HRGreen

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Please provide an early grading map for the work to be performed. the map should include the location of the temporary sediment basins.

Grandview Reserve Phase 2
Final Drainage Report
For
Early Grading

January 2025

HR Green Project No: 201662.202

EPC PCD Filing No.: PUD-SP236

Prepared For:

D.R. Horton

Contact: Riley Hillen, P.E.

9555 S. Kingston Ct.

Englewood, CO 80112

Prepared By:

HR Green Development, LLC

Contact: Ken Huhn, P.E.

khuhn@hrgreen.com

(630) 602-4965

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.

_____ _____

Ken Huhn, P.E. Date

State of Colorado No. 54022

For and on behalf of HR Green Development, LLC

Owner/Developer's Statement:

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

By: _____ _____

Authorized Signature Date

Address: D.R. Horton
9555 S. Kingston Court
Englewood, CO

El Paso County Statement

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.

_____

Joshua Palmer, P.E. Date

County Engineer/ECM Administrator

Conditions:

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I. General Purpose, Location and Description

a. Purpose

The purpose of this Final Drainage Report (FDR) for the Early Grading of Grandview Reserve Subdivision Phase 2 is to describe the onsite and offsite drainage patterns and convey undeveloped runoff to temporary sedimentation facilities while safely routing detained stormwater to adequate outfalls.

b. Location

The Grandview Reserve Phase 2 site is located in unincorporated El Paso County, Colorado. The Phase 2 location (referred to as the site herein) is located east of Grandview Reserve Filings 1-4 and MST2, north of Grandview Reserve Phase 3, and west of Rex Road.

The site lies within a tract of land within Sections 21, 22, 27 and 28, Township 12 South, Range 64 West of the 6th Principal Meridian, in El Paso County, State of Colorado. A Vicinity Map is included in **Appendix A**.

The site is bound by a segment of Rex Road to be developed with the full buildout of this development to the east and undeveloped land that has historically been used as ranching lands. The west of the site is bound by Grandview Reserve Filings 1-4 and MST2. A vicinity map is presented in Appendix A.

The Gieck Ranch Tributary #2 “MST2” (Channel B) is a part of the Gieck Ranch Drainage Basin tributary to Black Squirrel Creek. The channel draining through the site is an ongoing project with associated CLOMR Report and the PCD File No. is CDR228 with El Paso County. The Grandview Reserve improvements will follow any requirements of that report. There is another floodplain channel to the north of Rex Road that will not be disturbed by this phase of development and is studied as a future project.

The existing surrounding platted developments include the Grandview Reserve Phase 1 Filings 1-4 and Grandview Reserve Phase 3.

c. Description of Property

The site is approximately 68.72 acres of future residential development with associated right of way, open space tracts, public improvements, and stormwater treatment infrastructure.

The existing groundcover and topography of the site is native grasses/weeds and exposed soil on gently rolling hillside with slopes ranging from 2% to 4%.

Per a NRCS soil survey, the site is made up of Type A Columbine gravelly sandy loam. Soils were hydraulically analyzed as 90% Type B to account for being disturbed in the proposed condition. The NRCS soil survey is presented in **Appendix A**.

There is one major drainageway through the site. The Gieck Ranch Tributary #2 (MST2 in the MDDP) traverses through the site and divides it in two. The drainageway generally flows from the northwest to the southeast towards Highway 24, before crossing through existing drainage infrastructure. The CLOMR report by HR Green for MST2 is ongoing and pending approval for this channel. Refer to the CLOMR report for more specific design information regarding the MST2 channel. A tributary referred to as the East Fork Tributary (EFT) in the MDDP traverses the site along its northeastern boundary and forms the northeast boundary for Phase 2 along Rex Road. The initial analysis of this drainage way has been performed by HR Green in

conjunction with Phase 2. The analysis delineated the 100-yr floodplain and ensures the construction of Rex Road will not impact the floodplain. This channel will not be disturbed by this phase of development. A CLOMR report is not required by the County at this time.

There are no known irrigation facilities in the area.

There are no known existing utilities or other encumbrances on site.

d. Floodplain Statement

Based on FEMA Firm map 08041C0552G & 08041C0556G (eff. 12/7/2018), the site contains flood Zone A through the site which is part of the Gieck Ranch Tributary #2. See FEMA Firm Maps in **Appendix A**. This floodplain is being studied and revised in the Gieck Ranch Tributary # 2 CLOMR report. A copy of the current revised floodplain map is also provided in **Appendix A**. There is a Zone A floodplain northeast of the site which will not be altered with this project's improvements.

II. Drainage Design Criteria

a. Drainage Criteria

Temporary sediment basins were sized using tributary area acreages. The three basins are located at future full spectrum detention facility sites and have associated design calculations. Refer to the GEC Plans in the Appendices of the "Grandview Reserve Phase 2 Early Grading (Initial GEC) Stormwater Management Plan (SWMP)" for sediment basin locations and tributary area delineations. Sizing calculations have been provided in Appendix B. The El Paso County standard detail for the temporary sediment basins is included in Appendix C.

This final drainage report follows any recommendations and is in conformance with the previously approved MDDP for the site prepared by HR Green, "*Grandview Reserve Master Development Drainage Plan",* HR Green, November 2020 (MDDP), as well as the in-progress "*Grandview Phase 2 Preliminary Drainage Report*".

III. Drainage Basins and Subbasins

a. Major Basin Description

The site is located within the Gieck Ranch Drainage Basin. The site's drainage characteristics were previously studied in the following reports:

1. "Gieck Ranch Drainage Basin Planning Study" prepared by Drexel, Barrel & Co, February 2010.
2. "Grandview Reserve Master Development Drainage Plan" prepared by HR Green, August 2021.
3. "Grandview Reserve Filing No. 1 Preliminary Drainage Report" prepared by Galloway & Company, Inc., September 2022.
4. "Grandview Reserve CLOMR REPORT" prepared by HR Green, dated April 2024, approved November 15, 2024 (Case #24-08-0102R).
5. "Grandview Reserve Phase 2 Preliminary Drainage Report" prepared by HR Green, January 2025.
6. "Grandview Reserve Phase 2 Early Grading (Initial GEC) Stormwater Management Plan (SWMP)" prepared by HR Green, dated December 2024.

Gieck Ranch Drainage Basin is a 22.05 square mile watershed located in El Paso County, Colorado. Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains to the Arkansas River. The majority of the basin is undeveloped and rolling range land of 2% - 4% slopes.

The Grandview Reserve MDDP divided the site into 8 major drainage basins (A-H), where each basin is tributary to a full spectrum detention pond facility. The Grandview Reserve Phase 2 improvements are located in subbasins B3 and C1 of the MDDP.

There are no known existing irrigation facilities or other obstructions that could influence or will be influenced by local drainage characteristics. Early Grading local drainage characteristics will continue to follow historic patterns.

b. Existing Subbasin Description

The Grandview Reserve Phase 2 site drains from the northwest to the southeast slopes ranging from 2% - 4%. The site has historically drained into the Gieck Ranch Tributary #2 (the existing MST2).

The existing subbasins for the Grandview Reserve Phase 2 site were studied the approved MDDP for Grandview Reserve. This site is located within subbasins B3 and C1 of this report and are described as follows.

“Subbasin B3 is located between MS and EF and to the northeast of east of basin B2. The existing MST2 tributary runs through the basin. The site drains towards the southeast and towards Detention Pond B. Current planning documents call for high, medium-high, and medium density dwelling units along with a pocket park. The basin is 118.90 acres, with a composite impervious value of 49.42% and runoff rates for the 5 and 100 year of 92.76 cfs and 295.27 cfs respectively.”

“Subbasin C1 is located to the northeast of east of basin B1 and the existing MST2 tributary runs through the middle of the basin. The basin drains towards the southeast and towards Detention Pond C. Current planning documents call for an institutional parcel, medium and high-density dwelling units and a pocket park. The basin is 77.83 acres, with a composite impervious value of 51.20% and runoff rates for the 5 and 100-year of 77.99 cfs and 238.03 cfs respectively.”

Refer to the Appendices for a copy of the approved MDDP. The Early Grading drainage conditions for this development will follow historic drainage patterns as described in the MDDP.

c. Early Grading Subbasin Description

Description of Early Grading Project

The early grading drainage conditions for the site generally follow historic drainage patterns. The site drains from the northwest to the southeast at slopes between 0.6% - 4%, into proposed undercut roadway networks which drain to proposed temporary sedimentation basins for treatment and flood attenuation. Refer to the “Grandview Reserve Phase 2 Early Grading (Initial GEC) Stormwater Management Plan (SWMP)” for a description of construction practices utilized to mitigate erosion and sediment transport potential in this condition.

The central western corner of the site (31.5 tributary acres) will drain to and be treated by “Temporary Sediment Basin A” (Future FSD Pond A), which will outfall into the rerouted channel MST2, henceforth being referred to as “Channel B.” The outfall for this temporary pond directly corresponds to the future planned outfall for Full Spectrum Pond A. Historically, the tributary areas to this pond discharge to Channel B.

Discharge from the future, developed condition of the Full Spectrum Detention facility has been accounted for in the channel re-alignment design and is detailed in the CLOMR report.

The southwestern portion of the site (36.6 tributary acres) will drain to and be treated by “Temporary Sediment Basin B” (Future Pond B). The sediment basin will outfall into the rerouted Channel B. Historically, the tributary areas to this pond discharge to Channel B. Discharge from the future, developed condition of the Full Spectrum Detention facility has been accounted for in the channel re-alignment design and is detailed in the CLOMR report.

The northeastern portion of the site (36.6 tributary acres) will drain to and be treated by “Temporary Sediment Basin C” (Future Pond C). The sediment basin will outfall into an undercut roadway, where it will then be conveyed via the road to Temporary Sediment Basin B, ultimately discharging into the rerouted Channel B. Historically, the tributary areas to this pond discharge to Channel B.

Sediment basin sizing calculations are provided in Appendix B. Refer to the Early Grading Plans in the Appendices of “Grandview Reserve Phase 2 Early Grading (Initial GEC) Stormwater Management Plan (SWMP)” for temporary sediment basin locations and tributary area delineation.

There are minor offsite flows from Phase 2 that discharge to the Phase 3 site which are accounted for. Refer to the Preliminary Drainage Report for Future Subbasin Descriptions under the fully developed condition of this site. Refer to the Preliminary Drainage Report for Phase 3 for a detailed description of how offsite flows from Phase 2 are conveyed through the site.

IV. Drainage Facility Design

a. General Concept

Two of the three temporary sediment basins will be converted into Full Spectrum Detention facilities upon final buildout of this development (Temporary Sediment Basin A and Temporary Sediment Basin B). Refer to “Grandview Reserve Phase 2 Preliminary Drainage Report”” prepared by HR Green, dated January 2025, for hydraulic designs for these ponds.

b. Water Quality & Detention

Refer to the Preliminary Drainage Report for a full description of the two private Full Spectrum Detention facilities that will be utilized for water quality treatment and detention.

c. Channel Improvements

The Gieck Ranch Tributary #2 is proposed to be rerouted. As part of this rerouting of the channel, offsite upstream tributary flows will be captured upstream from the proposed Rex Road extension and be conveyed via culvert to the rerouted channel along the Grandview Reserve Phase 2 western boundary. An analysis has been done for the channel with both existing and future condition flows as described within the approved Grandview Reserve CLOMR Report, HR Green; dated April 2024; approved November 15, 2024 (Case #24-08-0102R) (CLOMR). Both scenarios throughout the channel fall within the channel stability criteria. Channel improvement construction plans have been submitted to El Paso County for review as a separate project (#CDR228).

d. Inspection and Maintenance

After completion of construction and upon the Board of County Commissioners acceptance, it is anticipated that all drainage facilities within the public Right-of-Way are to be owned and maintained by El Paso County.

All future private detention ponds are to be owned and maintained by the Grandview Reserve Metropolitan District NO. 2 (DISTRICT), once established, unless an agreement is reached stating otherwise. Maintenance access for all future full spectrum detention facilities will be provided from public Right-of-Way. Maintenance access for the drainageways will be provided through the future tracts.

V. Wetlands Mitigation

There is one existing wetlands on site associated with the Gieck Ranch Tributary #2. The wetlands are contained within the existing channel and classified as non-jurisdictional. The wetlands USACE determination will be provided with the Grandview Reserve CLOMR Report, HR Green; April 2022, which can be found in **the Preliminary Drainage Report appendices.** Wetlands maintenance will be the responsibility of the Grandview Reserve Metropolitan District No. 2.

VI. Four Step Method to Minimize Adverse Impacts of Urbanization

The four step will be implemented upon urbanization of this development as described in the future, final buildout condition of the Preliminary Drainage Report.

VII. Drainage and Bridge Fees

Gieck Ranch drainage basin has not been established as a fee basin within El Paso County. Therefore, no drainage basin fees are due at time of platting.

VIII. Opinion of Probable Cost

An engineer's opinion of probable cost will be provided with the Final Drainage Report (FDR) describing the future, full-buildout condition of the Phase 2 development.

IX. Hydraulic Grade Line Analysis

Hydraulic grade line analysis and final pipe sizes will be provided with the Final Drainage Report (FDR) describing the future, full-buildout condition of the Phase 2 development.

X. Summary

The Grandview Reserve Phase 2 site lies within the Gieck Ranch Drainage Basin. Water quality and detention for the site is provided in future full spectrum water quality and detention ponds. There is one major drainageway that traverses the site: Gieck Ranch Tributary #2. The future water quality and detention features ponds will be maintained by the Grandview Reserve Metropolitan District No. 2 (DISTRICT). The Early Grading described in this report will establish four temporary sediment basins to detain and mitigate negative impacts associated with these grading efforts. The associated SWMP report for the early grading describes construction practices that will be utilized to achieve this goal. All Early Grading and future drainage facilities were sized per the El Paso County Drainage Criteria Manuals.

The development of this project will not adversely affect adjacent or downstream properties.

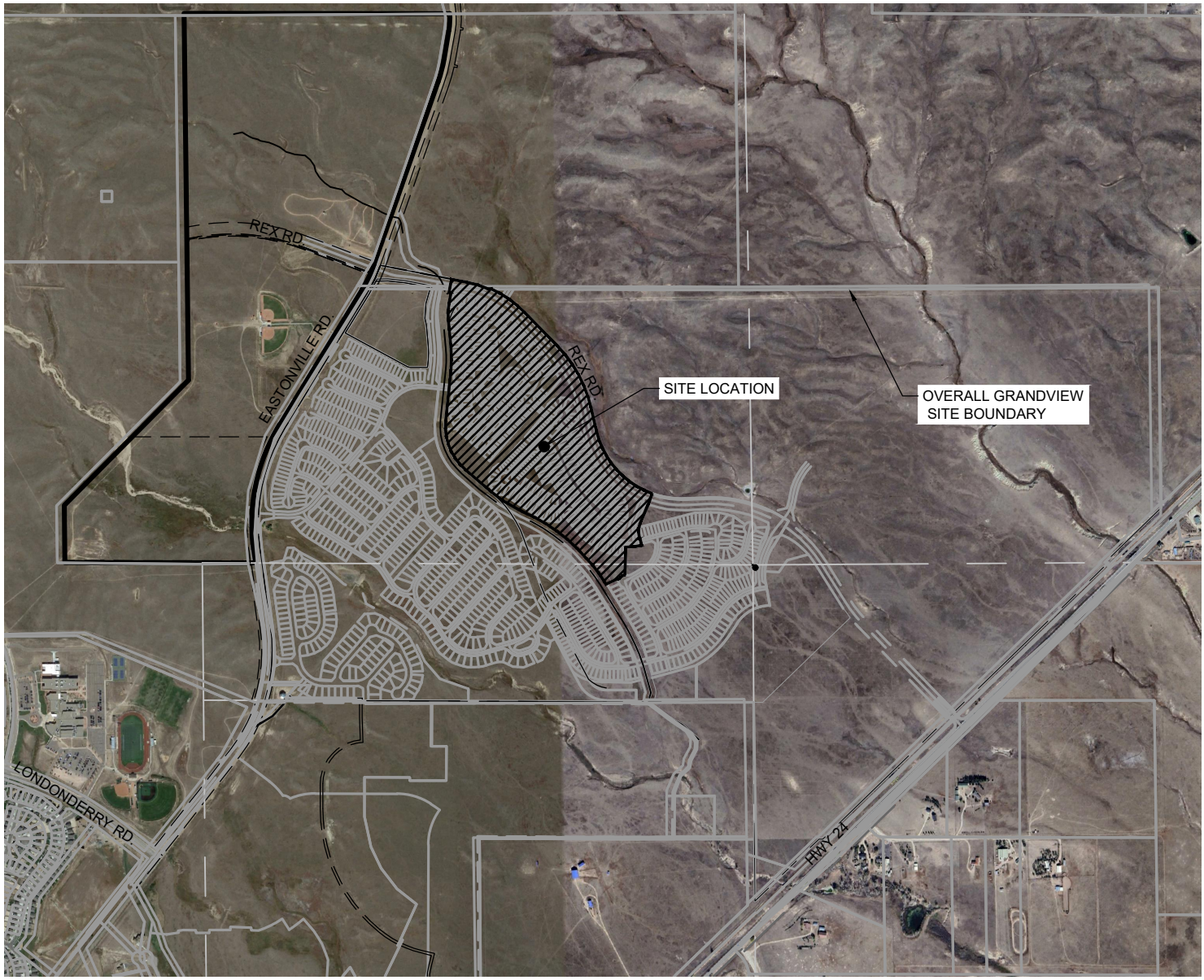
XI. Drawings

Refer to Appendix A for associated maps. Refer to the "Grandview Reserve Phase 2 Early Grading (Initial GEC) Stormwater Management Plan (SWMP)" for sediment basin locations, sizing information, and tributary area delineation.

XII. References

1. City of Colorado Springs – Drainage Criteria Manual, May 2014, Revised January 2021.
2. Drainage Criteria Manual of El Paso, Colorado, October 2018.
3. Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018.
4. "Gieck Ranch Drainage Basin Planning Study" prepared by Drexel, Barrel & Co, February 2010.
5. "Grandview Reserve Master Development Drainage Plan" prepared by HR Green, August 2021.
6. "Grandview Reserve Filing No. 1 Preliminary Drainage Report" prepared by Galloway & Company, Inc., September 2022.
7. "Grandview Reserve CLOMR REPORT" prepared by HR Green, dated April 2024, approved November 15, 2024 (Case #24-08-0102R).
8. "Grandview Reserve Phase 2 Preliminary Drainage Report" prepared by HR Green, January 2025.
9. "Grandview Reserve Phase 2 Early Grading (Initial GEC) Stormwater Management Plan (SWMP)" prepared by HR Green, dated December 2024.

APPENDIX A – VICINITY MAP, SOIL MAP, FEMA MAP



HRGreen

HRGreen.com

GRANDVIEW RESERVE

VICINITY MAP

SHEET

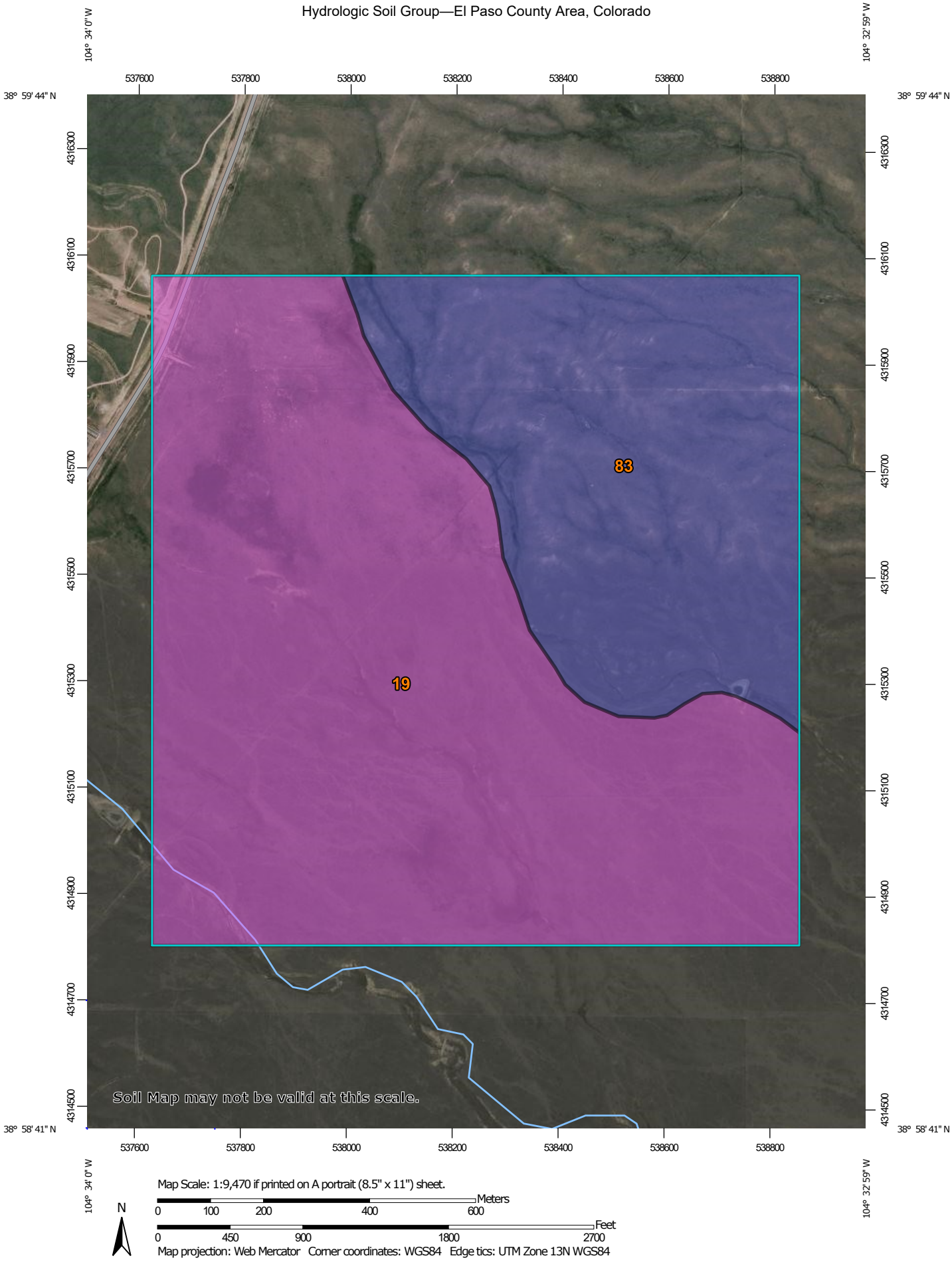
01

SCALE: 1" = 1500

DATE: 10/30/24

Xrefs: 01-DV-CONCEPT; xc-row-GVR-all; xc-row-F1-662.10; xc-row-F2; xc-row-F3; xc-row-F4; xc-filing-bndys; xc-row_662.08_Eastonville; xc-row-PH3; xc-row-PH2; xc-row-Fut_Phase; 01-XC-channel; xv-row-662; xc-d

Hydrologic Soil Group—El Paso County Area, Colorado



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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 20, Sep 2, 2022

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	254.0	66.5%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	127.8	33.5%
Totals for Area of Interest			**381.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

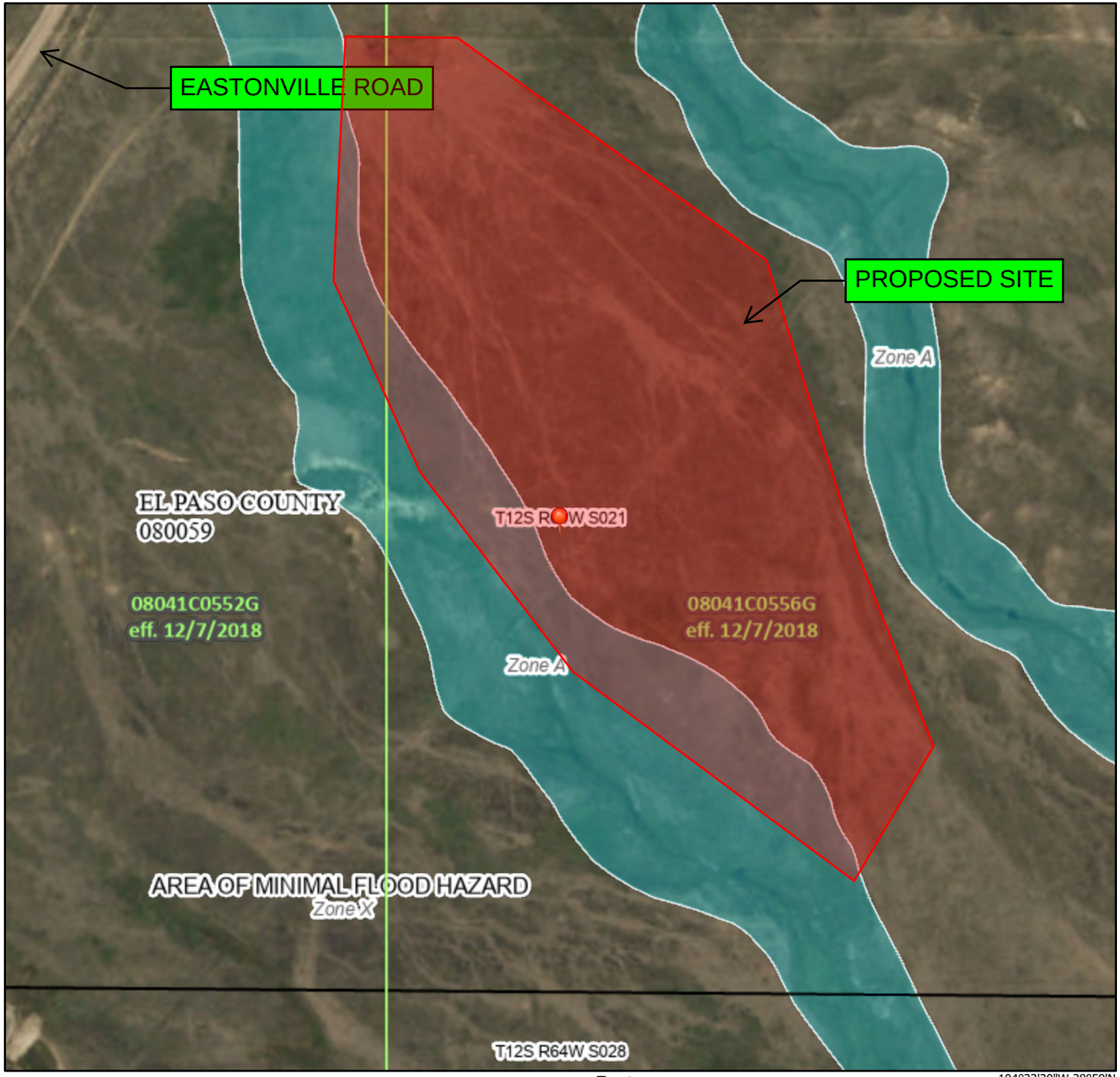
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

National Flood Hazard Layer FIRMette

FEMA

104°33'58"W 38°59'28"N



104°33'20"W 38°59'N

Feet

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS

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

OTHER AREAS OF FLOOD HAZARD

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

OTHER AREAS

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

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

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

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/14/2023 at 12:16 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX B – HYDRAULIC CALCULATIONS

SEDIMENT BASIN A - POND A
SEDIMENT BASIN STAGE-STORAGE CALCULATIONS

Elevation	Area S.F.	Area Acre	Volume Cu. Ft.	Volume Acre-Ft	Cumm Vol Cu. Ft.	Cumm Vol Acre-Ft	Proration Enter Vol. in Cu-Ft*	Proration Enter Vol. in Acre-Ft*	Elev. ft.
6966.5	**0**								
6967.0	**592**		99		**99**	**0.002**			
6968.0	**11497**		4,899		**4,998**	**0.115**	20,597	0.473	**6,968.89**
6969.0	**24552**		17,617		**22,615**	**0.519**			
6970.0	**34874**		29,562		**52,177**	**1.198**	61,792	1.419	**6,970.24**
6971.0	**44697**		39,684		**91,862**	**2.109**			
6972.0	**53878**		49,216		**141,078**	**3.239**			
6973.0	**62472**		58,122		**199,200**	**4.573**			
6974.0									
6975.0									
6976.0									
6977.0									
6978.0									
6979.0									
6980.0									
6981.0									
6982.0									
6983.0									
6984.0									
6985.0									
6986.0									
6987.0									

COLUMN 1	COLUMN 2	CENTROID EL.
ORIFICE 1-1	ORIFICE 1-2	6,968.89
ORIFICE 2-1	ORIFICE 2-2	6,969.22
ORIFICE 3-1	ORIFICE 3-2	6,969.55
ORIFICE 4-1	ORIFICE 4-2	6,969.88

SED Basin riser pipe orifice calculations				
A_0 =	area per row of orifices spaved on 4" centers (in^2)			
V=	1.4185	design volume (acre feet)	*<15 ac.	
T_D=	72	time to drain the prescribed colume (hrs) (Typically 72 hours for EURV)		
H=	1.357	depth of volume (ft)		
S=	0.0001	Trickel channel slope (ft/ft) [Use 0.0001 for flat slope]		
			S=0%	
$A_{0=}$	3.6810	in^2	**3.6702**	**in^2**
Dia	2.16	in	***EXCEEDS 1", USE TWO COLUMNS @ A_0=1.86 in^2**	
	4.32	Dia=/2	**1.86 in^2 = 1-9/16 in. dia.**	
	8.65	Dia=/4		
	17.29	Dia=/8		
	34.59	Dia=/16		
	69.18	Dia=/32		

SEDIMENT VOLUME CALCULATIONS				
Disturbed area-acres	20.810	Acres		
Undisturbed area-acres	11.210	Acres		
Total Area-acres	32.020	Acres		
Sediment volume	61,792	cu-ft	1.4185	Acres-ft
Volume below lowest hole	20,597	cu-ft	0.4728	Acres-ft
Volume above lowest hole	61,792	cu-ft	1.4185	Acres-ft
Total Volume	82,369	cu-ft	1.8909	Acres-ft

Note: Enter values in highlighted cells only.

SEDIMENT BASIN B - POND B
SEDIMENT BASIN STAGE-STORAGE CALCULATIONS

Elevation	Area S.F.	Area Acre	Volume Cu. Ft.	Volume Acre-Ft	Cumm Vol Cu. Ft.	Cumm Vol Acre-Ft	Proration Enter Vol. in Cu-Ft*	Proration Enter Vol. in Acre-Ft*	Elev. Cu-Ft
6932.0	0								
6933.0	17869		5,961		5,961	0.137	23,575		6,933.73
6934.0	30861		24,071		30,032	0.689			
6935.0	34515		32,671		62,703	1.439	70,724		6,935.22
6936.0	38511		36,495		99,198	2.277			
6937.0	42664		40,570		139,767	3.209			
6938.0	46975		44,802		184,570	4.237			
6939.0	51087		49,017		233,586	5.362			
6940.0									
6941.0									
6942.0									
6943.0									
6944.0									
6945.0									
6946.0									
6947.0									
6948.0									
6949.0									
6950.0									
6951.0									
6952.0									
6953.0									

COLUMN 1	COLUMN 2	CENTROID EL.
ORIFICE 1-1	ORIFICE 1-2	6,933.73
ORIFICE 2-1	ORIFICE 2-2	6,934.06
ORIFICE 3-1	ORIFICE 3-2	6,934.39
ORIFICE 4-1	ORIFICE 4-2	6,934.72
ORIFICE 5-1	ORIFICE 5-2	6,935.05

SED Basin riser pipe orifice calculations				
A_0 =	area per row of orifices spaved on 4" centers (in^2)			
V=	1.6236	design volume (acre feet) *<15 ac.		
T_D=	72	time to drain the prescribed colume (hrs) (Typically 72 hours for EURV)		
H=	1.488	depth of volume (ft)		
S=	0.0001	Trickel channel slope (ft/ft) [Use 0.0001 for flat slope]		
			S=0%	
A_0 =	4.0940	in^2	**4.0819**	**in^2**
Dia	2.28	in	***EXCEEDS 1", USE TWO COLUMNS @ A_0=2.05 in^2**	
	4.56	Dia=/2	**2.05 in^2 = 1-5/8" Dia.**	
	9.12	Dia=/4		
	18.24	Dia=/8		
	36.48	Dia=/16		
	72.95	Dia=/32		

SEDIMENT VOLUME CALCULATIONS				
Disturbed area-acres	23.820	Acres		
Undisturbed area-acres	12.820	Acres		
Total Area-acres	36.640	Acres		
Sediment volume	70,724	cu-ft	1.6236	Acres-ft
Volume below lowest hole	23,575	cu-ft	0.5412	Acres-ft
Volume above lowest hole	70,724	cu-ft	1.6236	Acres-ft
Total Volume	94,275	cu-ft	2.1643	Acres-ft

Note: Enter values in highlighted cells only.

SEDIMENT BASIN C
SEDIMENT BASIN STAGE-STORAGE CALCULATIONS

Elevation	Area S.F.	Area Acre	Volume Cu. Ft.	Volume Acre-Ft	Cumm Vol Cu. Ft.	Cumm Vol Acre-Ft	Proration Enter Vol. in Cu-Ft*	Proration Enter Vol. in Acre-Ft*	Elev. Cu-Ft
6942.5	0								
6943.0	4181		698		698	0.016			
6944.0	7102		5,577		6,275	0.144			
6945.0	8602		7,840		14,115	0.324	15,810		6,945.18
6946.0	10225		9,402		23,517	0.540	31,620		6,946.74
6947.0	11766		10,986		34,504	0.792			
6943.5									
6944.5									
6945.5									
6946.5									
6947.5									
6948.5									
6949.5									
6950.5									
6951.5									
6952.5									
6953.5									
6954.5									
6955.5									
6956.5									
6957.5									
6958.5									

COLUMN 1	COLUMN 2	CENTROID EL.
ORIFICE 1-1	ORIFICE 1-2	6,945.18
ORIFICE 2-1	ORIFICE 2-2	6,945.51
ORIFICE 3-1	ORIFICE 3-2	6,945.84
ORIFICE 4-1	ORIFICE 4-2	6,946.17
ORIFICE 5-1	ORIFICE 5-2	6,946.50

SED Basin riser pipe orifice calculations				
A_0 =	area per row of orifices spaved on 4" centers (in^2)			
V=	0.3629	design volume (acre feet) *<15 ac.		
T_D=	72	time to drain the prescribed colume (hrs) (Typically 72 hours for EURV)		
H=	1.557	depth of volume (ft)		
S=	0.0001	Trickel channel slope (ft/ft) [Use 0.0001 for flat slope]		
			S=0%	
A_0 =	1.0301	in^2	**1.0271**	**in^2**
Dia	1.14	in	***EXCEEDS 1", USE TWO COLUMNS @ A_0=1.027 in^2**	
	2.29	Dia=/2	**Area of 0.51 in^2 = Dia. Of 0.8" =13/16"**	
	4.57	Dia=/4		
	9.15	Dia=/8		
	18.30	Dia=/16		
	36.59	Dia=/32		

SEDIMENT VOLUME CALCULATIONS				
Disturbed area-acres	8.200	Acres		
Undisturbed area-acres	4.200	Acres		
Total Area-acres	12.400	Acres		
Sediment volume	31,620	cu-ft	0.7259	Acres-ft
Volume below lowest hole	15,810	cu-ft	0.3629	Acres-ft
Volume above lowest hole	15,810	cu-ft	0.3629	Acres-ft
Total Volume	31,620	cu-ft	0.7259	Acres-ft

Note: Enter values in highlighted cells only.

BMP FEATURE	TOTAL TRIBUTARY AREA (AC)	DISTURBED AREA (AC)	UNDISTURBED AREA (AC)	BOTTOM SIZE (FT)	SEDIMENT VOLUME (AC-FT)	BASIN VOLUME (AC-FT)	BOTTOM ELEVATION	CREST ELEVATION	CREST, WxL (FT)	TOP OF POND ELEVATION	LOWEST ORIFICE ELEVATION	AREA OF ORIFICES (SQ IN)	# OF ORIFICE COLUMNS	DIA. OF ORIFICES	RISER PIPE INVERT	DAYLIGHT ELEVATION	OUTLET PIPE LENGTH (FT)	OUTLET PIPE SLOPE
SB-A	32.02	20.81	11.21	400' x 140'	1.42	4.57	6966.50	6971.50	60' x 40'	6973.00	6968.89	1.86	2	1-9/16"	6967.56	6964.75	65	4.3%
SB-B	36.64	23.82	12.82	115' x 260'	1.62	5.36	6932.00	6939.00	77.5' x 40'	6939.00	6933.73	2.05	2	1-5/8"	6932.40	6929.20	72	4.4%
SB-C	12.40	8.20	4.20	85' x 124'	0.73	0.79	6942.50	6946.50	18' x 15'	6947.00	6945.18	0.51	2	13/16"	6943.85	6942.00	50	3.7%

APPENDIX C – STANDARD DETAILS

Description

A sediment basin is a temporary pond built on a construction site to capture eroded or disturbed soil transported in storm runoff prior to discharge from the site. Sediment basins are designed to capture site runoff and slowly release it to allow time for settling of sediment prior to discharge. Sediment basins are often constructed in locations that will later be modified to serve as post-construction stormwater basins.

Photograph SB-1. Sediment basin at the toe of a slope. Photo courtesy of WWE.

Appropriate Uses

Most large construction sites (typically greater than 2 acres) will require one or more sediment basins for effective management of construction site runoff. On linear construction projects, sediment basins may be impractical; instead, sediment traps or other combinations of BMPs may be more appropriate.

Sediment basins should not be used as stand-alone sediment controls. Erosion and other sediment controls should also be implemented upstream.

When feasible, the sediment basin should be installed in the same location where a permanent post-construction detention pond will be located.

Design and Installation

The design procedure for a sediment basin includes these steps:

- **Basin Storage Volume**: Provide a storage volume of at least 3,600 cubic feet per acre of drainage area. To the extent practical, undisturbed and/or off-site areas should be diverted around sediment basins to prevent "clean" runoff from mixing with runoff from disturbed areas. For undisturbed areas (both on-site and off-site) that cannot be diverted around the sediment basin, provide a minimum of 500 ft^3/acre of storage for undeveloped (but stable) off-site areas in addition to the 3,600 ft^3/acre for disturbed areas. For stable, developed areas that cannot be diverted around the sediment basin, storage volume requirements are summarized in Table SB-1.

- **Basin Geometry:** Design basin with a minimum length-to-width ratio of 2:1 (L:W). If this cannot be achieved because of site space constraints, baffling may be required to extend the effective distance between the inflow point(s) and the outlet to minimize short-circuiting.

- **Dam Embankment**: It is recommended that embankment slopes be 4:1 (H:V) or flatter and no steeper than 3:1 (H:V) in any location.

Sediment Basins	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No

- **Inflow Structure**: For concentrated flow entering the basin, provide energy dissipation at the point of inflow.

Table SB-1. Additional Volume Requirements for Undisturbed and Developed Tributary Areas Draining through Sediment Basins

Imperviousness (%)	Additional Storage Volume (ft^3) Per Acre of Tributary Area
Undeveloped	500
10	800
20	1230
30	1600
40	2030
50	2470
60	2980
70	3560
80	4360
90	5300
100	6460

- **Outlet Works**: The outlet pipe shall extend through the embankment at a minimum slope of 0.5 percent. Outlet works can be designed using one of the following approaches:
  - **Riser Pipe (Simplified Detail):** Detail SB-1 provides a simplified design for basins treating no more than 15 acres.
  - **Orifice Plate or Riser Pipe**: Follow the design criteria for Full Spectrum Detention outlets in the EDB Fact Sheet provided in Chapter 4 of this manual for sizing of outlet perforations with an emptying time of approximately 72 hours. In lieu of the trash rack, pack uniformly sized 1½ - to 2-inch gravel in front of the plate or surrounding the riser pipe. This gravel will need to be cleaned out frequently during the construction period as sediment accumulates within it. The gravel pack will need to be removed and disposed of following construction to reclaim the basin for use as a permanent detention facility. If the basin will be used as a permanent extended detention basin for the site, a trash rack will need to be installed once contributing drainage areas have been stabilized and the gravel pack and accumulated sediment have been removed.
  - **Floating Skimmer**: If a floating skimmer is used, install it using manufacturer's recommendations. Illustration SB-1 provides an illustration of a Faircloth Skimmer Floating Outlet™, one of the more commonly used floating skimmer outlets. A skimmer should be designed to release the design volume in no less than 48 hours. The use of a floating skimmer outlet can increase the sediment capture efficiency of a basin significantly. A floating outlet continually decants cleanest water off the surface of the pond and releases cleaner water than would discharge from a perforated riser pipe or plate.

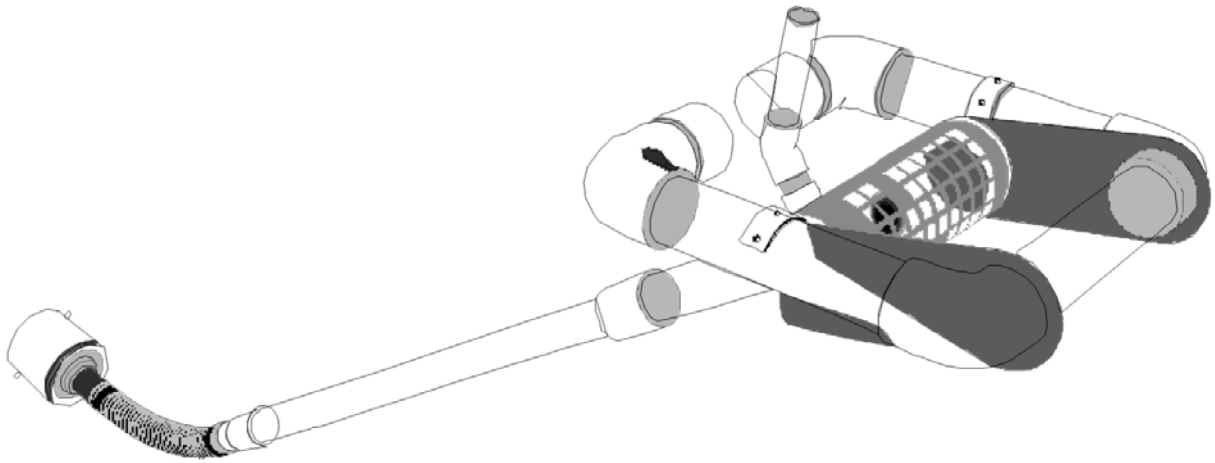


Illustration SB-1. Outlet structure for a temporary sediment basin - Faircloth Skimmer Floating Outlet. Illustration courtesy of J. W. Faircloth & Sons, Inc., FairclothSkimmer.com.

- **Outlet Protection and Spillway:** Consider all flow paths for runoff leaving the basin, including protection at the typical point of discharge as well as overtopping.
  - **Outlet Protection:** Outlet protection should be provided where the velocity of flow will exceed the maximum permissible velocity of the material of the waterway into which discharge occurs. This may require the use of a riprap apron at the outlet location and/or other measures to keep the waterway from eroding.
  - **Emergency Spillway:** Provide a stabilized emergency overflow spillway for rainstorms that exceed the capacity of the sediment basin volume and its outlet. Protect basin embankments from erosion and overtopping. If the sediment basin will be converted to a permanent detention basin, design and construct the emergency spillway(s) as required for the permanent facility. If the sediment basin will not become a permanent detention basin, it may be possible to substitute a heavy polyvinyl membrane or properly bedded rock cover to line the spillway and downstream embankment, depending on the height, slope, and width of the embankments.

Maintenance and Removal

Maintenance activities include the following:

- Dredge sediment from the basin, as needed to maintain BMP effectiveness, typically when the design storage volume is no more than one-third filled with sediment.
- Inspect the sediment basin embankments for stability and seepage.
- Inspect the inlet and outlet of the basin, repair damage, and remove debris. Remove, clean and replace the gravel around the outlet on a regular basis to remove the accumulated sediment within it and keep the outlet functioning.
- Be aware that removal of a sediment basin may require dewatering and associated permit requirements.
- Do not remove a sediment basin until the upstream area has been stabilized with vegetation.

Final disposition of the sediment basin depends on whether the basin will be converted to a permanent post-construction stormwater basin or whether the basin area will be returned to grade. For basins being converted to permanent detention basins, remove accumulated sediment and reconfigure the basin and outlet to meet the requirements of the final design for the detention facility. If the sediment basin is not to be used as a permanent detention facility, fill the excavated area with soil and stabilize with vegetation.

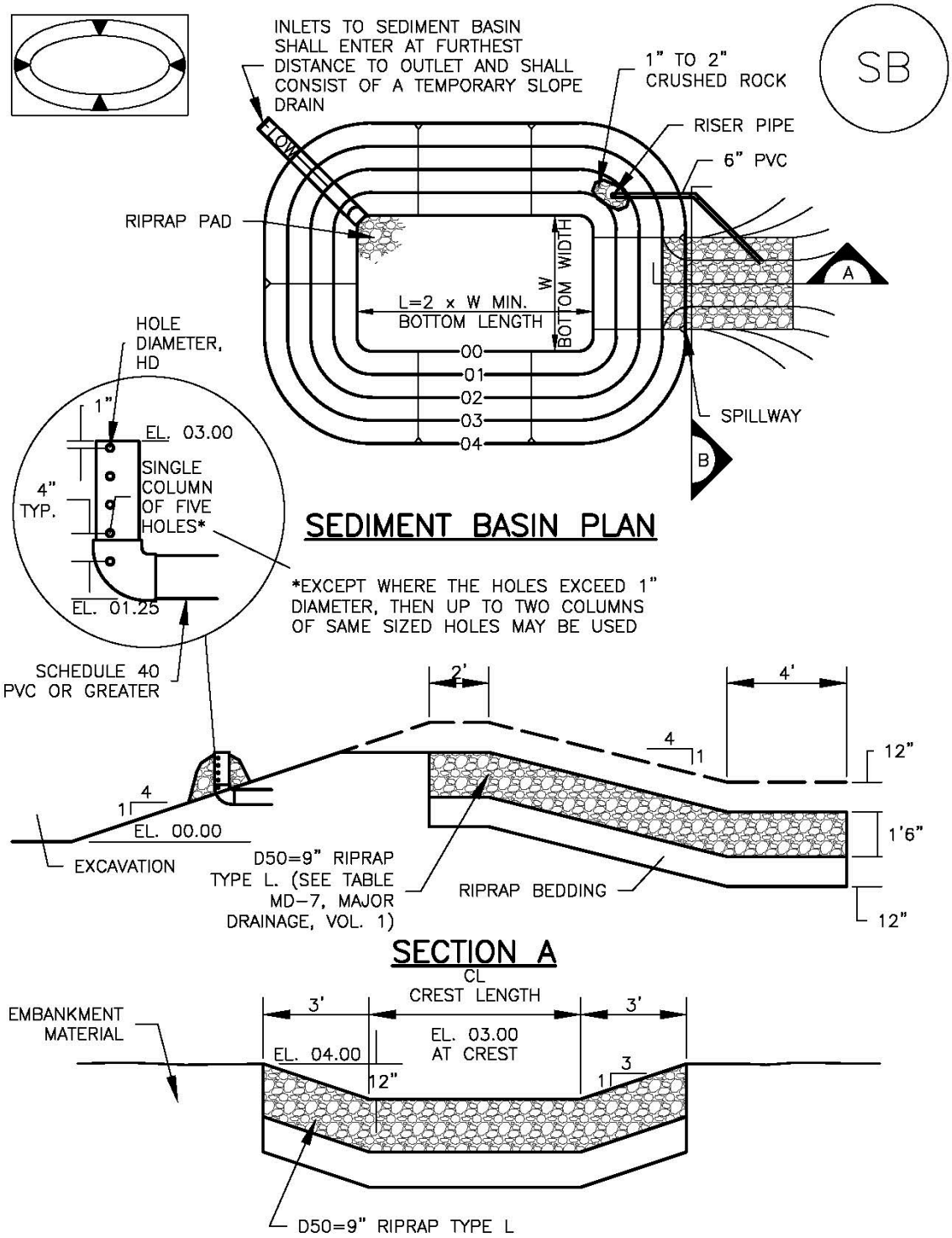

SB
INLETS TO SEDIMENT BASIN SHALL ENTER AT FURTHEST DISTANCE TO OUTLET AND SHALL CONSIST OF A TEMPORARY SLOPE DRAIN
FLOW
1" TO 2" CRUSHED ROCK
RISER PIPE
6" PVC
RIPRAP PAD
L=2 x W MIN. BOTTOM LENGTH
W BOTTOM WIDTH
00
01
02
03
04
A
B
SPILLWAY
SEDIMENT BASIN PLAN
HOLE DIAMETER, HD
1"
EL. 03.00
4" TYP.
SINGLE COLUMN OF FIVE HOLES*
EL. 01.25
*EXCEPT WHERE THE HOLES EXCEED 1" DIAMETER, THEN UP TO TWO COLUMNS OF SAME SIZED HOLES MAY BE USED
SCHEDULE 40 PVC OR GREATER
2'
4'
4
1
12"
1'6"
EL. 00.00
EXCAVATION
D50=9" RIPRAP TYPE L. (SEE TABLE MD-7, MAJOR DRAINAGE, VOL. 1)
RIPRAP BEDDING
12"
SECTION A
CL
CREST LENGTH
3'
3'
EMBANKMENT MATERIAL
EL. 04.00
EL. 03.00 AT CREST
12"
3
1
D50=9" RIPRAP TYPE L

TABLE SB–1. SIZING INFORMATION FOR STANDARD SEDIMENT BASIN			
Upstream Drainage Area (rounded to nearest acre), (ac)	Basin Bottom Width (W), (ft)	Spillway Crest Length (CL), (ft)	Hole Diameter (HD), (in)
1	12 ½	2	9/32
2	21	3	13/16
3	28	5	½
4	33 ½	6	9/16
5	38 ½	8	21/32
6	43	9	21/32
7	47 ¼	11	25/32
8	51	12	27/32
9	55	13	7/8
10	58 ¼	15	15/16
11	61	16	31/32
12	64	18	1
13	67 ½	19	1 1/16
14	70 ½	21	1 1/8
15	73 ¼	22	1 3/16

SEDIMENT BASIN INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - –LOCATION OF SEDIMENT BASIN.
   - –TYPE OF BASIN (STANDARD BASIN OR NONSTANDARD BASIN).
   - –FOR STANDARD BASIN, BOTTOM WIDTH W, CREST LENGTH CL, AND HOLE DIAMETER, HD.
   - –FOR NONSTANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT H, NUMBER OF COLUMNS N, HOLE DIAMETER HD AND PIPE DIAMETER D.

2. FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.

3. SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO ANY OTHER LAND–DISTURBING ACTIVITY THAT RELIES ON ON BASINS AS AS A STORMWATER CONTROL.

4. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.

5. EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.

6. PIPE SCH 40 OR GREATER SHALL BE USED.

7. THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES.

SEDIMENT BASIN MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. SEDIMENT ACCUMULATED IN BASIN SHALL BE REMOVED AS NEEDED TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN SEDIMENT DEPTH REACHES ONE FOOT (I.E., TWO FEET BELOW THE SPILLWAY CREST).

5. SEDIMENT BASINS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS ACCEPTED BY THE LOCAL JURISDICTION.

6. WHEN SEDIMENT BASINS ARE REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

APPENDIX D

HRGreen

HRGREEN.COM

Grandview Reserve
Master Development Drainage Plan

November 2020

HR Green Project No: 191850

Prepared For:

4 SITE INVESTMENTS, LLC

Mr. Peter Martz or Paul Howard

1271 Kelly Johnson Blvd., Ste. 100

Colorado Springs, CO 80920

719-499-8416

Prepared By:

HR Green Development, LLC

Contact: Chris McFarland, PE

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720-602-4956

SKP-20-001

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Engineer's Statement

This report and plan for the drainage design of the development , Grandview Reserve, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the *El Paso County Drainage Criteria* Manual and is in conformity with the master plan of the drainage basin. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

11-3-20

Greg Panza, PE Date

State of Colorado No. 37081

For and on behalf of HR Green Development, LLC

COLORADO LICENSED
GREGORY L. PANZA
37081
11-3-20
PROFESSIONAL ENGINEER

Developer's Statement

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

4 Site Investments LLC

By:

PAUL J. HOWARD

Title: MANAGER

Address: 1271 KELLY JOHNSON BLVD.

COLORADO SPRINGS, CO 80920

El Paso County:

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

APPROVED
Engineering Department

11/25/2020 1:19:15 PM
dsdnijkamp
EPC Planning & Community Development Department

Jennifer Irvine, P.E.

County Engineer/ECM Administrator

Master Development Drainage Plan – Grandview Reserve

I. General Purpose, Location and Description

a. Purpose and Scope of study

The Purpose of this Master Development Drainage Plan (MDDP) is to describe the onsite and offsite drainage patterns, existing and proposed storm infrastructure as it relates to preliminary water quality and stormwater detention, areas tributary to the site and the planned storm water management for Grandview Reserve 2 development. The items discussed in this report are preliminary in nature and final drainage calculations and design will be required as development proceeds. This reports provides a general drainage concept and guidance for future development of Grandview Reserve.

b. DBPS Investigations

The Gieck Ranch Drainage Basin Planning Study (DBPS) Preliminary Design Report prepared by Drexel, Barrell was reviewed to determine existing plans and constraints that would influence the design of Grandview Reserve. The proposed plans for Grandview Reserve are in general conformance with the DBPS.

The DBPS shows 4 reaches through Grandview Reserve. The Main Stem (MS) in the south western portion of the site, the Main Stem Tributary #2 (MST2) to the north and east of the Main Stem, the East Fork Tributary (EFT) in the middle of the site north and east of MST2, and the East Fork Upper (EF) at the north east side of the site. These drainageways have been reviewed in the following reports and further analysis will be completed of these major drainageways in future planning documents.

- Unnamed Tributary Black Squirrel Creek, Four Way Ranch Letter of Map Revisions, Kiowa Engineering, March 2004
- Haegler and Gieck Drainage Basins Letter of Map Revision, Four Way Ranch Subdivision, Kiowa, March 2004
- Unnamed Tributary Black Squirrel Creek Drainage Basin, Letter of Map Revision, Elbert Road Site, Kiowa Engineering, February 2006
- Geick Ranch Drainage Basin Planning Study (DBPS), Drexel Barrell, October 2010 (not approved)
- Meridian Ranch Master Development Drainage Plan (MDDP), Tech Contractors, January 2018

c. Agency Jurisdictions

Listed below are the jurisdictions that this project will conform to:

El Paso County

Falcon Colorado Municipal Code (where applicable)

Federal Emergency Management Agency

d. General Project Description

Grandview Reserve is located in Falcon, Colorado within El Paso County and contains approximately 765 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 Ela Paso County, Colorado. See below for approximate site location.

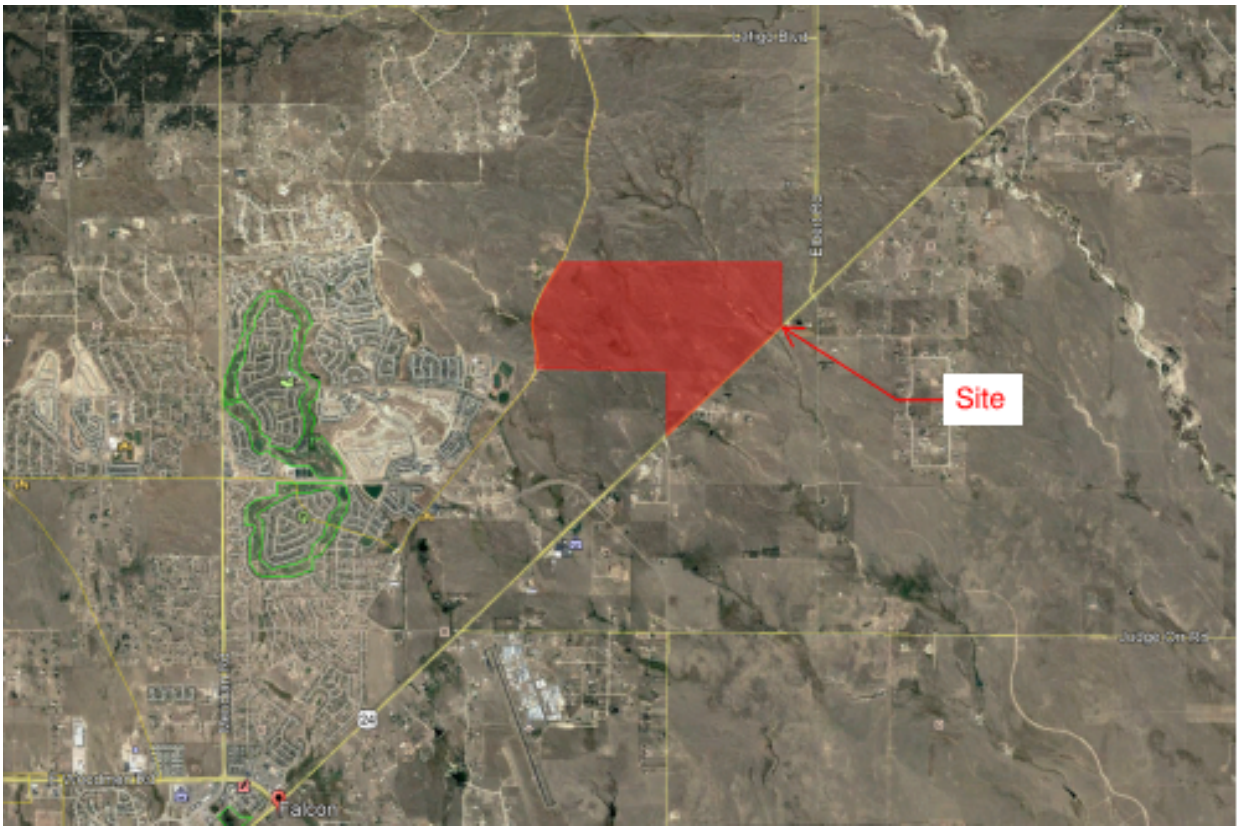


Figure 1 - Site Map

e. Data Sources

Listed Below are the technical resources reviewed in the preparation of this MDDP:

City of Colorado Springs Drainage Criteria Manual (DCM), Volumes 1 and 2

Mile High Flood District

NOAA Atlas 14

NRCS Soil Survey for El Paso County Area, Colorado

FEMA FIRM 08041C0556G and FIRM 08041C0552G (eff. 12/7/2018)

El Paso County Assessor Property Records

f. Applicable Criteria and Standards

Per the DBPS, flows from the proposed site will be limited to historic flows in an effort to maintain the stability and of the existing channels with the drainage basin. The master plan follows the Drainage Criteria Manual for El Paso County which refers to the City of Colorado Springs Drainage Criteria Manuals as amended.

II. Project Characteristics

a. Location in Drainage Basin, offsite flows, size

Grandview Reserve is located 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 Elicott, CO about 18 miles to the south. Black Squirrel Creek eventually drains to the Arkansas River in Pueblo Colorado. The majority of the Gieck Ranch Drainage basin is undeveloped consisting of rural farmland. The Geick Ranch Drainage basin lies north of the Haegler Ranch drainage basin.

As part of the Fourway LOMR discussed above, the study reviewed the hydrology and hydraulics for the Main Stem Tributaries, however only a small portion of the site within Grandview was analyzed. The peak flows rates for the Main Stem for the 100 year event was 413 cfs and for the Main Stem Tributary was 280 cfs.

For the East Fork tributaries (EF and EFT), the DBPS established 100 year flow rates of 595 cfs for the East Fork (EF) and 217 cfs for the East Fork Tributary (EFT)

Generally offsite flows are conveyed through the site via the 4 tributaries. Minor offsite basins may sheet flow onto the site. These flows will be routed through the site via the tributaries.

b. Compliance with DBPS

This MDDP is in general conformance with the guidelines outlined in the Gieck Ranch DBPS. Grandview Reserve will construct multiple full spectrum detention facilities to limit the effects of development and mimic natural flow patterns.

Existing downstream infrastructure is currently the historic drainage channels and minimal downstream improvements exist. As such, the site follows the DBPS and limits offsite flow rates to at or below historic rates. Outfalls out of the site will generally be along the same historic tributaries. Although outfall rates will be at or below historic, volume of runoff will increase and therefore downstream facilities may see additional flow volume than historic. This may provide a net benefit to the downstream facilities by providing more water to assist with vegetation however it should be noted that increased volume may also lead to more erosion or channel movement.

c. Site Characteristic

Per the NRCS web soil survey, the site is made up entirely of Type A and B soils. The majority of which are Type A soils. The predominate soils are Blakeland loamy sand, Columbine gravelly sandy loam, and Stapleton sandy loam. The first two soils are Type A soil and cover approximately 55.1% of the site and

the later soil is a Type B soil and covers the remaining 44.9% of the site. See Appendix A for the NRCS soil map.

Current ground cover is predominantly short- to mid-grass prairie grasslands and former farmland which consists of nonnative weeds and grasses. The site has very few, if any, trees and a minimal number of shrubs are found on the site.

d. Major drainage ways and structures

As mentioned previously, 4 major drainage ways exist on the site. These convey existing on and off-site flows and current on site flows through the site in a southeasterly direction. The drainageways eventually cross Highway 24 via culverts and other structures; further survey will be conducted to determine their effectiveness as the development of the site progresses.

A breached stock pond is located along the Main Stem and the effects of the existing breached dam are unknown at this time. As development occurs, this dam will be completely removed and improvements will be constructed along the channels to become high functioning low maintenance drainageway corridors.

e. Existing and proposed land uses

The existing site is open rangeland and farmland with no visible structures. The proposed development will consist of low, medium, and high density residential, along with two institutional sites, multiple pocket park sites, a large community park and a commercial area adjacent to Highway 24. The current land plan assumes approximately 3,261 dwelling units will be constructed on the site.

Land Use	MAX DU/AC
Low	2
Medium	4
Medium – High	8
High	12

III. Hydrologic Analysis

a. Major Basins and subbasins

Major Basin Description

- Previous basin study: Gieck Ranch Drainage Basin Planning Study
- Per FEMA FIRM 08041C0556G and 08041C0552G (eff. 12/7/2018), Grandview Reserve has four mapped channels within its boundaries. .
- Per aerial imaging, no major irrigation is in the vicinity that would affect Grandview Reserve.

The site has been divided into 8 major drainage basins per where each basin is tributary to a full spectrum detention pond facility. These basins and associated sub basins are described in more detail in the next section of this report.

Subbasin Description

The entire site drains in a south easterly direction and is divided into 8 major drainage basins and a total of 18 subbasins together as described below.

