80	64.54	0.90
Combined PR Chan	2055.98	10-yr	319.00	6932.86	6934.96		6935.29	0.007642	6.51	76.71	59.74	0.83

HEC-RAS Plan: Proposed River: ChannelB Reach: Combined PR Chan (Continued)

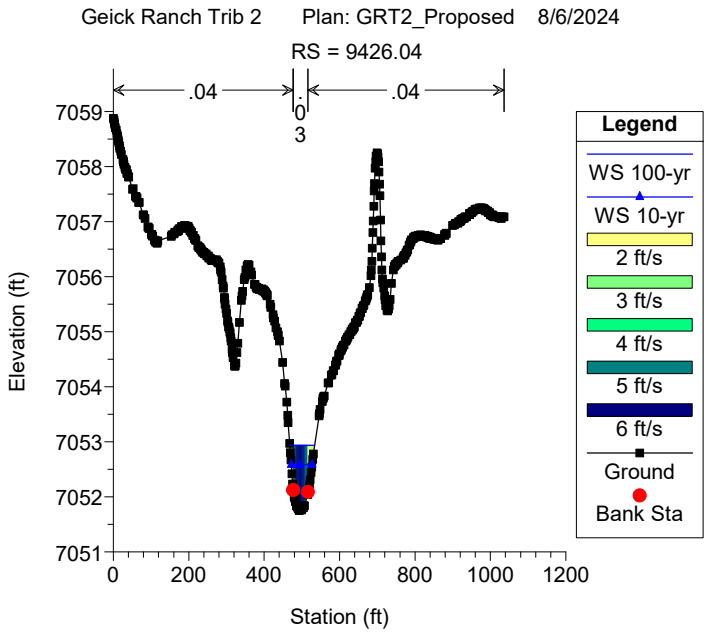
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Combined PR Chan	2055.98	Bankfull	33.53	6932.86	6933.86	6933.86	6934.01	0.007523	3.69	15.97	51.34	0.71
Combined PR Chan	1914.4	100-yr	621.00	6931.58	6934.29	6934.09	6934.88	0.009394	8.70	111.36	64.00	0.96
Combined PR Chan	1914.4	10-yr	319.00	6931.58	6933.61	6933.52	6934.03	0.010244	7.37	69.34	58.69	0.95
Combined PR Chan	1914.4	Bankfull	33.53	6931.58	6932.65	6932.65	6932.79	0.006384	3.58	16.47	51.52	0.67
Combined PR Chan	1747.66	100-yr	649.00	6930.08	6932.86		6933.40	0.008268	8.30	119.66	64.68	0.91
Combined PR Chan	1747.66	10-yr	332.00	6930.08	6932.20		6932.54	0.007721	6.59	78.43	59.76	0.84
Combined PR Chan	1747.66	Bankfull	33.53	6930.08	6931.07	6931.07	6931.21	0.007589	3.67	15.94	51.42	0.72
Combined PR Chan	1623.05	100-yr	649.00	6928.96	6931.63	6931.45	6932.25	0.010138	8.94	112.16	64.58	1.00
Combined PR Chan	1623.05	10-yr	332.00	6928.96	6930.95	6930.86	6931.39	0.010925	7.51	70.16	59.36	0.98
Combined PR Chan	1623.05	Bankfull	33.53	6928.96	6929.97	6929.97	6930.12	0.007951	3.81	15.38	49.52	0.74
Combined PR Chan	1501.74	100-yr	649.00	6927.87	6930.69		6931.17	0.007304	7.89	125.53	66.14	0.85
Combined PR Chan	1501.74	10-yr	332.00	6927.87	6930.00		6930.31	0.006971	6.30	81.68	60.80	0.79
Combined PR Chan	1501.74	Bankfull	33.53	6927.87	6928.83	6928.83	6928.97	0.007919	3.67	16.08	51.76	0.73
Combined PR Chan	1372.06	100-yr	649.00	6926.70	6929.42	6929.25	6930.05	0.010070	9.02	111.83	64.02	1.00
Combined PR Chan	1372.06	10-yr	332.00	6926.70	6928.75	6928.66	6929.19	0.010624	7.55	70.42	59.07	0.97
Combined PR Chan	1372.06	Bankfull	33.53	6926.70	6927.74	6927.74	6927.90	0.007453	3.78	15.04	45.60	0.72
Combined PR Chan	1245.44	100-yr	649.00	6925.56	6928.45	6928.06	6928.94	0.007174	7.96	125.90	66.03	0.85
Combined PR Chan	1245.44	10-yr	332.00	6925.56	6927.74		6928.06	0.007146	6.49	80.65	60.57	0.81
Combined PR Chan	1245.44	Bankfull	33.53	6925.56	6926.60	6926.60	6926.73	0.006790	3.60	16.41	51.82	0.68
Combined PR Chan	1146.93	100-yr	649.00	6924.68	6927.18	6927.18	6927.95	0.013952	10.03	100.51	62.50	1.16
Combined PR Chan	1146.93	10-yr	332.00	6924.68	6926.59	6926.59	6927.11	0.013440	8.12	65.26	58.21	1.08
Combined PR Chan	1146.93	Bankfull	33.53	6924.68	6925.69	6925.69	6925.84	0.007256	3.69	16.01	51.61	0.71
Combined PR Chan	1014.13	100-yr	649.00	6922.39	6925.17		6925.64	0.007027	7.69	127.72	67.30	0.84
Combined PR Chan	1014.13	10-yr	332.00	6922.39	6924.48		6924.78	0.006896	6.19	82.65	62.16	0.79
Combined PR Chan	1014.13	Bankfull	33.53	6922.39	6923.34	6923.34	6923.46	0.007669	3.58	16.64	53.63	0.72
Combined PR Chan	917.82	100-yr	649.00	6921.52	6924.23	6924.03	6924.84	0.009701	8.84	113.28	64.01	0.98
Combined PR Chan	917.82	10-yr	332.00	6921.52	6923.56	6923.43	6923.97	0.010050	7.32	71.87	59.16	0.95
Combined PR Chan	917.82	Bankfull	33.53	6921.52	6922.52	6922.52	6922.69	0.008401	3.90	14.69	46.57	0.76
Combined PR Chan	736.89	100-yr	649.00	6919.89	6922.72	6922.38	6923.24	0.007852	8.19	121.50	64.92	0.89
Combined PR Chan	736.89	10-yr	332.00	6919.89	6922.03	6921.79	6922.37	0.007599	6.60	78.75	59.91	0.83
Combined PR Chan	736.89	Bankfull	33.53	6919.89	6920.89	6920.89	6921.04	0.008073	3.80	15.20	49.11	0.74
Combined PR Chan	644.5	100-yr	649.00	6919.06	6921.48	6921.48	6922.26	0.014160	9.90	100.13	62.86	1.16
Combined PR Chan	644.5	10-yr	332.00	6919.06	6920.90	6920.90	6921.42	0.014143	8.09	64.51	58.76	1.10
Combined PR Chan	644.5	Bankfull	33.53	6919.06	6920.04	6920.04	6920.17	0.007141	3.55	16.57	52.80	0.70
Combined PR Chan	593.08	100-yr	649.00	6916.97	6920.99	6919.65	6921.21	0.002095	5.40	185.92	69.05	0.49
Combined PR Chan	593.08	10-yr	332.00	6916.97	6919.62	6919.02	6919.84	0.003476	5.17	98.90	58.51	0.58
Combined PR Chan	593.08	Bankfull	33.53	6916.97	6918.05	6918.05	6918.20	0.007013	3.69	15.24	47.77	0.70
Combined PR Chan	550		Culvert									
Combined PR Chan	506.48	100-yr	649.00	6916.72	6919.69	6919.69	6920.75	0.012365	10.64	83.59	66.84	1.12
Combined PR Chan	506.48	10-yr	332.00	6916.72	6918.90	6918.90	6919.58	0.012582	8.62	54.99	60.04	1.07
Combined PR Chan	506.48	Bankfull	33.53	6916.72	6917.77	6917.77	6917.95	0.007770	3.90	13.61	44.93	0.73
Combined PR Chan	444.71	100-yr	649.00	6916.17	6918.72	6918.72	6919.47	0.013025	9.80	102.18	63.04	1.12
Combined PR Chan	444.71	10-yr	332.00	6916.17	6918.13	6918.13	6918.62	0.012702	8.00	66.48	58.48	1.06
Combined PR Chan	444.71	Bankfull	33.53	6916.17	6917.21	6917.21	6917.35	0.007074	3.69	16.01	51.39	0.70
Combined PR Chan	284.91	100-yr	649.00	6912.10	6914.91	6914.58	6915.43	0.007927	8.19	121.51	65.49	0.89
Combined PR Chan	284.91	10-yr	332.00	6912.10	6914.24	6914.00	6914.57	0.007490	6.55	79.40	60.40	0.82
Combined PR Chan	284.91	Bankfull	33.53	6912.10	6913.09	6913.09	6913.24	0.007974	3.77	15.41	48.41	0.73
Combined PR Chan	164.39	100-yr	649.00	6911.01	6913.39	6913.39	6914.13	0.014800	9.94	103.01	69.10	1.18
Combined PR Chan	164.39	10-yr	332.00	6911.01	6912.85	6912.85	6913.34	0.014188	8.06	66.88	64.02	1.10
Combined PR Chan	164.39	Bankfull	33.53	6911.01	6912.02	6912.02	6912.15	0.006751	3.53	17.31	56.48	0.68
Combined PR Chan	72.04	100-yr	649.00	6909.09	6912.08		6912.53	0.006334	7.67	131.58	66.93	0.80
Combined PR Chan	72.04	10-yr	332.00	6909.09	6911.36		6911.65	0.006109	6.18	85.20	61.61	0.75
Combined PR Chan	72.04	Bankfull	33.53	6909.09	6910.13	6910.13	6910.29	0.007834	3.88	14.89	48.72	0.73
Combined PR Chan	3.14	100-yr	649.00	6908.47	6911.13	6911.13	6911.89	0.012901	10.06	103.05	63.35	1.12
Combined PR Chan	3.14	10-yr	332.00	6908.47	6910.53	6910.53	6911.05	0.012455	8.22	66.37	58.46	1.05
Combined PR Chan	3.14	Bankfull	33.53	6908.47	6909.58	6909.58	6909.75	0.006864	3.83	14.81	47.58	0.70
Combined PR Chan	-296.57	100-yr	649.00	6907.23	6909.25	6909.25	6909.86	0.008634	6.48	113.17	106.09	0.93
Combined PR Chan	-296.57	10-yr	332.00	6907.23	6908.78	6908.70	6909.16	0.008457	5.01	69.37	81.77	0.87
Combined PR Chan	-296.57	Bankfull	33.53	6907.23	6907.92		6907.99	0.004908	2.04	16.46	40.55	0.56

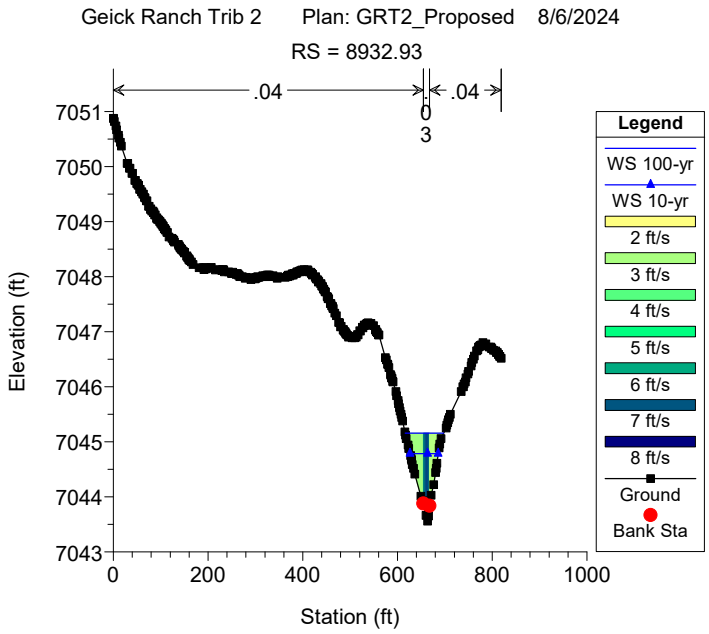
HEC-RAS Plan: Proposed River: ChannelB Reach: Combined PR Chan (Continued)

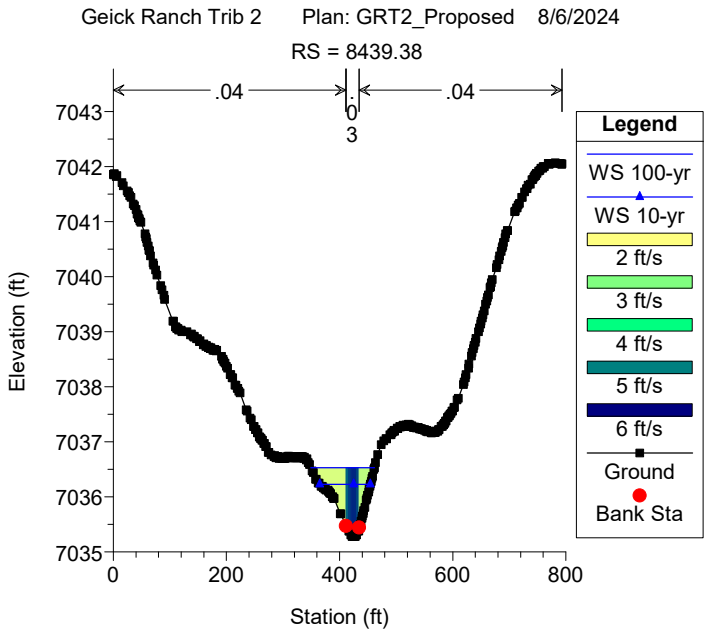
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Combined PR Chan	-530.34	100-yr	649.00	6905.98	6907.20	6907.20	6907.55	0.009816	5.42	161.42	224.58	0.93
Combined PR Chan	-530.34	10-yr	332.00	6905.98	6906.90	6906.90	6907.15	0.009879	4.35	98.44	195.53	0.89
Combined PR Chan	-530.34	Bankfull	33.53	6905.98	6906.33	6906.29	6906.40	0.012195	2.19	15.33	67.21	0.81
Combined PR Chan	-734.97	100-yr	649.00	6902.27	6903.80	6903.80	6904.20	0.008556	5.95	158.64	195.26	0.91
Combined PR Chan	-734.97	10-yr	332.00	6902.27	6903.45	6903.45	6903.74	0.008137	4.74	96.00	165.43	0.84
Combined PR Chan	-734.97	Bankfull	33.53	6902.27	6902.69	6902.69	6902.80	0.017420	2.68	12.49	52.68	0.97

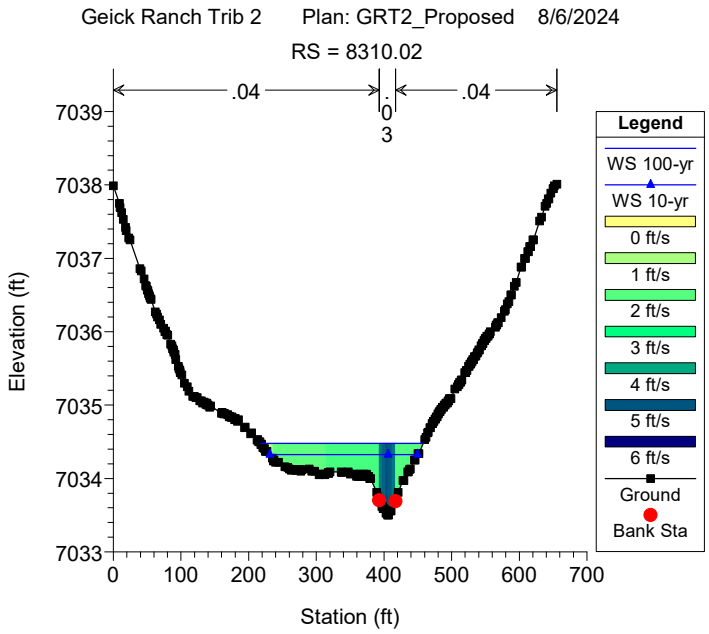
HEC-RAS Plan: Proposed River: ChannelB Reach: Combined PR Chan

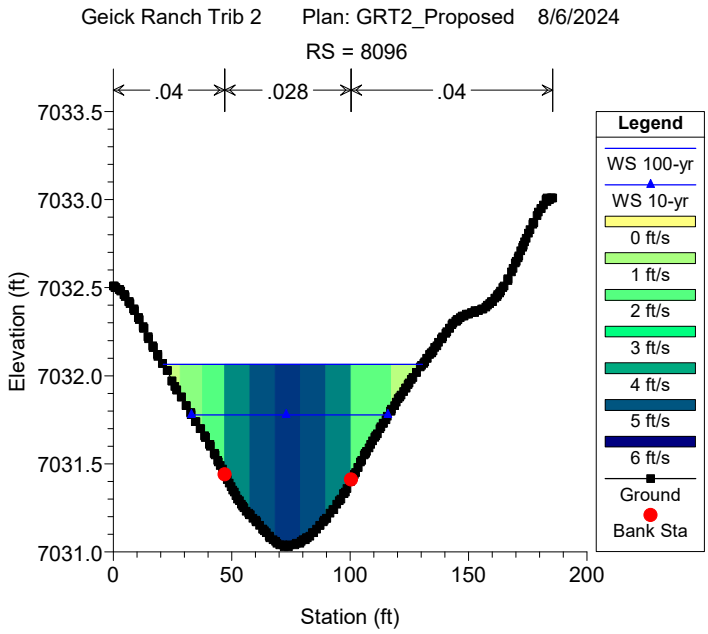
Reach	River Sta	Profile	E.G. US.	W.S. US.	E.G. IC	E.G. OC	Min El Weir Flow	Q Culv Group	Q Weir	Delta WS	Culv Vel US	Culv Vel DS
			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(ft)	(ft/s)	(ft/s)
Combined PR Chan	7290 Culvert #1	100-yr	7014.74	7014.69	7014.48	7014.74	7016.87	262.00		5.93	9.45	16.11
Combined PR Chan	7290 Culvert #1	10-yr	7013.08	7013.04	7012.86	7013.08	7016.87	137.00		5.20	7.61	13.39
Combined PR Chan	7290 Culvert #1	Bankfull	7010.84	7011.20	7010.73	7010.84	7016.87	19.00		4.66	3.94	6.50
Combined PR Chan	5800 Culvert #1	100-yr	6987.78	6987.24	6987.78	6987.99	6990.96	536.00		0.67	8.14	6.40
Combined PR Chan	5800 Culvert #1	10-yr	6986.57	6986.56	6986.57	6986.74	6990.96	277.00		0.66	6.53	4.44
Combined PR Chan	5800 Culvert #1	Bankfull	6984.95	6985.66	6984.95	6985.02	6990.96	31.72		0.89	3.17	1.08
Combined PR Chan	2238 Culvert #1	100-yr	6938.17	6937.82	6938.14	6938.17	6935.74	32.05	588.95	0.74	6.54	6.54
Combined PR Chan	2238 Culvert #1	10-yr	6937.27	6937.05	6937.29	6937.27	6935.74	28.97	290.03	0.66	5.91	5.91
Combined PR Chan	2238 Culvert #1	Bankfull	6935.90	6935.85	6935.91	6935.90	6935.74	25.05	8.48	0.61	5.11	5.11
Combined PR Chan	550 Culvert #1	100-yr	6921.21	6920.99	6921.05	6921.21	6923.33	649.00		1.30	7.66	6.00
Combined PR Chan	550 Culvert #1	10-yr	6919.84	6919.62	6919.65	6919.84	6923.33	332.00		0.72	5.48	4.14
Combined PR Chan	550 Culvert #1	Bankfull	6917.98	6918.05	6917.77	6917.98	6923.33	33.53		0.27	1.67	0.93

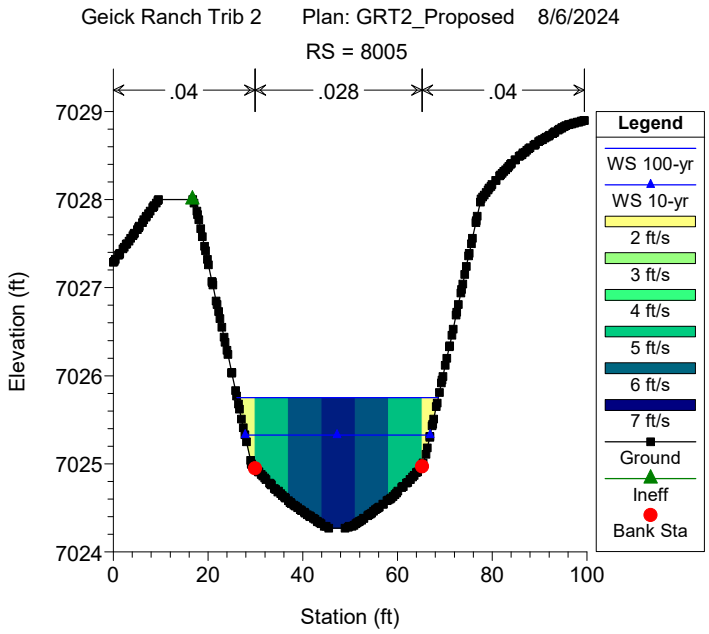

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 9426.04
.04
.04
0
3
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta

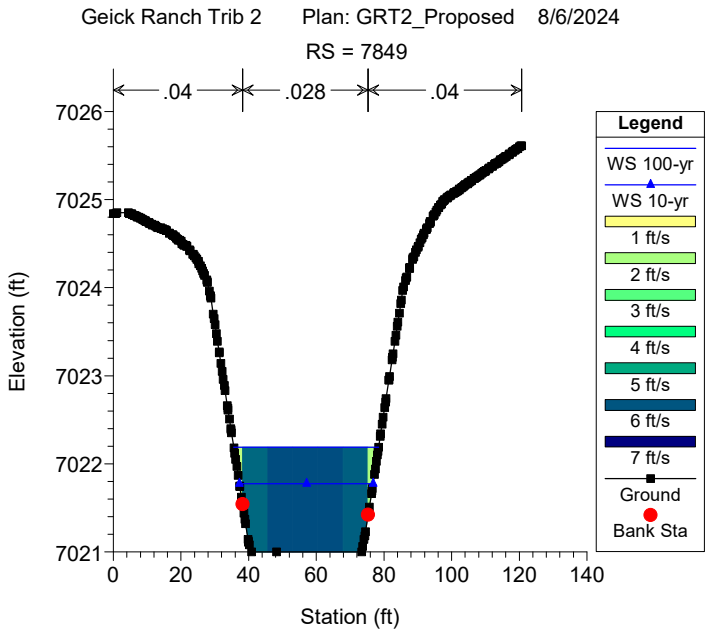

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 8932.93
.04
.04
0
3
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Bank Sta

