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Grandview Reserve
Master Development Drainage Plan

August 2020

HR Green Project No: 191850

Prepared For:

4 SITE INVESTMENTS, LLC

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Engineering Review

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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.

Sign and stamp

_____

Chris McFarland, PE Date

State of Colorado No. 44947

For and on behalf of HR Green Development, LLC

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: Sign and complete

Title: _____

Address: _____

_____

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.

_____ _____

Jennifer Irvine, P.E. Date

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.

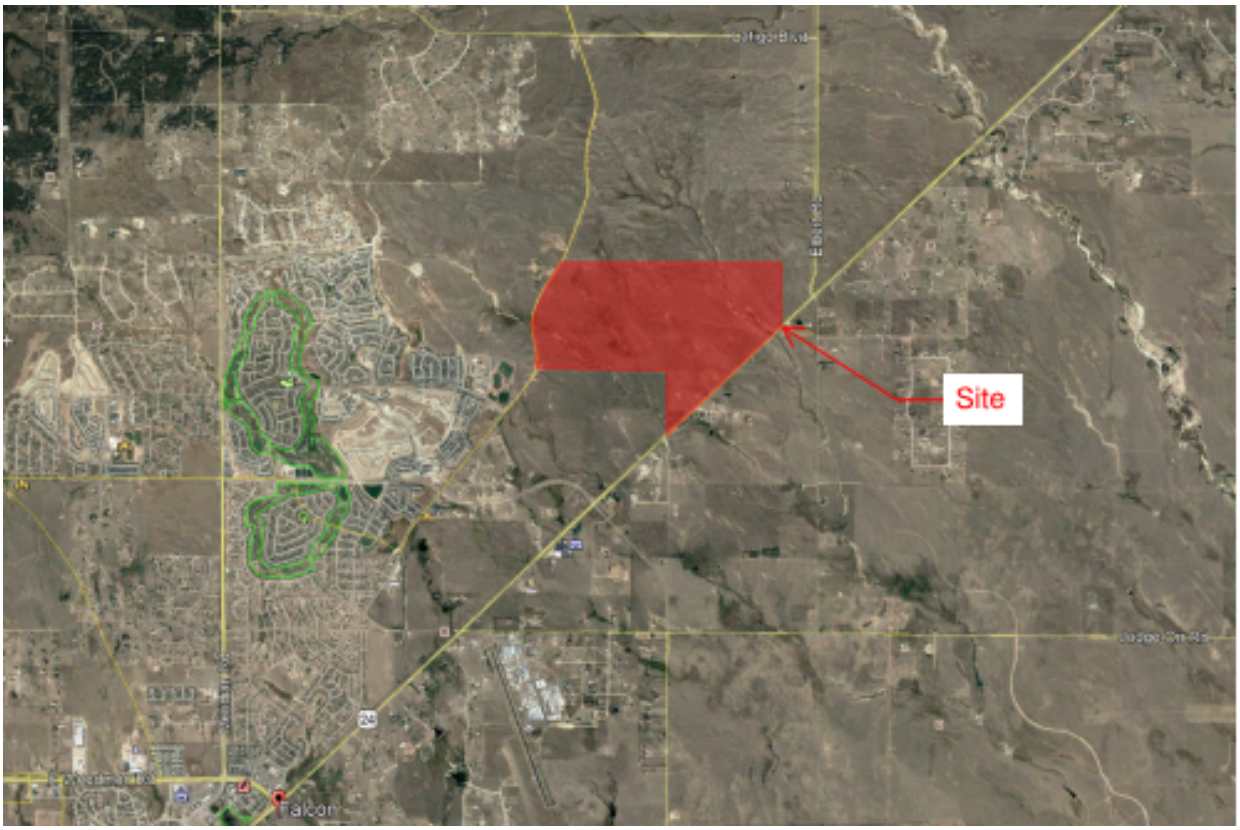

Figure 1 - Site Map

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*	116	56
East Fork*	357	175

reversed?

*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	13.03	66.80	5.43	53.95
2	26.96	317.41	34.45	256.11
3	30.00	154.35	2.52	160.7
4	100.05	523.77	35.27	478.86

*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

Drainage Basins

El Paso County
Colorado

Legend

- Drainage Basins Source: Muller Engineering Company (1988)
- 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 E S

Miles

0 0.5 1 2 3 4 5

Douglas County
Elbert County
Teller County
Fremont County
Lincoln County
Pueblo County

SITE

Upper Monument Creek FOMO5800
Monument Rock FOMO5000
Dirty Woman Creek FOMO5200
West Cherry Creek CYCY0400
East Cherry Creek CYCY0200
Jackson Creek FOMO4400
Black Forest FOMO4200
Beaver Creek FOMO4600
Monument Branch FOMO3800
Black Squirrel Creek FOMO3600
Pike National Forest
Air Force Academy FOMO3200
USAF Academy
Kettle Creek FOMO3000
Pine Creek FOMO2800
Dry Creek FOMO2400
South Pine Creek FOMO2600
Cottonwood Creek FOMO2200
Templeton Gap FOMO1200
Douglas Creek FOMO1000
Upper Fountain FOFO7600
Cheyenne Mountain Zoo
Cheyenne Mountain
Cascade
Williams Canyon FOFO7200
Camp Creek FOFO5800
Manitou Reservoir FOFO7400
MANITOU SPRINGS
COLORADO SPRINGS
Shooks Run FOFO4400
Spring Creek FOFO4800
Bear Creek FOFO4800
Ruxton Creek FOFO7000
Upper Beaver Creek BEBE0400
Sutherland Creek FOFO6400
Peterson AFB
Peterson Field FOFO3400
Municipal Airport
Jimmy Camp Creek FOFO2000
Schriever AFB
Fishers Canyon FOFO3600
Southwest Area FOFO4600
Windmill Gulch FOFO3000
Big Johnson FOFO2600
Fort Carson FOFO2200
Fort Carson
Little Fountain Creek FOFO1800
Calhan Reservoir FOFO1400
FOUNTAIN
Sand Canyon FOFO1600
Sand Creek FOFO0600
Turkey Creek TUTU0200
Red Creek BEBE0200
Young Hollow FOFO0200
Lower Williams Creek FOFO1000
Sand Creek FOFO4000
Falcon CHWS3400
Peyton
Bijou Creek BIBI0200
East Kiowa Creek KIKI0400
West Kiowa Creek KIKI0200
Upper Black Squirrel CHBS2000
Bennett Ranch CHWS1200
Geick Ranch CHMS0400
Upper Bracket Creek CHBR0600
La Vega Ranch CHBR0400
Hook And Line Ranch CHBS1800
Solbers Ranch CHWS0800
Curtis Ranch CHWS1000
Haegler Ranch CHMS0200
Livestock Company CHWS0400
Upper Big Sandy Creek BGBG1400
Antelope Creek BGBG0800
Lenard BGBG1200
Calhan BGBG1000
Ramah
Ramah BGBG0600
Simla BGBG0400
Mustang Creek BGBG0200
North Fork HOHO0400
Horse Creek HOHO0600
Little Horse Creek HOHO0200
Steels Fork HOPO1000
Baggett CHBR0200
West Big Springs Creek CHBG0200
Upper Big Springs Creek CHBG0400
Rush HOPO0800
Ellicott
Yoder
Rush
Telephone Exchange CHWS0200
Ellicott Consolidated CHBS1200
Ellicott CHBS1600
Lower Big Springs Creek CHBS1400
Upper Pond Creek HOPO0600
Lower Pond Creek HOPO0400
Upper East Chico CHEC0400
Drennan CHDS0400
Crows Roost CHBS1000
AFA Aux Field
Middle East Chico CHEC0200
Upper Williams Creek FOWI0600
Upper Williams Tributary FOWI0400
Upper Chico Creek CHCH1600
Upper Dry Squirrel CHDS0200
Truckton
Haynes Creek HAHA0600
St. Lukes HOPO0200
West Chico Tributary CHCH1200
Lower Black Squirrel CHBS0600
Squirrel Creek CHBS0200
Chico Creek CHCH1400
Lower Williams Tributary FOWI0200
Lower Dry Squirrel CHBS0400
Lower East Chico CHCH0800
East Haynes HAHA0400
East Kramer KRKR0600
Kramer Creek KRKR0400
West Kramer KRKR0200
Hammer Ranch CHCH0600
Williams Ranch FOFO0400
Finch Ranch CHCH0400
Windmill CHCH0200
West Haynes HAHA0200
West Chico Creek CHCH0600
Midway Ranch FOFO1800

possible updated or additional flood hazard information.

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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

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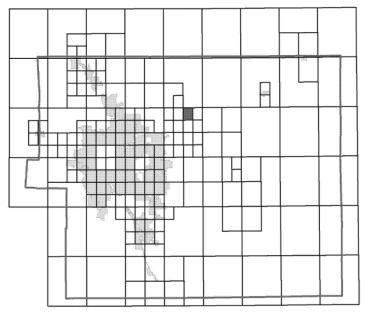
El Paso County Vertical Datum Offset Table

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



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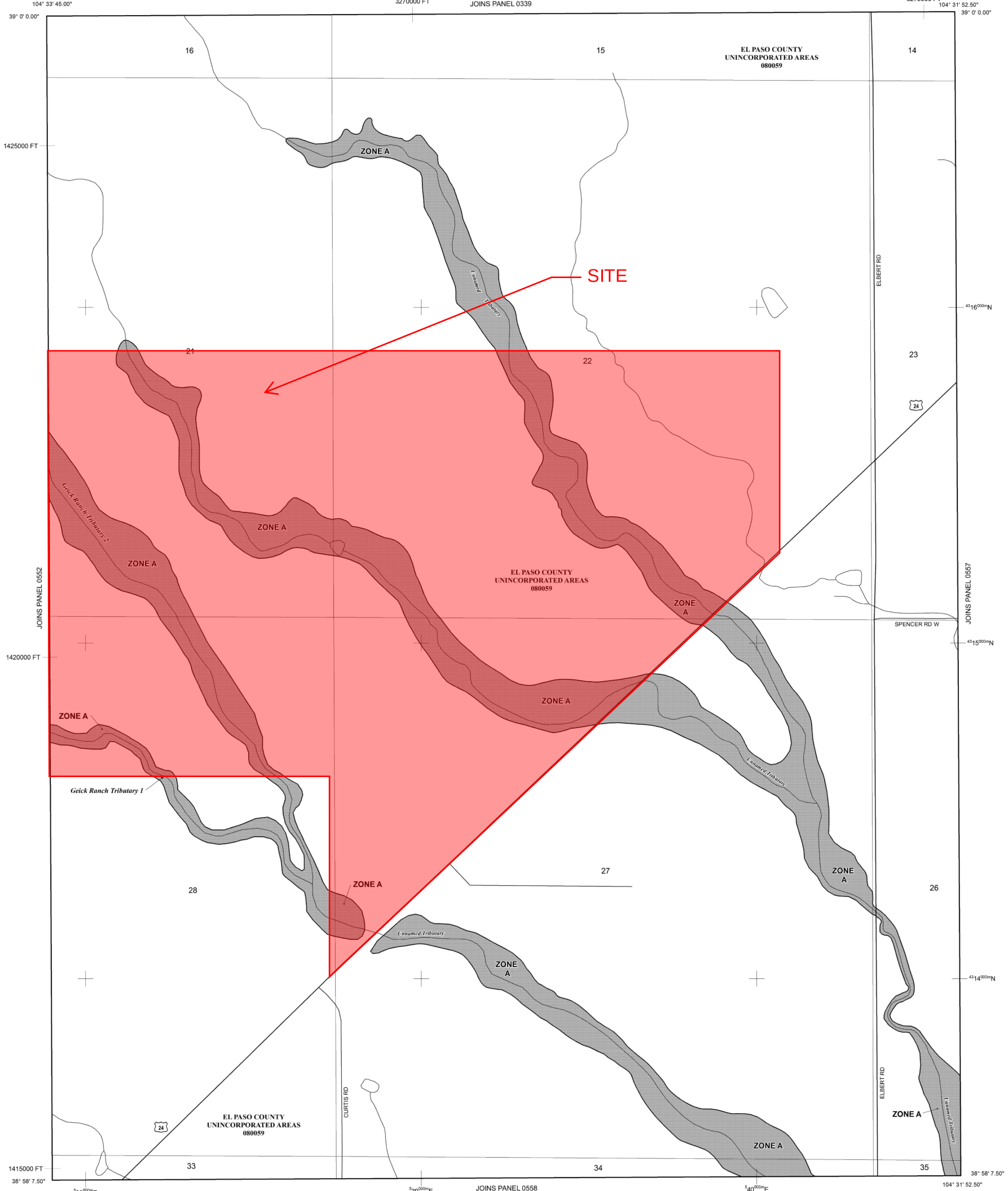

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, 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)

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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.

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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.

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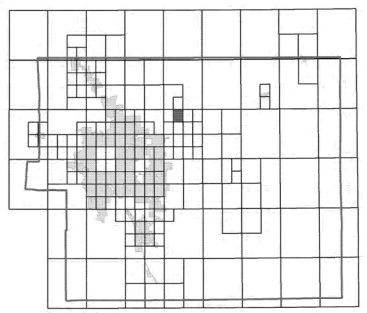

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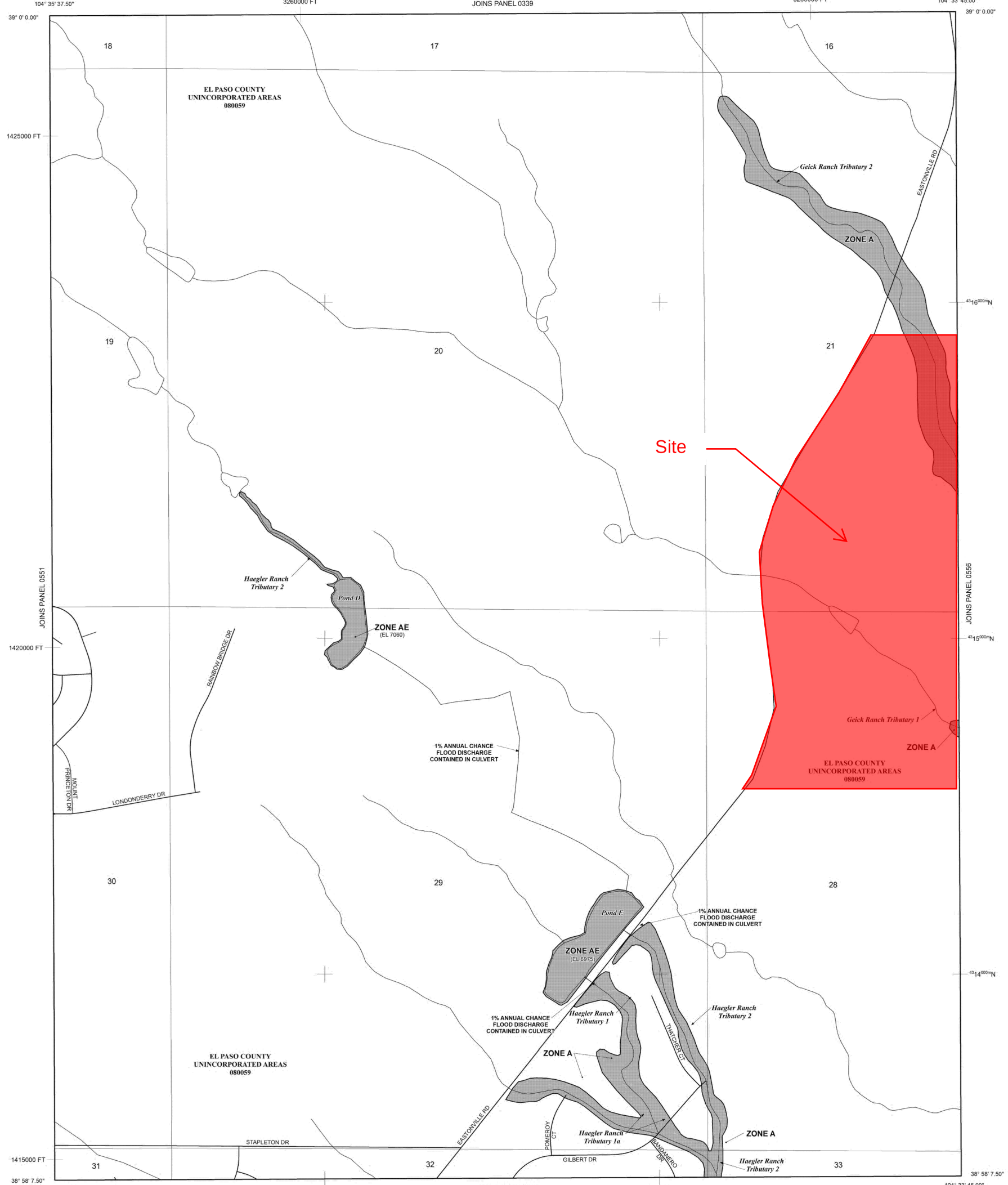

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For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

PANEL 0552G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 552 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

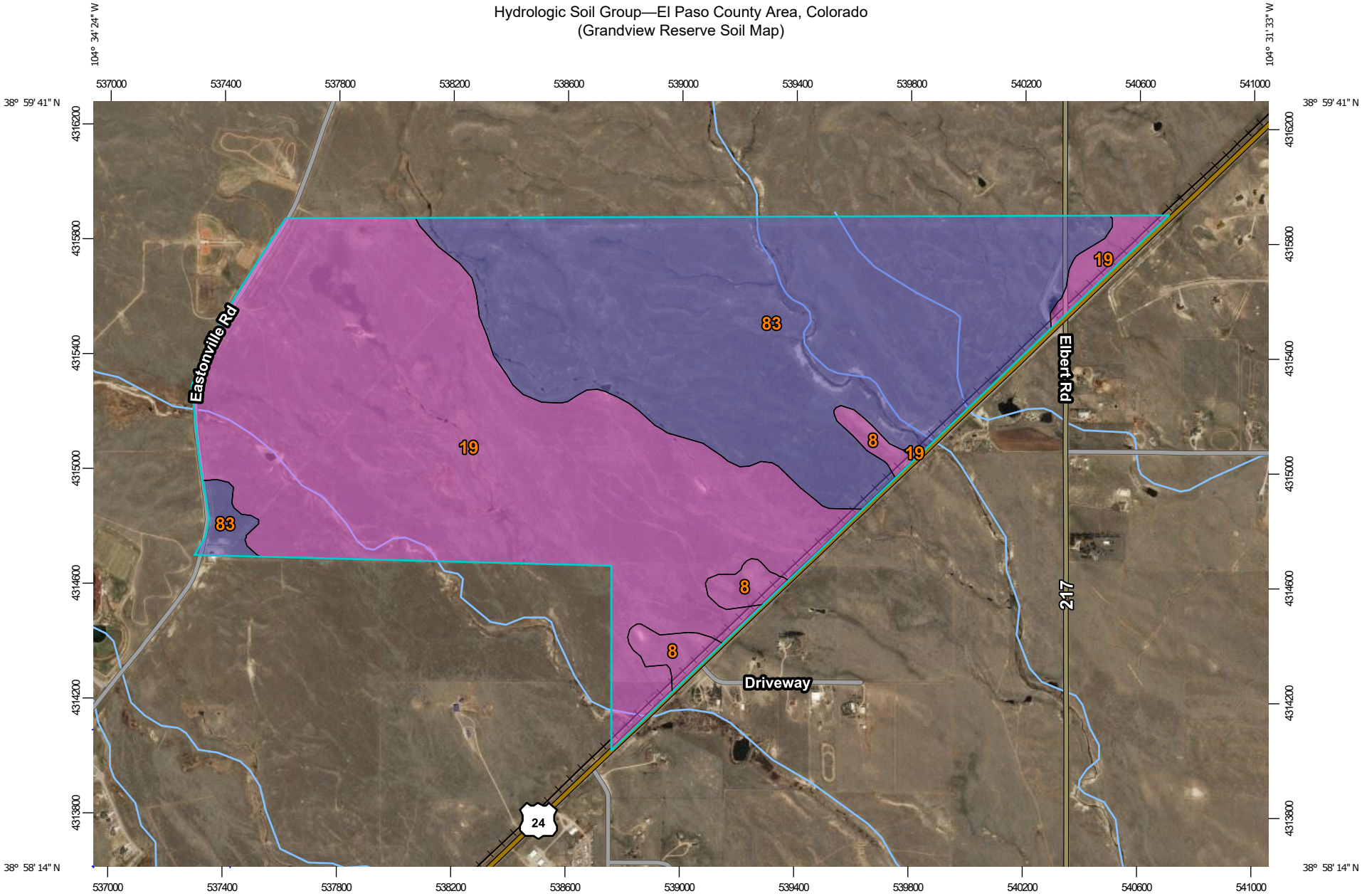
COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0552	G

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

MAP NUMBER
08041C0552G

MAP REVISED

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



Map Scale: 1:18,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 250 500 1000 1500

Feet: 0 500 1000 2000 3000

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil 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

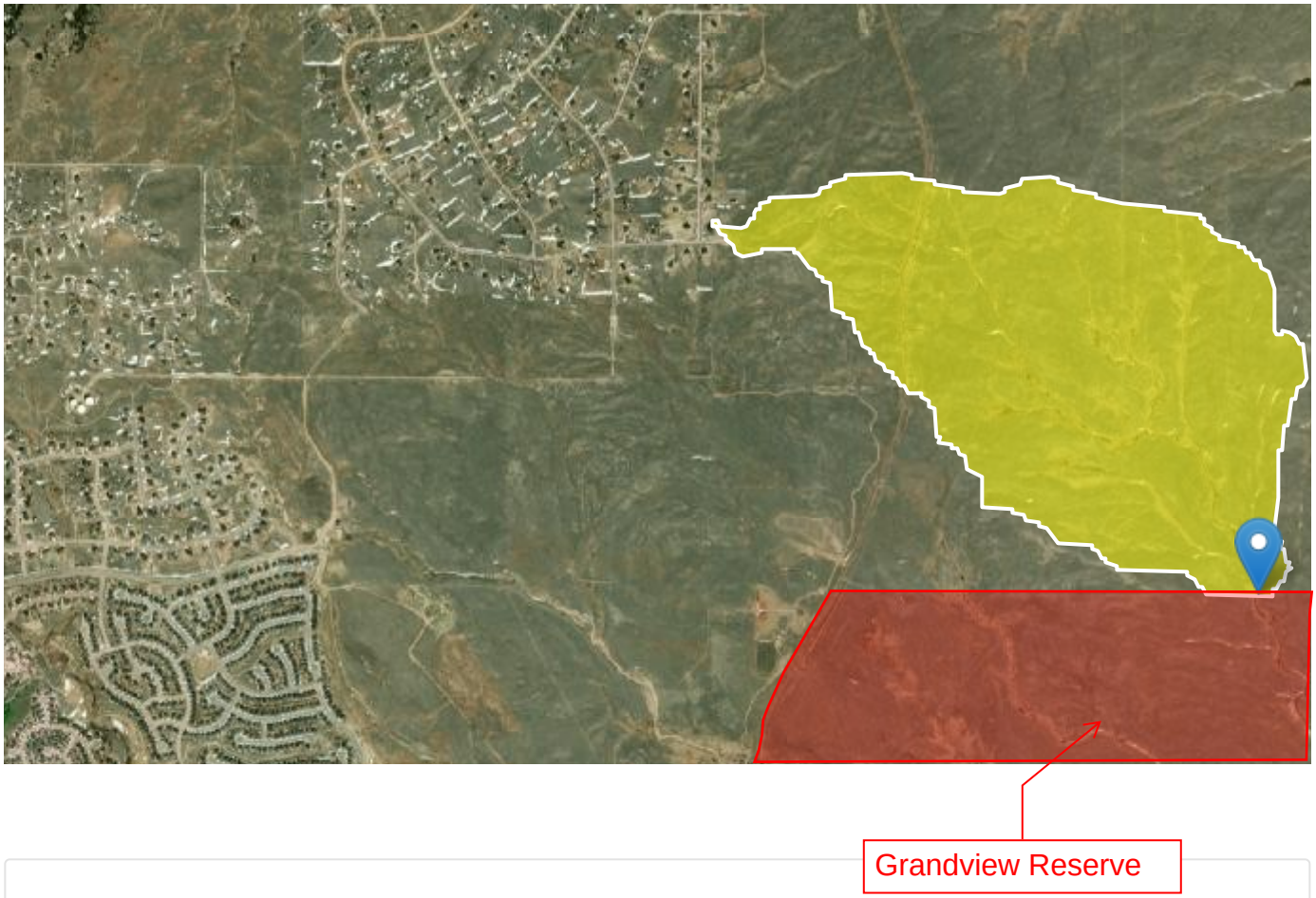
Aggregation Method: Dominant Condition

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

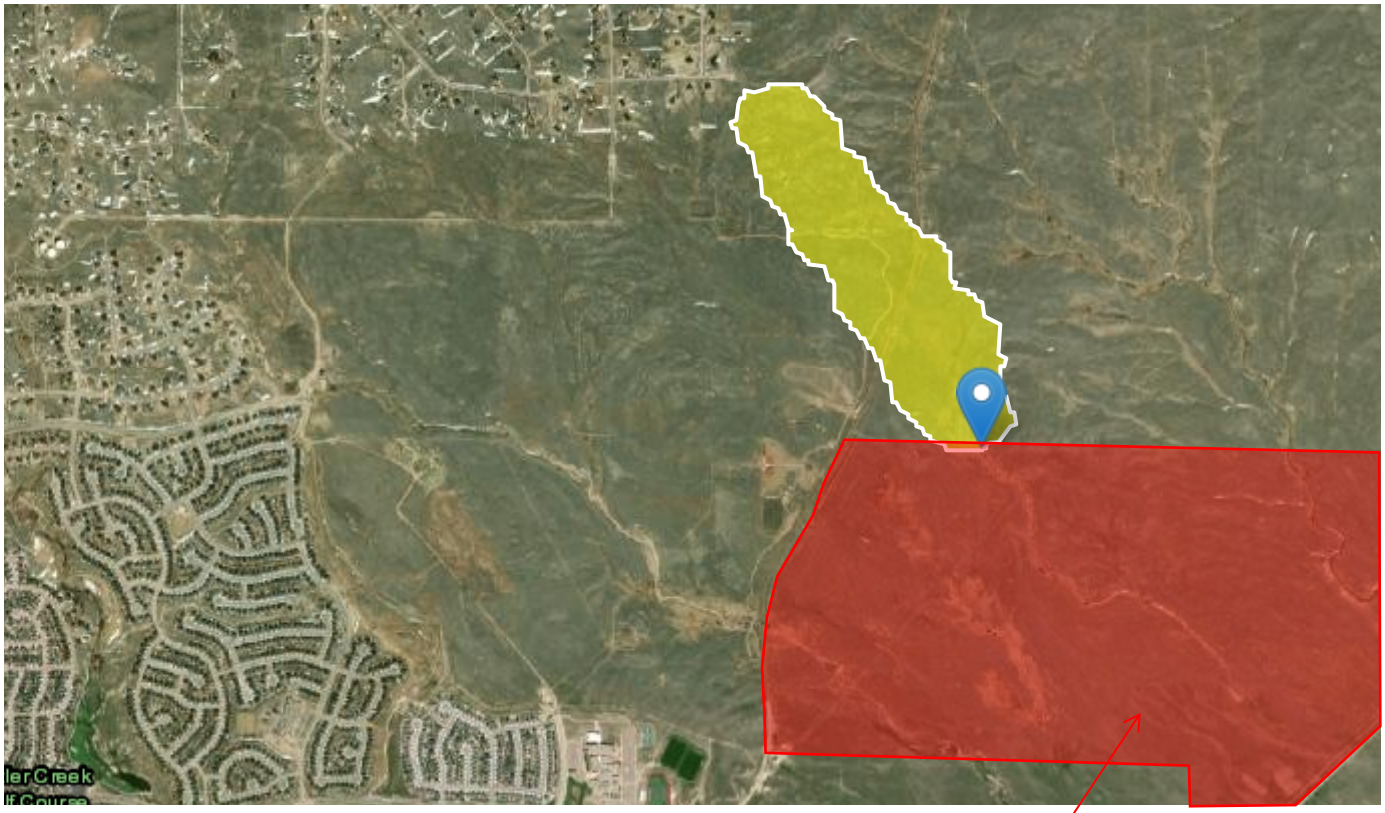
Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	4	percent
DRNAREA	Area that drains to a point on a stream	0.84	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.9	inches
I24H2Y	Maximum 24-hour precipitation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