- Subbasin A1 is located in the southwestern corner of the site, to the south and west of MS. The basin drains towards the southeast to proposed detention pond A. Current planning documents call for medium density dwelling units and a small pocket park. The basin is 37.00 acres, with a composite impervious value of 35.22% and runoff rates for the 5 and 100 year of 30.72 cfs and 100.64 cfs respectively. The pond will discharge at predevelopment rates and into MS via the ponds outlet structure.
- Subbasin B1 is located between MS and MST2 to the east of subbasin A1. The basin drains towards the southeast and towards subbasin B2. Current planning documents call for medium density dwelling units and some parkland area. The basin is 37.00 acres, with a composite impervious value of 45.00% and runoff rates for the 5 and 100 year of 29.46 cfs and 97.08 cfs respectively.
- Subbasin B2 is located between MS and MST2 to the northeast of subbasin A1. The basin drains towards the southeast and towards Detention Pond B. Current planning documents call for medium density dwelling units. The basin is 24.89 acres, with a composite impervious value of 43.26% and runoff rates for the 5 and 100 year of 12.02 cfs and 42.26 cfs respectively.
- Subbasin B3 is located between MS and EF and to the northeast of east of basin B2. The existing MST2 tributary runs through the basin. The site drains towards the southeast and towards Detention Pond B. Current planning documents call for high, medium-high, and medium density dwelling units along with a pocket park. The basin is 118.90 acres, with a composite impervious value of 49.42% and runoff rates for the 5 and 100 year of 92.76 cfs and 295.27 cfs respectively.
- Subbasin C1 is located to the northeast of east of basin B1 and the existing MST2 tributary runs through the middle of the basin. The basin drains towards the southeast and towards Detention Pond C. Current planning documents call for an institutional parcel, medium and high density dwelling units and a pocket park. The basin is 77.83 acres, with a composite impervious value of 51.20% and runoff rates for the 5 and 100 year of 77.99 cfs and 238.03 cfs respectively.
- Subbasin D1 is located between MS and MST2 to the east of Basin B3 and adjacent to the MST2 channel. The basin drains towards the southeast and towards drainage basin D2. Current planning documents call for medium density dwelling units along with a pocket park. The basin is 24.33 acres, with a composite impervious value of 53.89% and runoff rates for the 5 and 100 year of 24.15 cfs and 70.07 cfs respectively.
- Subbasin D2 is located between MS and MST2 to the south of basins D1 and B3. The basin drains towards the southwest and towards detention pond D. Current planning documents call for high density dwelling units along with a pocket park and a commercial parcel. The basin is 77.90 acres, with a composite impervious value of 62.10% and runoff rates for the 5 and 100 year of 98.47 cfs and 252.18 cfs respectively.
- Subbasin E1 is located just east of EFT along the northern portion of the site. The basin drains towards the southeast and towards basins F3 and F4. Current planning documents call for low density dwelling units. The basin is 88.60 acres, with a composite impervious value of 19.54% and runoff rates for the 5 and 100 year of 46.88 cfs and 178.04 cfs respectively.

- Subbasin F1 is located east of basin E1 and between EFT and EF along the northern portion of the site. The basin drains towards the southeast and towards basin F3 and F4. Current planning documents call for a large community park, high density dwelling units, commercial site and an institution parcel. The basin is 33.73 acres, with a composite impervious value of 25.00% and runoff rates for the 5 and 100 year of 16.28 cfs and 58.95 cfs respectively.
- Subbasin F2 is located east of the existing drainage channel EFT. The basin drains towards the southwest and towards basin F4 and to the EFT drainage channel which runs parallel to the north east with Highway 24. Current planning documents call for high density dwelling units and commercial space. The basin is 67.64 acres, with a composite impervious value of 51.39% and runoff rates for the 5 and 100 year of 60.11 cfs and 170.90 cfs respectively.
- Subbasin F3 is located west of the existing drainage channel EF. The basin drains towards the southeast towards drainage channel EF but will be conveyed south towards subbasin F4. Current planning documents call for medium density dwelling units. The basin is 12.84 acres, with a composite impervious value of 45.00% and runoff rates for the 5 and 100 year of 11.36 cfs and 32.93 cfs respectively.
- Subbasin F4 is located west of the existing drainage channel EF and south of subbasins F1 and F3. The basin drains towards the southeast towards detention pond F. Current planning documents call for medium and medium-high density dwelling units. The basin is 51.81 acres, with a composite impervious value of 49.54% and runoff rates for the 5 and 100 year of 42.32 cfs and 124.89 cfs respectively.
- Subbasin G1 is located west of the existing drainage channel EFT along the northern property boundary. The basin drains towards the southeast towards detention pond G. Current planning documents call for medium density dwelling units and a park. The basin is 20.13 acres, with a composite impervious value of 36.52% and runoff rates for the 5 and 100 year of 13.78 cfs and 43.95 cfs respectively.
- Subbasin G2 is located east of the existing drainage channel EFT along the northern property boundary. The basin drains towards the southeast towards detention pond G. Current planning documents call for low density dwelling units. The basin is 15.14 acres, with a composite impervious value of 25.00% and runoff rates for the 5 and 100 year of 6.55 cfs and 23.95 cfs respectively.
- Subbasin H1 is located in the northeast corner of the site and east of the existing drainage channel EFT. The basin drains towards the south towards subbasin H4. Current planning documents call for low density dwelling units and smallpark. The basin is 20.71 acres, with a composite impervious value of 24.49% and runoff rates for the 5 and 100 year of 5.68 cfs and 27.62 cfs respectively.
- Subbasin H2 is located south of basin G2 and east of the existing drainage channel EFT. The basin drains towards the south towards subbasin H4. Current planning documents call for medium density dwelling units and smallpark. The basin is 18.55 acres, with a composite impervious value of 46.68% and runoff rates for the 5 and 100 year of 16.24 cfs and 47.62 cfs respectively.

- Subbasin H3 is located south of basin H2 and east of the existing drainage channel EFT. The basin drains towards the southeast towards subbasin H4. Current planning documents call for medium density dwelling units and smallpark. The basin is 6.01 acres, with a composite impervious value of 40.57% and runoff rates for the 5 and 100 year of 5.21 cfs and 15.60 cfs respectively.
- Subbasin H4 is located south of basin H2 and east of the existing drainage channel EFT and basin H3. The basin drains towards the south towards detention pond H. Current planning documents call for medium density dwelling units and park/open space area. The basin is 27.65 acres, with a composite impervious value of 38.24% and runoff rates for the 5 and 100 year of 20.93 cfs and 64.71 cfs respectively.

The above mentioned basins are large planning area basins and as drainage reports are developed for the individual developed parcels additional drainage reports and calculations will be required. It is expected that storm drainage infrastructure consisting of inlets, storm sewer and open drainage channels will be constructed as the property develops.

- Offsite Basins as shown in the Meridian Ranch MDDP include basins HG4, HG5, HG6A, HG6B, HG13, and HG14. Flow contributing to the site from these basins will be routed through the existing tributaries. Flow rates as shown in the MDDP Ranch report include the following flows and associated tributary areas.

Offsite Flow Summary					
Basin Description	**Ultimate Design Point**	**Basin Area (ac)**	**Receiving Tributary**	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**
HG4	G6	57	Main Stem	2	42
HG5	G6	72	Main Stem	3	52
HG6A	G6	88	Main Stem	3	51
HG6B	G6	66	Main Stem	2	35
HG13	G08	54	Main Stem Tributary 2	4	59
HG14	G08	147	Main Stem Tributary 2	5	83

Offsite Flow Summary				
Design Point	**Basin Area (ac)**	**Receiving Tributary**	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**
G6	760	Main Stem	36	628
G08	201	Main Stem Tributary 2	8	122

These basins along with the offsite basins which lie east of Eastoneville Road contribute flows onto the site through the major tributaries. Estimate oncoming flows for each tributary are as follows:

Offsite Flow Summary		
Tributary	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**
Main Stem	36	628
Main Stem Tributary 2	8	122
East Fork Tributary*	56	116
East Fork*	175	357

*Flows from Gieck Ranch
DBPS, Oct 2010

As hydraulic analysis continues for the channels, these offsite flows will be used to size the channels for proper conveyance of the flow however it should be noted that the flows mentioned for the Main Stem and Main Stem Tributary 2 assume proper conveyance of the flow through (below or above) Eastonville Road. Due to the unknown nature of these conditions at the time of buildout, a probable scenario of the split flows will require analysis and agreed upon flow rates to each channel will be required. Currently some of the flow shown going to the Main Stem Tributary 2 may be diverted into the Main Stem Tributary. Previous analysis done by JR Engineering assumed approximately 160 additional cfs going to the Main Stem Tributary #2 during the 100 year event and as such it is recommended the following flows be used for analysis of the oncoming offsite flows:

Revised Offsite Flow Summary		
Tributary	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**
Main Stem**	67	413
Main Stem Tributary 2**	59	280
East Fork Tributary*	61	217
East Fork*	180	595

*Flows from Gieck Ranch
DBPS, Oct 2010

**Flows from 4 Way Ranch LOMR, Mar 2004

Please note that the preliminary drainage reports will be required to reconcile any differences between the various reports done for these channels.

b. Methodology

Design rainfall was determined utilizing figures from the NOAA Atlas 14, Volume 8, Version 2 to determine the 5-year and 100-year rainfall values for 1, 6 and 24-hour events. The 1-hour rainfall depths are 1.22 and 2.50 in/hr respectively, 6 hour 1.79 and 3.87 in/hr respectively and 2.36 and 4.90 in/hr for the 24 hour event. The rainfall values were then used as inputs into the Colorado Urban Hydrograph Procedure (CUHP) spreadsheets to determine runoff values for both pre-development and post-development site.

CUHP is an evolution of the Snyder unit hydrograph and is calibrated for use along the Colorado Front Range. 1 Hour rainfall amounts are input into the program to produce a storm hyetograph that is then uses to calculate a storm hydrograph for each basin depending on the subbasins properties including slope, length, shape, impervious area, pervious depression storage area, and various infiltration rates. Tabular hydrographs are then computed and can be used in EPA SWMM. The CUHP results are included within Appendix B.

EPA SWMM was used to determine flow routing via the kinematic wave method. Subbasins were routed to their respective design points and detention ponds for both the developed and predeveloped condition to determine peak runoff amounts for the 5-year and 100-year storm events. Information from these models along with information and calculations performed in the Colorado Springs BMP spreadsheets was used to determine pond sizing calculations and release rates.

c. Basin Hydrology

A summary of the flows for both the predeveloped and developed cases for each basin, subbasin and Pond are found on next page along with the full computation found in Appendix B.

SWMM Basin and Pond Summary						
Basin Description	**Basin Area (ac)**	**% Impervious**	**5 Year Peak Runoff (cfs)**	**100 Year Peak Runoff (cfs)**	**5 Year Pond Volume (ac-ft)**	**100 Year Pond Volume (ac-ft)**
A1	45.38	35.22%	30.72	100.64		
			Pond A		1.83	3.50
B1	37.00	45.00%	29.46	97.08		
B2	24.89	43.26%	12.02	42.26		
B3	118.90	49.42%	92.76	295.27		
			Pond B		5.90	19.00
C1	77.83	51.20%	77.99	238.03		
			Pond C		3.91	6.87
D1	24.33	44.14%	24.15	70.07		
D2	77.90	62.10%	98.47	252.18		
			Pond D		6.61	10.19
E1	88.60	19.54%	46.88	178.04		
			Pond E		1.96	2.44
F1	33.73	25.00%	16.28	58.95		
F2	67.64	51.39%	60.11	170.90		
F3	12.84	45.00%	11.36	32.93		
F4	51.81	46.54%	42.32	124.89		
			Pond F		7.38	12.62
G1	20.13	36.52%	13.78	43.95		
G2	15.14	25.00%	6.55	23.95		
			Pond G		0.72	2.03
H1	20.71	24.49%	5.68	27.62		
H2	18.55	43.68%	16.24	47.62		
H3	6.01	40.57%	5.21	15.60		
H4	27.65	38.24%	20.93	64.71		
			Pond H		2.93	6.17

IV. Hydraulic Analysis

a. Major Drainageways

In general the site runoff runs into the 4 major drainageways and in a southeasterly direction. These basins are described in more detail below:

The Main Stem (MS) in the south western portion of the site, the Main Stem Tributary #2 (MST2) to the north and east of the Main Stem, the East Fork Tributary (EFT) in the middle of the site north and east of MST2, and the East Fork Upper (EF)

The Main Stem (MS) is in the southwestern portion of the site. Offsite flows collect and are conveyed under Eastonville Road via a culvert. MS travels in a southeasterly direction and combines with the Main Stem Tributary #2 (MST2) just off site and then is conveyed past Highway 24 via a culvert. Jurisdictional wetlands exist within this channel and the area is within a Zone A floodplain towards the southern portion of the site. This channel sees only intermittent flows at this time however once development occurs there may be a more constant baseflow.

MST2 crosses Eastonville road via an existing culvert and flows through the site in a southeasterly direction. An existing breached stock pond exists in the approximate center point of the channel within the site. Portions of this channel are within a mapped floodplain as shown in the existing FIRM Panel. Per a July email from the USACE this drainage channel was determined to be a non-jurisdictional waters/wetland.

The East Fork tributary (EFT) crosses the north property line and are conveyed through the site via a natural channel. The channel has been mapped as a Zone A floodplain per the existing FIRM panel. There is no existing crossing for this section of the drainage channel below Highway 24 and instead the flows are conveyed to the north east towards the East Fork Upper (EF). Per a July email from the USACE this drainage channel was determined to be a non-jurisdictional waters/wetland.

The EF crosses the north property line approximately 1500’ east of the EFT crossing. The flow through the site is via a natural channel and travels in a southeasterly direction. The channel is mapped as a Zone A floodplain, and the channel crosses Highway 24 via an existing shallow bridge. The EF and EFT eventually merge approximately 1750 southeast of the site, however as mentioned above Highway 24 blocks the flow of the EFT and flows are conveyed northeast to the EF bridge crossing.

Per SWMM modeling the current velocities will require channel stabilization. The channels are to be engineered later in the design which will likely include a combination of channel widening, lowering of slope facilitated by the implementation of drop structures to meet non erosive velocity requirements. Bank stabilization, should it be necessary, may include coir rolls, erosion control blankets, live willow staking, soil lifts and/or other measures to ensure successful bank stabilization. These drainageways will require further analysis and design which will be completed as the project progresses.

V. Environmental Evaluations

a. Significant existing or potential wetland and riparian areas impacts

As part of this work, the developer has engaged Ecosystem Services, LLC (ECOS) to perform environmental studies of the site that will be submitted with the planning documents. Major information from these report related to the wetlands shows that two of the tributaries trough the site, the Main Stem

and the East Fork contain jurisdictional wetlands and the other two tributaries, the East Fork Tributary and the Main Stem Tributary #2 are non-jurisdictional wetlands.

At this time, only minor improvements to the jurisdictional channels are proposed. These stream improvements will be made with keeping the natural habitat intact and the natural function of these channels as it is to maintain the wetland habitat. The non-jurisdictional channels will be modified and the design of those channels is forthcoming.

b. Stormwater quality considerations and proposed practices

As part of the development, full spectrum detention facilities will be installed to provide water quality for the development. The facilities will be designed using El Paso County criteria and provide stormwater quality by slowing the release of stormwater captured by the ponds and allowing solids to settle out. Additionally when possible the revised drainage channels, which were not jurisdictional wetlands, will be used to convey stormwater via a natural channel. Stormwater must be treated before entering the natural channels. The natural channel will provide an pervious means to transport stormwater and provide some water quality benefits as well.

On site practices for the homes, schools, churches and other buildings should use means such that impervious areas drain across pervious area to allow for infiltration during the minor events. This would include discharge of the gutters onto landscape areas vs. directly connecting to storm sewer and using natural ditches and swales where it is logical and makes sense to convey stormwater inlieu of storm sewer piping.

c. Permitting requirements

When work infringes upon the wetlands or floodplain a 404 Permit will be required. If the work within the waterways is minimal, it will likely be covered under a nationwide 404 permit; it is however possible that an individual permits will be required.

The Colorado Department of Public Health and Environment will require permits for any disturbance that exceed 1 acre of land. Should groundwater be encountered, a dewatering permit will also be required.

El Paso County will require an Erosion and Stormwater Quality Control Permit and any other construction permits required to complete the construction of the site.

FEMA will require a permit for floodplain development prior to the commencement of any construction or development within any special flood hazard area (SFHA).

FEMA will require a letter of map revision (LOMR) should work alter the base flood elevation (BFE) of any area falling withing the floodplain as shown in FEMA FIRM 08041C0556G and FIRM 08041C0552G (eff. 12/7/2018).

d. 4-Step Process

In accordance with the Engineering Criteria Manual I.7.2.A and DCM V2, this site has implemented the four-step process to minimize adverse impacts of urbanization. The four-step process includes reducing runoff volumes, stabilizing drainageways, treating the water quality capture volume, and considering the need for Industrial Commercial BMPs.

Step 1 – Reducing Runoff Volumes: The development of the project site includes a variety of land uses including open and vegetated areas interspersed to help disconnect imperious areas and reduce runoff volumes.

Step 2 – Stabilize Drainageways: Altered channels will be designed in a manner that provides water quality benefits through infiltration and the removal of pollutants via phytoremediation. Vegetation will also be selected to stabilize the channel by reducing the velocity of flows and decreasing any scour. Should the final channel require, grade control structures may be implemented to further reduce flow velocities and protect against erosion. These improvements will help stabilize drainageways.

Step 3 – Provide WQCV: Runoff from this development is treated through capture and slow release of the WQCV via detention ponds that are designed per current El Paso County DCM V2.

Step 4 – Consider the need for Industrial and Commercial BMP's: A site specific storm water quality and erosion control plan and narrative will be prepared with subsequent land use approvals prepared in conjunction with the report prior to any construction. Site specific temporary source control BMPs as well as permanent BMPs are detailed in this plan and narrative. Guidelines detailed in the El Paso DCM V2 4.2 pertaining to the covering and storage handline and spill containment and control shall be followed as necessary.

VI. Selected Plan

a. Plan Hydrology

This MDDP schematically addressed on-site and off-site drainage patterns using the existing topography and proposed land use plan for the overall drainage design. Individual preliminary and final drainage reports will better define the planning areas as the site is developed. These reports will include inlet design, storm sewer hydraulics, street design and other requirements typical of more detailed drainage reports.

The overall site is divided into 8 separate major basins, basins A-H and contribute to individual detention ponds for each major basin. Basin sizes range from 35 acres to 181 acres in size. Basins A, B, C and D drain and eventually discharge into the Main Stem and Main Strem Tributary #2. Basins E, F, G, and H drain towards the East Fork Drainage channel.

The sub-basins are described in additional detail above.

b. Detention Ponds

The site plans propose the construction of 8 separate full spectrum detention facilities.

- Pond A is located in the southwest corner of the site and discharges into the Main Stem drainageway. The pond is planned to store a maximum of 4.05 ac-ft during the 100 year event and have a peak outflow of 55.9 cfs which is slightly below the pre development peak outflow of 57.1 cfs. The 5 year storage volume is 2.46 ac-ft with a peak outflow of 3.7 cfs.

- Pond B is located to the east of Pond A and the Main Stem and discharges into the Main Stem Tributary #2. The pond is planned to store a maximum of 16.60 ac-ft during the 100 year event and have a peak outflow of 165.4 cfs which is slightly above the pre development peak outflow of 164.2 cfs. The 5 year storage volume is 8.44 ac-ft with a peak outflow of 2.6 cfs.

- Pond C is located near the center of the western portion of the site near the existing Main Stem Tributary #2. The pond discharges into a revised open channel to be designed and discharges to the Main Stem Tributary #2 which merges with the Main Stem Tributary just off site. The pond is planned to store a maximum of 6.91 ac-ft during the 100 year event and have a peak outflow of 119.2 cfs which is slightly below the pre development peak outflow of 120.2 cfs. The 5 year storage volume is 4.07 ac-ft with a peak outflow of 1.5 cfs.

- Pond D is located near the southern portion of the site adjacent to Highway 24. The pond discharges into the Main Stem right after the Main Stem and Main Stem Tributary #2 merge. The pond is planned to store a maximum of 9.41 ac-ft during the 100 year event and have a peak outflow of 154.4 cfs which equals the predevelopment peak flow rate. The 5 year storage volume is 6.28 ac-ft with a peak outflow of 2.0 cfs.

- Pond E is located in the middle of the site just east of the East Fork drainage way. The pond discharges into the East Fork drainageway. The pond is planned to store a maximum of 2.40 ac-ft during the 100 year event and have a peak outflow of 163.4 cfs which is greater than the pre development peak outflow of 157.99 cfs. The 5 year storage volume is 1.70 ac-ft with a peak outflow of 18.8 cfs.

- Pond F is located near the south east corner of the site just west of the East Fork Tributary drainageway. The pond discharges into the East Fork Tributary drainageway. The pond is planned to store a maximum of 12.40 ac-ft during the 100 year event and have a peak outflow of 235.5 cfs which is greater than the pre development peak outflow of 221.11 cfs. The 5 year storage volume is 8.07 ac-ft with a peak outflow of 14.5 cfs.

- Pond G is located near the north east corner of the site just west of the East Fork Tributary drainageway. The pond discharges into the East Fork Tributary drainageway at an upstream location within the site. The pond is planned to store a maximum of 2.54 ac-ft during the 100 year event and have a peak outflow of 50.7 cfs which is slightly greater than the pre development peak outflow of 48.48 cfs. The 5 year storage volume is 1.69 ac-ft with a peak outflow of 9.1 cfs.

- Pond H is located near the south east corner of the site just east of the East Fork Tributary drainageway and adjacent to Highway 24. The pond discharges into the East Fork Tributary drainageway. The pond is planned to store a maximum of 6.60 ac-ft during the 100 year event and have a peak outflow of 99.1 cfs which matches the pred development peak outflow. The 5 year storage volume is 4.03 ac-ft with a peak outflow of 1.3 cfs.

Overall runoff from the site will by and large match the predevelopment peak flows. The volume of water will increase however as the drainage channels are designs, continuous simulation models will be done to see the effects of prolonged runoff rates. Predevelopment and post development flows for the 5-year and 100-year events are summarized in the following table for the 4 site outfalls.

OUTFALL	Predevelopment		Postdevelopment*	
	5 year	100 year	5 year	100 year
1	80.03	479.80	67.69	466.95
2	85.96	597.41	61.68	536.11
3	30.00	154.35	8.58	160.70
4	341.05	1335.77	276.10	1291.25

*Values to be refined with Preliminary and Final Drainage Reports for each filing

VII. Drawings

Please refer to the appendices for vicinity maps and drainage basin maps.

VIII. Summary

Grandview Reserve is a large master planned community consisting of various densities of dwelling units to include single family homes, multifamily homes, parks, institutional sites, and commercial areas. Due to development increased runoff will occur. In order to mitigate downstream impacts 8 large full spectrum detention facilities will be built to reduce the runoff rate to near historic levels. These detention facilities will provide water quality enhancements in order to account for the increased urbanization of the upstream catchment areas.

Additional analysis will be required and completed to review the hydraulics of the proposed major drainage channels and be included in future submittals. The proposed design, as described in this report, is not anticipated to cause any adverse impact to downstream properties however as noted previously due to the increased volume of water, downstream tributaries will see increases in the volume of flow. It is advised that low impact design be taken into account when designing and developing each filing. This shall include those items listed in the four step process above and any additional measures that are within reason to disconnect impervious areas and increase infiltration. This will alleviate the additional volume of water due to development. Although the rate will remain at or below historic levels, the amount of time the channels will see water will increase which may cause more channel movement than historic. Downstream planning efforts should allow for the natural migration and movement of the channel by continuing to provide large floodplain areas to allow movement of the channel.

IX. References

El Paso County – Drainage Criteria Manual, 2014

City of Colorado Springs – Drainage Criteria Manual, May 2014

Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018

Unnamed Tributary Black Squirrel Cree, Four Way Ranch Letter of Map Revisions, Kiowa Engineering, March 2004

Haegler and Gieck Drainage Basins Letter of Map Revision, Four Way Ranch Subdivision, Kiowa, March 2004

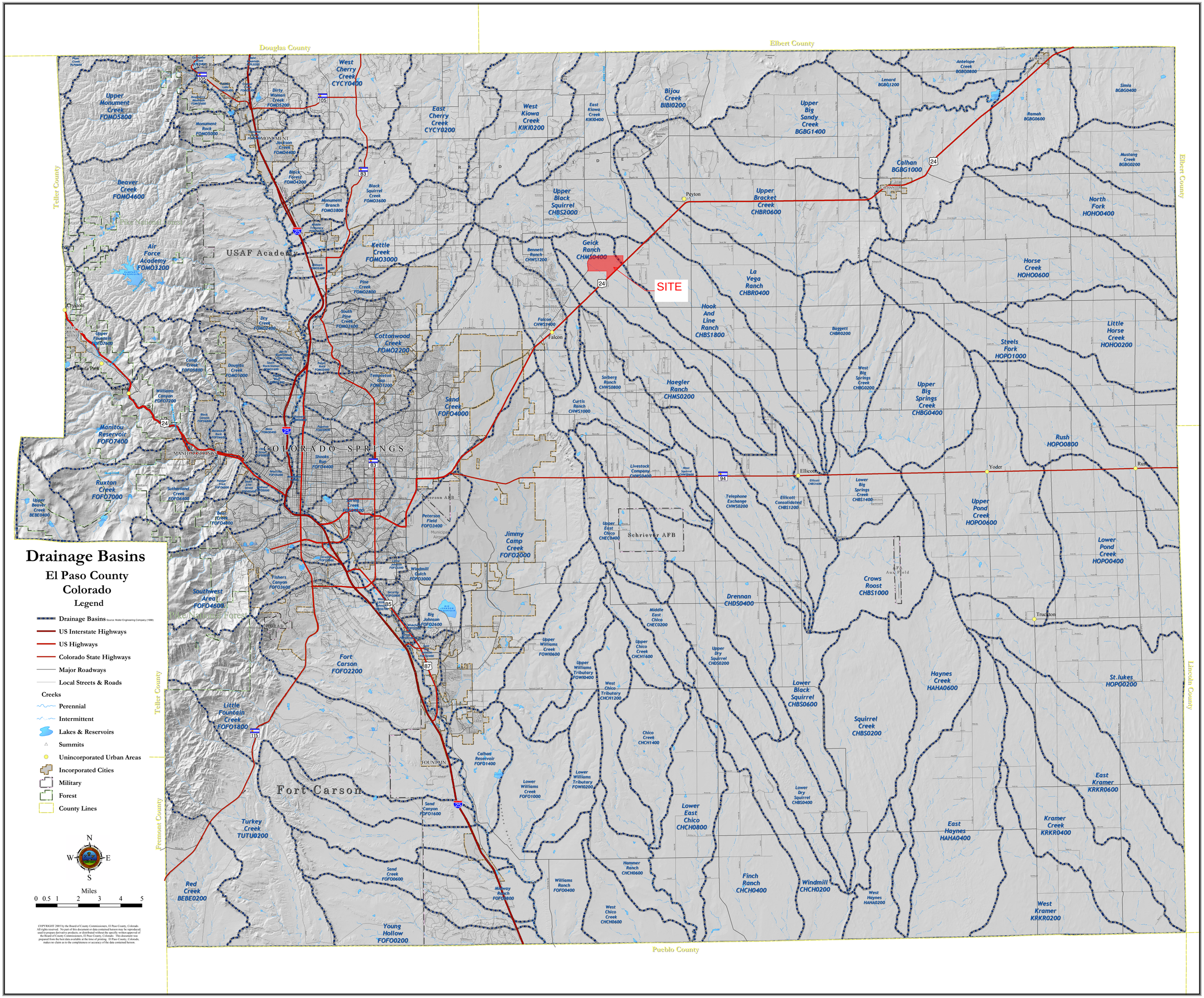
Unnamed Tributary Black Squirrel Creek Drainage Basin, Letter of Map Revision, Elbert Road Site, Kiowa Engineering, February 2006

Geick Ranch Drainage Basin Planning Study (DBPS), Drexel Barrell, October 2010 (not approved)

EPC Engineering Criteria Manual (Appendix I updated July, 2019)

Meridian Ranch MDDP, January 2018

Appendix A


Douglas County
Elbert County
Teller County
Lincoln County
Pueblo County
Fremont County
SITE
Drainage Basins
El Paso County
Colorado
Legend
Drainage Basins Source: Muller Engineering Company (1998)
US Interstate Highways
US Highways
Colorado State Highways
Major Roadways
Local Streets & Roads
Creeks
Perennial
Intermittent
Lakes & Reservoirs
Summits
Unincorporated Urban Areas
Incorporated Cities
Military
Forest
County Lines
N
W
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S
Miles
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Upper Monument Creek FOMO5800
Monument Rock FOMO5000
Beaver Creek FOMO4600
Air Force Academy FOMO3200
USAF Academy
Pike National Forest
West Cherry Creek CYCY0400
Dirty Woman Creek FOMO5200
Jackson Creek FOMO4400
Black Forest FOMO4200
Monument Branch FOMO3800
Black Squirrel Creek FOMO3600
Kettle Creek FOMO3000
Pine Creek FOMO2800
South Pine Creek FOMO2600
Dry Creek FOMO2400
Cottonwood Creek FOMO2200
Templeton Gap FOMO1200
Douglas Creek FOMO1000
Cant Creek FOFO5800
Williams Canyon FOFO7200
Manitou Reservoir FOFO7400
Ruxton Creek FOFO7000
Upper Beaver Creek BEBE0400
Sutherland Creek FOFO6400
Bear Creek FOFO4800
Shooks Run FOFO4400
Spring Creek FOFO4000
Sand Creek FOFO4000
Peterson Field FOFO3400
Fishers Canyon FOFO3600
Southwest Area FOFO4600
Windmill Gulch FOFO3000
Big Johnson FOFO2600
Fort Carson FOFO2200
Little Fountain Creek FOFO1800
Turkey Creek TUTU0200
Red Creek BEBE0200
Sand Creek FOFO0600
Young Hollow FOFO0200
Sand Canyon FOFO1600
Calhan Reservoir FOFO1400
Lower Williams Creek FOFO1000
Upper Williams Creek FOWI0600
Upper Williams Tributary FOWI0400
Lower Williams Tributary FOWI0200
Williams Ranch FOFO0400
Midway Ranch FOFO0800
Upper Black Squirrel CHBS2000
Bennett Ranch CHWS1200
Geick Ranch CHMS0400
Falcon CHWS1400
Solberg Ranch CHWS0800
Curtis Ranch CHWS1000
Livestock Company CHWS0400
West Squirrel CHWS0600
Bijou Creek BIBI0200
East Kiowa Creek KIKI0400
West Kiowa Creek KIKI0200
East Cherry Creek CYCY0200
Upper Big Sandy Creek BGBG1400
Upper Bracket Creek CHBR0600
La Vega Ranch CHBR0400
Hook And Line Ranch CHBS1800
Baggett CHBR0200
Haegler Ranch CHMS0200
Telephone Exchange CHWS0200
Ellicott Consolidated CHBS1200
Ellicott CHBS1600
Lower Big Springs Creek CHBS1400
West Big Springs Creek CHBG0200
Upper Big Springs Creek CHBG0400
Upper Pond Creek HOPO0600
Lower Pond Creek HOPO0400
Rush HOPO0800
Little Horse Creek HOHO0200
Steels Fork HOPO1000
Horse Creek HOHO0600
North Fork HOHO0400
Calhan BGBG1000
Lenard BGBG1200
Antelope Creek BGBG0800
Ramah BGBG0600
Simla BGBG0400
Mustang Creek BGBG0200
Jimmy Camp Creek FOFO2000
Upper East Chico CHEC0400
Middle East Chico CHEC0200
Upper Chico Creek CHCH1600
Upper Dry Squirrel CHBS0200
Drennan CHBS0400
Crows Roost CHBS1000
Lower Black Squirrel CHBS0600
Squirrel Creek CHBS0200
Haynes Creek HAHA0600
St.lukes HOPO0200
East Kramer KRKR0600
Kramer Creek KRKR0400
West Kramer KRKR0200
East Haynes HAHA0400
West Haynes HAHA0200
Windmill CHCH0200
Finch Ranch CHCH0400
Lower East Chico CHCH0800
Lower Dry Squirrel CHBS0400
West Chico Tributary CHCH1200
Chico Creek CHCH1400
Hammer Ranch CHCH0600
West Chico Creek CHCH0600
Schriever AFB
Peyton
Falcon
Calhan
Ellicott
Yoder
Rush
Truckton
Ramah
Cascade
Chipita Park
Crystola
Manitou Springs
COLORADO SPRINGS
Peterson AFB
Fort Carson
FOUNTAIN
Pueblo County

possible updated or additional flood hazard information.

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The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

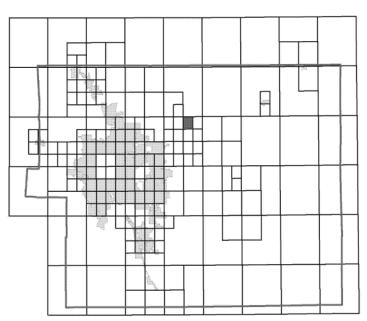
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

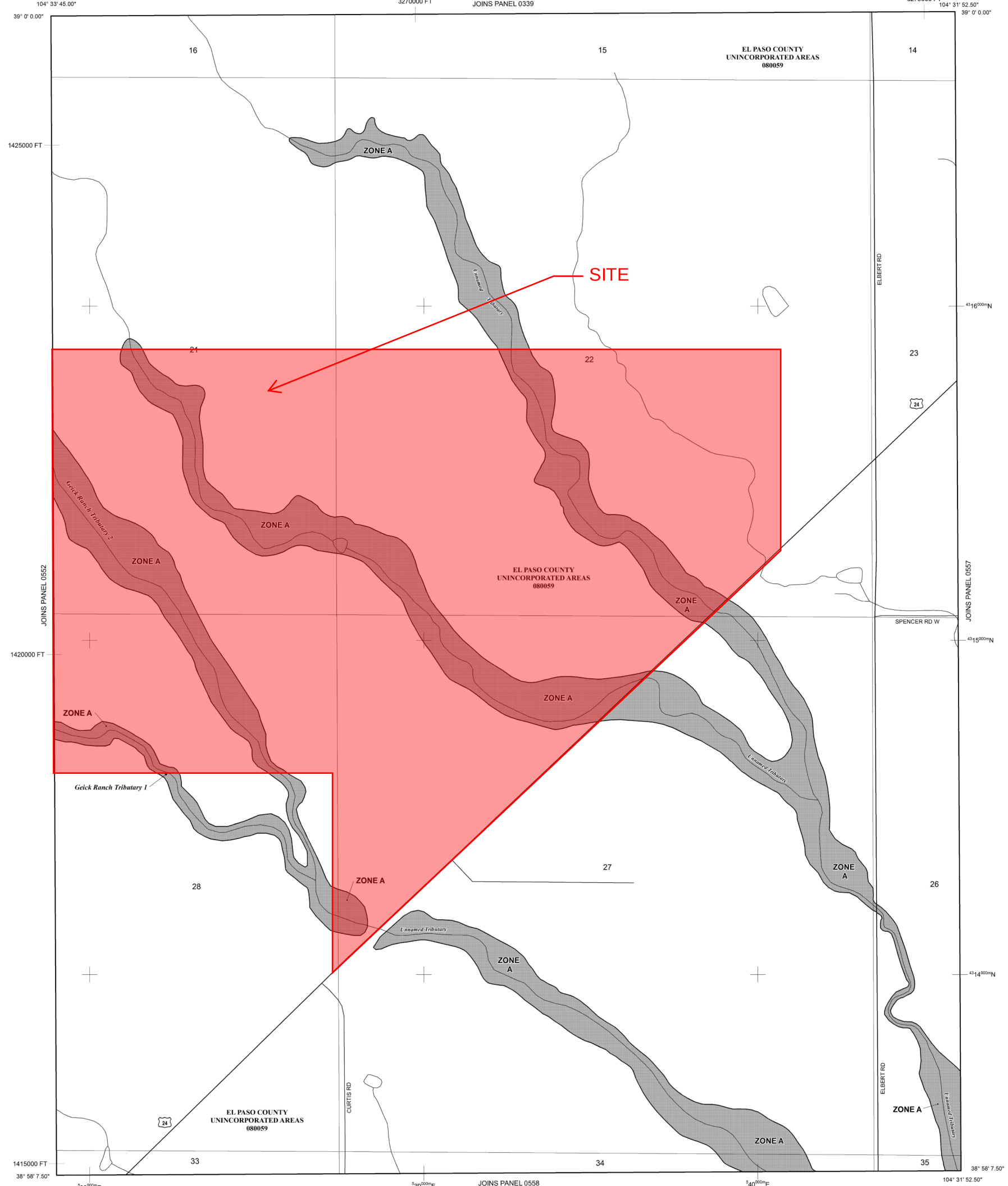
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



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

NATIONAL FLOOD INSURANCE PROGRAM

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

possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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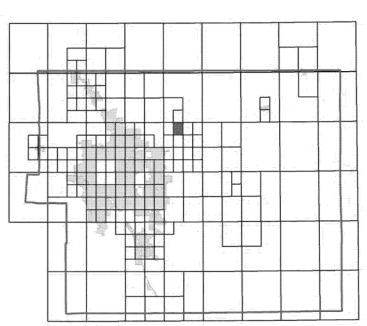

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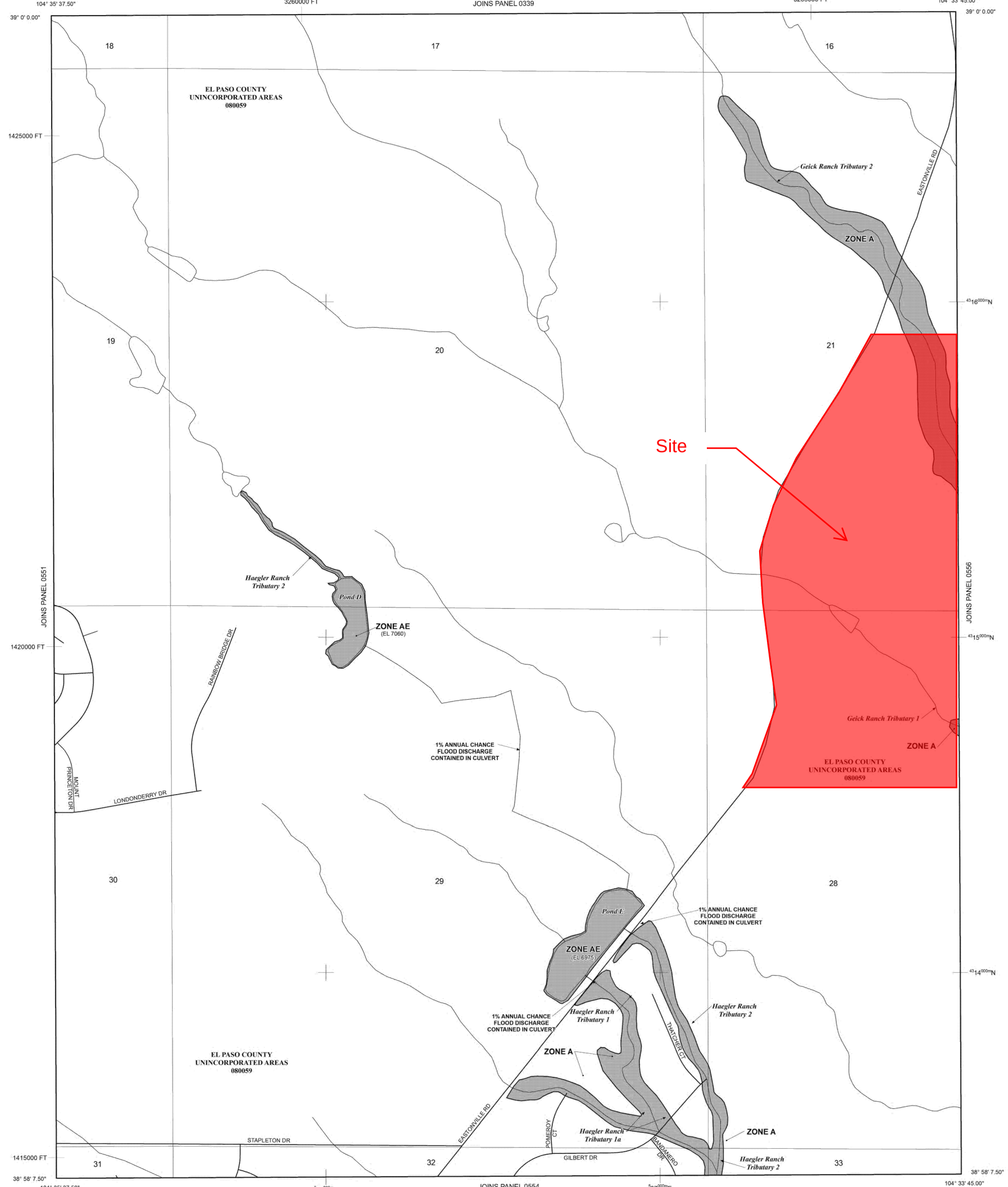

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FLOODWAY AREAS IN ZONE AE

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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

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(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

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

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

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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:

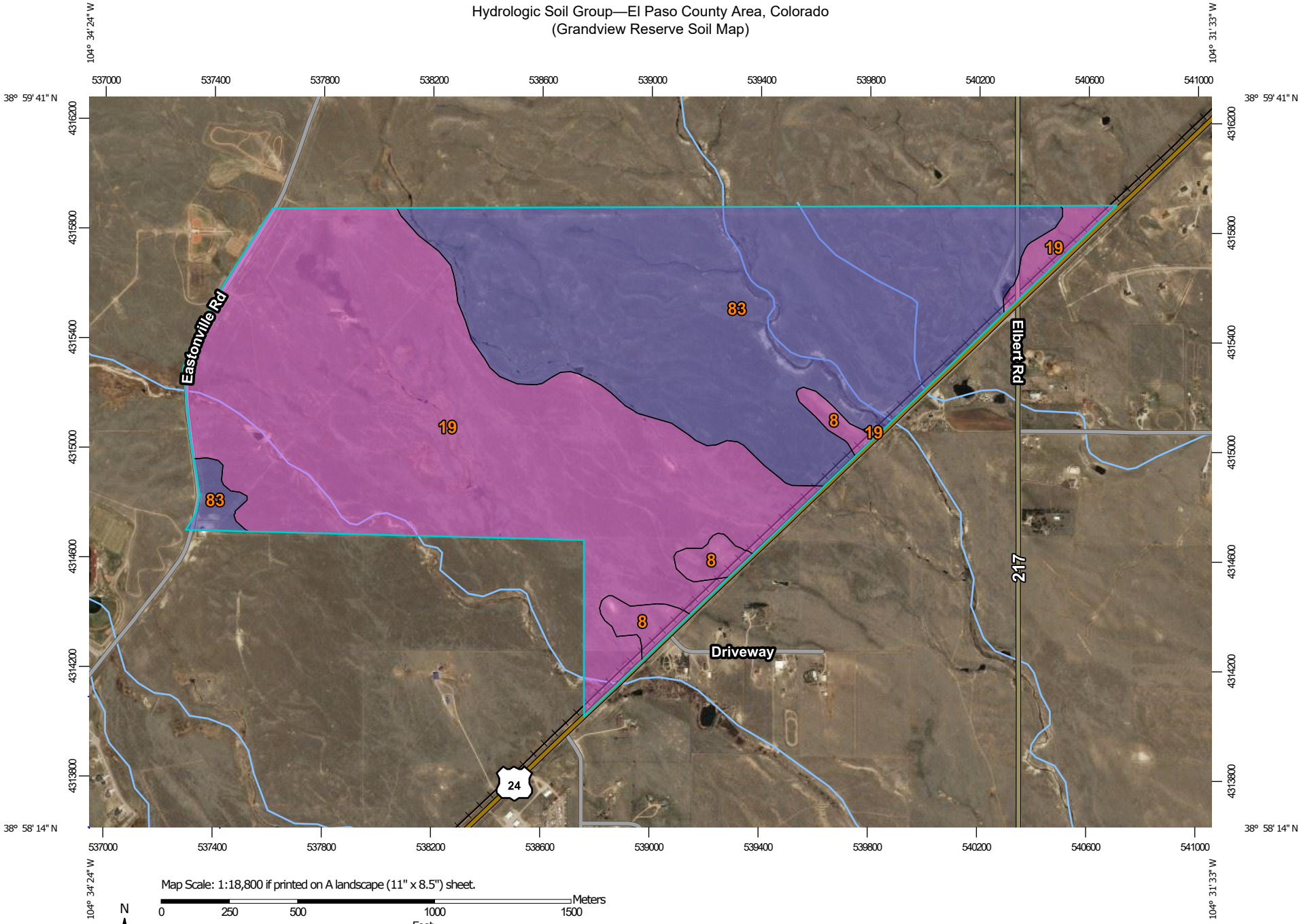
COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0552	G

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

Hydrologic Soil Group—El Paso County Area, Colorado
(Grandview Reserve Soil Map)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	22.4	2.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	450.7	52.5%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	385.4	44.9%
Totals for Area of Interest			**858.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

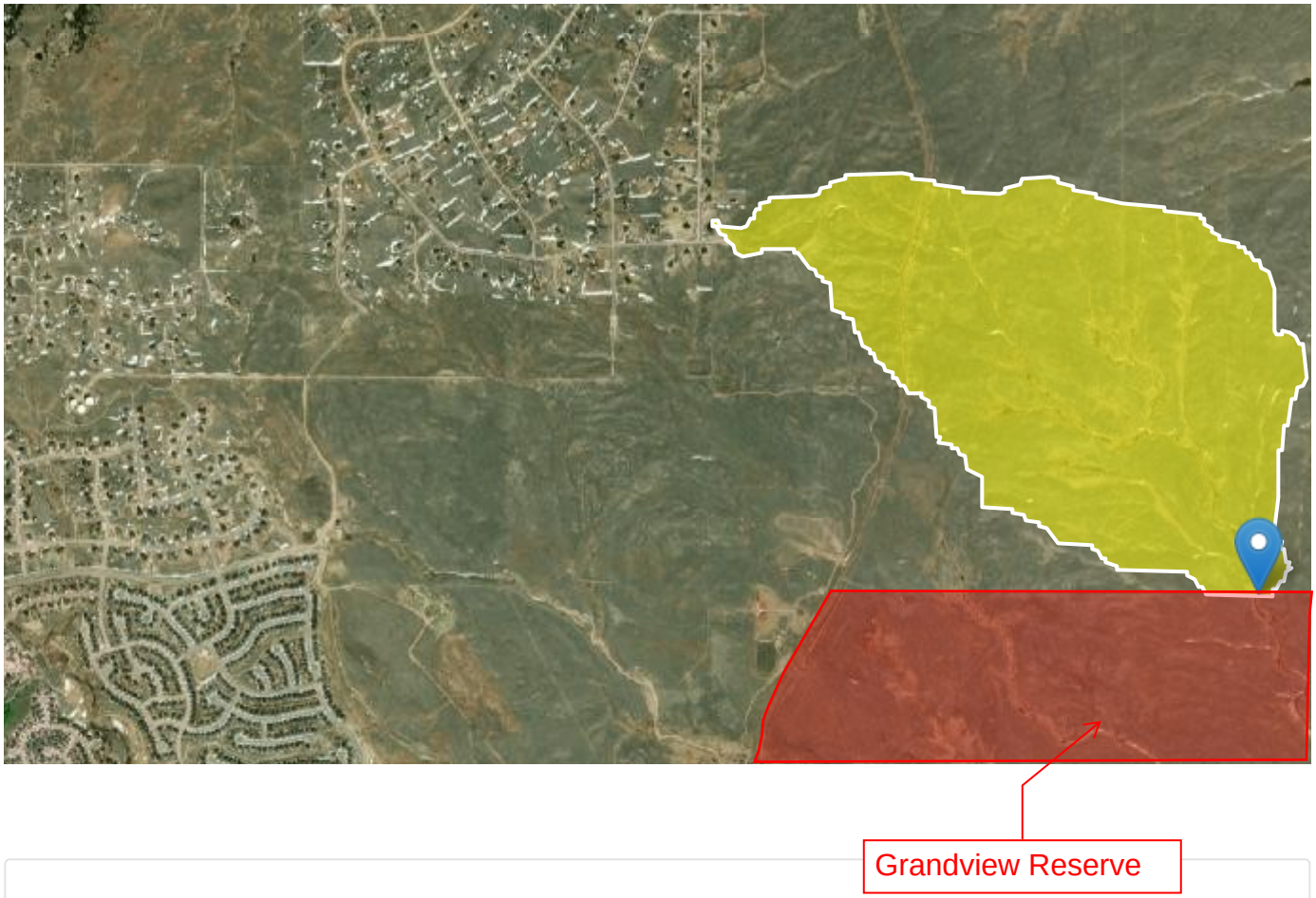
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EAST FORK

Region ID: CO
Workspace ID: CO20200817220340831000
Clicked Point (Latitude, Longitude): 38.99090, -104.54663
Time: 2020-08-17 16:03:57 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	4	percent
DRNAREA	Area that drains to a point on a stream	0.84	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.9	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.86	inches

Parameter Code	Parameter Description	Value	Unit
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	58.28	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.22	dimensionless

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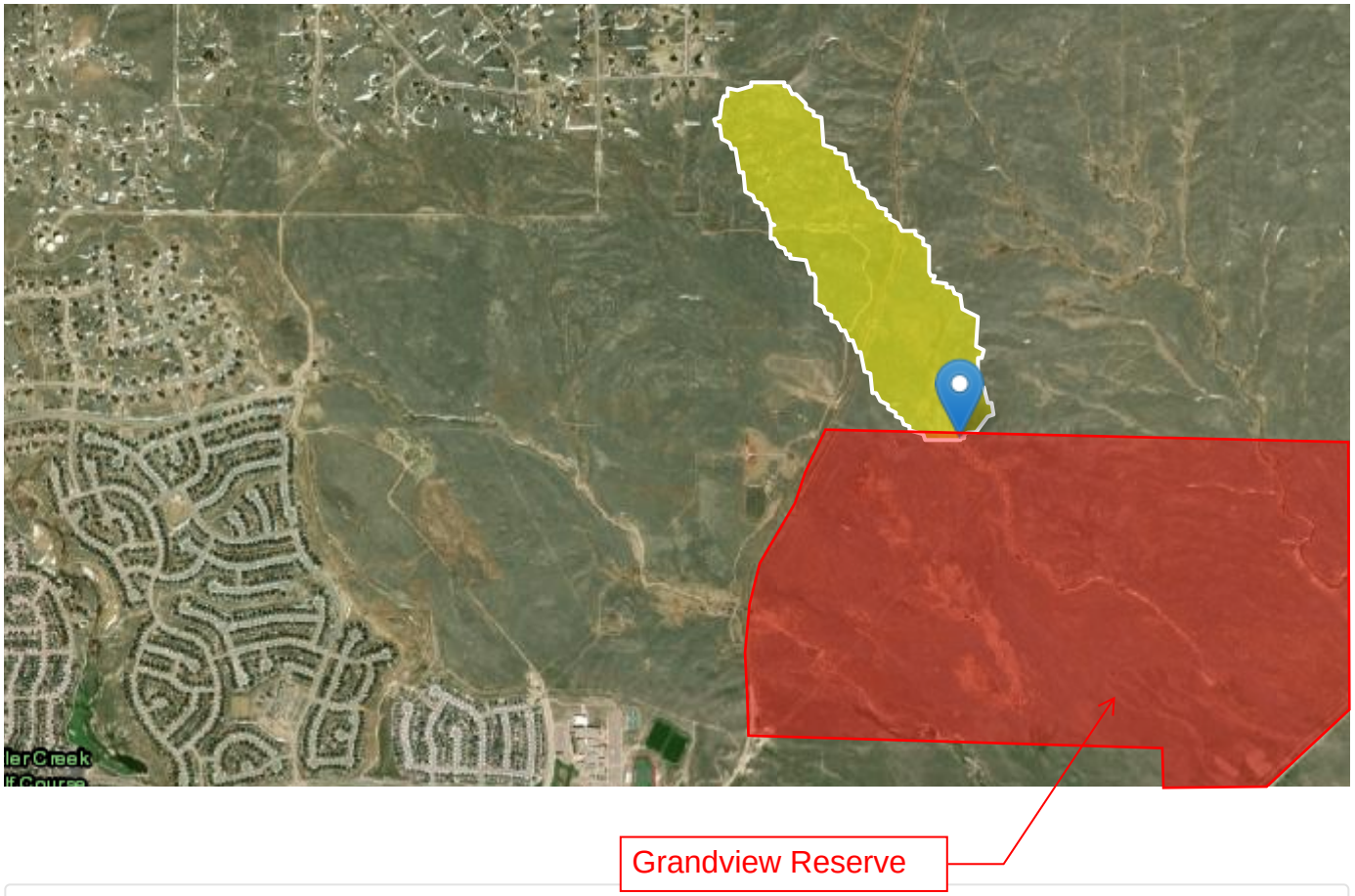
Application Version: 4.4.0

EAST FORK TRIBUTARY BASIN DELINATION

Region ID: CO
Workspace ID: CO20200817220732890000
Clicked Point (Latitude, Longitude): 38.99085, -104.55989
Time: 2020-08-17 16:07:50 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	3	percent
DRNAREA	Area that drains to a point on a stream	0.22	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.92	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.86	inches

Parameter Code	Parameter Description	Value	Unit
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	54.53	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.23	dimensionless

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Application Version: 4.4.0

MAIN STEM

Region ID: CO
Workspace ID: CO20200817221517278000
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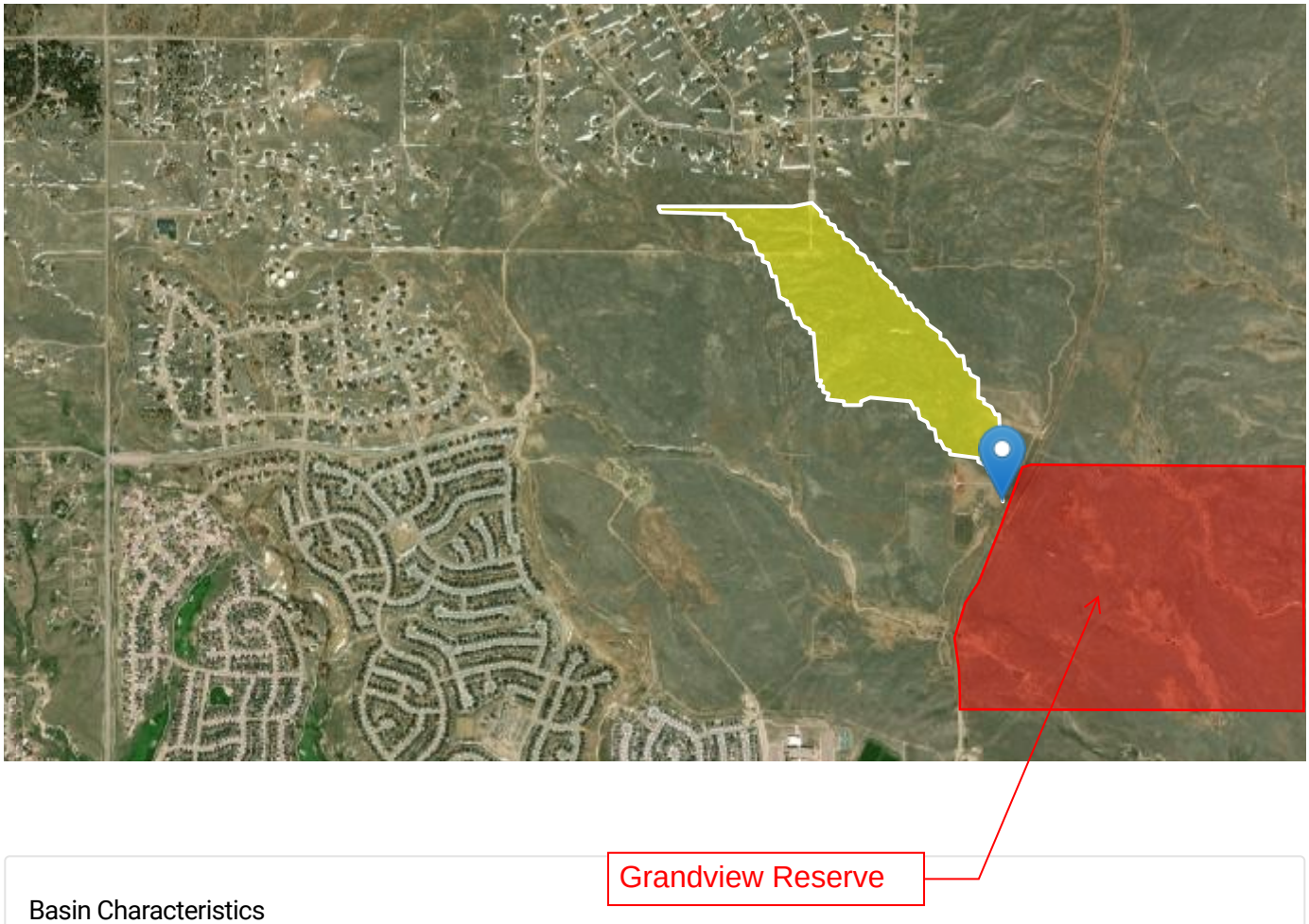
Time: 2020-08-17 16:15:34 -0600



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	3	percent
DRNAREA	Area that drains to a point on a stream	0.17	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.87	inches

Parameter Code	Parameter Description	Value	Unit
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	55.04	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.22	dimensionless

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Application Version: 4.4.0

MAIN STEM TRIBUTARY NUMBER 2

Region ID: CO
Workspace ID: CO20200817221139984000
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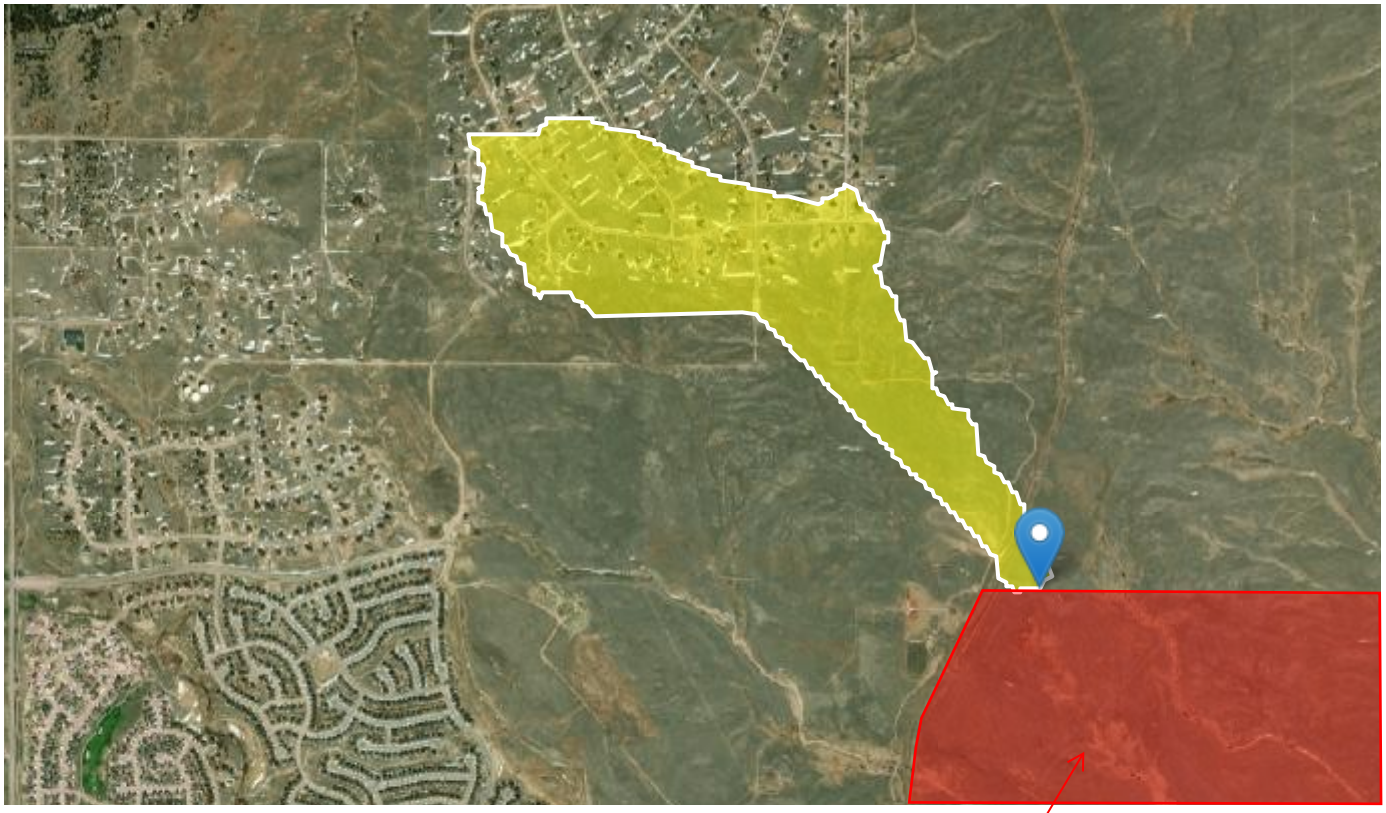
Time: 2020-08-17 16:11:57 -0600



Grandview Reserve

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	3	percent
DRNAREA	Area that drains to a point on a stream	0.44	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.94	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.87	inches

Parameter Code	Parameter Description	Value	Unit
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	56.49	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.23	dimensionless