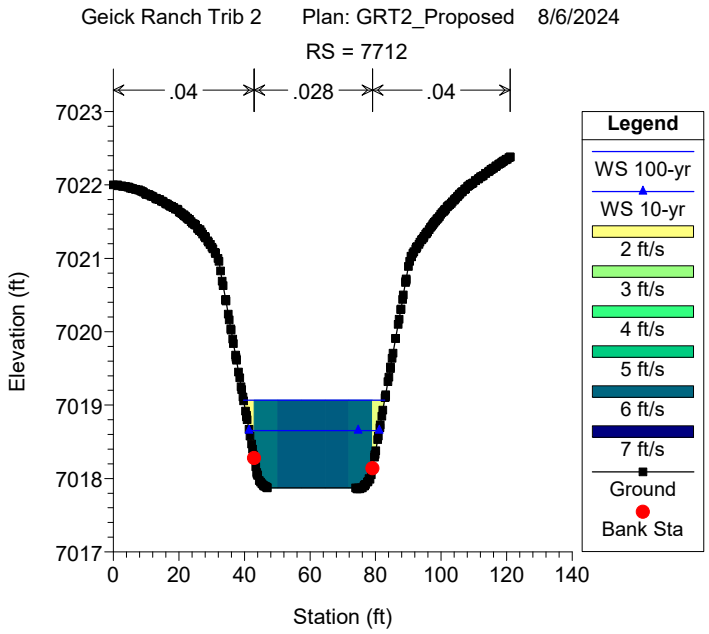

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 8439.38
.04
.04
0
3
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta

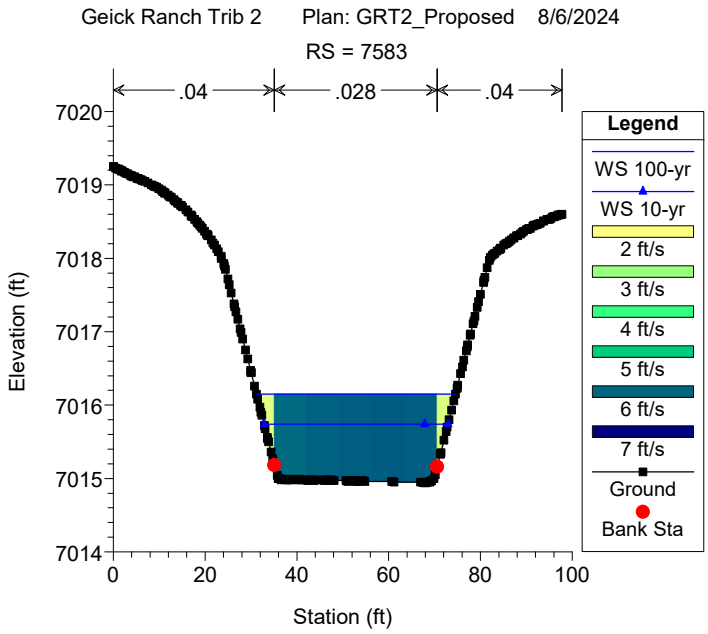

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 8310.02
.04
.04
0
3
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta

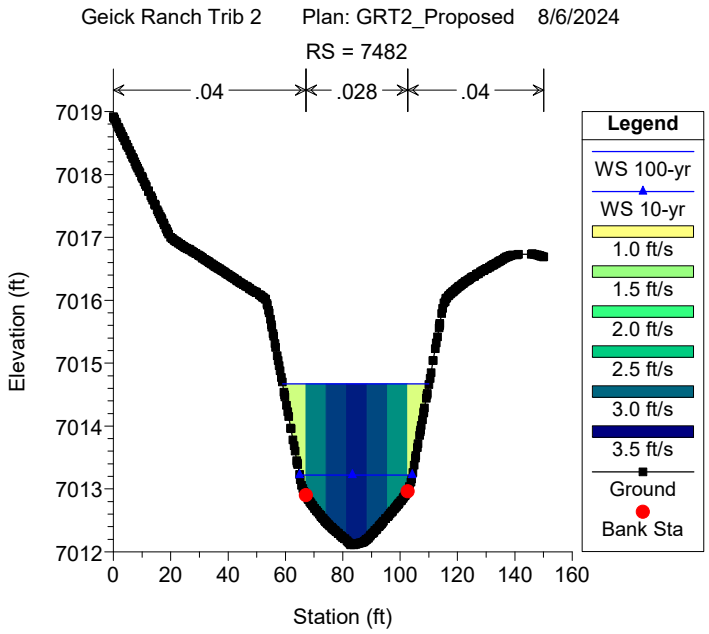

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 8096
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta

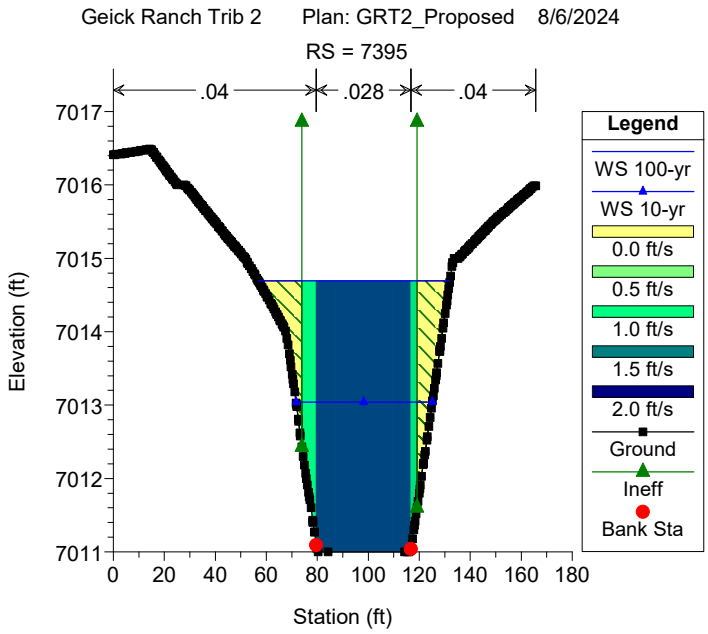

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 8005
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Ineff
Bank Sta

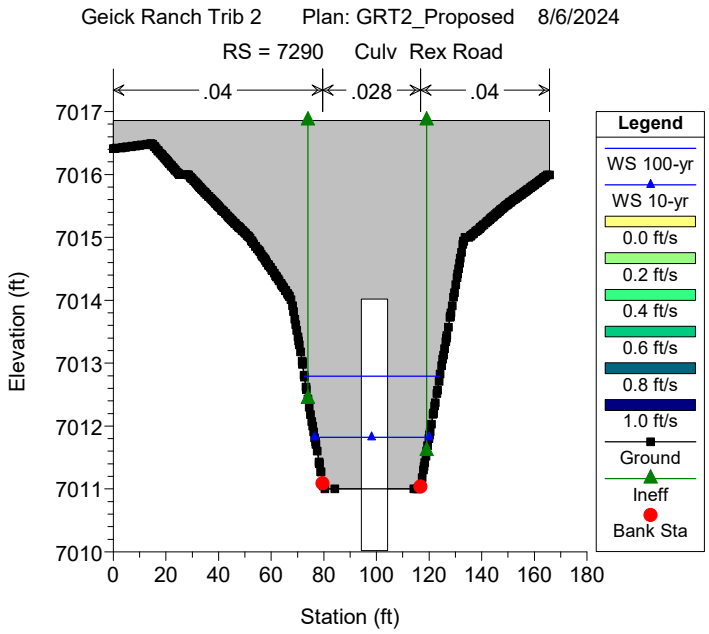

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 7849
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta

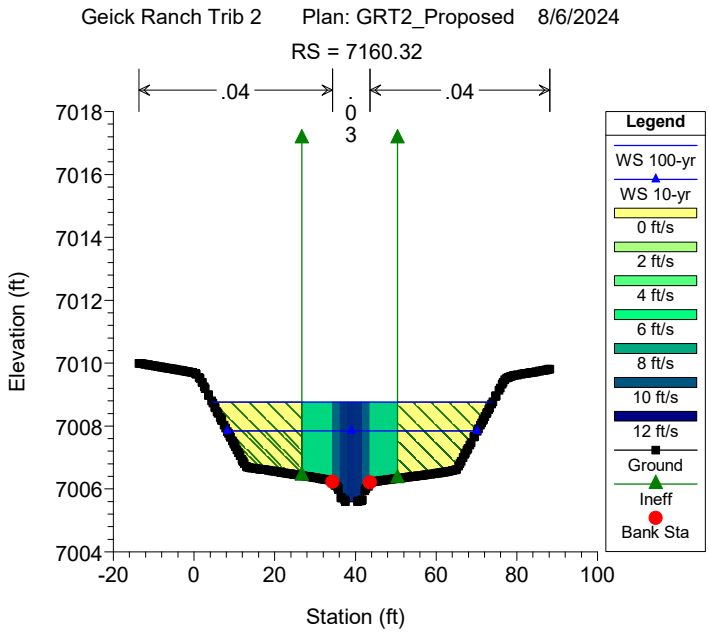

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 7712
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta

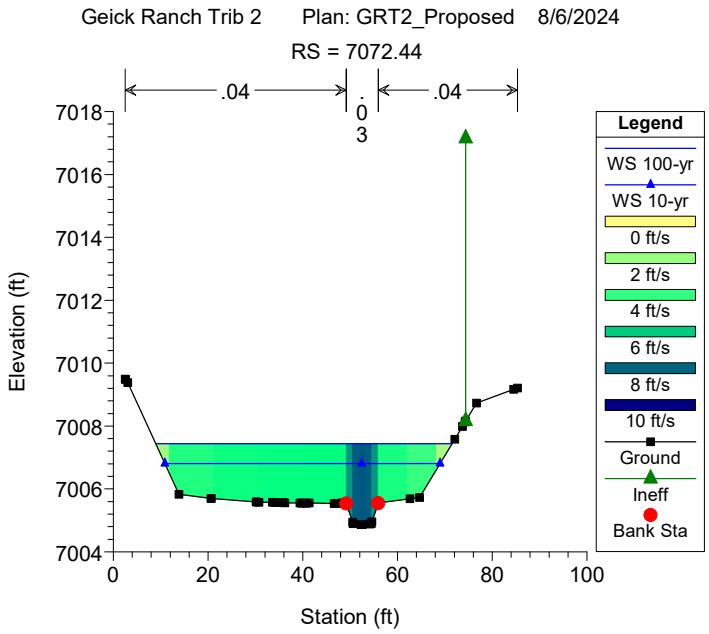

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 7583
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta

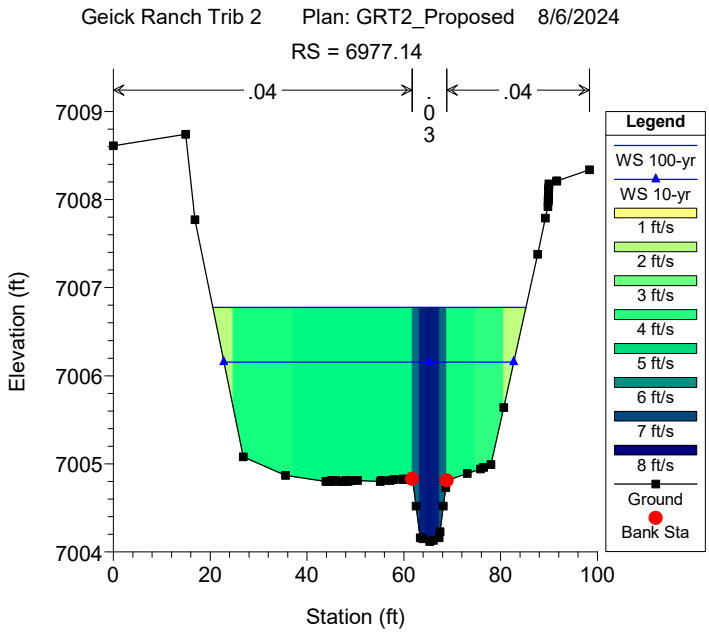

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 7482
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

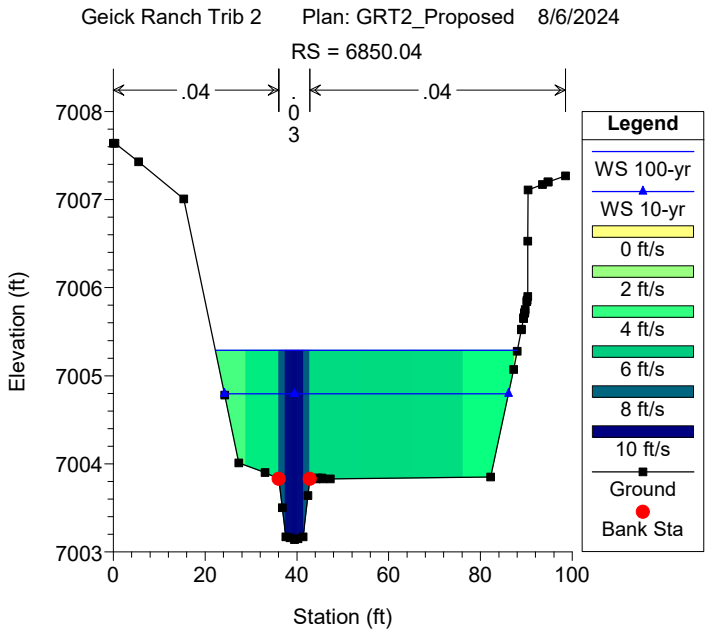

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 7395
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
Ground
Ineff
Bank Sta

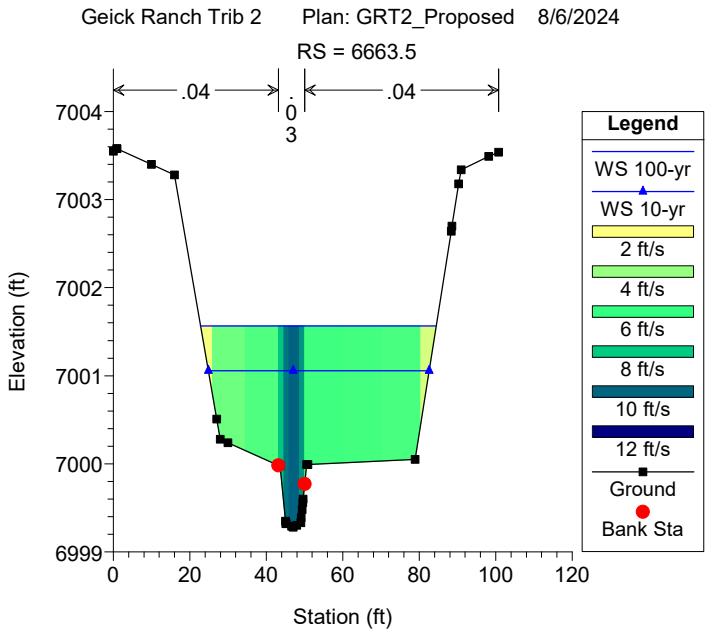

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 7290 Culv Rex Road
.04
.028
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta

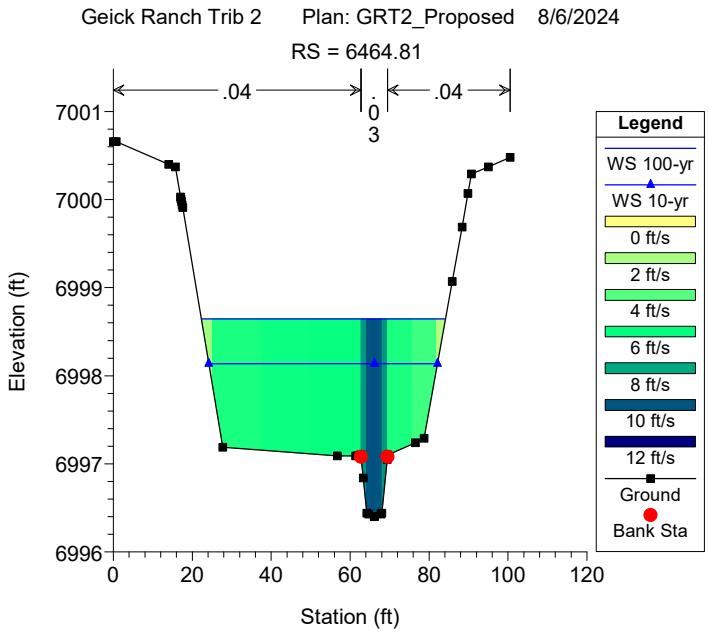

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 7160.32
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

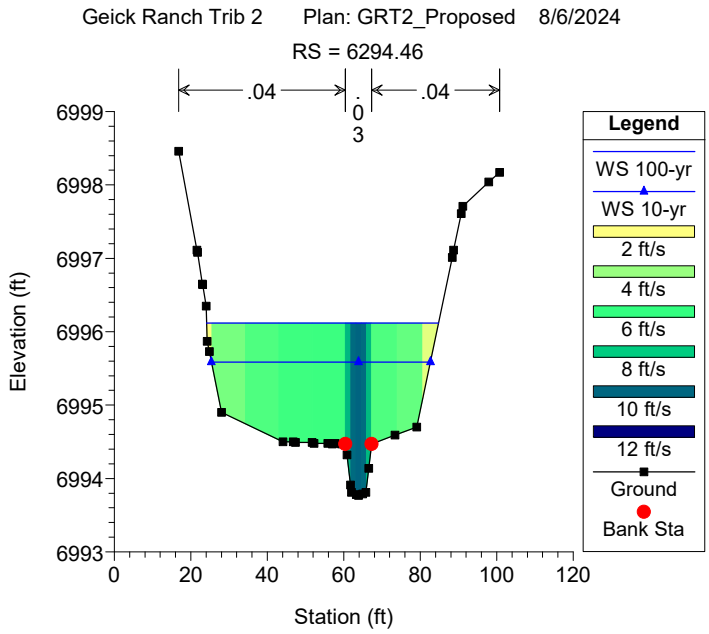

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 7072.44
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

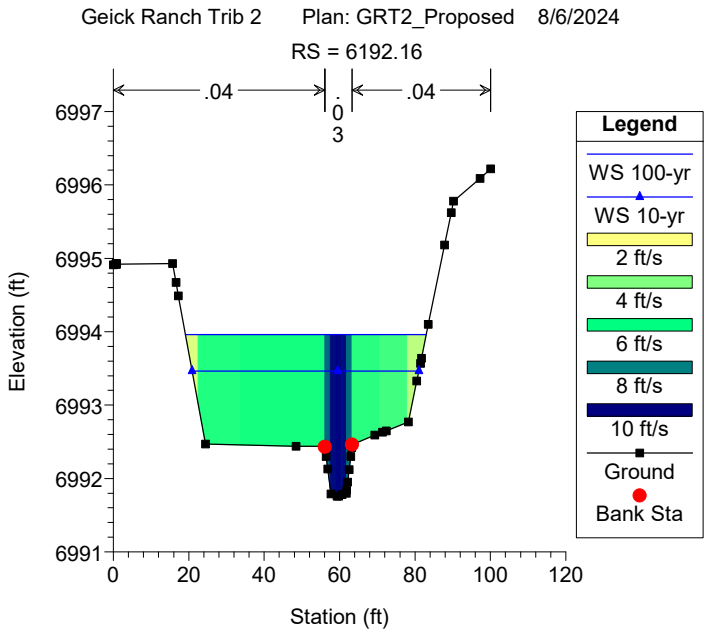

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 6977.14
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

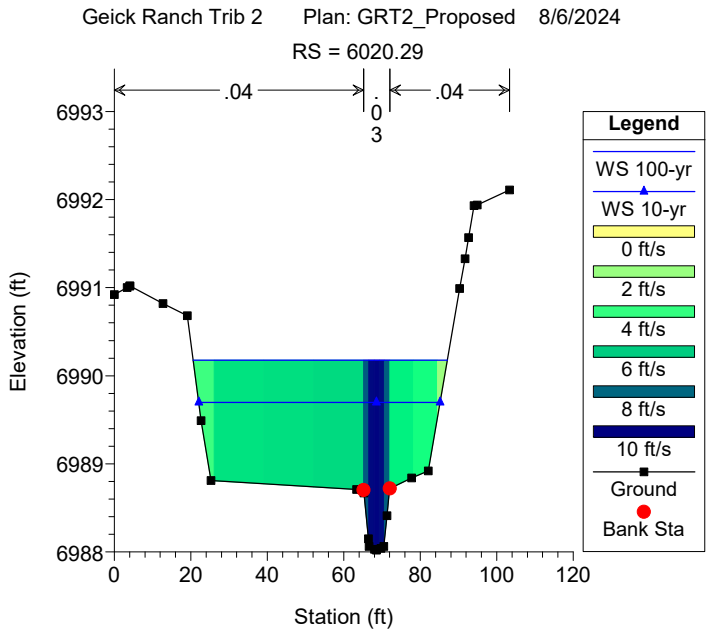

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 6850.04
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

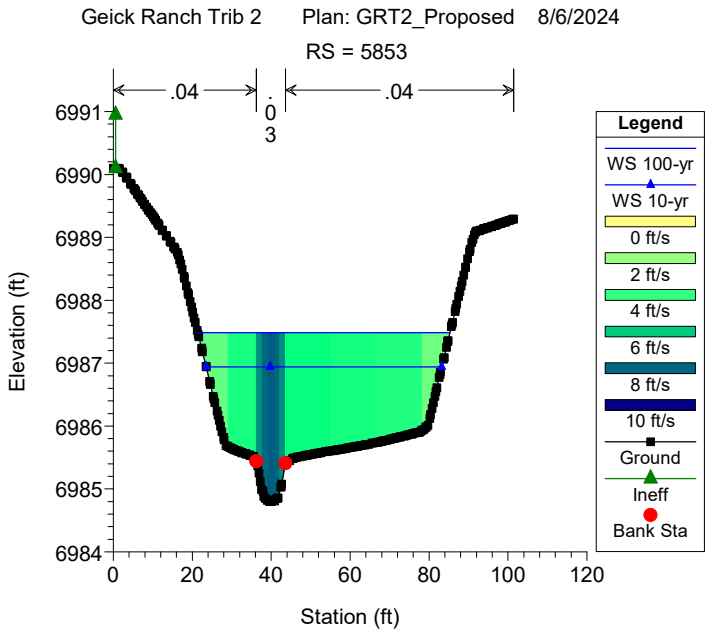

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 6663.5
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

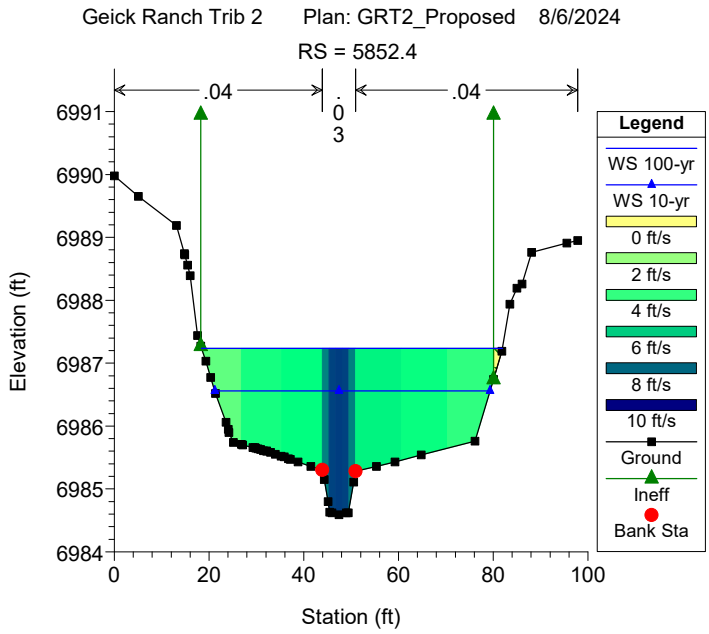

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 6464.81
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