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

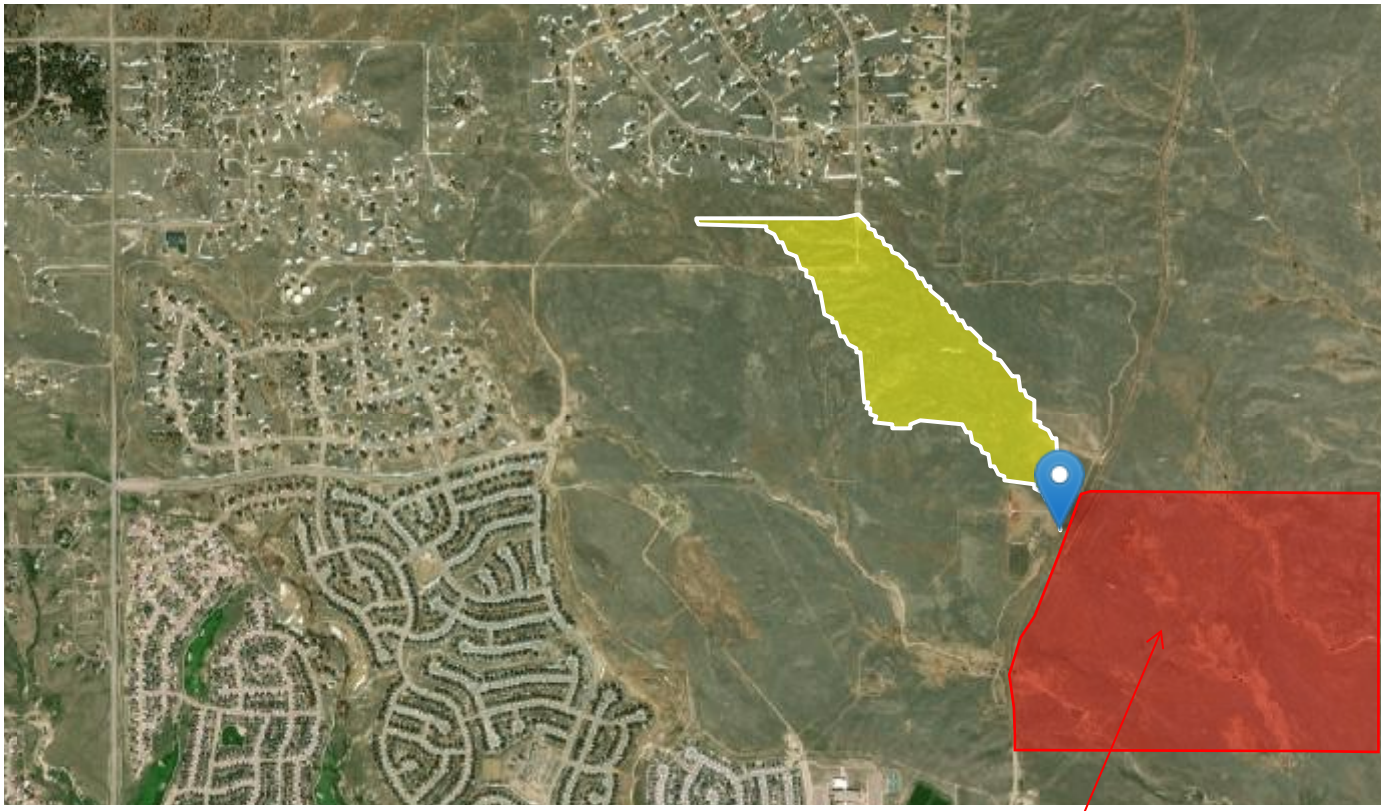
Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	3	percent
DRNAREA	Area that drains to a point on a stream	0.22	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.92	inches
I24H2Y	Maximum 24-hour precipitation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

Application Version: 4.4.0

MAIN STEM

Region ID: CO
Workspace ID: CO20200817221517278000
Clicked Point (Latitude, Longitude): 38.98969, -104.56703
Time: 2020-08-17 16:15:34 -0600



Basin Characteristics

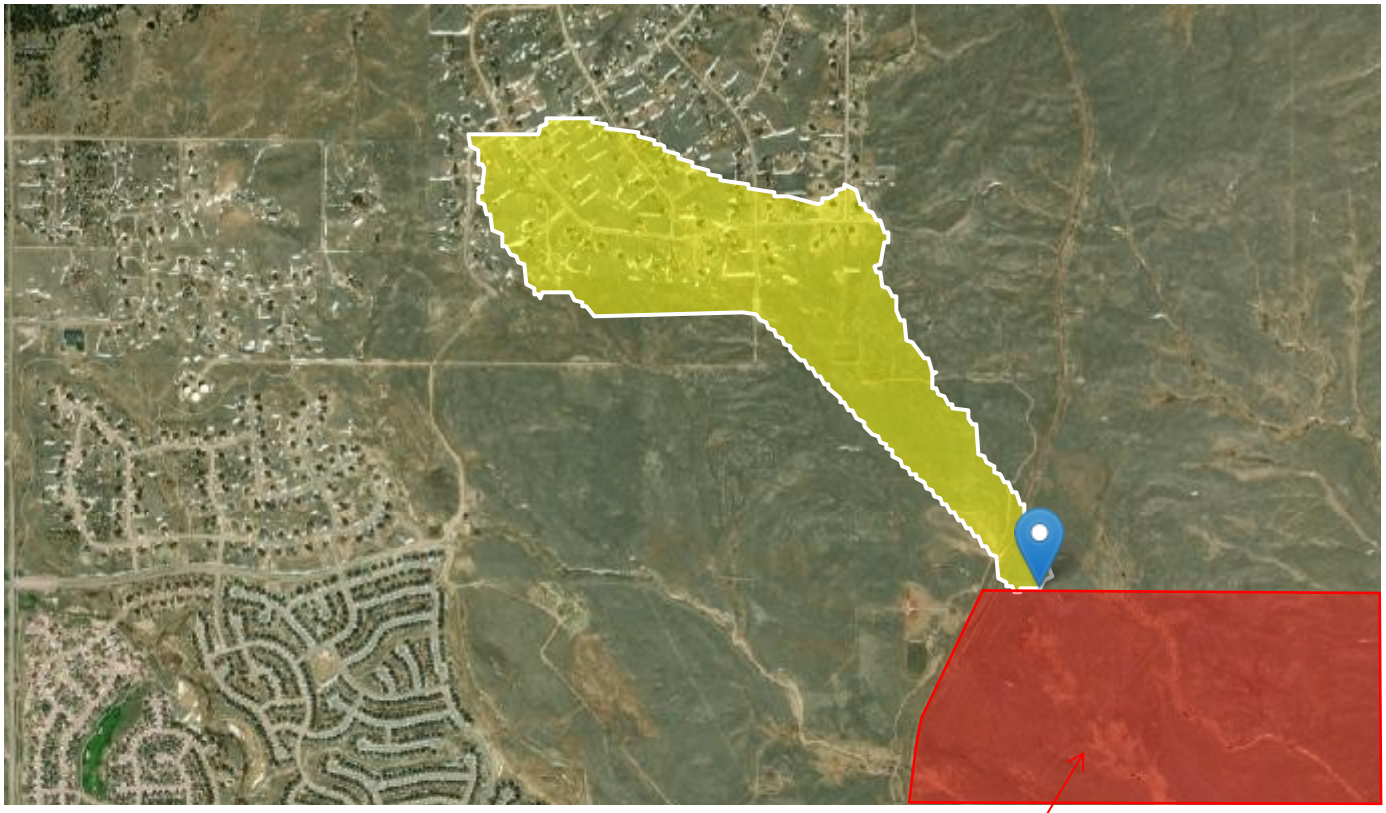
Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	3	percent
DRNAREA	Area that drains to a point on a stream	0.17	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4	inches
I24H2Y	Maximum 24-hour precipitation that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

Application Version: 4.4.0

MAIN STEM TRIBUTARY NUMBER 2

Region ID: CO
Workspace ID: CO20200817221139984000
Clicked Point (Latitude, Longitude): 38.99101, -104.56354
Time: 2020-08-17 16:11:57 -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	0.44	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