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Application Version: 4.4.0

Appendix B

Basin Description	Park/Open Space	High Density/Schools	Med/High Density	Med Density	Low Density	Commercial	Total Impervious	Total Acreage	Composite Percent Impervious	Predominant Soil Group	5 Year C Factor	100 Year C Factor
Impervious Percentage	10%	65%	55%	45%	25%	75%						
A1	12.68	0.00	0.00	32.70	0.00	0.00	15.98	45.38	35.22%	B	0.38	0.71
					Pond A			**45.38**	**35.22%**			
B1	0.00	0.00	0.00	37.00	0.00	0.00	16.65	37.00	45.00%	A	0.4	0.61
B2	1.24	0.00	0.00	23.65	0.00	0.00	10.77	24.89	43.26%	A	0.38	0.59
B3	7.42	12.64	53.20	45.64	0.00	0.00	58.76	118.90	49.42%	A	0.36	0.5
					Pond B			**180.79**	**47.66%**			
C1	4.19	30.61	1.70	41.33	0.00	0.00	39.85	77.83	51.20%	A	0.38	0.59
					Pond C			**77.83**	**51.20%**			
D1	0.60	0.00	0.00	23.73	0.00	0.00	10.74	24.33	44.14%	A	0.39	0.6
D2	5.60	64.10	0.00	0.00	0.00	8.20	48.38	77.90	62.10%	A	0.39	0.6
					Pond D			**102.23**	**57.82%**			
E1	32.26	0.00	0.00	0.00	56.34	0.00	17.31	88.60	19.54%	B	0.12	0.59
					Pond E			**88.60**	**19.54%**			
F1	0.00	0.00	0.00	0.00	33.73	0.00	8.43	33.73	25.00%	B	0.15	0.61
F2	18.34	40.50	0.00	0.00	0.00	8.80	34.76	67.64	51.39%	B	0.36	0.7
F3	0.00	0.00	0.00	12.84	0.00	0.00	5.78	12.84	45.00%	B	0.45	0.74
F4	6.24	0.00	29.80	15.77	0.00	0.00	24.11	51.81	46.54%	B	0.37	0.64
					Pond F			**166.02**	**44.02%**			
G1	4.88	0.00	0.00	15.25	0.00	0.00	7.35	20.13	36.52%	B	0.25	0.66
G2	0.00	0.00	0.00	0.00	15.14	0.00	3.79	15.14	25.00%	B	0.45	0.74
					Pond G			**35.27**	**31.57%**			
H1	0.70	0.00	0.00	0.00	20.01	0.00	5.07	20.71	24.49%	A	0.38	0.75
H2	0.70	0.00	0.00	17.85	0.00	0.00	8.10	18.55	43.68%	B	0.43	0.75
H3	0.76	0.00	0.00	5.25	0.00	0.00	2.44	6.01	40.57%	B	0.4	0.72
H4	5.34	0.00	0.00	22.31	0.00	0.00	10.57	27.65	38.24%	B	0.37	0.7
					Pond H			**72.92**	**35.91%**			

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A1		0.157	0.143	37.3	5.59	19.4	3.95	9.3	57	164,729	0.25	40,666	35.0	13	40,592	0.29
B1		0.158	0.131	33.0	4.82	17.2	3.41	8.0	53	134,310	0.08	11,390	35.0	4	11,363	0.12
B2		0.158	0.109	58.5	6.42	30.4	4.54	10.7	20	90,351	0.08	7,662	40.0	2	7,665	0.07
B3		0.158	0.221	39.1	8.15	20.3	5.76	13.6	142	431,607	0.08	36,602	40.0	12	36,572	0.10
C1		0.158	0.183	30.3	5.75	15.7	4.06	9.6	120	281,797	0.08	23,898	35.0	10	23,870	0.13
D1		0.157	0.108	31.5	4.11	16.4	2.91	6.9	36	88,318	0.25	21,803	35.0	8	21,721	0.33
D2		0.157	0.182	37.7	6.77	19.6	4.78	11.3	97	282,777	0.25	69,809	40.0	22	69,820	0.29
E1		0.157	0.193	28.9	5.77	15.0	4.08	9.6	144	321,618	0.25	79,397	35.0	32	79,287	0.37
F1		0.157	0.125	37.2	5.07	19.4	3.58	8.5	42	122,440	0.25	30,227	35.0	10	30,151	0.29
F2		0.157	0.171	45.1	7.42	23.5	5.24	12.4	70	245,533	0.25	60,614	40.0	16	60,563	0.24
F3		0.157	0.081	37.8	3.84	19.6	2.72	6.4	16	46,609	0.25	11,506	35.0	4	11,472	0.28
F4		0.157	0.151	43.2	6.52	22.5	4.61	10.9	56	186,981	0.25	46,160	40.0	13	46,174	0.25
G1		0.157	0.099	38.8	4.45	20.2	3.14	7.4	24	73,072	0.25	18,039	35.0	6	17,996	0.28
G2		0.157	0.087	42.3	4.33	22.0	3.06	7.2	17	54,958	0.25	13,567	35.0	4	13,536	0.26
H1		0.158	0.101	43.7	4.89	22.7	3.45	8.1	22	75,177	0.08	6,375	35.0	2	6,365	0.09
H2		0.157	0.095	37.0	4.21	19.2	2.97	7.0	24	67,337	0.25	16,623	35.0	5	16,581	0.29
H3		0.157	0.057	32.6	2.94	16.9	2.08	4.9	9	21,816	0.25	5,384	35.0	2	5,324	0.32
H4		0.157	0.114	36.7	4.72	19.1	3.33	7.9	35	100,370	0.25	24,778	35.0	8	24,718	0.29

Printouts for Storm Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.11	0.05	0.01	0.08	0.10	0.09	0.16	0.27	0.09	0.10	0.04	0.09	0.06	0.04	0.02	0.06	0.02	0.08
25	4.37	0.49	0.15	0.79	0.97	3.50	6.05	10.68	3.53	3.91	1.60	3.64	2.24	1.57	0.20	2.24	0.93	3.12
30	10.53	3.60	1.09	6.02	7.25	7.38	16.27	26.19	8.12	11.07	3.32	9.60	4.86	3.39	1.51	4.78	1.85	6.93
35	13.03	4.33	1.65	10.87	9.95	8.12	21.83	32.34	9.70	15.57	3.65	12.69	5.57	3.87	1.85	5.37	1.92	8.07
40	12.83	4.07	1.66	11.85	9.38	7.47	22.23	30.31	9.45	16.46	3.47	12.98	5.40	3.78	1.79	5.14	1.75	7.79
45	11.55	3.53	1.62	11.26	7.98	6.50	20.38	26.01	8.49	15.82	3.11	12.23	4.86	3.47	1.67	4.59	1.53	6.96
50	10.17	3.04	1.54	10.00	6.77	5.67	17.95	22.15	7.48	14.39	2.76	11.00	4.32	3.11	1.50	4.06	1.35	6.14
55	9.05	2.66	1.43	8.60	5.79	4.90	15.88	18.86	6.66	12.88	2.47	9.83	3.87	2.81	1.33	3.61	1.17	5.45
60	7.99	2.29	1.30	7.68	4.93	4.29	14.03	16.29	5.88	11.66	2.18	8.89	3.45	2.54	1.21	3.19	1.03	4.80
65	7.10	2.03	1.20	6.77	4.36	3.80	12.42	14.16	5.23	10.56	1.95	8.00	3.08	2.27	1.09	2.84	0.92	4.27
70	6.40	1.81	1.12	5.94	3.79	3.34	11.15	12.11	4.73	9.49	1.77	7.19	2.79	2.06	0.98	2.57	0.82	3.86
75	5.77	1.58	1.04	5.41	3.22	2.88	10.06	10.06	4.26	8.60	1.60	6.55	2.52	1.88	0.89	2.31	0.71	3.47
80	5.13	1.36	0.96	4.88	2.66	2.41	8.99	8.20	3.79	7.91	1.42	5.99	2.27	1.72	0.82	2.05	0.60	3.07
85	4.50	1.14	0.88	4.36	2.14	2.00	7.91	6.93	3.32	7.26	1.25	5.45	2.01	1.56	0.75	1.79	0.50	2.68
90	3.87	0.93	0.82	3.84	1.88	1.73	6.84	6.11	2.85	6.61	1.08	4.92	1.75	1.39	0.68	1.53	0.43	2.28
95	3.26	0.83	0.77	3.32	1.69	1.55	5.78	5.38	2.41	5.96	0.91	4.39	1.50	1.23	0.61	1.30	0.38	1.94
100	2.83	0.75	0.72	2.81	1.50	1.38	4.97	4.66	2.10	5.31	0.79	3.85	1.29	1.07	0.54	1.14	0.35	1.70
105	2.57	0.68	0.68	2.39	1.31	1.22	4.48	3.95	1.91	4.67	0.72	3.32	1.15	0.92	0.47	1.04	0.31	1.55
110	2.35	0.60	0.63	2.21	1.12	1.06	4.09	3.25	1.74	4.03	0.66	2.90	1.06	0.82	0.40	0.95	0.27	1.41
115	2.13	0.53	0.58	2.03	0.93	0.90	3.72	2.54	1.58	3.55	0.60	2.63	0.97	0.76	0.36	0.86	0.24	1.27
120	1.92	0.45	0.53	1.86	0.74	0.74	3.35	1.84	1.42	3.27	0.54	2.44	0.88	0.70	0.34	0.77	0.20	1.14
125	1.70	0.38	0.49	1.68	0.55	0.58	2.99	1.14	1.26	3.04	0.49	2.25	0.79	0.64	0.31	0.68	0.16	1.01
130	1.49	0.30	0.44	1.50	0.36	0.43	2.63	0.49	1.10	2.81	0.43	2.07	0.71	0.59	0.29	0.59	0.13	0.87
135	1.28	0.22	0.39	1.33	0.17	0.27	2.27	0.14	0.94	2.59	0.37	1.89	0.62	0.53	0.26	0.51	0.09	0.74
140	1.06	0.15	0.35	1.15	0.01	0.12	1.91	0.06	0.79	2.37	0.31	1.71	0.53	0.48	0.24	0.42	0.05	0.61
145	0.85	0.08	0.33	0.98	0.01	0.03	1.55	0.04	0.63	2.16	0.25	1.53	0.45	0.42	0.22	0.33	0.02	0.47
150	0.64	0.01	0.31	0.80	0.01	0.01	1.19	0.03	0.47	1.94	0.20	1.35	0.36	0.37	0.19	0.25	0.01	0.34
155	0.43	0.00	0.29	0.62	0.01	0.01	0.84	0.02	0.32	1.72	0.14	1.17	0.28	0.32	0.17	0.16	0.00	0.21
160	0.22	0.00	0.28	0.45	0.00	0.01	0.48	0.02	0.16	1.51	0.08	0.99	0.19	0.26	0.15	0.07	0.00	0.09
165	0.08	0.00	0.26	0.27	0.00	0.00	0.19	0.01	0.06	1.29	0.03	0.81	0.11	0.21	0.12	0.02	0.00	0.03
170	0.03	0.00	0.24	0.11	0.00	0.00	0.06	0.01	0.02	1.07	0.01	0.64	0.04	0.15	0.10	0.01	0.00	0.01
175	0.01	0.00	0.23	0.01	0.00	0.00	0.03	0.00	0.01	0.86	0.00	0.46	0.01	0.10	0.07	0.01	0.00	0.01
180	0.01	0.00	0.21	0.01	0.00	0.00	0.02	0.00	0.01	0.64	0.00	0.28	0.01	0.05	0.05	0.00	0.00	0.01
185	0.01	0.00	0.20	0.01	0.00	0.00	0.01	0.00	0.01	0.43	0.00	0.12	0.00	0.01	0.03	0.00	0.00	0.00
190	0.01	0.00	0.18	0.00	0.00	0.00	0.01	0.00	0.00	0.22	0.00	0.03	0.00	0.01	0.01	0.00	0.00	0.00
195	0.00	0.00	0.16	0.00	0.00	0.00	0.01	0.00	0.00	0.07	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
200	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
205	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
210	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
215	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
225	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
230	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
235	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
240	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
245	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
260	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
275	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
280	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
285	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
290	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
295	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
305	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
310	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
315	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
325	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
330	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
335	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
340	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Printouts for Unit Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	40.28	42.09	12.13	63.61	82.42	32.48	55.24	98.24	32.62	35.61	14.87	33.35	20.73	14.60	17.60	20.82	8.64	28.84
10	57.05	52.23	19.82	128.67	120.14	35.66	95.11	143.90	42.37	66.66	15.76	55.34	24.18	16.70	22.15	23.32	8.39	35.18
15	55.14	49.14	19.80	142.11	113.71	32.86	95.34	135.22	40.64	69.88	14.91	55.08	23.11	16.08	21.50	22.10	7.65	33.53
20	50.23	42.59	19.29	135.55	96.28	27.58	88.48	111.47	36.78	67.16	13.37	52.19	21.00	14.87	20.10	19.77	6.45	30.09
25	42.58	36.47	18.42	120.63	81.39	24.10	76.12	94.77	31.35	61.81	11.56	47.11	18.05	13.08	17.96	17.02	5.72	25.74
30	38.19	31.93	17.17	102.86	69.70	20.86	66.79	79.97	28.11	53.81	10.39	40.94	16.29	11.74	15.92	15.24	4.99	23.02
35	33.80	27.39	15.55	91.99	58.90	17.81	59.27	68.09	24.87	48.71	9.22	37.24	14.54	10.64	14.50	13.46	4.28	20.30
40	29.41	24.26	14.30	81.13	52.19	15.90	51.76	59.63	21.63	44.21	8.05	33.54	12.78	9.53	13.08	11.71	3.85	17.61
45	26.49	21.61	13.35	70.68	45.48	14.00	46.02	51.18	19.57	39.70	7.32	29.84	11.49	8.43	11.66	10.66	3.41	16.01
50	23.93	18.96	12.40	64.49	38.78	12.09	41.69	42.72	17.67	35.20	6.62	26.88	10.45	7.76	10.59	9.61	2.98	14.41
55	21.37	16.30	11.45	58.31	32.07	10.19	37.36	34.27	15.77	32.56	5.93	24.72	9.41	7.10	9.75	8.56	2.54	12.81
60	18.81	13.65	10.50	52.12	25.36	8.28	33.03	27.80	13.87	29.94	5.23	22.56	8.38	6.45	8.92	7.50	2.10	11.21
65	16.25	11.00	9.72	45.94	22.24	6.95	28.70	24.98	11.97	27.33	4.53	20.40	7.34	5.79	8.08	6.45	1.71	9.61
70	13.69	9.78	9.16	39.75	20.01	6.31	24.37	22.16	10.07	24.72	3.84	18.25	6.30	5.14	7.24	5.40	1.56	8.01
75	11.32	8.90	8.59	33.57	17.77	5.68	20.04	19.34	8.39	22.11	3.17	16.09	5.27	4.48	6.40	4.58	1.42	6.85
80	10.47	8.01	8.03	28.12	15.53	5.04	18.15	16.52	7.75	19.50	2.94	13.93	4.65	3.83	5.56	4.23	1.27	6.31
85	9.62	7.13	7.47	26.06	13.30	4.41	16.71	13.70	7.12	16.89	2.71	11.77	4.31	3.30	4.72	3.88	1.13	5.78
90	8.76	6.25	6.91	24.00	11.06	3.77	15.27	10.89	6.49	14.28	2.48	10.65	3.96	3.08	4.25	3.53	0.98	5.25
95	7.91	5.36	6.34	21.94	8.83	3.14	13.82	8.07	5.86	13.26	2.24	9.93	3.62	2.86	3.97	3.18	0.84	4.71
100	7.06	4.48	5.78	19.87	6.59	2.50	12.38	5.25	5.22	12.39	2.01	9.21	3.27	2.64	3.69	2.83	0.69	4.18
105	6.20	3.59	5.22	17.81	4.36	1.87	10.94	2.43	4.59	11.51	1.78	8.49	2.92	2.42	3.41	2.48	0.55	3.65
110	5.35	2.71	4.65	15.75	2.12	1.23	9.49	0.00	3.96	10.64	1.55	7.77	2.58	2.20	3.13	2.13	0.40	3.11
115	4.50	1.82	4.09	13.69	0.00	0.60	8.05		3.32	9.77	1.32	7.05	2.23	1.99	2.85	1.78	0.26	2.58
120	3.64	0.94	3.83	11.63		0.00	6.61		2.69	8.90	1.08	6.33	1.89	1.77	2.57	1.43	0.11	2.04
125	2.79	0.06	3.65	9.57			5.17		2.06	8.03	0.85	5.62	1.54	1.55	2.29	1.08	0.00	1.51
130	1.94	0.00	3.46	7.50			3.72		1.43	7.16	0.62	4.90	1.20	1.33	2.02	0.72		0.98
135	1.08		3.27	5.44			2.28		0.79	6.29	0.39	4.18	0.85	1.11	1.74	0.37		0.44
140	0.23		3.08	3.38			0.84		0.16	5.42	0.16	3.46	0.50	0.89	1.46	0.02		0.00
145	0.00		2.90	1.32			0.00		0.00	4.55	0.00	2.74	0.16	0.68	1.18	0.00		
150			2.71	0.00						3.68		2.02	0.00	0.46	0.90			
155			2.52							2.81		1.30		0.24	0.62			
160			2.33							1.94		0.58		0.02	0.34			
165			2.15							1.07		0.00		0.00	0.06			
170			1.96							0.20					0.00			
175			1.77							0.00								
180			1.58															
185			1.40															
190			1.21															
195			1.02															
200			0.83															
205			0.64															
210			0.46															
215			0.27															
220			0.08															
225			0.00															

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A1		0.156	0.142	37.3	5.57	19.4	3.93	9.3	57	164,729	1.56	257,605	45.0	67	257,125	1.47
B1		0.157	0.130	33.0	4.80	17.2	3.39	8.0	53	134,310	1.17	157,714	40.0	49	157,336	1.32
B2		0.157	0.109	58.5	6.39	30.4	4.52	10.6	20	90,351	1.17	106,094	50.0	21	106,130	0.83
B3		0.157	0.220	39.1	8.11	20.3	5.73	13.5	142	431,607	1.17	506,815	45.0	140	506,418	1.18
C1		0.157	0.182	30.3	5.72	15.7	4.04	9.5	120	281,797	1.17	330,900	40.0	111	330,490	1.43
D1		0.156	0.107	31.5	4.10	16.4	2.90	6.8	36	88,318	1.56	138,112	40.0	40	137,590	1.64
D2		0.156	0.181	37.7	6.75	19.6	4.77	11.2	97	282,777	1.56	442,208	45.0	115	442,279	1.47
E1		0.156	0.192	28.8	5.76	15.0	4.07	9.6	144	321,618	1.56	502,948	40.0	158	502,220	1.78
F1		0.156	0.124	37.2	5.06	19.4	3.57	8.4	42	122,440	1.56	191,472	45.0	49	190,993	1.47
F2		0.156	0.170	45.1	7.40	23.5	5.23	12.3	70	245,533	1.56	383,966	50.0	87	383,641	1.28
F3		0.156	0.081	37.7	3.83	19.6	2.71	6.4	16	46,609	1.56	72,888	45.0	18	72,670	1.43
F4		0.156	0.150	43.2	6.50	22.5	4.59	10.8	56	186,981	1.56	292,403	45.0	68	292,494	1.32
G1		0.156	0.099	38.8	4.44	20.2	3.14	7.4	24	73,072	1.56	114,270	45.0	28	113,996	1.41
G2		0.156	0.087	42.3	4.31	22.0	3.05	7.2	17	54,958	1.56	85,944	45.0	20	85,743	1.32
H1		0.157	0.100	43.7	4.86	22.7	3.44	8.1	22	75,177	1.17	88,277	45.0	22	88,139	1.06
H2		0.156	0.095	37.0	4.20	19.2	2.97	7.0	24	67,337	1.56	105,301	45.0	27	105,031	1.46
H3		0.156	0.057	32.6	2.93	16.9	2.07	4.9	9	21,816	1.56	34,116	40.0	10	33,729	1.58
H4		0.156	0.114	36.7	4.70	19.1	3.32	7.8	35	100,370	1.56	156,958	45.0	41	156,578	1.48

Printouts for Storm Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
20	0.19	0.10	0.03	0.16	0.20	0.16	0.27	0.47	0.16	0.17	0.07	0.16	0.10	0.07	0.04	0.10	0.04	0.14
25	8.12	3.13	0.92	4.86	6.18	6.49	11.23	19.84	6.56	7.27	2.97	6.77	4.15	2.92	1.31	4.16	1.72	5.78
30	34.59	26.76	8.08	44.30	53.77	25.80	50.87	85.32	27.24	33.89	11.70	30.29	16.76	11.74	11.22	16.64	6.64	23.63
35	55.93	43.27	15.49	97.67	95.72	36.82	90.40	139.23	42.28	63.07	16.51	52.88	24.75	17.20	18.33	24.08	8.94	35.59
40	64.93	48.76	18.92	129.21	110.70	40.00	109.38	157.99	48.34	79.01	18.22	63.75	27.87	19.43	21.16	26.79	9.51	40.19
45	66.80	48.19	20.36	140.35	108.85	39.34	114.87	155.63	49.45	85.76	18.42	67.82	28.46	20.06	21.89	27.12	9.32	40.86
50	64.59	44.98	20.74	138.21	100.81	37.49	112.26	146.93	47.76	86.73	17.78	67.62	27.55	19.63	21.22	26.14	8.91	39.39
55	61.26	40.75	20.19	127.94	90.29	34.77	106.51	135.02	45.25	83.59	16.83	64.71	26.19	18.75	19.74	24.71	8.30	37.23
60	57.64	36.45	19.11	117.17	79.70	32.18	100.16	123.69	42.57	79.90	15.87	61.71	24.78	17.90	18.34	23.24	7.72	34.96
65	54.17	32.98	18.06	106.73	71.53	30.21	94.06	114.66	40.04	76.47	14.98	58.85	23.43	17.05	17.02	21.88	7.28	32.86
70	49.50	29.39	16.95	95.81	63.09	26.87	86.32	101.69	36.49	71.24	13.57	54.41	21.31	15.53	15.43	19.83	6.47	29.87
75	44.49	25.88	15.77	86.25	54.40	23.41	77.73	86.59	32.81	64.76	12.22	49.38	19.24	14.13	13.98	17.82	5.68	26.80
80	39.66	22.48	14.61	77.59	45.94	20.04	69.44	72.09	29.24	59.04	10.92	44.90	17.27	12.84	12.74	15.86	4.91	23.82
85	35.05	19.22	13.48	69.37	38.02	16.98	61.48	60.25	25.85	53.80	9.69	40.70	15.40	11.62	11.61	14.01	4.19	20.99
90	30.75	16.13	12.47	61.54	32.26	14.46	54.04	51.51	22.66	48.89	8.53	36.78	13.66	10.48	10.54	12.25	3.57	18.32
95	26.60	13.89	11.62	54.03	28.03	12.58	46.90	44.50	19.60	44.35	7.40	33.11	11.95	9.39	9.51	10.59	3.11	15.80
100	22.94	12.24	10.86	46.67	24.54	11.06	40.40	38.42	16.94	39.99	6.40	29.55	10.37	8.32	8.50	9.19	2.75	13.72
105	20.31	10.86	10.14	40.05	21.41	9.70	35.55	32.88	15.01	35.72	5.68	26.07	9.12	7.30	7.50	8.16	2.43	12.18
110	18.18	9.62	9.45	35.53	18.50	8.47	31.77	27.72	13.44	31.55	5.10	22.87	8.17	6.44	6.54	7.31	2.14	10.90
115	16.30	8.47	8.77	32.01	15.69	7.31	28.48	22.84	12.06	27.80	4.58	20.38	7.35	5.79	5.80	6.55	1.87	9.75
120	14.59	7.37	8.10	28.94	12.97	6.22	25.53	18.25	10.79	24.99	4.12	18.44	6.63	5.26	5.26	5.86	1.61	8.71
125	13.00	6.29	7.44	26.14	10.33	5.18	22.79	13.83	9.62	22.73	3.68	16.78	5.96	4.78	4.81	5.22	1.37	7.73
130	11.49	5.24	6.78	23.51	7.70	4.19	20.20	9.50	8.50	20.76	3.27	15.27	5.33	4.35	4.41	4.61	1.14	6.80
135	10.07	4.20	6.11	20.95	5.08	3.19	17.76	5.87	7.45	18.98	2.89	13.89	4.74	3.94	4.05	4.03	0.92	5.93
140	8.73	3.16	5.48	18.46	2.69	2.20	15.47	3.75	6.46	17.33	2.52	12.59	4.18	3.56	3.69	3.48	0.69	5.09
145	7.39	2.12	5.01	16.03	1.47	1.36	13.20	2.42	5.47	15.78	2.16	11.37	3.64	3.20	3.35	2.93	0.47	4.26
150	6.05	1.15	4.66	13.61	0.84	0.87	10.94	1.51	4.47	14.31	1.79	10.21	3.10	2.86	3.02	2.38	0.29	3.42
155	4.72	0.63	4.37	11.19	0.46	0.56	8.68	0.88	3.48	12.94	1.43	9.09	2.55	2.51	2.69	1.83	0.18	2.58
160	3.38	0.36	4.11	8.77	0.25	0.35	6.42	0.45	2.49	11.57	1.06	7.96	2.01	2.17	2.36	1.28	0.12	1.77
165	2.17	0.20	3.86	6.35	0.13	0.20	4.29	0.17	1.60	10.20	0.72	6.83	1.47	1.83	2.03	0.80	0.07	1.09
170	1.37	0.11	3.63	3.98	0.05	0.11	2.67	0.04	1.00	8.84	0.44	5.70	0.97	1.49	1.70	0.51	0.04	0.70
175	0.88	0.05	3.40	2.12	0.01	0.04	1.71	0.03	0.65	7.48	0.28	4.58	0.60	1.15	1.37	0.33	0.02	0.45
180	0.56	0.02	3.18	1.17	0.00	0.01	1.09	0.02	0.41	6.11	0.18	3.45	0.39	0.80	1.05	0.20	0.01	0.28
185	0.33	0.00	2.96	0.66	0.00	0.01	0.67	0.02	0.25	4.75	0.11	2.36	0.25	0.50	0.72	0.12	0.00	0.16
190	0.18	0.00	2.74	0.36	0.00	0.01	0.38	0.01	0.13	3.39	0.06	1.46	0.15	0.32	0.41	0.06	0.00	0.08
195	0.08	0.00	2.52	0.19	0.00	0.00	0.19	0.01	0.06	2.17	0.03	0.93	0.08	0.21	0.22	0.03	0.00	0.03
200	0.02	0.00	2.30	0.09	0.00	0.00	0.07	0.01	0.02	1.36	0.01	0.60	0.04	0.13	0.12	0.01	0.00	0.01
205	0.01	0.00	2.07	0.03	0.00	0.00	0.02	0.00	0.01	0.88	0.00	0.37	0.01	0.08	0.07	0.00	0.00	0.01
210	0.01	0.00	1.85	0.00	0.00	0.00	0.01	0.00	0.01	0.56	0.00	0.22	0.00	0.04	0.04	0.00	0.00	0.00
215	0.01	0.00	1.63	0.00	0.00	0.00	0.01	0.00	0.00	0.33	0.00	0.11	0.00	0.02	0.02	0.00	0.00	0.00
220	0.00	0.00	1.41	0.00	0.00	0.00	0.01	0.00	0.00	0.18	0.00	0.04	0.00	0.00	0.01	0.00	0.00	0.00
225	0.00	0.00	1.19	0.00	0.00	0.00	0.01	0.00	0.00	0.08	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
230	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
235	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
240	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
245	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
260	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
275	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
280	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
285	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
290	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
295	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
305	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
310	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
315	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
325	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
330	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
335	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
340	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Printouts for Unit Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	40.40	42.25	12.21	64.08	82.83	32.53	55.47	98.57	32.71	35.78	14.89	33.49	20.77	14.63	17.67	20.86	8.64	28.91
10	57.06	52.24	19.84	129.10	120.16	35.66	95.22	143.91	42.37	66.77	15.76	55.38	24.18	16.70	22.15	23.33	8.39	35.19
15	55.13	49.12	19.80	142.11	113.65	32.85	95.32	135.16	40.63	69.88	14.91	55.08	23.11	16.08	21.49	22.10	7.65	33.52
20	50.21	42.56	19.29	135.46	96.16	27.57	88.44	111.36	36.77	67.15	13.37	52.17	21.00	14.87	20.09	19.76	6.45	30.08
25	42.57	36.46	18.41	120.46	81.35	24.10	76.05	94.73	31.34	61.78	11.56	47.08	18.04	13.08	17.95	17.02	5.72	25.74
30	38.18	31.92	17.16	102.78	69.66	20.85	66.76	79.93	28.10	53.77	10.39	40.93	16.29	11.74	15.92	15.24	4.99	23.02
35	33.79	27.37	15.54	91.92	58.88	17.80	59.25	68.07	24.86	48.70	9.22	37.23	14.53	10.63	14.50	13.46	4.28	20.29
40	29.40	24.25	14.30	81.06	52.17	15.90	51.73	59.61	21.62	44.19	8.04	33.53	12.78	9.53	13.08	11.71	3.85	17.61
45	26.48	21.60	13.35	70.65	45.46	13.99	46.01	51.16	19.56	39.69	7.32	29.82	11.49	8.43	11.66	10.66	3.41	16.01
50	23.92	18.95	12.40	64.46	38.75	12.09	41.68	42.70	17.67	35.18	6.62	26.87	10.45	7.76	10.59	9.61	2.97	14.41
55	21.36	16.29	11.45	58.28	32.04	10.18	37.35	34.24	15.77	32.55	5.93	24.71	9.41	7.10	9.75	8.55	2.54	12.81
60	18.80	13.64	10.50	52.09	25.33	8.28	33.02	27.79	13.87	29.94	5.23	22.56	8.38	6.45	8.91	7.50	2.10	11.20
65	16.24	10.99	9.72	45.91	22.24	6.95	28.69	24.97	11.97	27.33	4.53	20.40	7.34	5.79	8.07	6.45	1.71	9.60
70	13.68	9.78	9.16	39.72	20.00	6.31	24.36	22.15	10.07	24.71	3.84	18.24	6.30	5.14	7.23	5.39	1.56	8.00
75	11.32	8.90	8.59	33.53	17.76	5.68	20.03	19.33	8.39	22.10	3.17	16.08	5.26	4.48	6.39	4.58	1.42	6.85
80	10.47	8.01	8.03	28.11	15.53	5.04	18.15	16.52	7.75	19.49	2.94	13.92	4.65	3.83	5.56	4.23	1.27	6.31
85	9.61	7.13	7.47	26.05	13.29	4.41	16.71	13.70	7.12	16.88	2.71	11.77	4.31	3.30	4.72	3.88	1.13	5.78
90	8.76	6.24	6.90	23.99	11.06	3.77	15.26	10.88	6.49	14.27	2.48	10.65	3.96	3.08	4.25	3.53	0.98	5.25
95	7.91	5.36	6.34	21.93	8.82	3.14	13.82	8.06	5.85	13.25	2.24	9.93	3.61	2.86	3.97	3.18	0.84	4.71
100	7.05	4.47	5.78	19.87	6.58	2.50	12.38	5.24	5.22	12.38	2.01	9.21	3.27	2.64	3.69	2.83	0.69	4.18
105	6.20	3.59	5.21	17.80	4.35	1.87	10.93	2.42	4.59	11.51	1.78	8.49	2.92	2.42	3.41	2.48	0.55	3.64
110	5.35	2.70	4.65	15.74	2.11	1.23	9.49	0.00	3.95	10.64	1.55	7.77	2.58	2.20	3.13	2.13	0.40	3.11
115	4.49	1.82	4.09	13.68	0.00	0.60	8.05		3.32	9.77	1.32	7.05	2.23	1.99	2.85	1.78	0.25	2.58
120	3.64	0.94	3.83	11.62		0.00	6.60		2.69	8.90	1.08	6.33	1.89	1.77	2.57	1.43	0.11	2.04
125	2.79	0.05	3.65	9.56			5.16		2.06	8.03	0.85	5.61	1.54	1.55	2.29	1.07	0.00	1.51
130	1.93	0.00	3.46	7.49			3.72		1.42	7.16	0.62	4.89	1.19	1.33	2.01	0.72		0.97
135	1.08		3.27	5.43			2.27		0.79	6.29	0.39	4.17	0.85	1.11	1.73	0.37		0.44
140	0.23		3.08	3.37			0.83		0.16	5.42	0.15	3.45	0.50	0.89	1.45	0.02		0.00
145	0.00		2.90	1.31			0.00		0.00	4.55	0.00	2.74	0.16	0.67	1.17	0.00		
150			2.71	0.00						3.68		2.02	0.00	0.46	0.89			
155			2.52							2.81		1.30		0.24	0.61			
160			2.33							1.94		0.58		0.02	0.34			
165			2.14							1.07		0.00		0.00	0.06			
170			1.96							0.20					0.00			
175			1.77							0.00								
180			1.58															
185			1.39															
190			1.21															
195			1.02															
200			0.83															
205			0.64															
210			0.46															
215			0.27															
220			0.08															
225			0.00															

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A1		0.097	0.131	25.0	4.03	13.0	2.84	6.7	85	164,729	0.57	94,676	35.0	31	94,308	0.68
B1		0.092	0.139	18.2	3.44	9.5	2.43	5.7	95	134,310	0.58	77,837	30.0	29	77,220	0.80
B2		0.093	0.113	33.3	4.40	17.3	3.11	7.3	35	90,351	0.56	50,405	35.0	12	50,284	0.48
B3		0.109	0.171	35.1	6.09	18.2	4.30	10.2	159	431,607	0.31	135,184	35.0	37	135,109	0.31
C1		0.089	0.205	15.3	3.91	7.9	2.76	6.5	238	281,797	0.64	181,072	30.0	76	180,336	0.97
D1		0.092	0.115	17.3	3.03	9.0	2.14	5.1	66	88,318	0.67	59,557	30.0	24	58,560	0.99
D2		0.084	0.229	15.9	4.30	8.3	3.04	7.2	229	282,777	0.87	246,138	30.0	98	245,292	1.26
E1		0.114	0.151	26.8	4.61	13.9	3.25	7.7	155	321,618	0.41	131,675	35.0	47	131,227	0.53
F1		0.107	0.097	32.8	3.94	17.1	2.78	6.6	48	122,440	0.47	56,968	35.0	16	56,751	0.48
F2		0.088	0.198	21.9	4.83	11.4	3.41	8.1	145	245,533	0.75	184,862	35.0	60	183,986	0.89
F3		0.092	0.087	20.4	2.87	10.6	2.03	4.8	30	46,609	0.68	31,862	30.0	11	31,302	0.88
F4		0.121	0.121	41.5	5.37	21.6	3.79	8.9	58	186,981	0.36	67,763	35.0	17	67,675	0.34
G1		0.096	0.093	25.2	3.31	13.1	2.34	5.5	37	73,072	0.59	43,083	30.0	14	42,758	0.68
G2		0.107	0.067	37.3	3.43	19.4	2.42	5.7	19	54,958	0.47	25,571	35.0	7	25,468	0.43
H1		0.109	0.078	39.3	3.85	20.4	2.72	6.4	25	75,177	0.31	23,258	35.0	6	23,195	0.27
H2		0.092	0.101	20.5	3.09	10.6	2.18	5.2	42	67,337	0.67	45,076	30.0	16	44,528	0.88
H3		0.094	0.058	19.2	2.36	10.0	1.67	3.9	15	21,816	0.64	13,878	30.0	5	13,432	0.87
H4		0.095	0.111	22.8	3.45	11.9	2.44	5.7	57	100,370	0.61	61,173	30.0	21	60,592	0.76

Printouts for Unit Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	77.33	93.25	30.09	102.59	220.53	65.84	199.90	128.93	44.36	115.64	29.50	42.62	37.03	18.62	23.03	42.42	14.61	55.54
10	82.78	86.57	34.71	158.92	211.37	57.29	212.53	153.31	47.44	142.37	26.77	58.18	35.84	18.73	24.44	38.99	12.72	53.96
15	70.87	64.60	32.47	154.15	146.87	42.55	148.71	136.86	43.94	117.23	20.78	56.54	30.18	17.61	23.25	30.20	9.82	43.13
20	57.63	49.16	28.07	139.10	107.74	32.08	108.63	110.77	37.50	92.72	16.66	52.59	24.96	15.66	21.07	24.25	7.67	35.72
25	47.82	39.67	24.21	116.79	80.83	25.68	83.75	93.90	32.69	72.89	13.46	46.34	20.75	13.62	18.22	19.53	6.26	28.56
30	39.89	30.81	21.23	103.58	53.91	19.28	58.88	77.26	28.57	61.39	11.05	41.06	17.44	12.21	16.48	16.06	5.00	24.34
35	34.20	21.94	18.25	90.37	40.79	13.08	41.89	67.52	24.45	50.16	8.64	37.09	14.97	10.80	14.74	12.59	3.73	20.17
40	28.51	17.08	16.20	78.14	31.82	10.94	33.60	57.77	21.87	38.93	6.23	33.12	12.50	9.45	13.00	9.12	2.78	16.00
45	22.81	14.12	14.45	70.52	22.85	8.81	25.30	48.03	19.44	28.50	5.21	29.15	10.02	8.61	11.70	7.55	2.35	11.83
50	17.12	11.17	12.70	62.89	13.88	6.68	17.01	38.28	17.01	24.76	4.40	26.80	7.55	7.77	10.67	6.39	1.93	10.13
55	15.14	8.21	10.96	55.26	4.91	4.55	8.72	30.20	14.58	21.02	3.60	24.47	6.69	6.93	9.63	5.24	1.51	8.74
60	13.25	5.26	9.21	47.63	0.00	2.41	0.43	26.95	12.15	17.28	2.80	22.14	5.86	6.09	8.60	4.08	1.09	7.35
65	11.35	2.30	7.46	40.01		0.28	0.00	23.70	9.73	13.53	1.99	19.80	5.04	5.25	7.56	2.92	0.66	5.96
70	9.45	0.00	6.57	32.38		0.00		20.45	8.85	9.79	1.19	17.47	4.21	4.41	6.53	1.77	0.24	4.57
75	7.55		5.99	29.45				17.20	8.04	6.05	0.39	15.14	3.39	3.73	5.49	0.61	0.00	3.18
80	5.65		5.41	26.90				13.96	7.23	2.30	0.00	12.80	2.56	3.45	4.78	0.00		1.79
85	3.76		4.83	24.36				10.71	6.42	0.00		11.25	1.74	3.17	4.43			0.40
90	1.86		4.24	21.82				7.46	5.61			10.48	0.92	2.89	4.09			0.00
95	0.00		3.66	19.28				4.21	4.80			9.70	0.09	2.61	3.74			
100			3.08	16.73				0.96	3.99			8.92	0.00	2.33	3.40			
105			2.50	14.19				0.00	3.18			8.14		2.05	3.05			
110			1.91	11.65					2.37			7.37		1.77	2.71			
115			1.33	9.11					1.57			6.59		1.49	2.36			
120			0.75	6.57					0.76			5.81		1.21	2.02			
125			0.16	4.02					0.00			5.03		0.93	1.67			
130			0.00	1.48								4.25		0.65	1.33			
135				0.00								3.48		0.37	0.98			
140												2.70		0.09	0.64			
145												1.92		0.00	0.29			
150												1.14			0.00			
155												0.37						
160												0.00						

Printouts for Storm Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.36	0.64	0.20	0.23	1.74	0.44	2.08	0.18	0.10	0.95	0.20	0.04	0.18	0.04	0.05	0.28	0.09	0.30
15	2.32	4.09	1.30	1.64	11.12	2.79	13.53	1.21	0.67	6.30	1.29	0.24	1.17	0.28	0.33	1.79	0.56	1.93
20	6.67	9.83	3.33	5.52	26.84	6.88	33.61	5.50	2.52	16.68	3.21	1.29	3.22	1.04	1.05	4.47	1.38	5.10
25	20.87	22.60	7.93	17.10	59.49	18.93	77.51	25.66	9.83	42.33	8.75	7.68	9.89	4.07	3.28	12.38	4.00	15.21
30	30.38	29.46	11.46	31.45	75.68	24.15	98.47	43.67	15.39	59.83	11.36	14.72	13.78	6.23	5.43	16.24	5.21	20.93
35	30.72	26.67	12.02	36.88	66.79	21.82	89.51	46.88	16.28	60.11	10.60	17.33	13.54	6.55	5.68	15.19	4.80	20.15
40	27.81	22.58	11.45	35.92	54.47	18.39	74.71	42.71	15.34	53.80	9.29	17.30	12.26	6.29	5.48	13.31	4.14	17.97
45	24.51	19.22	10.58	32.86	44.66	15.44	62.27	37.28	13.93	46.86	8.06	16.18	10.85	5.79	5.07	11.52	3.55	15.68
50	21.78	16.55	9.82	29.65	36.85	13.05	52.12	32.55	12.68	41.47	7.06	14.80	9.70	5.34	4.66	10.08	3.07	13.90
55	19.37	13.99	9.08	26.95	30.79	10.72	43.60	28.65	11.43	36.51	6.07	13.55	8.65	4.91	4.30	8.67	2.59	12.22
60	17.19	12.08	8.45	24.37	26.55	9.18	37.60	25.43	10.42	31.82	5.18	12.40	7.70	4.50	3.96	7.40	2.19	10.64
65	15.12	10.81	7.94	22.29	22.96	8.12	32.85	22.34	9.59	27.79	4.57	11.31	6.80	4.17	3.65	6.51	1.94	9.21
70	13.24	9.76	7.45	20.59	19.65	7.15	28.46	19.37	8.80	25.18	4.16	10.45	5.97	3.90	3.41	5.91	1.74	8.23
75	11.79	8.53	6.89	18.85	16.26	6.00	23.71	16.54	7.92	22.91	3.71	9.69	5.33	3.60	3.17	5.26	1.52	7.41
80	10.62	7.22	6.30	17.03	13.53	4.85	19.26	14.42	6.99	20.51	3.23	8.91	4.82	3.27	2.93	4.59	1.29	6.62
85	9.57	6.07	5.76	15.23	12.11	3.89	16.78	12.86	6.11	18.18	2.78	8.12	4.36	2.94	2.68	3.95	1.07	5.87
90	8.59	5.20	5.35	13.56	11.42	3.34	15.58	11.48	5.49	15.96	2.36	7.34	3.93	2.63	2.44	3.35	0.88	5.16
95	7.65	4.76	5.07	12.35	10.98	3.08	14.84	10.17	5.07	13.90	2.00	6.56	3.52	2.36	2.21	2.83	0.74	4.47
100	6.58	4.29	4.75	11.49	9.92	2.75	13.45	8.75	4.63	11.66	1.65	5.77	3.04	2.14	2.00	2.33	0.63	3.69
105	5.52	3.91	4.43	10.66	9.00	2.49	12.15	7.33	4.21	9.81	1.45	5.11	2.58	1.98	1.85	2.03	0.57	2.99
110	4.54	3.64	4.12	9.86	8.35	2.30	11.26	5.94	3.80	8.73	1.33	4.64	2.14	1.83	1.74	1.86	0.53	2.52
115	3.70	3.43	3.83	9.09	7.88	2.17	10.60	4.61	3.41	8.10	1.24	4.29	1.76	1.69	1.63	1.74	0.49	2.27
120	3.19	3.19	3.52	8.32	7.31	2.00	9.84	3.37	3.02	7.53	1.15	3.97	1.51	1.55	1.52	1.61	0.46	2.09
125	2.62	2.47	3.05	7.36	5.48	1.52	7.54	2.39	2.55	6.26	0.91	3.63	1.23	1.38	1.38	1.28	0.35	1.70
130	2.11	1.84	2.57	6.30	3.83	1.12	5.34	1.80	2.09	4.91	0.70	3.29	0.99	1.21	1.23	0.99	0.27	1.34
135	1.69	1.37	2.11	5.27	2.67	0.82	3.79	1.42	1.65	3.82	0.54	2.96	0.80	1.05	1.09	0.76	0.20	1.06
140	1.35	1.02	1.70	4.28	1.82	0.60	2.64	1.13	1.23	2.98	0.42	2.63	0.64	0.89	0.95	0.58	0.15	0.84
145	1.08	0.74	1.34	3.35	1.21	0.42	1.78	0.90	0.87	2.30	0.31	2.32	0.51	0.74	0.82	0.44	0.11	0.65
150	0.86	0.52	1.07	2.50	0.80	0.29	1.19	0.71	0.64	1.75	0.23	2.01	0.41	0.59	0.69	0.33	0.08	0.50
155	0.67	0.37	0.89	1.83	0.51	0.20	0.79	0.56	0.52	1.31	0.17	1.71	0.32	0.45	0.57	0.24	0.06	0.38
160	0.51	0.25	0.74	1.42	0.29	0.14	0.47	0.43	0.42	0.98	0.13	1.41	0.25	0.33	0.45	0.18	0.04	0.29
165	0.40	0.16	0.62	1.18	0.13	0.08	0.23	0.33	0.34	0.73	0.09	1.12	0.19	0.24	0.34	0.13	0.03	0.22
170	0.31	0.09	0.51	0.98	0.03	0.04	0.08	0.25	0.28	0.52	0.06	0.83	0.15	0.18	0.25	0.09	0.02	0.16
175	0.23	0.04	0.42	0.82	0.00	0.01	0.00	0.19	0.22	0.36	0.04	0.55	0.11	0.15	0.19	0.05	0.01	0.11
180	0.17	0.01	0.35	0.67	0.00	0.00	0.00	0.14	0.18	0.23	0.02	0.35	0.08	0.12	0.15	0.03	0.00	0.08
185	0.12	0.00	0.29	0.56	0.00	0.00	0.00	0.10	0.14	0.13	0.01	0.24	0.06	0.10	0.13	0.01	0.00	0.05
190	0.08	0.00	0.23	0.46	0.00	0.00	0.00	0.07	0.11	0.06	0.00	0.19	0.04	0.08	0.11	0.00	0.00	0.03
195	0.05	0.00	0.19	0.38	0.00	0.00	0.00	0.05	0.09	0.02	0.00	0.15	0.02	0.07	0.09	0.00	0.00	0.01
200	0.02	0.00	0.15	0.30	0.00	0.00	0.00	0.03	0.07	0.00	0.00	0.12	0.01	0.05	0.08	0.00	0.00	0.00
205	0.01	0.00	0.11	0.24	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.10	0.00	0.04	0.06	0.00	0.00	0.00
210	0.00	0.00	0.08	0.18	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.08	0.00	0.03	0.05	0.00	0.00	0.00
215	0.00	0.00	0.06	0.14	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.06	0.00	0.03	0.04	0.00	0.00	0.00
220	0.00	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.05	0.00	0.02	0.03	0.00	0.00	0.00
225	0.00	0.00	0.02	0.07	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.01	0.03	0.00	0.00	0.00
230	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.02	0.00	0.00	0.00
235	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.01	0.00	0.00	0.00
240	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00
245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00
250	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
255	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
260	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
275	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A1		0.096	0.134	24.4	4.01	12.7	2.83	6.7	87	164,729	1.93	317,756	40.0	101	316,720	2.22
B1		0.091	0.141	17.8	3.42	9.2	2.42	5.7	98	134,310	1.82	243,813	35.0	97	241,630	2.62
B2		0.092	0.115	32.5	4.38	16.9	3.09	7.3	36	90,351	1.79	161,555	40.0	42	161,041	1.70
B3		0.089	0.250	19.5	5.26	10.2	3.72	8.8	285	431,607	1.88	813,554	40.0	295	807,930	2.48
C1		0.088	0.210	14.7	3.88	7.6	2.74	6.5	247	281,797	1.91	539,141	35.0	238	535,192	3.07
D1		0.092	0.116	17.1	3.02	8.9	2.14	5.0	67	88,318	2.03	179,570	35.0	70	176,587	2.88
D2		0.083	0.230	15.8	4.30	8.2	3.04	7.2	231	282,777	2.25	634,968	35.0	252	632,818	3.24
E1		0.113	0.150	26.5	4.56	13.8	3.23	7.6	157	321,618	1.75	563,176	40.0	178	561,356	2.01
F1		0.106	0.096	32.4	3.90	16.9	2.76	6.5	49	122,440	1.81	221,916	40.0	59	221,037	1.75
F2		0.088	0.199	21.7	4.82	11.3	3.40	8.0	146	245,533	2.12	520,116	40.0	171	517,601	2.53
F3		0.091	0.088	20.1	2.86	10.5	2.02	4.8	30	46,609	2.04	95,234	35.0	33	93,473	2.56
F4		0.090	0.168	22.4	4.39	11.7	3.10	7.3	108	186,981	2.06	385,413	40.0	125	383,174	2.42
G1		0.095	0.095	24.6	3.29	12.8	2.33	5.5	38	73,072	1.94	142,048	40.0	44	140,977	2.18
G2		0.106	0.067	36.8	3.40	19.2	2.41	5.7	19	54,958	1.81	99,609	45.0	24	99,196	1.58
H1		0.107	0.078	38.6	3.80	20.1	2.69	6.3	25	75,177	1.49	111,730	45.0	28	111,424	1.33
H2		0.092	0.102	20.2	3.08	10.5	2.18	5.1	43	67,337	2.03	136,549	35.0	48	134,796	2.57
H3		0.093	0.059	18.9	2.36	9.8	1.66	3.9	15	21,816	1.99	43,454	35.0	16	42,019	2.60
H4		0.094	0.113	22.3	3.44	11.6	2.43	5.7	58	100,370	1.96	197,106	35.0	65	195,054	2.34

Printouts for Storm Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.94	1.68	0.52	4.22	4.78	1.15	5.37	0.48	0.27	2.45	0.53	1.71	0.48	0.11	0.13	0.73	0.23	0.79
15	3.15	5.42	1.79	15.33	15.49	3.64	18.05	1.65	0.90	8.65	1.69	5.85	1.57	0.37	0.45	2.35	0.73	2.57
20	8.70	11.45	4.00	34.16	32.52	8.58	40.38	7.60	3.38	20.68	4.00	14.14	4.16	1.40	1.40	5.60	1.74	6.52
25	28.66	29.50	10.41	82.19	78.37	24.79	95.14	38.37	14.16	53.76	11.42	39.02	13.48	5.86	4.98	16.26	5.32	20.51
30	74.80	79.47	28.38	209.96	197.61	59.58	206.21	118.53	40.66	125.47	27.36	93.76	34.55	16.72	18.14	39.34	13.13	51.86
35	97.97	97.08	39.09	293.34	238.03	70.07	252.18	167.02	54.90	167.34	32.93	122.79	43.48	22.15	25.18	47.62	15.60	64.71
40	100.64	91.72	42.26	295.27	217.83	65.95	236.84	178.04	58.95	170.90	31.93	124.89	43.95	23.88	27.51	46.23	14.96	64.17
45	95.76	81.74	41.60	270.79	188.54	59.25	209.67	171.37	58.16	160.16	29.55	117.59	41.86	23.95	27.62	42.78	13.70	60.43
50	88.61	71.93	39.52	241.02	158.77	52.39	182.92	159.94	55.68	145.90	26.81	107.63	38.81	23.14	26.37	38.80	12.35	55.33
55	80.64	61.06	36.70	210.38	128.15	44.77	154.98	145.85	52.10	131.63	23.79	97.40	35.39	21.94	24.69	34.43	10.81	49.97
60	73.72	51.53	33.93	181.32	108.02	38.53	133.43	134.19	48.66	118.30	21.04	88.02	32.46	20.78	23.06	30.45	9.45	45.14
65	67.40	45.18	31.76	156.70	93.56	34.56	118.85	123.94	46.04	106.27	18.72	79.39	29.76	19.73	21.51	27.09	8.44	40.65
70	57.62	37.36	28.86	133.61	72.90	28.24	97.25	107.68	41.56	90.84	15.78	67.48	25.37	18.01	19.61	22.80	7.03	34.05
75	48.65	30.42	25.90	111.95	54.03	22.66	76.20	90.77	36.98	77.55	13.35	57.62	21.48	16.38	17.89	19.26	5.84	28.96
80	41.32	23.90	22.84	92.09	37.59	17.26	56.56	75.87	32.23	65.51	11.01	48.88	18.30	14.67	16.16	15.88	4.69	24.47
85	35.33	18.17	19.94	74.04	27.23	12.61	40.76	64.74	27.82	54.76	8.95	41.21	15.71	13.05	14.51	12.91	3.68	20.55
90	30.19	13.24	17.37	58.22	21.17	8.92	31.25	55.66	23.97	45.42	7.12	34.55	13.49	11.51	12.93	10.27	2.78	17.14
95	25.62	9.81	15.52	44.14	17.61	6.75	25.52	47.90	21.14	36.94	5.47	28.49	11.50	10.09	11.40	7.89	2.02	14.01
100	21.38	7.91	14.06	33.30	15.21	5.47	21.73	40.83	18.87	29.27	4.09	22.92	9.66	8.92	9.98	5.89	1.52	11.11
105	17.42	6.73	12.77	27.35	13.68	4.57	19.13	34.26	16.87	22.78	3.22	17.88	7.94	8.04	8.89	4.60	1.23	8.49
110	13.78	5.95	11.60	23.68	12.61	3.96	17.35	28.05	15.05	18.35	2.68	13.86	6.34	7.30	8.07	3.81	1.03	6.41
115	10.62	5.43	10.50	21.24	11.96	3.53	16.10	22.23	13.36	15.62	2.31	11.46	4.94	6.63	7.37	3.28	0.89	5.17
120	8.32	5.07	9.45	19.57	11.75	3.23	15.37	16.77	11.75	13.81	2.05	9.95	3.86	6.02	6.74	2.90	0.79	4.39
125	6.31	3.83	8.12	15.88	8.79	2.37	11.92	11.58	10.02	11.03	1.55	7.84	2.90	5.36	6.08	2.19	0.58	3.35
130	4.73	2.80	6.80	11.73	6.09	1.72	8.39	8.10	8.35	8.30	1.14	5.91	2.18	4.72	5.44	1.60	0.42	2.49
135	3.52	2.07	5.52	8.70	4.24	1.26	6.01	5.78	6.72	6.17	0.83	4.41	1.63	4.12	4.82	1.17	0.31	1.84
140	2.61	1.55	4.31	6.55	2.89	0.93	4.27	4.12	5.15	4.58	0.63	3.26	1.22	3.56	4.24	0.88	0.23	1.34
145	1.91	1.13	3.21	4.92	1.91	0.66	2.93	2.90	3.70	3.47	0.47	2.44	0.90	3.00	3.67	0.66	0.17	0.99
150	1.39	0.81	2.32	3.64	1.29	0.47	2.00	2.02	2.57	2.64	0.35	1.86	0.66	2.45	3.11	0.50	0.13	0.75
155	1.04	0.58	1.76	2.65	0.79	0.33	1.33	1.36	1.85	1.99	0.26	1.41	0.49	1.91	2.56	0.37	0.09	0.57
160	0.80	0.40	1.36	1.97	0.41	0.22	0.80	0.91	1.35	1.51	0.20	1.08	0.37	1.40	2.02	0.28	0.07	0.44
165	0.62	0.26	1.05	1.39	0.15	0.13	0.40	0.69	0.98	1.15	0.14	0.84	0.29	0.96	1.49	0.20	0.05	0.34
170	0.49	0.14	0.81	0.91	0.02	0.07	0.13	0.54	0.70	0.85	0.10	0.63	0.23	0.68	1.00	0.14	0.03	0.25
175	0.37	0.06	0.63	0.53	0.00	0.02	0.00	0.43	0.50	0.58	0.06	0.45	0.18	0.50	0.66	0.09	0.02	0.18
180	0.28	0.02	0.49	0.26	0.00	0.00	0.00	0.33	0.35	0.37	0.03	0.30	0.13	0.36	0.46	0.05	0.01	0.12
185	0.19	0.00	0.39	0.08	0.00	0.00	0.00	0.25	0.26	0.21	0.01	0.18	0.09	0.26	0.33	0.02	0.00	0.07
190	0.12	0.00	0.32	0.00	0.00	0.00	0.00	0.18	0.21	0.09	0.00	0.09	0.06	0.19	0.24	0.00	0.00	0.04
195	0.07	0.00	0.26	0.00	0.00	0.00	0.00	0.12	0.17	0.02	0.00	0.03	0.03	0.13	0.18	0.00	0.00	0.01
200	0.03	0.00	0.21	0.00	0.00	0.00	0.00	0.07	0.13	0.00	0.00	0.00	0.02	0.10	0.13	0.00	0.00	0.00
205	0.01	0.00	0.16	0.00	0.00	0.00	0.00	0.04	0.10	0.00	0.00	0.00	0.00	0.08	0.10	0.00	0.00	0.00
210	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.01	0.08	0.00	0.00	0.00	0.00	0.06	0.07	0.00	0.00	0.00
215	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.05	0.06	0.00	0.00	0.00
220	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.04	0.05	0.00	0.00	0.00
225	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.03	0.04	0.00	0.00	0.00
230	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00
235	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00
240	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
250	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
260	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Printouts for Unit Hydrographs

flow in cfs

time in minutes	A1	B1	B2	B3	C1	D1	D2	E1	F1	F2	F3	F4	G1	G2	H1	H2	H3	H4
5	79.48	95.51	30.93	212.33	229.82	66.81	201.50	131.02	45.09	117.17	29.92	92.63	37.90	18.89	23.57	43.06	14.85	56.70
10	84.67	87.92	35.54	282.68	215.27	57.76	213.46	154.59	47.98	143.83	27.05	104.96	36.56	18.95	24.84	39.42	12.85	54.86
15	71.63	65.18	33.09	218.45	147.65	42.75	148.95	137.43	44.32	117.53	20.92	85.95	30.43	17.77	23.57	30.43	9.89	43.38
20	58.21	48.97	28.30	170.33	107.98	32.20	108.75	111.17	37.59	92.99	16.68	69.02	25.18	15.74	21.25	24.29	7.66	35.92
25	47.87	39.61	24.48	132.75	78.94	25.61	83.53	93.98	32.85	72.85	13.48	54.84	20.77	13.71	18.39	19.57	6.27	28.68
30	40.08	30.32	21.34	107.50	49.89	19.02	58.31	77.43	28.63	61.37	11.00	46.28	17.51	12.26	16.59	16.00	4.96	24.34
35	34.09	21.04	18.21	82.24	39.94	13.05	41.79	67.50	24.41	49.89	8.52	38.16	14.92	10.82	14.79	12.42	3.65	20.00
40	28.10	16.93	16.26	57.04	30.26	10.85	33.38	57.58	21.90	38.40	6.04	30.04	12.33	9.48	12.98	8.85	2.77	15.66
45	22.11	13.83	14.43	48.62	20.58	8.66	24.98	47.65	19.41	28.45	5.18	21.93	9.74	8.62	11.74	7.51	2.33	11.51
50	16.99	10.74	12.59	40.20	10.90	6.46	16.57	37.72	16.92	24.63	4.35	18.95	7.50	7.76	10.67	6.32	1.89	10.06
55	15.00	7.64	10.76	31.78	1.22	4.26	8.16	30.14	14.43	20.80	3.52	16.25	6.63	6.90	9.60	5.12	1.46	8.61
60	13.00	4.55	8.92	23.36	0.00	2.07	0.00	26.83	11.95	16.97	2.70	13.54	5.77	6.04	8.53	3.93	1.02	7.17
65	11.00	1.45	7.15	14.94		0.00		23.53	9.65	13.14	1.87	10.83	4.91	5.18	7.46	2.74	0.58	5.72
70	9.01	0.00	6.53	6.53				20.22	8.82	9.32	1.04	8.13	4.04	4.32	6.39	1.55	0.15	4.27
75	7.01		5.92	0.00				16.91	7.99	5.49	0.22	5.42	3.18	3.72	5.32	0.36	0.00	2.82
80	5.01		5.31					13.60	7.16	1.66	0.00	2.72	2.31	3.43	4.76	0.00		1.38
85	3.02		4.70					10.29	6.33	0.00		0.01	1.45	3.15	4.41			0.00
90	1.02		4.09					6.98	5.50			0.00	0.59	2.86	4.05			
95	0.00		3.47					3.67	4.67				0.00	2.57	3.69			
100			2.86					0.36	3.84					2.29	3.34			
105			2.25					0.00	3.01					2.00	2.98			
110			1.64						2.18					1.71	2.62			
115			1.03						1.35					1.43	2.27			
120			0.41						0.52					1.14	1.91			
125			0.00						0.00					0.85	1.55			
130														0.57	1.19			
135														0.28	0.84			
140														0.00	0.48			
145															0.12			
150															0.00			

Appendix C

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  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------
SWMM Pre Development 5 Year

  *******************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  *******************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ NO
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Flow Routing Method ...... KINWAVE
  Starting Date ............ 01/01/2005 00:00:00
  Ending Date .............. 01/01/2005 06:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:05:00
  Routing Time Step ........ 30.00 sec


  **************************        Volume         Volume
  Flow Routing Continuity        acre-feet       10^6 gal
  **************************     ---------      ---------
  Dry Weather Inflow .......         0.000          0.000
  Wet Weather Inflow .......         0.000          0.000
  Groundwater Inflow .......         0.000          0.000
  RDII Inflow ..............         0.000          0.000
  External Inflow ..........        12.024          3.918
  External Outflow .........        12.024          3.918
  Flooding Loss ............         0.000          0.000
  Evaporation Loss .........         0.000          0.000
  Exfiltration Loss ........         0.000          0.000
  Initial Stored Volume ....         0.000          0.000
  Final Stored Volume ......         0.000          0.000
  Continuity Error (%) .....        -0.002
```

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.08	0.31	6945.31	0 00:35	0.30
24	JUNCTION	0.10	0.44	6934.44	0 00:40	0.44
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.10	0.48	6911.48	0 00:35	0.48
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.11	0.48	6900.48	0 00:35	0.48
65	JUNCTION	0.17	0.69	6880.69	0 00:36	0.69
66	JUNCTION	0.24	0.89	6868.89	0 00:40	0.89
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0 00:00	0.00
73	JUNCTION	0.11	0.43	6902.43	0 00:35	0.42

80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.11	0.48	6872.48	0	00:35	0.47
85	JUNCTION	0.06	0.30	6874.30	0	00:35	0.30
PondC	JUNCTION	0.00	0.00	6956.00	0	00:00	0.00
PondA	JUNCTION	0.00	0.00	6949.00	0	00:00	0.00
PondB	JUNCTION	0.11	0.44	6911.44	0	00:41	0.43
PondE	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
PondG	JUNCTION	0.11	0.42	6900.42	0	00:36	0.42
PondH	JUNCTION	0.11	0.47	6866.47	0	00:36	0.47
PondF	JUNCTION	0.24	0.89	6866.89	0	00:41	0.88
PondD	JUNCTION	0.10	0.48	6881.48	0	00:37	0.47
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.00	0.00	6865.00	0	00:00	0.00
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
31	OUTFALL	0.00	0.00	6953.00	0	00:00	0.00
51	OUTFALL	0.00	0.00	6920.00	0	00:00	0.00
74	OUTFALL	0.00	0.00	6897.00	0	00:00	0.00
67	OUTFALL	0.00	0.00	6865.50	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	13.03	13.03	0 00:35	0.304	0.304	0.000
20	JUNCTION	4.33	4.33	0 00:35	0.085	0.085	0.000
21	JUNCTION	1.66	1.66	0 00:40	0.0573	0.0573	0.000

22	JUNCTION	11.85	11.85	0	00:40	0.274	0.274	0.000
23	JUNCTION	0.00	5.99	0	00:35	0	0.142	0.000
24	JUNCTION	0.00	11.85	0	00:40	0	0.274	0.000
30	JUNCTION	9.95	9.95	0	00:35	0.179	0.179	0.000
40	JUNCTION	8.12	8.12	0	00:35	0.162	0.162	0.000
41	JUNCTION	22.23	22.23	0	00:40	0.522	0.522	0.000
42	JUNCTION	0.00	8.12	0	00:35	0	0.162	0.000
50	JUNCTION	32.34	32.34	0	00:35	0.593	0.593	0.000
60	JUNCTION	9.70	9.70	0	00:35	0.226	0.226	0.000
61	JUNCTION	16.46	16.46	0	00:40	0.453	0.453	0.000
62	JUNCTION	3.65	3.65	0	00:35	0.0858	0.0858	0.000
63	JUNCTION	12.98	12.98	0	00:40	0.345	0.345	0.000
64	JUNCTION	0.00	13.35	0	00:35	0	0.311	0.000
65	JUNCTION	0.00	26.04	0	00:36	0	0.657	0.000
66	JUNCTION	0.00	16.46	0	00:40	0	0.453	0.000
70	JUNCTION	5.57	5.57	0	00:35	0.135	0.135	0.000
71	JUNCTION	3.87	3.87	0	00:35	0.101	0.101	0.000
72	JUNCTION	0.00	3.87	0	00:35	0	0.101	0.000
73	JUNCTION	0.00	3.87	0	00:35	0	0.101	0.000
80	JUNCTION	1.85	1.85	0	00:35	0.0476	0.0476	0.000
81	JUNCTION	5.37	5.37	0	00:35	0.124	0.124	0.000
82	JUNCTION	1.92	1.92	0	00:35	0.0398	0.0398	0.000
83	JUNCTION	8.07	8.07	0	00:35	0.185	0.185	0.000
84	JUNCTION	0.00	7.22	0	00:35	0	0.172	0.000

```
  85                    JUNCTION      0.00     1.92     0  00:35           0
0.0398       0.000
  PondC                 JUNCTION      0.00     9.95     0  00:35           0
0.179       0.000
  PondA                 JUNCTION      0.00    13.03     0  00:35           0
0.304       0.000
  PondB                 JUNCTION      0.00    17.56     0  00:41           0
0.416       0.000
  PondE                 JUNCTION      0.00    32.34     0  00:35           0
0.593       0.000
  PondG                 JUNCTION      0.00     9.42     0  00:36           0
0.236       0.000
  PondH                 JUNCTION      0.00    17.11     0  00:36           0
0.397       0.000
  PondF                 JUNCTION      0.00    42.32     0  00:41           0
1.11       0.000
  PondD                 JUNCTION      0.00    30.00     0  00:38           0
0.685       0.000
  Outfall2              OUTFALL       0.00    17.56     0  00:41           0
0.416       0.000
  Outfall1              OUTFALL       0.00    13.03     0  00:35           0
0.304       0.000
  Outfall4              OUTFALL       0.00    17.11     0  00:36           0
0.397       0.000
  Outfall3              OUTFALL       0.00    30.00     0  00:38           0
0.685       0.000
  31                    OUTFALL       0.00     9.95     0  00:35           0
0.179       0.000
  51                    OUTFALL       0.00    32.34     0  00:35           0
0.593       0.000
  74                    OUTFALL       0.00     9.42     0  00:36           0
0.236       0.000
  67                    OUTFALL       0.00    42.32     0  00:41           0
1.11       0.000


  **********************
  Node Flooding Summary
  **********************

  No nodes were flooded.