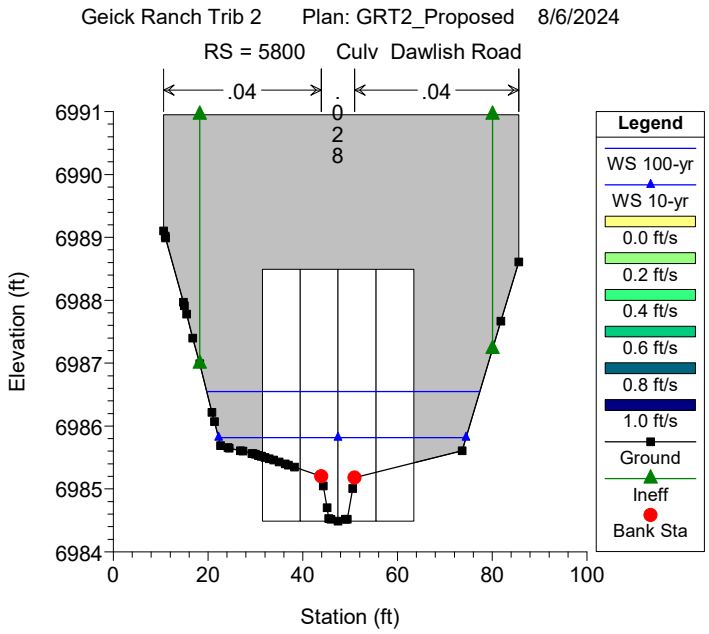

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 6294.46
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

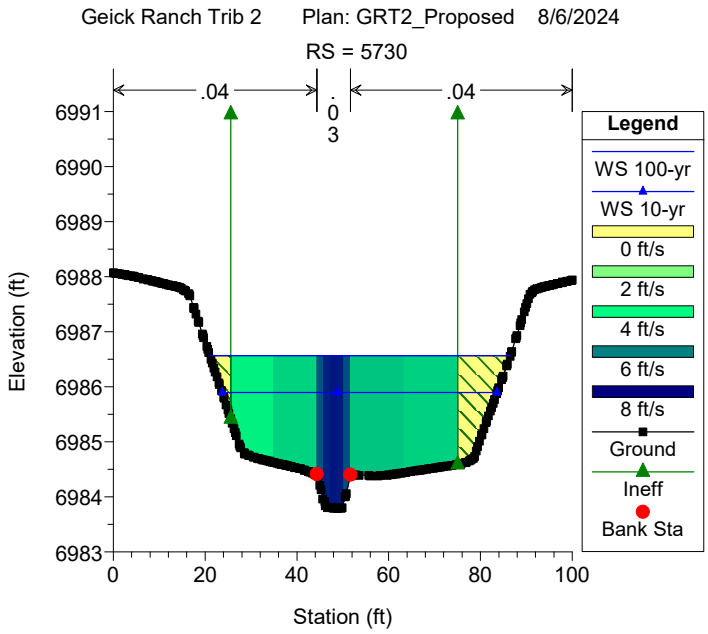

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 6192.16
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

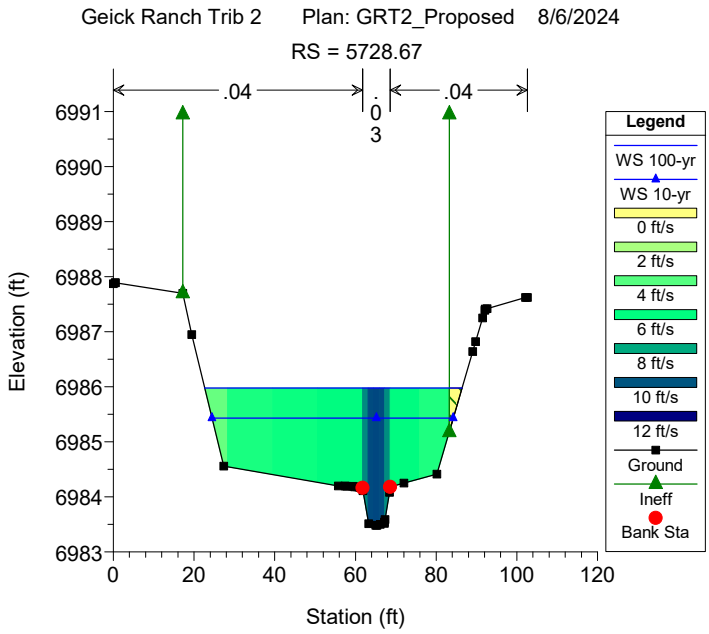

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 6020.29
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

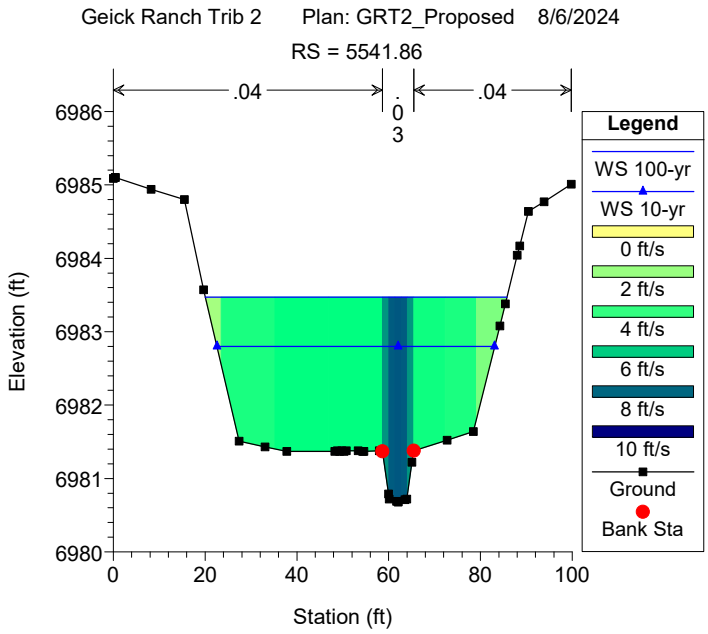

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5853
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

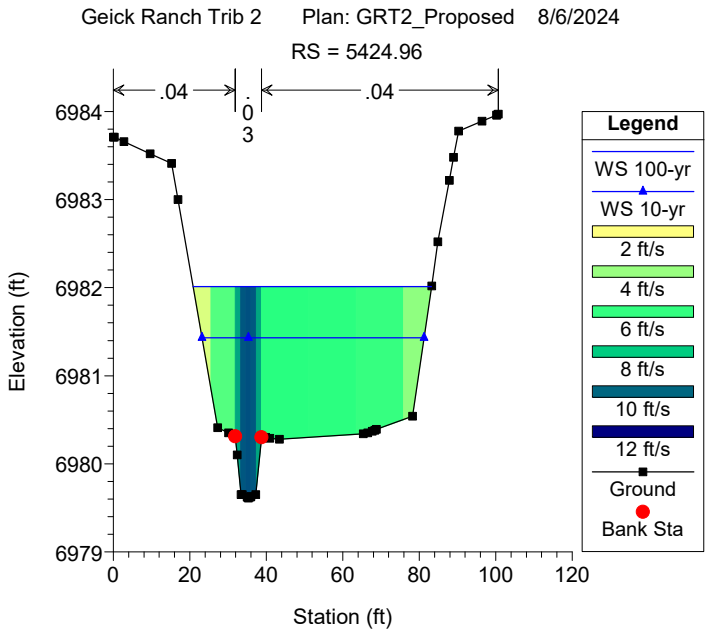

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5852.4
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

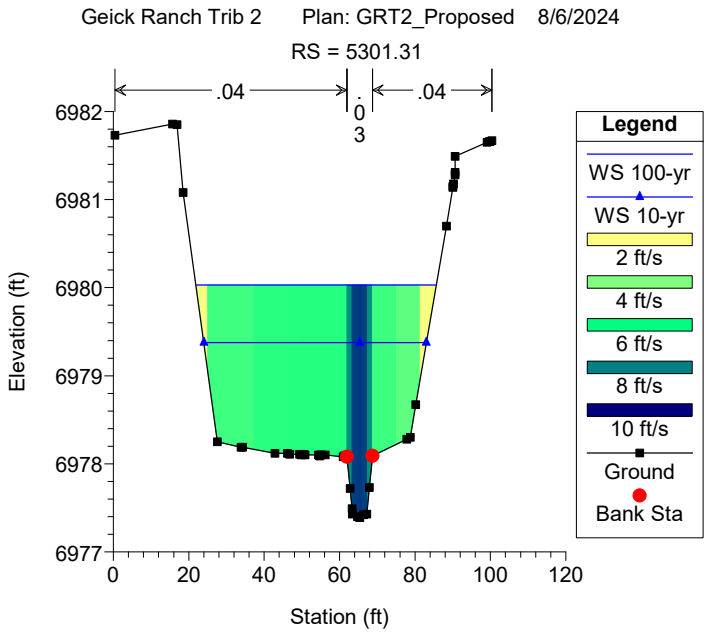

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5800 Culv Dawlish Road
.04
.028
.04
Legend
WS 100-yr
WS 10-yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

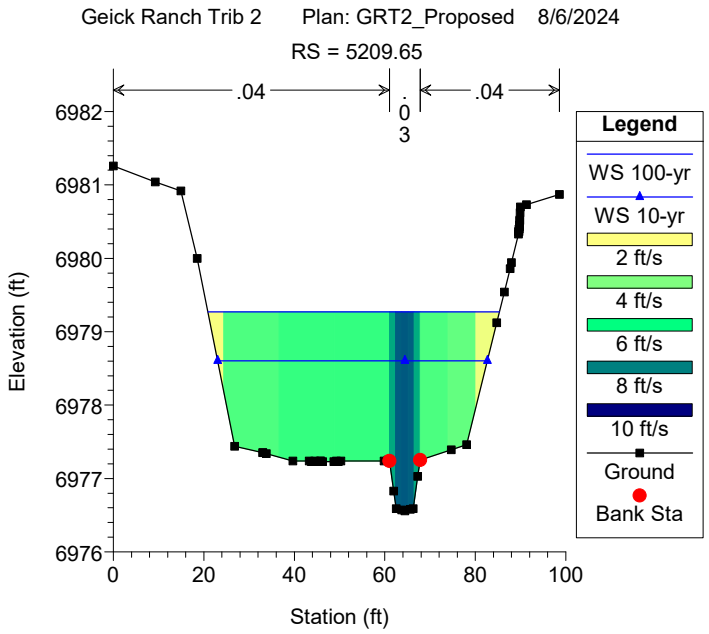

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5730
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

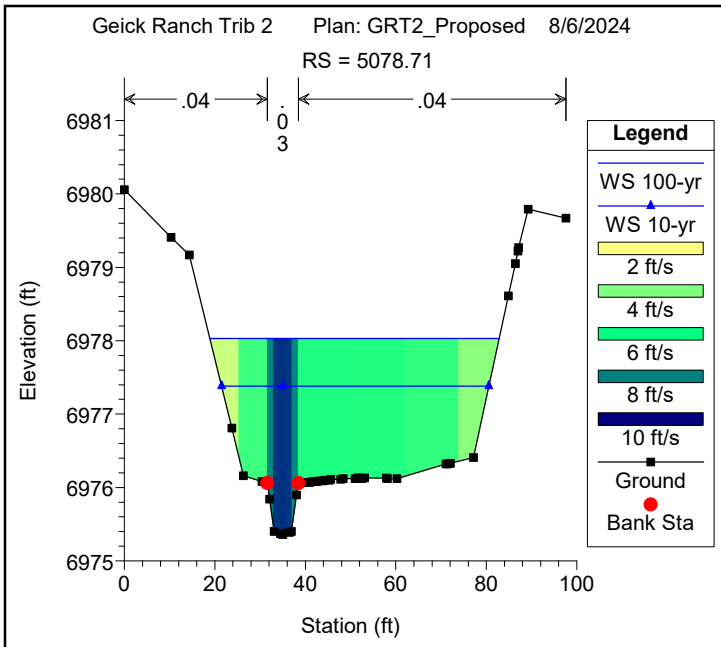

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5728.67
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

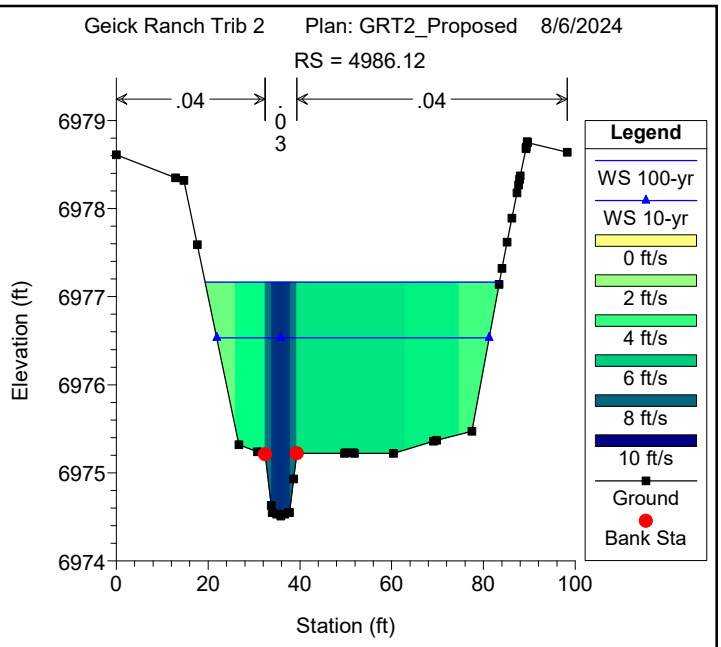

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5541.86
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

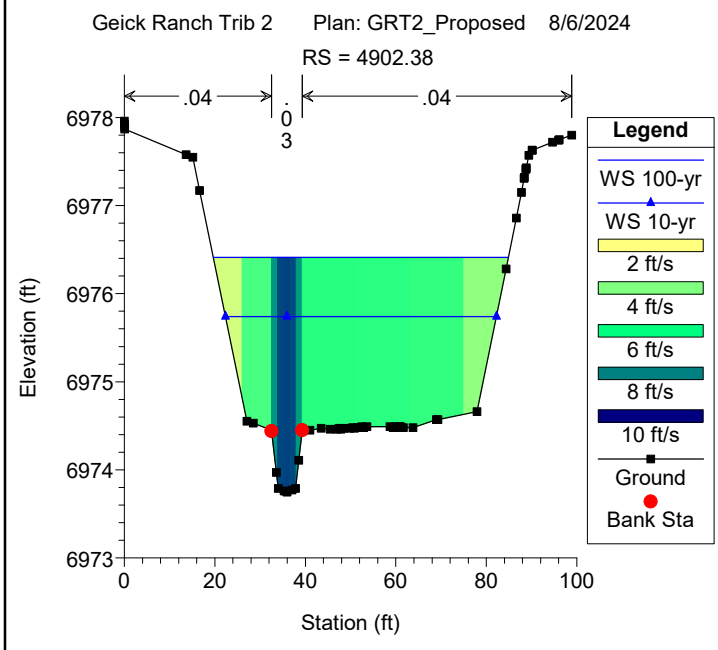

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5424.96
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

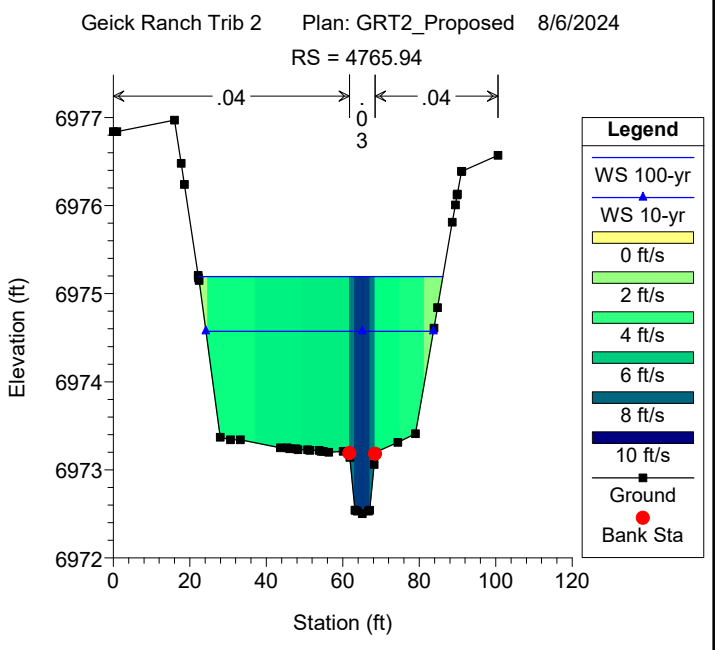

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5301.31
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

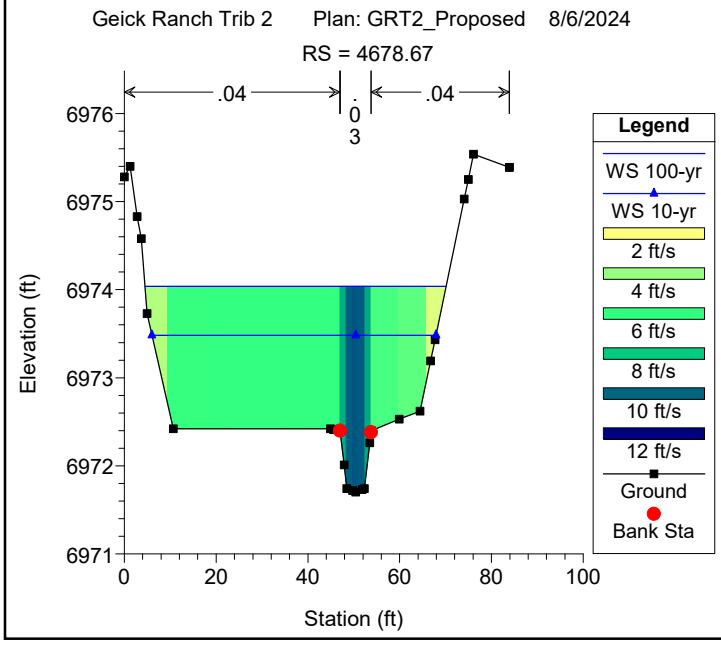

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5209.65
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

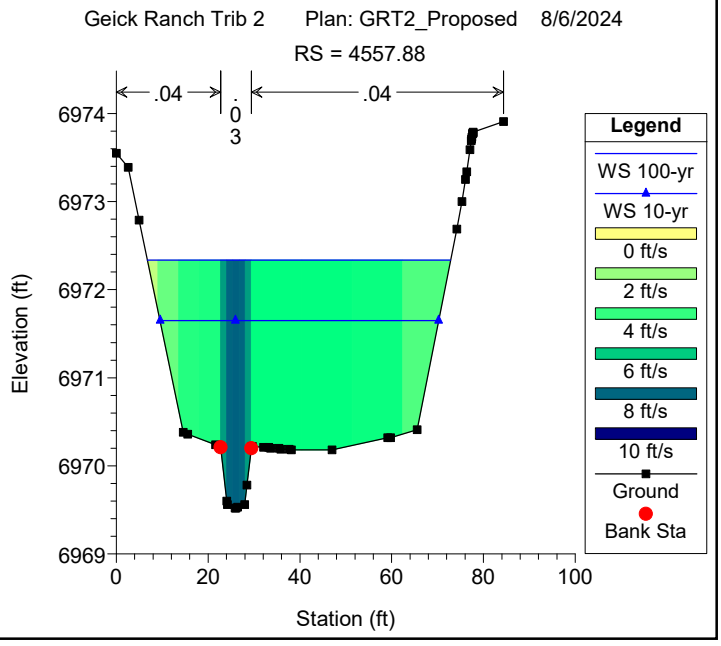

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 5078.71
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

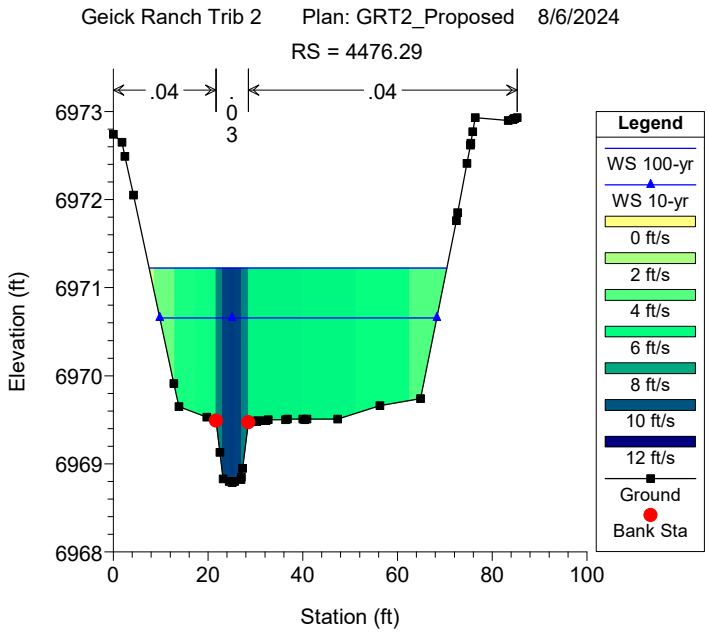

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4986.12
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

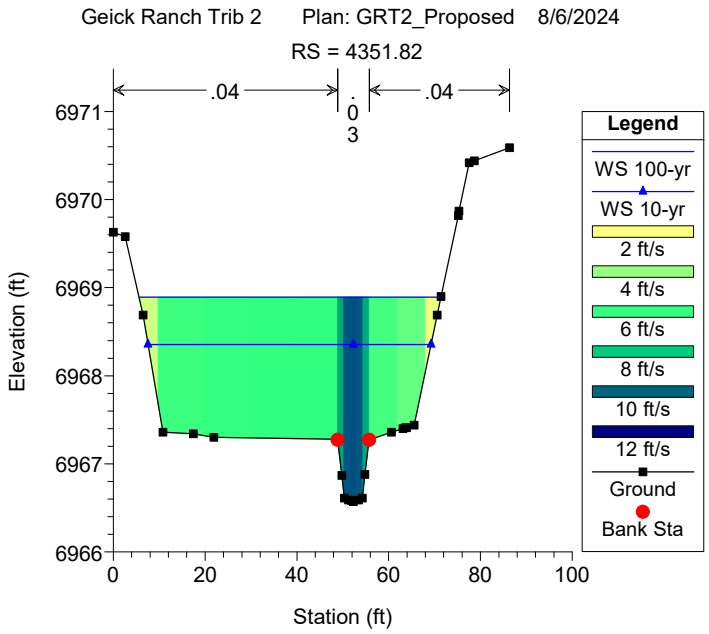

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4902.38
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