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
****

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

```
  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
****

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 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

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	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		

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	23.06	0	01:57	0	
2.4	-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	18.70	0	01:12	0	
0.69	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	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
****

	Average	Avg	Evap	Exfil	Maximum	Max	Time of Max	Maximum
	Volume	Pcnt	Pcnt	Pcnt	Volume	Pcnt		Occurrence	Outflow
Storage Unit	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days	hr:min	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 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

********** 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	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
****

	Average	Avg	Evap	Exfil	Maximum	Max	Time of Max	Maximum
	Volume	Pcnt	Pcnt	Pcnt	Volume	Pcnt		Outflow
Storage Unit	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days hr:min	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

****
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

Design Point Summary - 5 Year Predevelopment			
Node	**Max Inflow CFS**	**Hour of Max Inflow**	**Total Inflow Volume 10^6 gal**
10	13.03	0:35	0.304
20	4.33	0:35	0.085
21	1.66	0:40	0.0573
22	11.85	0:40	0.274
23	5.99	0:35	0.142
24	21.23	0:40	0.452
30	9.95	0:35	0.179
31	9.95	0:35	0.179
40	8.12	0:35	0.162
41	22.23	0:40	0.522
42	8.12	0:35	0.162
50	32.34	0:35	0.593
51	32.34	0:35	0.593
60	9.7	0:35	0.226
61	16.46	0:40	0.453
62	3.65	0:35	0.0858
63	12.98	0:40	0.345
64	13.35	0:35	0.311
65	26.04	0:36	0.657
66	16.46	0:40	0.453
67	51.47	0:40	1.35
70	5.57	0:35	0.135
71	3.87	0:35	0.101
72	3.87	0:35	0.101
73	3.87	0:35	0.101
74	9.42	0:36	0.236
80	1.85	0:35	0.0476
81	5.37	0:35	0.124
82	1.92	0:35	0.0398
83	8.07	0:35	0.185
84	7.22	0:35	0.172
85	1.92	0:35	0.0398
Outfall1	13.03	0:35	0.304
Outfall2	26.96	0:40	0.594
Outfall3	30	0:38	0.685
Outfall4	100.05	0:36	2.34

Link Summary - 5 Year Predevelopment		
Link	**Max Flow CFS**	**Hour of Max Flow**
100	13.03	0:35
101	13.03	0:35
200	4.33	0:35
201	1.66	0:40
202	5.95	0:36
204	11.85	0:40
205	21.2	0:40
206	26.96	0:40
300	9.95	0:35
301	9.95	0:35
400	8.12	0:35
401	8.03	0:37
402	22.23	0:40
403	30	0:38
41	9.95	0:35
42	32.34	0:35
43	51.47	0:40
44	9.42	0:36
500	32.34	0:35
501	32.34	0:35
601	16.46	0:40
602	16.42	0:41
603	9.7	0:35
604	3.65	0:35
605	13.32	0:36
606	12.98	0:40
607	26.04	0:36
608	42.32	0:41
700	5.57	0:35
701	3.87	0:35
702	3.87	0:35
703	3.86	0:36
704	9.42	0:36
801	1.85	0:35
802	5.37	0:35
803	7.18	0:36
804	1.92	0:35
805	1.91	0:37
806	8.07	0:35
807	17.11	0:36

Design Point Summary - 100 Year Predevelopment			
Node	**Max Inflow CFS**	**Hour of Max Inflow**	**Total Inflow Volume 10^6 gal**
10	66.8	0:45	1.92
20	48.76	0:40	1.18
21	20.74	0:50	0.794
22	140.35	0:45	3.79
23	68.56	0:45	1.97
24	249.2	0:45	6.26
30	110.7	0:40	2.47
31	110.7	0:40	2.47
40	40	0:40	1.03
41	114.87	0:45	3.31
42	40	0:40	1.03
50	157.99	0:40	3.76
51	157.99	0:40	3.76
60	49.45	0:45	1.43
61	86.73	0:50	2.87
62	18.42	0:45	0.544
63	67.82	0:45	2.19
64	67.87	0:45	1.97
65	135.62	0:45	4.16
66	86.73	0:50	2.87
67	269.52	0:46	8.52
70	28.46	0:45	0.853
71	20.06	0:45	0.641
72	20.06	0:45	0.641
73	20.06	0:45	0.641
74	48.48	0:45	1.49
80	21.89	0:45	0.659
81	27.12	0:45	0.786
82	9.51	0:40	0.252
83	40.86	0:45	1.17
84	49.01	0:45	1.44
85	9.51	0:40	0.252
Outfall1	66.8	0:45	1.92
Outfall2	317.41	0:45	8.22
Outfall3	154.35	0:45	4.34
Outfall4	523.77	0:45	15.1

Link Summary - 100 Year Predevelopment		
Link	**Max Flow CFS**	**Hour of Max Flow**
100	66.8	0:45
101	66.8	0:45
200	48.76	0:40
201	20.74	0:50
202	68.51	0:45
204	140.35	0:45
205	248.9	0:45
206	317.41	0:45
300	110.7	0:40
301	110.7	0:40
400	40	0:40
401	39.84	0:42
402	114.87	0:45
403	154.35	0:45
41	110.7	0:40
42	157.99	0:40
43	269.52	0:46
44	48.48	0:45
500	157.99	0:40
501	157.99	0:40
601	86.73	0:50
602	86.65	0:51
603	49.45	0:45
604	18.42	0:45
605	67.8	0:45
606	67.82	0:45
607	135.63	0:46
608	221.11	0:46
700	28.46	0:45
701	20.06	0:45
702	20.06	0:45
703	20.04	0:46
704	48.48	0:45
801	21.89	0:45
802	27.12	0:45
803	48.96	0:46
804	9.51	0:40
805	9.46	0:42
806	40.86	0:45
807	99.16	0:45

Design Point Summary - 5 Year Post Development			
Node	**Max Inflow CFS**	**Hour of Max Inflow**	**Total Inflow Volume 10^6 gal**
10	30.72	0:35	0.705
20	29.46	0:30	0.578
21	12.02	0:35	0.376
22	92.76	0:30	2.04
23	40.92	0:30	0.954
24	93.26	0:30	2.96
30	77.99	0:30	1.38
31	1.52	2:23	0.925
40	24.15	0:30	0.438
41	98.47	0:30	1.83
42	24.15	0:30	0.438
50	46.88	0:35	0.982
51	18.7	1:12	0.69
60	16.28	0:35	0.424
61	60.11	0:35	1.38
62	11.36	0:30	0.234
63	42.32	0:30	0.975
64	26.88	0:35	0.659
65	69.12	0:35	1.63
66	60.11	0:35	1.38
67	23.06	1:57	2.4
70	13.78	0:30	0.32
71	6.55	0:35	0.191
72	6.55	0:35	0.191
73	6.55	0:35	0.191
74	9.05	1:15	0.51
80	5.68	0:35	0.173
81	16.24	0:30	0.333
82	5.21	0:30	0.1
83	20.93	0:30	0.453
84	21.67	0:30	0.507
85	5.21	0:30	0.1
Outfall1	5.43	1:46	0.441
Outfall2	34.45	1:30	2.22
Outfall3	2.52	2:25	1.43
Outfall4	35.27	1:51	3.71

Link Summary - 5 Year Post Development		
Link	**Max Flow CFS**	**Hour of Max Flow**
100	30.72	0:35
101	5.43	1:46
200	29.46	0:30
201	12.02	0:35
202	40.84	0:31
203	1.52	2:24
204	92.76	0:30
205	93.43	0:31
206	34.45	1:30
300	77.99	0:30
301	1.52	2:23
400	24.15	0:30
401	23.53	0:32
402	98.47	0:30
403	2.52	2:25
500	46.88	0:35
501	18.7	1:12
600	18.26	1:17
601	60.11	0:35
602	60.09	0:35
603	16.28	0:35
604	11.36	0:30
605	26.88	0:35
606	42.32	0:30
607	69.12	0:31
608	16.38	2:02
700	13.78	0:30
701	6.55	0:35
702	6.55	0:35
703	6.54	0:36
704	9.05	1:15
800	8.95	1:25
801	5.68	0:35
802	16.24	0:30
803	21.49	0:32
804	5.21	0:30
805	5.08	0:32
806	20.93	0:30
807	4.21	2:09
808	23.06	1:57

Design Point Summary - 100 Year Post Development			
Node	**Max Inflow CFS**	**Hour of Max Inflow**	**Total Inflow Volume 10^6 gal**
10	100.64	0:40	2.37
20	97.08	0:35	1.81
21	42.26	0:40	1.2
22	295.27	0:40	6.04
23	136.17	0:35	3.01
24	334.84	0:51	9.43
30	238.03	0:35	4
31	115.75	0:59	3.39
40	70.07	0:35	1.32
41	252.18	0:35	4.73
42	70.07	0:35	1.32
50	178.04	0:40	4.2
51	164.75	0:49	3.95
60	58.95	0:40	1.65
61	170.9	0:40	3.87
62	32.93	0:35	0.699
63	124.89	0:40	2.87
64	90.88	0:40	2.35
65	215.63	0:40	5.22
66	170.9	0:40	3.87
67	270.41	1:13	9.72
70	43.95	0:40	1.05
71	23.95	0:45	0.742
72	23.95	0:45	0.742
73	23.95	0:45	0.742
74	42.13	1:12	1.79
80	27.62	0:45	0.833
81	47.62	0:35	1.01
82	15.6	0:35	0.314
83	64.71	0:35	1.46
84	73.73	0:40	1.84
85	15.6	0:35	0.314
Outfall1	53.95	1:13	2.03
Outfall2	256.11	1:16	10.3
Outfall3	160.7	1:04	5.21