  ************************
  Outfall Loading Summary
  ************************

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SWMM Model Pre Development 5 Year

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	67.36	3.82	17.56	0.416
Outfall1	55.28	3.40	13.03	0.304
Outfall4	59.31	4.14	17.11	0.397
Outfall3	60.56	7.00	30.00	0.685
31	50.97	2.17	9.95	0.179
51	51.53	7.12	32.34	0.593
74	58.61	2.49	9.42	0.236
67	65.97	10.41	42.32	1.110
System	58.70	40.55	169.75	3.918

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	13.03	0 00:35			
200	DUMMY	4.33	0 00:35			
201	DUMMY	1.66	0 00:40			
202	CONDUIT	5.95	0 00:36	10.09	0.00	0.04
204	DUMMY	11.85	0 00:40			
205	CONDUIT	11.83	0 00:41	11.82	0.01	0.06
300	DUMMY	9.95	0 00:35			
400	DUMMY	8.12	0 00:35			
401	CONDUIT	8.03	0 00:37	8.38	0.02	0.10
402	DUMMY	22.23	0 00:40			
500	DUMMY	32.34	0 00:35			
601	DUMMY	16.46	0 00:40			
602	CONDUIT	16.42	0 00:41	6.99	0.07	0.18
603	DUMMY	9.70	0 00:35			
604	DUMMY	3.65	0 00:35			
605	CONDUIT	13.32	0 00:36	11.62	0.01	0.07
606	DUMMY	12.98	0 00:40			
607	CONDUIT	26.04	0 00:36	12.42	0.02	0.09
700	DUMMY	5.57	0 00:35			
701	DUMMY	3.87	0 00:35			
702	DUMMY	3.87	0 00:35			
703	CONDUIT	3.86	0 00:36	4.80	0.01	0.08
801	DUMMY	1.85	0 00:35			

802	DUMMY	5.37	0	00:35			
803	CONDUIT	7.18	0	00:36	6.34	0.01	0.07
804	DUMMY	1.92	0	00:35			
806	DUMMY	8.07	0	00:35			
805	CONDUIT	1.91	0	00:37	4.00	0.01	0.06
301	DUMMY	9.95	0	00:35			
101	DUMMY	13.03	0	00:35			
206	DUMMY	17.56	0	00:41			
501	DUMMY	32.34	0	00:35			
704	DUMMY	9.42	0	00:36			
807	DUMMY	17.11	0	00:36			
608	DUMMY	42.32	0	00:41			
403	DUMMY	30.00	0	00:38			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Apr 10 17:42:01 2020
Analysis ended on: Fri Apr 10 17:42:01 2020
Total elapsed time: < 1 sec

SWMM 5 Year Output Ex 9-21-20

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------


*******************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*******************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2005 00:00:00
Ending Date .............. 01/01/2005 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 30.00 sec


**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........       193.874         63.177
External Outflow .........       193.874         63.177
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         0.000          0.000
Continuity Error (%) .....        -0.000
```

****
Highest Flow Instability Indexes
****

Link 205 (1)
Link 206 (1)

****
Routing Time Step Summary
****

```
Minimum Time Step           :    30.00 sec
Average Time Step           :    30.00 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00
```

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.08	0.31	6945.31	0 00:35	0.30
24	JUNCTION	0.13	0.58	6934.58	0 00:40	0.58
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.10	0.48	6911.48	0 00:35	0.48
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.11	0.48	6900.48	0 00:35	0.48
65	JUNCTION	0.17	0.69	6880.69	0 00:36	0.69
66	JUNCTION	0.24	0.89	6868.89	0 00:40	0.89
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0 00:00	0.00

73	JUNCTION	0.11	0.43	6902.43	0	00:35	0.42
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.11	0.48	6872.48	0	00:35	0.47
85	JUNCTION	0.06	0.30	6874.30	0	00:35	0.30
PondC	JUNCTION	0.00	0.00	6956.00	0	00:00	0.00
PondA	JUNCTION	0.00	0.00	6949.00	0	00:00	0.00
PondB	JUNCTION	0.13	0.58	6911.58	0	00:40	0.58
PondE	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
PondG	JUNCTION	0.11	0.42	6900.42	0	00:36	0.42
PondH	JUNCTION	0.11	0.47	6866.47	0	00:36	0.47
PondF	JUNCTION	0.24	0.89	6866.89	0	00:41	0.88
PondD	JUNCTION	0.10	0.48	6881.48	0	00:37	0.47
31	JUNCTION	0.00	0.00	6953.00	0	00:00	0.00
51	JUNCTION	0.00	0.00	6920.00	0	00:00	0.00
67	JUNCTION	0.00	0.00	6865.50	0	00:00	0.00
74	JUNCTION	0.00	0.00	6897.00	0	00:00	0.00
OS1	JUNCTION	0.00	0.00	6950.00	0	00:00	0.00
OS2	JUNCTION	0.00	0.00	6924.00	0	00:00	0.00
OS3	JUNCTION	0.00	0.00	6930.00	0	00:00	0.00
OS4	JUNCTION	0.00	0.00	6905.00	0	00:00	0.00
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.00	0.00	6865.00	0	00:00	0.00
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	13.03	13.03	0 00:35	0.304		

20	JUNCTION	4.33	4.33	0	00:35	0.085	0.304	0.000
21	JUNCTION	1.66	1.66	0	00:40	0.0573	0.085	0.000
22	JUNCTION	11.85	11.85	0	00:40	0.274	0.0573	0.000
23	JUNCTION	0.00	5.99	0	00:35	0	0.274	0.000
24	JUNCTION	0.00	21.23	0	00:40	0	0.142	0.000
30	JUNCTION	9.95	9.95	0	00:35	0.179	0.452	0.000
40	JUNCTION	8.12	8.12	0	00:35	0.162	0.179	0.000
41	JUNCTION	22.23	22.23	0	00:40	0.522	0.162	0.000
42	JUNCTION	0.00	8.12	0	00:35	0	0.522	0.000
50	JUNCTION	32.34	32.34	0	00:35	0.593	0.162	0.000
60	JUNCTION	9.70	9.70	0	00:35	0.226	0.593	0.000
61	JUNCTION	16.46	16.46	0	00:40	0.453	0.226	0.000
62	JUNCTION	3.65	3.65	0	00:35	0.0858	0.453	0.000
63	JUNCTION	12.98	12.98	0	00:40	0.345	0.0858	0.000
64	JUNCTION	0.00	13.35	0	00:35	0	0.345	0.000
65	JUNCTION	0.00	26.04	0	00:36	0	0.311	0.000
66	JUNCTION	0.00	16.46	0	00:40	0	0.657	0.000
70	JUNCTION	5.57	5.57	0	00:35	0.135	0.453	0.000
71	JUNCTION	3.87	3.87	0	00:35	0.101	0.135	0.000
72	JUNCTION	0.00	3.87	0	00:35	0	0.101	0.000
73	JUNCTION	0.00	3.87	0	00:35	0	0.101	0.000
80	JUNCTION	1.85	1.85	0	00:35	0.0476	0.101	0.000
81	JUNCTION	5.37	5.37	0	00:35	0.124	0.0476	0.000
82	JUNCTION	1.92	1.92	0	00:35	0.0398	0.124	0.000

83	JUNCTION	8.07	8.07	0	00:35	0.185	0.0398	0.000
84	JUNCTION	0.00	7.22	0	00:35	0	0.185	0.000
85	JUNCTION	0.00	1.92	0	00:35	0	0.172	0.000
PondC	JUNCTION	0.00	9.95	0	00:35	0	0.0398	0.000
PondA	JUNCTION	0.00	13.03	0	00:35	0	0.179	0.000
PondB	JUNCTION	0.00	26.96	0	00:40	0	0.304	0.000
PondE	JUNCTION	0.00	32.34	0	00:35	0	0.594	0.000
PondG	JUNCTION	0.00	189.42	0	00:36	0	0.593	0.000
PondH	JUNCTION	0.00	17.11	0	00:36	0	29.3	0.000
PondF	JUNCTION	0.00	42.32	0	00:41	0	0.397	0.000
PondD	JUNCTION	0.00	30.00	0	00:38	0	1.11	0.000
31	JUNCTION	0.00	9.95	0	00:35	0	0.685	0.000
51	JUNCTION	0.00	93.34	0	00:35	0	0.179	0.000
67	JUNCTION	0.00	231.47	0	00:40	0	10.4	0.000
74	JUNCTION	0.00	189.42	0	00:36	0	30.4	0.000
OS1	JUNCTION	67.00	67.00	0	00:00	10.8	29.3	0.000
OS2	JUNCTION	59.00	59.00	0	00:00	9.53	10.8	0.000
OS3	JUNCTION	61.00	61.00	0	00:00	9.86	9.53	0.000
OS4	JUNCTION	180.00	180.00	0	00:00	29.1	9.85	0.000
Outfall2	OUTFALL	0.00	85.96	0	00:40	0	29.1	0.000
Outfall1	OUTFALL	0.00	80.03	0	00:35	0	10.1	0.000
Outfall4	OUTFALL	0.00	341.05	0	00:36	0	11.1	0.000
Outfall3	OUTFALL	0.00	30.00	0	00:38	0	41.2	0.000
							0.685	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	100.00	62.68	85.96	10.120
Outfall1	100.00	68.88	80.03	11.121
Outfall4	100.00	255.45	341.05	41.246
Outfall3	60.56	7.00	30.00	0.685
System	90.14	394.01	536.81	63.172

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	13.03	0	00:35			
200	DUMMY	4.33	0	00:35			
201	DUMMY	1.66	0	00:40			
202	CONDUIT	5.95	0	00:36	10.09	0.00	0.04
204	DUMMY	11.85	0	00:40			
205	CONDUIT	21.20	0	00:40	14.13	0.01	0.08
300	DUMMY	9.95	0	00:35			
400	DUMMY	8.12	0	00:35			
401	CONDUIT	8.03	0	00:37	8.38	0.02	0.10
402	DUMMY	22.23	0	00:40			
500	DUMMY	32.34	0	00:35			
601	DUMMY	16.46	0	00:40			
602	CONDUIT	16.42	0	00:41	6.99	0.07	0.18
603	DUMMY	9.70	0	00:35			

604	DUMMY	3.65	0	00:35			
605	CONDUIT	13.32	0	00:36	11.62	0.01	0.07
606	DUMMY	12.98	0	00:40			
607	CONDUIT	26.04	0	00:36	12.42	0.02	0.09
700	DUMMY	5.57	0	00:35			
701	DUMMY	3.87	0	00:35			
702	DUMMY	3.87	0	00:35			
703	CONDUIT	3.86	0	00:36	4.80	0.01	0.08
801	DUMMY	1.85	0	00:35			
802	DUMMY	5.37	0	00:35			
803	CONDUIT	7.18	0	00:36	6.34	0.01	0.07
804	DUMMY	1.92	0	00:35			
806	DUMMY	8.07	0	00:35			
805	CONDUIT	1.91	0	00:37	4.00	0.01	0.06
301	DUMMY	9.95	0	00:35			
101	DUMMY	13.03	0	00:35			
206	DUMMY	26.96	0	00:40			
501	DUMMY	32.34	0	00:35			
704	DUMMY	189.42	0	00:36			
807	DUMMY	17.11	0	00:36			
608	DUMMY	42.32	0	00:41			
403	DUMMY	30.00	0	00:38			
41	DUMMY	9.95	0	00:35			
42	DUMMY	93.34	0	00:35			
43	DUMMY	231.47	0	00:40			
44	DUMMY	189.42	0	00:36			
45	DUMMY	180.00	0	00:00			
46	DUMMY	67.00	0	00:00			
47	DUMMY	59.00	0	00:00			
48	DUMMY	61.00	0	00:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 16:32:27 2020
Analysis ended on: Mon Sep 21 16:32:27 2020
Total elapsed time: < 1 sec

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------
SWMM 100 Year Pre Development

  *******************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  *******************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ NO
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Flow Routing Method ...... KINWAVE
  Starting Date ............ 01/01/2005 00:00:00
  Ending Date .............. 01/01/2005 06:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:05:00
  Routing Time Step ........ 30.00 sec


  **************************        Volume         Volume
  Flow Routing Continuity        acre-feet       10^6 gal
  **************************     ---------      ---------
  Dry Weather Inflow .......         0.000          0.000
  Wet Weather Inflow .......         0.000          0.000
  Groundwater Inflow .......         0.000          0.000
  RDII Inflow ..............         0.000          0.000
  External Inflow ..........        82.644         26.931
  External Outflow .........        82.609         26.919
  Flooding Loss ............         0.000          0.000
  Evaporation Loss .........         0.000          0.000
  Exfiltration Loss ........         0.000          0.000
  Initial Stored Volume ....         0.000          0.000
  Final Stored Volume ......         0.000          0.000
  Continuity Error (%) .....         0.043
```

****
Highest Flow Instability Indexes
****
Link 608 (1)

****
Routing Time Step Summary
****

```
Minimum Time Step           :    30.00 sec
Average Time Step           :    30.00 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.04
Percent Not Converging      :     0.00
```

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.21	0.59	6945.59	0 00:45	0.58
24	JUNCTION	0.36	1.43	6935.43	0 00:45	1.42
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.24	1.05	6912.05	0 00:40	1.05
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.27	1.04	6901.04	0 00:45	1.03
65	JUNCTION	0.43	1.52	6881.52	0 00:45	1.52
66	JUNCTION	0.61	2.08	6870.08	0 00:50	2.08
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0 00:00	0.00
73	JUNCTION	0.27	0.94	6902.94	0 00:45	0.94

80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.32	1.19	6873.19	0	00:45	1.18
85	JUNCTION	0.15	0.64	6874.64	0	00:40	0.64
PondC	JUNCTION	0.00	0.00	6956.00	0	00:00	0.00
PondA	JUNCTION	0.00	0.00	6949.00	0	00:00	0.00
PondB	JUNCTION	0.39	1.43	6912.43	0	00:46	1.42
PondE	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
PondG	JUNCTION	0.27	0.94	6900.94	0	00:46	0.94
PondH	JUNCTION	0.32	1.18	6867.18	0	00:46	1.18
PondF	JUNCTION	0.61	2.08	6868.08	0	00:51	2.08
PondD	JUNCTION	0.25	1.05	6882.05	0	00:42	1.05
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.00	0.00	6865.00	0	00:00	0.00
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
31	OUTFALL	0.00	0.00	6953.00	0	00:00	0.00
51	OUTFALL	0.00	0.00	6920.00	0	00:00	0.00
74	OUTFALL	0.00	0.00	6897.00	0	00:00	0.00
67	OUTFALL	0.00	0.00	6865.50	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	13.03	13.03	0 00:35	0.304	0.304	0.000
20	JUNCTION	4.33	4.33	0 00:35	0.085	0.085	0.000
21	JUNCTION	20.74	20.74	0 00:50	0.794	0.794	0.000

22	JUNCTION	140.35	140.35	0	00:45	3.79	3.79	0.000
23	JUNCTION	0.00	23.90	0	00:45	0	0.879	0.000
24	JUNCTION	0.00	140.35	0	00:45	0	3.79	0.000
30	JUNCTION	110.70	110.70	0	00:40	2.47	2.47	0.000
40	JUNCTION	40.00	40.00	0	00:40	1.03	1.03	0.000
41	JUNCTION	114.87	114.87	0	00:45	3.31	3.31	0.000
42	JUNCTION	0.00	40.00	0	00:40	0	1.03	0.000
50	JUNCTION	157.99	157.99	0	00:40	3.76	3.76	0.000
60	JUNCTION	49.45	49.45	0	00:45	1.43	1.43	0.000
61	JUNCTION	86.73	86.73	0	00:50	2.87	2.87	0.000
62	JUNCTION	18.42	18.42	0	00:45	0.544	0.544	0.000
63	JUNCTION	67.82	67.82	0	00:45	2.19	2.19	0.000
64	JUNCTION	0.00	67.87	0	00:45	0	1.97	0.000
65	JUNCTION	0.00	135.62	0	00:45	0	4.16	0.000
66	JUNCTION	0.00	86.73	0	00:50	0	2.87	0.000
70	JUNCTION	28.46	28.46	0	00:45	0.853	0.853	0.000
71	JUNCTION	20.06	20.06	0	00:45	0.641	0.641	0.000
72	JUNCTION	0.00	20.06	0	00:45	0	0.641	0.000
73	JUNCTION	0.00	20.06	0	00:45	0	0.641	0.000
80	JUNCTION	21.89	21.89	0	00:45	0.659	0.659	0.000
81	JUNCTION	27.12	27.12	0	00:45	0.786	0.786	0.000
82	JUNCTION	9.51	9.51	0	00:40	0.252	0.252	0.000
83	JUNCTION	40.86	40.86	0	00:45	1.17	1.17	0.000
84	JUNCTION	0.00	49.01	0	00:45	0	1.44	0.000

85	JUNCTION	0.00	9.51	0	00:40	0	0.252 0.000
PondC	JUNCTION	0.00	110.70	0	00:40	0	2.47 0.000
PondA	JUNCTION	0.00	13.03	0	00:35	0	0.304 0.000
PondB	JUNCTION	0.00	164.21	0	00:46	0	4.66 0.000
PondE	JUNCTION	0.00	157.99	0	00:40	0	3.76 0.000
PondG	JUNCTION	0.00	48.48	0	00:45	0	1.49 0.000
PondH	JUNCTION	0.00	99.16	0	00:45	0	2.87 0.000
PondF	JUNCTION	0.00	221.11	0	00:46	0	7.02 0.000
PondD	JUNCTION	0.00	154.35	0	00:45	0	4.34 0.000
Outfall2	OUTFALL	0.00	164.21	0	00:46	0	4.66 0.000
Outfall1	OUTFALL	0.00	13.03	0	00:35	0	0.304 0.000
Outfall4	OUTFALL	0.00	99.16	0	00:45	0	2.87 0.000
Outfall3	OUTFALL	0.00	154.35	0	00:45	0	4.34 0.000
31	OUTFALL	0.00	110.70	0	00:40	0	2.47 0.000
51	OUTFALL	0.00	157.99	0	00:40	0	3.76 0.000
74	OUTFALL	0.00	48.48	0	00:45	0	1.49 0.000
67	OUTFALL	0.00	221.11	0	00:46	0	7.02 0.000

```
**********************
Node Flooding Summary
**********************

No nodes were flooded.


************************
Outfall Loading Summary
************************

-------------------------------------------------------------
```

SWMM Model Pre Development 100 Year

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	76.53	37.73	164.21	4.665
Outfall1	55.28	3.40	13.03	0.304
Outfall4	67.08	26.46	99.16	2.867
Outfall3	67.92	39.52	154.35	4.336
31	53.89	28.39	110.70	2.472
51	58.47	39.76	157.99	3.757
74	67.08	13.78	48.48	1.494
67	74.31	58.49	221.11	7.022
System	65.07	247.53	962.28	26.917

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	13.03	0 00:35			
200	DUMMY	4.33	0 00:35			
201	DUMMY	20.74	0 00:50			
202	CONDUIT	23.89	0 00:46	15.49	0.01	0.08
204	DUMMY	140.35	0 00:45			
205	CONDUIT	140.32	0 00:46	24.86	0.09	0.20
300	DUMMY	110.70	0 00:40			
400	DUMMY	40.00	0 00:40			
401	CONDUIT	39.84	0 00:42	13.30	0.10	0.21
402	DUMMY	114.87	0 00:45			
500	DUMMY	157.99	0 00:40			
601	DUMMY	86.73	0 00:50			
602	CONDUIT	86.65	0 00:51	11.22	0.36	0.42
603	DUMMY	49.45	0 00:45			
604	DUMMY	18.42	0 00:45			
605	CONDUIT	67.80	0 00:45	19.12	0.05	0.15
606	DUMMY	67.82	0 00:45			
607	CONDUIT	135.63	0 00:46	20.33	0.08	0.19
700	DUMMY	28.46	0 00:45			
701	DUMMY	20.06	0 00:45			
702	DUMMY	20.06	0 00:45			
703	CONDUIT	20.04	0 00:46	7.87	0.08	0.19
801	DUMMY	21.89	0 00:45			

802	DUMMY	27.12	0	00:45			
803	CONDUIT	48.96	0	00:46	11.36	0.06	0.17
804	DUMMY	9.51	0	00:40			
806	DUMMY	40.86	0	00:45			
805	CONDUIT	9.46	0	00:42	6.45	0.04	0.13
301	DUMMY	110.70	0	00:40			
101	DUMMY	13.03	0	00:35			
206	DUMMY	164.21	0	00:46			
501	DUMMY	157.99	0	00:40			
704	DUMMY	48.48	0	00:45			
807	DUMMY	99.16	0	00:45			
608	DUMMY	221.11	0	00:46			
403	DUMMY	154.35	0	00:45			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Apr 10 13:11:18 2020
Analysis ended on: Fri Apr 10 13:11:18 2020
Total elapsed time: < 1 sec

SWMM 100 Year Output EX 9-21-20

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------


*******************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*******************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2005 00:00:00
Ending Date .............. 01/01/2005 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 30.00 sec


**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........       836.701        272.651
External Outflow .........       836.646        272.634
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         0.000          0.000
Continuity Error (%) .....         0.007
```

****
Highest Flow Instability Indexes
****

Link 205 (1)
Link 608 (1)
Link 206 (1)

****
Routing Time Step Summary
****

```
Minimum Time Step           :    30.00 sec
Average Time Step           :    30.00 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.03
Percent Not Converging      :     0.00
```

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.28	0.97	6945.97	0 00:45	0.97
24	JUNCTION	0.45	1.91	6935.91	0 00:45	1.91
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.24	1.05	6912.05	0 00:40	1.05
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.27	1.04	6901.04	0 00:45	1.03
65	JUNCTION	0.43	1.52	6881.52	0 00:45	1.52
66	JUNCTION	0.61	2.08	6870.08	0 00:50	2.08
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00

72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.27	0.94	6902.94	0	00:45	0.94
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.32	1.19	6873.19	0	00:45	1.18
85	JUNCTION	0.15	0.64	6874.64	0	00:40	0.64
PondC	JUNCTION	0.00	0.00	6956.00	0	00:00	0.00
PondA	JUNCTION	0.00	0.00	6949.00	0	00:00	0.00
PondB	JUNCTION	0.48	1.91	6912.91	0	00:45	1.90
PondE	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
PondG	JUNCTION	0.27	0.94	6900.94	0	00:46	0.94
PondH	JUNCTION	0.32	1.18	6867.18	0	00:46	1.18
PondF	JUNCTION	0.61	2.08	6868.08	0	00:51	2.08
PondD	JUNCTION	0.25	1.05	6882.05	0	00:42	1.05
31	JUNCTION	0.00	0.00	6953.00	0	00:00	0.00
51	JUNCTION	0.00	0.00	6920.00	0	00:00	0.00
67	JUNCTION	0.00	0.00	6865.50	0	00:00	0.00
74	JUNCTION	0.00	0.00	6897.00	0	00:00	0.00
OS1	JUNCTION	0.00	0.00	6950.00	0	00:00	0.00
OS2	JUNCTION	0.00	0.00	6924.00	0	00:00	0.00
OS3	JUNCTION	0.00	0.00	6930.00	0	00:00	0.00
OS4	JUNCTION	0.00	0.00	6905.00	0	00:00	0.00
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.00	0.00	6865.00	0	00:00	0.00
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent

10	JUNCTION	66.80	66.80	0	00:45	1.92	1.92	0.000
20	JUNCTION	48.76	48.76	0	00:40	1.18	1.18	0.000
21	JUNCTION	20.74	20.74	0	00:50	0.794	0.794	0.000
22	JUNCTION	140.35	140.35	0	00:45	3.79	3.79	0.000
23	JUNCTION	0.00	68.56	0	00:45	0	1.97	0.000
24	JUNCTION	0.00	249.20	0	00:45	0	6.26	0.000
30	JUNCTION	110.70	110.70	0	00:40	2.47	2.47	0.000
40	JUNCTION	40.00	40.00	0	00:40	1.03	1.03	0.000
41	JUNCTION	114.87	114.87	0	00:45	3.31	3.31	0.000
42	JUNCTION	0.00	40.00	0	00:40	0	1.03	0.000
50	JUNCTION	157.99	157.99	0	00:40	3.76	3.76	0.000
60	JUNCTION	49.45	49.45	0	00:45	1.43	1.43	0.000
61	JUNCTION	86.73	86.73	0	00:50	2.87	2.87	0.000
62	JUNCTION	18.42	18.42	0	00:45	0.544	0.544	0.000
63	JUNCTION	67.82	67.82	0	00:45	2.19	2.19	0.000
64	JUNCTION	0.00	67.87	0	00:45	0	1.97	0.000
65	JUNCTION	0.00	135.62	0	00:45	0	4.16	0.000
66	JUNCTION	0.00	86.73	0	00:50	0	2.87	0.000
70	JUNCTION	28.46	28.46	0	00:45	0.853	0.853	0.000
71	JUNCTION	20.06	20.06	0	00:45	0.641	0.641	0.000
72	JUNCTION	0.00	20.06	0	00:45	0	0.641	0.000
73	JUNCTION	0.00	20.06	0	00:45	0	0.641	0.000
80	JUNCTION	21.89	21.89	0	00:45	0.659	0.659	0.000
81	JUNCTION	27.12	27.12	0	00:45	0.786	0.786	0.000

82	JUNCTION	9.51	9.51	0	00:40	0.252	0.252	0.000
83	JUNCTION	40.86	40.86	0	00:45	1.17	1.17	0.000
84	JUNCTION	0.00	49.01	0	00:45	0	1.44	0.000
85	JUNCTION	0.00	9.51	0	00:40	0	0.252	0.000
PondC	JUNCTION	0.00	110.70	0	00:40	0	2.47	0.000
PondA	JUNCTION	0.00	66.80	0	00:45	0	1.92	0.000
PondB	JUNCTION	0.00	317.41	0	00:45	0	8.22	0.000
PondE	JUNCTION	0.00	157.99	0	00:40	0	3.76	0.000
PondG	JUNCTION	0.00	643.48	0	00:45	0	97.6	0.000
PondH	JUNCTION	0.00	99.16	0	00:45	0	2.87	0.000
PondF	JUNCTION	0.00	221.11	0	00:46	0	7.02	0.000
PondD	JUNCTION	0.00	154.35	0	00:45	0	4.34	0.000
31	JUNCTION	0.00	110.70	0	00:40	0	2.47	0.000
51	JUNCTION	0.00	374.99	0	00:40	0	38.8	0.000
67	JUNCTION	0.00	864.52	0	00:46	0	105	0.000
74	JUNCTION	0.00	643.48	0	00:45	0	97.6	0.000
OS1	JUNCTION	413.00	413.00	0	00:00	66.7	66.7	0.000
OS2	JUNCTION	280.00	280.00	0	00:00	45.2	45.2	0.000
OS3	JUNCTION	217.00	217.00	0	00:00	35.1	35	0.000
OS4	JUNCTION	595.00	595.00	0	00:00	96.1	96.1	0.000
Outfall2	OUTFALL	0.00	597.41	0	00:45	0	53.4	0.000
Outfall1	OUTFALL	0.00	479.80	0	00:45	0	68.6	0.000
Outfall4	OUTFALL	0.00	1335.77	0	00:45	0	146	0.000
Outfall3	OUTFALL	0.00	154.35	0	00:45	0	4.34	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	100.00	330.89	597.41	53.430
Outfall1	100.00	424.90	479.80	68.605
Outfall4	100.00	905.71	1335.77	146.242
Outfall3	67.92	39.52	154.35	4.336
System	91.98	1701.02	2567.34	272.613

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	66.80	0 00:45			
200	DUMMY	48.76	0 00:40			
201	DUMMY	20.74	0 00:50			
202	CONDUIT	68.51	0 00:45	21.36	0.04	0.14
204	DUMMY	140.35	0 00:45			
205	CONDUIT	248.90	0 00:45	29.30	0.16	0.27
300	DUMMY	110.70	0 00:40			
400	DUMMY	40.00	0 00:40			
401	CONDUIT	39.84	0 00:42	13.30	0.10	0.21
402	DUMMY	114.87	0 00:45			
500	DUMMY	157.99	0 00:40			
601	DUMMY	86.73	0 00:50			
602	CONDUIT	86.65	0 00:51	11.22	0.36	0.42

603	DUMMY	49.45	0	00:45			
604	DUMMY	18.42	0	00:45			
605	CONDUIT	67.80	0	00:45	19.12	0.05	0.15
606	DUMMY	67.82	0	00:45			
607	CONDUIT	135.63	0	00:46	20.33	0.08	0.19
700	DUMMY	28.46	0	00:45			
701	DUMMY	20.06	0	00:45			
702	DUMMY	20.06	0	00:45			
703	CONDUIT	20.04	0	00:46	7.87	0.08	0.19
801	DUMMY	21.89	0	00:45			
802	DUMMY	27.12	0	00:45			
803	CONDUIT	48.96	0	00:46	11.36	0.06	0.17
804	DUMMY	9.51	0	00:40			
806	DUMMY	40.86	0	00:45			
805	CONDUIT	9.46	0	00:42	6.45	0.04	0.13
301	DUMMY	110.70	0	00:40			
101	DUMMY	66.80	0	00:45			
206	DUMMY	317.41	0	00:45			
501	DUMMY	157.99	0	00:40			
704	DUMMY	643.48	0	00:45			
807	DUMMY	99.16	0	00:45			
608	DUMMY	221.11	0	00:46			
403	DUMMY	154.35	0	00:45			
41	DUMMY	110.70	0	00:40			
42	DUMMY	374.99	0	00:40			
43	DUMMY	864.52	0	00:46			
44	DUMMY	643.48	0	00:45			
45	DUMMY	595.00	0	00:00			
46	DUMMY	413.00	0	00:00			
47	DUMMY	280.00	0	00:00			
48	DUMMY	217.00	0	00:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 16:37:19 2020
Analysis ended on: Mon Sep 21 16:37:19 2020
Total elapsed time: < 1 sec

SWMM 5 Year Post Development

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------


  ***********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  ***********************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ NO
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Flow Routing Method ...... KINWAVE
  Starting Date ............ 01/01/2005 00:00:00
  Ending Date .............. 01/02/2005 06:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:05:00
  Routing Time Step ........ 30.00 sec


  **************************        Volume         Volume
  Flow Routing Continuity        acre-feet       10^6 gal
  **************************     ---------      ---------
  Dry Weather Inflow .......         0.000          0.000
  Wet Weather Inflow .......         0.000          0.000
  Groundwater Inflow .......         0.000          0.000
  RDII Inflow ..............         0.000          0.000
  External Inflow ..........        39.629         12.914
  External Outflow .........        23.957          7.807
  Flooding Loss ............         0.000          0.000
  Evaporation Loss .........         0.000          0.000
  Exfiltration Loss ........         0.000          0.000
  Initial Stored Volume ....         0.000          0.000
  Final Stored Volume ......        15.654          5.101
  Continuity Error (%) .....         0.045
```

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.01
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.04	0.75	6945.75	0 00:30	0.74
24	JUNCTION	0.21	1.17	6935.17	0 00:30	1.16
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
31	JUNCTION	0.17	0.20	6953.20	0 02:23	0.20
67	JUNCTION	0.16	0.59	6866.09	0 01:57	0.59
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.03	0.82	6911.82	0 00:30	0.81
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
51	JUNCTION	0.03	0.21	6920.21	0 01:12	0.21
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.03	0.66	6900.66	0 00:35	0.66
65	JUNCTION	0.05	1.10	6881.10	0 00:35	1.10
66	JUNCTION	0.08	1.71	6869.71	0 00:35	1.71

70	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0	00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.03	0.55	6902.55	0	00:35	0.54
74	JUNCTION	0.02	0.24	6897.24	0	01:15	0.24
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.04	0.80	6872.80	0	00:30	0.79
85	JUNCTION	0.02	0.48	6874.48	0	00:30	0.47
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.16	0.59	6865.59	0	01:57	0.59
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
PondB	STORAGE	5.89	6.37	6917.37	0	01:30	6.37
PondC	STORAGE	4.70	5.56	6961.56	0	02:23	5.56
PondA	STORAGE	4.01	4.67	6953.67	0	01:46	4.67
PondD	STORAGE	5.54	6.51	6887.51	0	02:25	6.51
PondE	STORAGE	4.04	4.77	6927.77	0	01:12	4.77
PondF	STORAGE	5.76	6.73	6872.73	0	02:02	6.73
PondG	STORAGE	0.11	1.20	6901.20	0	01:15	1.20
PondH	STORAGE	4.49	5.12	6871.12	0	02:09	5.12

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	30.72	30.72	0 00:35	0.705	0.705	0.000
20	JUNCTION	29.46	29.46	0 00:30	0.578	0.578	0.000
21	JUNCTION	12.02	12.02	0 00:35	0.376		

22	JUNCTION	92.76	92.76	0	00:30	2.04	0.376	0.000	2.04
23	JUNCTION	0.00	40.92	0	00:30	0	0.954	0.000	2.96
24	JUNCTION	0.00	93.26	0	00:30	0	2.96	0.000	1.38
30	JUNCTION	77.99	77.99	0	00:30	1.38	1.38	0.000	0.925
31	JUNCTION	0.00	1.52	0	02:23	0	0.925	0.000	2.4
67	JUNCTION	0.00	23.06	0	01:57	0	2.4	-0.000	0.438
40	JUNCTION	24.15	24.15	0	00:30	0.438	0.438	0.000	1.83
41	JUNCTION	98.47	98.47	0	00:30	1.83	1.83	0.000	0.438
42	JUNCTION	0.00	24.15	0	00:30	0	0.438	-0.000	0.982
50	JUNCTION	46.88	46.88	0	00:35	0.982	0.982	0.000	0.69
51	JUNCTION	0.00	18.70	0	01:12	0	0.69	0.000	0.424
60	JUNCTION	16.28	16.28	0	00:35	0.424	0.424	0.000	1.38
61	JUNCTION	60.11	60.11	0	00:35	1.38	1.38	0.000	0.234
62	JUNCTION	11.36	11.36	0	00:30	0.234	0.234	0.000	0.975
63	JUNCTION	42.32	42.32	0	00:30	0.975	0.975	0.000	0.659
64	JUNCTION	0.00	26.88	0	00:35	0	0.659	0.000	1.63
65	JUNCTION	0.00	69.12	0	00:35	0	1.63	0.000	1.38
66	JUNCTION	0.00	60.11	0	00:35	0	1.38	0.000	0.32
70	JUNCTION	13.78	13.78	0	00:30	0.32	0.32	0.000	0.191
71	JUNCTION	6.55	6.55	0	00:35	0.191	0.191	0.000	0.191
72	JUNCTION	0.00	6.55	0	00:35	0	0.191	0.000	0.191
73	JUNCTION	0.00	6.55	0	00:35	0	0.191	0.000	0.51
74	JUNCTION	0.00	9.05	0	01:15	0	0.51	-0.000	
80	JUNCTION	5.68	5.68	0	00:35	0.173			

```
0.173       0.000
  81                    JUNCTION     16.24    16.24     0  00:30       0.333
0.333       0.000
  82                    JUNCTION      5.21     5.21     0  00:30         0.1
0.1       0.000
  83                    JUNCTION     20.93    20.93     0  00:30       0.453
0.453       0.000
  84                    JUNCTION      0.00    21.67     0  00:30           0
0.507       0.000
  85                    JUNCTION      0.00     5.21     0  00:30           0
0.1       0.000
  Outfall2              OUTFALL       0.00    34.45     0  01:30           0
2.22       0.000
  Outfall1              OUTFALL       0.00     5.43     0  01:46           0
0.441       0.000
  Outfall4              OUTFALL       0.00    35.27     0  01:51           0
3.71       0.000
  Outfall3              OUTFALL       0.00     2.52     0  02:25           0
1.43       0.000
  PondB                 STORAGE       0.00   134.27     0  00:31           0
3.91       0.047
  PondC                 STORAGE       0.00    77.99     0  00:30           0
1.38       0.005
  PondA                 STORAGE       0.00    30.72     0  00:35           0
0.705       0.012
  PondD                 STORAGE       0.00   120.96     0  00:30           0
2.27       0.003
  PondE                 STORAGE       0.00    46.88     0  00:35           0
0.982       0.118
  PondF                 STORAGE       0.00   129.20     0  00:35           0
3.01       0.014
  PondG                 STORAGE       0.00    20.07     0  00:35           0
0.51       0.116
  PondH                 STORAGE       0.00    47.25     0  00:32           0
1.06       0.001


  *********************
  Node Flooding Summary
  *********************

  No nodes were flooded.


  **********************
  Storage Volume Summary
  **********************
```

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
PondB	241.825	30	0	0	296.729	37	0 01:30	34.45
PondC	111.256	19	0	0	174.130	30	0 02:23	1.52
PondA	53.736	15	0	0	79.797	22	0 01:46	5.43
PondD	192.634	28	0	0	287.984	41	0 02:24	2.52
PondE	56.473	16	0	0	85.437	24	0 01:11	18.70
PondF	235.289	29	0	0	351.325	44	0 02:02	16.38
PondG	2.647	0	0	0	31.290	6	0 01:15	9.05
PondH	88.617	17	0	0	127.653	25	0 02:09	4.21

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	99.64	2.76	34.45	2.223
Outfall1	99.67	0.55	5.43	0.441
Outfall4	99.67	4.61	35.27	3.709
Outfall3	99.69	1.78	2.52	1.434
System	99.67	9.70	73.13	7.806

****

Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	30.72	0	00:35			
200	DUMMY	29.46	0	00:30			
201	DUMMY	12.02	0	00:35			
202	CONDUIT	40.84	0	00:31	18.27	0.02	0.11
203	CONDUIT	1.52	0	02:24	6.34	0.00	0.05
204	DUMMY	92.76	0	00:30			
205	CONDUIT	93.43	0	00:31	22.09	0.06	0.17
300	DUMMY	77.99	0	00:30			
400	DUMMY	24.15	0	00:30			
401	CONDUIT	23.53	0	00:32	11.46	0.06	0.16
402	DUMMY	98.47	0	00:30			
500	DUMMY	46.88	0	00:35			
601	DUMMY	60.11	0	00:35			
602	CONDUIT	60.09	0	00:35	10.17	0.25	0.34
603	DUMMY	16.28	0	00:35			
604	DUMMY	11.36	0	00:30			
605	CONDUIT	26.88	0	00:35	14.61	0.02	0.09
606	DUMMY	42.32	0	00:30			
607	CONDUIT	69.12	0	00:31	16.65	0.04	0.14
700	DUMMY	13.78	0	00:30			
701	DUMMY	6.55	0	00:35			
702	DUMMY	6.55	0	00:35			
703	CONDUIT	6.54	0	00:36	5.62	0.03	0.11
801	DUMMY	5.68	0	00:35			
802	DUMMY	16.24	0	00:30			
803	CONDUIT	21.49	0	00:32	8.87	0.03	0.11
804	DUMMY	5.21	0	00:30			
806	DUMMY	20.93	0	00:30			
805	CONDUIT	5.08	0	00:32	5.42	0.02	0.09
808	CONDUIT	23.06	0	01:57	2.25	0.00	0.06
800	CONDUIT	8.95	0	01:25	2.34	0.00	0.02
600	CONDUIT	18.26	0	01:17	5.75	0.00	0.03
101	DUMMY	5.43	0	01:46			
206	DUMMY	34.45	0	01:30			
301	DUMMY	1.52	0	02:23			
501	DUMMY	18.70	0	01:12			
704	DUMMY	9.05	0	01:15			
807	DUMMY	4.21	0	02:09			
608	DUMMY	16.38	0	02:02			
403	DUMMY	2.52	0	02:25			

```
************************
Conduit Surcharge Summary
************************

No conduits were surcharged.


Analysis begun on:  Mon Apr 13 19:10:46 2020
Analysis ended on:  Mon Apr 13 19:10:46 2020
Total elapsed time: < 1 sec
```

SWMM 5 Year Output 9-21-20

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

```
*******************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*******************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2005 00:00:00
Ending Date .............. 01/02/2005 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 30.00 sec


**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........       949.387        309.372
External Outflow .........       930.375        303.177
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......        20.095          6.548
Continuity Error (%) .....        -0.114
```

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.04	0.75	6945.75	0 00:30	0.74
24	JUNCTION	0.21	1.17	6935.17	0 00:30	1.16
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
31	JUNCTION	0.17	0.20	6953.20	0 02:23	0.20
67	JUNCTION	1.87	1.97	6867.47	0 01:59	1.97
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.03	0.82	6911.82	0 00:30	0.81
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
51	JUNCTION	0.71	0.71	6920.71	0 00:32	0.71
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.03	0.66	6900.66	0 00:35	0.66
65	JUNCTION	0.05	1.10	6881.10	0 00:35	1.10
66	JUNCTION	0.08	1.71	6869.71	0 00:35	1.71
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00

71	JUNCTION	0.00	0.00	6908.00	0	00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.03	0.55	6902.55	0	00:35	0.54
74	JUNCTION	1.36	1.40	6898.40	0	01:15	1.40
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.04	0.80	6872.80	0	00:30	0.79
85	JUNCTION	0.02	0.48	6874.48	0	00:30	0.47
OS1	JUNCTION	0.45	0.45	6953.05	0	00:00	0.45
OS3	JUNCTION	0.71	0.71	6923.51	0	00:00	0.71
OS4	JUNCTION	1.21	1.21	6901.01	0	00:00	1.21
OS2	JUNCTION	0.42	0.42	6924.42	0	00:00	0.42
Outfall2	OUTFALL	0.42	0.42	6910.42	0	03:03	0.42
Outfall1	OUTFALL	0.45	0.45	6947.45	0	01:12	0.45
Outfall4	OUTFALL	1.87	1.97	6866.97	0	01:59	1.97
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
PondB	STORAGE	6.42	6.96	6917.96	0	02:52	6.96
PondC	STORAGE	4.70	5.56	6961.56	0	02:23	5.56
PondA	STORAGE	5.16	6.43	6955.43	0	02:35	6.43
PondD	STORAGE	5.57	6.66	6887.66	0	02:07	6.65
PondE	STORAGE	3.99	4.85	6927.85	0	01:03	4.85
PondF	STORAGE	5.76	6.72	6872.72	0	02:04	6.72
PondG	STORAGE	0.11	1.20	6901.20	0	01:15	1.20
PondH	STORAGE	4.38	5.01	6871.01	0	02:39	5.01

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	30.72	30.72	0 00:35	0.705	0.705	0.000

20	JUNCTION	29.46	29.46	0	00:30	0.578	0.578	0.000
21	JUNCTION	12.02	12.02	0	00:35	0.376	0.376	0.000
22	JUNCTION	92.76	92.76	0	00:30	2.04	2.04	0.000
23	JUNCTION	0.00	40.92	0	00:30	0	0.954	0.000
24	JUNCTION	0.00	93.26	0	00:30	0	2.96	0.000
30	JUNCTION	77.99	77.99	0	00:30	1.38	1.38	0.000
31	JUNCTION	0.00	1.52	0	02:23	0	0.925	0.000
67	JUNCTION	0.00	201.42	0	01:59	0	147	0.000
40	JUNCTION	24.15	24.15	0	00:30	0.438	0.438	0.000
41	JUNCTION	98.47	98.47	0	00:30	1.83	1.83	0.000
42	JUNCTION	0.00	24.15	0	00:30	0	0.438	-0.000
50	JUNCTION	46.88	46.88	0	00:35	0.982	0.982	0.000
51	JUNCTION	0.00	85.04	0	01:03	0	50	0.000
60	JUNCTION	16.28	16.28	0	00:35	0.424	0.424	0.000
61	JUNCTION	60.11	60.11	0	00:35	1.38	1.38	0.000
62	JUNCTION	11.36	11.36	0	00:30	0.234	0.234	0.000
63	JUNCTION	42.32	42.32	0	00:30	0.975	0.975	0.000
64	JUNCTION	0.00	26.88	0	00:35	0	0.659	0.000
65	JUNCTION	0.00	69.12	0	00:35	0	1.63	0.000
66	JUNCTION	0.00	60.11	0	00:35	0	1.38	0.000
70	JUNCTION	13.78	13.78	0	00:30	0.32	0.32	0.000
71	JUNCTION	6.55	6.55	0	00:35	0.191	0.191	0.000
72	JUNCTION	0.00	6.55	0	00:35	0	0.191	0.000
73	JUNCTION	0.00	6.55	0	00:35	0	0.191	0.000

74	JUNCTION	0.00	189.05	0	01:15	0	146	0.000
80	JUNCTION	5.68	5.68	0	00:35	0.173	0.173	0.000
81	JUNCTION	16.24	16.24	0	00:30	0.333	0.333	0.000
82	JUNCTION	5.21	5.21	0	00:30	0.1	0.1	0.000
83	JUNCTION	20.93	20.93	0	00:30	0.453	0.453	0.000
84	JUNCTION	0.00	21.67	0	00:30	0	0.507	0.000
85	JUNCTION	0.00	5.21	0	00:30	0	0.1	0.000
OS1	JUNCTION	67.00	67.00	0	00:00	54.1	54.1	0.000
OS3	JUNCTION	61.00	61.00	0	00:00	49.3	49.3	0.000
OS4	JUNCTION	180.00	180.00	0	00:00	145	145	0.000
OS2	JUNCTION	59.00	59.00	0	00:00	47.7	47.7	0.000
Outfall2	OUTFALL	0.00	61.68	0	02:52	0	49.4	0.000
Outfall1	OUTFALL	0.00	67.69	0	02:35	0	54.5	0.000
Outfall4	OUTFALL	0.00	276.10	0	01:07	0	198	0.000
Outfall3	OUTFALL	0.00	8.58	0	02:07	0	1.45	0.000
PondB	STORAGE	0.00	134.27	0	00:31	0	3.91	-0.000
PondC	STORAGE	0.00	77.99	0	00:30	0	1.38	0.005
PondA	STORAGE	0.00	30.72	0	00:35	0	0.705	0.003
PondD	STORAGE	0.00	120.96	0	00:30	0	2.27	0.003
PondE	STORAGE	0.00	46.88	0	00:35	0	0.982	0.190
PondF	STORAGE	0.00	129.20	0	00:35	0	3.01	0.010
PondG	STORAGE	0.00	20.07	0	00:35	0	0.51	0.116
PondH	STORAGE	0.00	47.25	0	00:32	0	1.06	0.003

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
PondB	321.956	38	0	0	389.908	46	0 02:51	2.68
PondC	111.256	19	0	0	174.130	30	0 02:23	1.52
PondA	59.417	29	0	0	88.970	44	0 02:35	0.69
PondD	184.527	30	0	0	278.950	45	0 02:07	8.58
PondE	46.471	16	0	0	72.497	25	0 01:03	24.04
PondF	238.240	29	0	0	353.902	43	0 02:03	15.59
PondG	2.647	0	0	0	31.289	6	0 01:15	9.05
PondH	86.593	14	0	0	132.766	21	0 02:39	1.11

****
Outfall Loading Summary
****

	Flow Freq	Avg Flow	Max Flow	Total Volume

Outfall Node	Pcnt	CFS	CFS	10^6 gal
Outfall2	99.97	61.16	61.68	49.385
Outfall1	99.97	67.44	67.69	54.456
Outfall4	99.89	245.24	276.10	197.866
Outfall3	99.69	1.80	8.58	1.447
System	99.88	375.63	407.24	303.154

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	30.72	0	00:35			
200	DUMMY	29.46	0	00:30			
201	DUMMY	12.02	0	00:35			
202	CONDUIT	40.84	0	00:31	18.27	0.02	0.11
203	CONDUIT	1.52	0	02:24	6.34	0.00	0.05
204	DUMMY	92.76	0	00:30			
205	CONDUIT	93.43	0	00:31	22.09	0.06	0.17
300	DUMMY	77.99	0	00:30			
400	DUMMY	24.15	0	00:30			
401	CONDUIT	23.53	0	00:32	11.46	0.06	0.16
402	DUMMY	98.47	0	00:30			
500	DUMMY	46.88	0	00:35			
601	DUMMY	60.11	0	00:35			
602	CONDUIT	60.09	0	00:35	10.17	0.25	0.34
603	DUMMY	16.28	0	00:35			
604	DUMMY	11.36	0	00:30			
605	CONDUIT	26.88	0	00:35	14.61	0.02	0.09
606	DUMMY	42.32	0	00:30			
607	CONDUIT	69.12	0	00:31	16.65	0.04	0.14
700	DUMMY	13.78	0	00:30			
701	DUMMY	6.55	0	00:35			
702	DUMMY	6.55	0	00:35			
703	CONDUIT	6.54	0	00:36	5.62	0.03	0.11
801	DUMMY	5.68	0	00:35			
802	DUMMY	16.24	0	00:30			
803	CONDUIT	21.49	0	00:32	8.87	0.03	0.11
804	DUMMY	5.21	0	00:30			
806	DUMMY	20.93	0	00:30			
805	CONDUIT	5.08	0	00:32	5.42	0.02	0.09

808	CONDUIT	201.42	0	01:59	4.47	0.03	0.20
800	CONDUIT	189.04	0	01:19	6.57	0.02	0.14
600	CONDUIT	84.88	0	01:06	9.93	0.00	0.06
EastForkTrib	CONDUIT	61.00	0	00:32	3.08	0.01	0.07
EastFork	CONDUIT	180.00	0	00:24	4.29	0.03	0.15
MainStem	CONDUIT	67.00	0	01:15	2.39	0.00	0.05
MainStemTrib	CONDUIT	59.00	0	03:06	2.28	0.00	0.04
101	DUMMY	0.69	0	02:35			
206	DUMMY	2.68	0	02:52			
301	DUMMY	1.52	0	02:23			
501	DUMMY	24.04	0	01:03			
704	DUMMY	9.05	0	01:15			
807	DUMMY	1.11	0	02:39			
608	DUMMY	15.59	0	02:04			
403	DUMMY	8.58	0	02:07			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 16:22:13 2020
Analysis ended on: Mon Sep 21 16:22:14 2020
Total elapsed time: 00:00:01

SWMM 100 Year Post Development

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------


  ********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  ********************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ NO
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Flow Routing Method ...... KINWAVE
  Starting Date ............ 01/01/2005 00:00:00
  Ending Date .............. 01/02/2005 06:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:05:00
  Routing Time Step ........ 30.00 sec


  **************************        Volume         Volume
  Flow Routing Continuity        acre-feet       10^6 gal
  **************************     ---------      ---------
  Dry Weather Inflow .......         0.000          0.000
  Wet Weather Inflow .......         0.000          0.000
  Groundwater Inflow .......         0.000          0.000
  RDII Inflow ..............         0.000          0.000
  External Inflow ..........       123.320         40.186
  External Outflow .........       105.086         34.244
  Flooding Loss ............         0.000          0.000
  Evaporation Loss .........         0.000          0.000
  Exfiltration Loss ........         0.000          0.000
  Initial Stored Volume ....         0.000          0.000
  Final Stored Volume ......        18.084          5.893
  Continuity Error (%) .....         0.122
```

```
*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :    30.00 sec
Average Time Step           :    30.00 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.02
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.06	1.35	6946.35	0 00:35	1.34
24	JUNCTION	0.27	2.22	6936.22	0 00:51	2.22
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
31	JUNCTION	0.24	1.68	6954.68	0 00:59	1.68
67	JUNCTION	0.24	2.30	6867.80	0 01:13	2.30
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.05	1.40	6912.40	0 00:35	1.38
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
51	JUNCTION	0.04	0.74	6920.74	0 00:49	0.74
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.06	1.19	6901.19	0 00:40	1.19
65	JUNCTION	0.09	1.92	6881.92	0 00:40	1.92

66	JUNCTION	0.13	3.12	6871.12	0	00:40	3.12
70	JUNCTION	0.00	0.00	6923.00	0	00:00	0.00
71	JUNCTION	0.00	0.00	6908.00	0	00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.06	1.02	6903.02	0	00:45	1.02
74	JUNCTION	0.05	0.60	6897.60	0	01:12	0.60
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.07	1.45	6873.45	0	00:40	1.45
85	JUNCTION	0.03	0.82	6874.82	0	00:35	0.81
Outfall2	OUTFALL	0.00	0.00	6910.00	0	00:00	0.00
Outfall1	OUTFALL	0.00	0.00	6947.00	0	00:00	0.00
Outfall4	OUTFALL	0.24	2.30	6867.30	0	01:13	2.30
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
PondB	STORAGE	6.72	9.85	6920.85	0	01:16	9.85
PondC	STORAGE	5.17	7.08	6963.08	0	00:59	7.08
PondA	STORAGE	5.81	8.60	6957.60	0	01:13	8.59
PondD	STORAGE	5.66	8.08	6889.08	0	01:04	8.08
PondE	STORAGE	4.04	5.84	6928.84	0	00:49	5.84
PondF	STORAGE	5.86	8.17	6874.17	0	01:09	8.17
PondG	STORAGE	0.20	2.69	6902.69	0	01:12	2.68
PondH	STORAGE	4.95	6.51	6872.51	0	01:12	6.51

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	100.64	100.64	0 00:40	2.37	2.37	0.000
20	JUNCTION	97.08	97.08	0 00:35	1.81	1.81	0.000

21	JUNCTION	42.26	42.26	0	00:40	1.2	1.2	0.000
22	JUNCTION	295.27	295.27	0	00:40	6.04	6.04	0.000
23	JUNCTION	0.00	136.17	0	00:35	0	3.01	0.000
24	JUNCTION	0.00	334.84	0	00:51	0	9.43	-0.000
30	JUNCTION	238.03	238.03	0	00:35	4	4	0.000
31	JUNCTION	0.00	115.75	0	00:59	0	3.39	0.000
67	JUNCTION	0.00	270.41	0	01:13	0	9.72	-0.000
40	JUNCTION	70.07	70.07	0	00:35	1.32	1.32	0.000
41	JUNCTION	252.18	252.18	0	00:35	4.73	4.73	0.000
42	JUNCTION	0.00	70.07	0	00:35	0	1.32	0.000
50	JUNCTION	178.04	178.04	0	00:40	4.2	4.2	0.000
51	JUNCTION	0.00	164.75	0	00:49	0	3.95	0.000
60	JUNCTION	58.95	58.95	0	00:40	1.65	1.65	0.000
61	JUNCTION	170.90	170.90	0	00:40	3.87	3.87	0.000
62	JUNCTION	32.93	32.93	0	00:35	0.699	0.699	0.000
63	JUNCTION	124.89	124.89	0	00:40	2.87	2.87	0.000
64	JUNCTION	0.00	90.88	0	00:40	0	2.35	0.000
65	JUNCTION	0.00	215.63	0	00:40	0	5.22	0.000
66	JUNCTION	0.00	170.90	0	00:40	0	3.87	0.000
70	JUNCTION	43.95	43.95	0	00:40	1.05	1.05	0.000
71	JUNCTION	23.95	23.95	0	00:45	0.742	0.742	0.000
72	JUNCTION	0.00	23.95	0	00:45	0	0.742	0.000
73	JUNCTION	0.00	23.95	0	00:45	0	0.742	0.000
74	JUNCTION	0.00	42.13	0	01:12	0	1.79	-0.000

```
  80                    JUNCTION     27.62    27.62     0  00:45       0.833
0.833       0.000
  81                    JUNCTION     47.62    47.62     0  00:35        1.01
1.01       0.000
  82                    JUNCTION     15.60    15.60     0  00:35       0.314
0.314       0.000
  83                    JUNCTION     64.71    64.71     0  00:35        1.46
1.46       0.000
  84                    JUNCTION      0.00    73.73     0  00:40           0
1.84       0.000
  85                    JUNCTION      0.00    15.60     0  00:35           0
0.314       0.000
  Outfall2              OUTFALL       0.00   256.11     0  01:16           0
10.3       0.000
  Outfall1              OUTFALL       0.00    53.95     0  01:13           0
2.03       0.000
  Outfall4              OUTFALL       0.00   478.86     0  01:05           0
16.7       0.000
  Outfall3              OUTFALL       0.00   160.70     0  01:04           0
5.21       0.000
  PondB                 STORAGE       0.00   447.00     0  00:49           0
12.4       0.062
  PondC                 STORAGE       0.00   238.03     0  00:35           0
 4       0.130
  PondA                 STORAGE       0.00   100.64     0  00:40           0
2.37       0.096
  PondD                 STORAGE       0.00   320.21     0  00:35           0
6.05       0.105
  PondE                 STORAGE       0.00   178.04     0  00:40           0
4.2       0.178
  PondF                 STORAGE       0.00   385.87     0  00:41           0
9.08       0.109
  PondG                 STORAGE       0.00    67.73     0  00:40           0
1.8       0.079
  PondH                 STORAGE       0.00   153.03     0  00:38           0
3.61       0.143


  **********************
  Node Flooding Summary
  **********************

  No nodes were flooded.


  **********************
  Storage Volume Summary
  **********************
```

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
PondB	363.135	43	0	0	827.701	97	0 01:15	256.11
PondC	146.763	26	0	0	299.338	52	0 00:58	115.75
PondA	75.030	37	0	0	152.554	76	0 01:12	53.95
PondD	192.591	31	0	0	418.291	67	0 01:04	160.70
PondE	48.028	17	0	0	106.230	37	0 00:48	164.75
PondF	250.108	31	0	0	549.589	67	0 01:09	229.20
PondG	5.811	1	0	0	88.594	16	0 01:11	42.13
PondH	131.315	21	0	0	268.983	42	0 01:12	80.17

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall2	99.64	12.77	256.11	10.280
Outfall1	99.69	2.53	53.95	2.035
Outfall4	99.67	20.76	478.86	16.717
Outfall3	99.69	6.47	160.70	5.209
System	99.67	42.53	924.48	34.241

SWMM 100 Year Output

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	100.64	0	00:40			
200	DUMMY	97.08	0	00:35			
201	DUMMY	42.26	0	00:40			
202	CONDUIT	136.36	0	00:36	26.17	0.08	0.19
203	CONDUIT	115.74	0	00:59	23.03	0.37	0.42
204	DUMMY	295.27	0	00:40			
205	CONDUIT	334.86	0	00:51	31.89	0.22	0.32
300	DUMMY	238.03	0	00:35			
400	DUMMY	70.07	0	00:35			
401	CONDUIT	69.37	0	00:36	15.63	0.17	0.28
402	DUMMY	252.18	0	00:35			
500	DUMMY	178.04	0	00:40			
601	DUMMY	170.90	0	00:40			
602	CONDUIT	170.58	0	00:41	13.26	0.71	0.62
603	DUMMY	58.95	0	00:40			
604	DUMMY	32.93	0	00:35			
605	CONDUIT	90.74	0	00:41	20.83	0.06	0.17
606	DUMMY	124.89	0	00:40			
607	CONDUIT	215.42	0	00:40	23.26	0.13	0.24
700	DUMMY	43.95	0	00:40			
701	DUMMY	23.95	0	00:45			
702	DUMMY	23.95	0	00:45			
703	CONDUIT	23.94	0	00:45	8.29	0.09	0.20
801	DUMMY	27.62	0	00:45			
802	DUMMY	47.62	0	00:35			
803	CONDUIT	73.66	0	00:40	12.80	0.09	0.21
804	DUMMY	15.60	0	00:35			
806	DUMMY	64.71	0	00:35			
805	CONDUIT	15.43	0	00:37	7.47	0.06	0.16
808	CONDUIT	270.40	0	01:13	4.87	0.04	0.23
800	CONDUIT	41.98	0	01:17	4.06	0.00	0.06
600	CONDUIT	164.38	0	00:51	12.48	0.01	0.09
101	DUMMY	53.95	0	01:13			
206	DUMMY	256.11	0	01:16			
301	DUMMY	115.75	0	00:59			
501	DUMMY	164.75	0	00:49			
704	DUMMY	42.13	0	01:12			
807	DUMMY	80.17	0	01:12			
608	DUMMY	229.20	0	01:09			

```
403                  DUMMY      160.70     0  01:04
```

```
************************
Conduit Surcharge Summary
************************

No conduits were surcharged.


Analysis begun on:  Mon Apr 13 19:00:38 2020
Analysis ended on:  Mon Apr 13 19:00:38 2020
Total elapsed time: < 1 sec
```