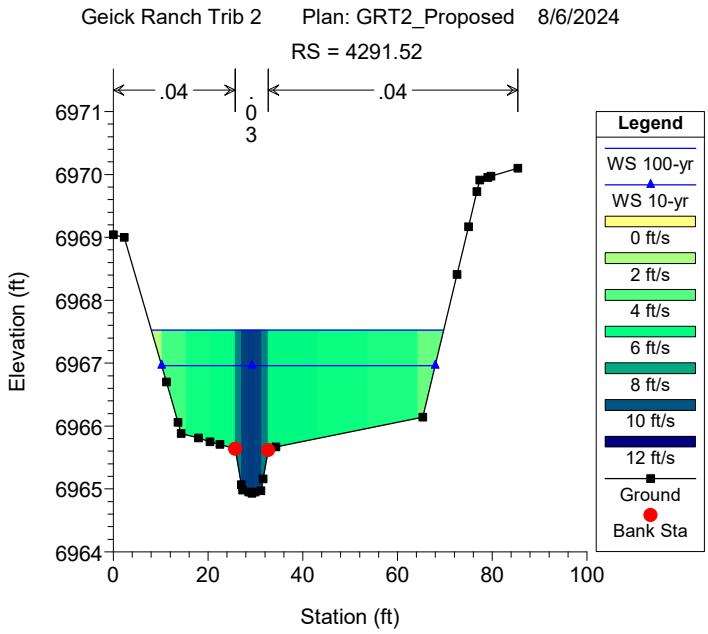

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4765.94
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

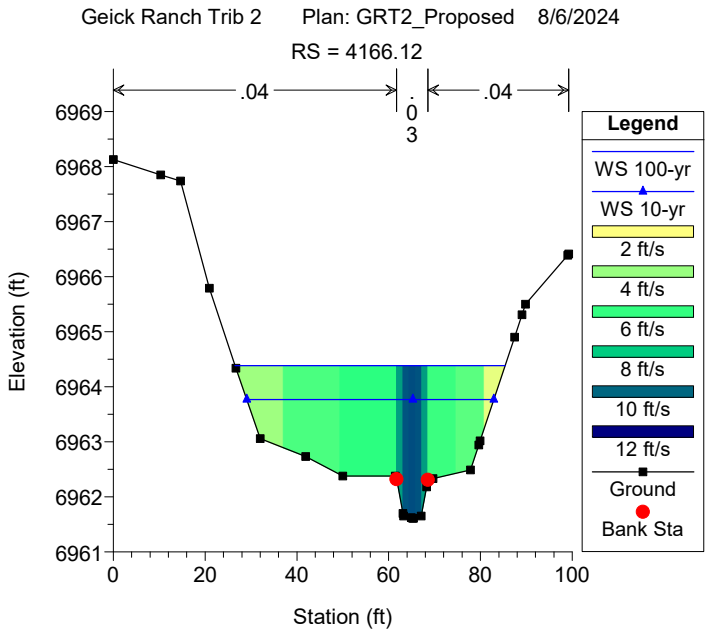

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4678.67
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

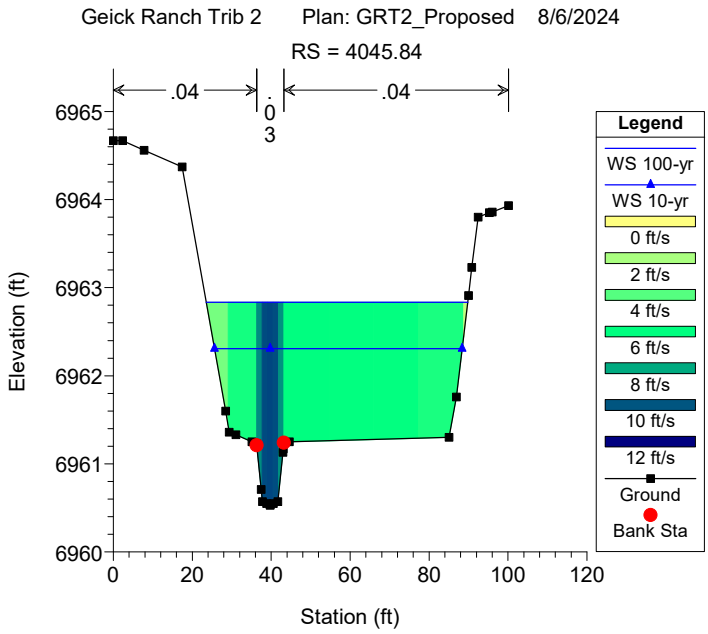

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4557.88
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

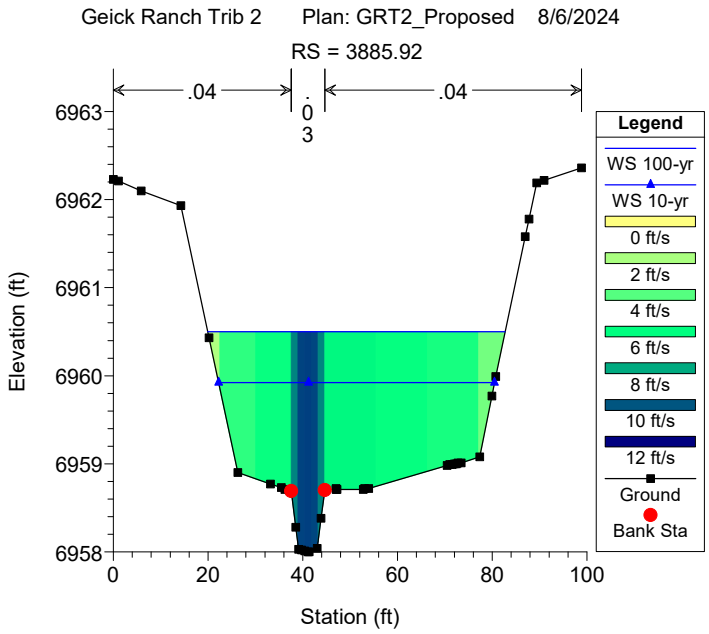

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4476.29
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

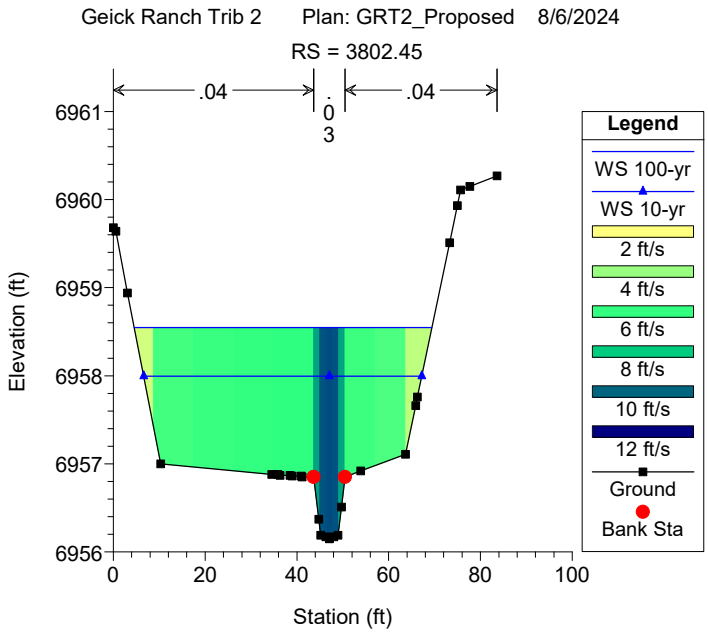

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4351.82
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

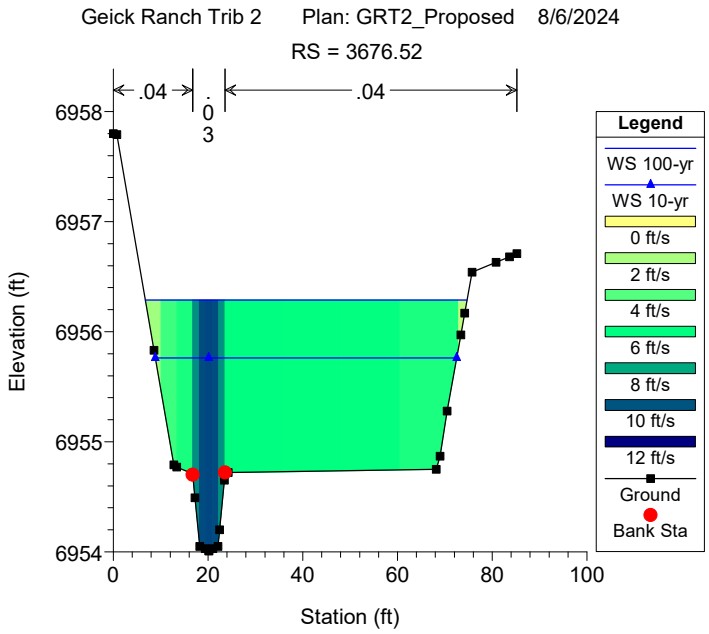

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4291.52
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

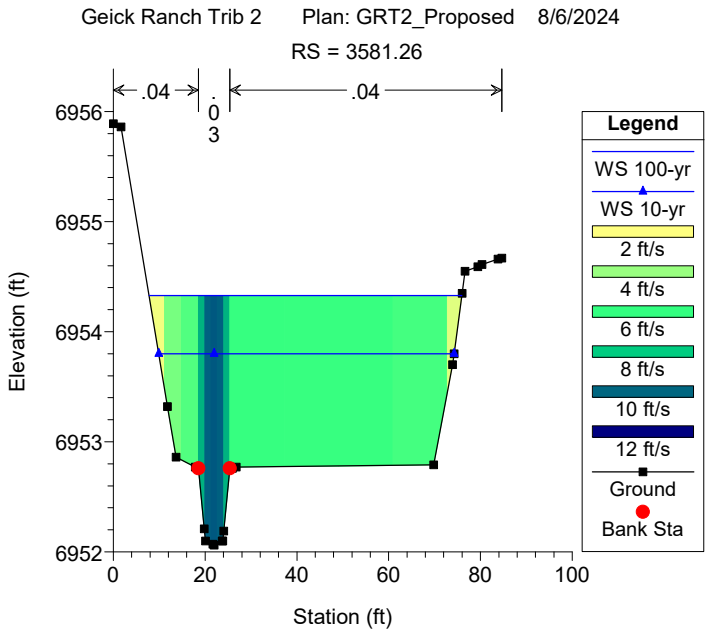

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4166.12
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

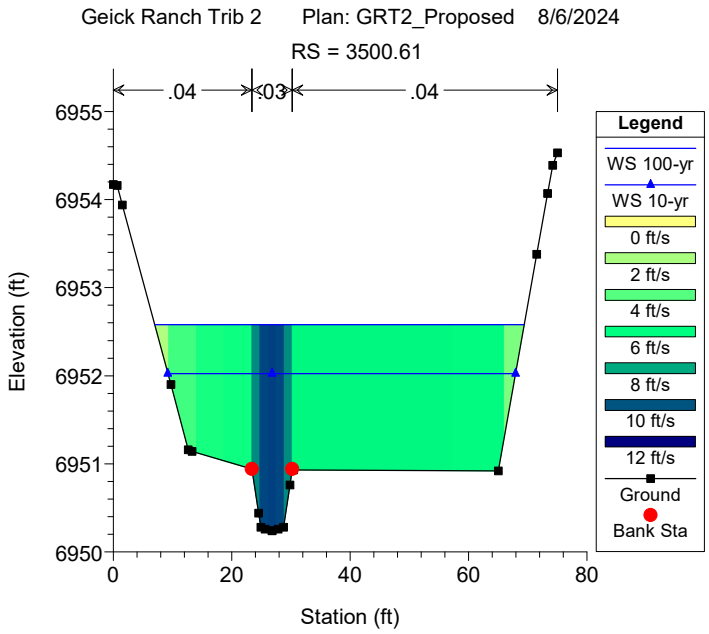

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 4045.84
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

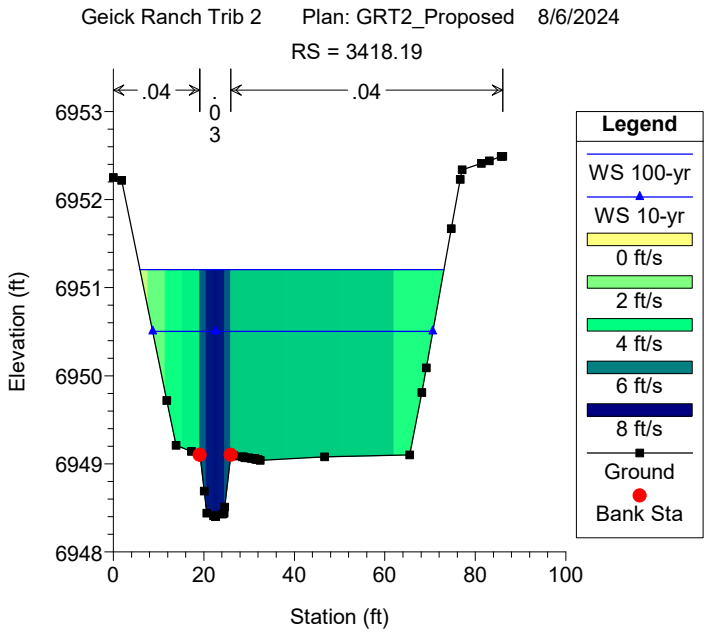

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3885.92
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

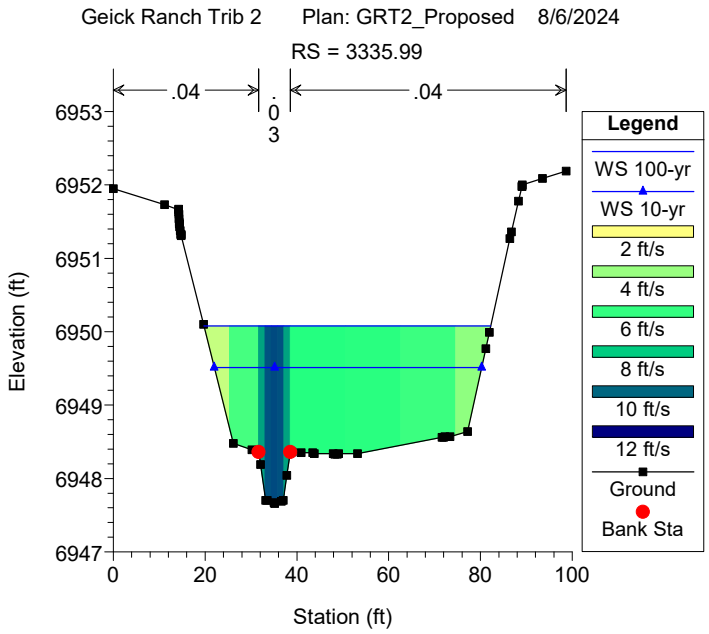

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3802.45
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

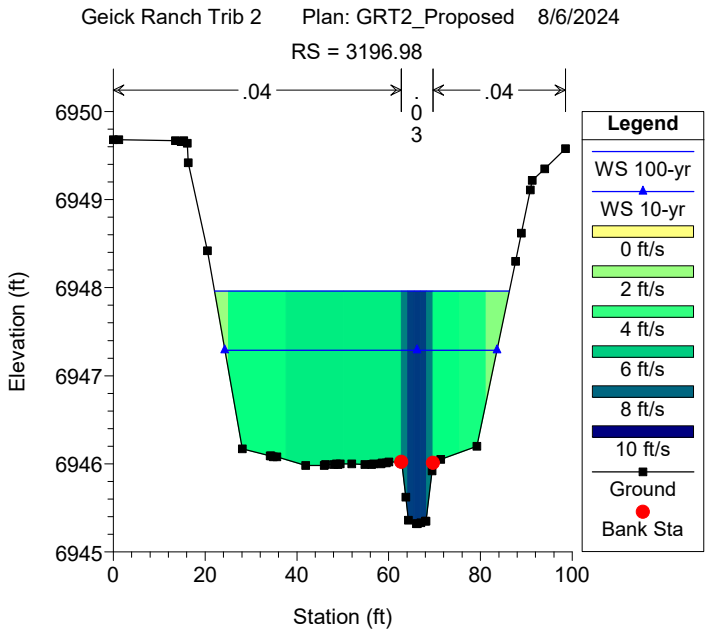

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3676.52
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

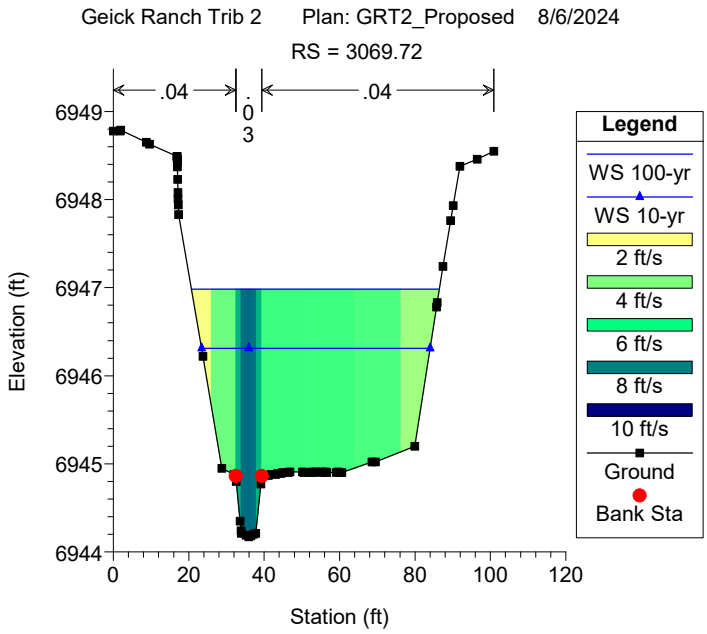

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3581.26
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

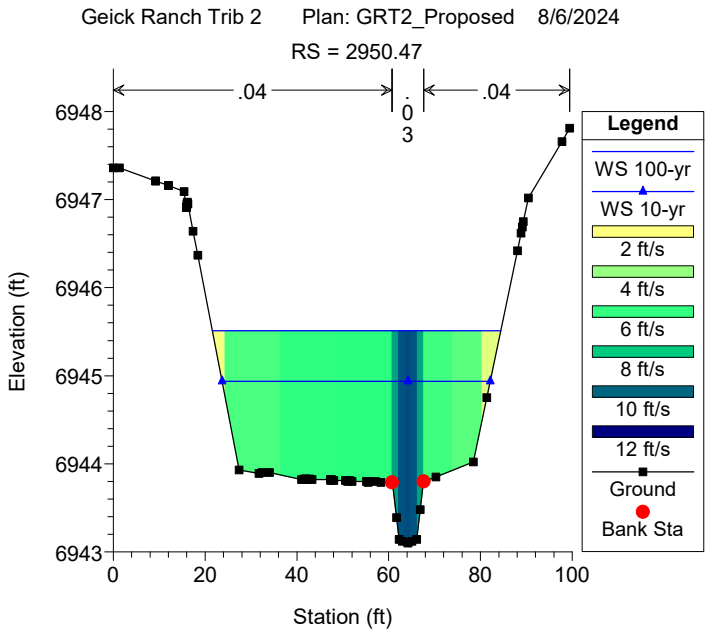

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3500.61
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

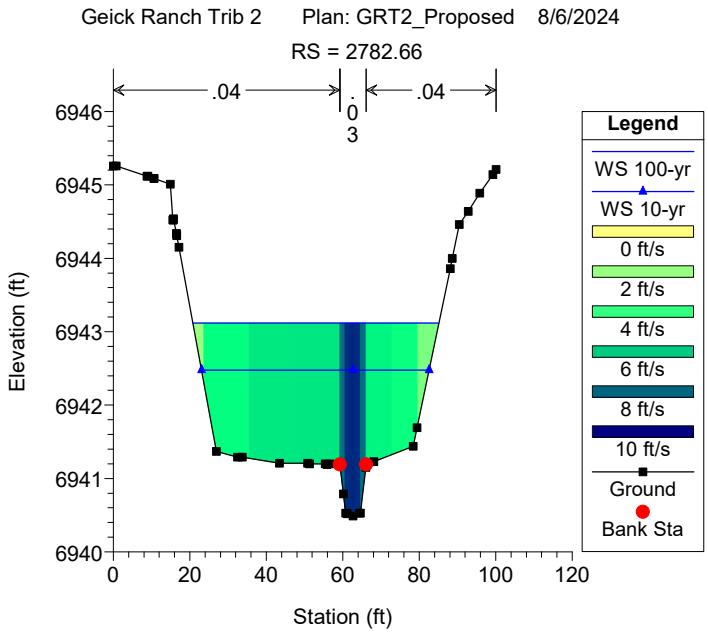

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3418.19
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta

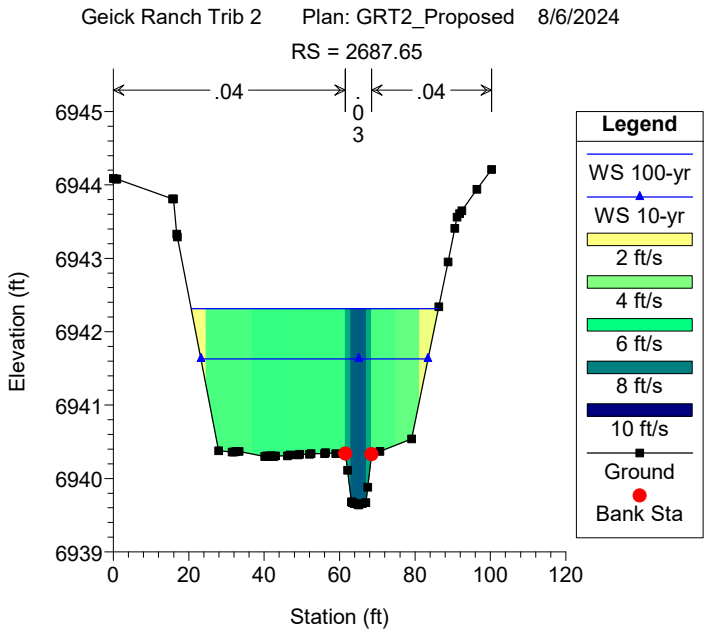

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3335.99
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

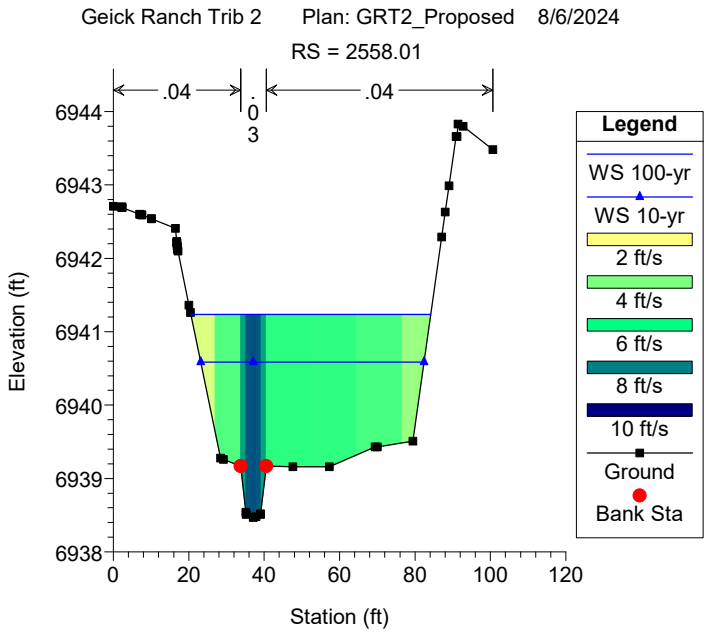

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3196.98
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