Outfall4	478.86	1:05	16.7

Link Summary - 100 Year Post Development		
Link	**Max Flow CFS**	**Hour of Max Flow**
100	100.64	0:40
101	53.95	1:13
200	97.08	0:35
201	42.26	0:40
202	136.36	0:36
203	115.74	0:59
204	295.27	0:40
205	334.86	0:51
206	256.11	1:16
300	238.03	0:35
301	115.75	0:59
400	70.07	0:35
401	69.37	0:36
402	252.18	0:35
403	160.7	1:04
500	178.04	0:40
501	164.75	0:49
600	164.38	0:51
601	170.9	0:40
602	170.58	0:41
603	58.95	0:40
604	32.93	0:35
605	90.74	0:41
606	124.89	0:40
607	215.42	0:40
608	229.2	1:09
700	43.95	0:40
701	23.95	0:45
702	23.95	0:45
703	23.94	0:45
704	42.13	1:12
800	41.98	1:17
801	27.62	0:45
802	47.62	0:35
803	73.66	0:40
804	15.6	0:35
805	15.43	0:37
806	64.71	0:35
807	80.17	1:12
808	270.4	1:13

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	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	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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5:35							

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 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	Input Parameters COS DCM	
A) Overflow Weir Front Edge Height (relative to Stage = 0 ft) $H_{weir\ front}$ =	4.50	4.50	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox) $L_{weir\ front}$ =	8.00	9.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate) $S_{weir\ sides}$ =	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox) Horizontal $L_{weir\ sides}$ =	8.00	5.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area) Grate Open Area =	70%	70%	%
F) Debris Clogging % Debris Clogging =	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox) $H_{grate\ top}$ =	4.50	4.50	ft
H) Overflow Grate Slope Length (inside edge of dropbox) Slope $L_{weir\ sides}$ =	8.00	5.00	ft
I) Overflow Grate Open Area (without debris) Open Area $_{(No\ Clogging)}$ =	44.80	31.50	sq ft
J) Overflow Grate Open Area (with debris) Open Area $_{(Clogged)}$ =	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	Input Parameters COS DCM	
B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft) Pipe Invert Depth =	1.50	1.50	ft
C) Outlet Pipe Diameter Pipe Diameter =	36.00	30.00	inches
D) Restrictor Plate Height above Pipe Invert Plate Height =	22.42	28.11	inches
E) Half-Central Angle of Restrictor Plate on Pipe Theta =	1.82	2.63	radians
F) Outlet Orifice Area Outlet Ao =	4.63	4.78	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert $Outlet_{centroid}$ =	1.06	1.22	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4) Open Area Ratio =	9.68	6.59	

8. Emergency Spillway (Rectangular or Trapezoidal)

	Input Parameters User Input	Input Parameters COS DCM	
A) Spillway Invert Stage (relative to Stage = 0 ft) $H_{spillway\ invert}$ =	5.90	6.00	ft
B) Spillway Crest Length $L_{spillway\ crest}$ =	42.00	33.00	ft
C) Spillway End Slopes (H:V) $S_{spillway\ ends}$ =	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface Freeboard Depth=	1.00	1.00	ft
E) Spillway Design Flow Depth Flow $Depth_{spillway}$ =	0.80	1.00	ft
F) Stage at Top of Freeboard Freeboard Top Stage =	7.70	8.00	ft
G) Basin Area at Top of Freeboard Max Basin Area =	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

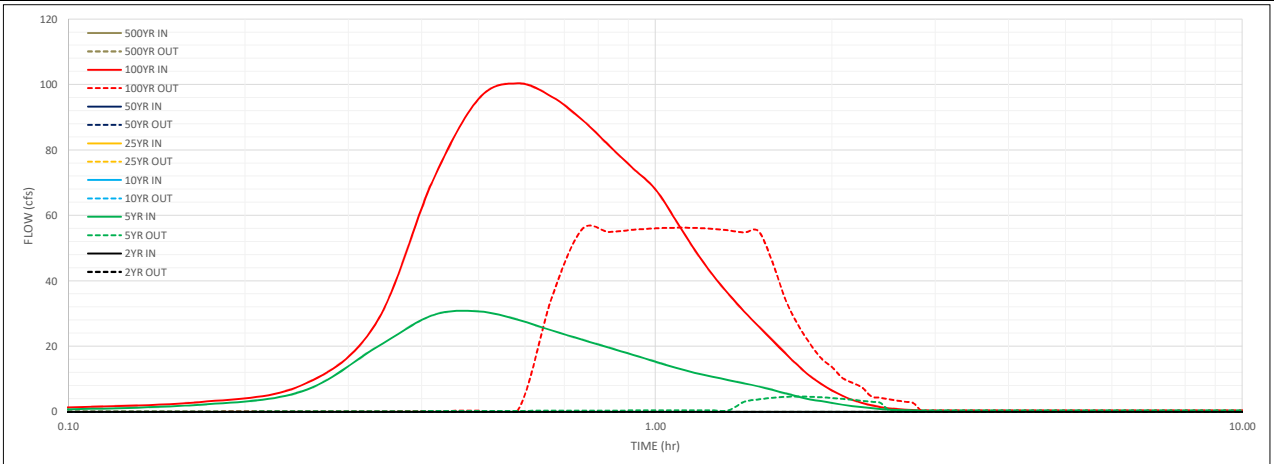
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.64	1.66		2.16				7.27	
Predevelopment Peak Q (cfs) =	N/A	N/A		13.0				57.1	
Peak Inflow (cfs) =	N/A	N/A		30.7				100.4	
Peak Outflow (cfs) =	0.3	0.5		4.3				57.5	
Ratio (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	

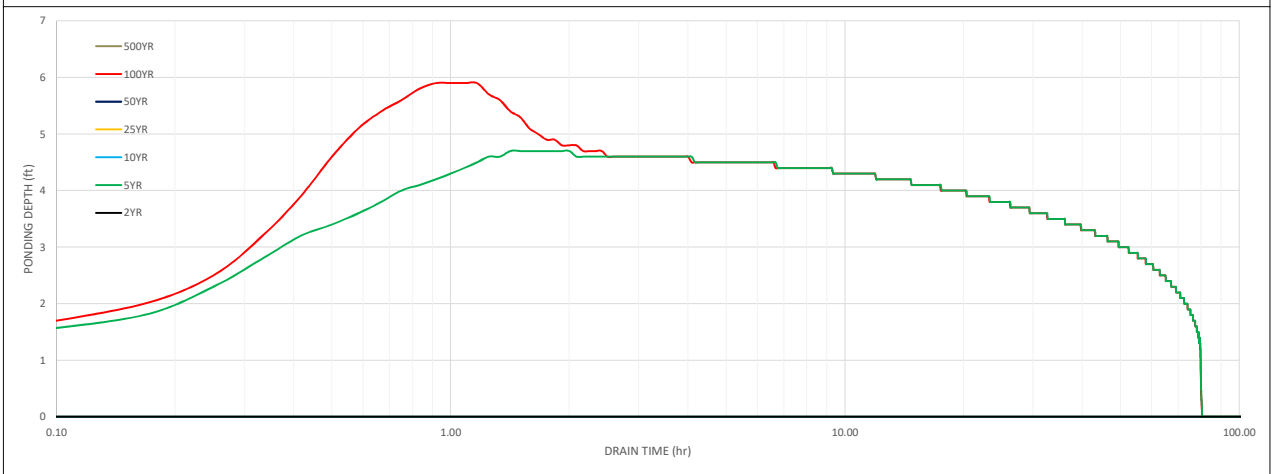
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

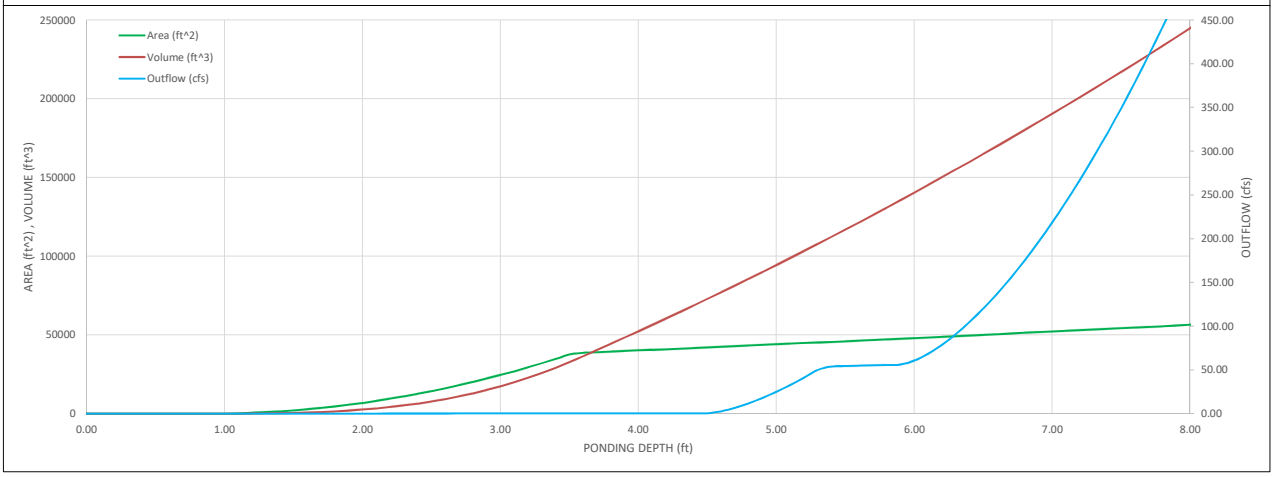
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

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

	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 =	14	14	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	1.49	1.49	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	4.70	4.70	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	1.49	1.49	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} =	644.7	644.7	ft
B) Width of Basin at Top of EURV, W_{PCM} =	191.2	191.2	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} =	645.5	645.5	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	192.0	192.0	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
	17.56				164.21	

B) Adjust "Time Interval" to match hydrograph data

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

Time Interval: 5.0 minutes

Post-Development Storm Inflow Hydrographs (cfs)

Time (min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
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	
4:05		1.46				1.64	
4:10		1.46				1.64	
4:15		1.46				1.64	
4:20		1.46				1.64	
4:25		1.45				1.64	
4:30		1.45				1.63	
4:35		1.45				1.63	
4:40		1.45				1.63	
4:45		1.45				1.63	
4:50		1.44				1.63	
4:55		1.44				1.63	
5:00		1.44				1.62	
5:05		1.44				1.62	
5:10		1.44				1.62	
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)

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

Input Parameters	User Input	COS DCM	
$H_{weir\ front}$ =	6.00	6.00	ft
$L_{weir\ front}$ =	17.00	17.00	ft
$S_{weir\ sides}$ =	0.00	0.00	ft / ft
Horizontal $L_{weir\ sides}$ =	17.00	7.00	ft
Grate Open Area =	70%	70%	%
Debris Clogging =	50%	50%	%
$H_{grate\ top}$ =	6.00	6.00	ft
Slope $L_{weir\ sides}$ =	17.00	7.00	ft
Open Area $_{(No\ Clogging)}$ =	202.30	83.30	sq ft
Open Area $_{(Clogged)}$ =	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

B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)
C) Outlet Pipe Diameter
D) Restrictor Plate Height above Pipe Invert
E) Half-Central Angle of Restrictor Plate on Pipe
F) Outlet Orifice Area
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)

Input Parameters	User Input	COS DCM	
Pipe Invert Depth =	1.50	1.50	ft
Pipe Diameter =	54.00	48.00	inches
Plate Height =	37.00	42.00	inches
Theta =	1.95	2.42	radians
Outlet Ao =	11.61	11.66	sq ft
$Outlet_{centroid}$ =	1.73	1.87	ft
Open Area Ratio =	17.42	7.14	

8. Emergency Spillway (Rectangular or Trapezoidal)

A) Spillway Invert Stage (relative to Stage = 0 ft)
B) Spillway Crest Length
C) Spillway End Slopes (H:V)
D) Freeboard above Maximum Water Surface
E) Spillway Design Flow Depth
F) Stage at Top of Freeboard
G) Basin Area at Top of Freeboard

Input Parameters	User Input	COS DCM	
$H_{spillway\ invert}$ =	9.50	9.30	ft
$L_{spillway\ crest}$ =	136.00	122.00	ft
$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
Freeboard Depth=	1.00	1.00	ft
Flow $Depth_{spillway}$ =	0.90	1.00	ft
Freeboard Top Stage =	11.40	11.30	ft
Max Basin Area =	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

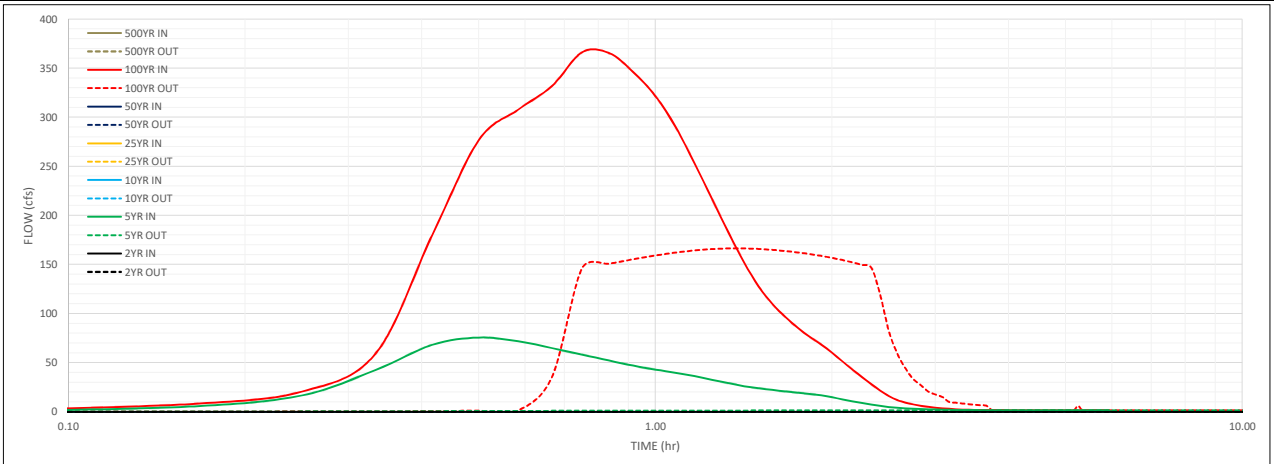
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.41	5.73		6.67				31.72	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.6				164.2	