SWMM 100 Year Output 9-21-20

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/01/2005 00:00:00
Ending Date 01/02/2005 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	3854.070	1255.906
External Outflow	3828.229	1247.485
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	28.186	9.185
Continuity Error (%)	-0.061	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.02
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
10	JUNCTION	0.00	0.00	6975.00	0 00:00	0.00
20	JUNCTION	0.00	0.00	6982.00	0 00:00	0.00
21	JUNCTION	0.00	0.00	6953.00	0 00:00	0.00
22	JUNCTION	0.00	0.00	6936.00	0 00:00	0.00
23	JUNCTION	0.06	1.35	6946.35	0 00:35	1.34
24	JUNCTION	0.27	2.22	6936.22	0 00:51	2.22
30	JUNCTION	0.00	0.00	6985.00	0 00:00	0.00
31	JUNCTION	0.24	1.68	6954.68	0 00:59	1.68
67	JUNCTION	3.45	4.11	6869.61	0 01:12	4.11
40	JUNCTION	0.00	0.00	6918.00	0 00:00	0.00
41	JUNCTION	0.00	0.00	6888.00	0 00:00	0.00
42	JUNCTION	0.05	1.40	6912.40	0 00:35	1.38
50	JUNCTION	0.00	0.00	6945.00	0 00:00	0.00
51	JUNCTION	1.48	1.48	6921.48	0 00:21	1.48
60	JUNCTION	0.00	0.00	6942.00	0 00:00	0.00
61	JUNCTION	0.00	0.00	6893.00	0 00:00	0.00
62	JUNCTION	0.00	0.00	6908.00	0 00:00	0.00
63	JUNCTION	0.00	0.00	6882.00	0 00:00	0.00
64	JUNCTION	0.06	1.19	6901.19	0 00:40	1.19
65	JUNCTION	0.09	1.92	6881.92	0 00:40	1.92
66	JUNCTION	0.13	3.12	6871.12	0 00:40	3.12
70	JUNCTION	0.00	0.00	6923.00	0 00:00	0.00

71	JUNCTION	0.00	0.00	6908.00	0	00:00	0.00
72	JUNCTION	0.00	0.00	6904.00	0	00:00	0.00
73	JUNCTION	0.06	1.02	6903.02	0	00:45	1.02
74	JUNCTION	2.57	2.66	6899.66	0	01:12	2.66
80	JUNCTION	0.00	0.00	6890.00	0	00:00	0.00
81	JUNCTION	0.00	0.00	6896.00	0	00:00	0.00
82	JUNCTION	0.00	0.00	6886.00	0	00:00	0.00
83	JUNCTION	0.00	0.00	6878.00	0	00:00	0.00
84	JUNCTION	0.07	1.45	6873.45	0	00:40	1.45
85	JUNCTION	0.03	0.82	6874.82	0	00:35	0.81
OS1	JUNCTION	1.33	1.33	6953.93	0	00:00	1.33
OS3	JUNCTION	1.48	1.48	6924.28	0	00:00	1.48
OS4	JUNCTION	2.38	2.38	6902.18	0	00:00	2.38
OS2	JUNCTION	1.06	1.06	6925.06	0	00:00	1.06
Outfall2	OUTFALL	1.06	1.06	6911.06	0	01:47	1.06
Outfall1	OUTFALL	1.33	1.33	6948.33	0	00:39	1.33
Outfall4	OUTFALL	3.45	4.11	6869.11	0	01:12	4.11
Outfall3	OUTFALL	0.00	0.00	6880.00	0	00:00	0.00
PondB	STORAGE	6.72	9.85	6920.85	0	01:16	9.85
PondC	STORAGE	5.17	7.08	6963.08	0	00:59	7.08
PondA	STORAGE	5.81	8.60	6957.60	0	01:13	8.59
PondD	STORAGE	5.66	8.08	6889.08	0	01:04	8.08
PondE	STORAGE	4.04	5.84	6928.84	0	00:49	5.84
PondF	STORAGE	5.86	8.17	6874.17	0	01:09	8.17
PondG	STORAGE	0.20	2.69	6902.69	0	01:12	2.68
PondH	STORAGE	4.95	6.51	6872.51	0	01:12	6.51

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
10	JUNCTION	100.64	100.64	0 00:40	2.37	2.37	0.000

20	JUNCTION	97.08	97.08	0	00:35	1.81	1.81
21	JUNCTION	42.26	42.26	0	00:40	1.2	1.2
22	JUNCTION	295.27	295.27	0	00:40	6.04	6.04
23	JUNCTION	0.00	136.17	0	00:35	0	3.01
24	JUNCTION	0.00	334.84	0	00:51	0	9.43
30	JUNCTION	238.03	238.03	0	00:35	4	4
31	JUNCTION	0.00	115.75	0	00:59	0	3.39
67	JUNCTION	0.00	865.98	0	01:12	0	489
40	JUNCTION	70.07	70.07	0	00:35	1.32	1.32
41	JUNCTION	252.18	252.18	0	00:35	4.73	4.73
42	JUNCTION	0.00	70.07	0	00:35	0	1.32
50	JUNCTION	178.04	178.04	0	00:40	4.2	4.2
51	JUNCTION	0.00	381.75	0	00:49	0	179
60	JUNCTION	58.95	58.95	0	00:40	1.65	1.65
61	JUNCTION	170.90	170.90	0	00:40	3.87	3.87
62	JUNCTION	32.93	32.93	0	00:35	0.699	0.699
63	JUNCTION	124.89	124.89	0	00:40	2.87	2.87
64	JUNCTION	0.00	90.88	0	00:40	0	2.35
65	JUNCTION	0.00	215.63	0	00:40	0	5.22
66	JUNCTION	0.00	170.90	0	00:40	0	3.87
70	JUNCTION	43.95	43.95	0	00:40	1.05	1.05
71	JUNCTION	23.95	23.95	0	00:45	0.742	0.742
72	JUNCTION	0.00	23.95	0	00:45	0	0.742
73	JUNCTION	0.00	23.95	0	00:45	0	0.742

74	JUNCTION	0.00	637.13	0	01:12	0	482	0.000
80	JUNCTION	27.62	27.62	0	00:45	0.833	0.833	0.000
81	JUNCTION	47.62	47.62	0	00:35	1.01	1.01	0.000
82	JUNCTION	15.60	15.60	0	00:35	0.314	0.314	0.000
83	JUNCTION	64.71	64.71	0	00:35	1.46	1.46	0.000
84	JUNCTION	0.00	73.73	0	00:40	0	1.84	0.000
85	JUNCTION	0.00	15.60	0	00:35	0	0.314	0.000
OS1	JUNCTION	413.00	413.00	0	00:00	334	334	0.000
OS3	JUNCTION	217.00	217.00	0	00:00	175	175	-0.000
OS4	JUNCTION	595.00	595.00	0	00:00	481	481	0.000
OS2	JUNCTION	280.00	280.00	0	00:00	226	226	0.000
Outfall2	OUTFALL	0.00	536.11	0	01:16	0	236	0.000
Outfall1	OUTFALL	0.00	466.95	0	01:13	0	335	0.000
Outfall4	OUTFALL	0.00	1291.25	0	01:05	0	671	0.000
Outfall3	OUTFALL	0.00	160.70	0	01:04	0	5.21	0.000
PondB	STORAGE	0.00	447.00	0	00:49	0	12.4	0.062
PondC	STORAGE	0.00	238.03	0	00:35	0	4	0.130
PondA	STORAGE	0.00	100.64	0	00:40	0	2.37	0.096
PondD	STORAGE	0.00	320.21	0	00:35	0	6.05	0.105
PondE	STORAGE	0.00	178.04	0	00:40	0	4.2	0.178
PondF	STORAGE	0.00	385.87	0	00:41	0	9.08	0.109
PondG	STORAGE	0.00	67.73	0	00:40	0	1.8	0.079
PondH	STORAGE	0.00	153.03	0	00:38	0	3.61	0.143

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
PondB	363.135	43	0	0	827.701	97	0 01:15	256.11
PondC	146.763	26	0	0	299.338	52	0 00:58	115.75
PondA	75.030	37	0	0	152.554	76	0 01:12	53.95
PondD	192.591	31	0	0	418.291	67	0 01:04	160.70
PondE	48.028	17	0	0	106.230	37	0 00:48	164.75
PondF	250.108	31	0	0	549.589	67	0 01:09	229.20
PondG	5.811	1	0	0	88.594	16	0 01:11	42.13
PondH	131.315	21	0	0	268.983	42	0 01:12	80.17

****
Outfall Loading Summary
****

	Flow Freq	Avg Flow	Max Flow	Total Volume

SWMM 100 Year Output 9-21-20

Outfall Node	Pcnt	CFS	CFS	10^6 gal
Outfall2	99.97	292.00	536.11	235.796
Outfall1	99.97	415.18	466.95	335.258
Outfall4	99.92	831.58	1291.25	671.130
Outfall3	99.69	6.47	160.70	5.209
System	99.89	1545.23	2428.13	1247.393

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
100	DUMMY	100.64	0	00:40			
200	DUMMY	97.08	0	00:35			
201	DUMMY	42.26	0	00:40			
202	CONDUIT	136.36	0	00:36	26.17	0.08	0.19
203	CONDUIT	115.74	0	00:59	23.03	0.37	0.42
204	DUMMY	295.27	0	00:40			
205	CONDUIT	334.86	0	00:51	31.89	0.22	0.32
300	DUMMY	238.03	0	00:35			
400	DUMMY	70.07	0	00:35			
401	CONDUIT	69.37	0	00:36	15.63	0.17	0.28
402	DUMMY	252.18	0	00:35			
500	DUMMY	178.04	0	00:40			
601	DUMMY	170.90	0	00:40			
602	CONDUIT	170.58	0	00:41	13.26	0.71	0.62
603	DUMMY	58.95	0	00:40			
604	DUMMY	32.93	0	00:35			
605	CONDUIT	90.74	0	00:41	20.83	0.06	0.17
606	DUMMY	124.89	0	00:40			
607	CONDUIT	215.42	0	00:40	23.26	0.13	0.24
700	DUMMY	43.95	0	00:40			
701	DUMMY	23.95	0	00:45			
702	DUMMY	23.95	0	00:45			
703	CONDUIT	23.94	0	00:45	8.29	0.09	0.20
801	DUMMY	27.62	0	00:45			
802	DUMMY	47.62	0	00:35			
803	CONDUIT	73.66	0	00:40	12.80	0.09	0.21
804	DUMMY	15.60	0	00:35			
806	DUMMY	64.71	0	00:35			
805	CONDUIT	15.43	0	00:37	7.47	0.06	0.16

808	CONDUIT	865.97	0	01:12	6.70	0.14	0.41
800	CONDUIT	637.10	0	01:15	9.35	0.06	0.27
600	CONDUIT	381.54	0	00:50	16.34	0.02	0.15
EastForkTrib	CONDUIT	217.00	0	00:21	4.75	0.02	0.15
EastFork	CONDUIT	595.00	0	00:16	6.34	0.10	0.30
MainStem	CONDUIT	413.00	0	00:40	4.75	0.03	0.13
MainStemTrib	CONDUIT	280.00	0	01:49	4.12	0.02	0.11
101	DUMMY	53.95	0	01:13			
206	DUMMY	256.11	0	01:16			
301	DUMMY	115.75	0	00:59			
501	DUMMY	164.75	0	00:49			
704	DUMMY	42.13	0	01:12			
807	DUMMY	80.17	0	01:12			
608	DUMMY	229.20	0	01:09			
403	DUMMY	160.70	0	01:04			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 16:06:21 2020
Analysis ended on: Mon Sep 21 16:06:21 2020
Total elapsed time: < 1 sec

Appendix D

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 1 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond A
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters: User Input	COS DCM	
A) Average Infiltration Rate of WQCV (i =)	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface (y =)	N/A	N/A	inches
C) Underdrain Outlet Orifice Area (Underdrain Ao =)	N/A	N/A	sq in
D) Number of WQCV Orifice Rows (# WQCV rows =)	10	10	
E) Vertical Spacing between WQCV Orifice Rows (Orifice Spacing =)	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row (WQCV Ao =)	0.61	0.61	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth) (Max Stage $_{WQCV}$ =)	3.40	3.40	ft
H) EURV Orifice Area (A_o) in Single Row (EURV Ao =)	2.96	2.96	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth) (Max Stage $_{EURV}$ =)	4.50	4.50	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s) (Cd =)	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters: User Input	COS DCM	
A) Length of Basin at Top of EURV (L_{PCM} =)	370.3	370.3	ft
B) Width of Basin at Top of EURV (W_{PCM} =)	113.6	113.6	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge) (Stage at Top of Bench =)	4.60	4.60	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) (L_{Bench} =)	371.1	371.1	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) (W_{Bench} =)	114.4	114.4	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.) ($Z_{Surcharge}$ =)	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	13.03				57.08	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time (min)	Post-Development Storm Inflow Hydrographs (cfs): 2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		0.32				0.84	
0:10		2.12				2.93	
0:15		6.24				8.14	
0:20		19.45				26.66	
0:25		29.43				70.19	
0:30		30.68				95.65	
0:35		28.10				100.37	
0:40		24.84				96.25	
0:45		22.05				89.32	
0:50		19.61				81.43	
0:55		17.40				74.41	
1:00		15.33				68.04	
1:05		13.43				58.60	
1:10		11.93				49.54	
1:15		10.74				42.06	
1:20		9.68				35.93	
1:25		8.69				30.71	
1:30		7.74				26.07	
1:35		6.69				21.81	
1:40		5.63				17.82	
1:45		4.64				14.14	
1:50		3.79				10.94	
1:55		3.24				8.55	
2:00		2.68				6.51	
2:05		2.16				4.89	
2:10		1.73				3.64	
2:15		1.39				2.70	
2:20		1.11				1.98	
2:25		0.88				1.45	
2:30		0.68				1.07	
2:35		0.53				0.82	
2:40		0.41				0.64	
2:45		0.32				0.50	
2:50		0.24				0.39	
2:55		0.17				0.29	
3:00		0.12				0.20	
3:05		0.08				0.13	
3:10		0.05				0.07	
3:15		0.02				0.03	
3:20		0.01				0.01	
3:25		0.00				0.00	
3:30							
3:35							
3:40							
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5:30							
5:35							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

5:40							
5:45							
5:50							
5:55							
6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond A
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)	4.50	4.50	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	8.00	9.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	8.00	5.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area)	70%	70%	%
F) Debris Clogging %	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox)	4.50	4.50	ft
H) Overflow Grate Slope Length (inside edge of dropbox)	8.00	5.00	ft
I) Overflow Grate Open Area (without debris)	44.80	31.50	sq ft
J) Overflow Grate Open Area (with debris)	22.40	15.75	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction
(Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)	1.50	1.50	ft
C) Outlet Pipe Diameter	36.00	30.00	inches
D) Restrictor Plate Height above Pipe Invert	22.42	28.11	inches
E) Half-Central Angle of Restrictor Plate on Pipe	1.82	2.63	radians
F) Outlet Orifice Area	4.63	4.78	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	1.06	1.22	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	9.68	6.59	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft)	5.90	6.00	ft
B) Spillway Crest Length	42.00	33.00	ft
C) Spillway End Slopes (H:V)	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface	1.00	1.00	ft
E) Spillway Design Flow Depth	0.80	1.00	ft
F) Stage at Top of Freeboard	7.70	8.00	ft
G) Basin Area at Top of Freeboard	1.27	1.29	acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.64	1.66		2.16				7.27	
Predevelopment Peak Q (cfs) =	N/A	N/A		13.0				57.1	
Peak Inflow (cfs) =	N/A	N/A		30.7				100.4	
Peak Outflow (cfs) =	0.3	0.5		4.6				56.3	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.4				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.1				1.2	
Time to Drain 97% of Volume (hr) =	39	69		73				61	
Time to Drain 99% of Volume (hr) =	41	72		77				72	
Maximum Ponding Depth (ft) =	3.40	4.50		4.70				5.90	
Area at Max Ponding Depth (ac) =	0.80	0.97		0.98				1.09	
Maximum Volume Stored (ac-ft) =	0.64	1.66		1.87				3.11	

Results based on COS DCM Inputs

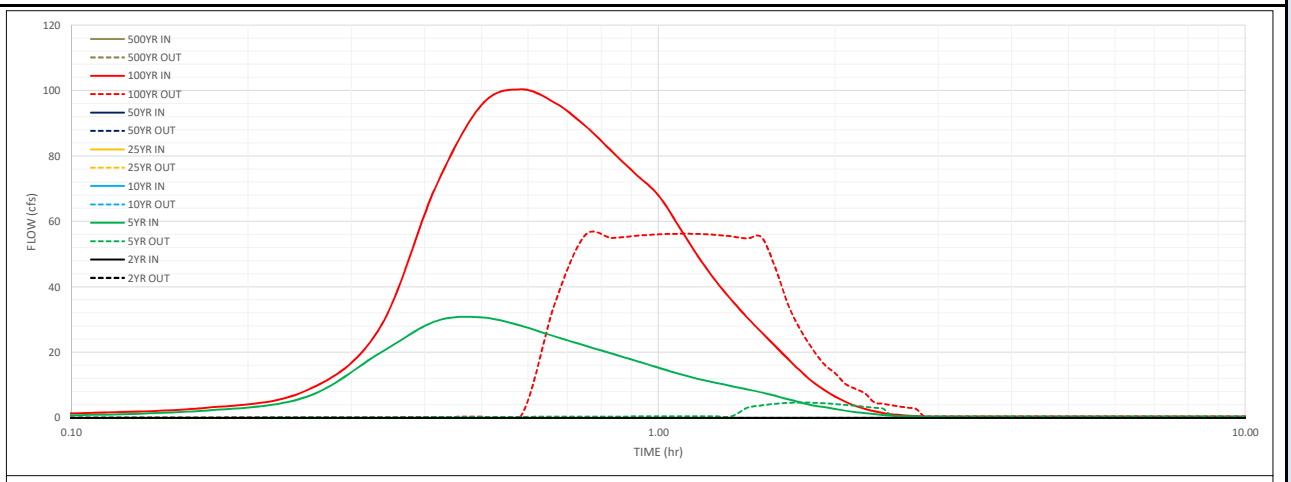
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.64	1.66		2.16				7.27	
Predevelopment Peak Q (cfs) =	N/A	N/A		13.0				57.1	
Peak Inflow (cfs) =	N/A	N/A		30.7				100.4	
Peak Outflow (cfs) =	0.3	0.5		4.3				57.5	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.3				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.2				1.8	
Time to Drain 97% of Volume (hr) =	39	69		73				61	
Time to Drain 99% of Volume (hr) =	41	72		77				72	
Maximum Ponding Depth (ft) =	3.40	4.50		4.70				5.90	
Area at Max Ponding Depth (ac) =	0.80	0.97		0.98				1.09	
Maximum Volume Stored (ac-ft) =	0.64	1.66		1.87				3.11	

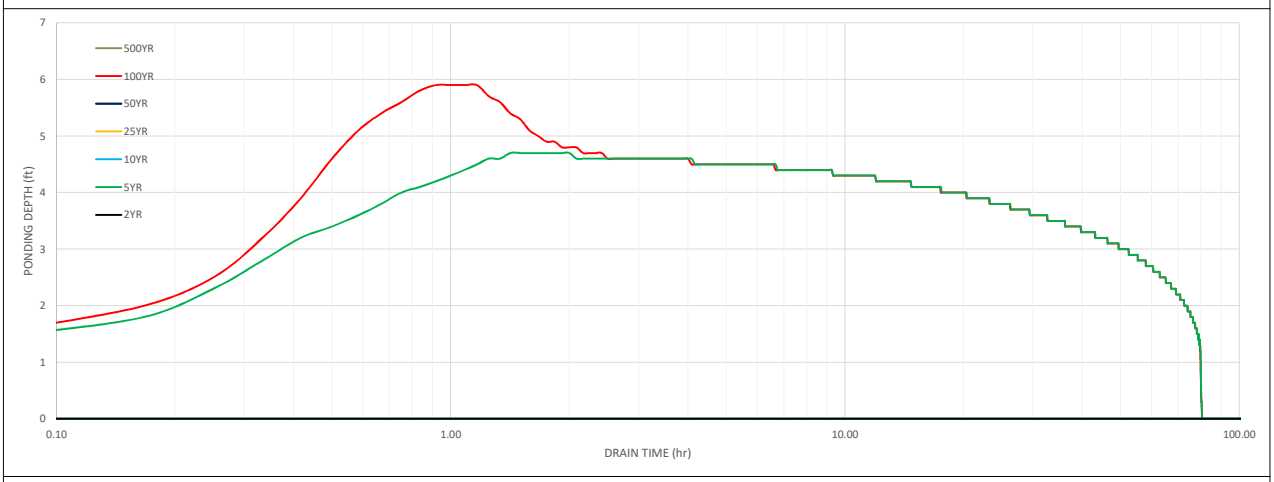
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

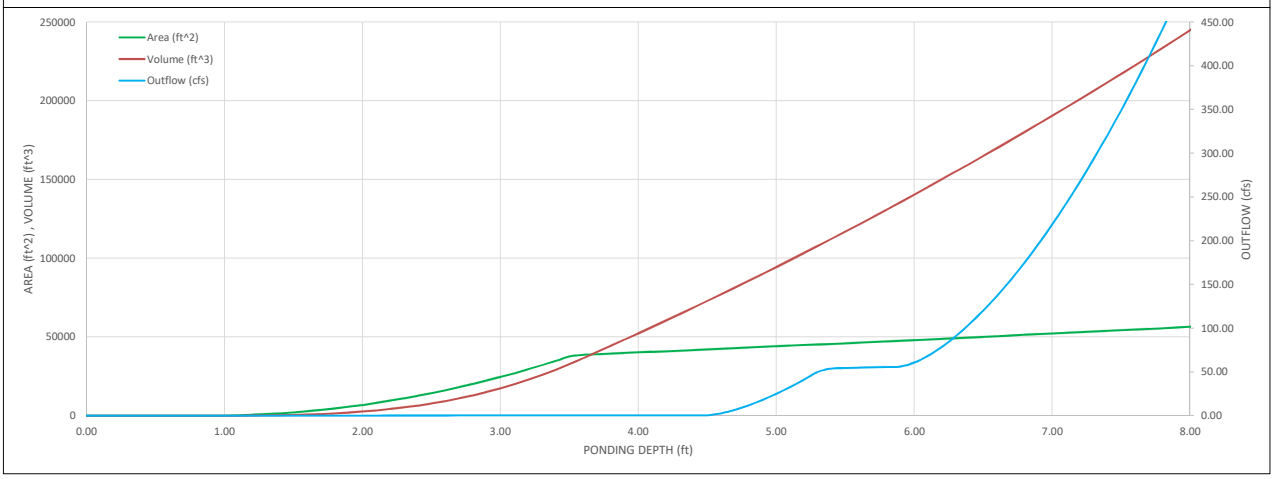
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond A
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 1 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond B
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

A) Average Infiltration Rate of WQCV
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface
C) Underdrain Outlet Orifice Area
D) Number of WQCV Orifice Rows
E) Vertical Spacing between WQCV Orifice Rows
F) WQCV Orifice Area (A_o) per Row
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth)
H) EURV Orifice Area (A_o) in Single Row
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth)
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s)

Input Parameters	User Input	COS DCM	
i =	N/A	N/A	in / hr
y =	N/A	N/A	inches
Underdrain Ao =	N/A	N/A	sq in
# WQCV rows =	14	14	
Orifice Spacing =	4.0	4.0	inches
WQCV Ao =	1.49	1.49	sq in
Max Stage $_{WQCV}$ =	4.70	4.70	ft
EURV Ao =	1.49	1.49	sq in
Max Stage $_{EURV}$ =	6.00	6.00	ft
Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

A) Length of Basin at Top of EURV
B) Width of Basin at Top of EURV
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge)
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge)
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge)
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.)

Input Parameters	User Input	COS DCM	
L_{PCM} =	644.7	644.7	ft
W_{PCM} =	191.2	191.2	ft
Stage at Top of Bench =	6.10	6.10	ft
L_{Bench} =	645.5	645.5	ft
W_{Bench} =	192.0	192.0	ft
$Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

B) Adjust "Time Interval" to match hydrograph data

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time Interval: 5.0 minutes

Pre-Development Peak Flow (cfs)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
		17.56				164.21	

Time (min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	Post-Development Storm Inflow Hydrographs (cfs)						
0:00		0.00				0.00	
0:05		0.69				2.08	
0:10		5.80				8.30	
0:15		16.64				20.58	
0:20		42.42				58.80	
0:25		68.16				179.82	
0:30		75.65				276.49	
0:35		71.78				307.62	
0:40		64.91				331.81	
0:45		58.24				366.22	
0:50		52.24				365.58	
0:55		47.02				346.26	
1:00		42.99				321.76	
1:05		39.68				290.00	
1:10		36.25				252.97	
1:15		32.60				216.52	
1:20		29.09				182.15	
1:25		26.07				152.09	
1:30		23.97				127.70	
1:35		22.28				109.78	
1:40		20.74				96.42	
1:45		19.35				85.46	
1:50		18.07				76.27	
1:55		16.77				68.63	
2:00		14.81				60.20	
2:05		12.66				51.42	
2:10		10.67				42.95	
2:15		8.88				35.32	
2:20		7.28				28.18	
2:25		5.90				21.64	
2:30		4.82				15.96	
2:35		4.08				11.89	
2:40		3.58				9.39	
2:45		3.19				7.53	
2:50		2.86				6.09	
2:55		2.60				4.98	
3:00		2.39				4.12	
3:05		2.22				3.47	
3:10		2.09				2.97	
3:15		1.97				2.55	
3:20		1.86				2.21	
3:25		1.77				2.08	
3:30		1.70				1.98	
3:35		1.63				1.88	
3:40		1.58				1.81	
3:45		1.54				1.75	
3:50		1.51				1.70	
3:55		1.49				1.67	
4:00		1.47				1.65	
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5:15		1.43				1.62	
5:20		1.43				1.62	
5:25		1.43				1.61	
5:30		1.43				1.61	
5:35		1.43				1.61	

5:40		1.42				1.61	
5:45		1.42				1.61	
5:50		1.42				1.60	
5:55		1.42				1.60	
6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond B
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)	6.00	6.00	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	17.00	17.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	17.00	7.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area)	70%	70%	%
F) Debris Clogging %	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox)	6.00	6.00	ft
H) Overflow Grate Slope Length (inside edge of dropbox)	17.00	7.00	ft
I) Overflow Grate Open Area (without debris)	202.30	83.30	sq ft
J) Overflow Grate Open Area (with debris)	101.15	41.65	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction
(Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)	1.50	1.50	ft
C) Outlet Pipe Diameter	54.00	48.00	inches
D) Restrictor Plate Height above Pipe Invert	37.00	42.00	inches
E) Half-Central Angle of Restrictor Plate on Pipe	1.95	2.42	radians
F) Outlet Orifice Area	11.61	11.66	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	1.73	1.87	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	17.42	7.14	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft)	9.50	9.30	ft
B) Spillway Crest Length	136.00	122.00	ft
C) Spillway End Slopes (H:V)	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface	1.00	1.00	ft
E) Spillway Design Flow Depth	0.90	1.00	ft
F) Stage at Top of Freeboard	11.40	11.30	ft
G) Basin Area at Top of Freeboard	3.70	3.68	acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.41	5.73		6.67				31.72	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.6				164.2	
Peak Inflow (cfs) =	N/A	N/A		75.7				366.2	
Peak Outflow (cfs) =	1.1	1.4		1.4				166.4	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.1				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				0.8	
Time to Drain 97% of Volume (hr) =	40	68		76				61	
Time to Drain 99% of Volume (hr) =	42	72		80				73	
Maximum Ponding Depth (ft) =	4.70	6.00		6.10				9.10	
Area at Max Ponding Depth (ac) =	1.92	2.83		2.85				3.32	
Maximum Volume Stored (ac-ft) =	2.41	5.73		6.04				15.28	

Results based on COS DCM Inputs

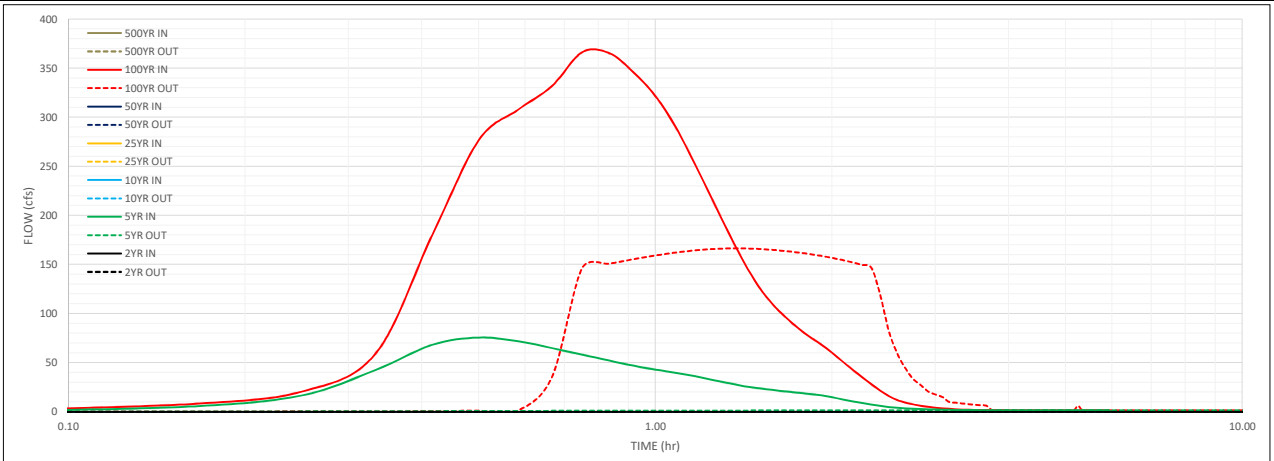
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.41	5.73		6.67				31.72	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.6				164.2	
Peak Inflow (cfs) =	N/A	N/A		75.7				366.2	
Peak Outflow (cfs) =	1.1	1.4		1.4				166.5	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.1				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				2.0	
Time to Drain 97% of Volume (hr) =	40	68		76				61	
Time to Drain 99% of Volume (hr) =	42	72		80				73	
Maximum Ponding Depth (ft) =	4.70	6.00		6.10				9.20	
Area at Max Ponding Depth (ac) =	1.92	2.83		2.85				3.34	
Maximum Volume Stored (ac-ft) =	2.41	5.73		6.04				15.62	

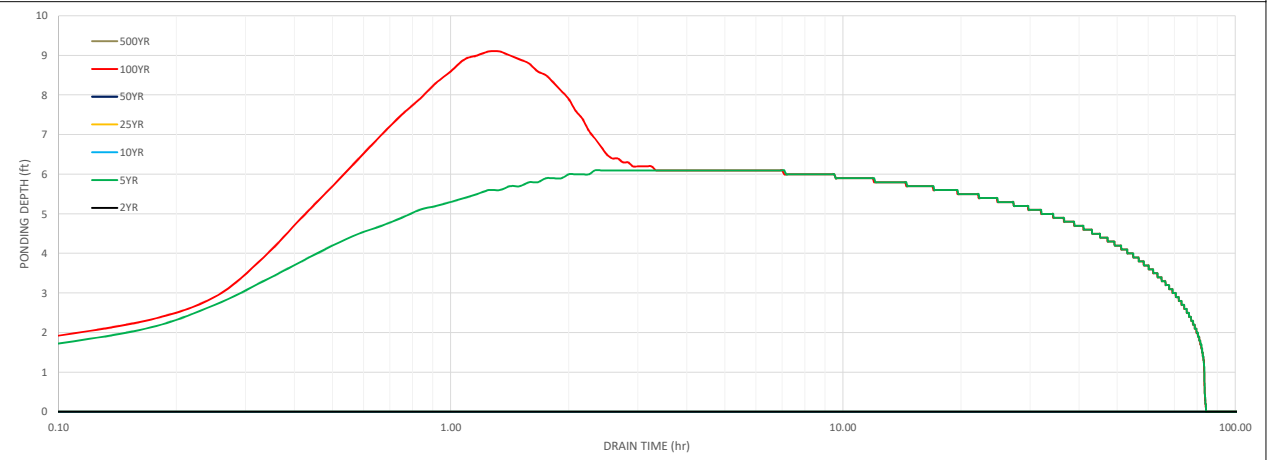
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

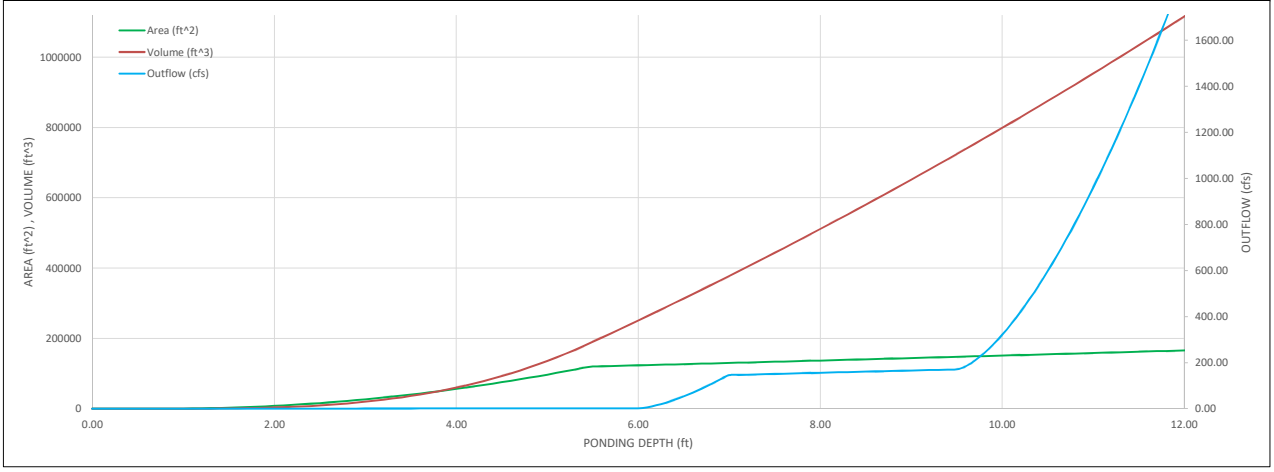
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond B
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 1 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond C
Date: April 6, 2020 — Last Edited: April 08, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters: User Input	COS DCM	
A) Average Infiltration Rate of WQCV i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows # WQCV rows =	12	12	
E) Vertical Spacing between WQCV Orifice Rows Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row WQCV Ao =	1.05	1.05	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth) Max Stage $_{WQCV}$ =	4.00	4.00	ft
H) EURV Orifice Area (A_o) in Single Row EURV Ao =	17.07	17.07	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth) Max Stage $_{EURV}$ =	6.00	6.00	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s) Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters: User Input	COS DCM	
A) Length of Basin at Top of EURV L_{PCM} =	453.3	453.3	ft
B) Width of Basin at Top of EURV W_{PCM} =	177.8	177.8	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge) Stage at Top of Bench =	6.10	6.10	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) L_{Bench} =	454.1	454.1	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) W_{Bench} =	178.6	178.6	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.) $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	9.95				120.21	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time (min)	Post-Development Storm Inflow Hydrographs (cfs): 2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		1.75				4.56	
0:10		11.33				15.20	
0:15		27.93				32.42	
0:20		61.14				76.70	
0:25		78.99				190.43	
0:30		71.29				238.04	
0:35		58.22				222.59	
0:40		47.28				193.29	
0:45		38.58				162.70	
0:50		32.22				131.89	
0:55		27.64				110.47	
1:00		23.60				95.05	
1:05		20.00				74.37	
1:10		16.49				54.92	
1:15		14.05				38.35	
1:20		12.80				27.93	
1:25		12.09				21.76	
1:30		11.62				18.07	
1:35		10.55				15.64	
1:40		9.56				14.06	
1:45		8.84				12.98	
1:50		8.33				12.35	
1:55		7.74				12.15	
2:00		5.88				9.32	
2:05		4.08				6.49	
2:10		2.79				4.48	
2:15		1.86				3.04	
2:20		1.21				1.99	
2:25		0.80				1.32	
2:30		0.49				0.80	
2:35		0.25				0.40	
2:40		0.09				0.14	
2:45		0.01				0.01	
2:50		0.00				0.00	
2:55							
3:00							
3:05							
3:10							
3:15							
3:20							
3:25							
3:30							
3:35							
3:40							
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3:50							
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5:40							
5:45							
5:50							
5:55							
6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond C
Date: April 6, 2020 — Last Edited: April 08, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)	6.00	6.00	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	12.00	11.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	12.00	11.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area)	70%	70%	%
F) Debris Clogging %	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox)	6.00	6.00	ft
H) Overflow Grate Slope Length (inside edge of dropbox)	12.00	11.00	ft
I) Overflow Grate Open Area (without debris)	100.80	84.70	sq ft
J) Overflow Grate Open Area (with debris)	50.40	42.35	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction
(Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)	1.50	1.50	ft
C) Outlet Pipe Diameter	48.00	42.00	inches
D) Restrictor Plate Height above Pipe Invert	33.13	39.36	inches
E) Half-Central Angle of Restrictor Plate on Pipe	1.96	2.63	radians
F) Outlet Orifice Area	9.25	9.37	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	1.54	1.71	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	10.90	9.04	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft)	8.00	999.00	ft
B) Spillway Crest Length	79.00	42.00	ft
C) Spillway End Slopes (H:V)	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface	1.00	1.00	ft
E) Spillway Design Flow Depth	1.00		ft
F) Stage at Top of Freeboard	10.00		ft
G) Basin Area at Top of Freeboard	2.34		acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.36	4.79		4.34				12.42	
Predevelopment Peak Q (cfs) =	N/A	N/A		10.0				120.2	
Peak Inflow (cfs) =	N/A	N/A		79.0				238.0	
Peak Outflow (cfs) =	0.6	1.7		1.5				119.2	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.2				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Orifice Plate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		N/A				1.2	
Time to Drain 97% of Volume (hr) =	39	67		65				63	
Time to Drain 99% of Volume (hr) =	41	72		69				72	
Maximum Ponding Depth (ft) =	4.00	6.00		5.60				7.10	
Area at Max Ponding Depth (ac) =	1.32	1.85		1.80				1.98	
Maximum Volume Stored (ac-ft) =	1.36	4.79		4.07				6.91	

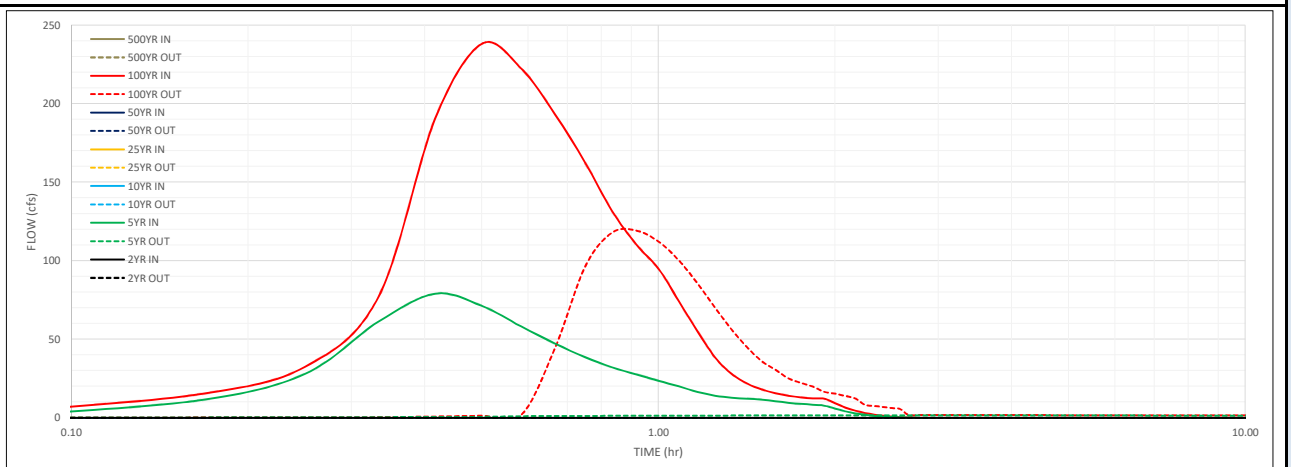
Results based on COS DCM Inputs

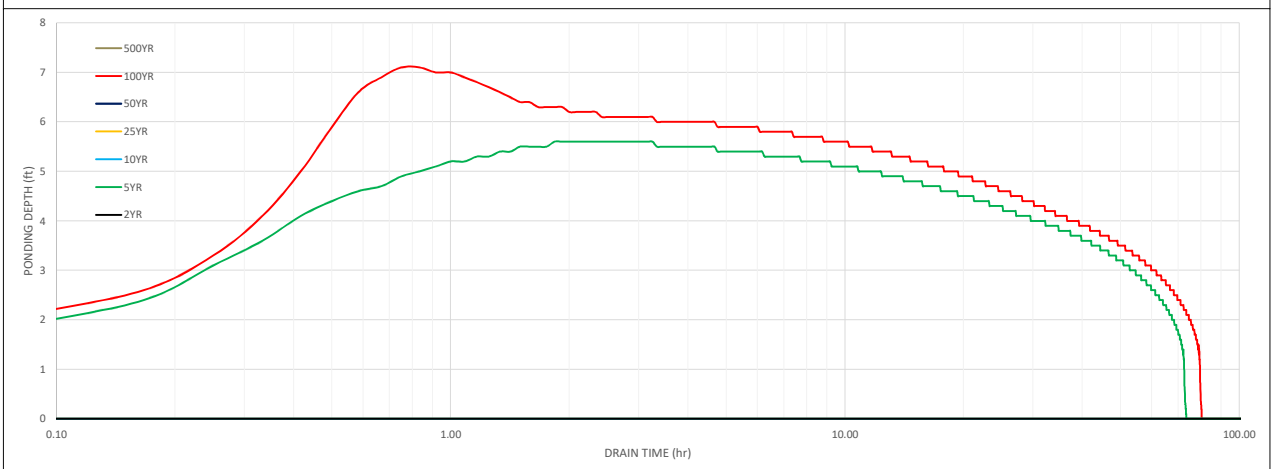
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.36	4.79		4.34				12.42	
Predevelopment Peak Q (cfs) =	N/A	N/A		10.0				120.2	
Peak Inflow (cfs) =	N/A	N/A		79.0				238.0	
Peak Outflow (cfs) =	0.6	1.7		1.5				116.8	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.2				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Orifice Plate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		N/A				1.3	
Time to Drain 97% of Volume (hr) =	39	67		65				63	
Time to Drain 99% of Volume (hr) =	41	72		69				72	
Maximum Ponding Depth (ft) =	4.00	6.00		5.60				7.10	
Area at Max Ponding Depth (ac) =	1.32	1.85		1.80				1.98	
Maximum Volume Stored (ac-ft) =	1.36	4.79		4.07				6.91	

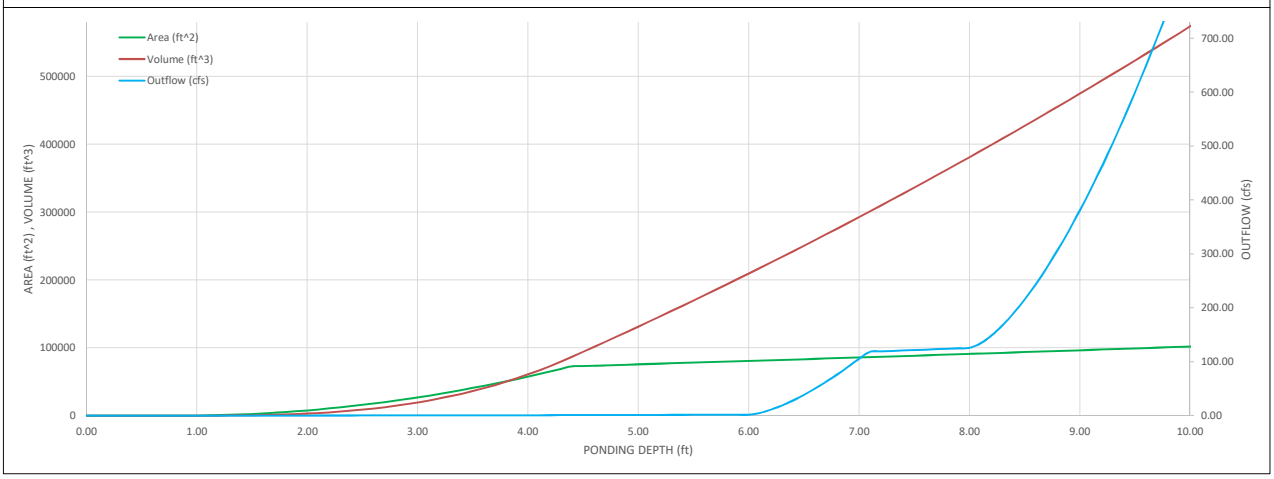
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond C
Date: April 6, 2020 — Last Edited: April 08, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 1 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond D
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters: User Input	COS DCM	
A) Average Infiltration Rate of WQCV i =	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface y =	N/A	N/A	inches
C) Underdrain Outlet Orifice Area Underdrain Ao =	N/A	N/A	sq in
D) Number of WQCV Orifice Rows # WQCV rows =	13	13	
E) Vertical Spacing between WQCV Orifice Rows Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row WQCV Ao =	1.34	1.34	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth) Max Stage $_{WQCV}$ =	4.50	4.50	ft
H) EURV Orifice Area (A_o) in Single Row EURV Ao =	20.83	20.83	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth) Max Stage $_{EURV}$ =	6.50	6.50	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s) Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters: User Input	COS DCM	
A) Length of Basin at Top of EURV L_{PCM} =	588.5	588.5	ft
B) Width of Basin at Top of EURV W_{PCM} =	180.1	180.1	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge) Stage at Top of Bench =	6.60	6.60	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) L_{Bench} =	589.3	589.3	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) W_{Bench} =	180.9	180.9	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.) $Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	30.00				154.35	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time (min)	Post-Development Storm Inflow Hydrographs (cfs): 2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		1.91				5.05	
0:10		13.55				18.88	
0:15		36.44				44.44	
0:20		87.25				108.47	
0:25		118.48				244.10	
0:30		113.01				314.40	
0:35		95.70				305.49	
0:40		80.03				273.09	
0:45		67.12				239.63	
0:50		56.09				204.40	
0:55		48.05				175.96	
1:00		41.91				156.02	
1:05		36.47				129.55	
1:10		30.68				102.47	
1:15		25.11				77.55	
1:20		21.41				56.75	
1:25		19.34				42.46	
1:30		18.14				33.79	
1:35		16.52				28.16	
1:40		14.92				24.40	
1:45		13.77				21.80	
1:50		12.92				19.98	
1:55		12.02				18.83	
2:00		9.58				15.10	
2:05		6.95				10.86	
2:10		4.98				7.82	
2:15		3.53				5.61	
2:20		2.44				3.93	
2:25		1.66				2.73	
2:30		1.13				1.86	
2:35		0.72				1.18	
2:40		0.41				0.67	
2:45		0.20				0.31	
2:50		0.08				0.11	
2:55		0.04				0.05	
3:00		0.02				0.02	
3:05		0.01				0.01	
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5:40							
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5:50							
5:55							
6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond D
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)	6.50	6.50	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	11.00	9.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	11.00	9.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area)	70%	70%	%
F) Debris Clogging %	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox)	6.50	6.50	ft
H) Overflow Grate Slope Length (inside edge of dropbox)	11.00	9.00	ft
I) Overflow Grate Open Area (without debris)	84.70	56.70	sq ft
J) Overflow Grate Open Area (with debris)	42.35	28.35	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction
(Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)	1.50	1.50	ft
C) Outlet Pipe Diameter	48.00	48.00	inches
D) Restrictor Plate Height above Pipe Invert	44.00	44.00	inches
E) Half-Central Angle of Restrictor Plate on Pipe	2.56	2.56	radians
F) Outlet Orifice Area	12.07	12.07	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	1.93	1.93	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	7.02	4.70	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft)	8.00	999.00	ft
B) Spillway Crest Length	105.00	42.00	ft
C) Spillway End Slopes (H:V)	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface	1.00	1.00	ft
E) Spillway Design Flow Depth	1.00		ft
F) Stage at Top of Freeboard	10.00		ft
G) Basin Area at Top of Freeboard	2.95		acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.96	6.56		6.97				18.57	
Predevelopment Peak Q (cfs) =	N/A	N/A		30.0				154.4	
Peak Inflow (cfs) =	N/A	N/A		118.5				314.4	
Peak Outflow (cfs) =	0.9	2.2		2.2				161.7	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.1				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Orifice Plate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		N/A				1.8	
Time to Drain 97% of Volume (hr) =	40	67		70				62	
Time to Drain 99% of Volume (hr) =	42	72		75				72	
Maximum Ponding Depth (ft) =	4.50	6.50		6.50				7.90	
Area at Max Ponding Depth (ac) =	1.71	2.43		2.43				2.63	
Maximum Volume Stored (ac-ft) =	1.96	6.56		6.59				10.13	

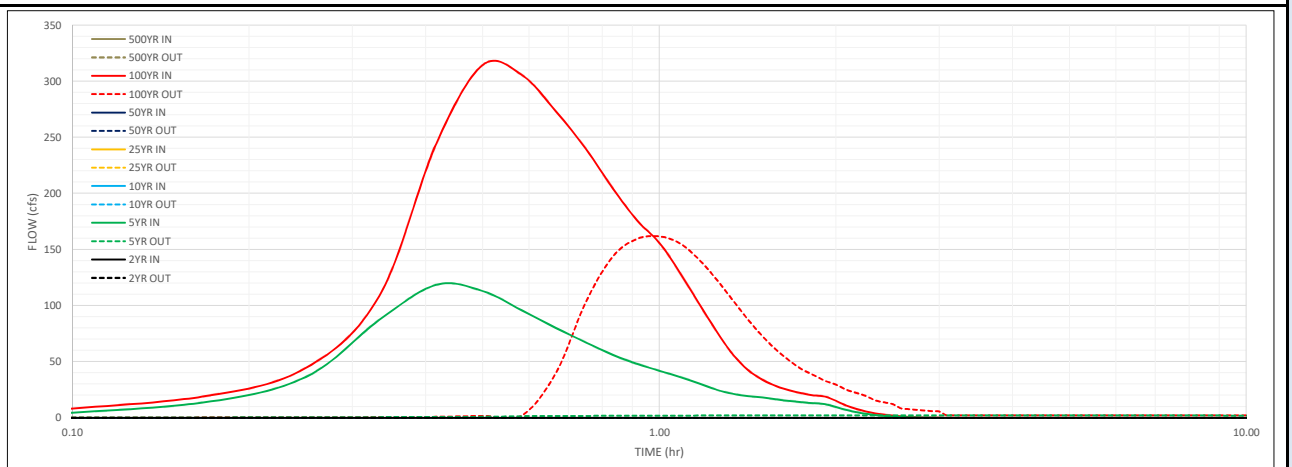
Results based on COS DCM Inputs

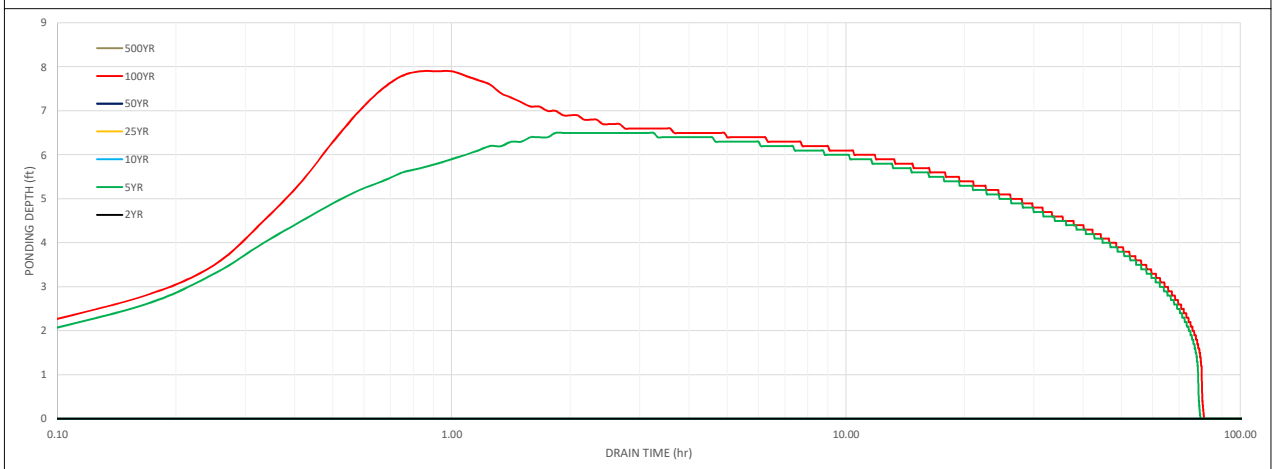
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.96	6.56		6.97				18.57	
Predevelopment Peak Q (cfs) =	N/A	N/A		30.0				154.4	
Peak Inflow (cfs) =	N/A	N/A		118.5				314.4	
Peak Outflow (cfs) =	0.9	2.2		2.2				153.1	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.1				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Orifice Plate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		N/A				2.8	
Time to Drain 97% of Volume (hr) =	40	67		70				63	
Time to Drain 99% of Volume (hr) =	42	72		75				72	
Maximum Ponding Depth (ft) =	4.50	6.50		6.50				8.10	
Area at Max Ponding Depth (ac) =	1.71	2.43		2.43				2.66	
Maximum Volume Stored (ac-ft) =	1.96	6.56		6.59				10.66	

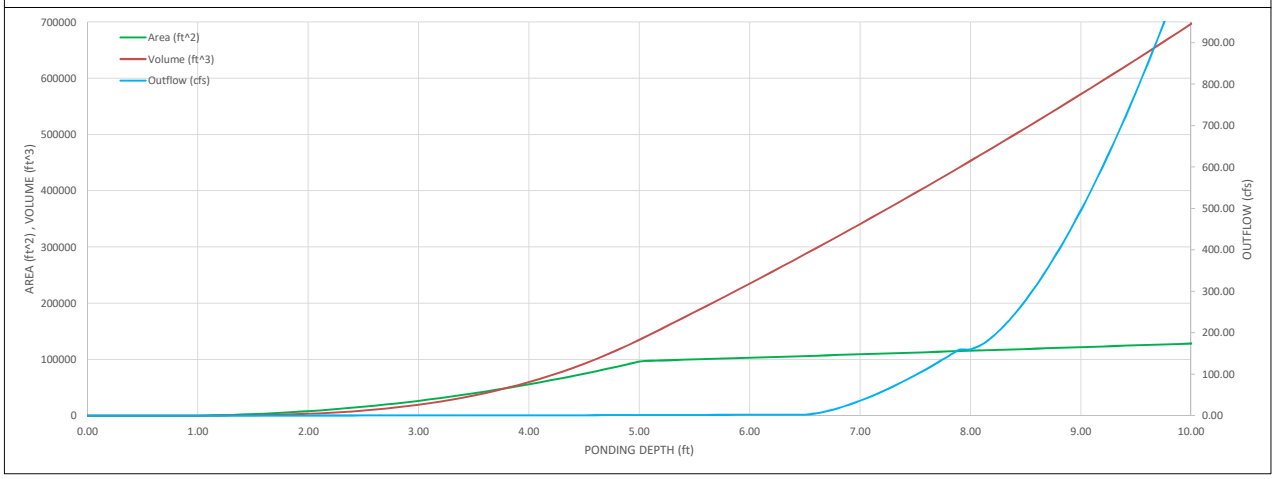
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond D
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 1 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond E
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	Input Parameters: User Input	COS DCM	
A) Average Infiltration Rate of WQCV (i =)	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface (y =)	N/A	N/A	inches
C) Underdrain Outlet Orifice Area (Underdrain Ao =)	N/A	N/A	sq in
D) Number of WQCV Orifice Rows (# WQCV rows =)	10	10	
E) Vertical Spacing between WQCV Orifice Rows (Orifice Spacing =)	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row (WQCV Ao =)	0.67	0.67	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth) (Max Stage $_{WQCV}$ =)	3.60	3.60	ft
H) EURV Orifice Area (A_o) in Single Row (EURV Ao =)	0.67	0.67	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth) (Max Stage $_{EURV}$ =)	4.50	4.50	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s) (Cd =)	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	Input Parameters: User Input	COS DCM	
A) Length of Basin at Top of EURV (L_{PCM} =)	327.0	327.0	ft
B) Width of Basin at Top of EURV (W_{PCM} =)	127.7	127.7	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge) (Stage at Top of Bench =)	4.60	4.60	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) (L_{Bench} =)	327.8	327.8	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) (W_{Bench} =)	128.5	128.5	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.) ($Z_{Surcharge}$ =)	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	32.34				157.99	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time (min)	Post-Development Storm Inflow Hydrographs (cfs): 2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		0.16				0.43	
0:10		1.11				1.54	
0:15		5.07				7.00	
0:20		23.64				35.29	
0:25		41.87				110.52	
0:30		46.56				162.17	
0:35		43.13				176.94	
0:40		37.83				172.03	
0:45		33.03				161.08	
0:50		29.04				147.26	
0:55		25.75				135.35	
1:00		22.65				124.96	
1:05		19.67				109.31	
1:10		16.82				92.46	
1:15		14.63				77.36	
1:20		13.01				65.86	
1:25		11.61				56.57	
1:30		10.30				48.68	
1:35		8.90				41.54	
1:40		7.47				34.92	
1:45		6.08				28.67	
1:50		4.75				22.81	
1:55		3.50				17.32	
2:00		2.49				12.10	
2:05		1.86				8.45	
2:10		1.45				6.02	
2:15		1.16				4.29	
2:20		0.92				3.03	
2:25		0.73				2.11	
2:30		0.57				1.42	
2:35		0.44				0.96	
2:40		0.34				0.71	
2:45		0.26				0.55	
2:50		0.20				0.44	
2:55		0.15				0.34	
3:00		0.11				0.26	
3:05		0.07				0.19	
3:10		0.05				0.13	
3:15		0.03				0.08	
3:20		0.02				0.04	
3:25		0.01				0.02	
3:30		0.00				0.00	
3:35		0.00				0.00	
3:40		0.00					
3:45		0.00					
3:50		0.00					
3:55		0.00					
4:00		0.00					
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6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond E
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)	4.50	4.50	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	15.00	9.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	15.00	9.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area)	70%	70%	%
F) Debris Clogging %	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox)	4.50	4.50	ft
H) Overflow Grate Slope Length (inside edge of dropbox)	15.00	9.00	ft
I) Overflow Grate Open Area (without debris)	157.50	56.70	sq ft
J) Overflow Grate Open Area (with debris)	78.75	28.35	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction
(Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)	1.50	1.50	ft
C) Outlet Pipe Diameter	60.00	54.00	inches
D) Restrictor Plate Height above Pipe Invert	43.00	50.00	inches
E) Half-Central Angle of Restrictor Plate on Pipe	2.02	2.59	radians
F) Outlet Orifice Area	15.06	15.37	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	1.99	2.18	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	10.46	3.69	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft)	5.80	999.00	ft
B) Spillway Crest Length	100.00	42.00	ft
C) Spillway End Slopes (H:V)	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface	1.00	1.00	ft
E) Spillway Design Flow Depth	0.70		ft
F) Stage at Top of Freeboard	7.50		ft
G) Basin Area at Top of Freeboard	1.22		acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.81	1.70		3.01				12.89	
Predevelopment Peak Q (cfs) =	N/A	N/A		32.3				158.0	
Peak Inflow (cfs) =	N/A	N/A		46.6				176.9	
Peak Outflow (cfs) =	0.3	0.4		18.0				164.2	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.6				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.1				1.0	
Time to Drain 97% of Volume (hr) =	44	69		71				54	
Time to Drain 99% of Volume (hr) =	46	72		76				69	
Maximum Ponding Depth (ft) =	3.60	4.50		4.80				5.70	
Area at Max Ponding Depth (ac) =	0.88	0.96		0.98				1.06	
Maximum Volume Stored (ac-ft) =	0.81	1.70		1.99				2.91	