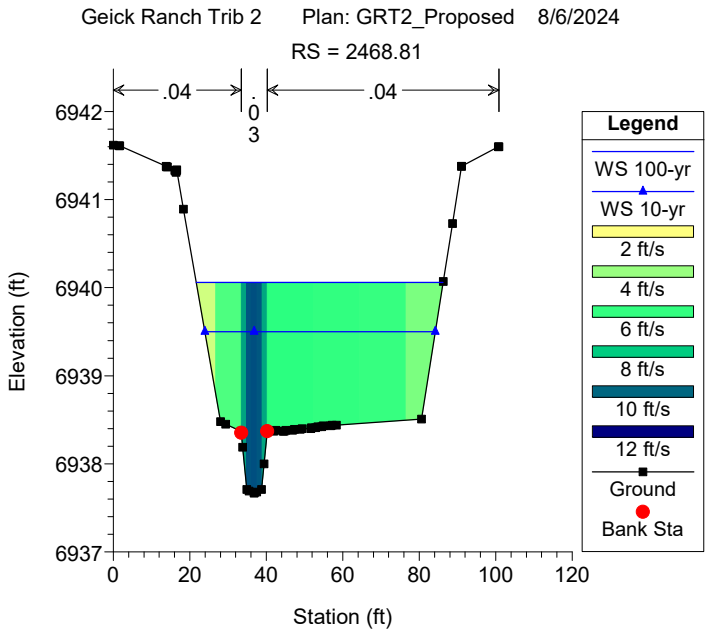

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3069.72
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

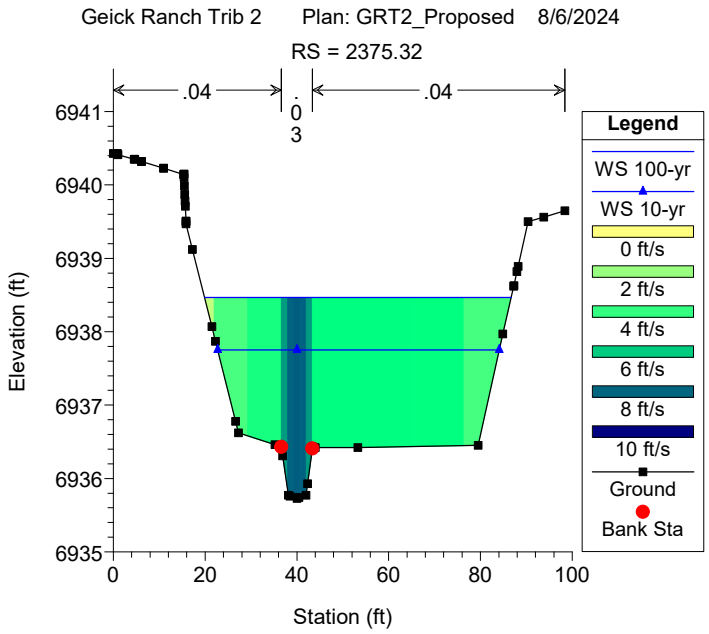

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2950.47
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

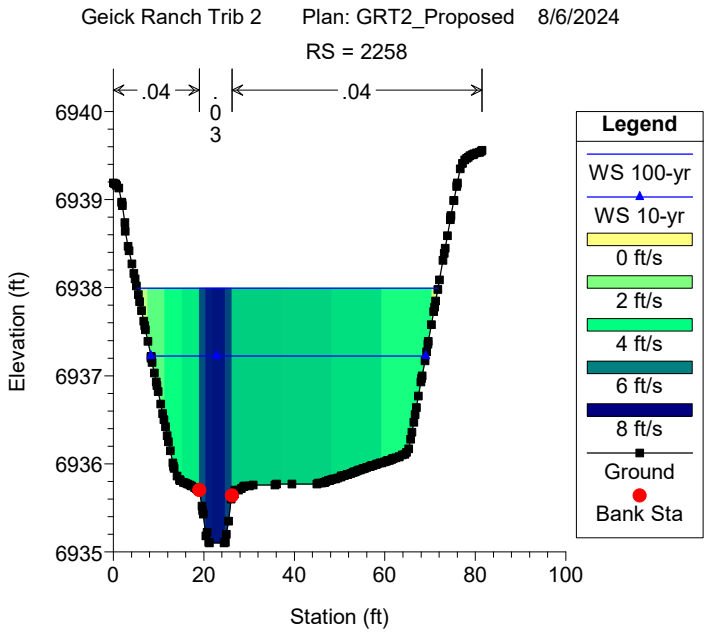

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2782.66
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

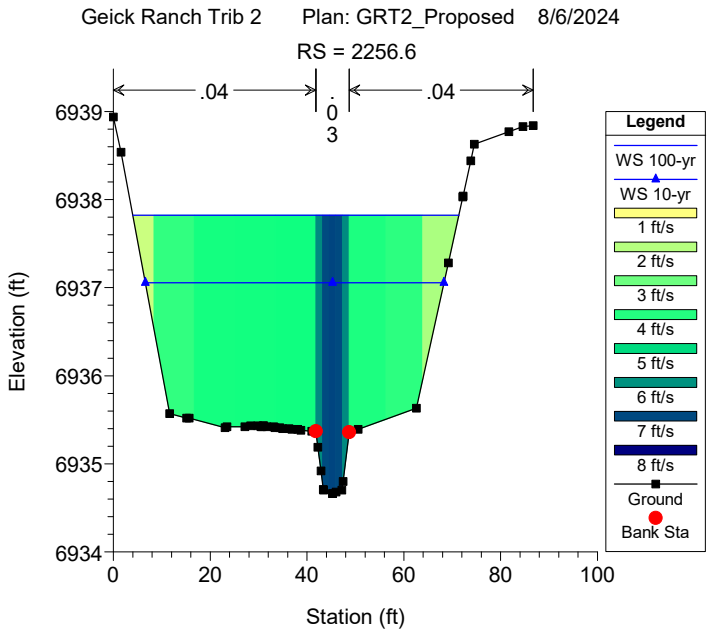

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2687.65
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

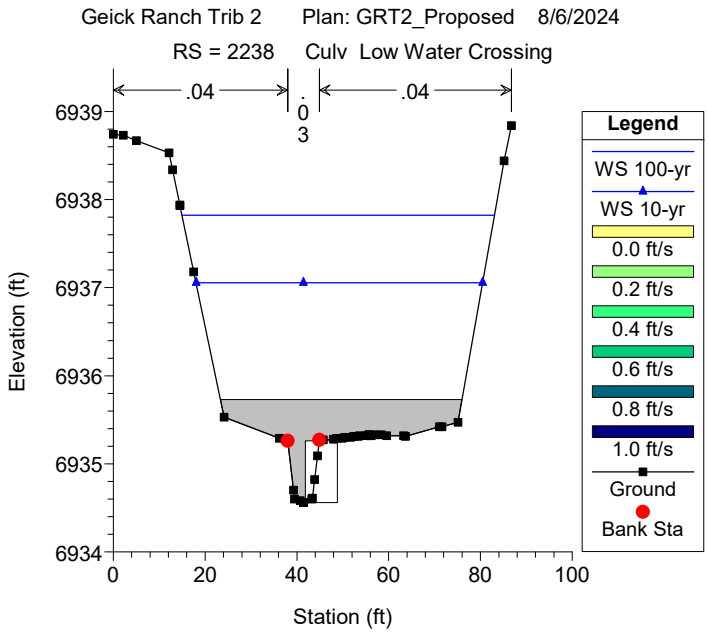

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2558.01
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

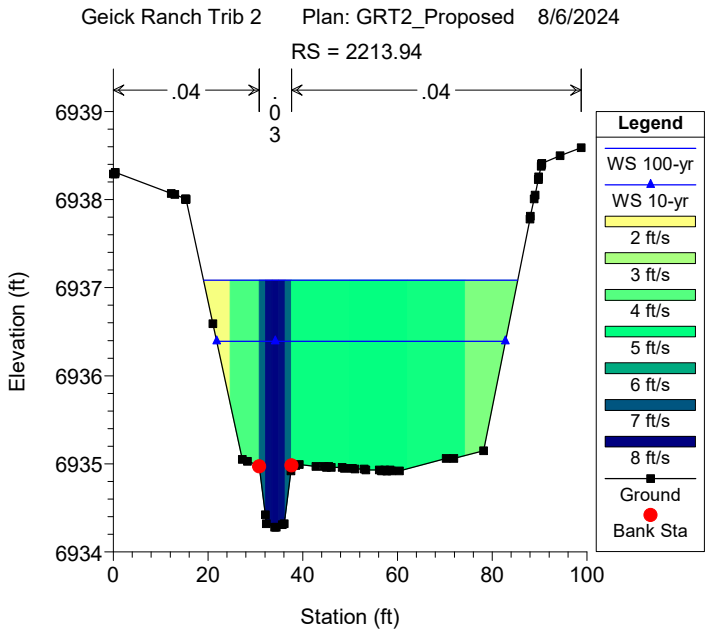

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2468.81
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

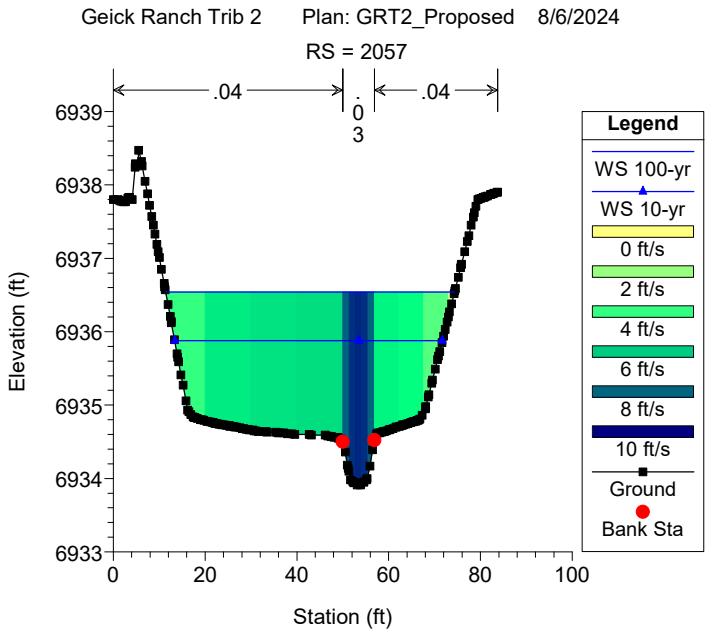

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2375.32
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

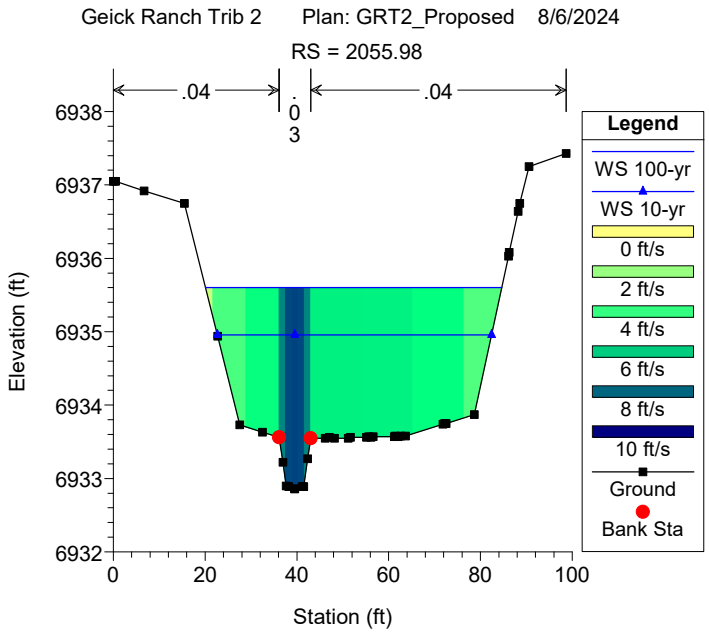

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2258
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

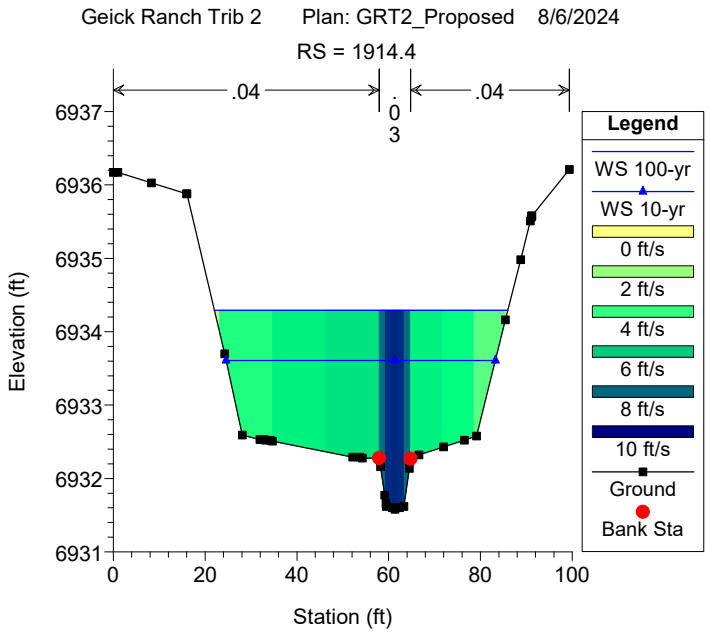

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2256.6
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

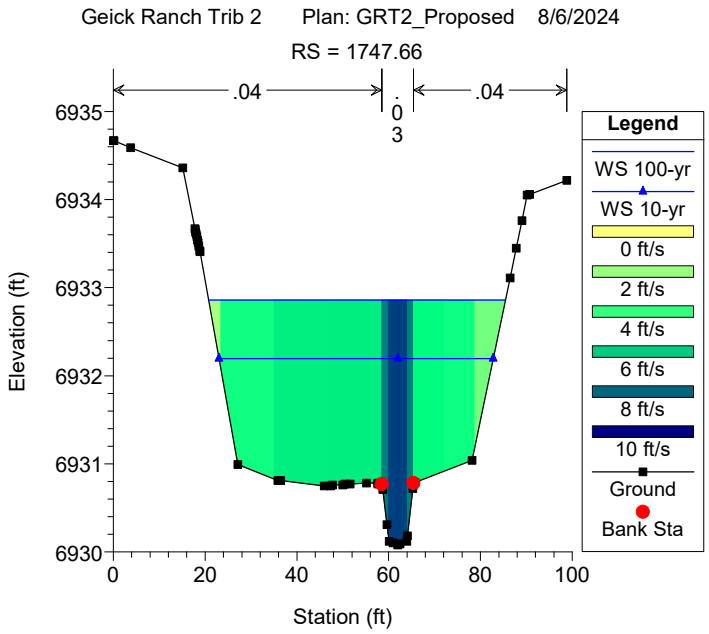

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2238 Culv Low Water Crossing
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

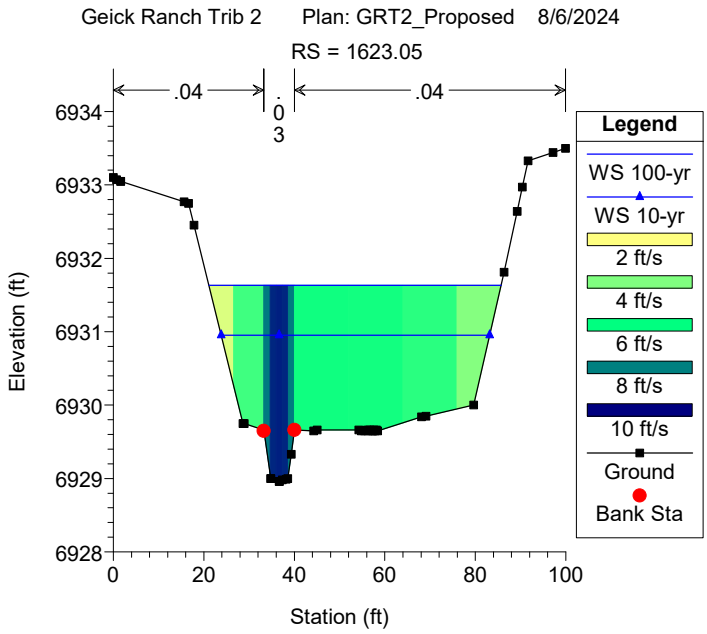

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2213.94
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

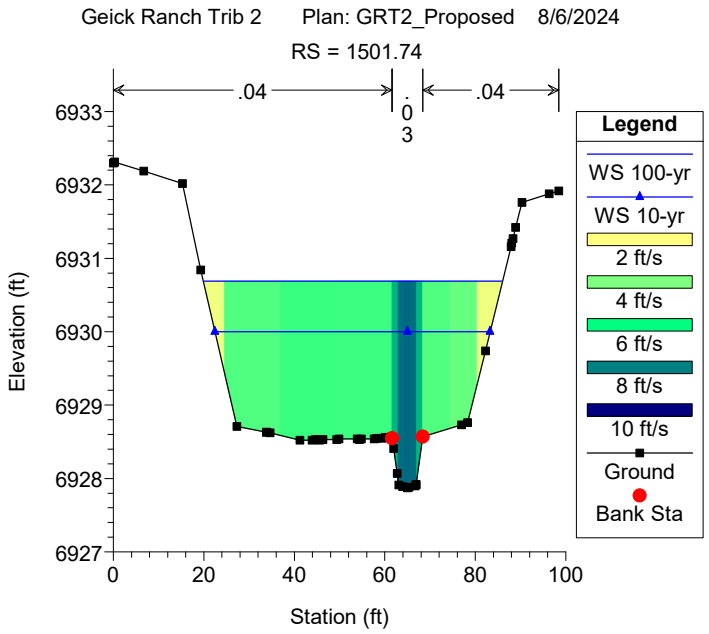

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2057
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

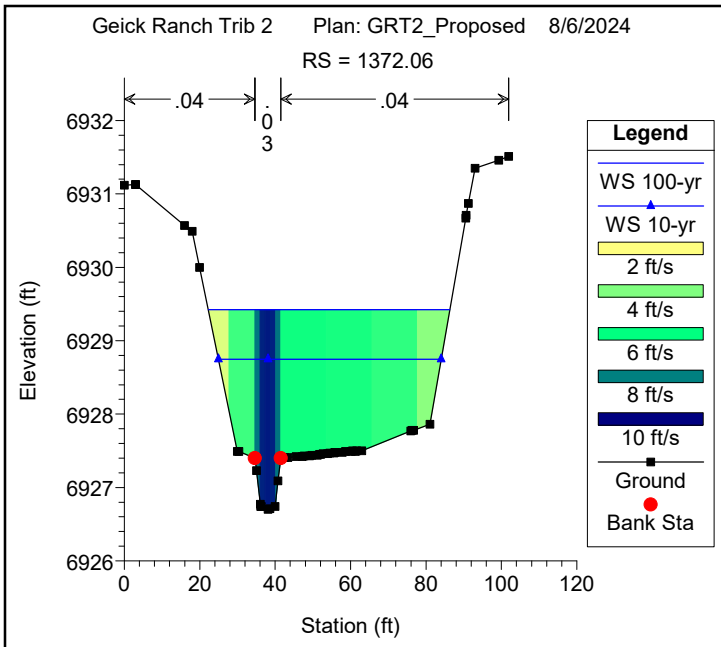

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 2055.98
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

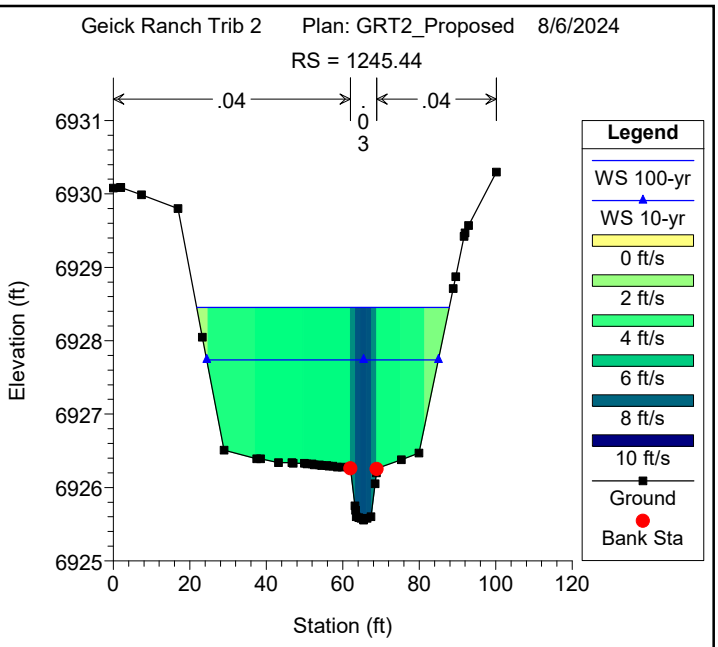

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 1914.4
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

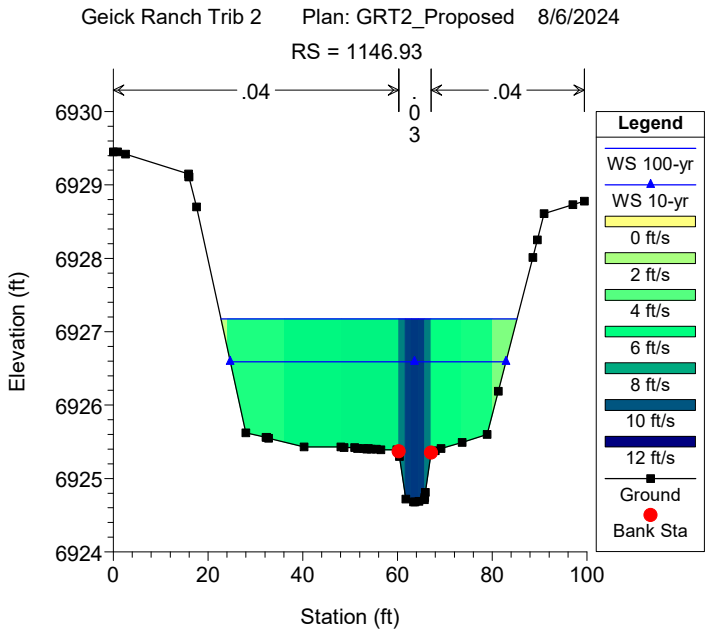

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 1747.66
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