Peak Inflow (cfs) =	N/A	N/A		75.7				366.2	
Peak Outflow (cfs) =	1.1	1.4		1.4				166.5	
Ratio (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	

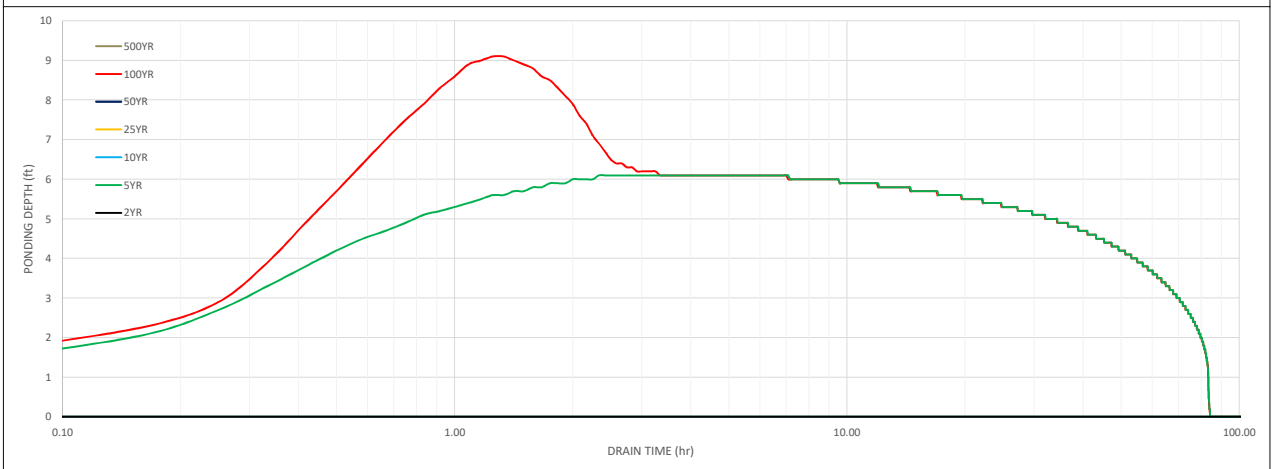
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

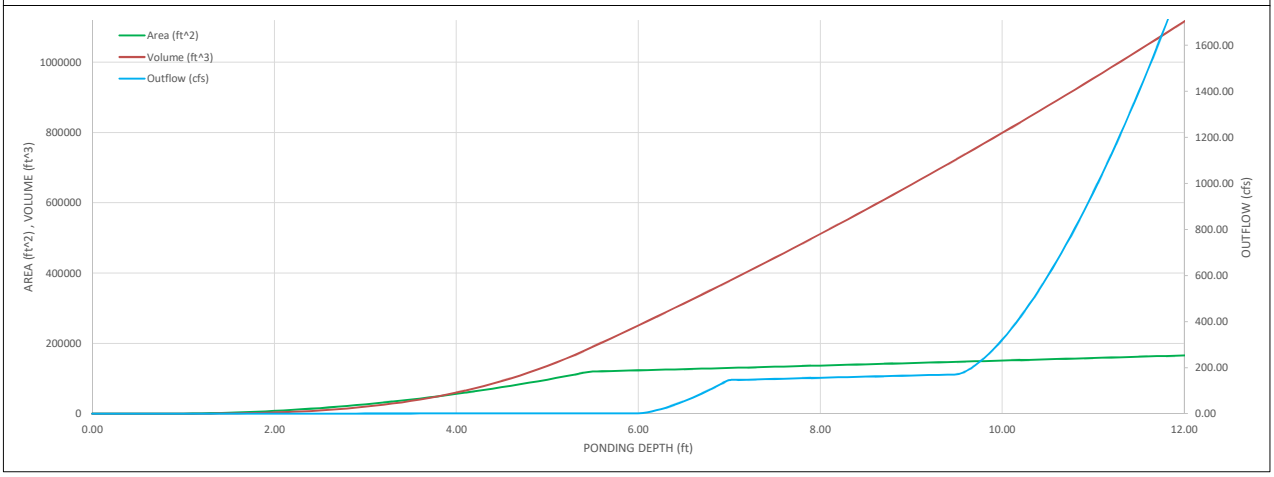
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

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

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 =	12	12	
Orifice Spacing =	4.0	4.0	inches
WQCV Ao =	1.05	1.05	sq in
Max Stage $_{WQCV}$ =	4.00	4.00	ft
EURV Ao =	17.07	17.07	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} =	453.3	453.3	ft
W_{PCM} =	177.8	177.8	ft
Stage at Top of Bench =	6.10	6.10	ft
L_{Bench} =	454.1	454.1	ft
W_{Bench} =	178.6	178.6	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)

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

Time Interval: 5.0 minutes

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							
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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 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)

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

Input Parameters	User Input	COS DCM	
$H_{weir\ front}$ =	6.00	6.00	ft
$L_{weir\ front}$ =	12.00	11.00	ft
$S_{weir\ sides}$ =	0.00	0.00	ft / ft
Horizontal $L_{weir\ sides}$ =	12.00	11.00	ft
Grate Open Area =	70%	70%	%
Debris Clogging =	50%	50%	%
$H_{grate\ top}$ =	6.00	6.00	ft
Slope $L_{weir\ sides}$ =	12.00	11.00	ft
Open Area $_{(No\ Clogging)}$ =	100.80	84.70	sq ft
Open Area $_{(Clogged)}$ =	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

B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)
C) Outlet Pipe Diameter
D) Restrictor Plate Height above Pipe Invert
E) Half-Central Angle of Restrictor Plate on Pipe
F) Outlet Orifice Area
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)

Input Parameters	User Input	COS DCM	
Pipe Invert Depth =	1.50	1.50	ft
Pipe Diameter =	48.00	42.00	inches
Plate Height =	33.13	39.36	inches
Theta =	1.96	2.63	radians
Outlet Ao =	9.25	9.37	sq ft
$Outlet_{centroid}$ =	1.54	1.71	ft
Open Area Ratio =	10.90	9.04	

8. Emergency Spillway (Rectangular or Trapezoidal)

A) Spillway Invert Stage (relative to Stage = 0 ft)
B) Spillway Crest Length
C) Spillway End Slopes (H:V)
D) Freeboard above Maximum Water Surface
E) Spillway Design Flow Depth
F) Stage at Top of Freeboard
G) Basin Area at Top of Freeboard

Input Parameters	User Input	COS DCM	
$H_{spillway\ invert}$ =	8.00	999.00	ft
$L_{spillway\ crest}$ =	79.00	42.00	ft
$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
Freeboard Depth=	1.00	1.00	ft
Flow $Depth_{spillway}$ =	1.00		ft
Freeboard Top Stage =	10.00		ft
Max Basin Area =	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

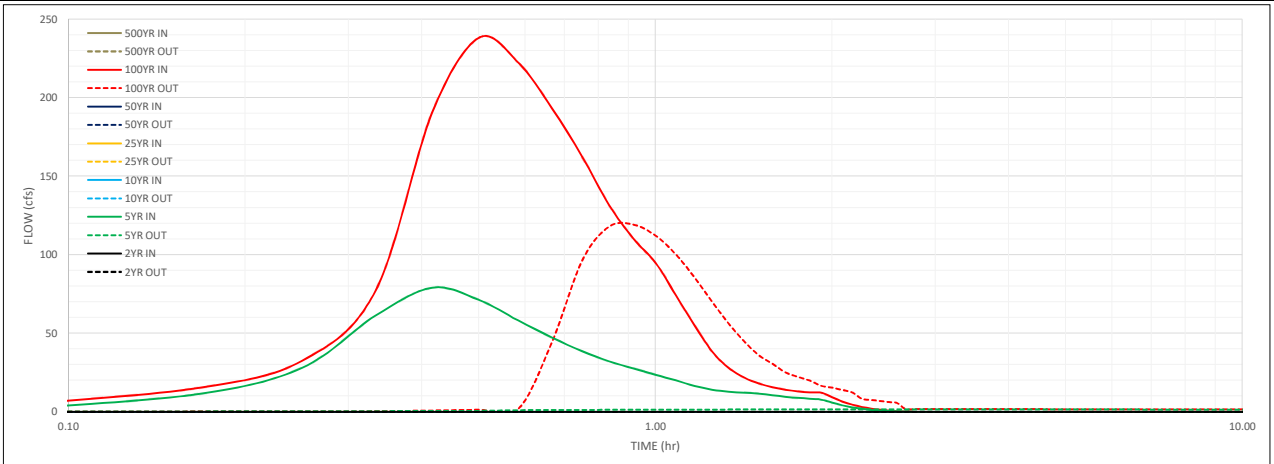
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.36	4.79		4.34				12.42	
Predevelopment Peak Q (cfs) =	N/A	N/A		10.0				120.2	
Peak Inflow (cfs) =	N/A	N/A		79.0				238.0	
Peak Outflow (cfs) =	0.6	1.7		1.5				116.8	
Ratio (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	

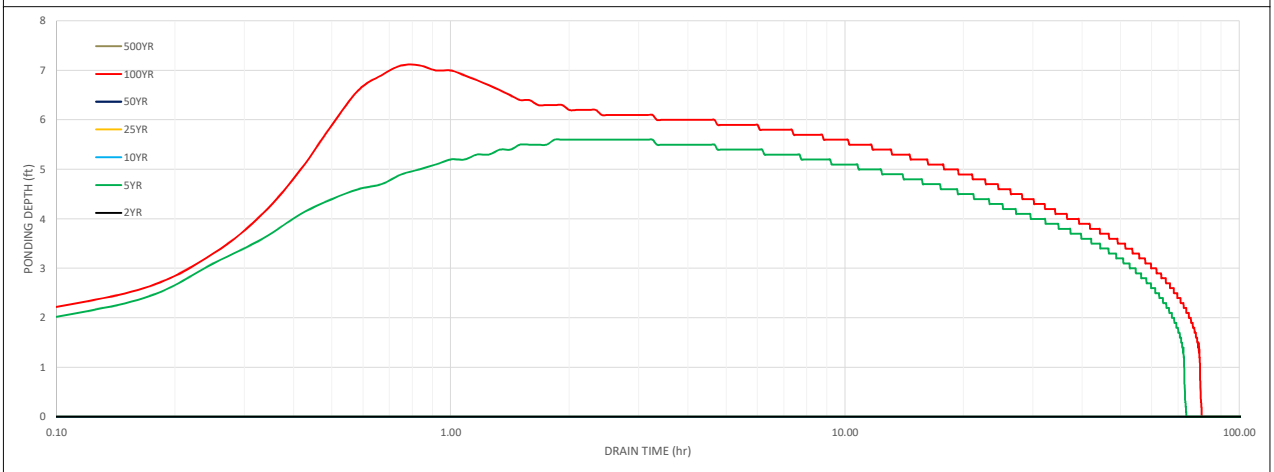
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

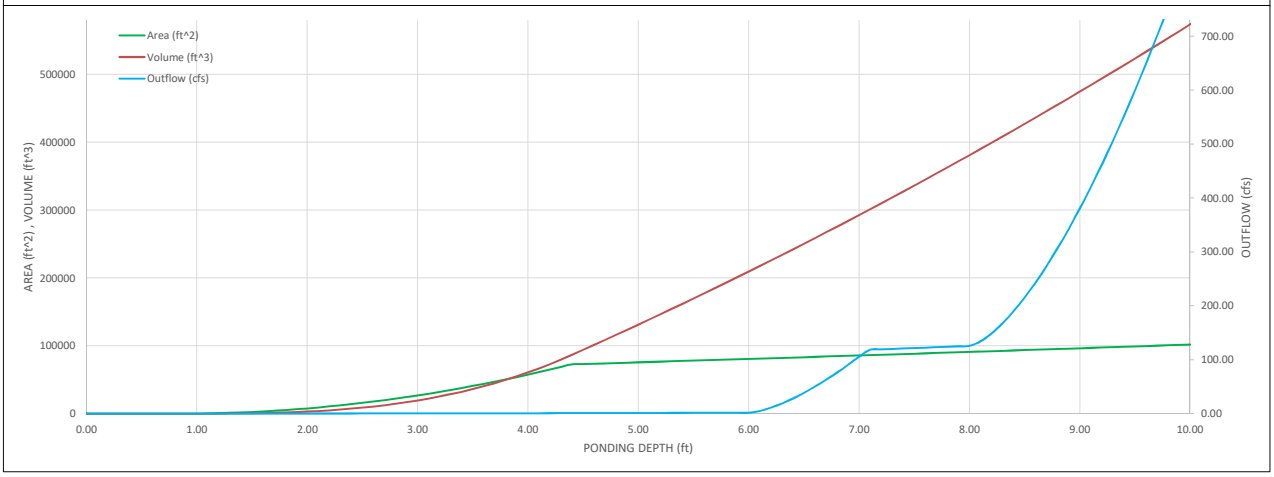
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

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

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 =	13	13	
Orifice Spacing =	4.0	4.0	inches
WQCV Ao =	1.34	1.34	sq in
Max Stage $_{WQCV}$ =	4.50	4.50	ft
EURV Ao =	20.83	20.83	sq in
Max Stage $_{EURV}$ =	6.50	6.50	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} =	588.5	588.5	ft
W_{PCM} =	180.1	180.1	ft
Stage at Top of Bench =	6.60	6.60	ft
L_{Bench} =	589.3	589.3	ft
W_{Bench} =	180.9	180.9	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

B) Adjust "Time Interval" to match hydrograph data

Time Interval: 5.0 minutes

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

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

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	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	
3:10		0.01				0.01	
3:15		0.00				0.00	
3:20						0.00	
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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 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)

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

Input Parameters	User Input	COS DCM	
$H_{weir\ front}$ =	6.50	6.50	ft
$L_{weir\ front}$ =	11.00	9.00	ft
$S_{weir\ sides}$ =	0.00	0.00	ft / ft
Horizontal $L_{weir\ sides}$ =	11.00	9.00	ft
Grate Open Area =	70%	70%	%
Debris Clogging =	50%	50%	%
$H_{grate\ top}$ =	6.50	6.50	ft
Slope $L_{weir\ sides}$ =	11.00	9.00	ft
Open Area $_{(No\ Clogging)}$ =	84.70	56.70	sq ft
Open Area $_{(Clogged)}$ =	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

B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)
C) Outlet Pipe Diameter
D) Restrictor Plate Height above Pipe Invert
E) Half-Central Angle of Restrictor Plate on Pipe
F) Outlet Orifice Area
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)

Input Parameters	User Input	COS DCM	
Pipe Invert Depth =	1.50	1.50	ft
Pipe Diameter =	48.00	48.00	inches
Plate Height =	44.00	44.00	inches
Theta =	2.56	2.56	radians
Outlet Ao =	12.07	12.07	sq ft
$Outlet_{centroid}$ =	1.93	1.93	ft
Open Area Ratio =	7.02	4.70	

8. Emergency Spillway (Rectangular or Trapezoidal)

A) Spillway Invert Stage (relative to Stage = 0 ft)
B) Spillway Crest Length
C) Spillway End Slopes (H:V)
D) Freeboard above Maximum Water Surface
E) Spillway Design Flow Depth
F) Stage at Top of Freeboard
G) Basin Area at Top of Freeboard

Input Parameters	User Input	COS DCM	
$H_{spillway\ invert}$ =	8.00	999.00	ft
$L_{spillway\ crest}$ =	105.00	42.00	ft
$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
Freeboard Depth=	1.00	1.00	ft
Flow $Depth_{spillway}$ =	1.00		ft
Freeboard Top Stage =	10.00		ft
Max Basin Area =	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

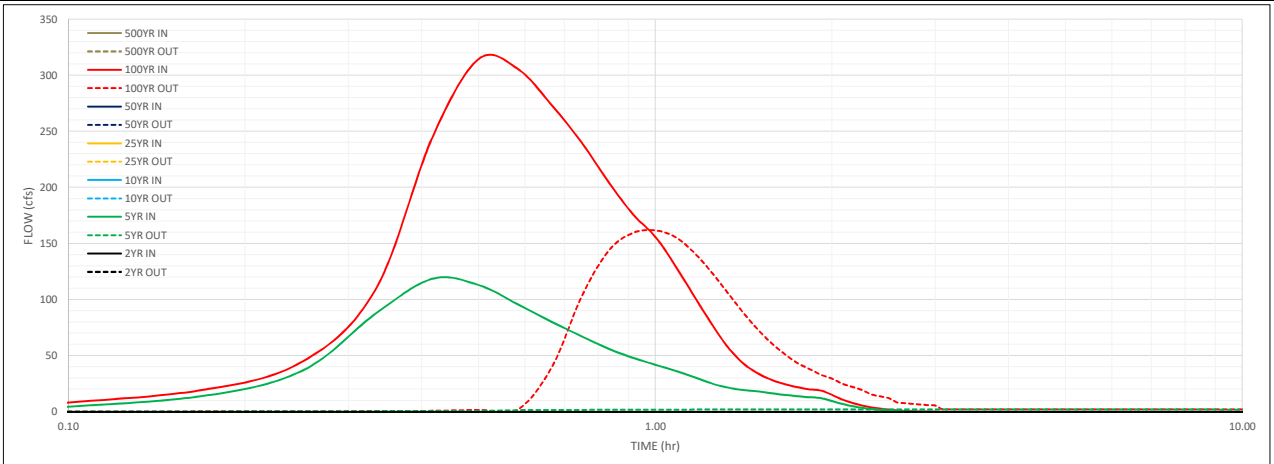
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.96	6.56		6.97				18.57	
Predevelopment Peak Q (cfs) =	N/A	N/A		30.0				154.4	
Peak Inflow (cfs) =	N/A	N/A		118.5				314.4	
Peak Outflow (cfs) =	0.9	2.2		2.2				153.1	
Ratio (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	

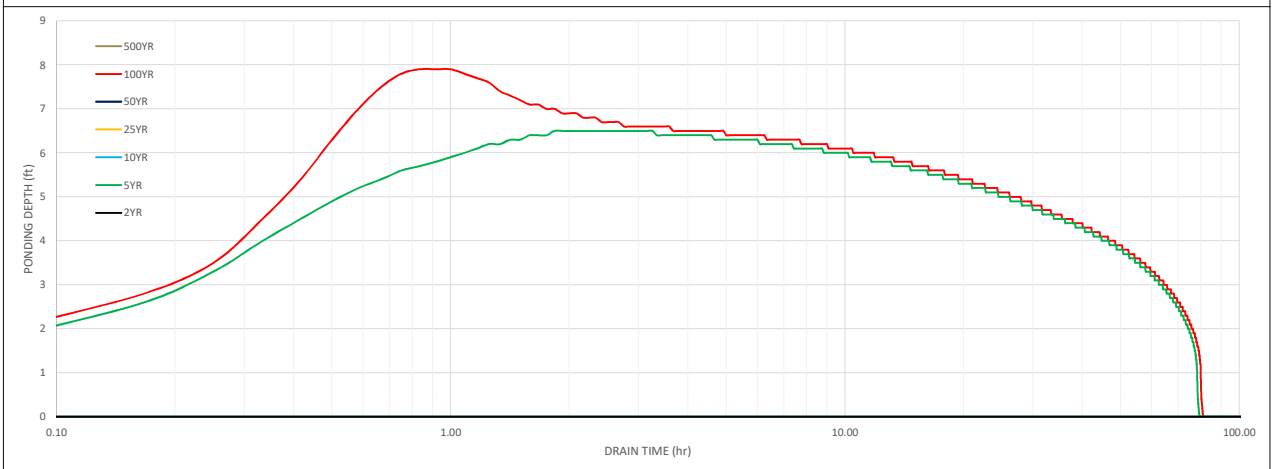
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

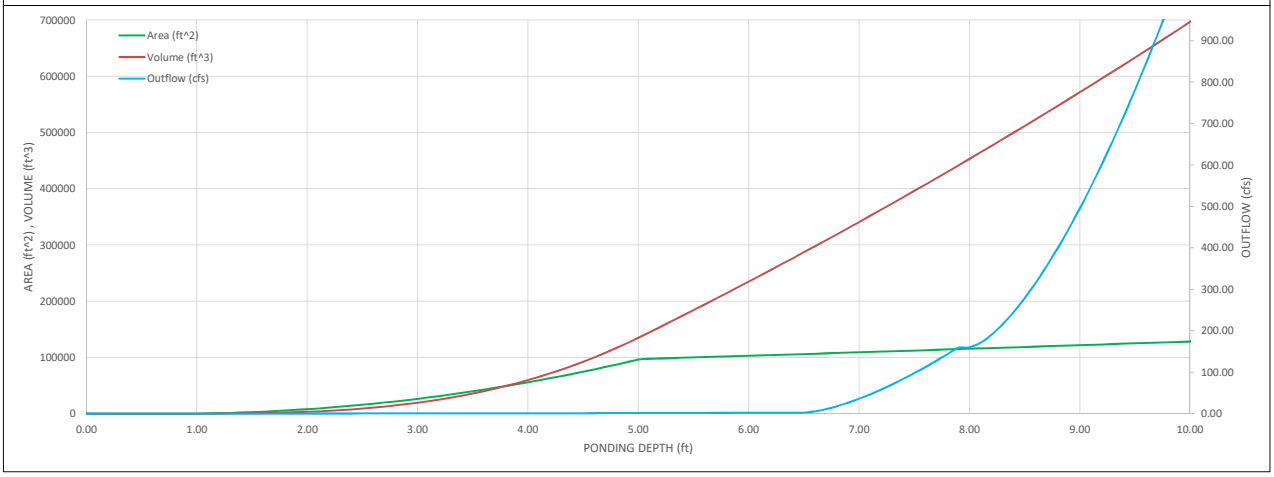
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

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	327.8	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

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

Time Interval: 5.0 minutes

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					