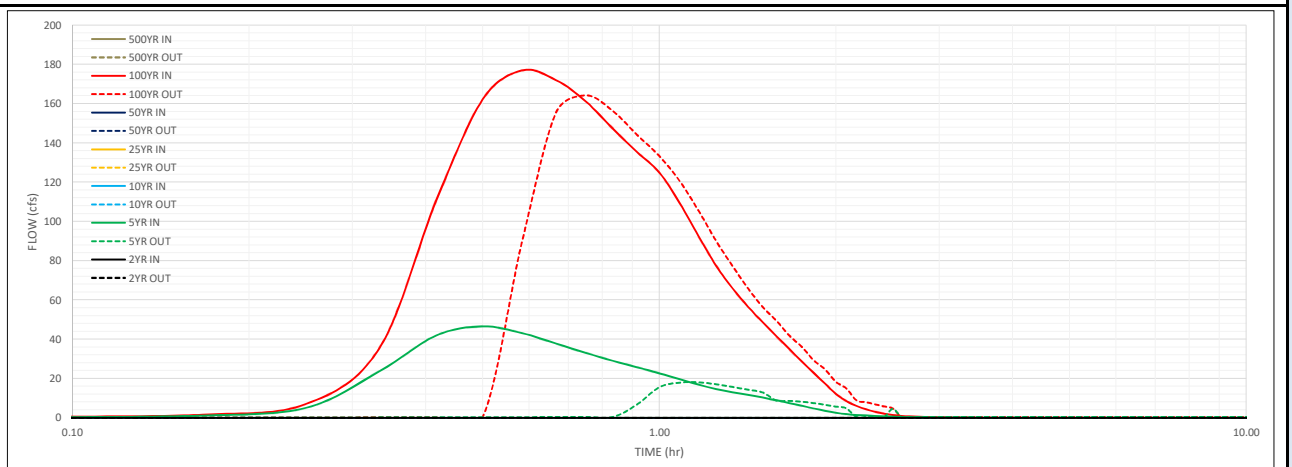
Results based on COS DCM Inputs

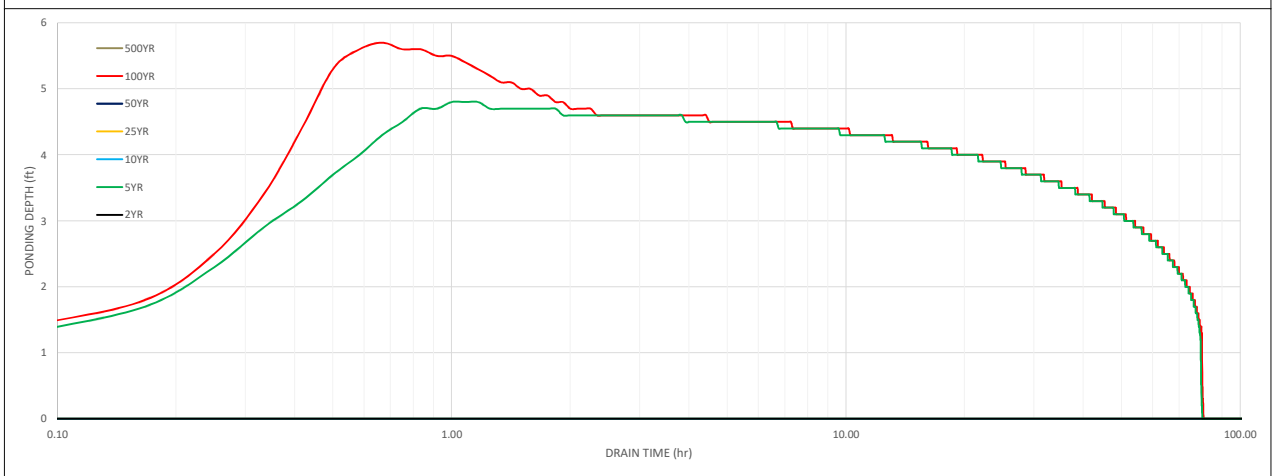
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.81	1.70		3.01				12.89	
Predevelopment Peak Q (cfs) =	N/A	N/A		32.3				158.0	
Peak Inflow (cfs) =	N/A	N/A		46.6				176.9	
Peak Outflow (cfs) =	0.3	0.4		16.3				153.2	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.5				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		0.3				2.8	
Time to Drain 97% of Volume (hr) =	44	69		71				54	
Time to Drain 99% of Volume (hr) =	46	72		76				69	
Maximum Ponding Depth (ft) =	3.60	4.50		4.90				6.10	
Area at Max Ponding Depth (ac) =	0.88	0.96		0.99				1.10	
Maximum Volume Stored (ac-ft) =	0.81	1.70		2.09				3.34	

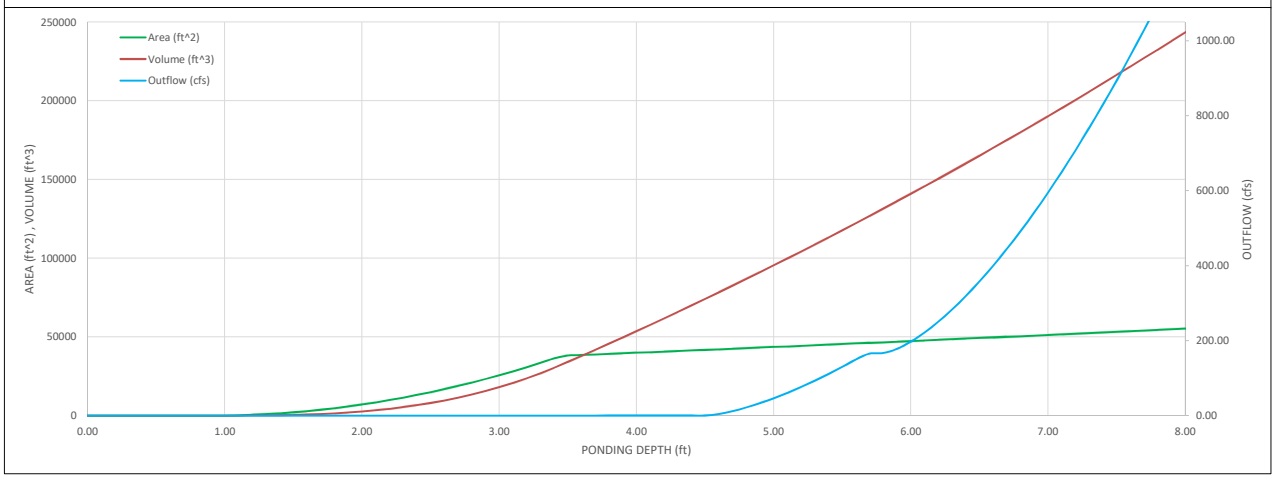
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond E
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 1 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond F
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

	User Input	COS DCM	
A) Average Infiltration Rate of WQCV (i =)	N/A	N/A	in / hr
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface (y =)	N/A	N/A	inches
C) Underdrain Outlet Orifice Area (Underdrain Ao =)	N/A	N/A	sq in
D) Number of WQCV Orifice Rows (# WQCV rows =)	14	13	
E) Vertical Spacing between WQCV Orifice Rows (Orifice Spacing =)	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row (WQCV Ao =)	1.55	1.47	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth) (Max Stage $_{WQCV}$ =)	4.80	4.50	ft
H) EURV Orifice Area (A_o) in Single Row (EURV Ao =)	1.55	7.84	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth) (Max Stage $_{EURV}$ =)	6.00	6.00	ft
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s) (Cd =)	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

	User Input	COS DCM	
A) Length of Basin at Top of EURV (L_{PCM} =)	570.9	570.9	ft
B) Width of Basin at Top of EURV (W_{PCM} =)	217.0	217.0	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge) (Stage at Top of Bench =)	6.10	6.10	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) (L_{Bench} =)	571.7	571.7	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge) (W_{Bench} =)	217.8	217.8	ft
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.) ($Z_{Surcharge}$ =)	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)						
2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	42.34				221.11	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time (min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	Post-Development Storm Inflow Hydrographs (cfs)						
0:00		0.00				0.00	
0:05		0.52				1.80	
0:10		5.98				8.99	
0:15		19.71				25.32	
0:20		58.79				77.64	
0:25		94.74				207.48	
0:30		103.82				301.83	
0:35		97.47				329.97	
0:40		87.23				323.46	
0:45		77.84				304.34	
0:50		69.34				281.05	
0:55		61.26				257.82	
1:00		54.52				237.51	
1:05		49.46				211.11	
1:10		45.22				185.26	
1:15		40.70				161.15	
1:20		36.24				139.03	
1:25		32.06				119.17	
1:30		28.34				101.90	
1:35		24.61				86.26	
1:40		21.24				72.79	
1:45		19.05				62.33	
1:50		17.44				54.79	
1:55		16.04				48.91	
2:00		13.99				42.35	
2:05		11.69				35.81	
2:10		9.57				29.96	
2:15		7.79				24.91	
2:20		6.28				20.57	
2:25		5.03				16.95	
2:30		4.03				13.95	
2:35		3.21				11.42	
2:40		2.52				9.20	
2:45		1.92				7.18	
2:50		1.38				5.32	
2:55		0.95				3.69	
3:00		0.65				2.49	
3:05		0.46				1.70	
3:10		0.33				1.17	
3:15		0.24				0.81	
3:20		0.18				0.56	
3:25		0.14				0.38	
3:30		0.11				0.26	
3:35		0.08				0.18	
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3:55		0.02				0.05	
4:00		0.02				0.04	
4:05		0.01				0.03	
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6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond F
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)	6.00	6.00	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	13.00	10.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	13.00	10.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area)	70%	70%	%
F) Debris Clogging %	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox)	6.00	6.00	ft
H) Overflow Grate Slope Length (inside edge of dropbox)	13.00	10.00	ft
I) Overflow Grate Open Area (without debris)	118.30	70.00	sq ft
J) Overflow Grate Open Area (with debris)	59.15	35.00	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction
(Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)	1.50	1.50	ft
C) Outlet Pipe Diameter	66.00	60.00	inches
D) Restrictor Plate Height above Pipe Invert	46.05	54.00	inches
E) Half-Central Angle of Restrictor Plate on Pipe	1.98	2.50	radians
F) Outlet Orifice Area	17.70	18.61	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	2.14	2.38	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	6.68	3.76	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft)	7.60	999.00	ft
B) Spillway Crest Length	126.00	42.00	ft
C) Spillway End Slopes (H:V)	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface	1.00	1.00	ft
E) Spillway Design Flow Depth	0.90		ft
F) Stage at Top of Freeboard	9.50		ft
G) Basin Area at Top of Freeboard	3.37		acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.62	5.94		7.80				26.37	
Predevelopment Peak Q (cfs) =	N/A	N/A		42.3				221.1	
Peak Inflow (cfs) =	N/A	N/A		103.8				330.0	
Peak Outflow (cfs) =	1.1	1.5		15.1				227.3	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.4				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.2				1.9	
Time to Drain 97% of Volume (hr) =	42	68		72				61	
Time to Drain 99% of Volume (hr) =	45	72		77				72	
Maximum Ponding Depth (ft) =	4.80	6.00		6.30				7.60	
Area at Max Ponding Depth (ac) =	2.12	2.84		2.89				3.08	
Maximum Volume Stored (ac-ft) =	2.62	5.94		6.82				10.70	

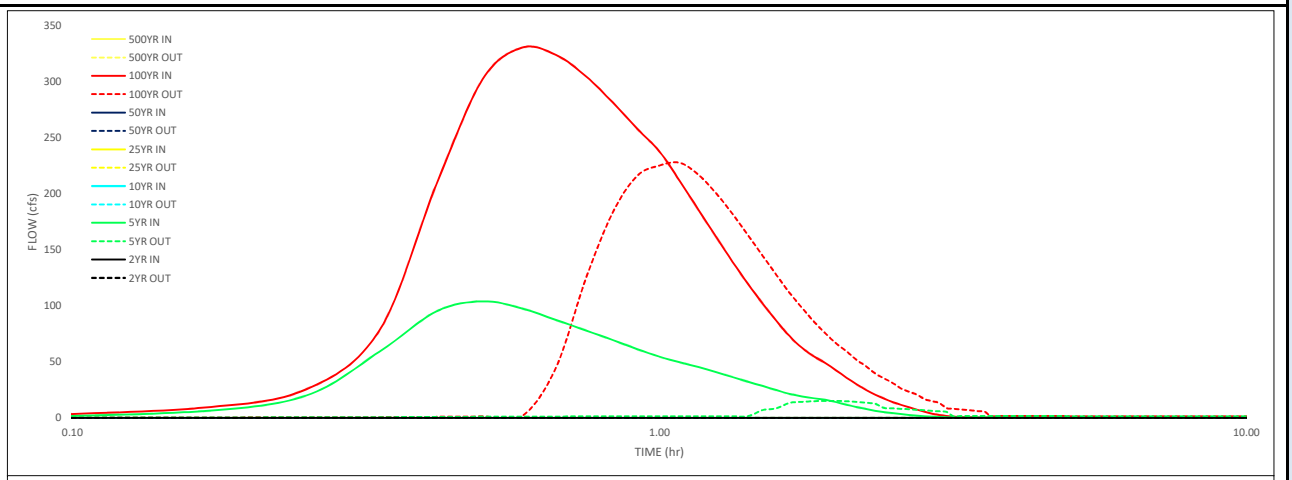
Results based on COS DCM Inputs

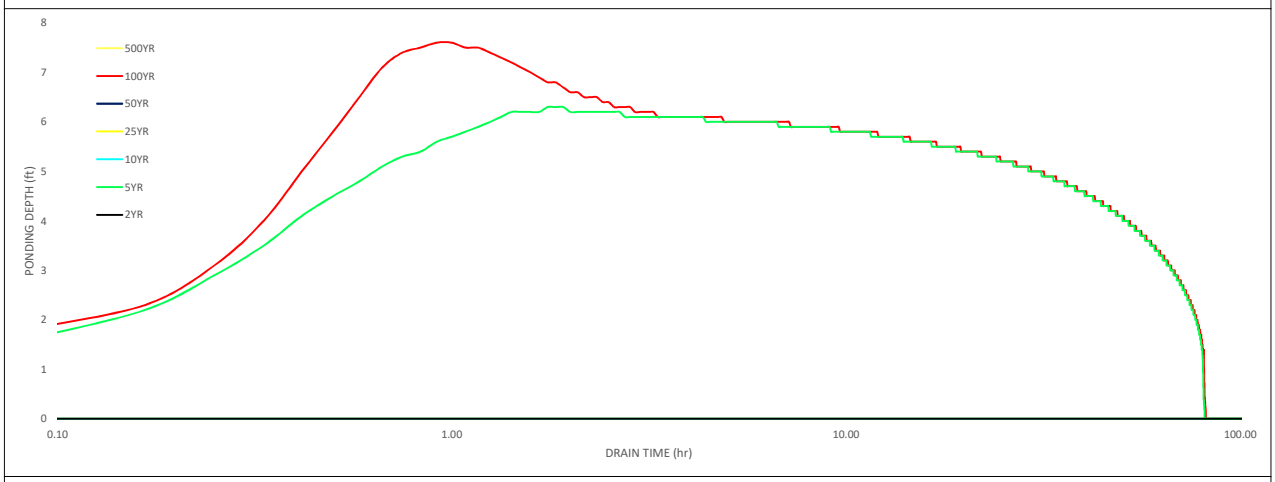
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.21	5.94		7.80				26.37	
Predevelopment Peak Q (cfs) =	N/A	N/A		42.3				221.1	
Peak Inflow (cfs) =	N/A	N/A		103.8				330.0	
Peak Outflow (cfs) =	1.1	1.4		13.2				214.5	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.3				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		0.2				3.0	
Time to Drain 97% of Volume (hr) =	36	69		74				63	
Time to Drain 99% of Volume (hr) =	38	73		78				73	
Maximum Ponding Depth (ft) =	4.50	6.00		6.30				7.80	
Area at Max Ponding Depth (ac) =	1.81	2.84		2.89				3.11	
Maximum Volume Stored (ac-ft) =	2.21	5.94		6.82				11.32	

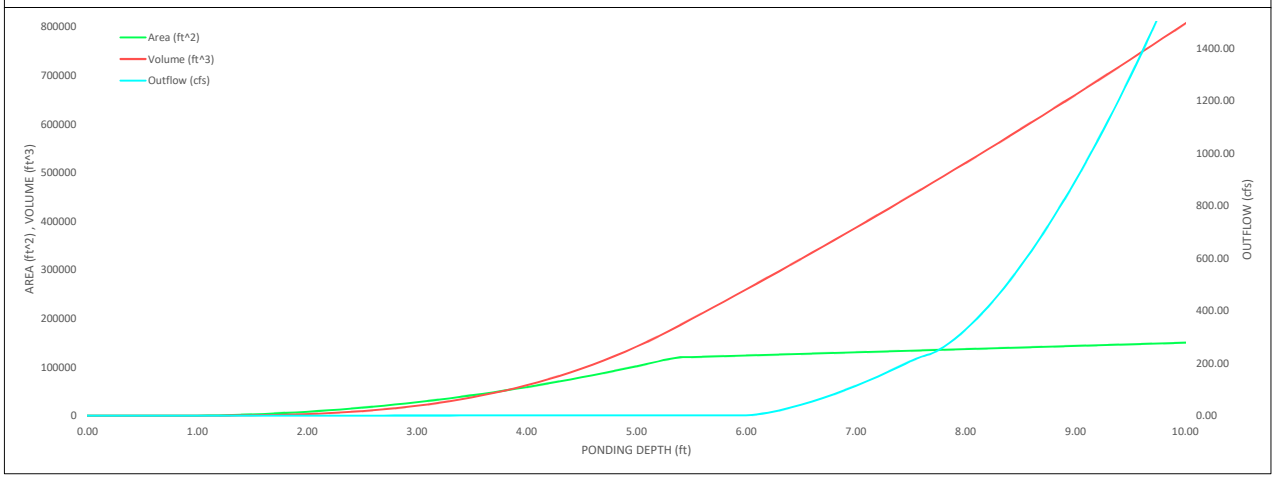
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond F
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 1 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

A) Average Infiltration Rate of WQCV
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface
C) Underdrain Outlet Orifice Area
D) Number of WQCV Orifice Rows
E) Vertical Spacing between WQCV Orifice Rows
F) WQCV Orifice Area (A_o) per Row
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth)
H) EURV Orifice Area (A_o) in Single Row
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth)
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s)

Input Parameters	User Input	COS DCM	
i =	N/A	N/A	in / hr
y =	N/A	N/A	inches
Underdrain Ao =	N/A	N/A	sq in
# WQCV rows =	9	9	
Orifice Spacing =	4.0	4.0	inches
WQCV Ao =	0.49	0.49	sq in
Max Stage $_{WQCV}$ =	3.20	3.20	ft
EURV Ao =	1.94	1.94	sq in
Max Stage $_{EURV}$ =	4.00	4.00	ft
Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

A) Length of Basin at Top of EURV
B) Width of Basin at Top of EURV
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge)
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge)
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge)
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.)

Input Parameters	User Input	COS DCM	
L_{PCM} =	349.7	349.7	ft
W_{PCM} =	105.4	105.4	ft
Stage at Top of Bench =	4.10	4.10	ft
L_{Bench} =	350.5	350.5	ft
W_{Bench} =	106.2	106.2	ft
$Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
		9.42				48.48	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time (min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
	Post-Development Storm Inflow Hydrographs (cfs)						
0:00		0.00				0.00	
0:05		0.18				0.49	
0:10		1.27				1.75	
0:15		3.86				5.05	
0:20		12.69				17.55	
0:25		19.21				47.38	
0:30		20.06				63.86	
0:35		18.72				67.51	
0:40		16.88				66.01	
0:45		15.24				62.38	
0:50		13.74				57.86	
0:55		12.37				53.71	
1:00		11.12				49.93	
1:05		10.01				44.10	
1:10		9.05				38.52	
1:15		8.20				33.58	
1:20		7.42				29.30	
1:25		6.67				25.48	
1:30		5.98				22.03	
1:35		5.28				18.97	
1:40		4.64				16.31	
1:45		4.05				13.93	
1:50		3.52				11.83	
1:55		3.12				10.10	
2:00		2.67				8.48	
2:05		2.26				7.10	
2:10		1.90				5.93	
2:15		1.58				4.93	
2:20		1.30				4.04	
2:25		1.05				3.25	
2:30		0.82				2.54	
2:35		0.62				1.90	
2:40		0.46				1.36	
2:45		0.35				0.99	
2:50		0.28				0.73	
2:55		0.22				0.54	
3:00		0.17				0.39	
3:05		0.13				0.28	
3:10		0.10				0.19	
3:15		0.07				0.13	
3:20		0.05				0.09	
3:25		0.04				0.07	
3:30		0.03				0.06	
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3:45		0.01				0.03	
3:50		0.01				0.02	
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Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)	4.00	4.00	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	26.00	26.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	26.00	26.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area)	70%	70%	%
F) Debris Clogging %	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox)	4.00	4.00	ft
H) Overflow Grate Slope Length (inside edge of dropbox)	26.00	26.00	ft
I) Overflow Grate Open Area (without debris)	473.20	473.20	sq ft
J) Overflow Grate Open Area (with debris)	236.60	236.60	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction
(Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)	1.50	1.50	ft
C) Outlet Pipe Diameter	30.00	27.00	inches
D) Restrictor Plate Height above Pipe Invert	22.22	26.24	inches
E) Half-Central Angle of Restrictor Plate on Pipe	2.07	2.80	radians
F) Outlet Orifice Area	3.90	3.94	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	1.03	1.12	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	121.39	119.97	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft)	5.40	4.90	ft
B) Spillway Crest Length	136.00	23.00	ft
C) Spillway End Slopes (H:V)	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface	1.00	1.00	ft
E) Spillway Design Flow Depth	0.30	0.90	ft
F) Stage at Top of Freeboard	6.70	6.80	ft
G) Basin Area at Top of Freeboard	1.08	1.09	acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.47	1.15		1.57				5.51	
Predevelopment Peak Q (cfs) =	N/A	N/A		9.4				48.5	
Peak Inflow (cfs) =	N/A	N/A		20.1				67.5	
Peak Outflow (cfs) =	0.2	0.3		9.4				47.1	
Ratio (Outflow/Predevelopment) =	N/A	N/A		1.0				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				0.1	
Time to Drain 97% of Volume (hr) =	41	69		73				63	
Time to Drain 99% of Volume (hr) =	43	72		78				74	
Maximum Ponding Depth (ft) =	3.20	4.00		4.10				4.80	
Area at Max Ponding Depth (ac) =	0.67	0.85		0.85				0.91	
Maximum Volume Stored (ac-ft) =	0.47	1.15		1.24				1.85	

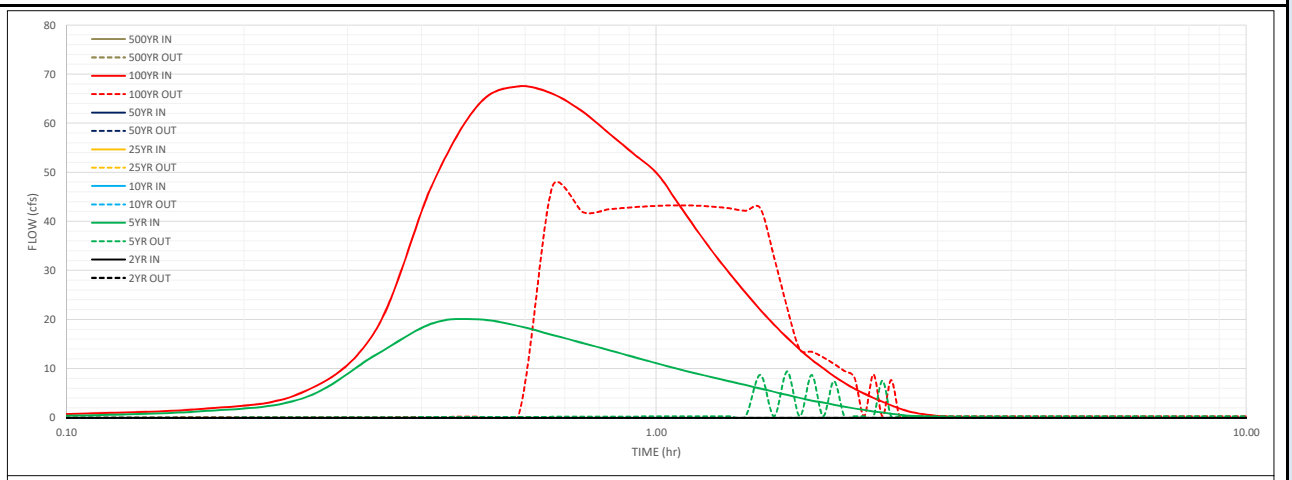
Results based on COS DCM Inputs

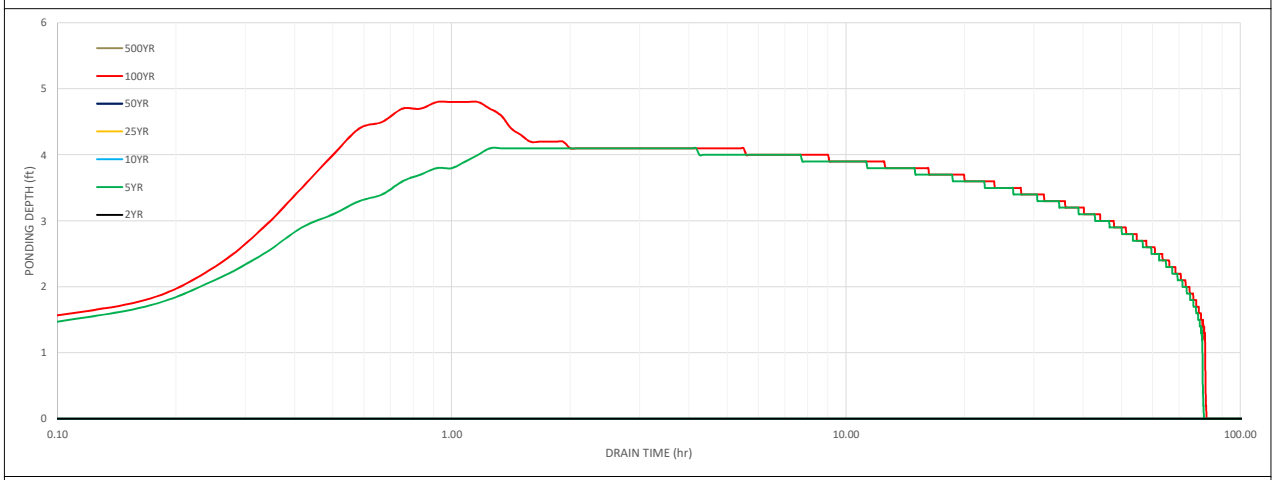
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.47	1.15		1.57				5.51	
Predevelopment Peak Q (cfs) =	N/A	N/A		9.4				48.5	
Peak Inflow (cfs) =	N/A	N/A		20.1				67.5	
Peak Outflow (cfs) =	0.2	0.3		9.4				47.1	
Ratio (Outflow/Predevelopment) =	N/A	N/A		1.0				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				0.1	
Time to Drain 97% of Volume (hr) =	41	69		73				63	
Time to Drain 99% of Volume (hr) =	43	72		78				74	
Maximum Ponding Depth (ft) =	3.20	4.00		4.10				4.80	
Area at Max Ponding Depth (ac) =	0.67	0.85		0.85				0.91	
Maximum Volume Stored (ac-ft) =	0.47	1.15		1.24				1.85	

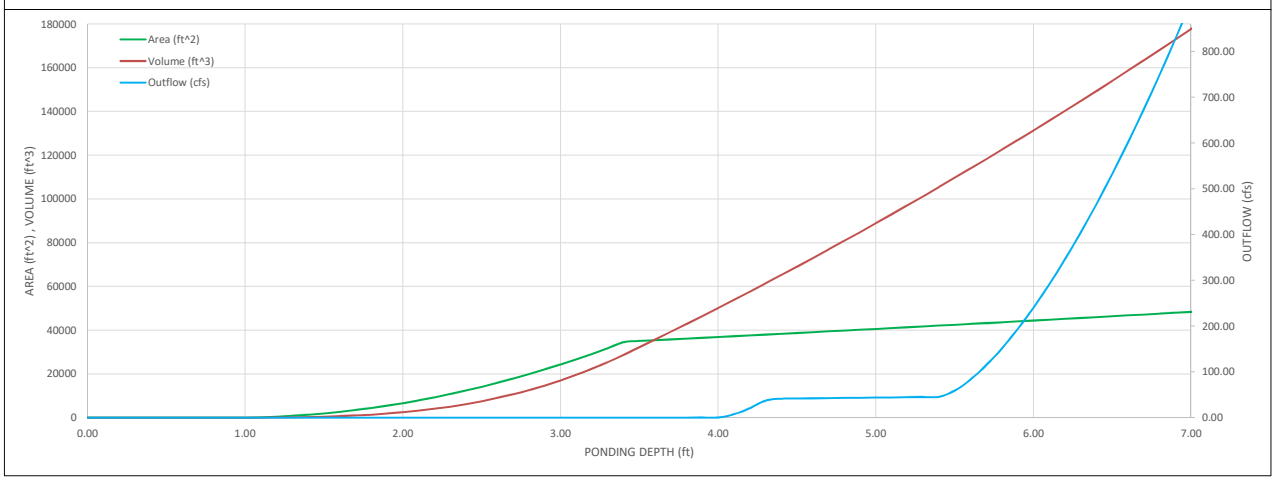
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020







Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 1 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020

1. Select WQCV/EURV PCM Type:
   Imports the Stage-Area-Volume-Discharge information from the corresponding PCM worksheet. The selected PCM worksheet must be completed before the import will work.

Extended Detention Basin (EDB)

2. WQCV/EURV Outlet Details

A) Average Infiltration Rate of WQCV
B) Depth to Centroid of Underdrain Outlet Orifice from filter media surface
C) Underdrain Outlet Orifice Area
D) Number of WQCV Orifice Rows
E) Vertical Spacing between WQCV Orifice Rows
F) WQCV Orifice Area (A_o) per Row
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth)
H) EURV Orifice Area (A_o) in Single Row
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth)
J) Discharge Coefficient for all WQCV/EURV Outlet Orifice(s)

Input Parameters	User Input	COS DCM	
i =	N/A	N/A	in / hr
y =	N/A	N/A	inches
Underdrain Ao =	N/A	N/A	sq in
# WQCV rows =	11	11	
Orifice Spacing =	4.0	4.0	inches
WQCV Ao =	0.86	0.86	sq in
Max Stage $_{WQCV}$ =	3.80	3.80	ft
EURV Ao =	4.73	4.73	sq in
Max Stage $_{EURV}$ =	5.00	5.00	ft
Cd =	0.60	0.60	

3. Flood Control Surcharge Basin Geometry (above EURV) - See Figure
   Default Flood Surcharge Geometry inputs represent a continuation of the PCM Geometry in an upward direction without a transition bench.

A) Length of Basin at Top of EURV
B) Width of Basin at Top of EURV
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge)
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge)
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge)
F) Average Side Slopes of Flood Control Surcharge above Transition Bench (Recommend no steeper than 3H:1V slope. Use zero for vertical walls.)

Input Parameters	User Input	COS DCM	
L_{PCM} =	468.4	468.4	ft
W_{PCM} =	141.1	141.1	ft
Stage at Top of Bench =	5.10	5.10	ft
L_{Bench} =	469.2	469.2	ft
W_{Bench} =	141.9	141.9	ft
$Z_{Surcharge}$ =	4.00	4.00	ft / ft

User can override default flood surcharge geometry inputs to create a transition bench between the top of the PCM and the Flood Surcharge Volume by entering larger dimensions in C), D), and E).
See the Figure to the right.

Bench Slope is 4H:1V in length direction
Bench Slope is 4H:1V in width direction

4. Tributary Watershed Hydrology

A) Input hydrology data (copy/paste) from model runs

Pre-Development Peak Flow (cfs)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
		17.11				99.16	

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

5-yr and 100-yr Hydrology Required (Other Storms are Optional)

Time (min)	Post-Development Storm Inflow Hydrographs (cfs) 2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
0:00		0.00				0.00	
0:05		0.41				1.20	
0:10		3.42				4.91	
0:15		10.22				13.16	
0:20		29.97				40.46	
0:25		45.35				109.08	
0:30		46.22				147.68	
0:35		41.85				152.97	
0:40		36.79				145.92	
0:45		32.51				134.77	
0:50		28.57				122.07	
0:55		24.90				110.10	
1:00		21.86				99.42	
1:05		19.69				85.33	
1:10		17.78				73.97	
1:15		15.86				63.12	
1:20		14.00				53.39	
1:25		12.24				44.73	
1:30		10.61				36.81	
1:35		9.00				29.80	
1:40		7.68				24.16	
1:45		6.80				19.99	
1:50		6.25				17.20	
1:55		5.79				15.20	
2:00		4.96				12.77	
2:05		4.07				10.46	
2:10		3.32				8.57	
2:15		2.70				7.04	
2:20		2.18				5.80	
2:25		1.75				4.76	
2:30		1.37				3.85	
2:35		1.07				3.04	
2:40		0.81				2.31	
2:45		0.60				1.65	
2:50		0.43				1.12	
2:55		0.31				0.76	
3:00		0.23				0.51	
3:05		0.17				0.34	
3:10		0.12				0.23	
3:15		0.09				0.16	
3:20		0.07				0.12	
3:25		0.06				0.09	
3:30		0.05				0.07	
3:35		0.04				0.06	
3:40		0.03				0.05	
3:45		0.03				0.04	
3:50		0.02				0.03	
3:55		0.01				0.02	
4:00		0.01				0.01	
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5:10							
5:15							
5:20							
5:25							
5:30							
5:35							

5:40							
5:45							
5:50							
5:55							
6:00							

Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 2 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020

5. Flood Control Outlet Structure Type

A) Select Flood Control Outlet Structure Type: Overflow Weir/Grate, Outlet Pipe Restriction & Emergency Spillway

6. Overflow Weir (Dropbox) and Grate (Flat or Sloped)
(Assumes that top of grate is flush with the top of the concrete dropbox)

	Input Parameters User Input	COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft)	5.00	5.00	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	9.00	7.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	9.00	7.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area)	70%	70%	%
F) Debris Clogging %	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox)	5.00	5.00	ft
H) Overflow Grate Slope Length (inside edge of dropbox)	9.00	7.00	ft
I) Overflow Grate Open Area (without debris)	56.70	34.30	sq ft
J) Overflow Grate Open Area (with debris)	28.35	17.15	sq ft

7. Outlet Pipe with Flow Restriction Plate

A) Select Type of Outlet Restriction
(Circular Pipe w/ Restrictor Plate, Circular Orifice or Rectangular Orifice): Circular Outlet Pipe w/ Restrictor Plate

	Input Parameters User Input	COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)	1.50	1.50	ft
C) Outlet Pipe Diameter	42.00	42.00	inches
D) Restrictor Plate Height above Pipe Invert	34.00	34.00	inches
E) Half-Central Angle of Restrictor Plate on Pipe	2.24	2.24	radians
F) Outlet Orifice Area	8.34	8.34	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	1.54	1.54	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	6.80	4.11	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft)	6.70	999.00	ft
B) Spillway Crest Length	136.00	27.00	ft
C) Spillway End Slopes (H:V)	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface	1.00	1.00	ft
E) Spillway Design Flow Depth	0.50		ft
F) Stage at Top of Freeboard	8.20		ft
G) Basin Area at Top of Freeboard	1.89		acres

9. Routed Hydrograph Results

Results based on User Input

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.03	2.73		3.25				11.08	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.1				99.2	
Peak Inflow (cfs) =	N/A	N/A		46.2				153.0	
Peak Outflow (cfs) =	0.4	0.7		4.2				101.9	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.2				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Outlet Pipe	
Max Velocity through Grate =	N/A	N/A		0.0				1.7	
Time to Drain 97% of Volume (hr) =	39	68		73				62	
Time to Drain 99% of Volume (hr) =	41	72		77				72	
Maximum Ponding Depth (ft) =	3.80	5.00		5.10				6.20	
Area at Max Ponding Depth (ac) =	1.09	1.52		1.53				1.65	
Maximum Volume Stored (ac-ft) =	1.03	2.73		2.90				4.65	

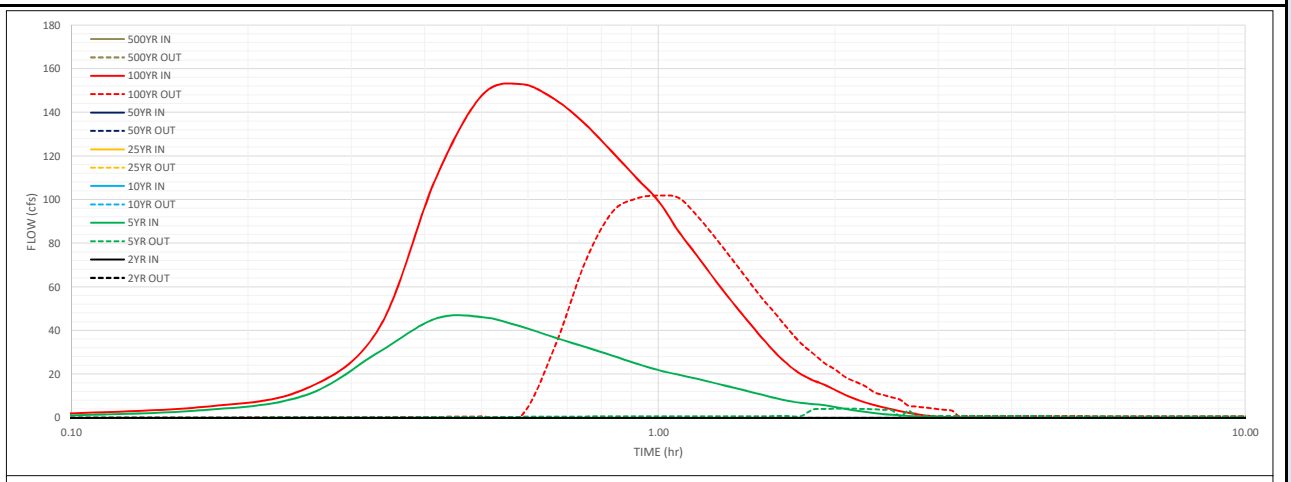
Results based on COS DCM Inputs

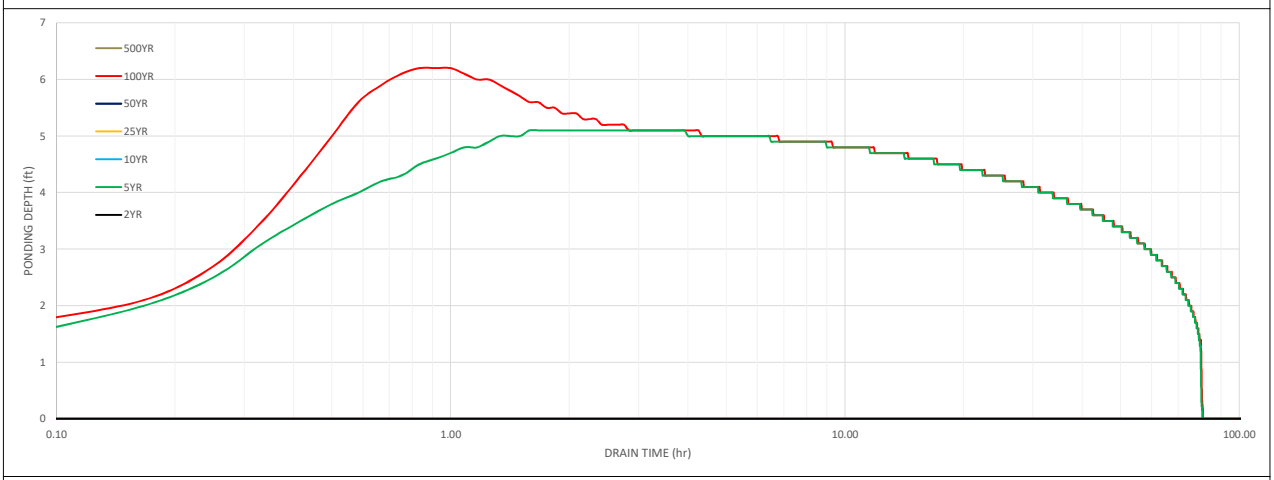
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.03	2.73		3.25				11.08	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.1				99.2	
Peak Inflow (cfs) =	N/A	N/A		46.2				153.0	
Peak Outflow (cfs) =	0.4	0.7		3.6				98.1	
Ratio (Outflow/Predevelopment) =	N/A	N/A		0.2				1.0	
Structure Controlling Flow =	Orifice Plate	Orifice Plate		Overflow Grate				Overflow Grate	
Max Velocity through Grate =	N/A	N/A		0.2				2.8	
Time to Drain 97% of Volume (hr) =	39	68		73				62	
Time to Drain 99% of Volume (hr) =	41	72		77				73	
Maximum Ponding Depth (ft) =	3.80	5.00		5.20				6.40	
Area at Max Ponding Depth (ac) =	1.09	1.52		1.54				1.68	
Maximum Volume Stored (ac-ft) =	1.03	2.73		3.05				4.98	

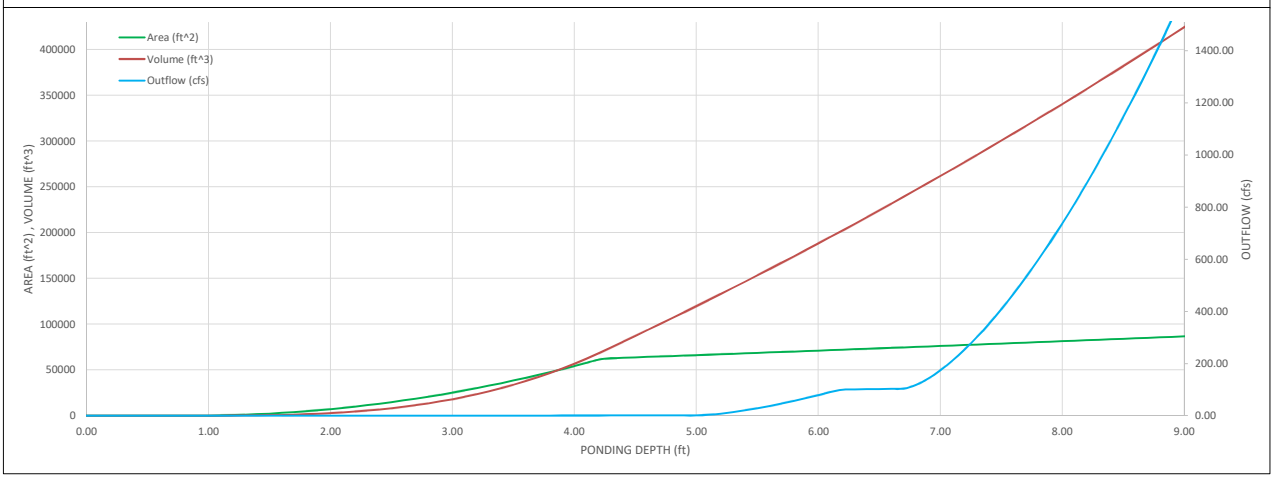
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

COS PCM-FSD Preliminary Design (Beta Version 1.00, September 2019) — Sheet 3 of 3

Designer: Chris McFarland
Project: Grandview Reserve Pond G
Date: April 6, 2020 — Last Edited: April 13, 2020

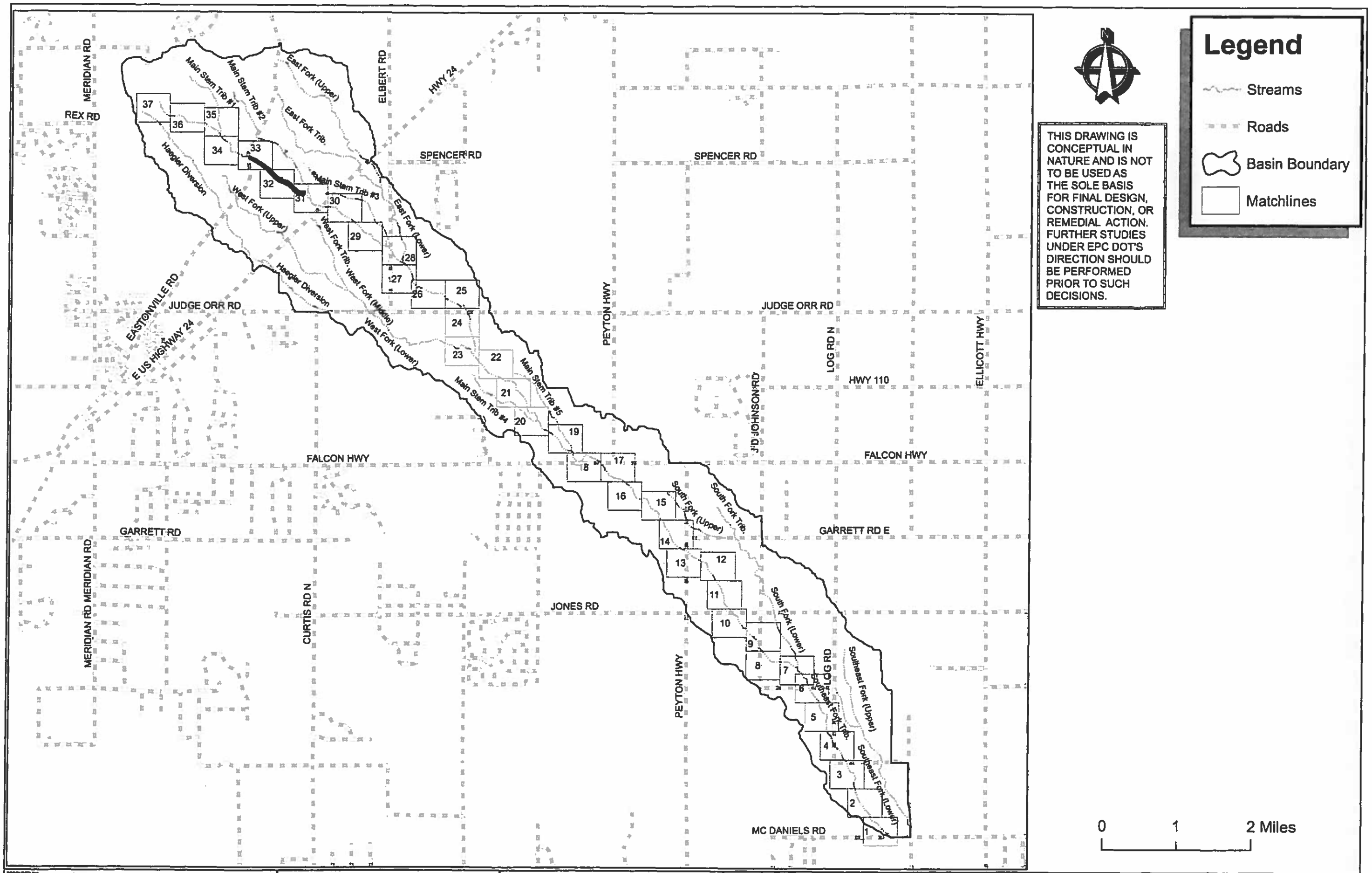






Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Appendix E



PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
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CONTACT: ROBERT BENNETT

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1622

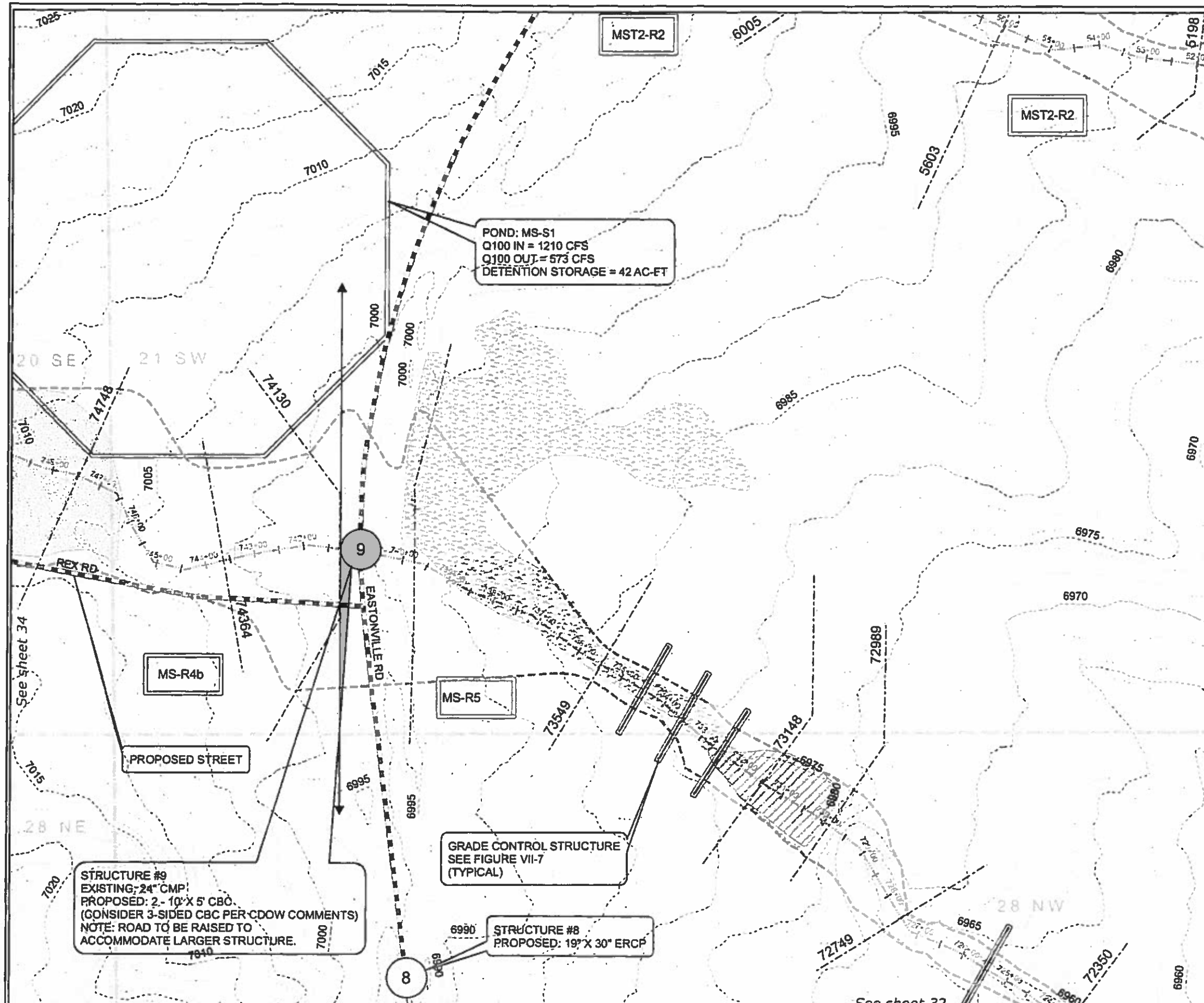
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: SLF
CHECKED BY: RJB

REVISION DESCRIPTIONS | DATE

DRAWING INFO: GIECK RANCH
KEY MAP
MAIN STEM

DATE:	JOB NO:	SET
AUGUST 2007	C7706-1	PL
SCALE: H: 1" = 6000' V:	DRAWING NO.: 6D 038	SHEET K1



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
MS-R4b	1.76	1094	4.24
MS-R5	1.88	573	5.00

RECOMMENDED PLAN IMPROVEMENTS

Reach	
MS-R4b	Channelization
MS-R5	Vegetation Augmentation

Note:
See Technical Addenda for grade control data.

THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.

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CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

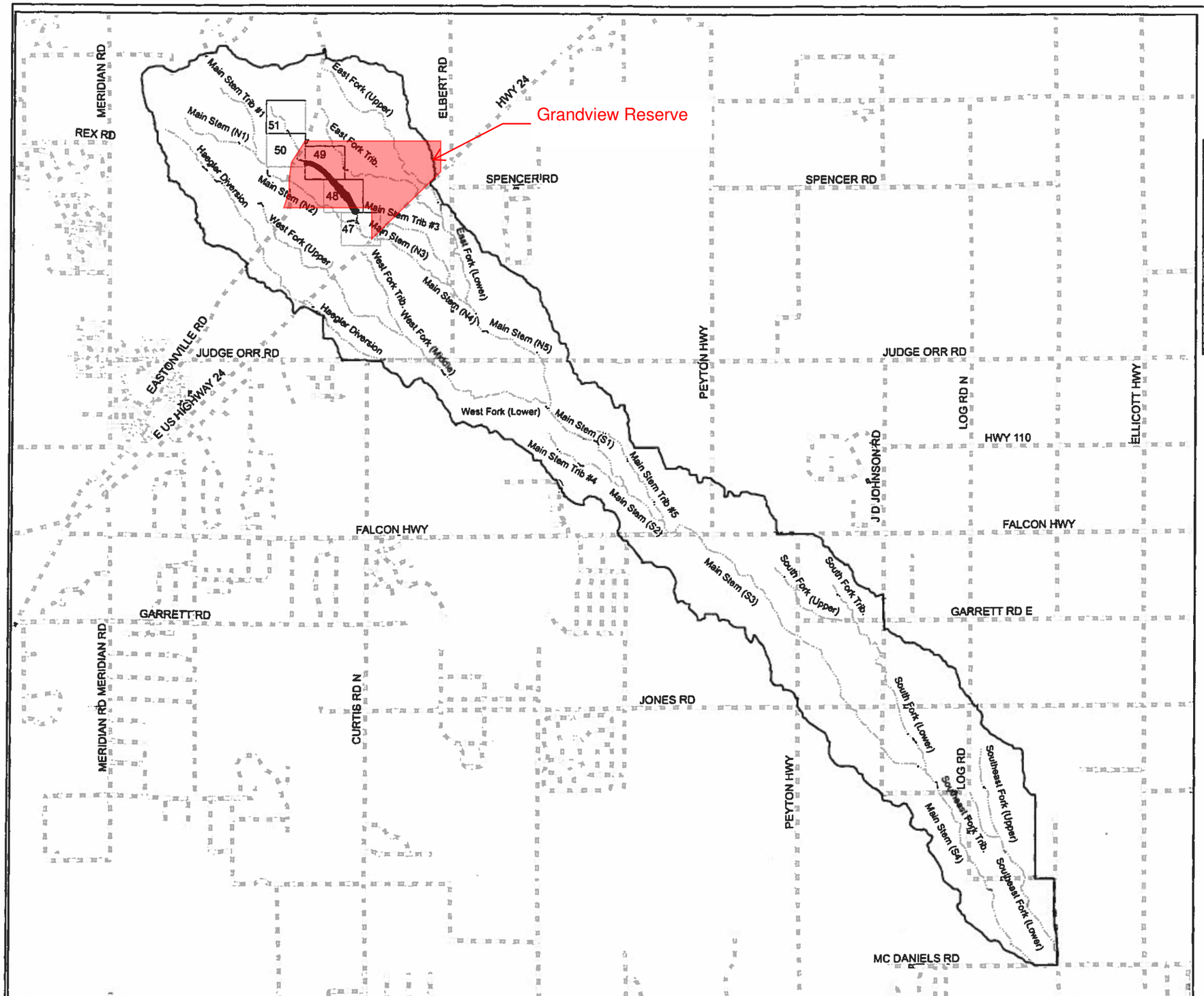
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTIONS	DATE
PER EPC/DOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
MAIN STEM #33

DATE:	JOB NO:	SET
AUGUST 2007	C7706-2	PL
SCALE: H: 1" = 200' V: NONE	DRAWING NO.: 6D 038	SHEET 33



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Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1890 30TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
4513 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-9646
CONTACT: ROBERT BENNETT

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

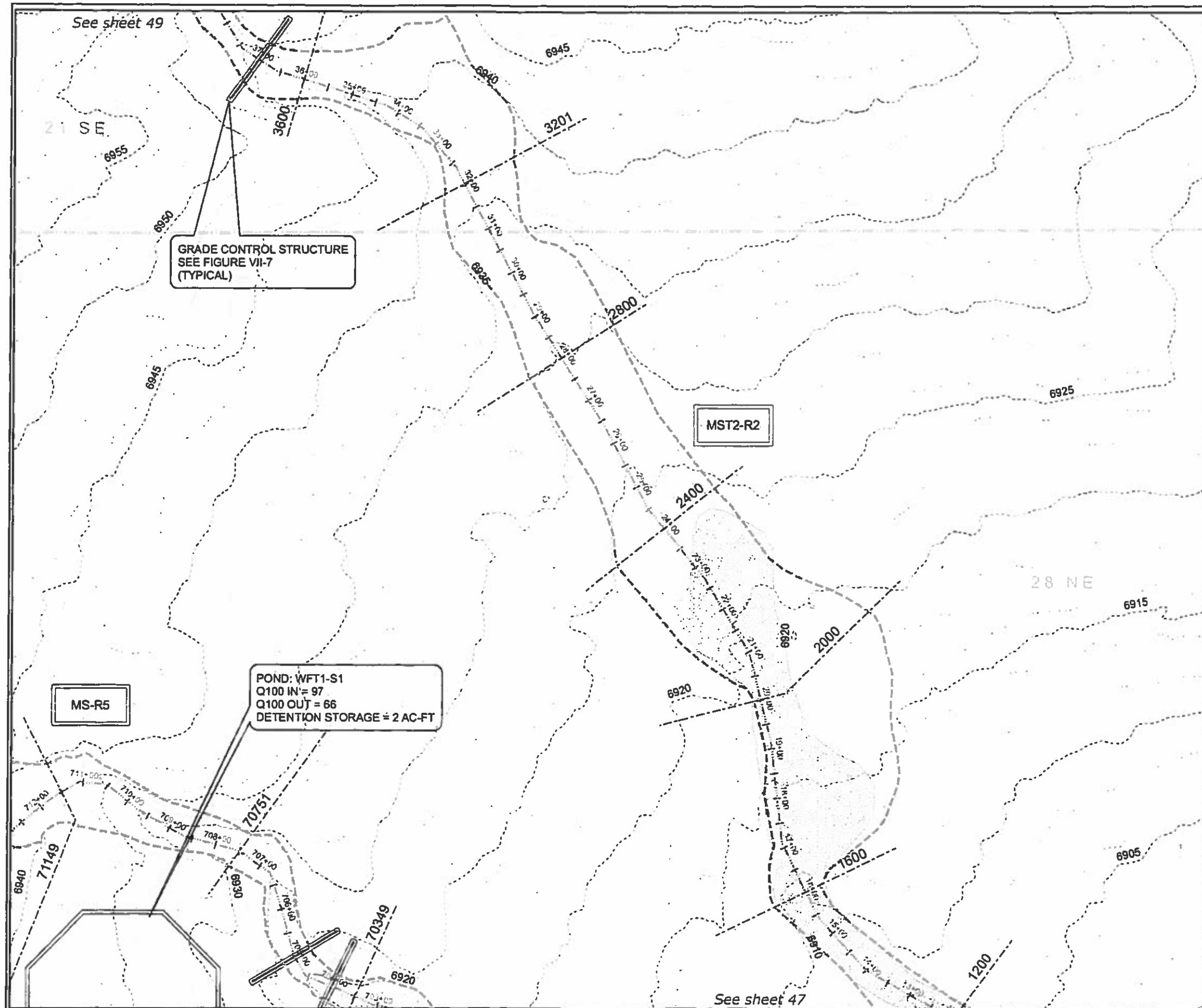
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF
CHECKED BY: RJB

REVISION DESCRIPTIONS | DATE

DRAWING INFO: GIECK RANCH
KEY MAP
MAIN STEM TRIBUTARY #2

DATE: AUGUST 2007
JOB NO: C7706-1
SET: PL
SCALE: H 1" = 6000' V
DRAWING NO.: 6D 038
SHEET: K5



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- Proposed Future Conditions 100-yr Flood Limits
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
MST2-R2	1.93	271	3.16

RECOMMENDED PLAN IMPROVEMENTS

Reach	
MST2-R2	Vegetation Augmentation

Note:
See Technical Addenda for grade control data.