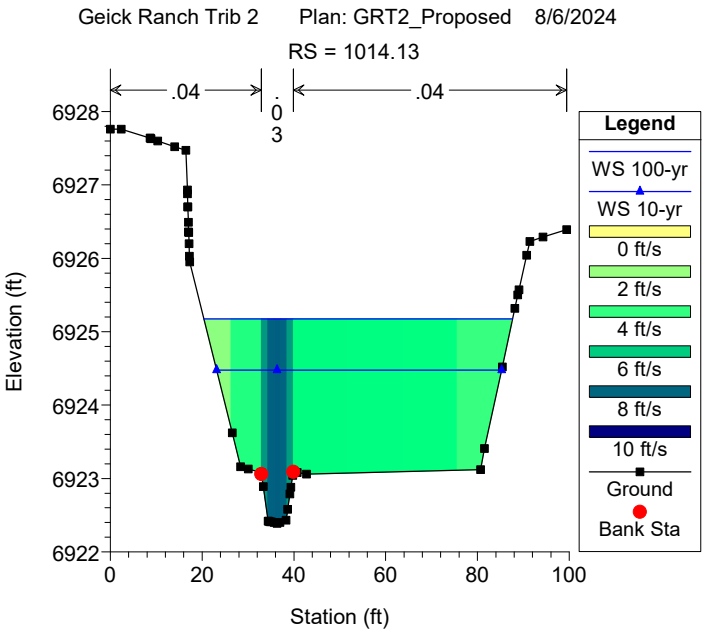

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 1623.05
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

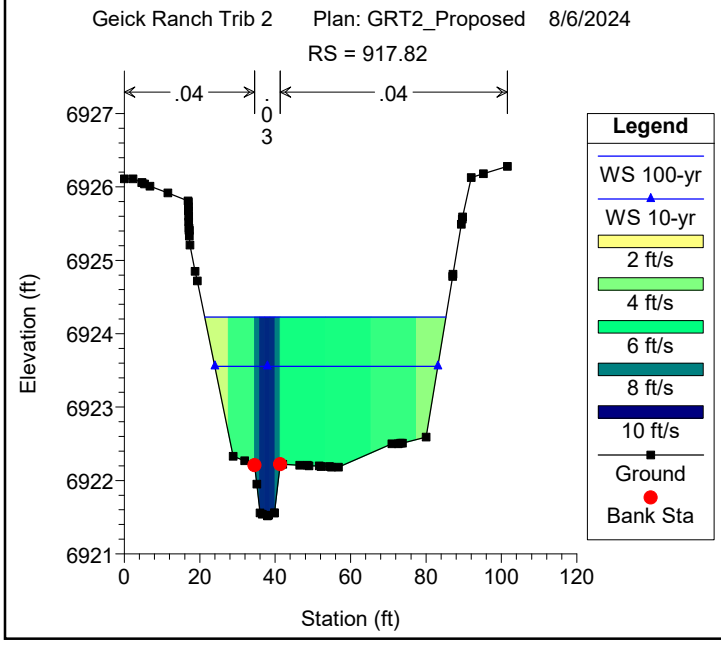

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 1501.74
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

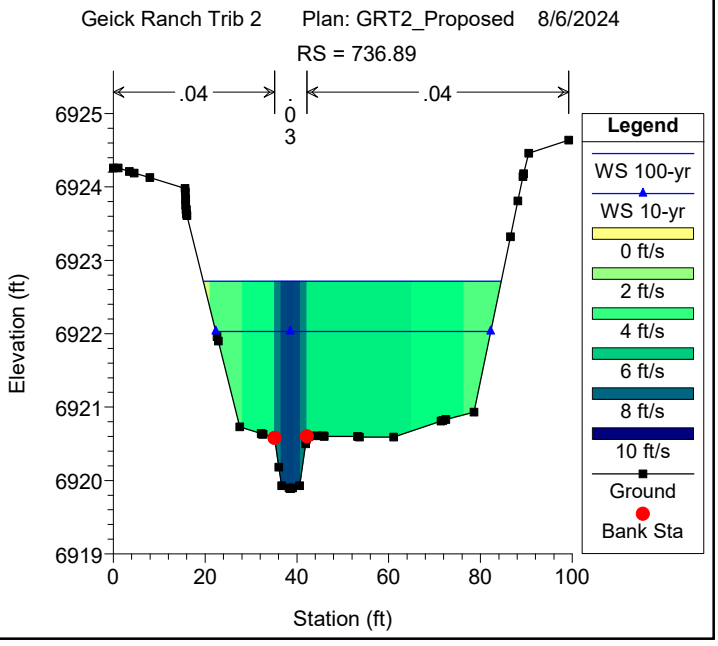

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 1372.06
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

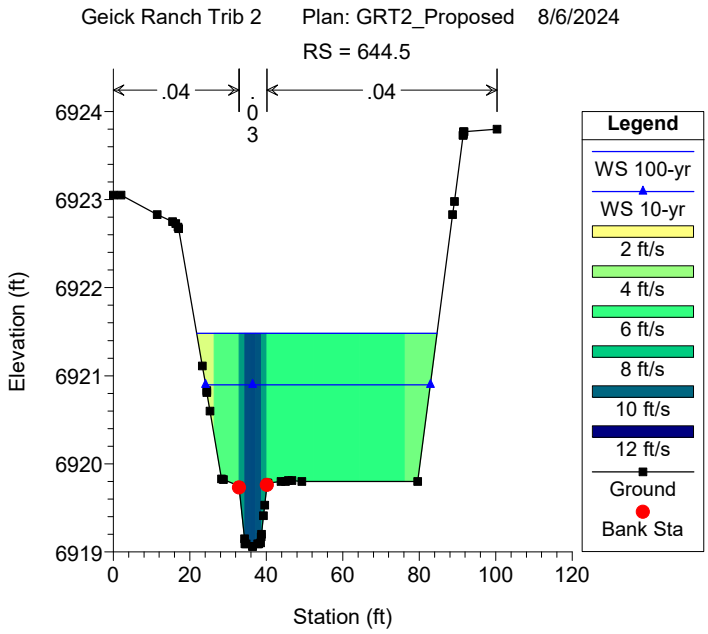

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 1245.44
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

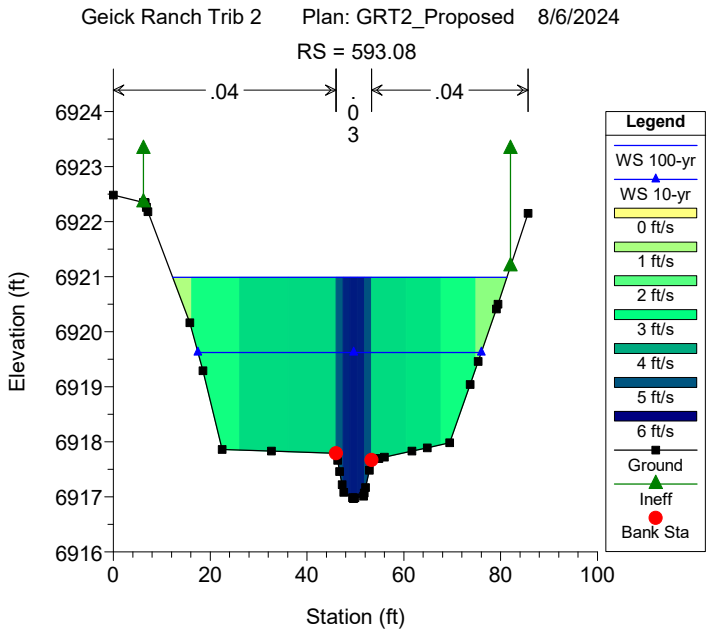

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 1146.93
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta

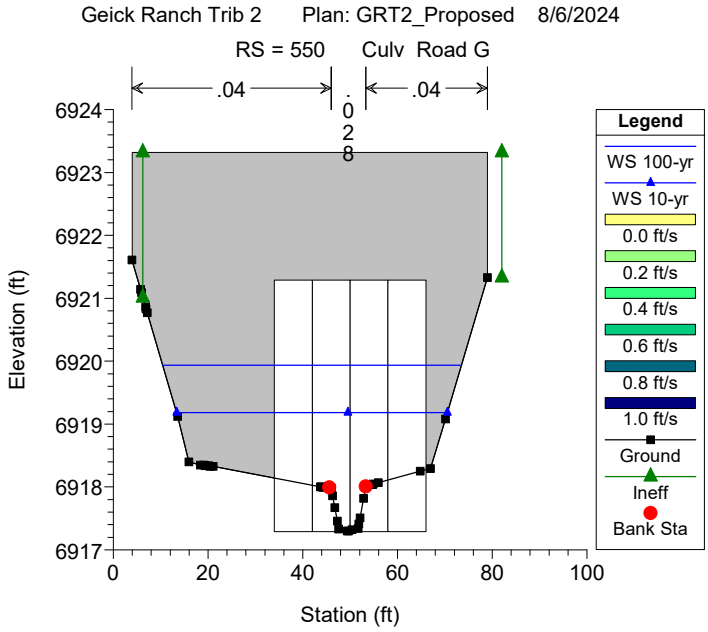

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 1014.13
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

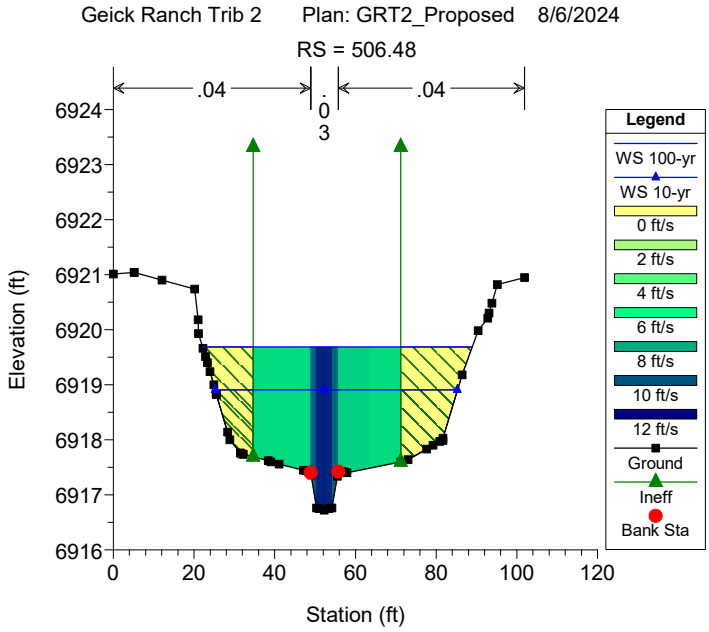

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 917.82
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

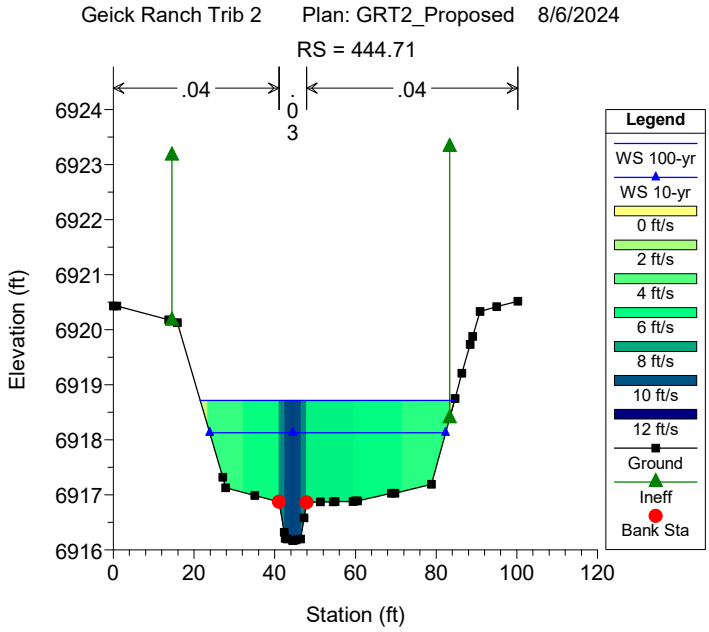

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 736.89
.04
.03
.04
Elevation (ft)
Station (ft)
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta

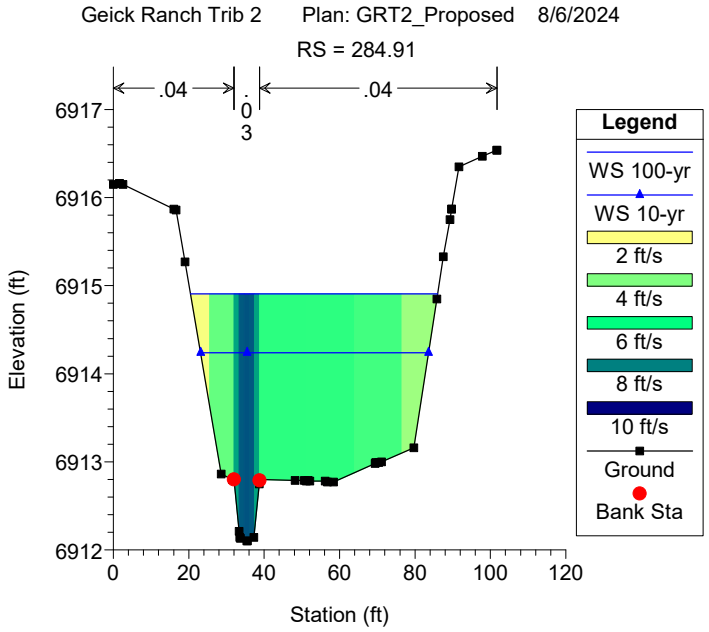

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 644.5
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

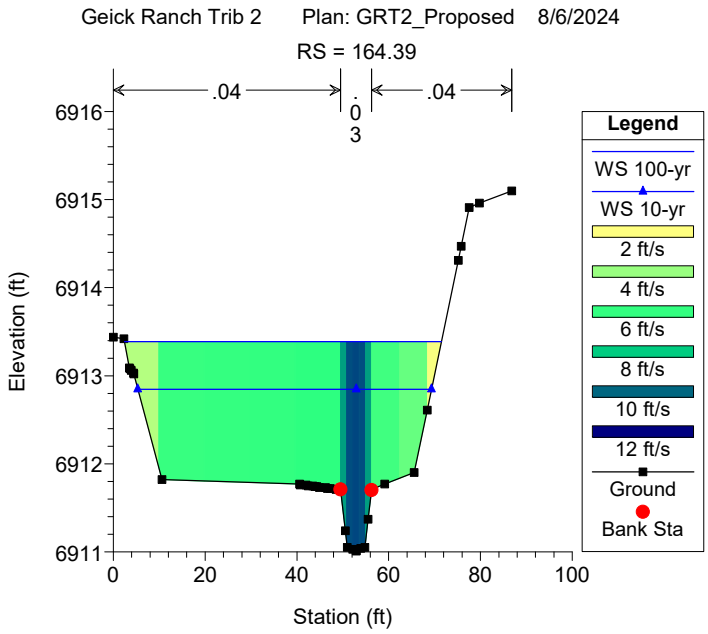

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 593.08
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

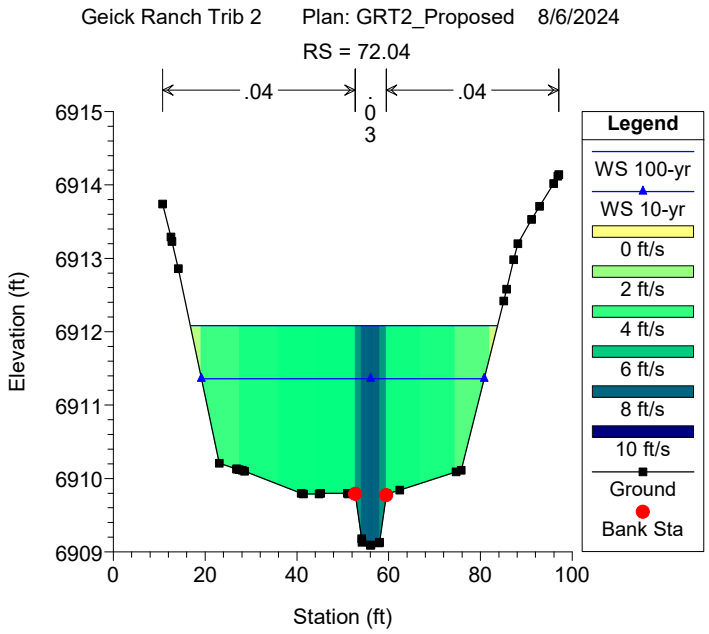

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 550 Culv Road G
.04
.028
.04
Legend
WS 100-yr
WS 10-yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

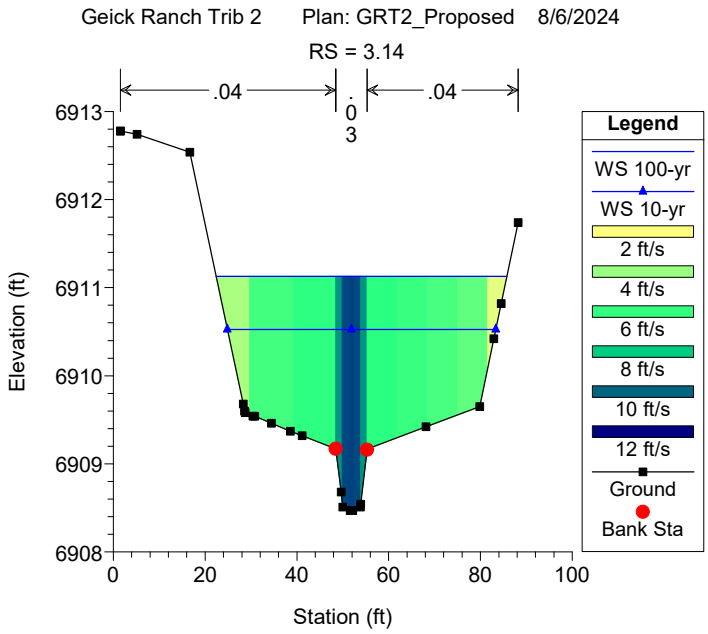

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 506.48
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

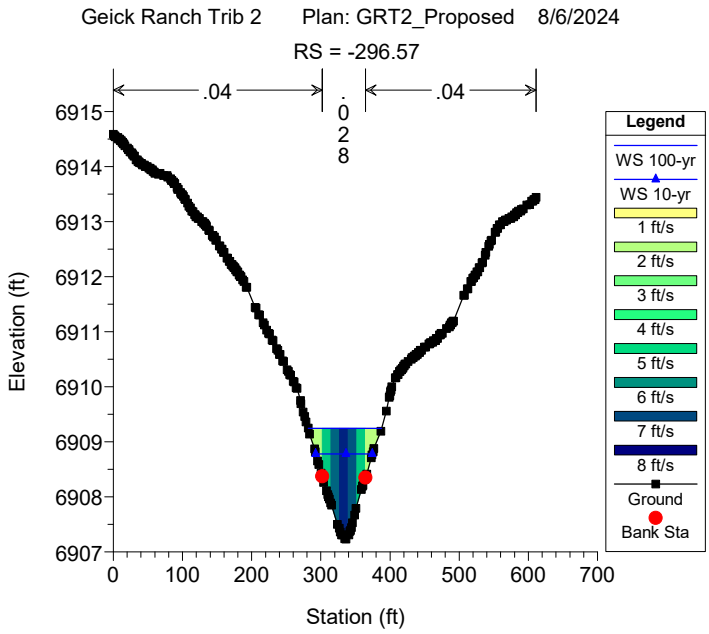

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 444.71
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

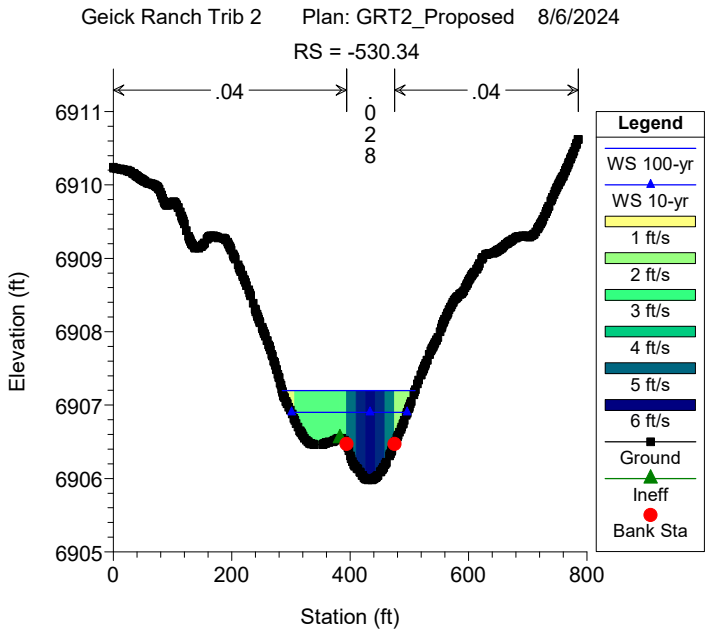

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 284.91
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

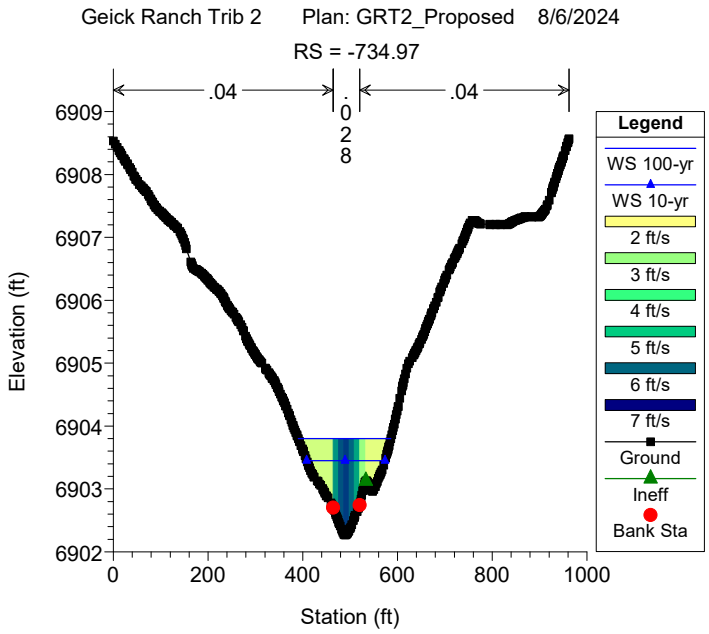

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 164.39
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)