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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 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	Input Parameters 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	Input Parameters 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	Input Parameters 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

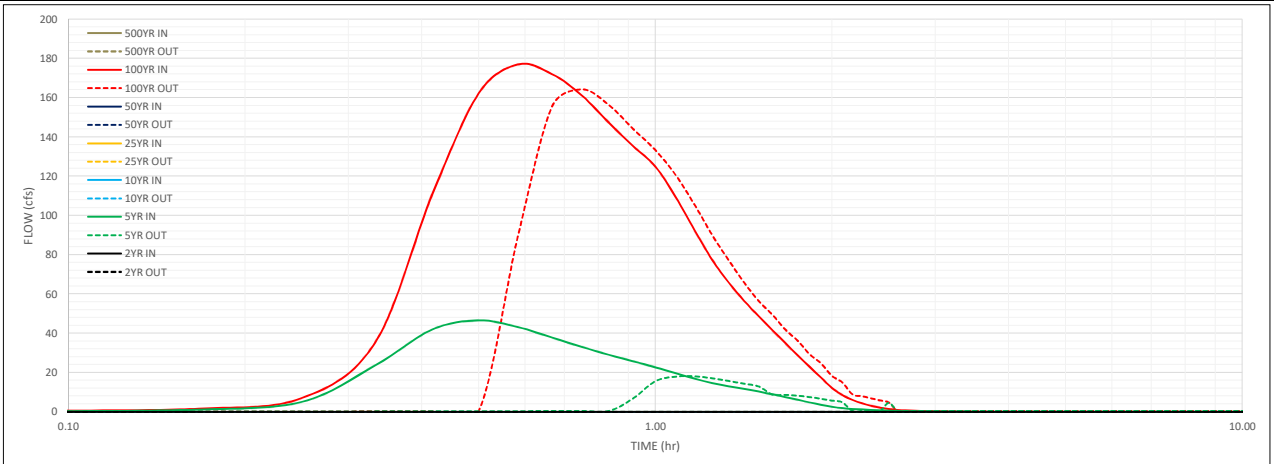
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.81	1.70		3.01				12.89	
Predevelopment Peak Q (cfs) =	N/A	N/A		32.3				158.0	
Peak Inflow (cfs) =	N/A	N/A		46.6				176.9	
Peak Outflow (cfs) =	0.3	0.4		16.3				153.2	
Ratio (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	

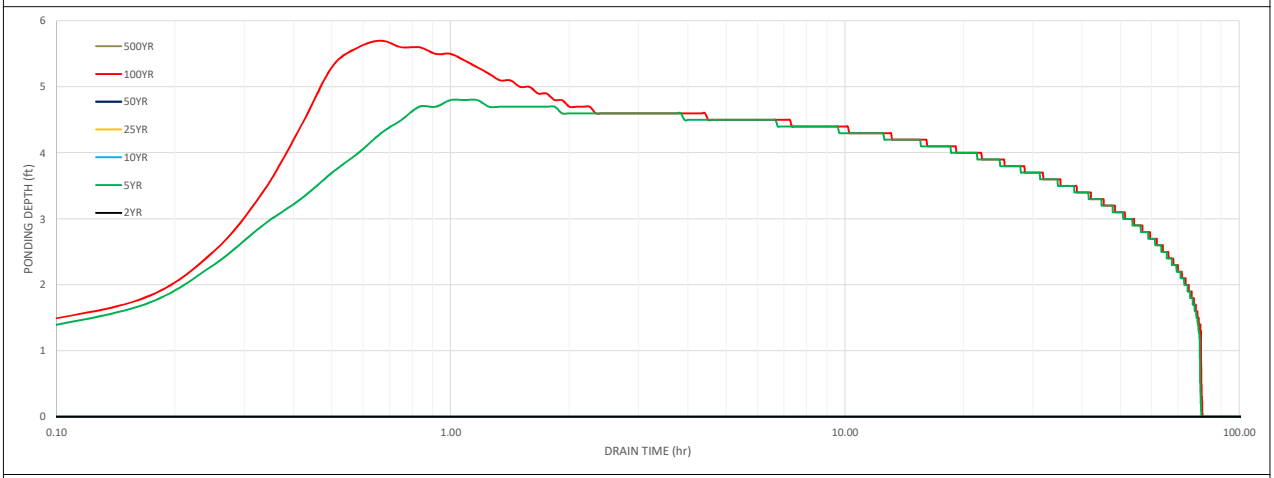
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

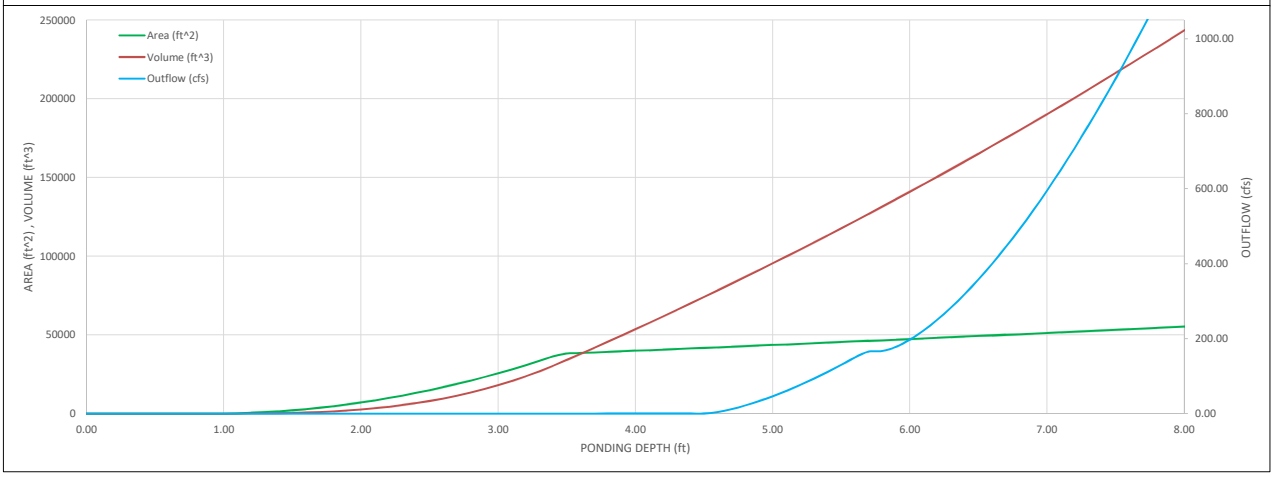
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

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

	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 =	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.

	Input Parameters: 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

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

Time Interval: 5.0 minutes

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		0.52				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	
3:40		0.06				0.13	
3:45		0.05				0.10	
3:50		0.03				0.07	
3:55		0.02				0.05	
4:00		0.02				0.04	
4:05		0.01				0.03	
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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 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)

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

Input Parameters	User Input	COS DCM	
$H_{weir\ front}$ =	6.00	6.00	ft
$L_{weir\ front}$ =	13.00	10.00	ft
$S_{weir\ sides}$ =	0.00	0.00	ft / ft
Horizontal $L_{weir\ sides}$ =	13.00	10.00	ft
Grate Open Area =	70%	70%	%
Debris Clogging =	50%	50%	%
$H_{grate\ top}$ =	6.00	6.00	ft
Slope $L_{weir\ sides}$ =	13.00	10.00	ft
Open Area $_{(No\ Clogging)}$ =	118.30	70.00	sq ft
Open Area $_{(Clogged)}$ =	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

B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)
C) Outlet Pipe Diameter
D) Restrictor Plate Height above Pipe Invert
E) Half-Central Angle of Restrictor Plate on Pipe
F) Outlet Orifice Area
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)

Input Parameters	User Input	COS DCM	
Pipe Invert Depth =	1.50	1.50	ft
Pipe Diameter =	66.00	60.00	inches
Plate Height =	46.05	54.00	inches
Theta =	1.98	2.50	radians
Outlet Ao =	17.70	18.61	sq ft
$Outlet_{centroid}$ =	2.14	2.38	ft
Open Area Ratio =	6.68	3.76	

8. Emergency Spillway (Rectangular or Trapezoidal)

A) Spillway Invert Stage (relative to Stage = 0 ft)
B) Spillway Crest Length
C) Spillway End Slopes (H:V)
D) Freeboard above Maximum Water Surface
E) Spillway Design Flow Depth
F) Stage at Top of Freeboard
G) Basin Area at Top of Freeboard

Input Parameters	User Input	COS DCM	
$H_{spillway\ invert}$ =	7.60	999.00	ft
$L_{spillway\ crest}$ =	126.00	42.00	ft
$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
Freeboard Depth=	1.00	1.00	ft
Flow $Depth_{spillway}$ =	0.90		ft
Freeboard Top Stage =	9.50		ft
Max Basin Area =	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

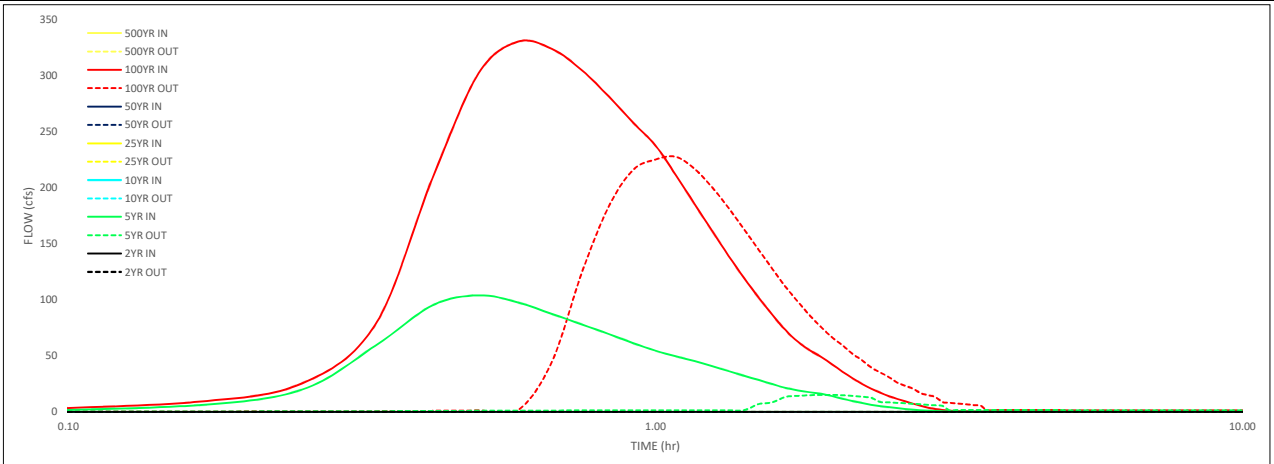
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	2.21	5.94		7.80				26.37	
Predevelopment Peak Q (cfs) =	N/A	N/A		42.3				221.1	
Peak Inflow (cfs) =	N/A	N/A		103.8				330.0	
Peak Outflow (cfs) =	1.1	1.4		13.2				214.5	
Ratio (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	

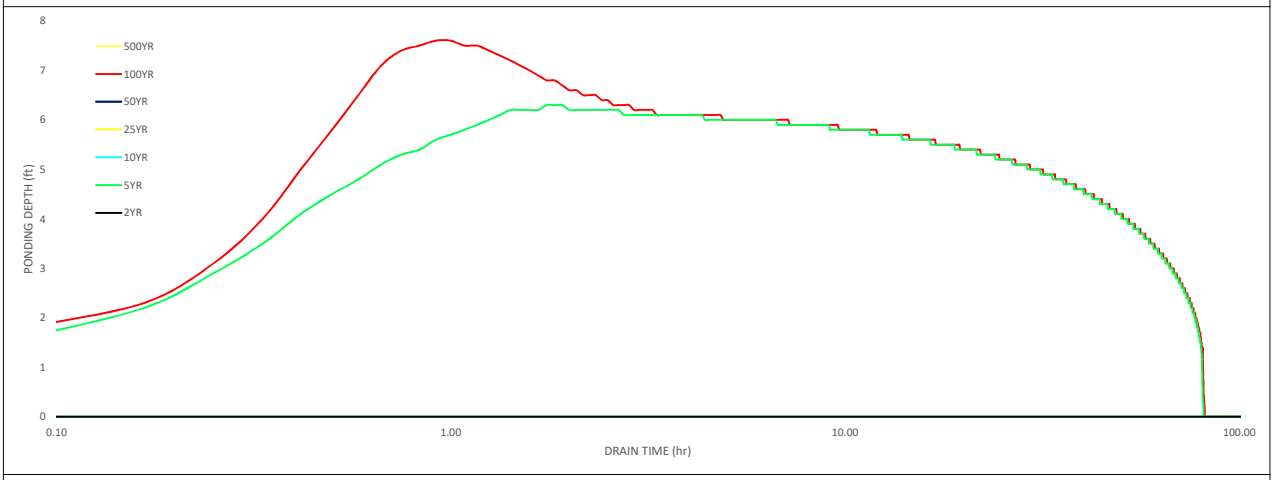
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

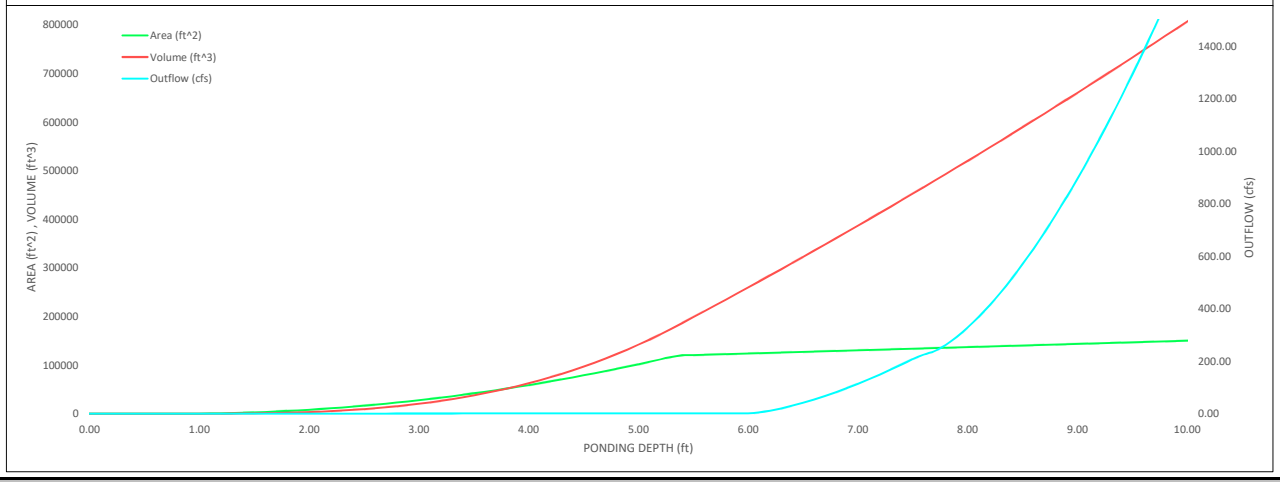
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

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

	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 =	9	9	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	0.49	0.49	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	3.20	3.20	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	1.94	1.94	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	4.00	4.00	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} =	349.7	349.7	ft
B) Width of Basin at Top of EURV, W_{PCM} =	105.4	105.4	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	4.10	4.10	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	350.5	350.5	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	106.2	106.2	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
	9.42				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	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	2 Year	**5 Year**	10 Year	25 Year	50 Year	**100 Year**	500 Year
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	
3:35		0.02				0.04	
3:40		0.02				0.03	
3:45		0.01				0.03	
3:50		0.01				0.02	
3:55		0.01				0.01	
4:00		0.00				0.01	
4:05						0.00	
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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)	$H_{weir\ front}$ =	4.00	4.00	ft
B) Overflow Weir Front Edge Length (inside edge of dropbox)	$L_{weir\ front}$ =	26.00	26.00	ft
C) Overflow Weir Grate Slope (H:V, enter zero for flat grate)	$S_{weir\ sides}$ =	0.00	0.00	ft / ft
D) Horizontal Length of Weir Sides (inside edge of dropbox)	Horizontal $L_{weir\ sides}$ =	26.00	26.00	ft
E) Overflow Grate Open Area % (grate open area / total grate area)	Grate Open Area =	70%	70%	%
F) Debris Clogging %	Debris Clogging =	50%	50%	%
G) Height of Grate Upper Edge (at back side of dropbox)	$H_{grate\ top}$ =	4.00	4.00	ft
H) Overflow Grate Slope Length (inside edge of dropbox)	Slope $L_{weir\ sides}$ =	26.00	26.00	ft
I) Overflow Grate Open Area (without debris)	Open Area $_{(No\ Clogging)}$ =	473.20	473.20	sq ft
J) Overflow Grate Open Area (with debris)	Open Area $_{(Clogged)}$ =	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)	Pipe Invert Depth =	1.50	1.50	ft
C) Outlet Pipe Diameter	Pipe Diameter =	30.00	27.00	inches
D) Restrictor Plate Height above Pipe Invert	Plate Height =	22.22	26.24	inches
E) Half-Central Angle of Restrictor Plate on Pipe	Theta =	2.07	2.80	radians
F) Outlet Orifice Area	Outlet Ao =	3.90	3.94	sq ft
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert	$Outlet_{centroid}$ =	1.03	1.12	ft
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)	Open Area Ratio =	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)	$H_{spillway\ invert}$ =	5.40	4.90	ft
B) Spillway Crest Length	$L_{spillway\ crest}$ =	136.00	23.00	ft
C) Spillway End Slopes (H:V)	$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
D) Freeboard above Maximum Water Surface	Freeboard Depth=	1.00	1.00	ft
E) Spillway Design Flow Depth	Flow $Depth_{spillway}$ =	0.30	0.90	ft