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1609 35TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-9697
5313 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-9648
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

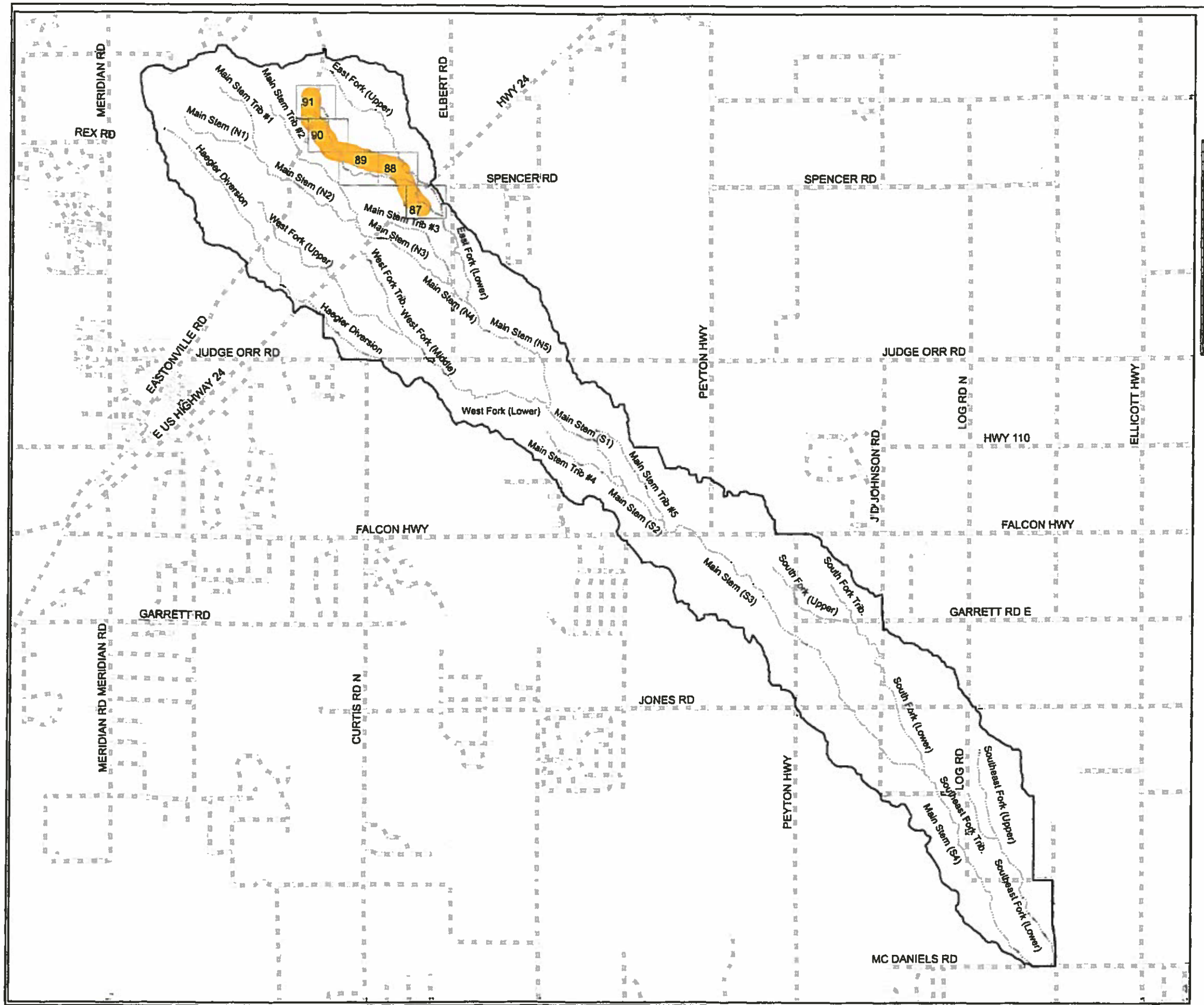
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
MAIN STEM TRIBUTARY-2 #2

DATE: AUGUST 2007
JOB NO.: C7706-2
SET: PL
SCALE: 1" = 200' ½ NONE
DRAWING NO.: 6D 038
SHEET: 48



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Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1506 38TH STREET, BOULDER, COLORADO 80301 (303) 443-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 265-8887
5313 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-8645
CONTACT: ROBERT BENNETT

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1922

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF
CHECKED BY: RJB
REVISION DESCRIPTIONS | DATE

DRAWING INFO: GIECK RANCH
KEY MAP
EAST FORK TRIBUTARY

DATE: AUGUST 2007
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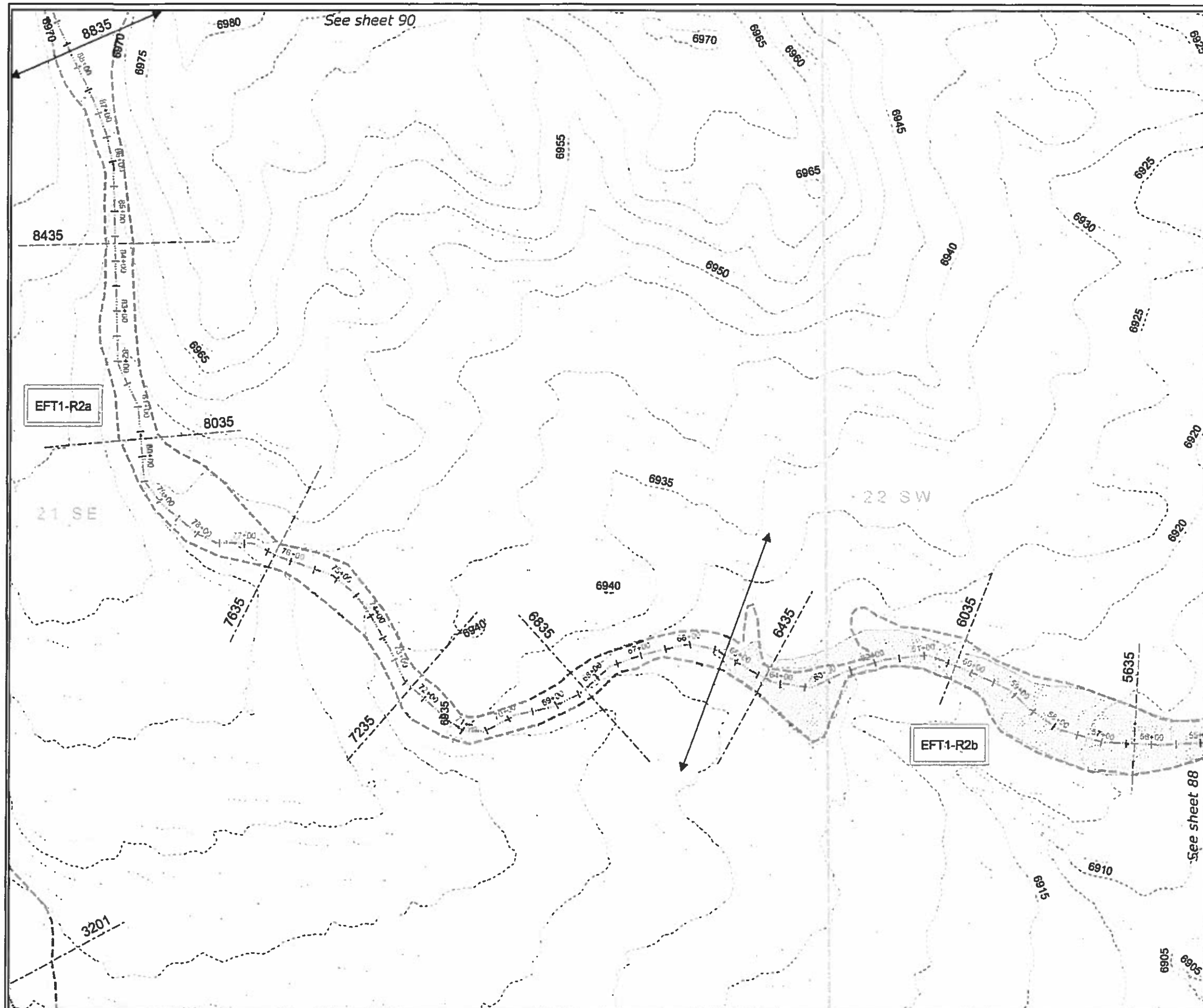
DRAWING NO.: 6D 038
SET: PL
SHEET: K11



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Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
EFT1-R2a	1.83	217	3.73
EFT1-R2b	1.60	217	2.68

RECOMMENDED PLAN IMPROVEMENTS

Reach	
EFT1-R2a	As-needed Improvements
EFT1-R2b	As-needed Improvements

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PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1880 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
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PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
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CONTACT: RAY D' SULLIVAN (719) 227-1022

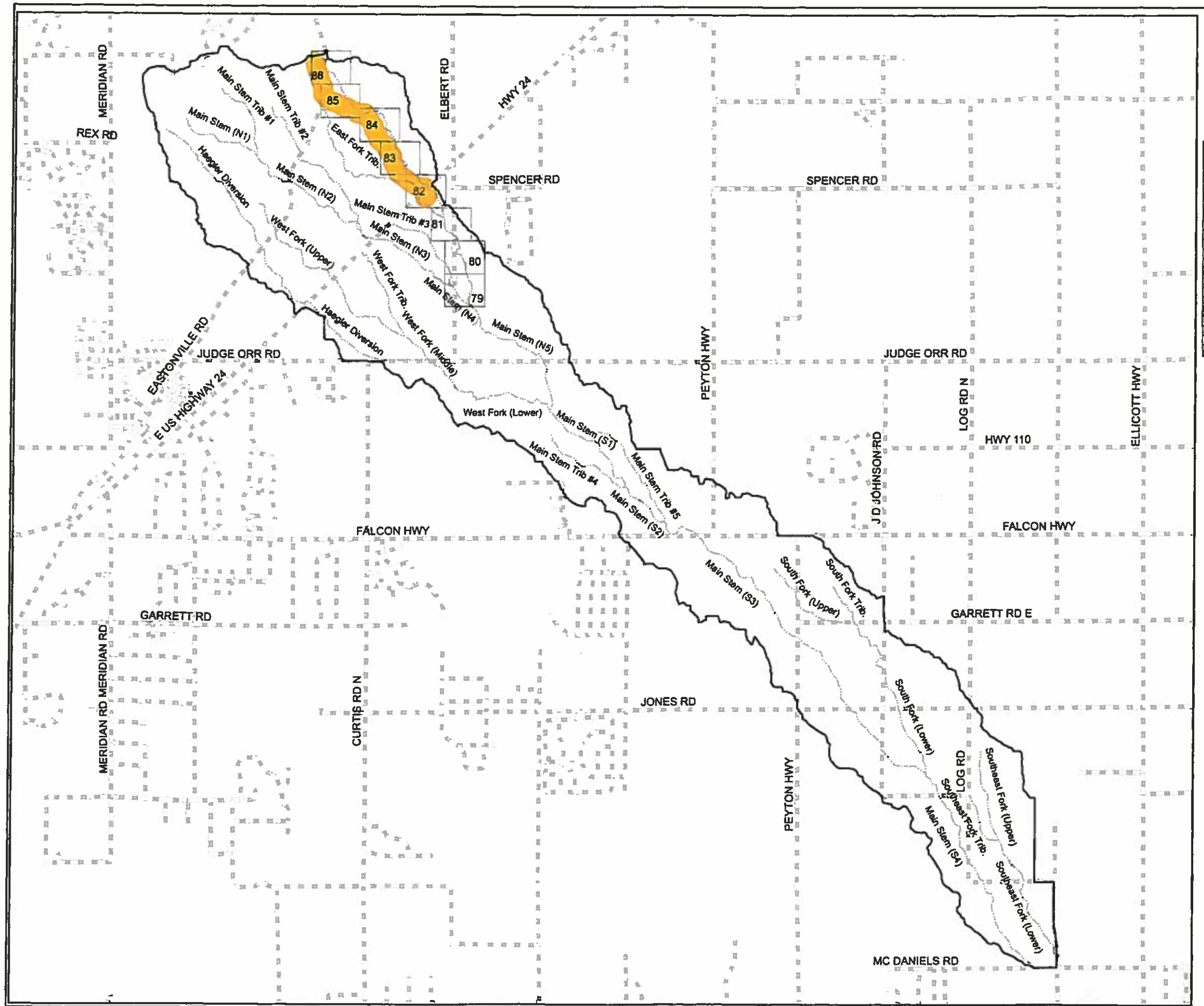
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: SLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTION	DATE
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
EAST FORK TRIBUTARY #3

DATE: AUGUST 2007
JOB NO: C7706-2
SET: PL
SCALE: H: 1" = 200' V: NONE
DRAWING NO.: 6D 038
SHEET: 89



THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.

Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1690 38TH STREET, BOULDER, COLORADO 80301 (303) 443-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80906 (719) 358-8667
6313 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1822

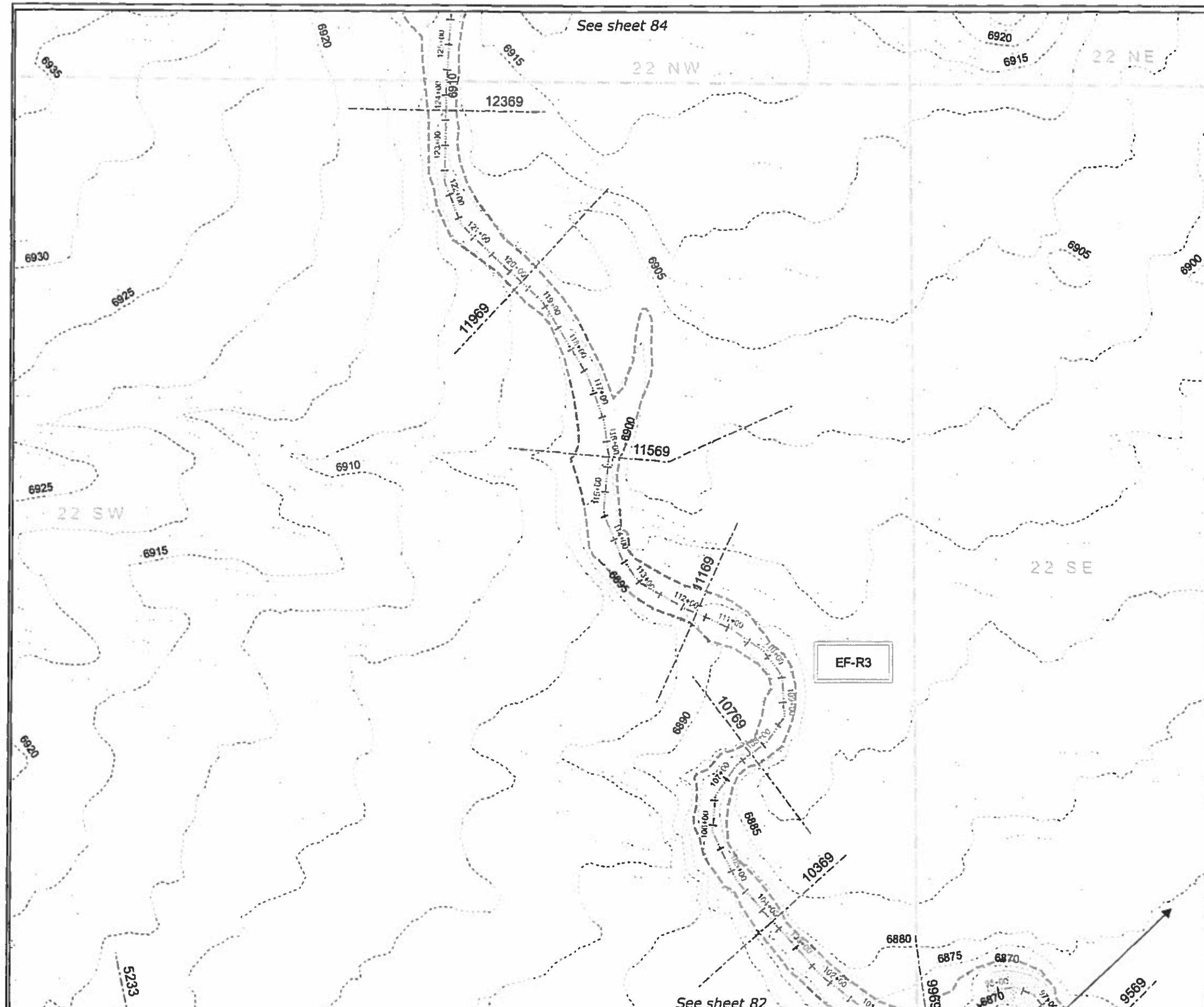
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF
CHECKED BY: RJB

REVISION DESCRIPTIONS | DATE

DRAWING INFO: GIECK RANCH
KEY MAP
EAST FORK

DATE: AUGUST 2007
SCALE: H: 1" = 6000' V:
JOB NO: C7706-1
DRAWING NO: 6D 038
SET: PL
SHEET: K10



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- *Proposed Future Conditions 100-yr Flood Limits*
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
EF-R3	1.53	595	5.09

RECOMMENDED PLAN IMPROVEMENTS

Reach	
EF-R3	As-needed Improvements

THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 28TH STREET, BOULDER, COLORADO 80301 (303) 443-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
8513 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-9646
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
23 NORTH TEJON STREET, SUITE 200
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: SLF/MLM
CHECKED BY: RJB/TML

REVISION DESCRIPTIONS: PER EPC FINAL REVIEW — DATE: JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
EAST FORK #5

DATE: AUGUST 2007
SCALE: = 1" = 200' = NONE
JOB NO.: C7706-2
DRAWING NO.: 6D 038
SET: PL
SHEET: 83

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 25 2019

East Fork Tributary 1 Reach 3 - Proposed Channel_Capacity

Trapezoidal

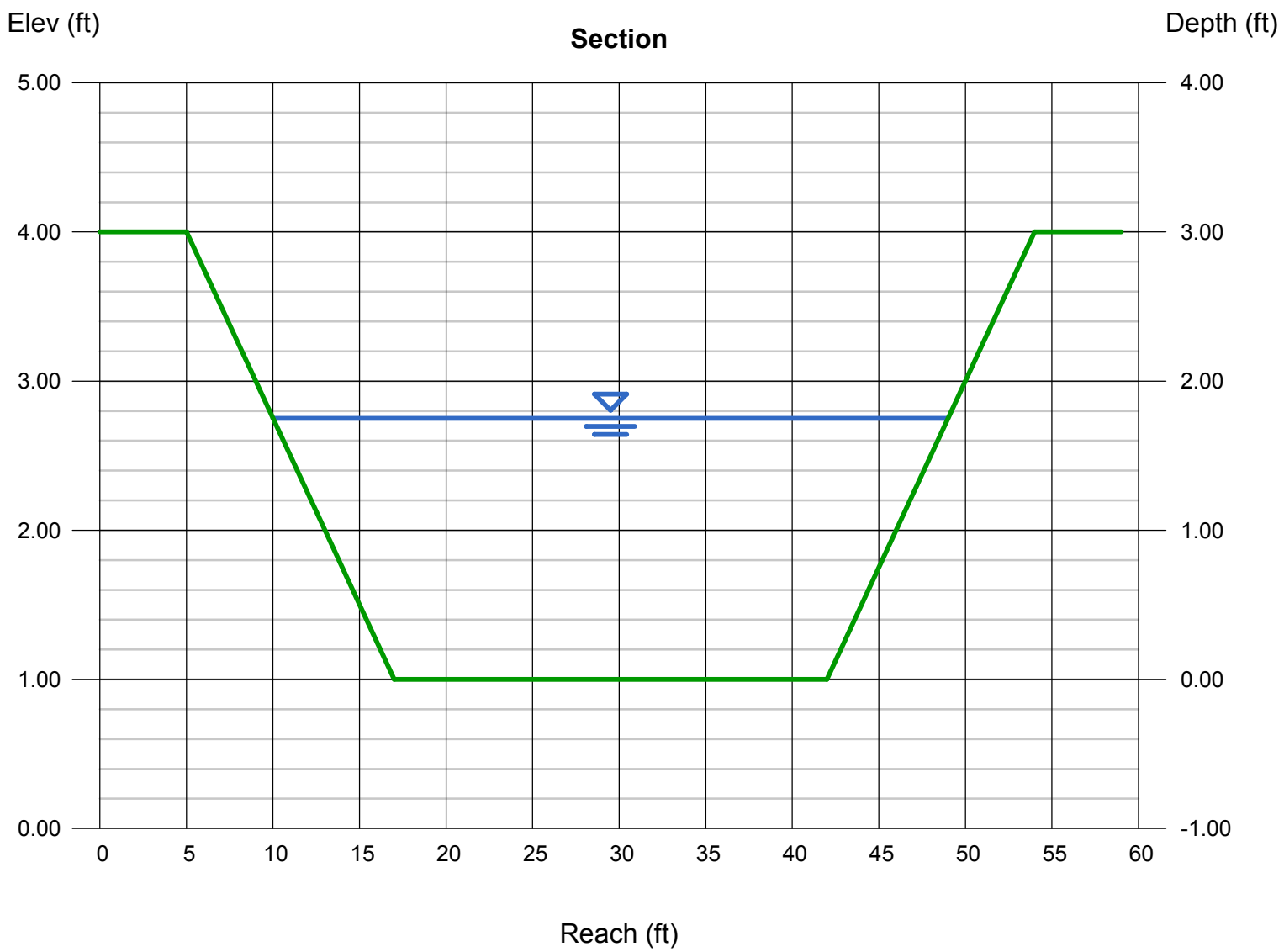
Bottom Width (ft)	= 25.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.69
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 217.00

Highlighted

Depth (ft)	= 1.75
Q (cfs)	= 217.00
Area (sqft)	= 56.00
Velocity (ft/s)	= 3.88
Wetted Perim (ft)	= 39.43
Crit Depth, Yc (ft)	= 1.24
Top Width (ft)	= 39.00
EGL (ft)	= 1.98



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 25 2019

East Fork Tributary 1 Reach 3 - Proposed Channel_Velocity

Trapezoidal

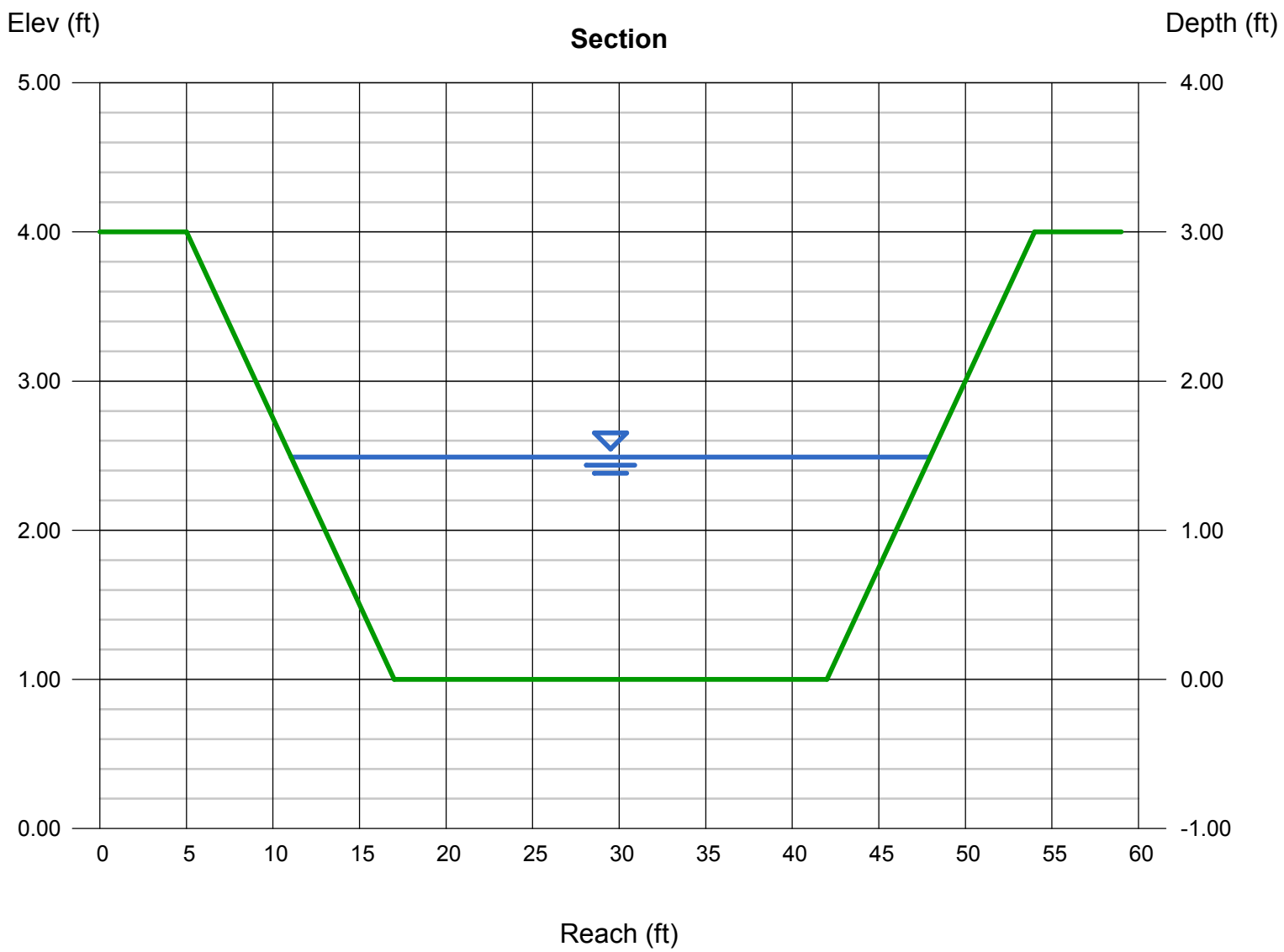
Bottom Width (ft)	= 25.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.69
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 217.00

Highlighted

Depth (ft)	= 1.49
Q (cfs)	= 217.00
Area (sqft)	= 46.13
Velocity (ft/s)	= 4.70
Wetted Perim (ft)	= 37.29
Crit Depth, Yc (ft)	= 1.24
Top Width (ft)	= 36.92
EGL (ft)	= 1.83



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 18 2019

East Fork Tributary 1 Reach 2 - Proposed Channel_Capacity

Trapezoidal

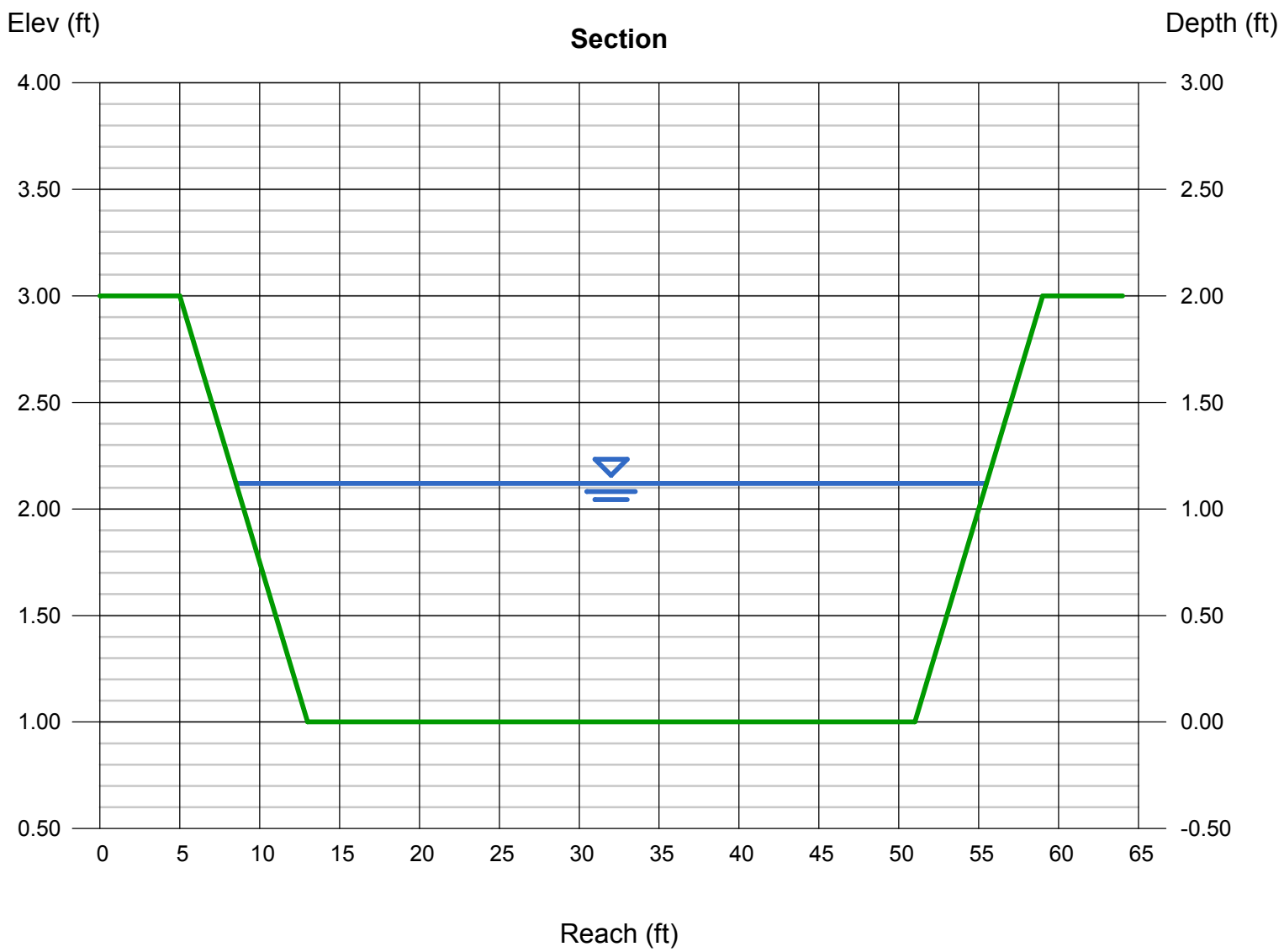
Bottom Width (ft)	= 38.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.58
N-Value	= 0.050

Calculations

Compute by:	Known Q
Known Q (cfs)	= 177.00

Highlighted

Depth (ft)	= 1.12
Q (cfs)	= 177.00
Area (sqft)	= 47.58
Velocity (ft/s)	= 3.72
Wetted Perim (ft)	= 47.24
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 46.96
EGL (ft)	= 1.34



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 18 2019

East Fork Tributary 1 Reach 2 - Proposed Channel_Velocity

Trapezoidal

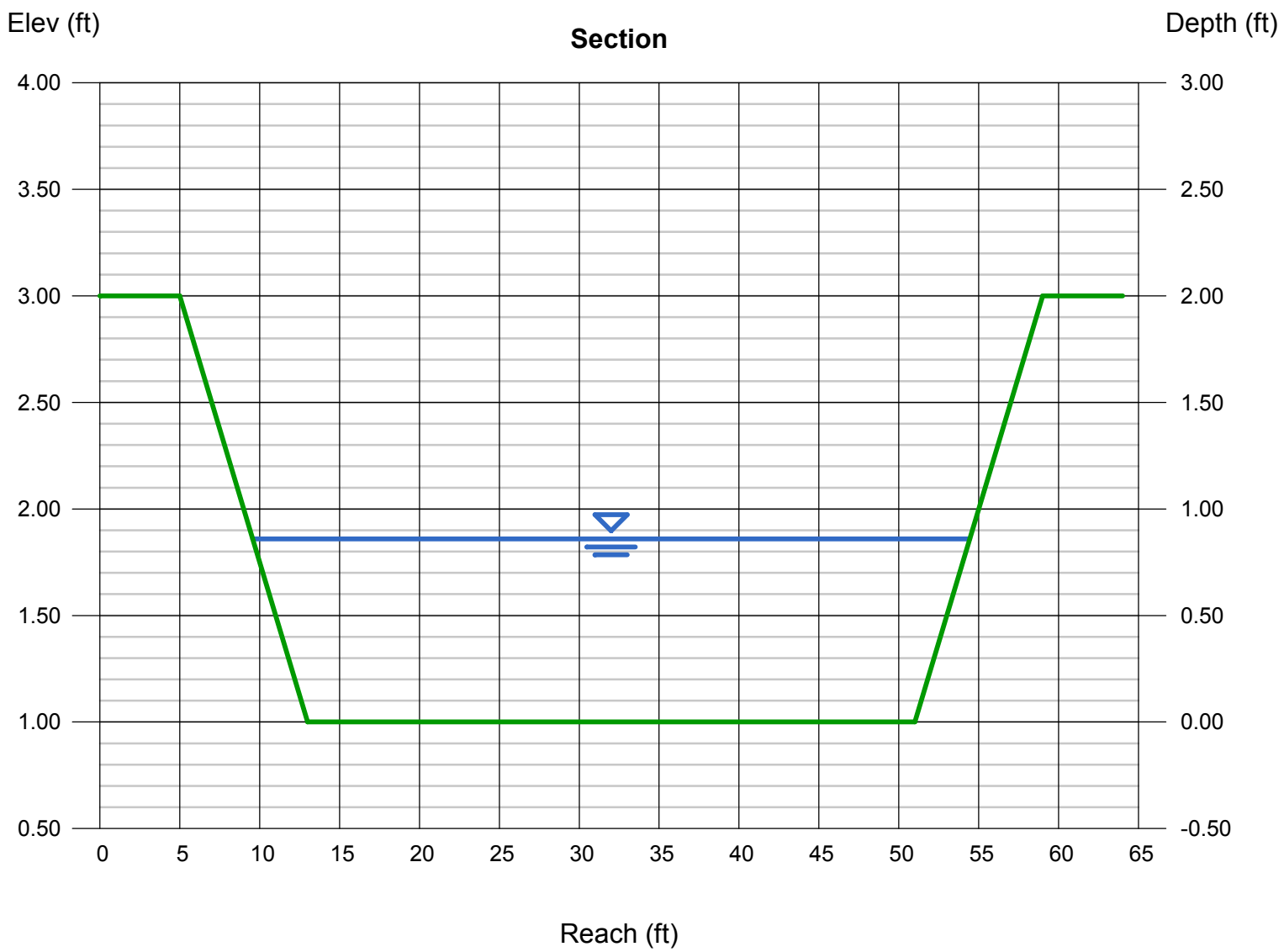
Bottom Width (ft)	= 38.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.58
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 177.00

Highlighted

Depth (ft)	= 0.86
Q (cfs)	= 177.00
Area (sqft)	= 35.64
Velocity (ft/s)	= 4.97
Wetted Perim (ft)	= 45.09
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 44.88
EGL (ft)	= 1.24



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Main Stem Trib 2

Gieck Ranch Tributary 2 - Proposed Channel Section Capacity Check

Trapezoidal

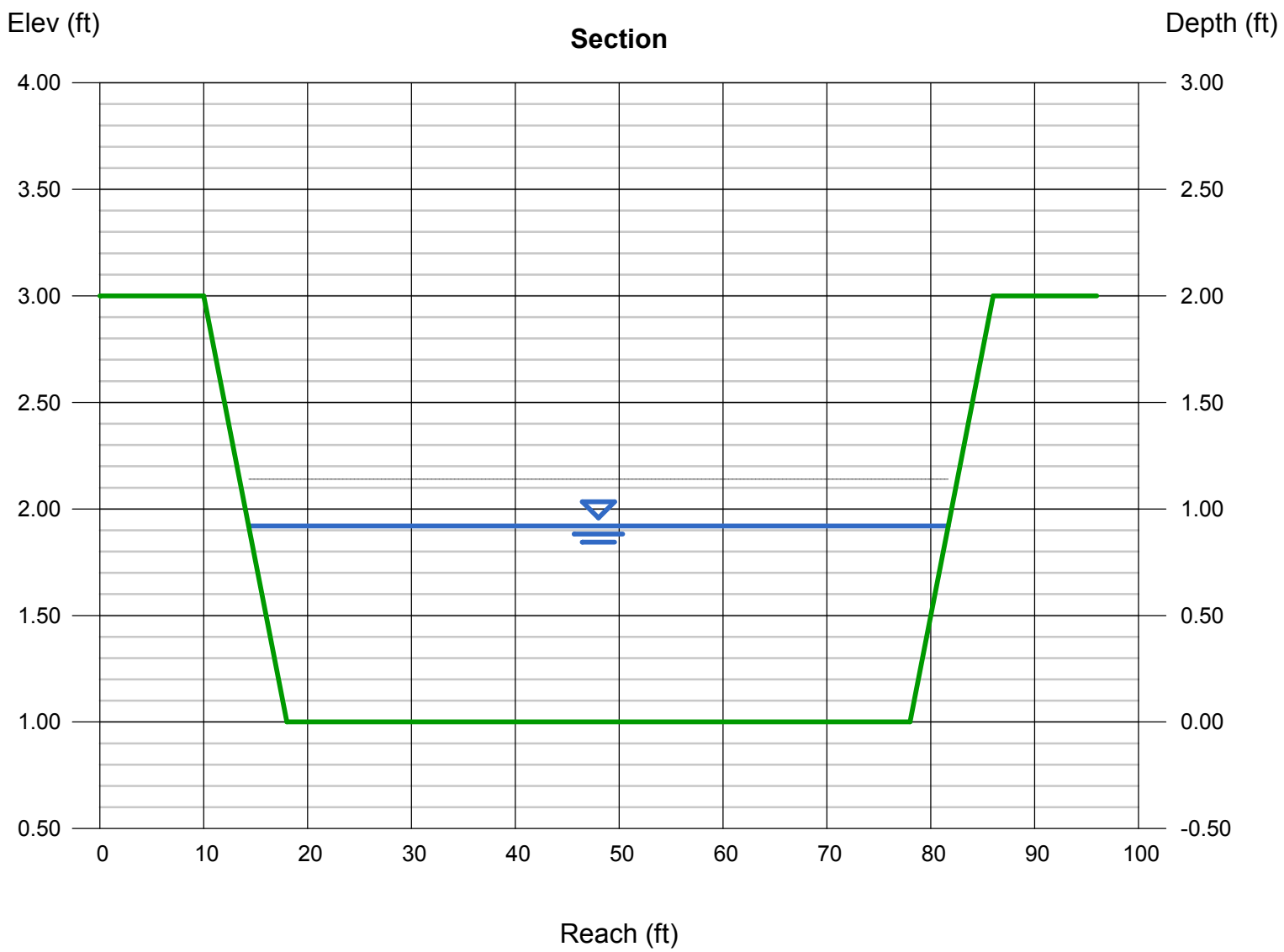
Bottom Width (ft)	=	60.00
Side Slopes (z:1)	=	4.00, 4.00
Total Depth (ft)	=	2.00
Invert Elev (ft)	=	1.00
Slope (%)	=	2.00
N-Value	=	0.050

Calculations

Compute by:		Known Q
Known Q (cfs)	=	220.00

Highlighted

Depth (ft)	=	0.92
Q (cfs)	=	220.00
Area (sqft)	=	58.59
Velocity (ft/s)	=	3.76
Wetted Perim (ft)	=	67.59
Crit Depth, Yc (ft)	=	0.74
Top Width (ft)	=	67.36
EGL (ft)	=	1.14



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Main Stem Trib 2

Gieck Ranch Tributary 2 - Proposed Channel Section Velocity Check

Trapezoidal

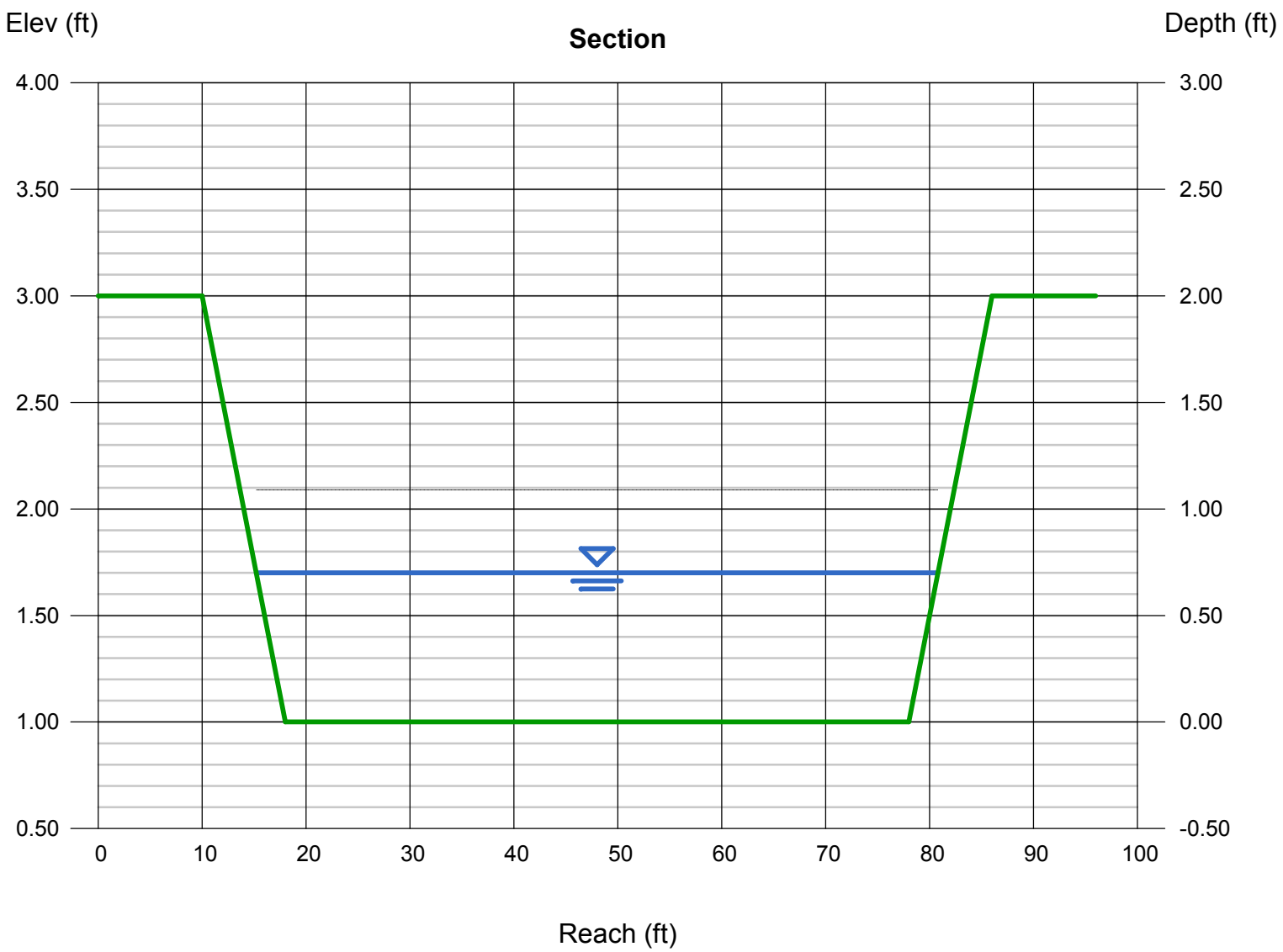
Bottom Width (ft)	=	60.00
Side Slopes (z:1)	=	4.00, 4.00
Total Depth (ft)	=	2.00
Invert Elev (ft)	=	1.00
Slope (%)	=	2.00
N-Value	=	0.032

Calculations

Compute by:		Known Q
Known Q (cfs)	=	220.00

Highlighted

Depth (ft)	=	0.70
Q (cfs)	=	220.00
Area (sqft)	=	43.96
Velocity (ft/s)	=	5.00
Wetted Perim (ft)	=	65.77
Crit Depth, Yc (ft)	=	0.74
Top Width (ft)	=	65.60
EGL (ft)	=	1.09



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Gieck Ranch Tributary 2_Reach 1 - Proposed Channel Section Capacity Check

Main Stem

Trapezoidal

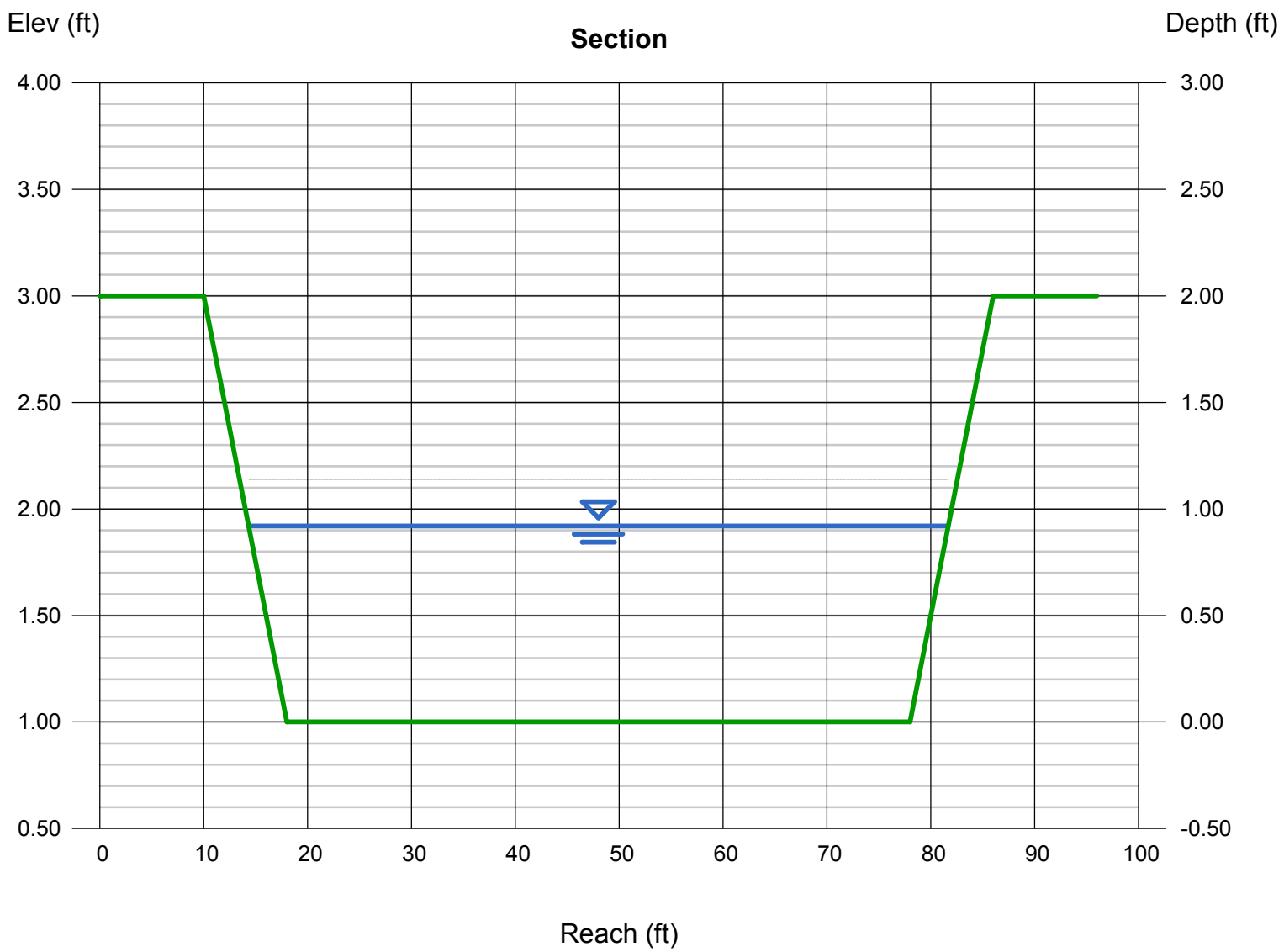
Bottom Width (ft)	=	60.00
Side Slopes (z:1)	=	4.00, 4.00
Total Depth (ft)	=	2.00
Invert Elev (ft)	=	1.00
Slope (%)	=	2.00
N-Value	=	0.050

Calculations

Compute by:		Known Q
Known Q (cfs)	=	220.00

Highlighted

Depth (ft)	=	0.92
Q (cfs)	=	220.00
Area (sqft)	=	58.59
Velocity (ft/s)	=	3.76
Wetted Perim (ft)	=	67.59
Crit Depth, Yc (ft)	=	0.74
Top Width (ft)	=	67.36
EGL (ft)	=	1.14



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Gieck Ranch Tributary 2, Reach 1 - Proposed Channel Section Velocity Check

Main Stem

Trapezoidal

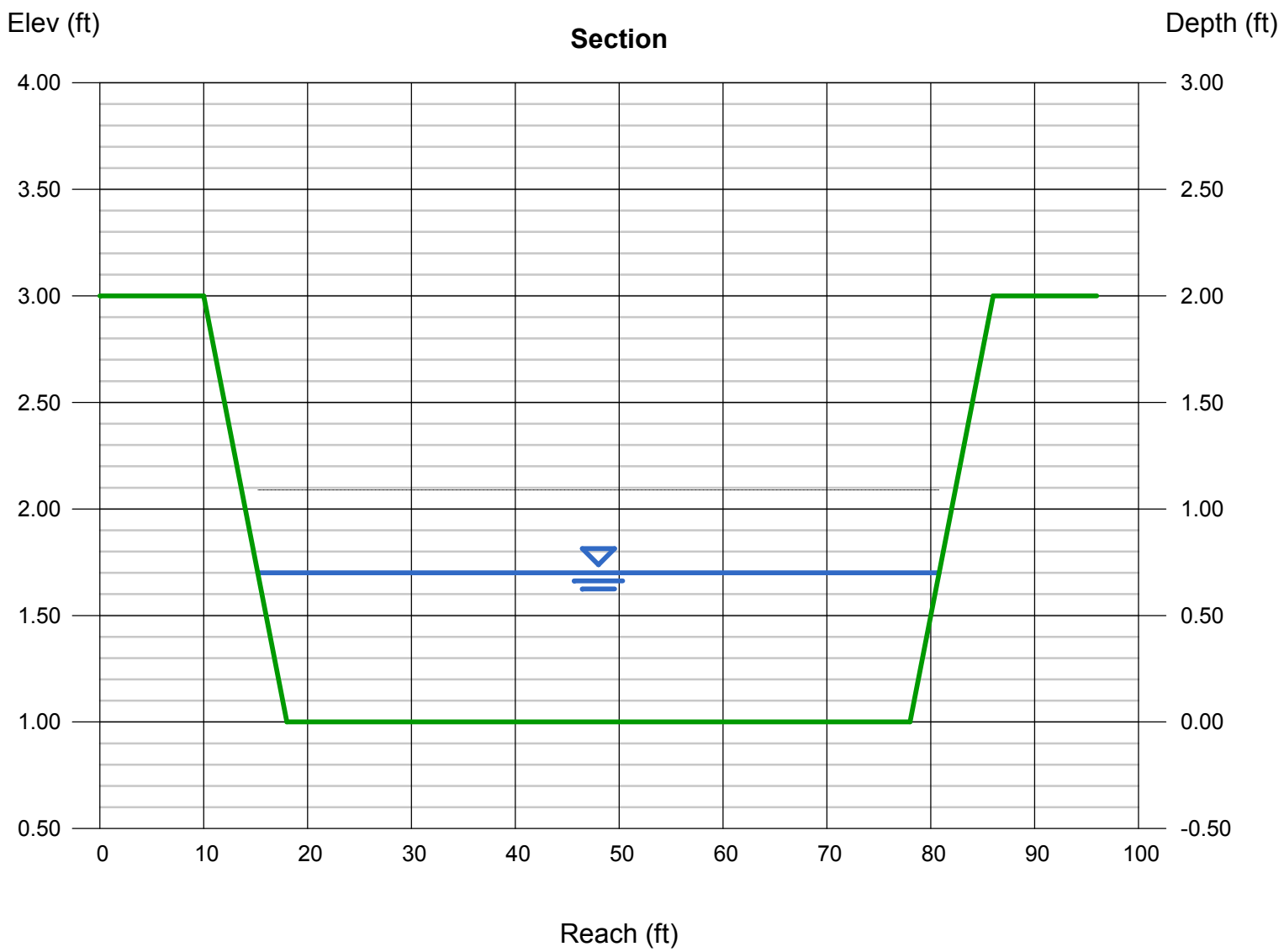
Bottom Width (ft)	=	60.00
Side Slopes (z:1)	=	4.00, 4.00
Total Depth (ft)	=	2.00
Invert Elev (ft)	=	1.00
Slope (%)	=	2.00
N-Value	=	0.032

Calculations

Compute by:		Known Q
Known Q (cfs)	=	220.00

Highlighted

Depth (ft)	=	0.70
Q (cfs)	=	220.00
Area (sqft)	=	43.96
Velocity (ft/s)	=	5.00
Wetted Perim (ft)	=	65.77
Crit Depth, Yc (ft)	=	0.74
Top Width (ft)	=	65.60
EGL (ft)	=	1.09



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Gieck Ranch Tributary 2, Reach 2 - Proposed Channel Section Capacity Check

Main Stem

Trapezoidal

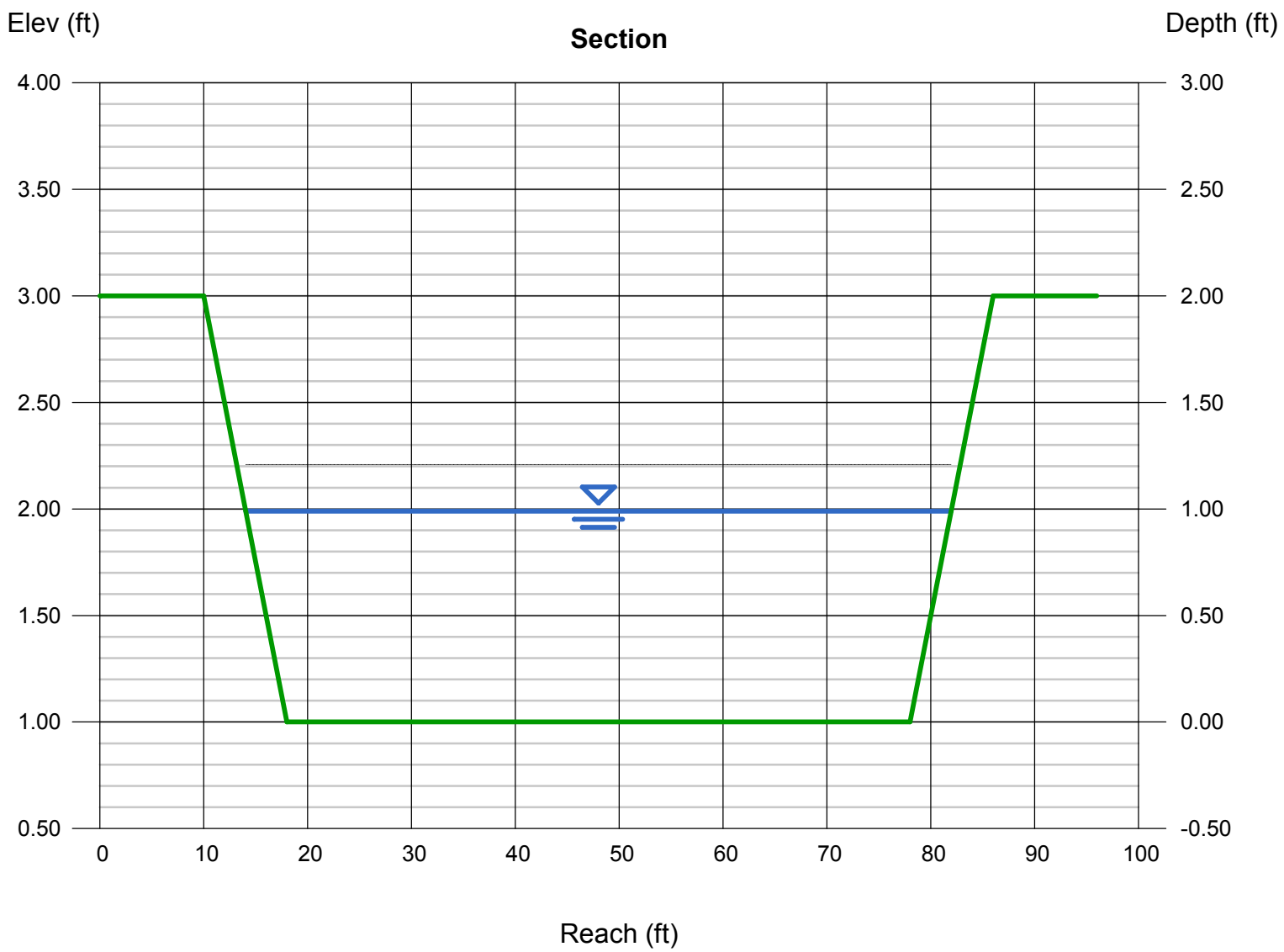
Bottom Width (ft)	=	60.00
Side Slopes (z:1)	=	4.00, 4.00
Total Depth (ft)	=	2.00
Invert Elev (ft)	=	1.00
Slope (%)	=	1.80
N-Value	=	0.050

Calculations

Compute by:		Known Q
Known Q (cfs)	=	237.00

Highlighted

Depth (ft)	=	0.99
Q (cfs)	=	237.00
Area (sqft)	=	63.32
Velocity (ft/s)	=	3.74
Wetted Perim (ft)	=	68.16
Crit Depth, Yc (ft)	=	0.78
Top Width (ft)	=	67.92
EGL (ft)	=	1.21



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Jan 17 2019

Gieck Ranch Tributary 2_Reach 2 - Proposed Channel Section Velocity Check

Main Stem

Trapezoidal

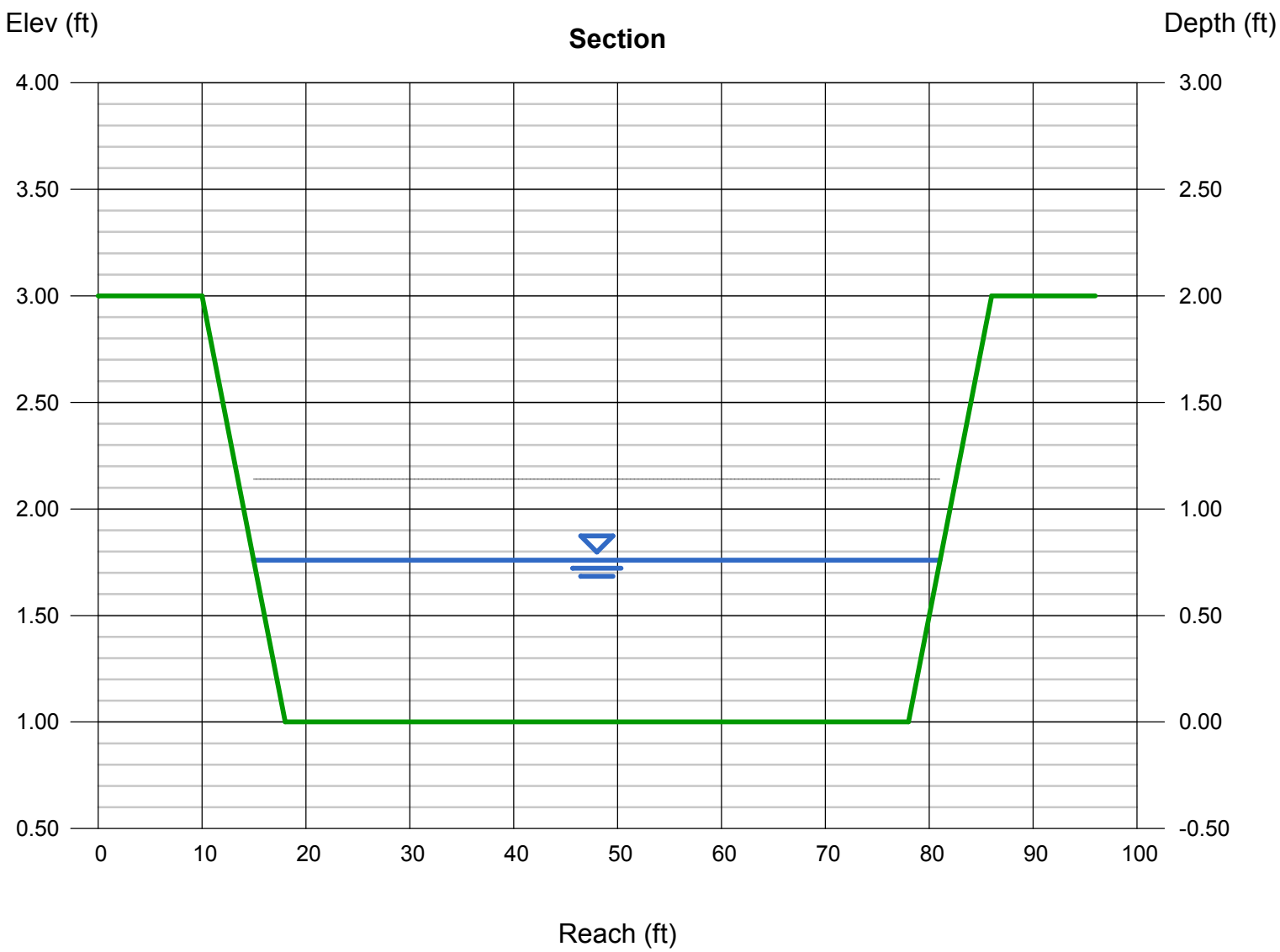
Bottom Width (ft)	=	60.00
Side Slopes (z:1)	=	4.00, 4.00
Total Depth (ft)	=	2.00
Invert Elev (ft)	=	1.00
Slope (%)	=	1.80
N-Value	=	0.032

Calculations

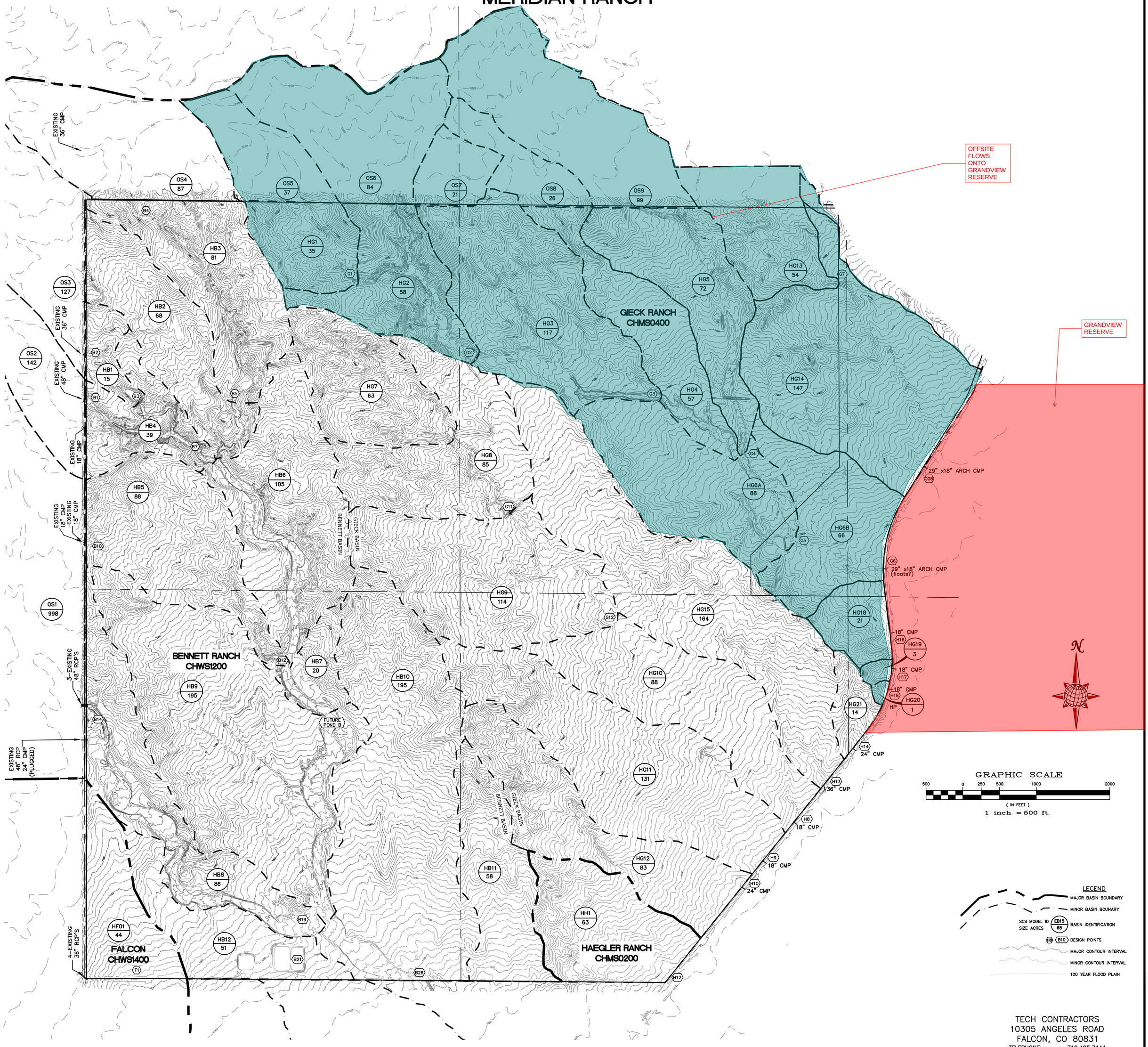
Compute by:		Known Q
Known Q (cfs)	=	237.00

Highlighted

Depth (ft)	=	0.76
Q (cfs)	=	237.00
Area (sqft)	=	47.91
Velocity (ft/s)	=	4.95
Wetted Perim (ft)	=	66.27
Crit Depth, Yc (ft)	=	0.78
Top Width (ft)	=	66.08
EGL (ft)	=	1.14



MASTER DEVELOPMENT DRAINAGE PLAN
MERIDIAN RANCH



HISTORIC CONDITIONS - SCS MAP

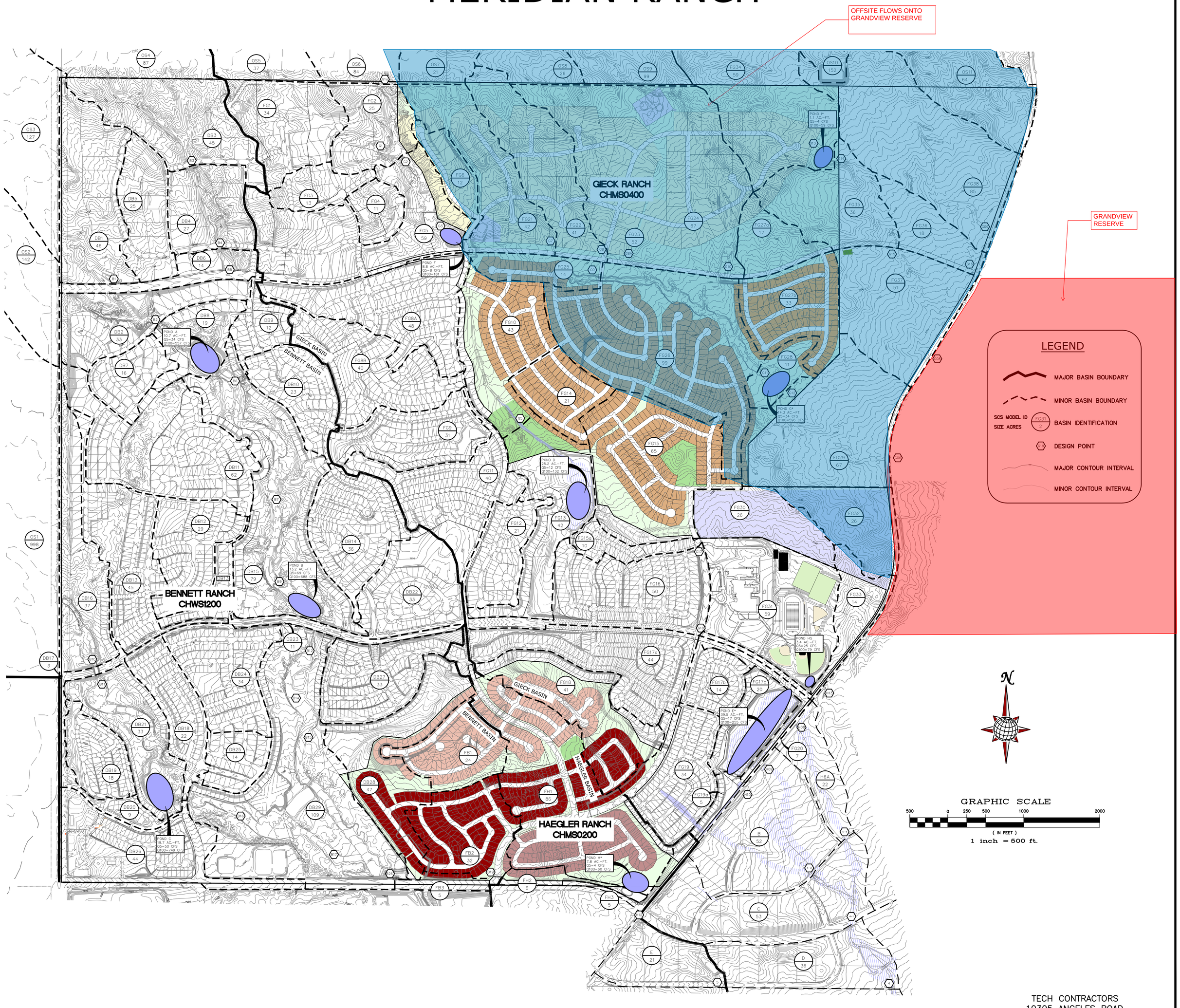
AUG 2017

TECH CONTRACTORS
10305 ANGELES ROAD
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.7608

FIGURE 4

S:\Civil Proj\Meridian Ranch MDDP\dwgs\Plan Sheets\2017 Basin Maps\2017-MDDP-HIST.dwg, HIS-SCS-MAP, 8/17/2017 10:59:19 AM

MASTER DEVELOPMENT DRAINAGE PLAN
MERIDIAN RANCH



*NOTE: PRELIMINARY STORAGE VOLUMES AND OUTFLOW QUANTITIES HAVE BEEN PROVIDED FOR EACH OF THE FUTURE DETENTION FACILITIES LOCATED WITHIN THE DEVELOPMENT. THE ACTUAL STORAGE VOLUMES AND DISCHARGE RATES WILL BE DETERMINED UPON A COMPLETE ANALYSIS FOR EACH DETENTION FACILITY PRIOR TO CONSTRUCTION. THE VALUES GIVEN FOR DISCHARGE AND VOLUME ARE ESTIMATES FOR PLANNING PURPOSES ONLY.