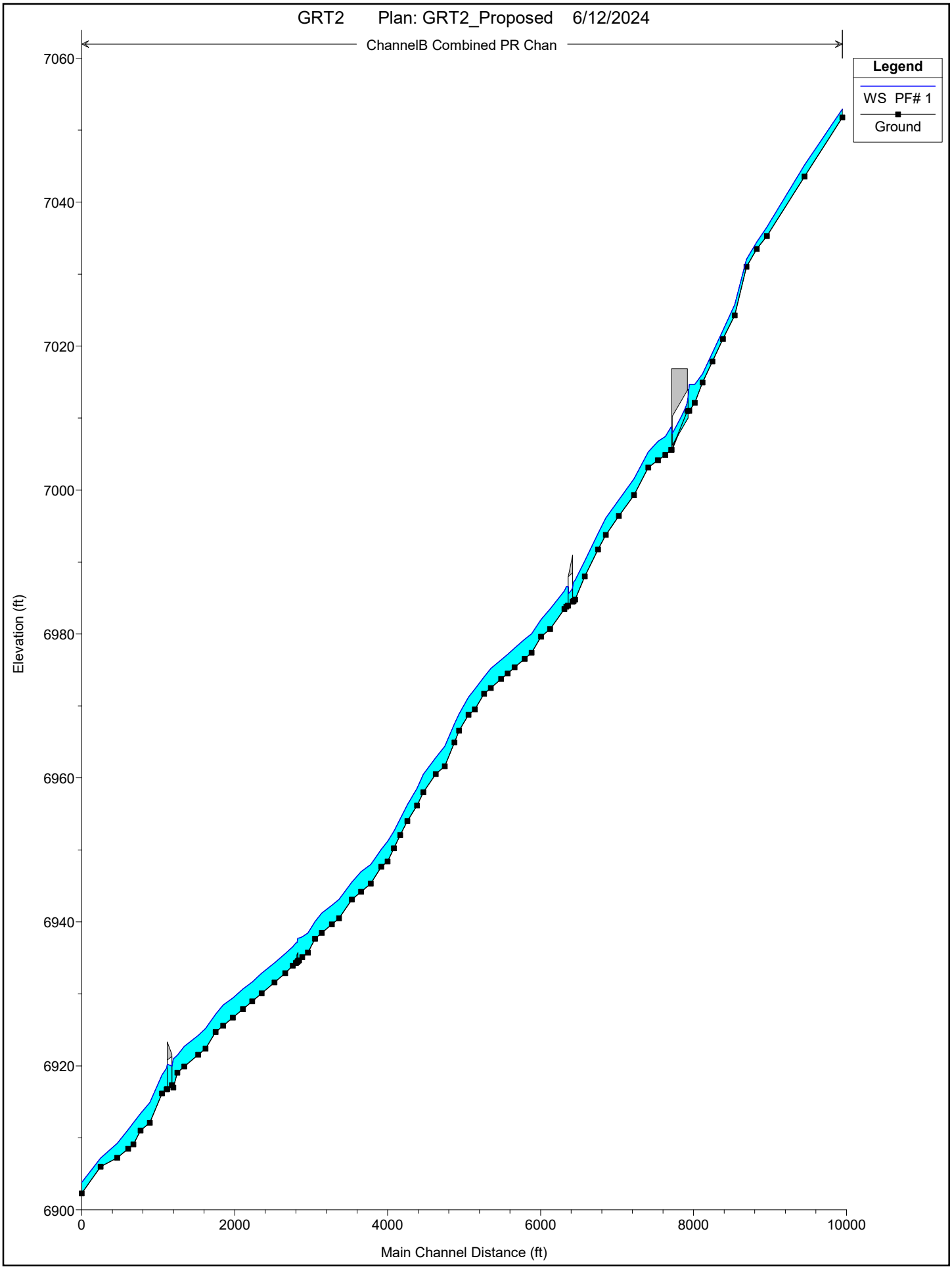

Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 72.04
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)


Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = 3.14
.04
.03
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)


Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = -296.57
.04
.028
.04
Legend
WS 100-yr
WS 10-yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Bank Sta
Elevation (ft)
Station (ft)


Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = -530.34
.04
.028
.04
Legend
WS 100-yr
WS 10-yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Geick Ranch Trib 2 Plan: GRT2_Proposed 8/6/2024
RS = -734.97
.04
.028
.04
Legend
WS 100-yr
WS 10-yr
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


GRT2 Plan: GRT2_Proposed 6/12/2024
ChannelB Combined PR Chan
Legend
WS PF# 1
Ground
Elevation (ft)
7060
7040
7020
7000
6980
6960
6940
6920
6900
0
2000
4000
6000
8000
10000
Main Channel Distance (ft)

River Sta	Profile	Length Chnl	Min El	Vel Chnl	Slope	Lining	Rock	D50
		(ft)	(ft)	(ft/s)	(ft/ft)	Value	Type	
8005	100-yr	155.99	7024.27	5.98				
7849	100-yr	136.68	7021	5.99	0.021	2.38	VL	6
7712	100-yr	129.14	7017.86	6.02	0.023	2.43	VL	6
7583	100-yr	101.65	7014.94	6.05	0.023	2.43	VL	6
7482	100-yr	72.05	7012.11	3.1	0.028	1.29	VL	6
7395	100-yr	234.95	7011	1.72	0.015	0.65	VL	6
7290		Culvert						
7160.32	100-yr	76.87	7005.6	10.44				
7072.44	100-yr	95.3	7004.86	7.78	0.010	2.70	VL	6
6977.14	100-yr	127.1	7004.12	7.22	0.008	2.42	VL	6
6850.04	100-yr	186.54	7003.14	9.25	0.008	3.10	VL	6
6663.5	100-yr	198.69	6999.28	9.47	0.021	3.75	L	9
6464.81	100-yr	170.35	6996.4	9.46	0.014	3.52	L	9
6294.46	100-yr	102.3	6993.77	9.38	0.015	3.53	L	9
6192.16	100-yr	171.87	6991.76	9.31	0.020	3.65	L	9
6020.29	100-yr	126.94	6988.02	9.27	0.022	3.70	L	9
5853	100-yr	19.5	6984.8	7.75	0.025	3.18	VL	6
5852.4	100-yr	96.83	6984.59	8.27	0.011	2.93	VL	6
5800		Culvert						
5730	100-yr	24.9	6983.79	7.27				
5728.67	100-yr	186.81	6983.48	9.7	0.012	3.52	L	9
5541.86	100-yr	116.9	6980.68	7.81	0.015	2.93	VL	6
5424.96	100-yr	123.65	6979.61	9.76	0.009	3.36	L	9
5301.31	100-yr	91.66	6977.39	8.56	0.018	3.31	L	9
5209.65	100-yr	130.94	6976.56	8.09	0.009	2.78	VL	6
5078.71	100-yr	92.59	6975.36	8.72	0.009	3.01	VL	6
4986.12	100-yr	83.74	6974.51	8.53	0.009	2.94	VL	6
4902.38	100-yr	136.44	6973.75	8.43	0.009	2.90	VL	6
4765.94	100-yr	87.27	6972.5	8.39	0.009	2.89	VL	6
4678.67	100-yr	120.79	6971.7	9.65	0.009	3.33	L	9

S_s
2.5

$VS^{0.17}/(S_s-1)^{0.66}$	
1.4 to 3.2	VL
3.3 to 3.9	L
4.0 to 4.5	M
4.6 to 5.5	H
5.6 to 6.4	VH

River Sta	Profile	Length Chnl	Min El	Vel Chnl	Slope	Lining	Rock	D50
		(ft)	(ft)	(ft/s)	(ft/ft)	Value	Type	
4557.88	100-yr	81.59	6969.52	7.62	0.018	2.95	VL	6
4476.29	100-yr	124.47	6968.79	9.91	0.009	3.40	L	9
4351.82	100-yr	60.3	6966.57	9.76	0.018	3.77	L	9
4291.52	100-yr	125.4	6964.93	9.97	0.027	4.13	M	12
4166.12	100-yr	120.28	6961.61	9.85	0.026	4.07	M	12
4045.84	100-yr	159.92	6960.53	9.68	0.009	3.32	L	9
3885.92	100-yr	83.47	6958	9.87	0.016	3.73	L	9
3802.45	100-yr	125.93	6956.15	9.83	0.022	3.94	M	12
3676.52	100-yr	95.26	6954.01	9.68	0.017	3.71	L	9
3581.26	100-yr	80.65	6952.06	9.58	0.020	3.78	L	9
3500.61	100-yr	82.42	6950.24	9.8	0.023	3.94	M	12
3418.19	100-yr	82.2	6948.4	7.25	0.022	2.91	VL	6
3335.99	100-yr	139.01	6947.66	9.87	0.009	3.39	L	9
3196.98	100-yr	127.26	6945.32	8.34	0.017	3.19	VL	6
3069.72	100-yr	119.25	6944.17	7.86	0.009	2.70	VL	6
2950.47	100-yr	167.81	6943.1	9.83	0.009	3.38	L	9
2782.66	100-yr	95.01	6940.49	8.67	0.016	3.27	L	9
2687.65	100-yr	129.64	6939.64	8.09	0.009	2.78	VL	6
2558.01	100-yr	89.2	6938.47	8.21	0.009	2.82	VL	6
2468.81	100-yr	93.49	6937.67	9.79	0.009	3.36	L	9
2375.32	100-yr	75.07	6935.73	7.69	0.021	3.05	VL	6
2258	100-yr	39.67	6935.1	7.33	0.008	2.49	VL	6
2256.6	100-yr	42.66	6934.66	6.67	0.011	2.37	VL	6
2238		Culvert						
2213.94	100-yr	41.3	6934.28	7.49				
2057	100-yr	97.48	6933.91	8.75	0.009	3.00	VL	6
2055.98	100-yr	141.58	6932.86	8.16	0.011	2.89	VL	6
1914.4	100-yr	166.74	6931.58	8.7	0.009	2.99	VL	6
1747.66	100-yr	124.61	6930.08	8.3	0.009	2.85	VL	6
1623.05	100-yr	121.31	6928.96	8.94	0.009	3.07	VL	6

S_s
2.5

$VS^{0.17}/(S_s-1)^{0.66}$	
1.4 to 3.2	VL
3.3 to 3.9	L
4.0 to 4.5	M
4.6 to 5.5	H
5.6 to 6.4	VH

River Sta	Profile	Length Chnl	Min El	Vel Chnl	Slope	Lining	Rock	D50
		(ft)	(ft)	(ft/s)	(ft/ft)	Value	Type	
1501.74	100-yr	129.68	6927.87	7.89	0.009	2.71	VL	6
1372.06	100-yr	126.62	6926.7	9.02	0.009	3.10	VL	6
1245.44	100-yr	98.51	6925.56	7.96	0.009	2.73	VL	6
1146.93	100-yr	132.8	6924.68	10.03	0.009	3.44	L	9
1014.13	100-yr	96.31	6922.39	7.69	0.017	2.95	VL	6
917.82	100-yr	180.93	6921.52	8.84	0.009	3.04	VL	6
736.89	100-yr	92.39	6919.89	8.19	0.009	2.81	VL	6
644.5	100-yr	51.42	6919.06	9.9	0.009	3.40	L	9
593.08	100-yr	86.6	6916.97	5.4	0.041	2.40	VL	6
550		Culvert						
506.48	100-yr	61.77	6916.72	10.64				
444.71	100-yr	159.8	6916.17	9.8	0.009	3.36	L	9
284.91	100-yr	120.52	6912.1	8.19	0.025	3.36	L	9
164.39	100-yr	92.35	6911.01	9.94	0.009	3.42	L	9
72.04	100-yr	68.9	6909.09	7.67	0.021	3.04	VL	6
3.14	100-yr	143.44	6908.47	10.06	0.009	3.46	L	9

S_s
2.5

$VS^{0.17}/(S_s-1)^{0.66}$	
1.4 to 3.2	VL
3.3 to 3.9	L
4.0 to 4.5	M
4.6 to 5.5	H
5.6 to 6.4	VH

Appendix E
Hydraulic Calculations

Drainage B Riprap Bend Protection Upstream of Rex Road								
Model Station	River Station	Q Total (cfs)	Max Chl Dpth (ft)	Vel Chnl (ft/s)	Froude # Chl	Invert Slope	Riprap Req.	Rock Type
7849	60+70.02	262	1.19	5.99	0.98	0.02	2.4	VL
7712	59+33.34	262	1.21	6.02	0.98	0.02	2.4	VL
7583	58+04.2	262	1.21	6.05	0.98	0.03	2.5	VL
7482	57+02.55	262	2.56	3.1	0.37	0.02	1.2	--
7395	56+30.5	262	3.69	1.72	0.16	0.02	0.7	--

Drainage A Riprap Protection								
River Sta	Profile	Q Total	Max Chl Dpth	Vel Chnl	Froude # Chl	Invert Slope	Riprap	Rock Type
		(cfs)	(ft)	(ft/s)			Req.	
2748.72	100-YR	413	0.9	5.1	1.01	0.0216	2.0	VL
2592.31	100-YR	413	1.92	7.39	0.98	0.0295	3.1	VL
2527.18	100-YR	413	1.89	7.25	0.95	0.0294	3.0	VL
2478.84	100-YR	413	2.4	7.84	0.92	0.0192	3.1	VL

GRANDVIEW OUTLET PROTECTION RIPRAP CALCULATIONS

$$D_{50} = 0.023D\left(\frac{Q}{\alpha D^{2.5}}\right)\left(\frac{D}{TW}\right)^{1.2} \quad \text{(D.1a)}$$

$$D_{50} = 0.014D\left(\frac{Q}{\alpha BD^{1.5}}\right)\left(\frac{D}{TW}\right) \quad \text{(D.1b)}$$

where,

- D_{50} = riprap size, m (ft)
- Q = design discharge, m^3/s (ft^3/s)
- D = culvert diameter (circular) or culvert rise (rectangular), m (ft)
- B = culvert span (rectangular), m (ft)
- TW = tailwater depth, m (ft)
- α = unit conversion constant, 1.811 (SI) and 1.0 (CU)

Unresolved: Provide design calculations for each culvert (including exhibits showing headwater depth/profile, HGL, velocity, all inlet and outlet protection dimensions, etc.)

Rex Rd Culvert	
Q (cfs) =	262
D (ft) =	4
B (ft) =	10
TW (ft) =	2.66
D50 (ft) =	0.276
D50 Selected	**6 in**
Apron Length (L)	**16 ft**

Dawlish Rd Culvert	
Q (cfs) =	536
D (ft) =	4
B (ft) =	32
TW (ft) =	2.1
D50 (ft) =	0.223
D50 Selected	**6 in**
Apron Length (L)	**16 ft**

Low Water Crossing	
Q (cfs) =	32.05
D (ft) =	0.7
B (ft) =	7
TW (ft) =	1.89
D50 (ft) =	0.028
D50 Selected	**6 in**
Apron Length (L)	**2.8 ft (Use 3 ft)**

Road G	
Q (cfs) =	649
D (ft) =	4
B (ft) =	32
TW (ft) =	2.28
D50 (ft) =	0.249
D50 Selected	**6 in**
Apron Length (L)	**16 ft**

Froude numbers are not per criteria or approved deviation request.

Riprap Bankful Channel Calculations

Model Station	River Station	Q Total (cfs)	Max Chl Dpth (ft)	Vel Chnl (ft/s)	Froude # Chl	Invert Slope	Riprap Req.	Rock Type
8005	62+23	262	1.48	5.98	0.96	0.021	2.4	VL
7849	60+67	262	1.19	5.99	0.98	0.023	2.4	VL
7712	59+31	262	1.21	6.02	0.98	0.0226	2.4	VL
7583	58+03	262	1.21	6.05	0.98	0.0278	2.5	VL
7482	57+01	262	2.56	3.1	0.37	0.0154	1.2	VL
7395	56+29	262	3.69	1.72	0.16	0.023	0.7	VL
7160.32	53+87	536	3.17	10.44	1.07	0.0096	3.6	L
7072.44	53+31	536	2.58	7.78	0.88	0.0078	2.6	VL
6977.14	52+63	536	2.66	7.22	0.81	0.0077	2.4	VL
6850.04	51+76	536	2.15	9.25	1.16	0.0207	3.7	L
6663.5	50+34	536	2.29	9.47	1.15	0.0145	3.5	L
6464.81	49+13	536	2.25	9.46	1.16	0.0154	3.6	L
6294.46	48+06	536	2.35	9.38	1.12	0.0197	3.7	L
6192.16	47+29	536	2.2	9.31	1.15	0.0218	3.7	L
6020.29	46+16	536	2.16	9.27	1.16	0.0254	3.8	L
5853	45+16	536	2.69	7.75	0.86	0.0108	2.7	VL
5852.4	44+95	536	2.65	8.27	0.93	0.0083	2.8	VL
5730	44+00	536	2.77	7.27	0.79	0.0125	2.6	VL
5728.67	43+80	621	2.5	9.7	1.12	0.015	3.6	L
5541.86	42+51	621	2.79	7.81	0.85	0.0092	2.7	VL
5424.96	41+78	621	2.4	9.76	1.15	0.018	3.8	L
5301.31	41+07	621	2.64	8.56	0.96	0.0091	2.9	VL
5209.65	40+47	621	2.71	8.09	0.9	0.0092	2.8	VL
5078.71	39+66	621	2.67	8.72	0.97	0.0092	3.0	VL
4986.12	39+04	621	2.66	8.53	0.96	0.0091	2.9	VL
4902.38	38+56	621	2.66	8.43	0.94	0.0092	2.9	VL
4765.94	37+67	621	2.69	8.39	0.93	0.0092	2.9	VL
4678.67	37+10	621	2.34	9.65	1.16	0.018	3.7	L
4557.88	36+35	621	2.82	7.62	0.83	0.0089	2.6	VL
4476.29	35+83	621	2.43	9.91	1.16	0.0178	3.8	L
4351.82	35+05	621	2.32	9.76	1.17	0.0272	4.0	M
4291.52	34+63	621	2.6	9.97	1.13	0.0265	4.1	M
4166.12	33+82	621	2.77	9.85	1.08	0.009	3.4	L
4045.84	33+07	621	2.3	9.68	1.17	0.0158	3.7	L
3885.92	32+09	621	2.5	9.87	1.14	0.0222	4.0	M
3802.45	31+51	621	2.4	9.83	1.16	0.017	3.8	L
3676.52	30+57	621	2.28	9.68	1.18	0.0205	3.8	L
3581.26	29+94	621	2.27	9.58	1.17	0.0226	3.8	L
3500.61	29+44	621	2.34	9.8	1.17	0.0223	3.9	M
3418.19	298+89	621	2.8	7.25	0.79	0.009	2.5	VL
3335.99	28+39	621	2.42	9.87	1.16	0.0168	3.8	L

3196.98	27+43	621	2.64	8.34	0.94	0.009	2.9	VL
3069.72	26+62	621	2.81	7.86	0.85	0.009	2.7	VL
2950.47	25+88	621	2.41	9.83	1.16	0.0156	3.7	L
2782.66	24+82	621	2.63	8.67	0.98	0.0089	3.0	VL
2687.65	24+17	621	2.68	8.09	0.9	0.009	2.8	VL
2558.01	23+38	621	2.76	8.21	0.9	0.009	2.8	VL
2468.81	22+84	621	2.39	9.79	1.16	0.0208	3.9	L
2375.32	22+21	621	2.74	7.69	0.85	0.0084	2.6	VL
2258	21+69	621	2.89	7.33	0.78	0.0111	2.6	VL
2256.6	21+42	621	3.16	6.67	0.68	0.0089	2.3	VL
2213.94	21+15	621	2.81	7.49	0.81	0.0089	2.6	VL
2057	20+87	621	2.63	8.75	0.98	0.0108	3.1	VL
2055.98	20+19	621	2.74	8.16	0.9	0.009	2.8	VL
1914.4	19+22	621	2.71	8.7	0.96	0.009	3.0	VL
1747.66	17+99	649	2.78	8.3	0.91	0.009	2.9	VL
1623.05	17+21	649	2.67	8.94	1	0.009	3.1	VL
1501.74	16+43	649	2.82	7.89	0.85	0.009	2.7	VL
1372.06	15+73	649	2.72	9.02	1	0.009	3.1	VL
1245.44	14+93	649	2.89	7.96	0.85	0.0089	2.7	VL
1146.93	14+23	649	2.49	10.03	1.16	0.0172	3.8	L
1014.13	13+38	649	2.78	7.69	0.84	0.009	2.6	VL
917.82	12+62	649	2.71	8.84	0.98	0.009	3.0	VL
736.89	11+39	649	2.82	8.19	0.89	0.009	2.8	VL
644.5	10+79	649	2.42	9.9	1.16	0.0406	4.4	M
593.08	10+41	649	4.02	5.4	0.49	0.0029	1.5	VL
506.48	9+55	649	2.97	10.64	1.12	0.0089	3.6	L
444.71	9+11	649	2.55	9.8	1.12	0.0255	4.0	M
284.91	7+91	649	2.81	8.19	0.89	0.009	2.8	VL
164.39	7+23	649	2.38	9.94	1.18	0.0208	3.9	M
72.04	6+60	649	2.99	7.67	0.8	0.009	2.6	VL
3.14	6+00	649	2.66	10.06	1.12	0.0086	3.4	L

*Riprap sizing calculation based on El Paso Criteria Manual (Section 10.10.2)

North American Green
5401 St. Wendel-Cynthiana Rd.
Poseyville, Indiana 47633
Tel. 800.772.2040
>Fax 812.867.0247
www.nagreen.com
ECMDS v7.0

CHANNEL ANALYSIS

> > > Grandview Drainage B

Name	Grandview Drainage B
Discharge	500
Channel Slope	0.01
Channel Bottom Width	39
Left Side Slope	4
Right Side Slope	4
Low Flow Liner	
Retardence Class	E <2 in
Vegetation Type	Bunch Type
Vegetation Density	Poor < 50%
Soil Type	Sandy Loam (GM)

C125BN

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125BN Unvegetated	Straight	500 cfs	6.77 ft/s	1.62 ft	0.028	2.8 lbs/ft2	1.01 lbs/ft2	2.77	STABLE	D
Underlying Substrate	Straight	500 cfs	6.77 ft/s	1.62 ft	0.028	2.65 lbs/ft2	0.88 lbs/ft2	3.02	STABLE	D

S150BN

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S150BN Unvegetated	Straight	500 cfs	5.88 ft/s	1.84 ft	0.034	1.9 lbs/ft2	1.15 lbs/ft2	1.66	STABLE	D
Underlying Substrate	Straight	500 cfs	5.88 ft/s	1.84 ft	0.034	1.8 lbs/ft2	0.98 lbs/ft2	1.83	STABLE	D

SC150BN

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC150BN Unvegetated	Straight	500 cfs	5.88 ft/s	1.84 ft	0.034	2 lbs/ft2	1.15 lbs/ft2	1.75	STABLE	D
Underlying Substrate	Straight	500 cfs	5.88 ft/s	1.84 ft	0.034	1.89 lbs/ft2	0.98 lbs/ft2	1.93	STABLE	D

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	500 cfs	7.88 ft/s	1.42 ft	0.022	4 lbs/ft2	0.89 lbs/ft2	4.52	STABLE	--
Underlying Substrate	Straight	500 cfs	7.88 ft/s	1.42 ft	0.022	0.32 lbs/ft2	0.78 lbs/ft2	0.41	UNSTABLE	--

S75BN

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75BN Unvegetated	Straight	500 cfs	6.36 ft/s	1.71 ft	0.03	1.6 lbs/ft2	1.07 lbs/ft2	1.5	STABLE	D

Underlying Substrate	Straight	500 cfs	6.36 ft/s	1.71 ft	0.03	1.51 lbs/ft2	0.92 lbs/ft2	1.64	STABLE	D

$y_e = (A/2)^{1/2}$ or $(D^2/16)^{1/2}$

The specific energy $H_o = y_e + V_o^2/2g$ and the Froude number

$F = V_o/(gy_e)^{1/2}$.