F) Stage at Top of Freeboard	Freeboard Top Stage =	6.70	6.80	ft
G) Basin Area at Top of Freeboard	Max Basin Area =	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

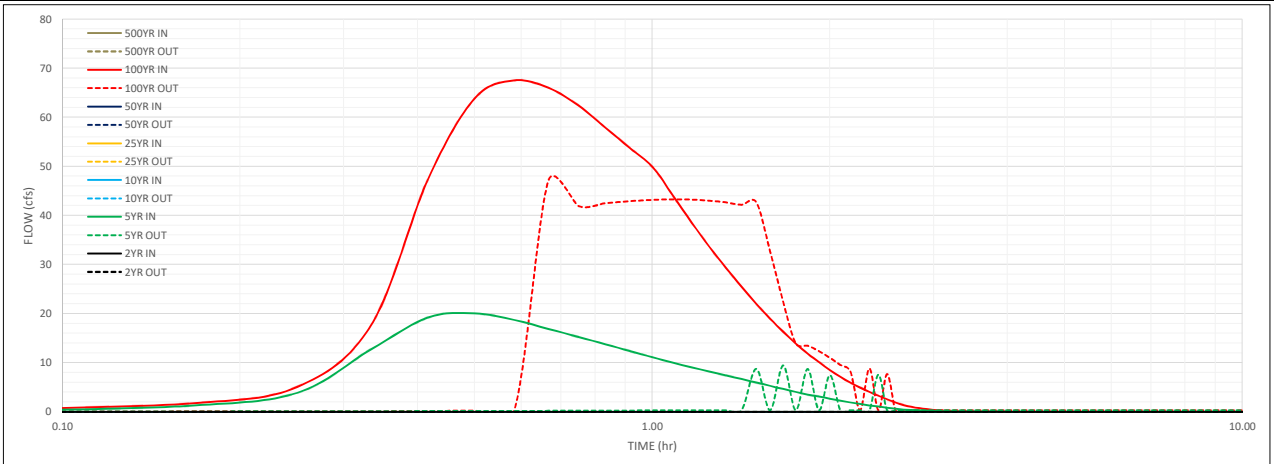
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	0.47	1.15		1.57				5.51	
Predevelopment Peak Q (cfs) =	N/A	N/A		9.4				48.5	
Peak Inflow (cfs) =	N/A	N/A		20.1				67.5	
Peak Outflow (cfs) =	0.2	0.3		9.4				47.1	
Ratio (Outflow/Predevelopment) =	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	

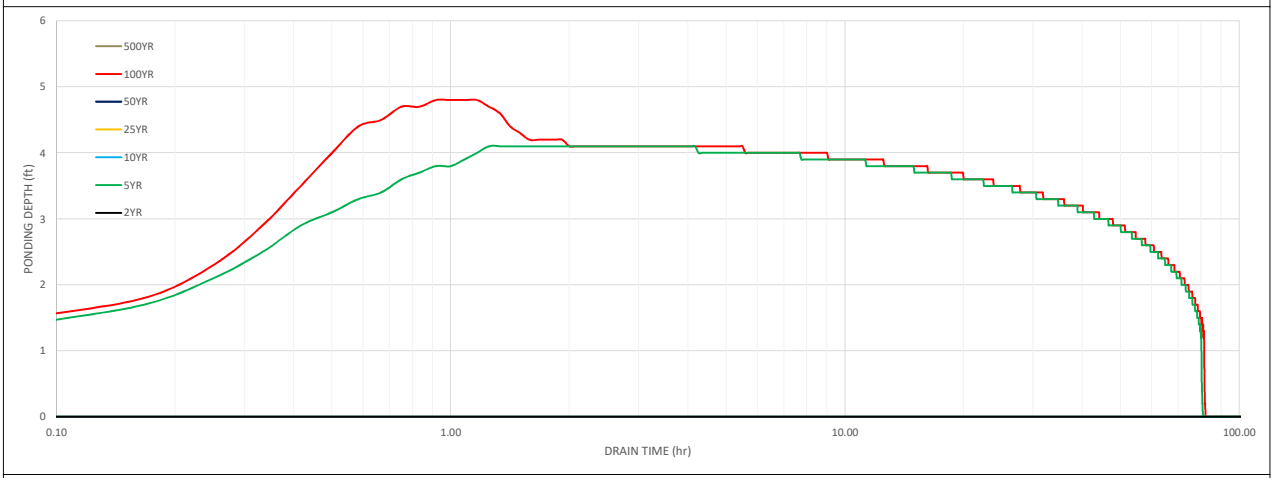
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

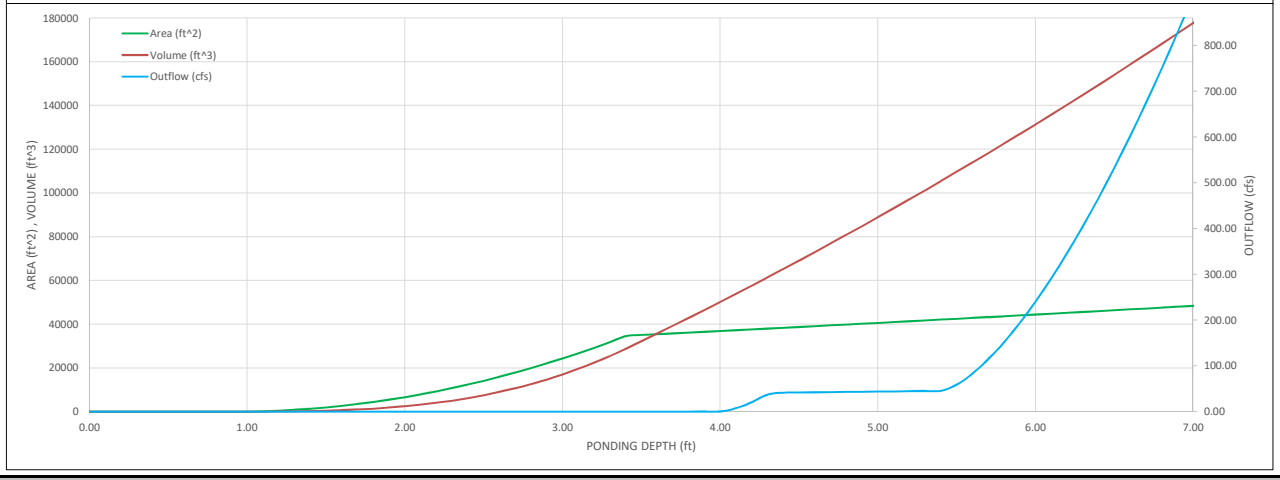
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

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

	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 =	11	11	
E) Vertical Spacing between WQCV Orifice Rows, Orifice Spacing =	4.0	4.0	inches
F) WQCV Orifice Area (A_o) per Row, WQCV Ao =	0.86	0.86	sq in
G) Maximum Stage of WQCV (includes ISD and Trickle Channel Depth), Max Stage $_{WQCV}$ =	3.80	3.80	ft
H) EURV Orifice Area (A_o) in Single Row, EURV Ao =	4.73	4.73	sq in
I) Maximum Stage of EURV (includes ISD and Trickle Channel Depth), Max Stage $_{EURV}$ =	5.00	5.00	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} =	468.4	468.4	ft
B) Width of Basin at Top of EURV, W_{PCM} =	141.1	141.1	ft
C) Stage at Top of Transition Bench (Bottom of Flood Control Surcharge), Stage at Top of Bench =	5.10	5.10	ft
D) Length of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), L_{Bench} =	469.2	469.2	ft
E) Width of Basin at Top of Transition Bench (Bottom of Flood Control Surcharge), W_{Bench} =	141.9	141.9	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
	17.11				99.16	

B) Adjust "Time Interval" to match hydrograph data

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

Time Interval: 5.0 minutes

Time	Post-Development Storm Inflow Hydrographs (cfs)						
(min)	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	
4:05		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 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)

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

Input Parameters	User Input	COS DCM	
$H_{weir\ front}$ =	5.00	5.00	ft
$L_{weir\ front}$ =	9.00	7.00	ft
$S_{weir\ sides}$ =	0.00	0.00	ft / ft
Horizontal $L_{weir\ sides}$ =	9.00	7.00	ft
Grate Open Area =	70%	70%	%
Debris Clogging =	50%	50%	%
$H_{grate\ top}$ =	5.00	5.00	ft
Slope $L_{weir\ sides}$ =	9.00	7.00	ft
Open Area $_{(No\ Clogging)}$ =	56.70	34.30	sq ft
Open Area $_{(Clogged)}$ =	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

B) Depth to Invert of Outlet Pipe (relative to Stage = 0 ft)
C) Outlet Pipe Diameter
D) Restrictor Plate Height above Pipe Invert
E) Half-Central Angle of Restrictor Plate on Pipe
F) Outlet Orifice Area
G) Height of Outlet Orifice Centroid above Outlet Pipe Invert
H) Ratio of Grate Open Area / 100-yr Orifice Area (should be ≥ 4)

Input Parameters	User Input	COS DCM	
Pipe Invert Depth =	1.50	1.50	ft
Pipe Diameter =	42.00	42.00	inches
Plate Height =	34.00	34.00	inches
Theta =	2.24	2.24	radians
Outlet Ao =	8.34	8.34	sq ft
$Outlet_{centroid}$ =	1.54	1.54	ft
Open Area Ratio =	6.80	4.11	

8. Emergency Spillway (Rectangular or Trapezoidal)

A) Spillway Invert Stage (relative to Stage = 0 ft)
B) Spillway Crest Length
C) Spillway End Slopes (H:V)
D) Freeboard above Maximum Water Surface
E) Spillway Design Flow Depth
F) Stage at Top of Freeboard
G) Basin Area at Top of Freeboard

Input Parameters	User Input	COS DCM	
$H_{spillway\ invert}$ =	6.70	999.00	ft
$L_{spillway\ crest}$ =	136.00	27.00	ft
$S_{spillway\ ends}$ =	4.00	4.00	ft / ft
Freeboard Depth=	1.00	1.00	ft
Flow $Depth_{spillway}$ =	0.50		ft
Freeboard Top Stage =	8.20		ft
Max Basin Area =	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

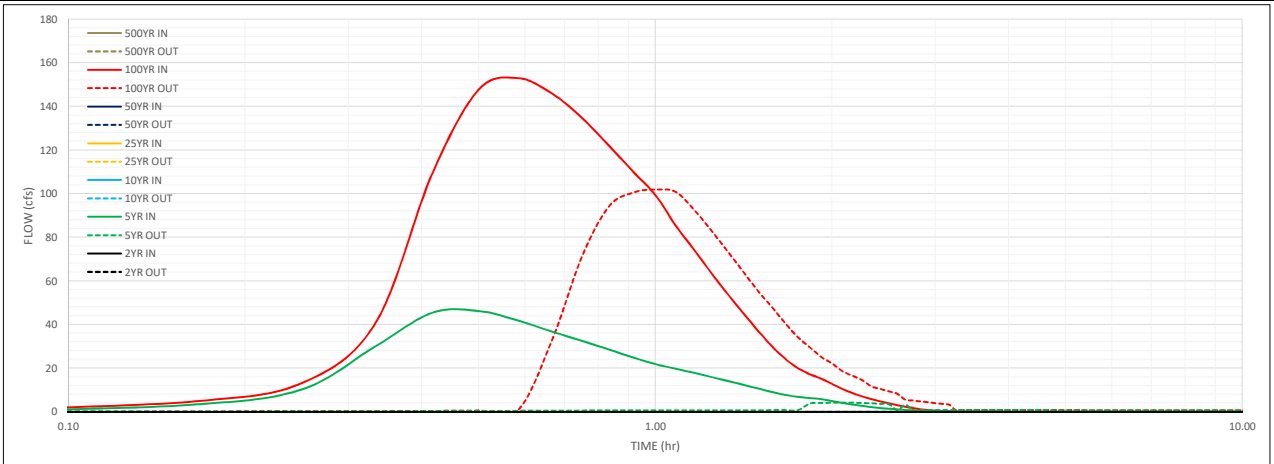
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Inflow Hydrograph Volume (ac-ft) =	1.03	2.73		3.25				11.08	
Predevelopment Peak Q (cfs) =	N/A	N/A		17.1				99.2	
Peak Inflow (cfs) =	N/A	N/A		46.2				153.0	
Peak Outflow (cfs) =	0.4	0.7		3.6				98.1	
Ratio (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	

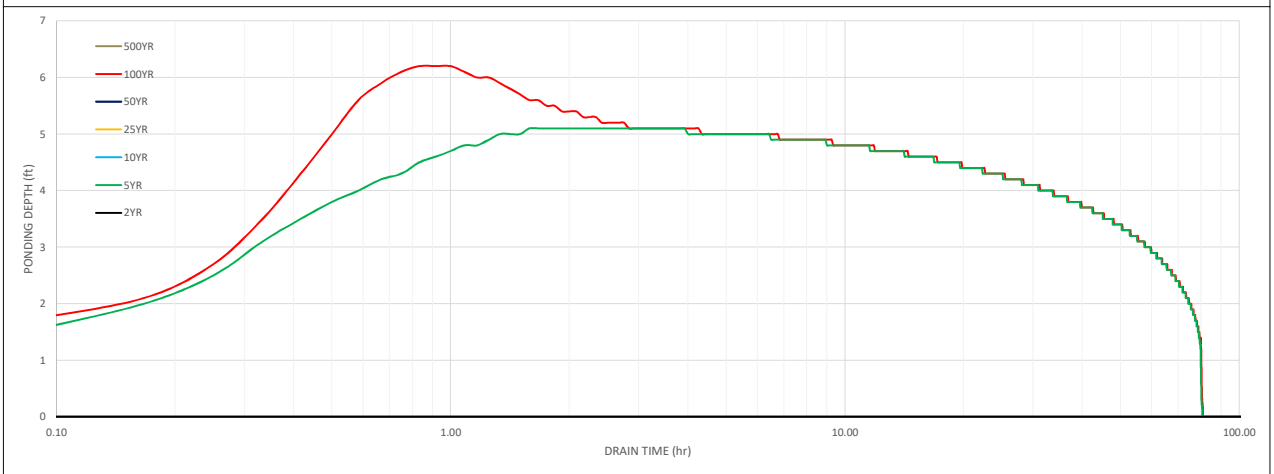
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

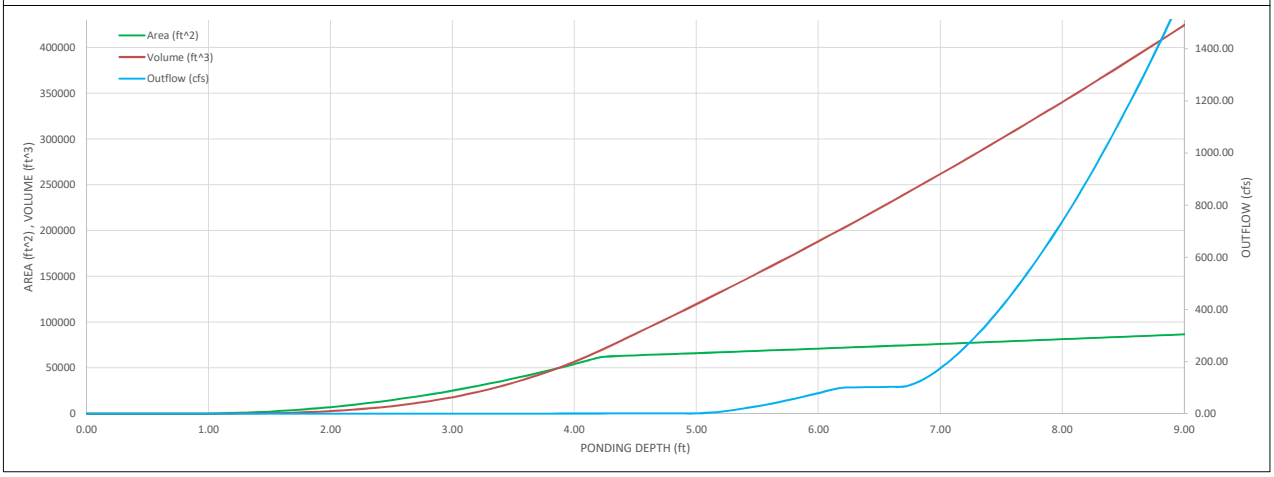
Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

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

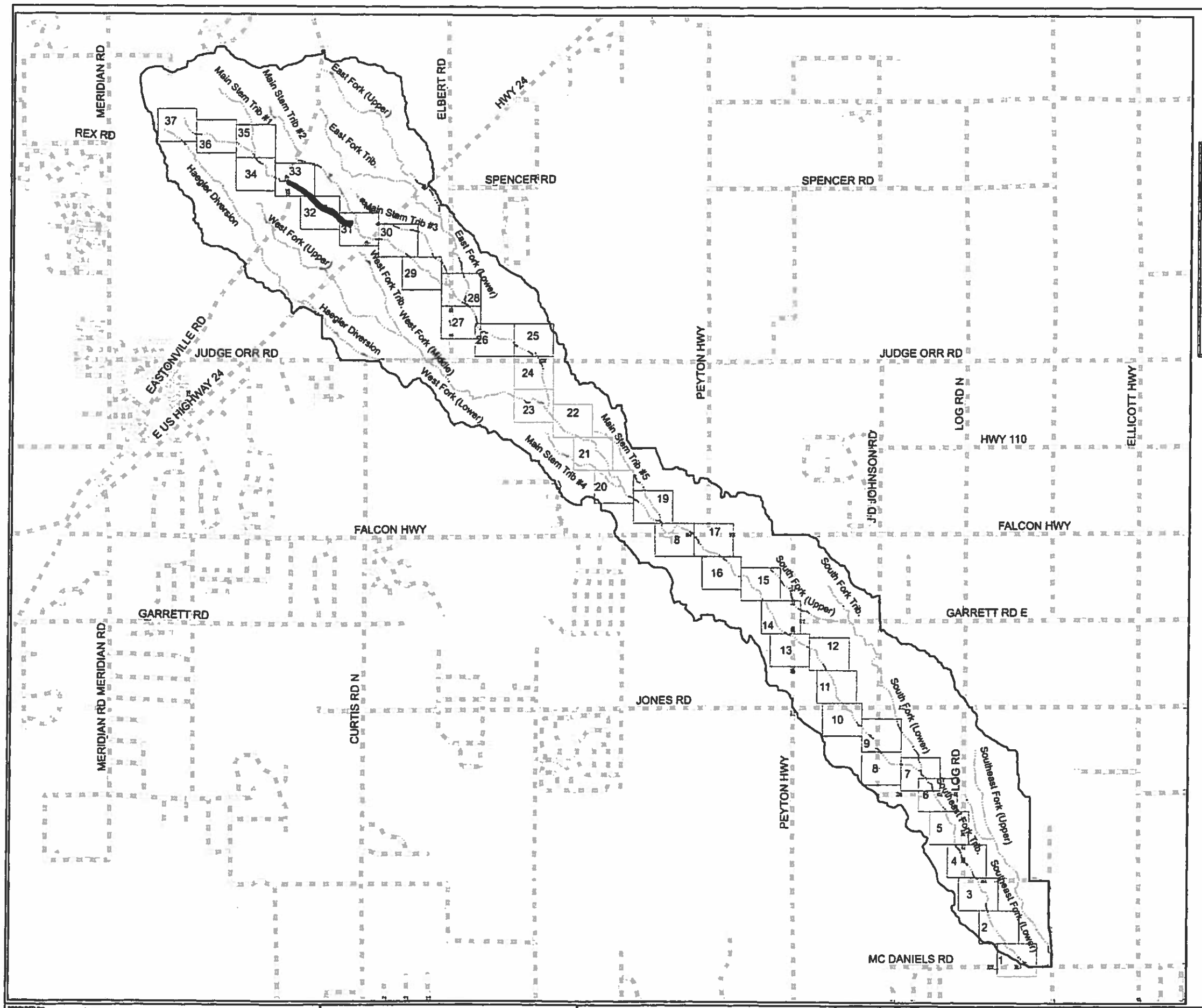






Preliminary Design Procedure Form: Full Spectrum Detention (FSD) Routing

Appendix E



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Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

Drexel, Barrell & Co. Engineers · Surveyors
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6513 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-6645
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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: AUGUST 2007
JOB NO: C7706-1
SHT: PL
SCALE: H: 1" = 6000' V:
DRAWING NO: 6D 038
SHEET: K1

MST2-R2

MST2-R2

POND: MS-S1
Q100 IN = 1210 CFS
Q100 OUT = 573 CFS
DETENTION STORAGE = 42 AC-FT

MS-R4b

MS-R5

PROPOSED STREET

REX RD

EASTONVILLE RD

See sheet 34

STRUCTURE #9
EXISTING: 24" CMP
PROPOSED: 2 - 10' X 5' CBC
(CONSIDER 3-SIDED CBC PER CDOW COMMENTS)
NOTE: ROAD TO BE RAISED TO
ACCOMMODATE LARGER STRUCTURE.

GRADE CONTROL STRUCTURE
SEE FIGURE VII-7
(TYPICAL)

STRUCTURE #8
PROPOSED: 19' X 30" ERCP

See sheet 32

20 SE 21 SW 28 NE 28 NW

9 8

Environmental Key

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

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

0 100 200 Feet

Legend

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

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.

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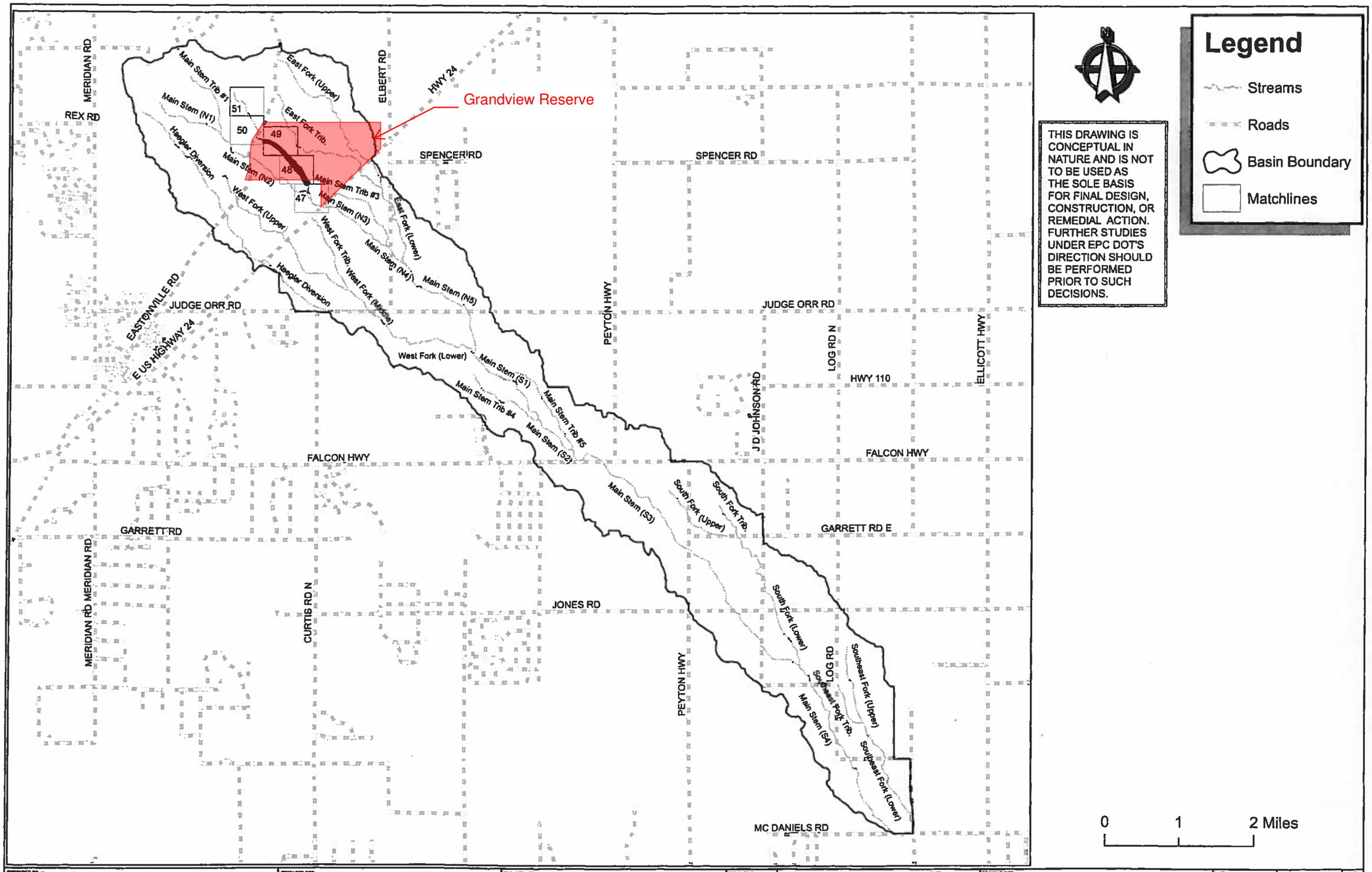
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

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

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

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



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

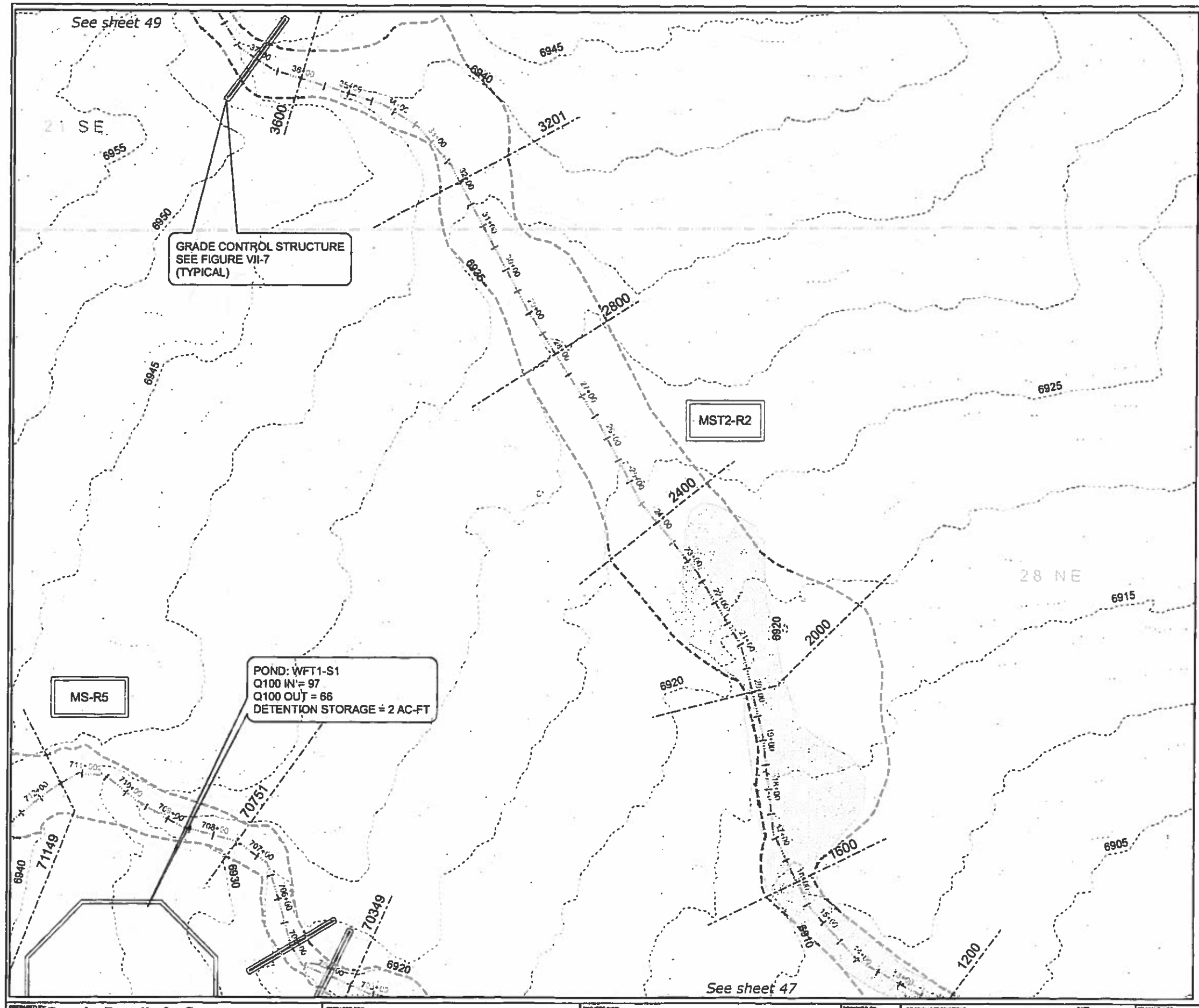
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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.

0 100 200 Feet

Legend

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

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.

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
1609 35TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
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 308
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

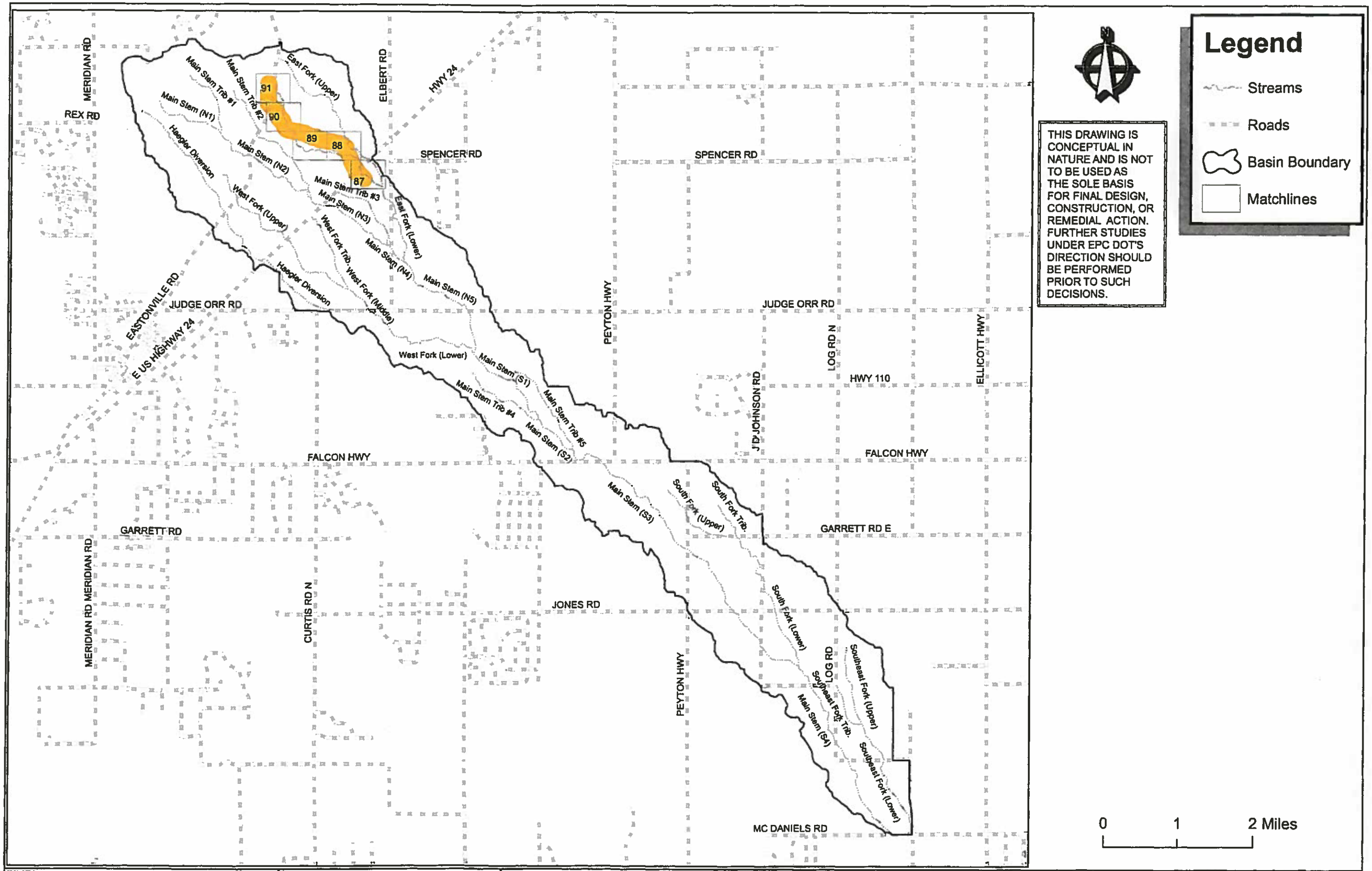
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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' / NONE