DEVELOPED CONDITIONS - SCS MAP

NOV 2017

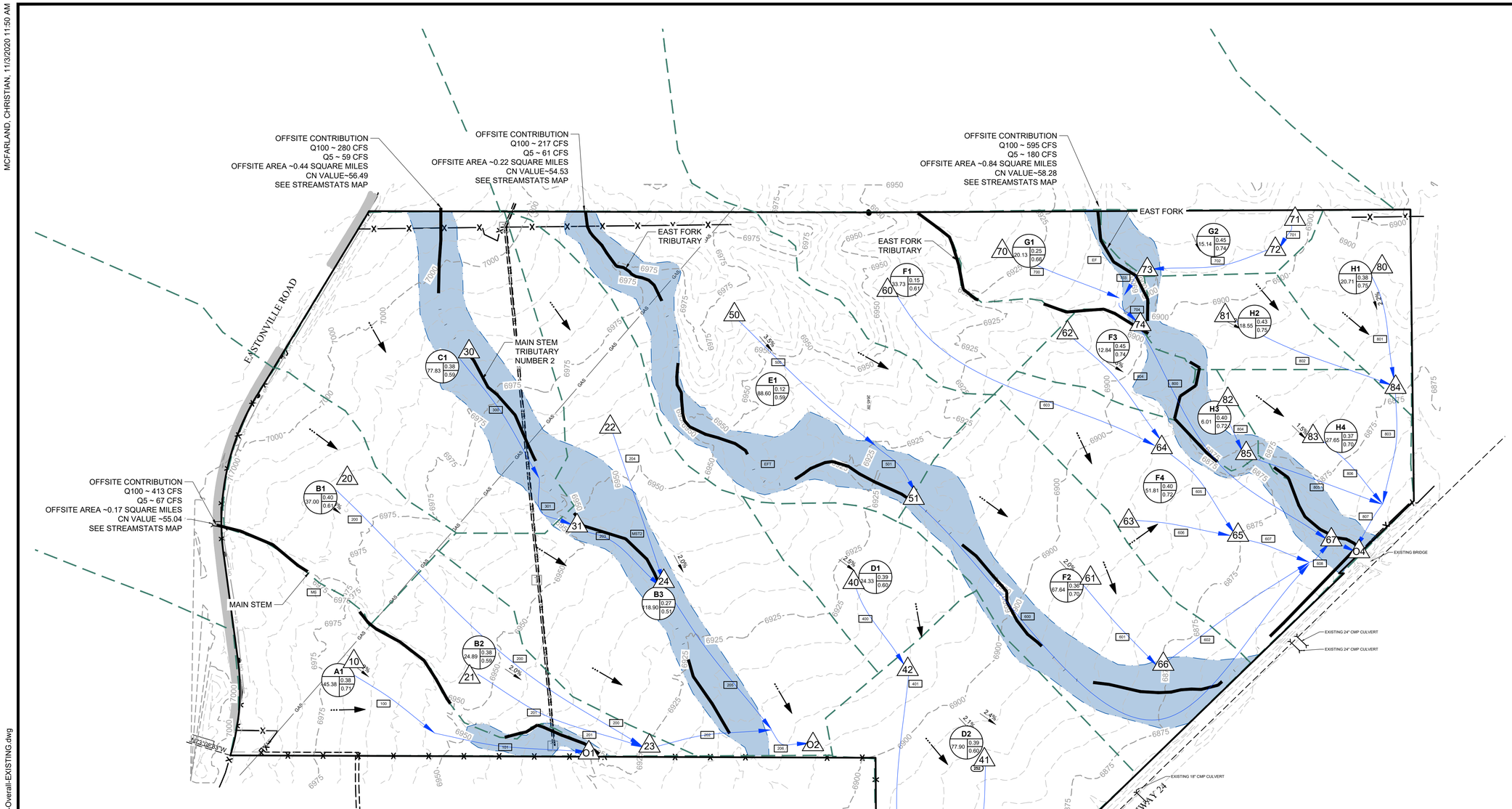
TECH CONTRACTORS
10305 ANGELES ROAD
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.7608

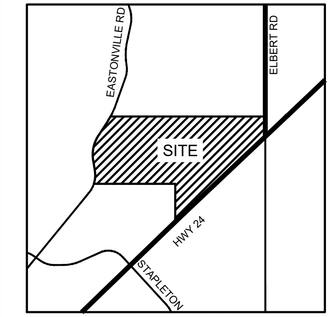
FIGURE 5

S:\Civil\Proj\Meridian Ranch MDDP\dwg\Plan Sheets\2017 Basin Maps\2017-MDDP-DEV.dwg, DEV-SCS-MAP, 11/29/2017 9:43:04 AM

Appendix F

MCFARLAND, CHRISTIAN, 11/3/2020 11:50 AM





VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION
- POTENTIAL WATER QUALITY LOCATION
- SWMM CONVEYANCE ELEMENT
- PROPOSED PEAK FLOW RATE (CFS)
- DESIGN POINT
- PROPOSED BASIN LABEL
- BASIN DESIGNATION
- AREA (AC.)
- C5
- C100

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

Basin	Design Point	5 Year Pre Development	100 Year Pre Development
A1	10	13.03	66.80
B1	20	4.33	48.76
B2	21	1.66	20.74
	22	11.85	140.35
	23	5.99	68.56
B3	24	21.23	249.20
C1	30	9.95	110.70
	31	9.95	110.70
D1	40	8.12	40.00
D2	41	22.23	114.87
	42	8.12	40.00
E1	50	32.34	157.99
	51	93.34	374.99
F1	60	9.70	49.45
F2	61	16.46	86.73
F3	62	3.65	18.42
F4	63	12.98	67.82
	64	13.35	67.87
	65	26.04	135.62

	66	16.46	86.73
	67	231.47	864.52
G1	70	5.57	28.46
G2	71	3.87	20.06
	72	3.87	20.06
	73	3.87	20.06
	74	189.42	643.48
H1	80	1.85	21.89
H2	81	5.37	27.12
H3	82	1.92	9.51
H4	83	8.07	40.86
	84	7.22	49.01
	85	1.92	9.51
OS1	OS1	67.00	413.00
OS2	OS2	59.00	280.00
OS3	OS3	61.00	217.00
OS4	OS4	180.00	595.00
	Outfall1	80.03	479.80
	Outfall2	85.96	597.41
	Outfall3	30.00	154.35
	Outfall4	341.05	1335.77

NORTH

0 200
100

HRGreen

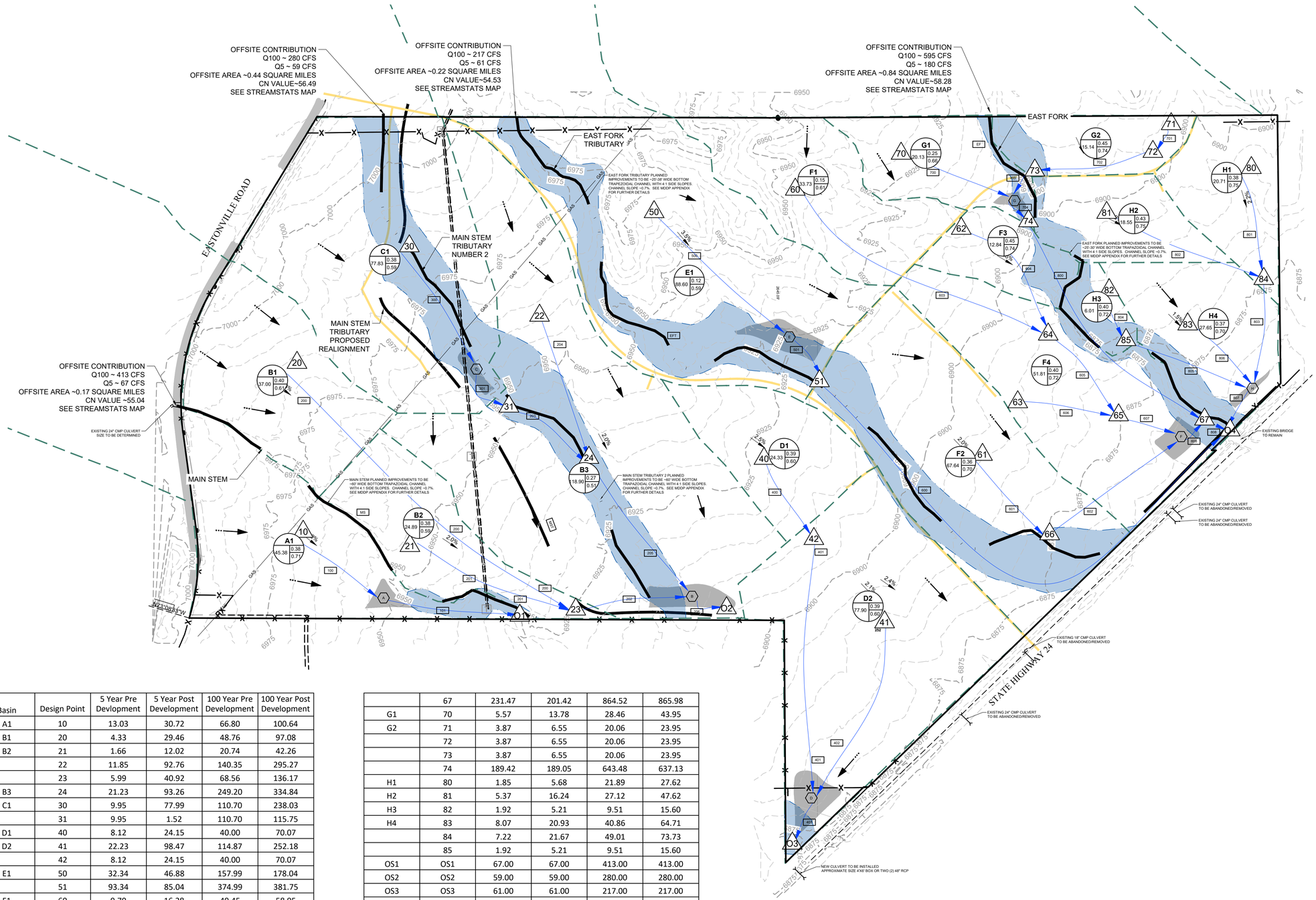
Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

EXISTING EX1

FIG.EX1

HRGreen DRAWING PATH:J:\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins-Overall-EXISTING.dwg

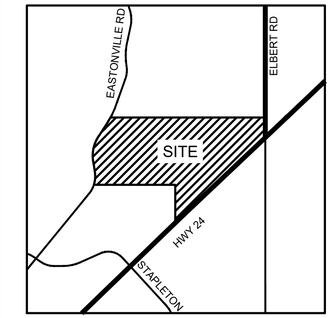
MCFARLAND, CHRISTIAN, 11/3/2020 12:56 PM



Basin	Design Point	5 Year Pre Devlopment	5 Year Post Development	100 Year Pre Development	100 Year Post Development
A1	10	13.03	30.72	66.80	100.64
B1	20	4.33	29.46	48.76	97.08
B2	21	1.66	12.02	20.74	42.26
	22	11.85	92.76	140.35	295.27
	23	5.99	40.92	68.56	136.17
B3	24	21.23	93.26	249.20	334.84
C1	30	9.95	77.99	110.70	238.03
	31	9.95	1.52	110.70	115.75
D1	40	8.12	24.15	40.00	70.07
D2	41	22.23	98.47	114.87	252.18
	42	8.12	24.15	40.00	70.07
E1	50	32.34	46.88	157.99	178.04
	51	93.34	85.04	374.99	381.75
F1	60	9.70	16.28	49.45	58.95
F2	61	16.46	60.11	86.73	170.90
F3	62	3.65	11.36	18.42	32.93
F4	63	12.98	42.32	67.82	124.89
	64	13.35	26.88	67.87	90.88
	65	26.04	69.12	135.62	215.63
	66	16.46	60.11	86.73	170.90

	67	231.47	201.42	864.52	865.98
G1	70	5.57	13.78	28.46	43.95
G2	71	3.87	6.55	20.06	23.95
	72	3.87	6.55	20.06	23.95
	73	3.87	6.55	20.06	23.95
	74	189.42	189.05	643.48	637.13
H1	80	1.85	5.68	21.89	27.62
H2	81	5.37	16.24	27.12	47.62
H3	82	1.92	5.21	9.51	15.60
H4	83	8.07	20.93	40.86	64.71
	84	7.22	21.67	49.01	73.73
	85	1.92	5.21	9.51	15.60
OS1	OS1	67.00	67.00	413.00	413.00
OS2	OS2	59.00	59.00	280.00	280.00
OS3	OS3	61.00	61.00	217.00	217.00
OS4	OS4	180.00	180.00	595.00	595.00
	Outfall1	80.03	67.69	479.80	466.95
	Outfall2	85.96	61.68	597.41	536.11
	Outfall3	30.00	8.58	154.35	160.70*
	Outfall4	341.05	276.10	1335.77	1291.25

*THIS VALUE IS HIGHER THAN PRE-EXISTING AND WILL BE ADJUSTED TO MEET CRITERIA WITH THE PRELIMINARY DRAINAGE REPORT



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION — A
- POTENTIAL WATER QUALITY LOCATION — WQ
- SWMM CONVEYANCE ELEMENT — SWMM
- PROPOSED PEAK FLOW RATE (CFS) — 850
- DESIGN POINT — X
- PROPOSED BASIN LABEL — XX BASIN DESIGNATION; AREA (AC.) XX; XX C5; XX C100

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

PRELIMINARY CHANNEL GEOMETRY (BY OTHERS)

MAIN STEM
BOTTOM WIDTH: 60'
SIDE SLOPES: 4:1

MAIN STEM TRIBUTARY 2
BOTTOM WIDTH: 60'
SIDE SLOPES: 4:1

EAST FORK TRIBUTARY 1 REACH 2
BOTTOM WIDTH: 38'
SIDE SLOPES: 4:1

EAST FORK TRIBUTARY 1 REACH 1
BOTTOM WIDTH: 25'
SIDE SLOPES: 4:1

NORTH
0 400
200

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR1

FIG.DR1

HRGreen DRAWING PATH:J:\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins-Overall.dwg

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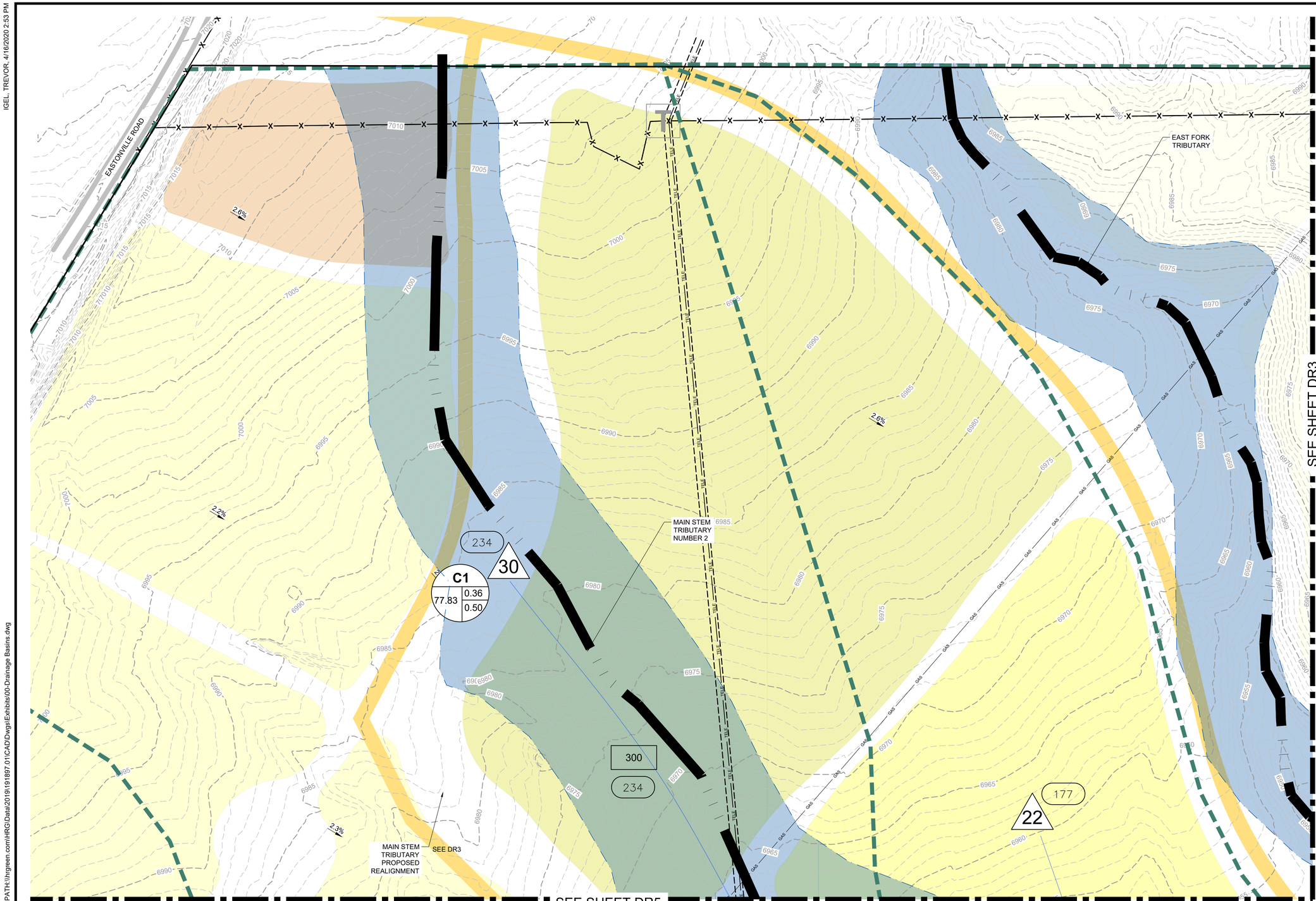

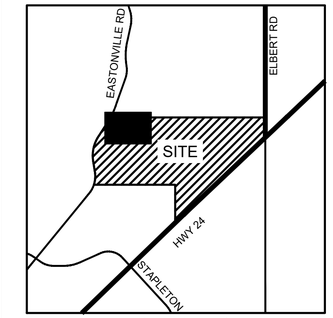

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION — A
- POTENTIAL WATER QUALITY LOCATION — WQ
- SWMM CONVEYANCE ELEMENT — SWMM
- PROPOSED PEAK FLOW RATE (CFS) — 850
- DESIGN POINT — X
- PROPOSED BASIN LABEL — XX BASIN DESIGNATION; AREA (AC.) XX; XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	CMM
Date:	4/9/2020

PROPOSED DR2

FIG.DR2

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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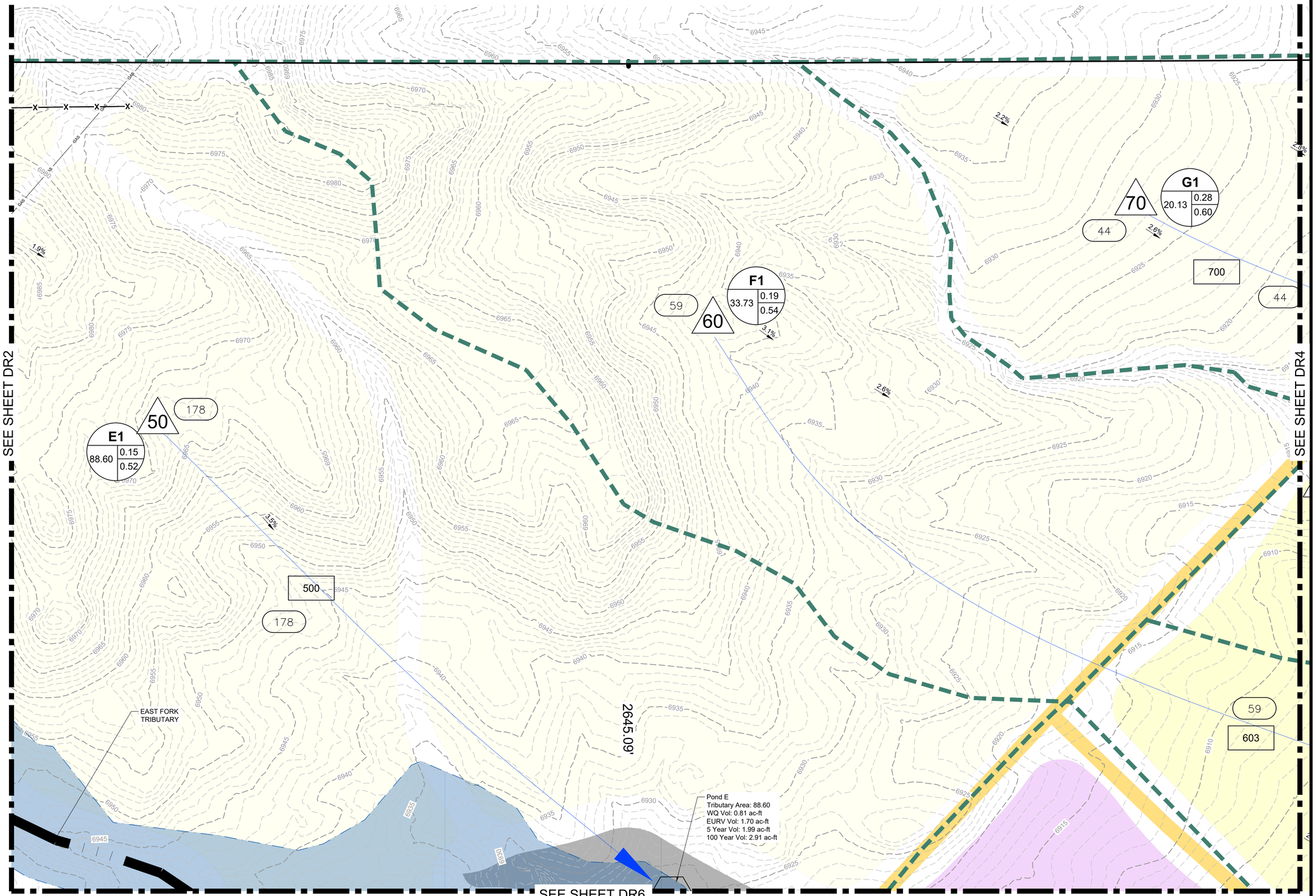

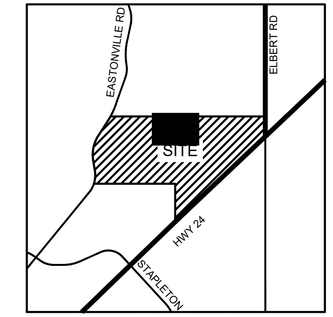

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION — A
- POTENTIAL WATER QUALITY LOCATION — WQ
- SWMM CONVEYANCE ELEMENT — SWMM
- PROPOSED PEAK FLOW RATE (CFS) — 850
- DESIGN POINT — X
- PROPOSED BASIN LABEL — XX BASIN DESIGNATION; AREA (AC.) XX; XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR3

FIG.DR3

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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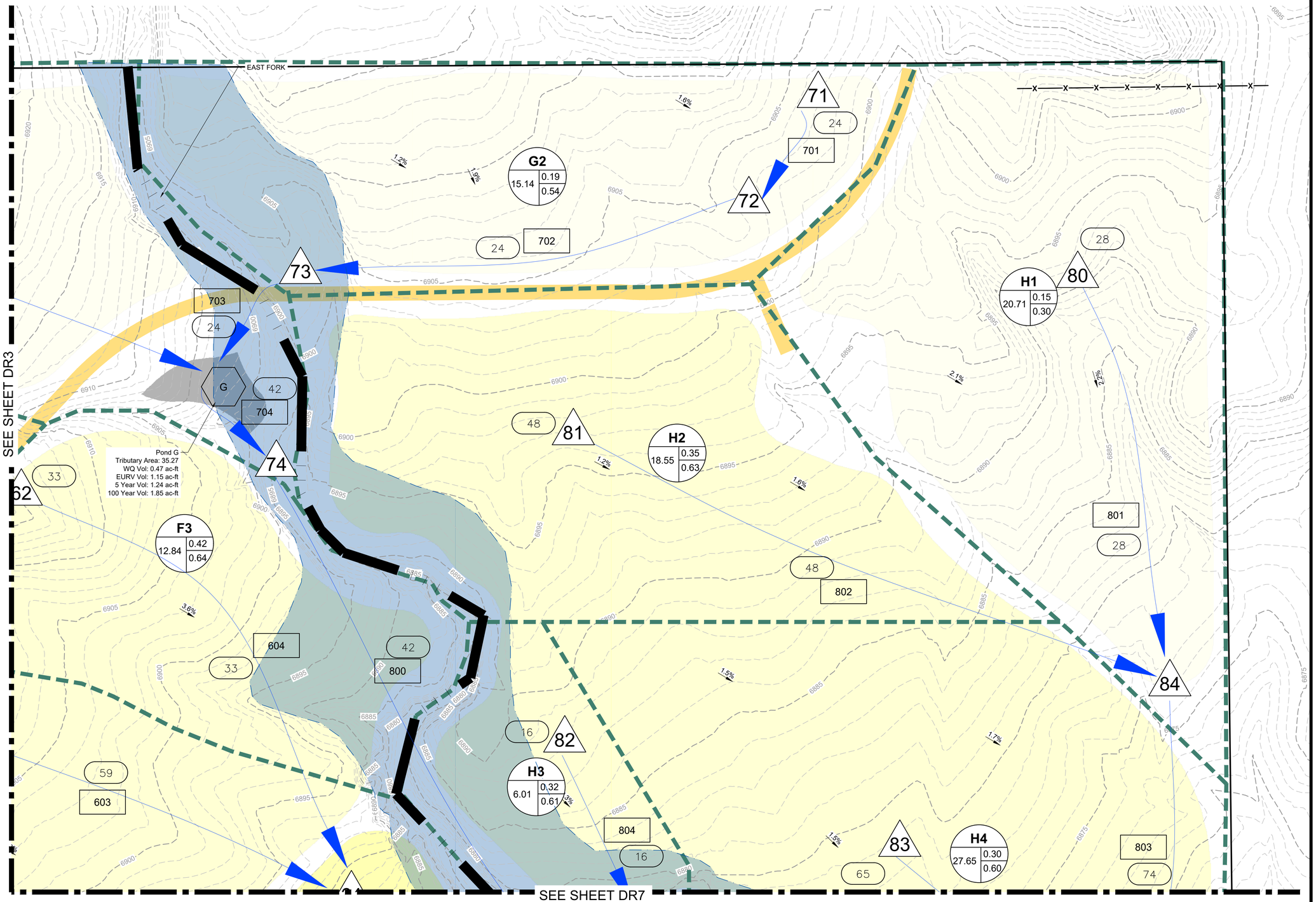

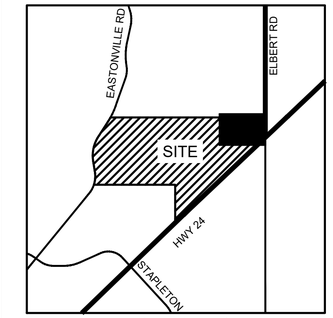

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) BASIN DESIGNATION; AREA (AC.) (XX) (XX) % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR4

FIG.DR4

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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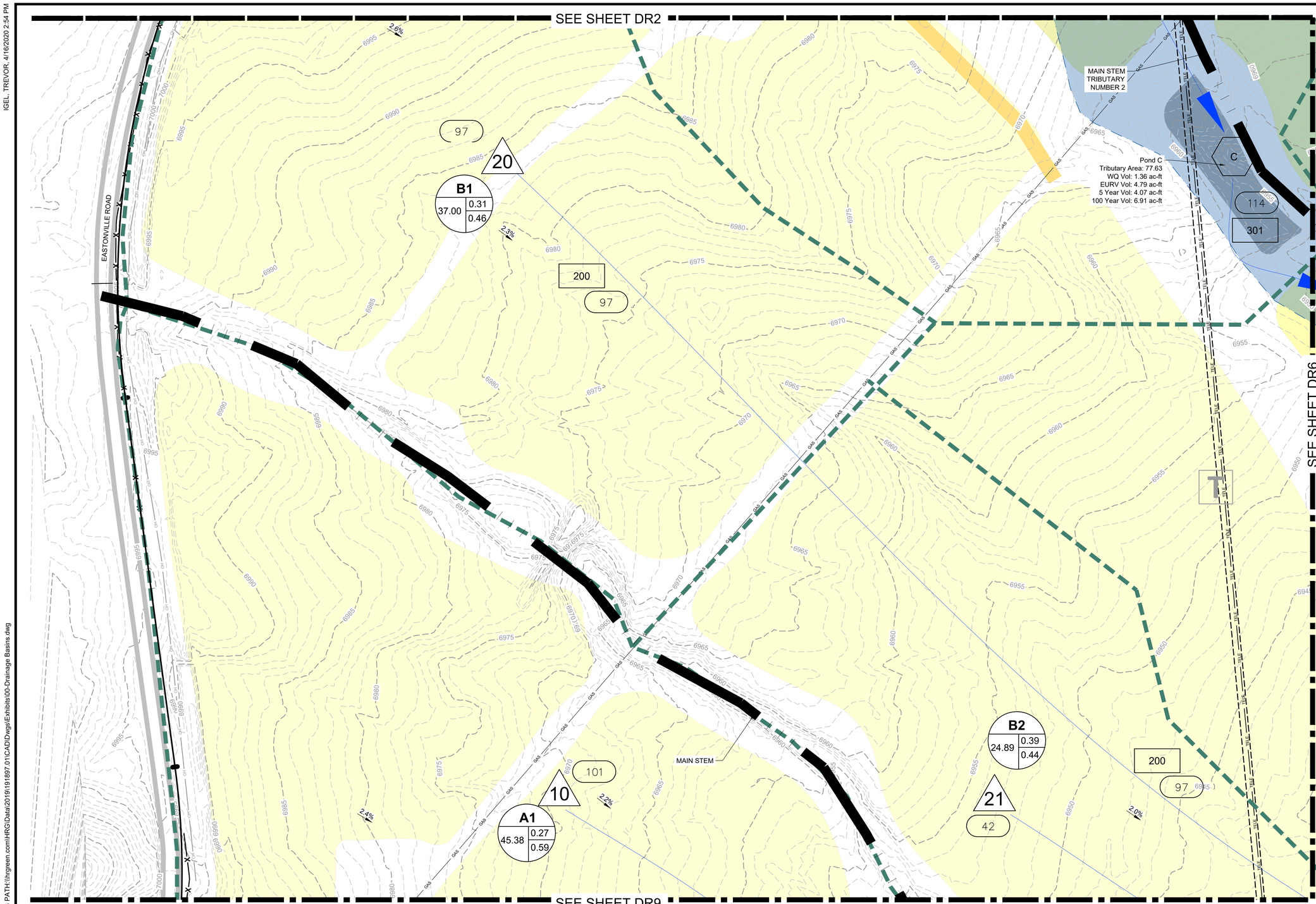

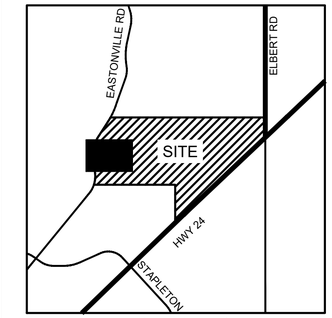

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION — A
- POTENTIAL WATER QUALITY LOCATION — WQ
- SWMM CONVEYANCE ELEMENT — SWMM
- PROPOSED PEAK FLOW RATE (CFS) — 850
- DESIGN POINT — X
- PROPOSED BASIN LABEL — XX — BASIN DESIGNATION; AREA (AC.) XX — XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR5

FIG.DR5

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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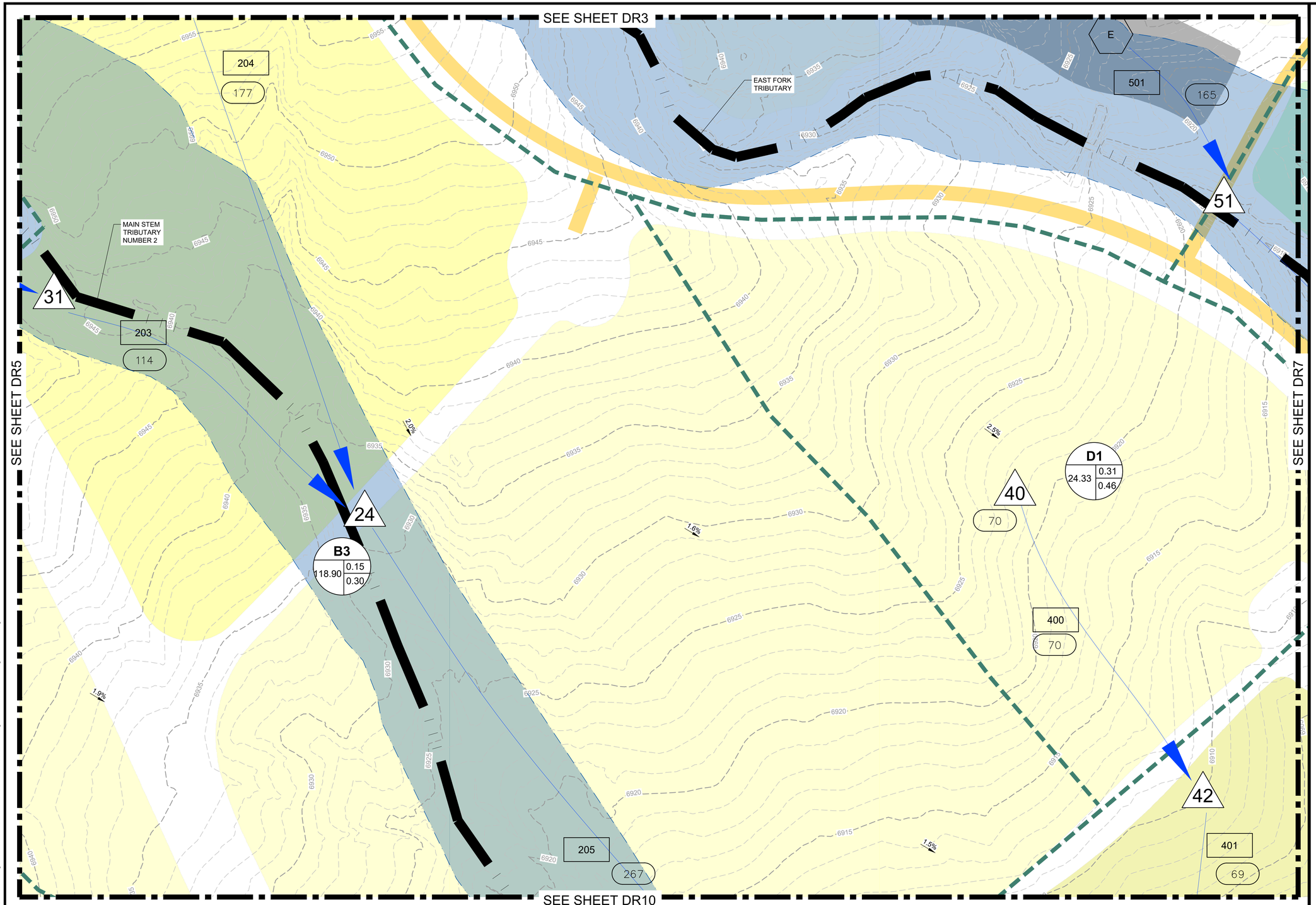

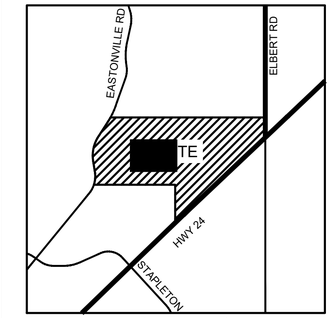

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION — A
- POTENTIAL WATER QUALITY LOCATION — WQ
- SWMM CONVEYANCE ELEMENT — SWMM
- PROPOSED PEAK FLOW RATE (CFS) — 850
- DESIGN POINT — X
- PROPOSED BASIN LABEL — XX BASIN DESIGNATION; AREA (AC.) XX; XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR6

FIG.DR6

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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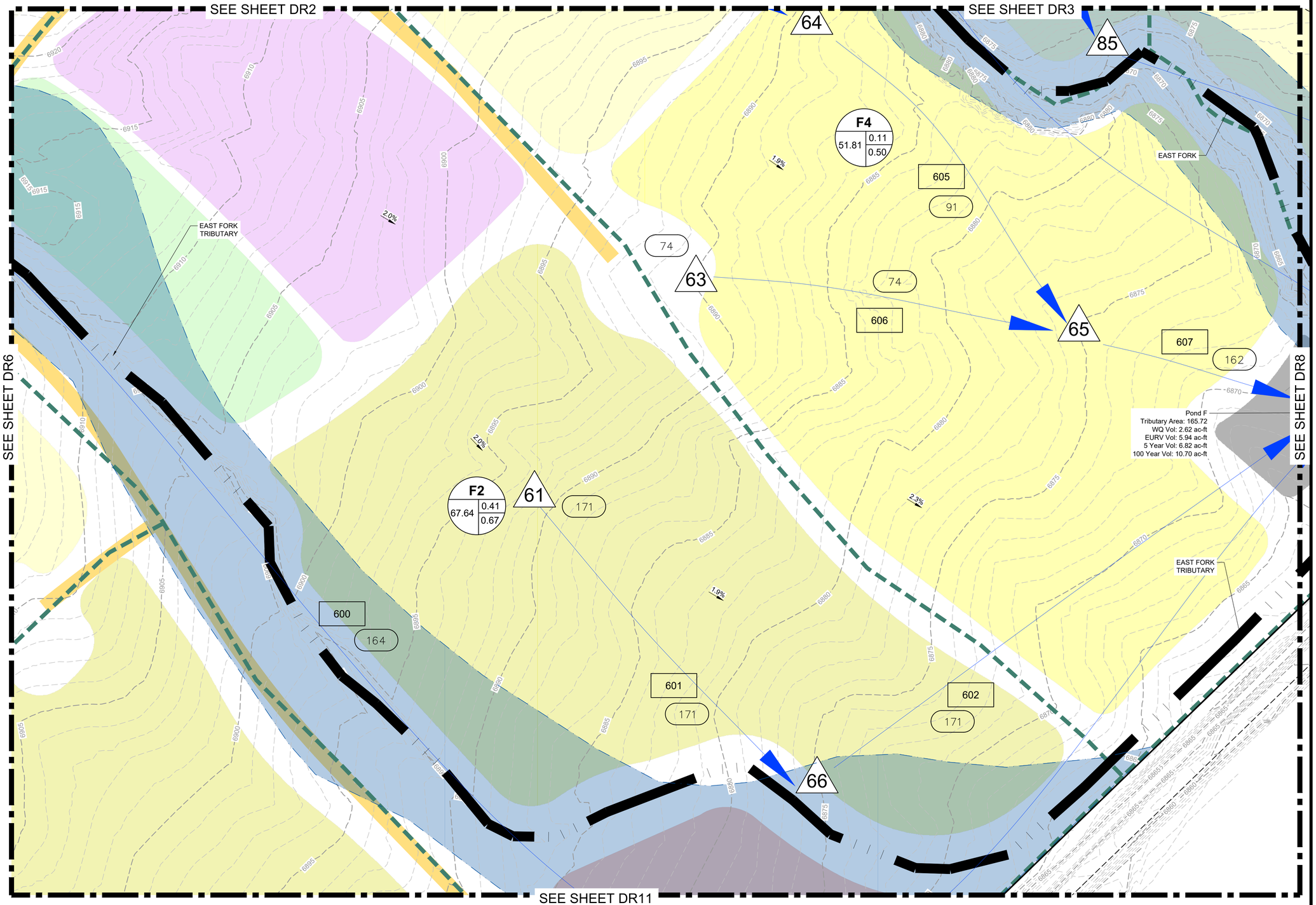

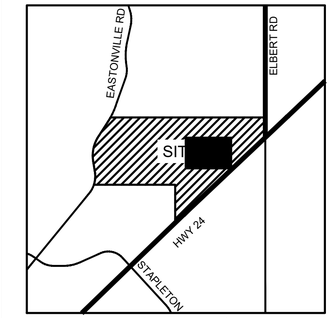

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION — A
- POTENTIAL WATER QUALITY LOCATION — WQ
- SWMM CONVEYANCE ELEMENT — SWMM
- PROPOSED PEAK FLOW RATE (CFS) — 850
- DESIGN POINT — X
- PROPOSED BASIN LABEL — XX (BASIN DESIGNATION); AREA (AC.) XX; XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR7

FIG.DR7

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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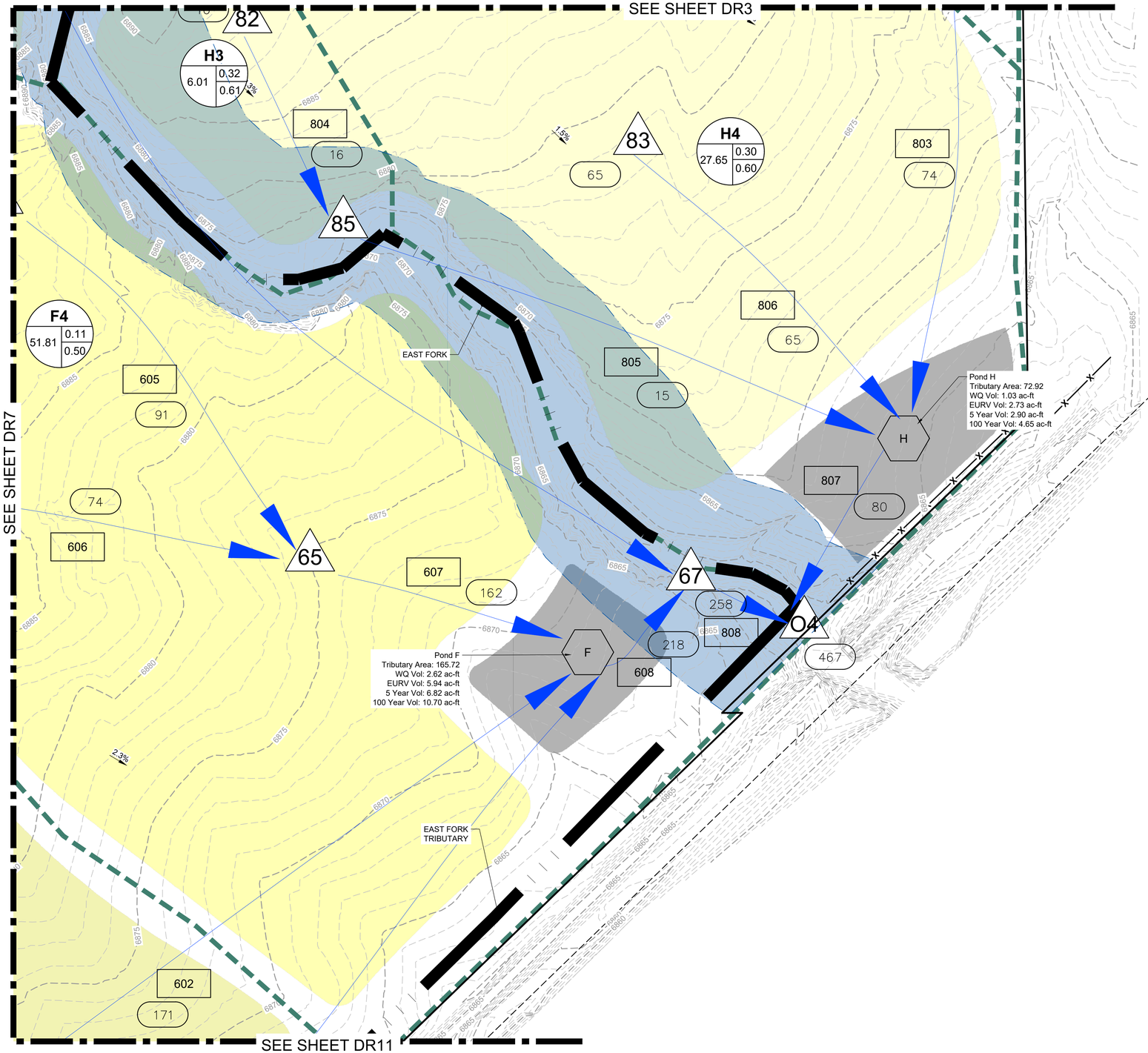

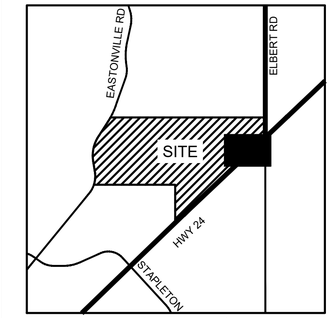

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION — A
- POTENTIAL WATER QUALITY LOCATION — WQ
- SWMM CONVEYANCE ELEMENT — SWMM
- PROPOSED PEAK FLOW RATE (CFS) — 850
- DESIGN POINT — X
- PROPOSED BASIN LABEL — XX BASIN DESIGNATION; AREA (AC.) XX; XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR8

FIG.DR8

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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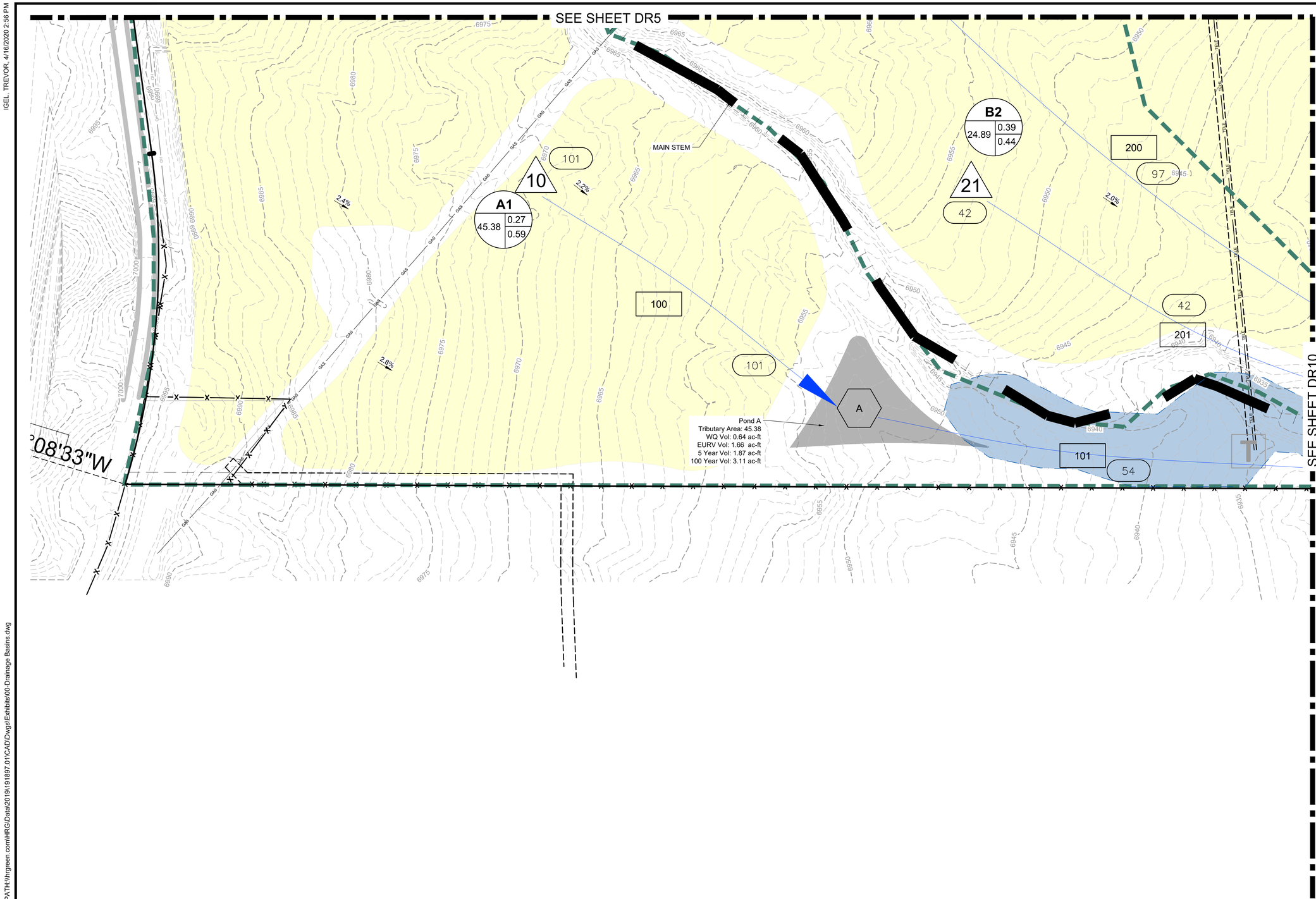

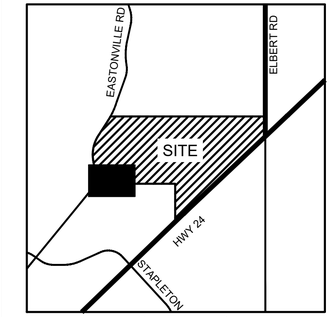

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100–YR FLOODWAY
- EXISTING 100–YR FLOODPLAIN
- PROPOSED 100–YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX) BASIN DESIGNATION; AREA (AC.) (XX) (XX) % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR9

FIG.DR9

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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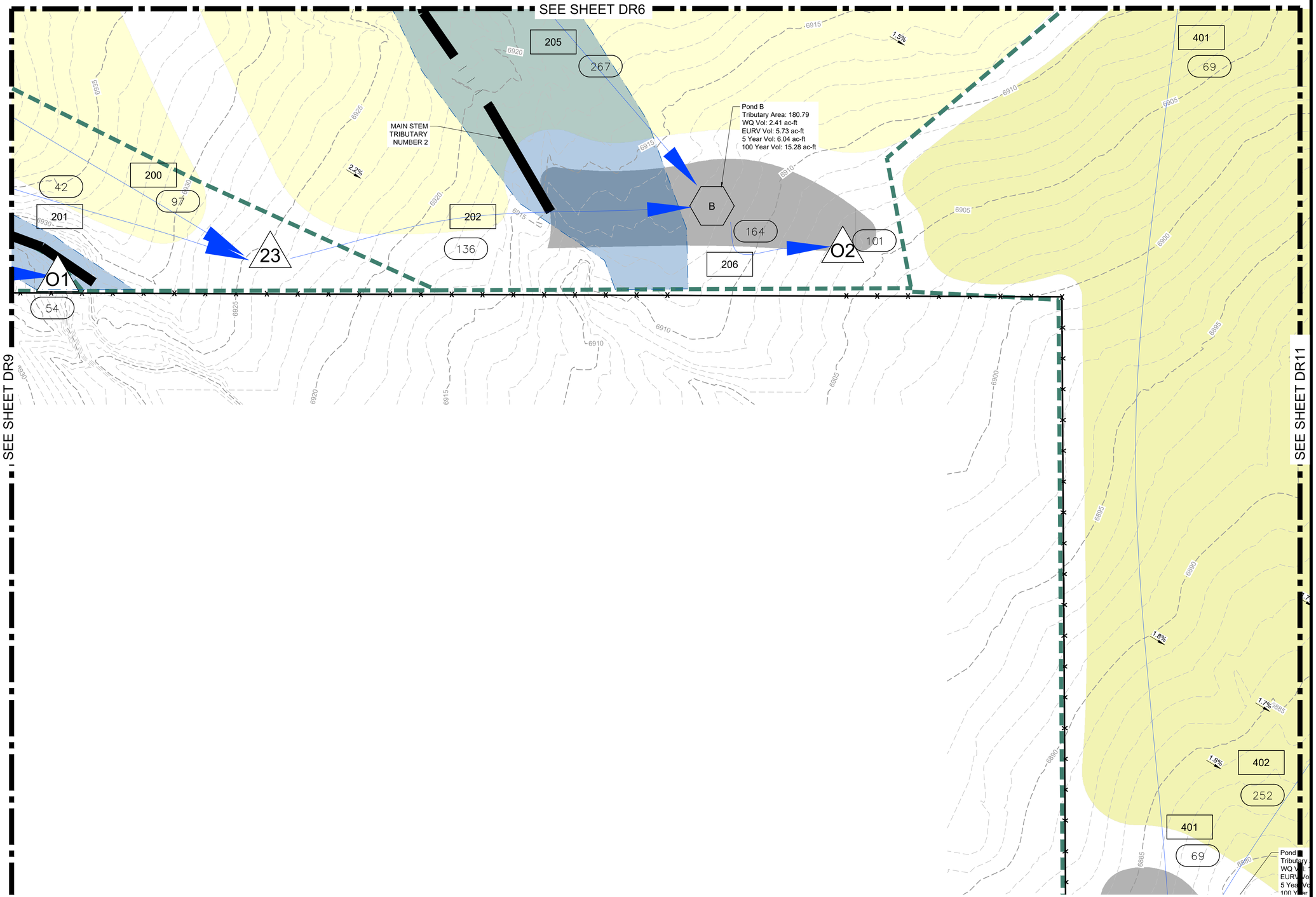

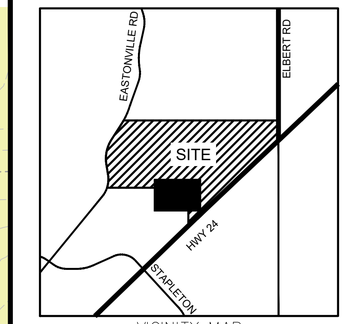

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL (XX; AREA (AC.) XX; % IMPERVIOUSNESS XX; BASIN DESIGNATION)

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR10

FIG.DR10

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

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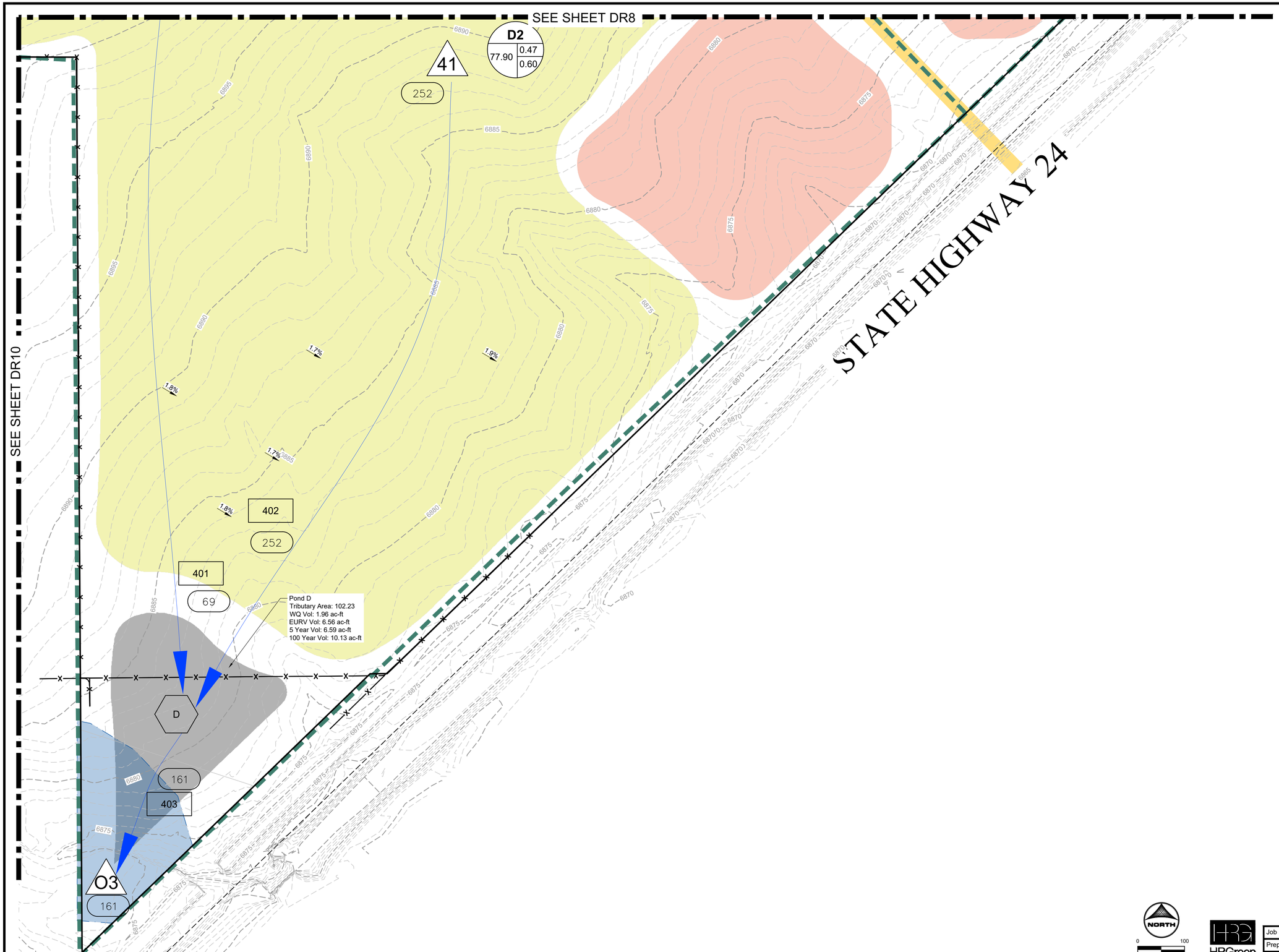

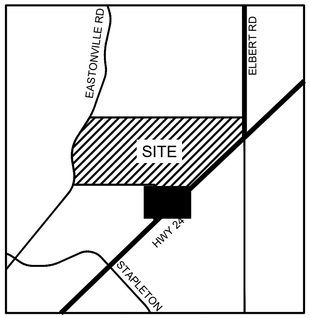

VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
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- PROPERTY LINE
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- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
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- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION — A
- POTENTIAL WATER QUALITY LOCATION — WQ
- SWMM CONVEYANCE ELEMENT — SWMM
- PROPOSED PEAK FLOW RATE (CFS) — 850
- DESIGN POINT — X
- PROPOSED BASIN LABEL — XX (BASIN DESIGNATION); AREA (AC.) XX; XX % IMPERVIOUSNESS

LAND USE

- LOW DENSITY
- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
- CHURCH
- COMMERCIAL
- ELEMENTARY SCHOOL
- COMMUNITY PARK

NOTES:

NORTH

0 50 100

HRGreen

Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

PROPOSED DR11

FIG.DR11

HRGreen DRAWING PATH:\\hrgreen.com\HRG\Data\2019\191897.01\CAD\Dwgs\Exhibits\00-Drainage Basins.dwg

V4_ FRD Grading.pdf Markup Summary

Bret (1)

Please provide an early grading map for the work to be performed. the map should include the location of the temporary sediment basins.

Subject: Engineer
Page Label: 1
Author: Bret
Date: 2/19/2025 2:20:44 PM
Status:
Color:
Layer:
Space:

Please provide an early grading map for the work to be performed. the map should include the location of the temporary sediment basins.