River Sta	Vel Left	Vel Right	Area Left	Area Right	y_e Left	y_e Right	Fr Left	Fr Right
	(ft/s)	(ft/s)	(sq ft)	(sq ft)				
9426.04	2.31	2.35	3.86	7.81	1.39	1.98	0.35	0.29
8932.93	3.1	2.85	25.85	17.6	3.60	2.97	0.29	0.29
8439.38	2.3	2.52	30.38	15.1	3.90	2.75	0.21	0.27
8310.02	2	2.02	64.42	15.15	5.68	2.75	0.15	0.21
8096	1.7	1.7	8.02	9.28	2.00	2.15	0.21	0.20
8005	2.16	2.02	1.76	1.43	0.94	0.85	0.39	0.39
7849	1.76	1.96	0.86	1.18	0.66	0.77	0.38	0.39
7712	2	2.22	1.25	1.72	0.79	0.93	0.40	0.41
7583	2.29	2.33	1.89	1.98	0.97	0.99	0.41	0.41
7482	1.23	1.17	7.96	6.69	1.99	1.83	0.15	0.15
7395	1.02	1.12	29.22	27.92	3.82	3.74	0.09	0.10
7072.44	4.71	4.1	68.12	21.57	5.84	3.28	0.34	0.40
6977.14	4.39	3.84	72.42	23.69	6.02	3.44	0.32	0.36
6850.04	4.77	5.53	15.16	61.4	2.75	5.54	0.51	0.41
6663.5	5.05	5.55	25.25	48.9	3.55	4.94	0.47	0.44
6464.81	5.6	4.92	56.99	17.1	5.34	2.92	0.43	0.51
6294.46	5.47	5.01	52.31	22.09	5.11	3.32	0.43	0.48
6192.16	5.55	4.9	51.78	22.86	5.09	3.38	0.43	0.47
6020.29	5.5	4.82	60.01	16.77	5.48	2.90	0.41	0.50
5853	4.02	4.47	21.29	68.99	3.26	5.87	0.39	0.33
5852.4	4.46	4.79	37.28	47.67	4.32	4.88	0.38	0.38
5728.67	5.6	5.73	59.55	24.34	5.46	3.49	0.42	0.54
5541.86	4.78	4.27	72.11	32.22	6.00	4.01	0.34	0.38
5424.96	4.8	5.91	12.82	69.41	2.53	5.89	0.53	0.43
5301.31	5.22	4.56	70.13	24.28	5.92	3.48	0.38	0.43
5209.65	4.99	4.34	73.58	26.15	6.07	3.62	0.36	0.40
5078.71	4.39	5.22	17.11	76.18	2.92	6.17	0.45	0.37
4986.12	4.33	5.18	17.63	77.07	2.97	6.21	0.44	0.37
4902.38	4.25	5.1	17.26	79.28	2.94	6.30	0.44	0.36
4765.94	5.1	4.51	70.45	26.35	5.94	3.63	0.37	0.42
4678.67	5.84	5.1	64.31	20.3	5.67	3.19	0.43	0.50
4557.88	4.01	4.7	24.16	82.64	3.48	6.43	0.38	0.33
4476.29	5.13	5.86	17.87	64.23	2.99	5.67	0.52	0.43

$y_e = (A/2)^{1/2}$ or $(D^2/16)^{1/2}$

The specific energy $H_o = y_e + V_o^2/2g$ and the Froude number

$F = V_o/(gy_e)^{1/2}$.

River Sta	Vel Left	Vel Right	Area Left	Area Right	y_e Left	y_e Right	Fr Left	Fr Right
	(ft/s)	(ft/s)	(sq ft)	(sq ft)				
4351.82	5.86	5.15	64.34	19.28	5.67	3.10	0.43	0.52
4291.52	5.36	5.61	25.29	56.43	3.56	5.31	0.50	0.43
4166.12	5.5	5.26	56.66	25.51	5.32	3.57	0.42	0.49
4045.84	4.96	5.84	15.04	69.19	2.74	5.88	0.53	0.42
3885.92	5.31	5.68	24.32	57.74	3.49	5.37	0.50	0.43
3802.45	5.81	5.29	58.66	24.74	5.42	3.52	0.44	0.50
3676.52	4.69	5.82	10.73	74.26	2.32	6.09	0.54	0.42
3581.26	4.73	5.8	11.74	73.84	2.42	6.08	0.54	0.41
3500.61	5.19	6.04	20.51	61.19	3.20	5.53	0.51	0.45
3418.19	3.65	4.58	18.71	92.15	3.06	6.79	0.37	0.31
3335.99	4.96	5.91	14.3	67.26	2.67	5.80	0.53	0.43
3196.98	5.14	4.45	72.47	23.95	6.02	3.46	0.37	0.42
3069.72	3.8	4.77	15.86	87.64	2.82	6.62	0.40	0.33
2950.47	5.89	5.23	60.48	21.83	5.50	3.30	0.44	0.51
2782.66	5.24	4.7	65.9	27.86	5.74	3.73	0.39	0.43
2687.65	4.97	4.35	73.63	26.27	6.07	3.62	0.36	0.40
2558.01	4.14	5	18.37	79.98	3.03	6.32	0.42	0.35
2468.81	4.9	5.83	13.93	69.63	2.64	5.90	0.53	0.42
2375.32	4.09	4.77	25.01	80.71	3.54	6.35	0.38	0.33
2258	3.69	4.45	20.78	89.56	3.22	6.69	0.36	0.30
2256.6	4.07	3.7	80.51	41.9	6.34	4.58	0.28	0.30
2213.94	3.63	4.67	15.83	91.93	2.81	6.78	0.38	0.32
2057	5.29	4.66	67.29	25.26	5.80	3.55	0.39	0.44
2055.98	4.32	4.96	23.75	75.31	3.45	6.14	0.41	0.35
1914.4	5.12	4.76	61.31	32.63	5.54	4.04	0.38	0.42
1747.66	5.09	4.53	70.23	31.41	5.93	3.96	0.37	0.40
1623.05	4.43	5.38	15.98	79.22	2.83	6.29	0.46	0.38
1501.74	4.88	4.23	80.07	27.48	6.33	3.71	0.34	0.39
1372.06	4.48	5.37	16.61	77.81	2.88	6.24	0.47	0.38
1245.44	4.8	4.32	76.19	30.92	6.17	3.93	0.34	0.38
1146.93	5.94	5.4	59.56	24.95	5.46	3.53	0.45	0.51
1014.13	3.81	4.8	17.31	92.19	2.94	6.79	0.39	0.32
917.82	4.48	5.33	18.23	77.75	3.02	6.23	0.45	0.38

$y_e = (A/2)^{1/2}$ or $(D^2/16)^{1/2}$

The specific energy $H_o = y_e + V_o^2/2g$ and the Froude number

$F = V_o/(gy_e)^{1/2}$.

River Sta	Vel Left	Vel Right	Area Left	Area Right	y_e Left	y_e Right	Fr Left	Fr Right
	(ft/s)	(ft/s)	(sq ft)	(sq ft)				
736.89	4.29	4.98	23.49	79.39	3.43	6.30	0.41	0.35
644.5	4.89	5.99	13.18	70.67	2.57	5.94	0.54	0.43
593.08	3.21	3.08	88.93	69.07	6.67	5.88	0.22	0.22
444.71	5.32	5.89	27.8	58.4	3.73	5.40	0.49	0.45
284.91	3.94	5	15.25	88.3	2.76	6.64	0.42	0.34
164.39	5.81	5.22	68.98	19.11	5.87	3.09	0.42	0.52
72.04	4.58	4.28	69.76	42.66	5.91	4.62	0.33	0.35
3.14	5.54	5.58	39.6	46.55	4.45	4.82	0.46	0.45
-296.57	2	1.93	8.99	9.67	2.12	2.20	0.24	0.23
-530.34	2.56	1.92	63.22	13.07	5.62	2.56	0.19	0.21
-734.97	2.45	2.46	44.32	40.01	4.71	4.47	0.20	0.20

Appendix F
Financial Assurances Form

2024 Financial Assurance Estimate Form
(with pre-plat construction)

Updated: 10/2023

PROJECT INFORMATION		
Grandview Reserve Gieck Basin Channel	**8/6/2024**	**CDR-228**
Project Name	**Date**	**PCD File No.**

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
SECTION 1 - GRADING AND EROSION CONTROL (Construction and Permanent BMPs)								
Earthwork								*
less than 1,000; $5,300 min		CY	$ 8.00	=	$ -		$ -	*
1,000-5,000; $8,000 min		CY	$ 6.00	=	$ -		$ -	*
5,001-20,000; $30,000 min		CY	$ 5.00	=	$ -		$ -	*
20,001-50,000; $100,000 min		CY	$ 3.50	=	$ -		$ -	*
50,001-200,000; $175,000 min	195223.	CY	$ 2.50	=	$ 488,057.50		$ 488,057.50	*
greater than 200,000; $500,000 min		CY	$ 2.00	=	$ -		$ -	*
Permanent Erosion Control Blanket	40000.	SY	$ 9.00	=	$ 360,000.00		$ 360,000.00	*
Permanent Seeding (inc. noxious weed mgmnt.) & Mulching	84.	AC	$ 2,018.00	=	$ 169,512.00		$ 169,512.00	*
Permanent Pond/BMP (provide engineer's estimate)		EA		=	$ -		$ -	*
Concrete Washout Basin	1.	EA	$ 1,172.00	=	$ 1,172.00		$ 1,172.00	
Inlet Protection		EA	$ 217.00	=	$ -		$ -	
Rock Check Dam	2.	EA	$ 651.00	=	$ 1,302.00		$ 1,302.00	
Safety Fence		LF	$ 3.00	=	$ -		$ -	
Sediment Basin		EA	$ 2,294.00	=	$ -		$ -	
Sediment Trap		EA	$ 538.00	=	$ -		$ -	
Silt Fence	1168.	LF	$ 3.00	=	$ 3,504.00		$ 3,504.00	
Slope Drain		LF	$ 43.00		$ -		$ -	
Straw Bale		EA	$ 33.00	=	$ -		$ -	
Straw Wattle/Rock Sock		LF	$ 8.00	=	$ -		$ -	
Surface Roughening		AC	$ 269.00		$ -		$ -	
Temporary Erosion Control Blanket		SY	$ 3.00	=	$ -		$ -	
Temporary Seeding and Mulching		AC	$ 1,793.00	=	$ -		$ -	
Vehicle Tracking Control	1.	EA	$ 3,085.00	=	$ 3,085.00		$ 3,085.00	
Riprap Drop Structures	29.	EA	$ 34,000.00	=	$ 986,000.00		$ 986,000.00	
[insert items not listed but part of construction plans]				=	$ -		$ -	
MAINTENANCE (35% of Construction BMPs)				=	$ 347,861.85		$ 347,861.85	
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)		**Section 1 Subtotal**		**=**	**$ 2,360,494.35**		**$ 2,360,494.35**	
SECTION 2 - PUBLIC IMPROVEMENTS *								
ROADWAY IMPROVEMENTS								*
Construction Traffic Control		LS		=	$ -		$ -	*
Aggregate Base Course (135 lbs/cf)		Tons	$ 37.00	=	$ -		$ -	*
Aggregate Base Course (135 lbs/cf)		CY	$ 66.00		$ -		$ -	*
Asphalt Pavement (3" thick)		SY	$ 18.00		$ -		$ -	*
Asphalt Pavement (4" thick)		SY	$ 25.00		$ -		$ -	*
Asphalt Pavement (6" thick)		SY	$ 38.00		$ -		$ -	*
Asphalt Pavement (147 lbs/cf) __" thick		Tons	$ 114.00	=	$ -		$ -	*
Raised Median, Paved		SF	$ 11.00	=	$ -		$ -	*
Regulatory Sign/Advisory Sign		EA	$ 392.00	=	$ -		$ -	*
Guide/Street Name Sign		EA		=	$ -		$ -	*
Epoxy Pavement Marking		SF	$ 17.00	=	$ -		$ -	*
Thermoplastic Pavement Marking		SF	$ 30.00	=	$ -		$ -	*
Barricade - Type 3		EA	$ 259.00	=	$ -		$ -	*
Delineator - Type I		EA	$ 31.00	=	$ -		$ -	*
Curb and Gutter, Type A (6" Vertical)		LF	$ 38.00	=	$ -		$ -	*
Curb and Gutter, Type B (Median)		LF	$ 38.00	=	$ -		$ -	*
Curb and Gutter, Type C (Ramp)		LF	$ 38.00	=	$ -		$ -	*
4" Sidewalk (common areas only)		SY	$ 62.00	=	$ -		$ -	*
5" Sidewalk		SY	$ 77.00	=	$ -		$ -	*
6" Sidewalk		SY	$ 94.00	=	$ -		$ -	*
8" Sidewalk		SY	$ 125.00		$ -		$ -	*
Pedestrian Ramp		EA	$ 1,496.00	=	$ -		$ -	*
Cross Pan, local (8" thick, 6' wide to include return)		LF	$ 79.00	=	$ -		$ -	*
Cross Pan, collector (9" thick, 8' wide to include return)		LF	$ 119.00		$ -		$ -	*
Curb Opening with Drainage Chase		EA	$ 1,926.00	=	$ -		$ -	*
Guardrail Type 3 (W-Beam)		LF	$ 65.00	=	$ -		$ -	*
Guardrail Type 7 (Concrete)		LF	$ 94.00	=	$ -		$ -	*
Guardrail End Anchorage		EA	$ 2,731.00	=	$ -		$ -	*
Guardrail Impact Attenuator		EA	$ 4,902.00	=	$ -		$ -	*
Sound Barrier Fence (CMU block, 6' high)		LF	$ 102.00		$ -		$ -	*
Sound Barrier Fence (panels, 6' high)		LF	$ 104.00	=	$ -		$ -	*
Electrical Conduit, Size =		LF	$ 22.00	=	$ -		$ -	*
Traffic Signal, (provide engineer's estimate)		EA		=	$ -		$ -	*

PROJECT INFORMATION		
Grandview Reserve Gieck Basin Channel	8/6/2024	CDR-228
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	*
STORM DRAIN IMPROVEMENTS								*
Concrete Box Culvert (M Standard), Size (8' x 4')	480.	LF	$ 3,025.00	=	$ 1,452,000.00		$ 1,452,000.00	
Concrete Box Culvert (M Standard), Size (10' x 4')	206.	LF	$ 3,760.00	=	$ 774,560.00		$ 774,560.00	
Concrete Box Culvert (M Standard), Size (7' x 1')	12.	LF	$ 1,370.00	=	$ 16,440.00		$ 16,440.00	
18" Reinforced Concrete Pipe		LF	$ 82.00	=	$ -		$ -	*
24" Reinforced Concrete Pipe		LF	$ 98.00	=	$ -		$ -	*
30" Reinforced Concrete Pipe		LF	$ 123.00	=	$ -		$ -	*
36" Reinforced Concrete Pipe		LF	$ 151.00	=	$ -		$ -	*
42" Reinforced Concrete Pipe		LF	$ 201.00	=	$ -		$ -	*
48" Reinforced Concrete Pipe		LF	$ 245.00	=	$ -		$ -	*
54" Reinforced Concrete Pipe		LF	$ 320.00	=	$ -		$ -	*
60" Reinforced Concrete Pipe		LF	$ 374.00	=	$ -		$ -	*
66" Reinforced Concrete Pipe		LF	$ 433.00	=	$ -		$ -	*
72" Reinforced Concrete Pipe		LF	$ 495.00	=	$ -		$ -	*
18" Corrugated Steel Pipe		LF	$ 105.00	=	$ -		$ -	*
24" Corrugated Steel Pipe		LF	$ 121.00	=	$ -		$ -	*
30" Corrugated Steel Pipe		LF	$ 154.00	=	$ -		$ -	*
36" Corrugated Steel Pipe		LF	$ 184.00	=	$ -		$ -	*
42" Corrugated Steel Pipe		LF	$ 212.00	=	$ -		$ -	*
48" Corrugated Steel Pipe		LF	$ 223.00	=	$ -		$ -	*
54" Corrugated Steel Pipe		LF	$ 327.00	=	$ -		$ -	*
60" Corrugated Steel Pipe		LF	$ 353.00	=	$ -		$ -	*
66" Corrugated Steel Pipe		LF	$ 427.00	=	$ -		$ -	*
72" Corrugated Steel Pipe		LF	$ 502.00	=	$ -		$ -	*
78" Corrugated Steel Pipe		LF	$ 578.00	=	$ -		$ -	*
84" Corrugated Steel Pipe		LF	$ 691.00	=	$ -		$ -	*
Flared End Section (FES) RCP Size = (unit cost = 6x pipe unit cost)		EA		=	$ -		$ -	*
Flared End Section (FES) CSP Size = (unit cost = 6x pipe unit cost)		EA		=	$ -		$ -	*
End Treatment- Headwall	53.	CY	$ 1,798.00	=	$ 95,294.00		$ 95,294.00	*
End Treatment- Wingwall	23.	CY	$ 1,084.00	=	$ 24,932.00		$ 24,932.00	*
End Treatment - Cutoff Wall	12.	CY	$ 4,083.00	=	$ 48,996.00		$ 48,996.00	*
Curb Inlet (Type R) L=5', Depth < 5'		EA	$ 7,212.00	=	$ -		$ -	*
Curb Inlet (Type R) L=5', 5' ≤ Depth < 10'		EA	$ 9,377.00	=	$ -		$ -	*
Curb Inlet (Type R) L =5', 10' ≤ Depth < 15'		EA	$ 10,859.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', Depth < 5'		EA	$ 9,925.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 5' ≤ Depth < 10'		EA	$ 10,230.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 10' ≤ Depth < 15'		EA	$ 12,805.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', Depth < 5'		EA	$ 12,907.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 5' ≤ Depth < 10'		EA	$ 13,835.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 10' ≤ Depth < 15'		EA	$ 15,130.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', Depth < 5'		EA	$ 13,755.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', 5' ≤ Depth < 10'		EA	$ 15,181.00	=	$ -		$ -	*
Grated Inlet (Type C), Depth < 5'		EA	$ 6,037.00	=	$ -		$ -	*
Grated Inlet (Type D), Depth < 5'		EA	$ 7,458.00	=	$ -		$ -	*
Storm Sewer Manhole, Box Base		EA	$ 15,130.00	=	$ -		$ -	*
Storm Sewer Manhole, Slab Base		EA	$ 8,322.00	=	$ -		$ -	*
Geotextile (Erosion Control)		SY	$ 9.00	=	$ -		$ -	*
Rip Rap, d50 size from 6" to 24"		Tons	$ 104.00	=	$ -		$ -	*
Rip Rap, Grouted		Tons	$ 124.00	=	$ -		$ -	*
Drainage Channel Lining, Concrete		CY	$ 741.00	=	$ -		$ -	*
Drainage Channel Lining, Rip Rap				=	$ -		$ -	*
Drainage Channel Lining, Grass				=	$ -		$ -	*
Drainage Channel Lining, Other Stabilization				=	$ -		$ -	*
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)		**Section 2 Subtotal**		=	**$ 2,412,222.00**		**$ 2,412,222.00**	

PROJECT INFORMATION		
Grandview Reserve Gieck Basin Channel	8/6/2024	CDR-228
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	(with Pre-Plat Construction) Remaining
SECTION 3 - COMMON DEVELOPMENT IMPROVEMENTS (Private or District and NOT Maintained by EPC)**							
ROADWAY IMPROVEMENTS							
Maintenance Road - Aggregate Base Course (135 lbs/cf)	2671.	CY	$ 65.00	=	$ 173,615.00		$ 173,615.00
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
STORM DRAIN IMPROVEMENTS (Exception: Permanent Pond/BMP shall be itemized under Section 1)							
Drainage Channel Lining, Rip Rap 6"	1034.	CY	$ 105.00	=	$ 108,570.00		$ 108,570.00
Drainage Channel Lining, Rip Rap 9"	1262.	CY	$ 115.00	=	$ 145,130.00		$ 145,130.00
Drainage Channel Lining, Rip Rap 12"	177.	CY	$ 125.00	=	$ 22,125.00		$ 22,125.00
Drainage Channel Lining, Grass	9.21	AC	$ 98,900.00	=	$ 910,869.00		$ 910,869.00
Drainage Channel Lining, Soil Rip Rap	900.	CY	$ 209.00	=	$ 188,100.00		$ 188,100.00
				=	$ -		$ -
WATER SYSTEM IMPROVEMENTS							
Water Main Pipe (PVC), Size 8"		LF	$ 84.00	=	$ -		$ -
Water Main Pipe (Ductile Iron), Size 8"		LF	$ 98.00	=	$ -		$ -
Gate Valves, 8"		EA	$ 2,418.00	=	$ -		$ -
Fire Hydrant Assembly, w/ all valves		EA	$ 8,584.00	=	$ -		$ -
Water Service Line Installation, inc. tap and valves		EA	$ 1,723.00	=	$ -		$ -
Fire Cistern Installation, complete		EA		=	$ -		$ -
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
SANITARY SEWER IMPROVEMENTS							
Sewer Main Pipe (PVC), Size 8"		LF	$ 84.00	=	$ -		$ -
Sanitary Sewer Manhole, Depth < 15 feet		EA	$ 5,708.00	=	$ -		$ -
Sanitary Service Line Installation, complete		EA	$ 1,825.00	=	$ -		$ -
Sanitary Sewer Lift Station, complete		EA		=	$ -		$ -
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
LANDSCAPING IMPROVEMENTS (For subdivision specific condition of approval, or PUD)							
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
** - Section 3 is not subject to defect warranty requirements		**Section 3 Subtotal**		=	**$ 1,548,409.00**		**$ 1,548,409.00**

PROJECT INFORMATION		
Grandview Reserve Gieck Basin Channel	8/6/2024	CDR-228
Project Name	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	(with Pre-Plat Construction) Remaining
AS-BUILT PLANS (Public Improvements inc. Permanent WQCV BMPs)			$ 5,000.00	=	$ 5,000.00		$ 5,000.00
POND/BMP CERTIFICATION (inc. elevations and volume calculations)		LS		=	$ -		$ -

Total Construction Financial Assurance **$ 6,326,125.35**
(Sum of all section subtotals plus as-builts and pond/BMP certification)

Total Remaining Construction Financial Assurance (with Pre-Plat Construction) **$ 6,326,125.35**
(Sum of all section totals less credit for items complete plus as-builts and pond/BMP certification)

Total Defect Warranty Financial Assurance **$ 685,958.30**
(20% of all items identified as (*). To be collateralized at time of preliminary acceptance)

Approvals

I hereby certify that this is an accurate and

COLORADO LICENSED 01-26-24 PROFESSIONAL ENGINEER

Engineer (P.E. Seal Required)

Approved by Owner / Applicant — Date

Approved by El Paso County Engineer / ECM Administrator — Date