DRAWING NO: 6D 038
SHEET: 48



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
1888 38TH STREET
3 S 7TH STREET
5313 W 4TH STREET
CONTACT: ROBERT BENNETT
BOULDER, COLORADO 80301 (303) 443-4338
COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
GREELEY, COLORADO 80634 (970) 351-6845

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

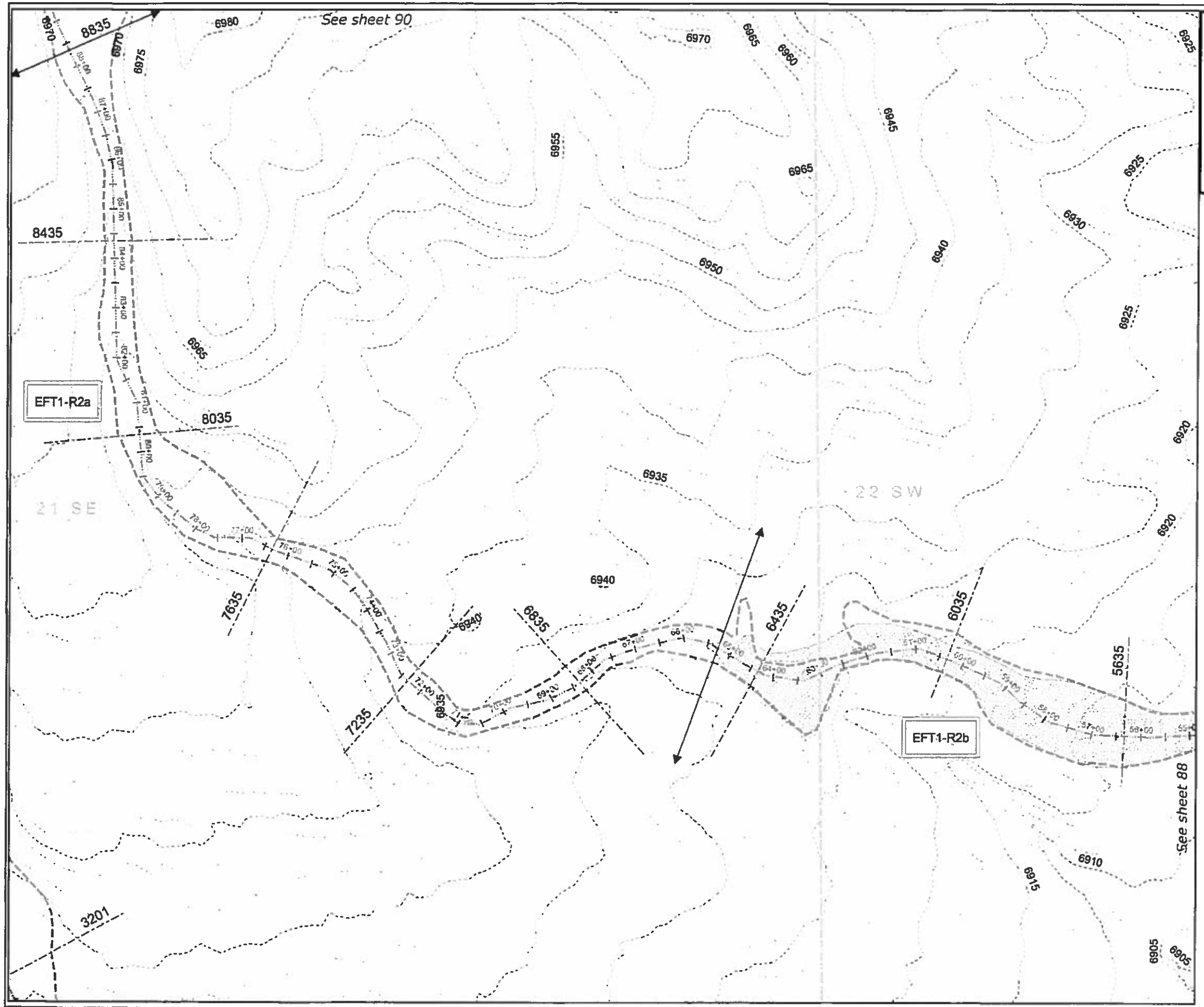
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

REVISION DESCRIPTIONS — DATE

DRAWING INFO: GIECK RANCH
KEY MAP
EAST FORK TRIBUTARY

DATE: AUGUST 2007
JOB NO: C7706-1
SHT: PL
SCALE: H: 1" = 6000' V:
DRAWING NO.: 6D 038
SHEET: K11



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

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

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) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
8513 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-6445
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

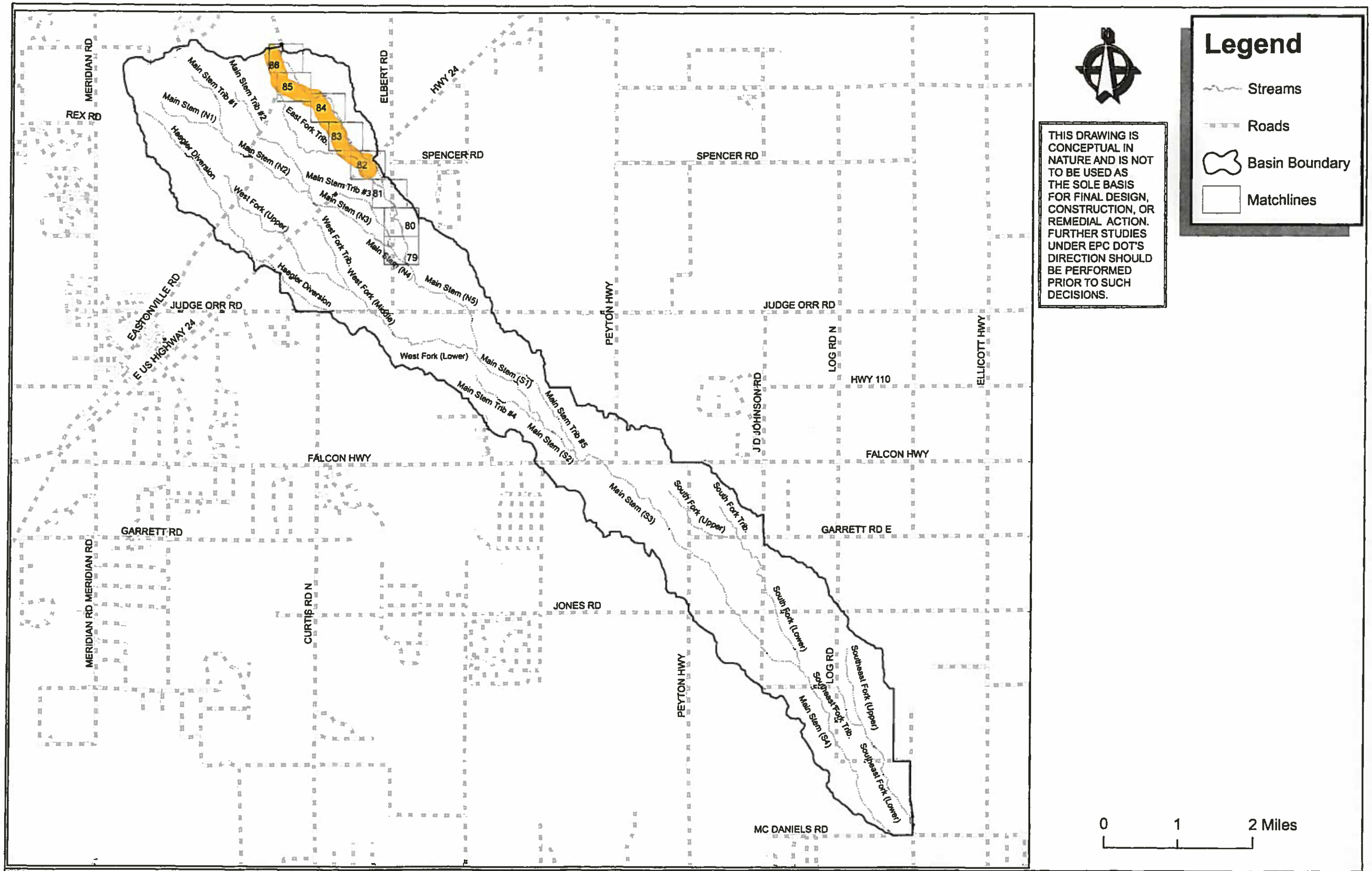
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

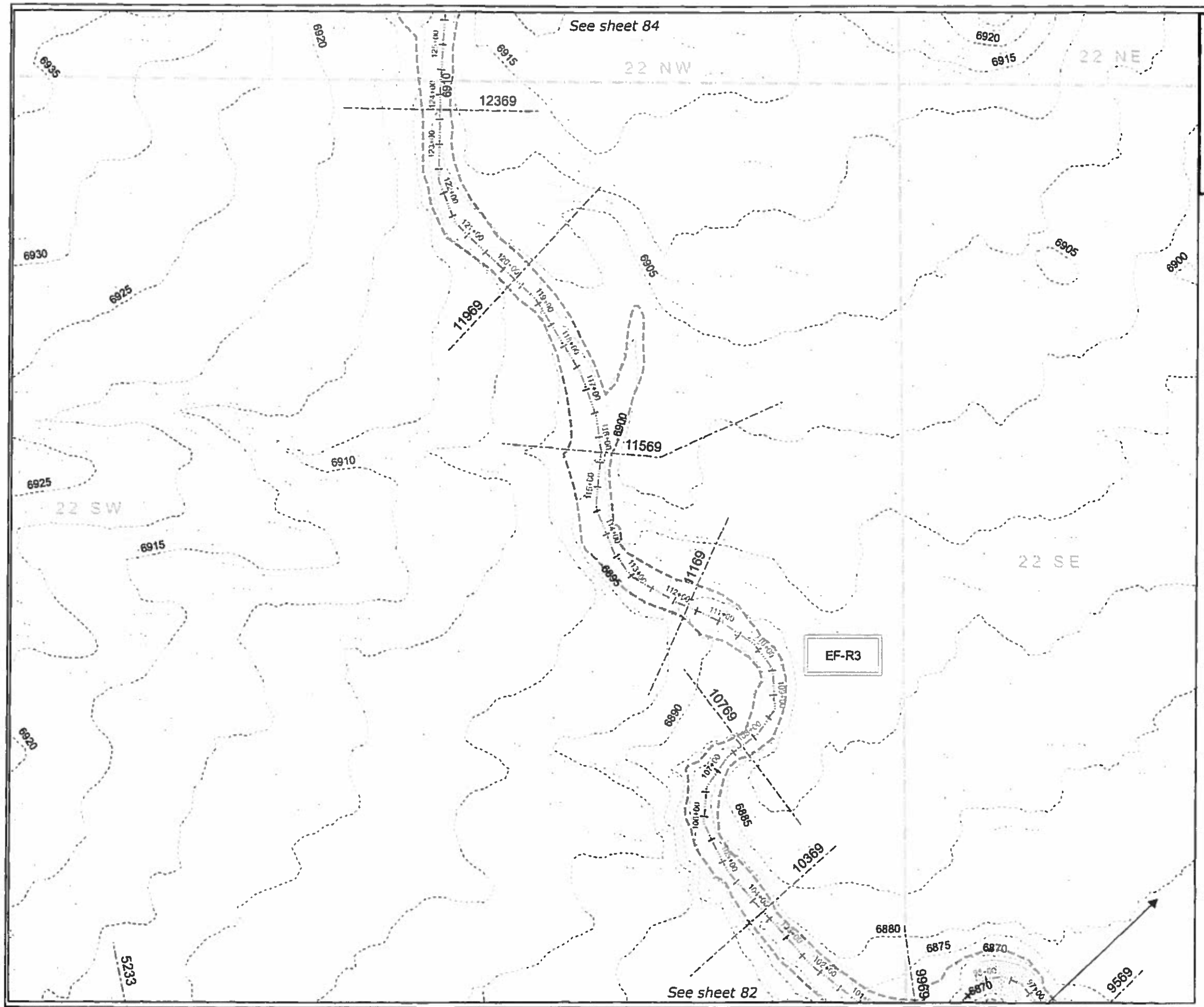
REVISION DESCRIPTION	DATE
PER EPC FINAL REVIEW	JANUARY 2010

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



PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors 1898 38TH STREET, BOULDER, COLORADO 80301 (303) 442-4338 3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887 6313 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0648 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: SLF 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

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.

Drexel, Barrell & Co. Engineers · Surveyors
1888 38TH STREET
3 S 7TH STREET
8513 W 4TH STREET
BOULDER, COLORADO 80301 (303) 443-4335
COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
GREELEY, COLORADO 80634 (970) 351-9645
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 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 DESCRIPTION & DATE: PER EPC FINAL REVIEW — JANUARY 2010

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

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

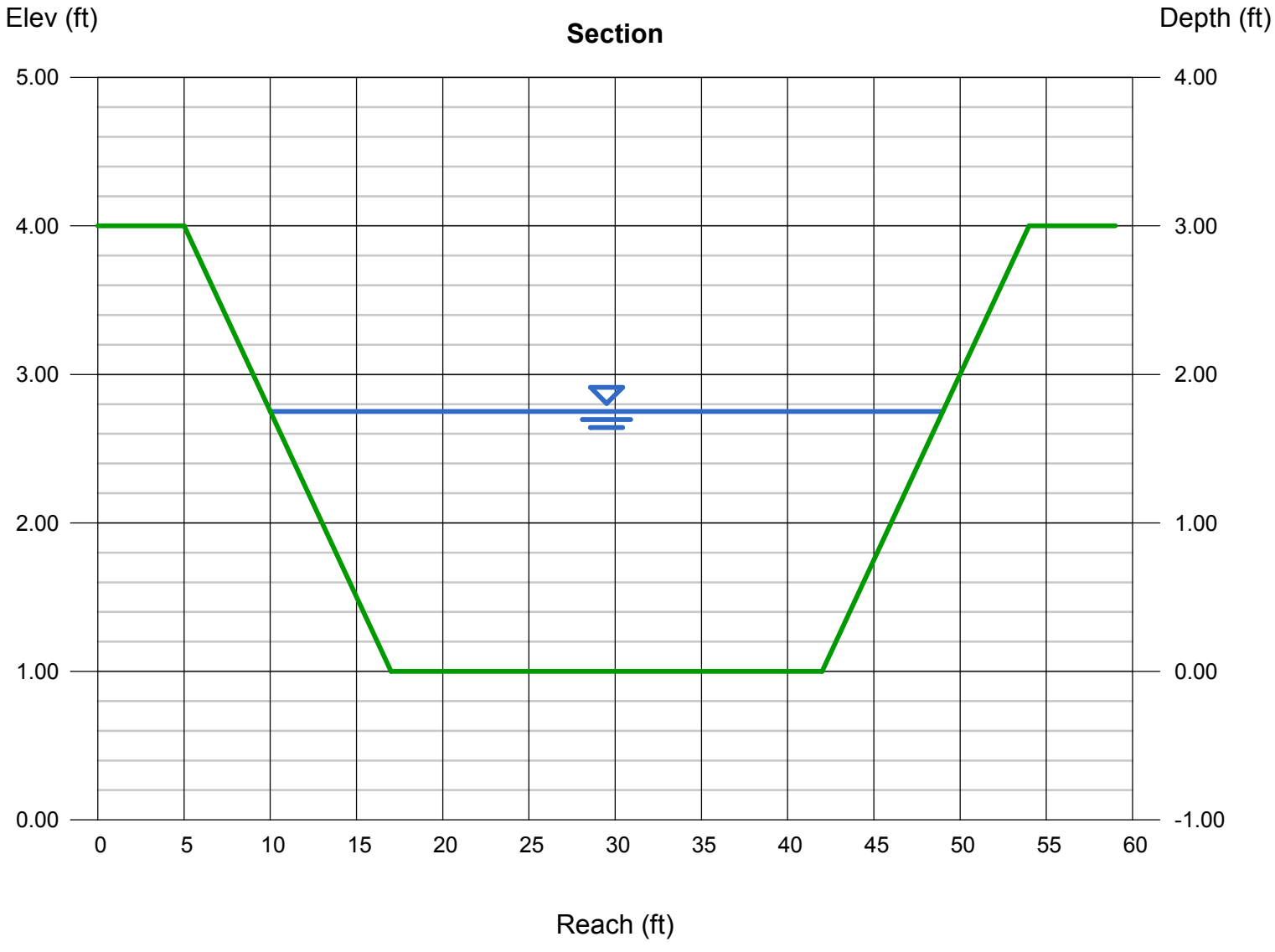
Bottom Width (ft)	= 25.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.69
N-Value	= 0.040

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

East Fork Tributary 1 Reach 3 - Proposed Channel_Velocity

Trapezoidal

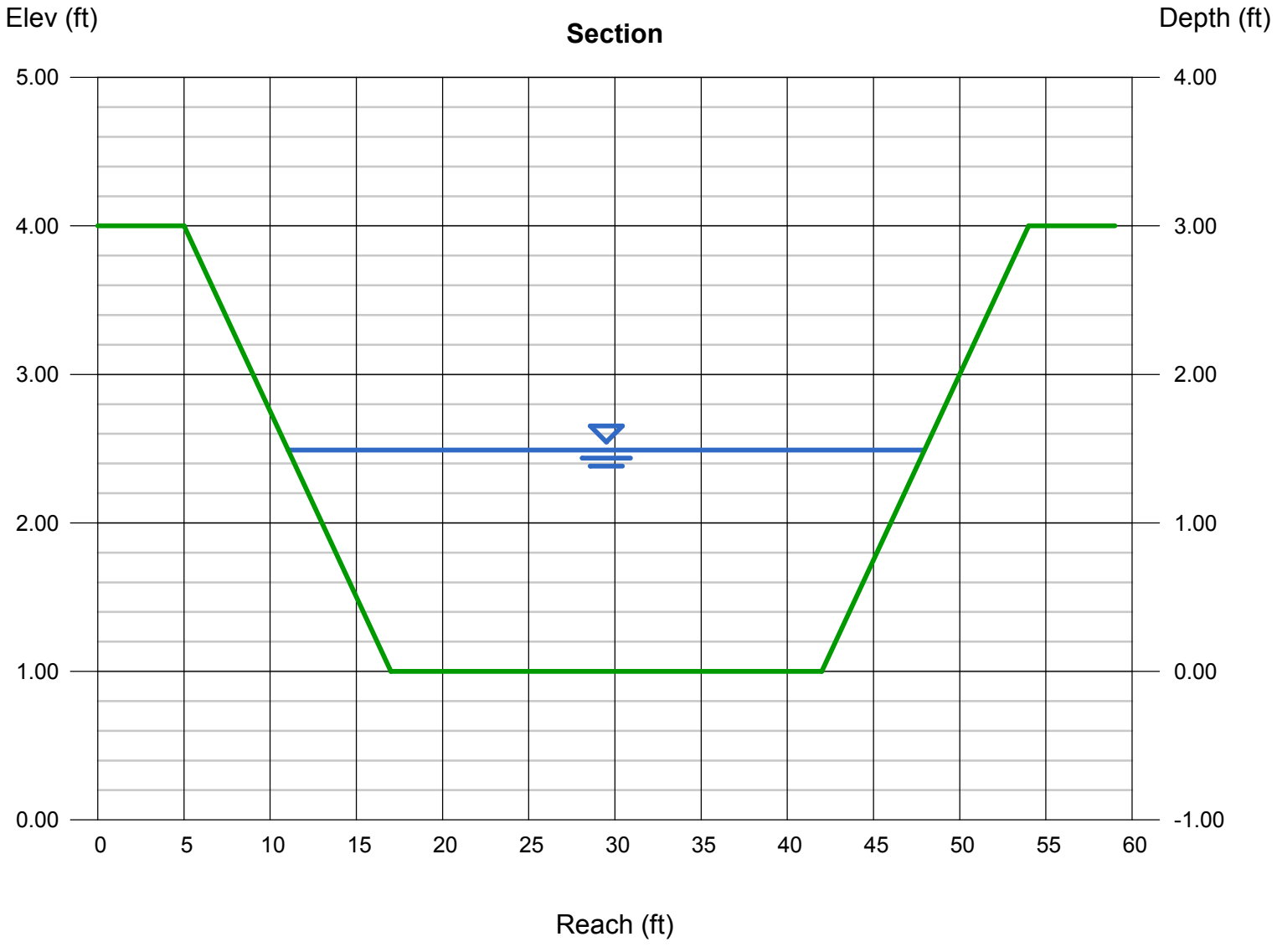
Bottom Width (ft)	= 25.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.69
N-Value	= 0.030

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

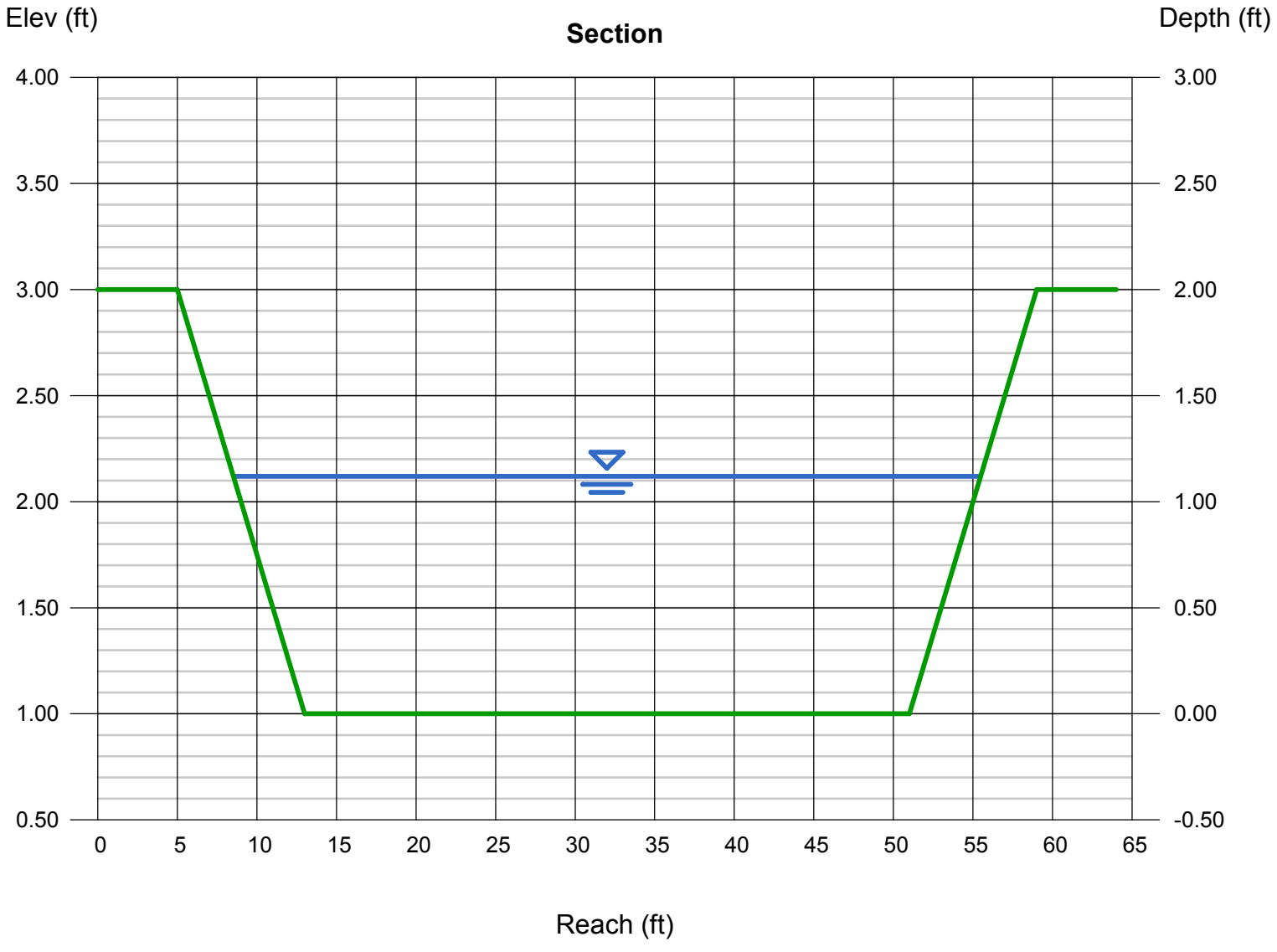
Bottom Width (ft)	= 38.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.58
N-Value	= 0.050

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

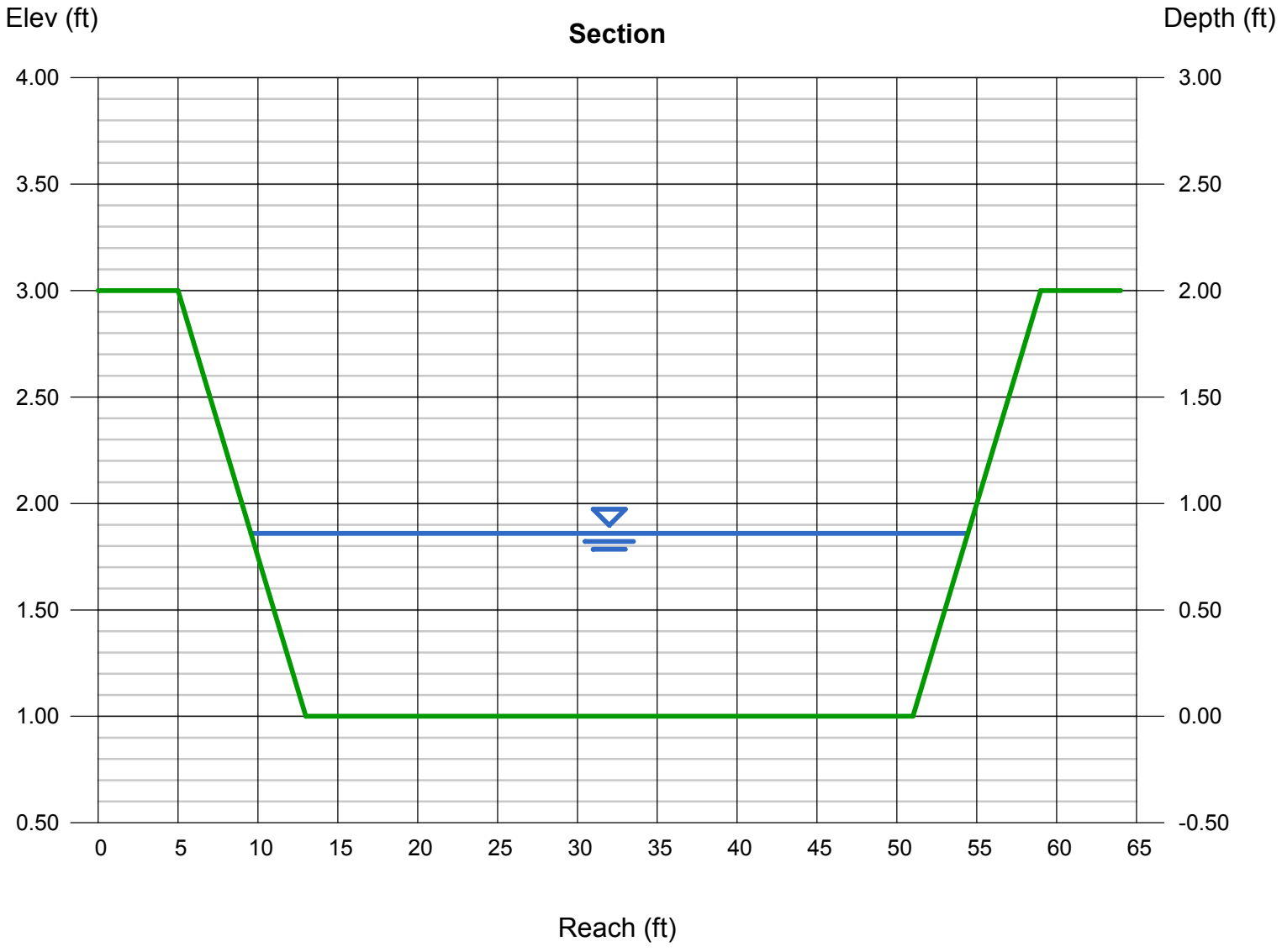
Bottom Width (ft)	= 38.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.58
N-Value	= 0.032

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

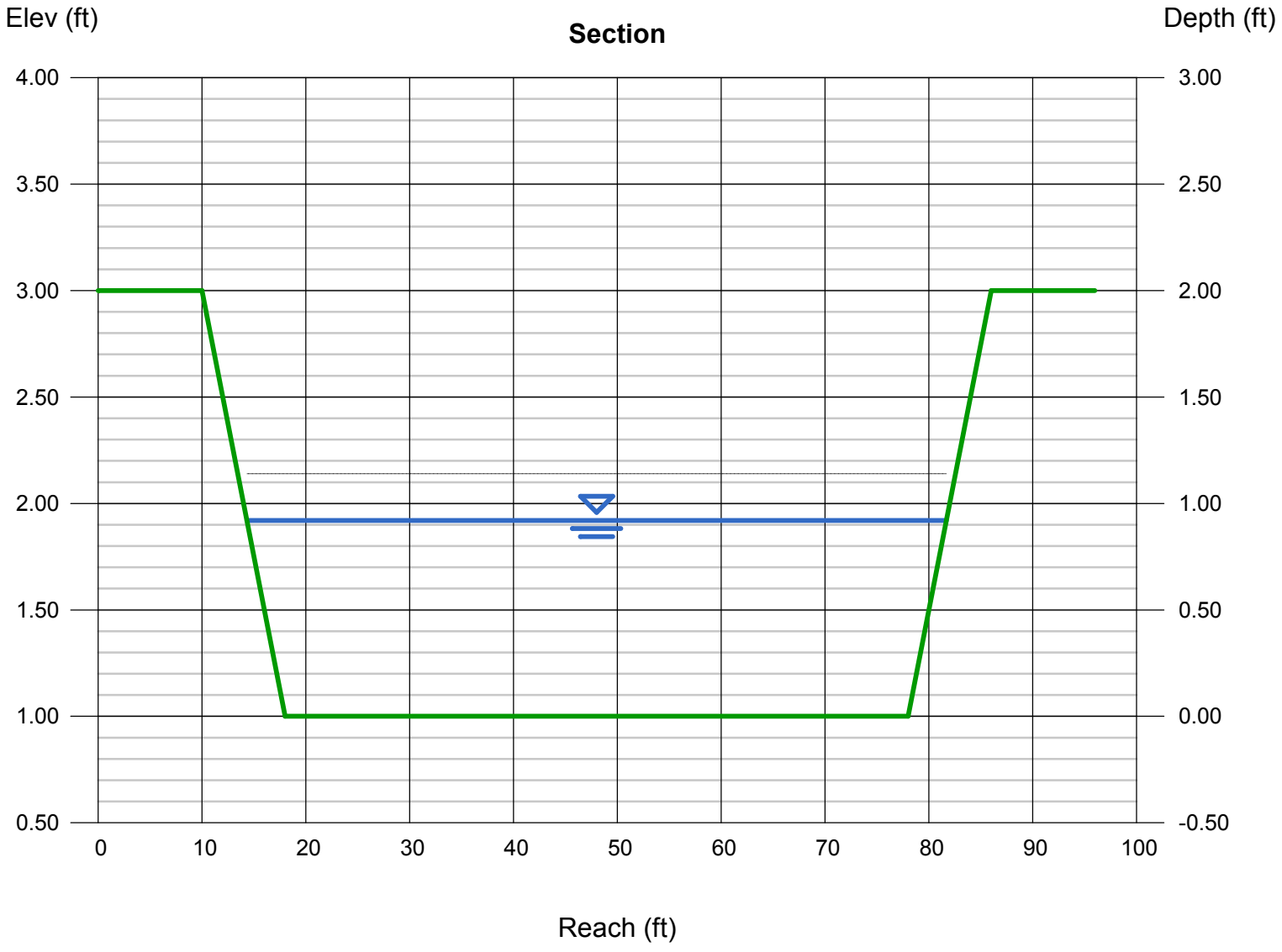
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.050

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

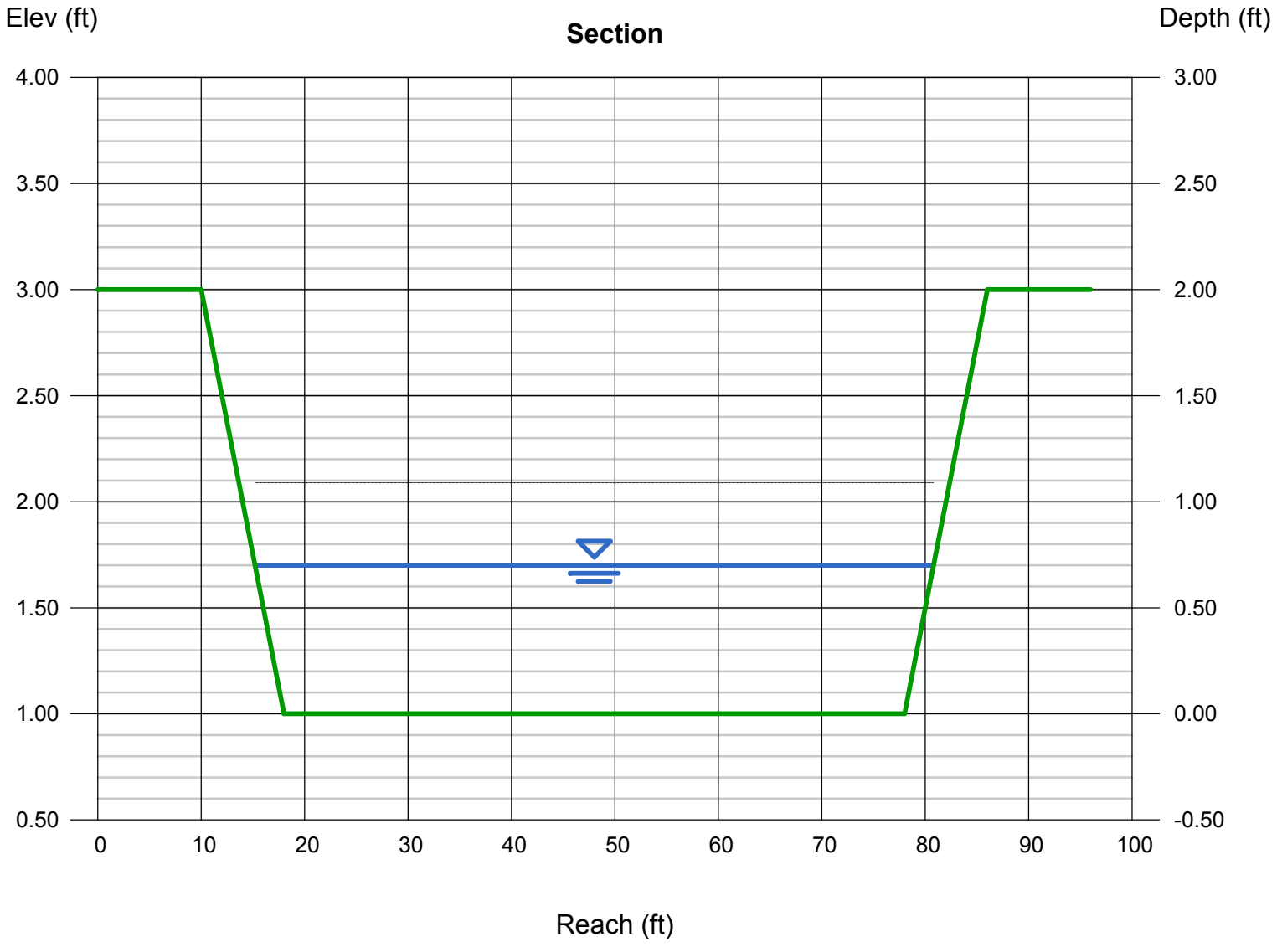
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.032

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

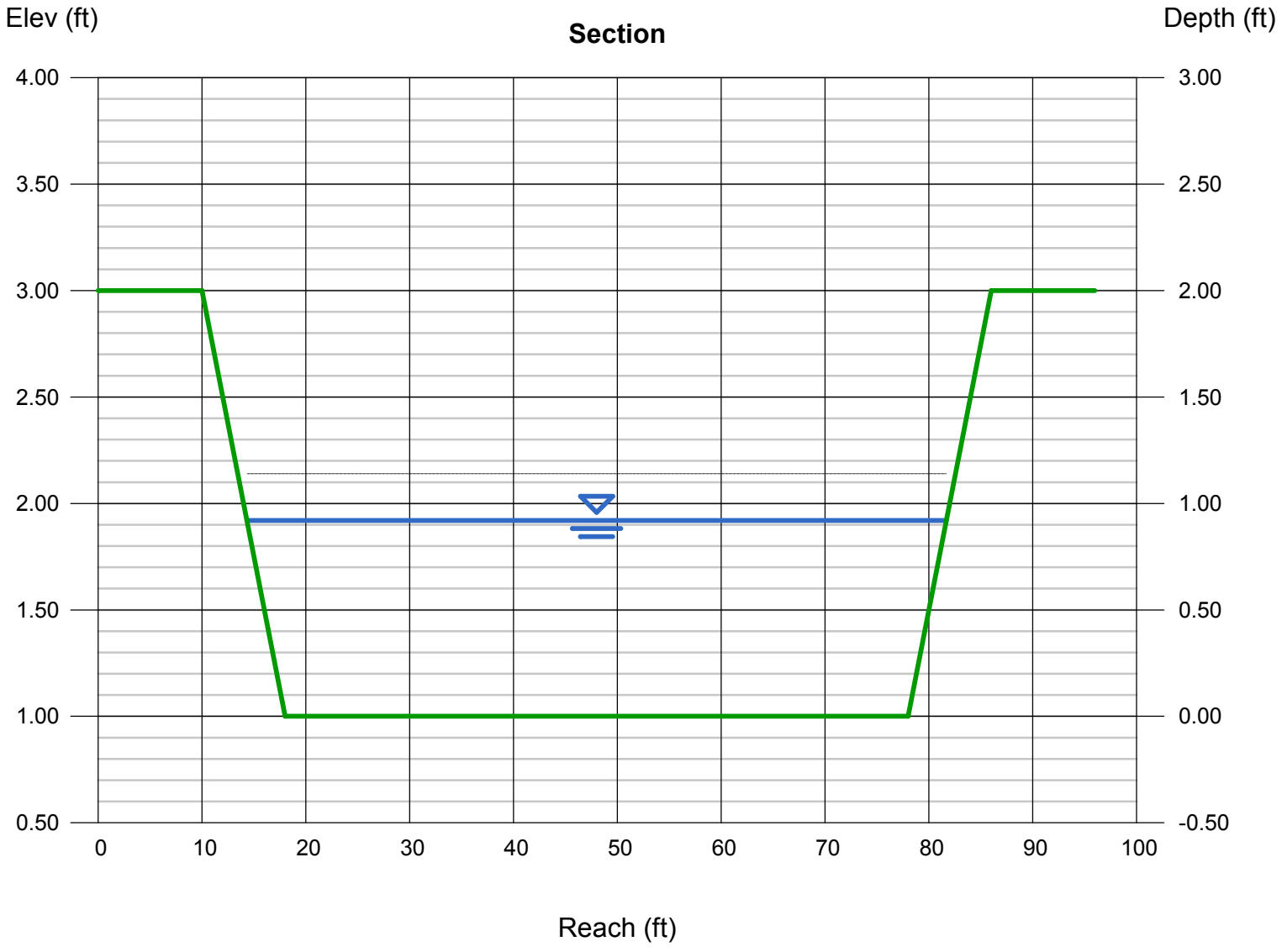
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.050

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

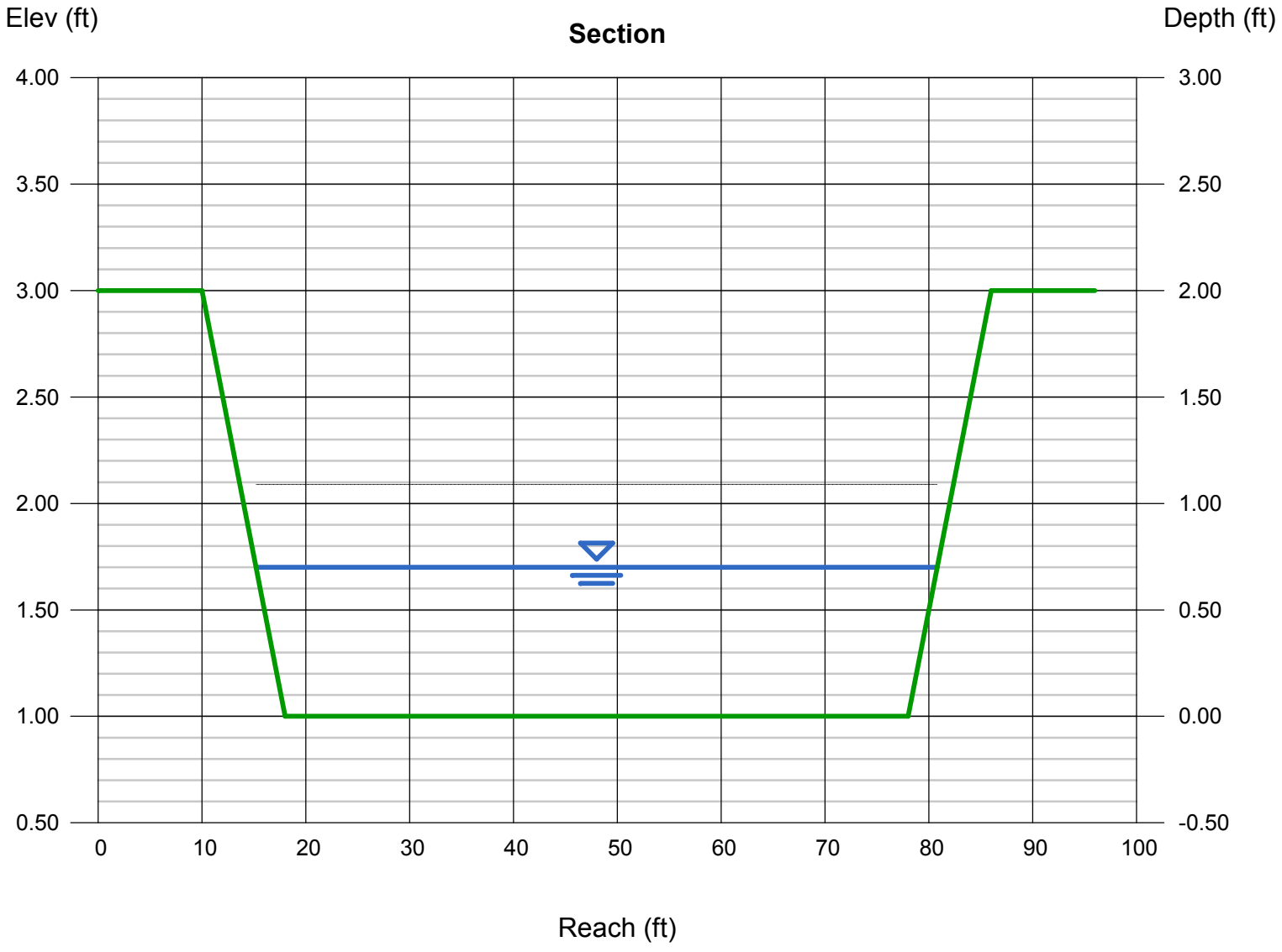
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.032

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

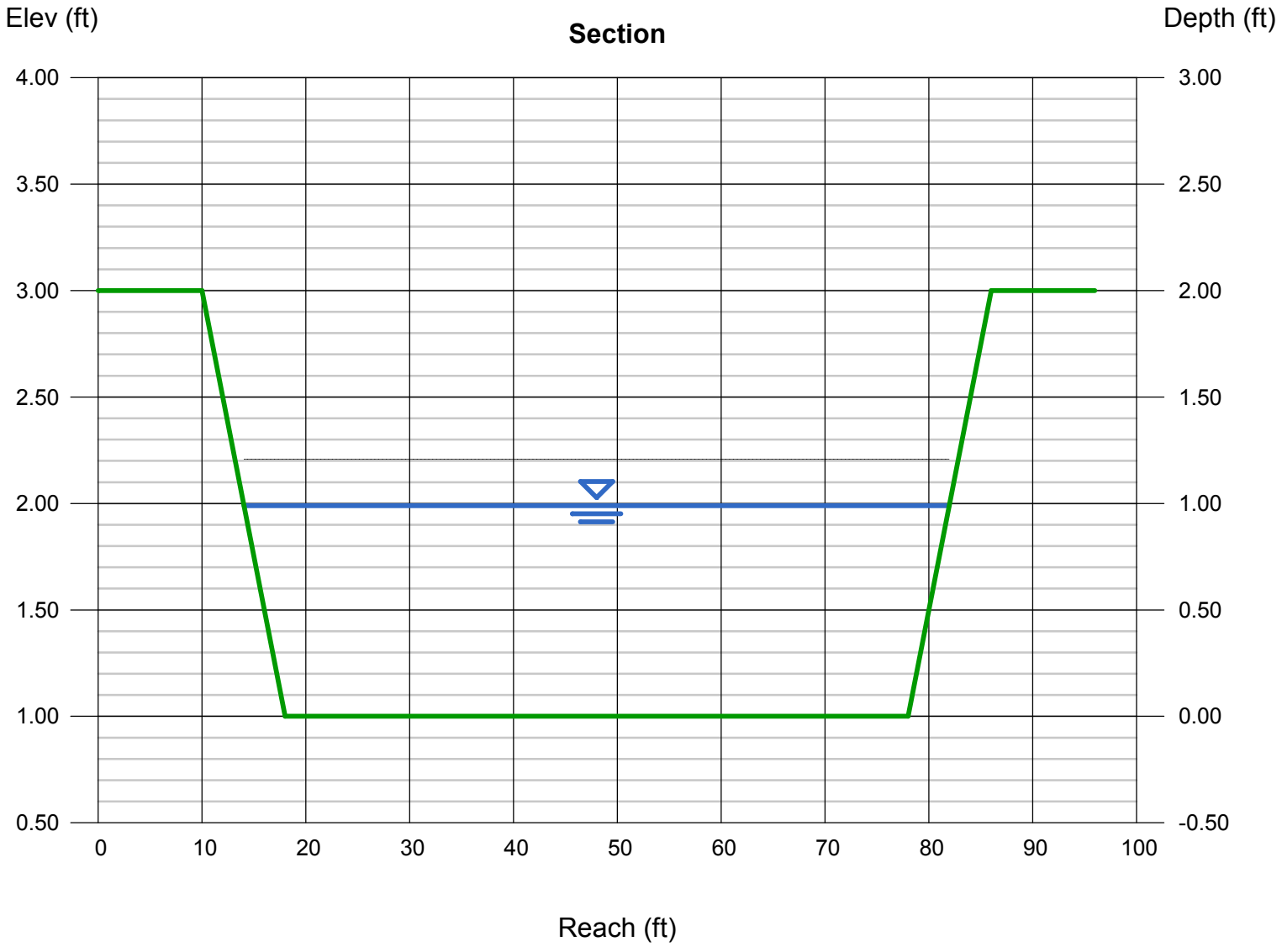
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.80
N-Value	= 0.050

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

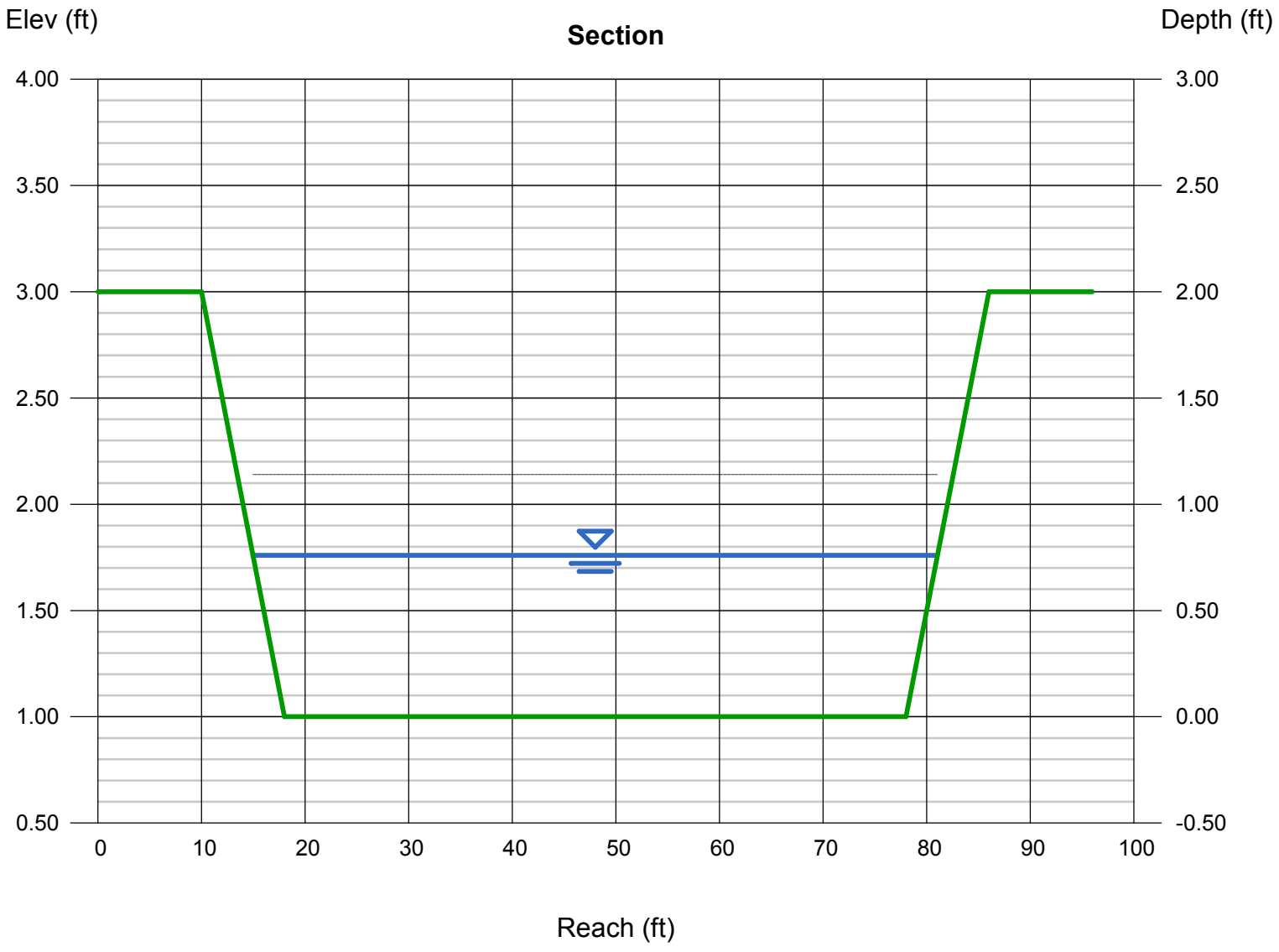
Bottom Width (ft)	= 60.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.80
N-Value	= 0.032

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

EXISTING 36" CMP
EXISTING 36" CMP
EXISTING 48" CMP
EXISTING 18" CMP
EXISTING 18" CMP
EXISTING 18" CMP
3-EXISTING 48" RCP'S
EXISTING 48" RCP 24" CMP (PLUGGED)
4-EXISTING 36" RCP'S

OS1 998
OS2 142
OS3 127
OS4 87
OS5 37
OS6 84
OS7 21
OS8 26
OS9 99

HB1 15
HB2 68
HB3 81
HB4 39
HB5 88
HB6 105
HB7 20
HB8 86
HB9 195
HB10 195
HB11 58
HB12 51
HF01 44

HG1 35
HG2 58
HG3 117
HG4 57
HG5 72
HG6A 88
HG6B 66
HG7 63
HG8 85
HG9 114
HG10 88
HG11 131
HG12 83
HG13 54
HG14 147
HG15 164
HG18 21
HG19 3
HG20 1
HG21 14
HH1 63

GIECK RANCH
CHMS0400
BENNETT RANCH
CHWS1200
FALCON
CHWS1400
HAEGLER RANCH
CHMS0200

GIECK BASIN
BENNETT BASIN
FUTURE POND B

OFFSITE FLOW ONTO GRANDVIEW RESERVE
GRANDVIEW RESERVE
29" x18" ARCH CMP
29" x18" ARCH CMP (floats?)
18" CMP
18" CMP
18" CMP
HP
24" CMP
36" CMP
18" CMP
18" CMP
24" CMP

Oregon Wagon Tr
Conestoga Trail N
Radiate Dr W

N

GRAPHIC SCALE
500 0 250 500 1000 2000
(IN FEET)
1 inch = 500 ft.

LEGEND
MAJOR BASIN BOUNDARY
MINOR BASIN BOUNARY
SCS MODEL ID / SIZE ACRES — EB15 / 65 — BASIN IDENTIFICATION
H8 / B10 DESIGN POINTS
MAJOR CONTOUR INTERVAL
MINOR CONTOUR INTERVAL
100 YEAR FLOOD PLAIN

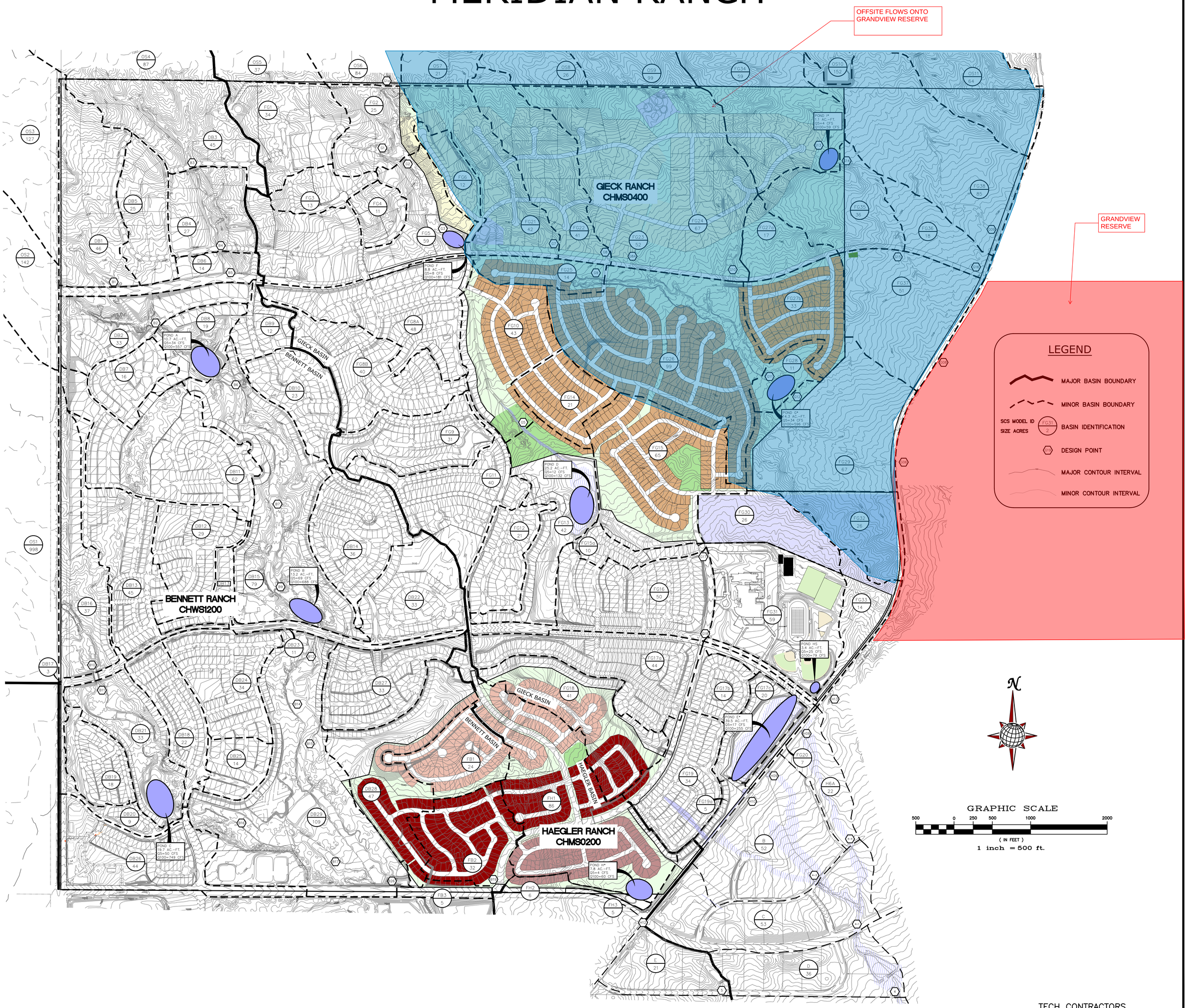
HISTORIC CONDITIONS - SCS MAP

AUG 2017

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

FIGURE 4

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

FIGURE 5

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

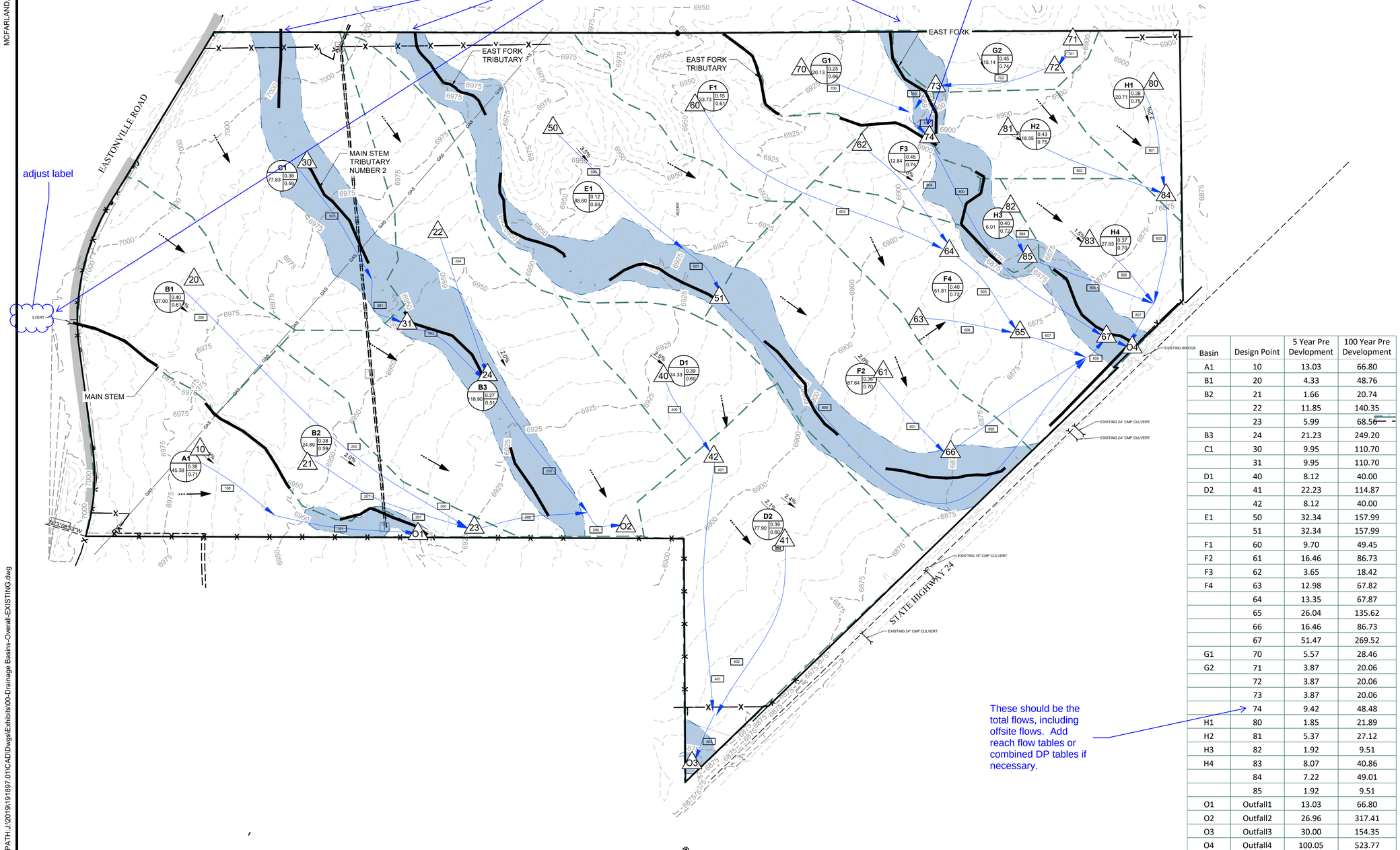
Appendix F

Label the contributing basins and continue the basin lines north to some extent. Refer to the respective other exhibits if necessary

replace the offfsite flow labels or provide DPs and show in table

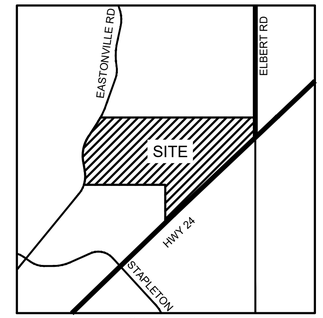
704 should include upstream basin.

adjust label



Basin	Design Point	5 Year Pre Devlopment	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	32.34	157.99
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	51.47	269.52
G1	70	5.57	28.46
G2	71	3.87	20.06
	72	3.87	20.06
	73	3.87	20.06
	74	9.42	48.48
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
O1	Outfall1	13.03	66.80
O2	Outfall2	26.96	317.41
O3	Outfall3	30.00	154.35
O4	Outfall4	100.05	523.77

These should be the total flows, including offsite flows. Add reach flow tables or combined DP tables if necessary.



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 C5, XX C100

LAND USE

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

NOTES:

NORTH

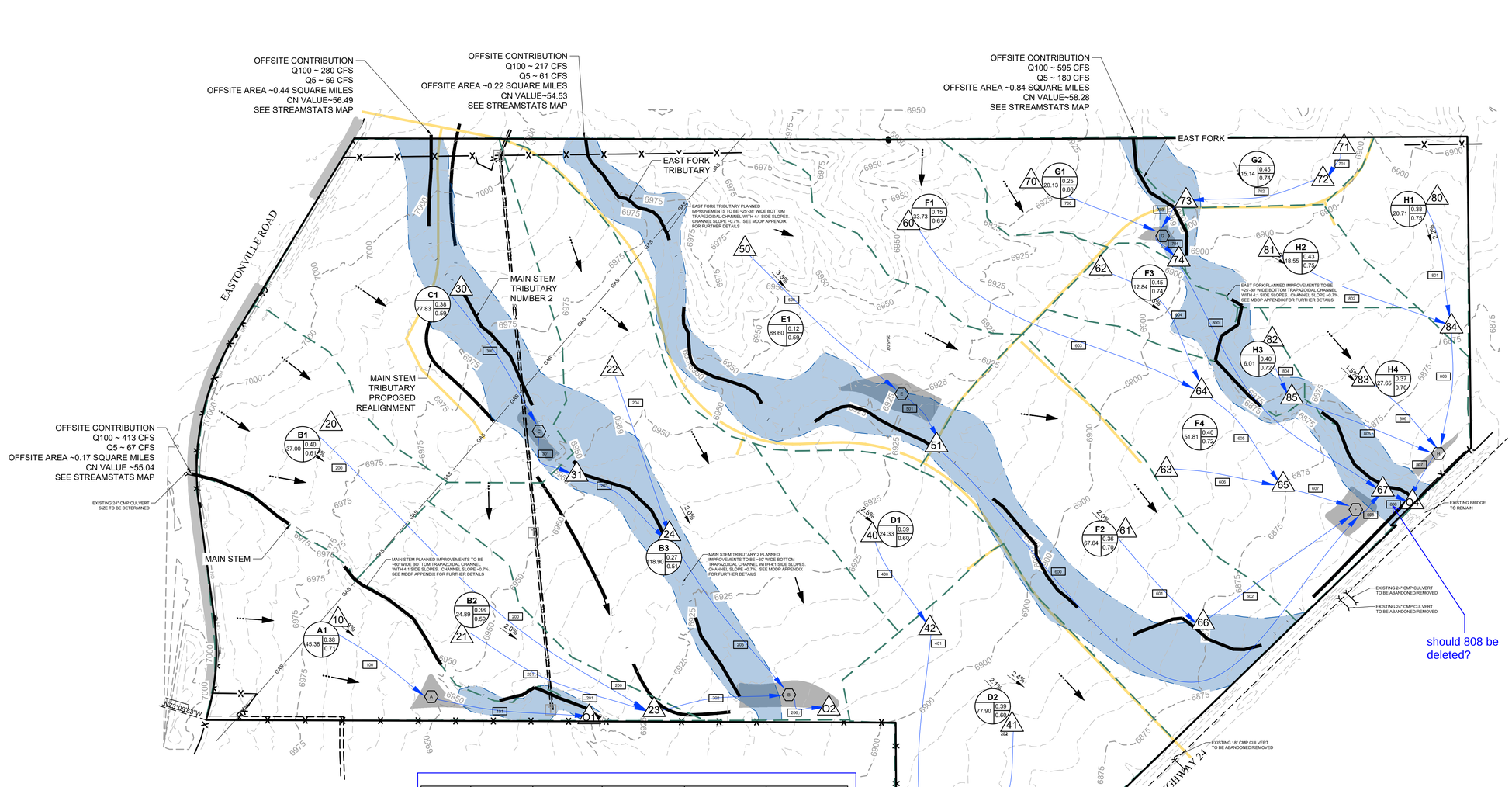
0 100 200

HRGreen

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

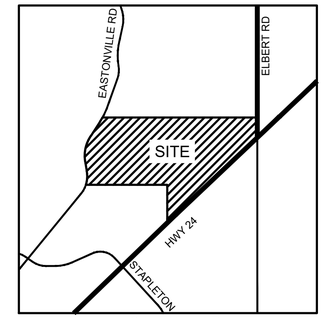
EXISTING EX1

FIG.EX1



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	66.8	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	249.2	334.84
C1	30	9.95	77.99	110.7	238.03
	31	9.95	1.52	110.7	115.75
D1	40	8.12	24.15	40	70.07
D2	41	22.23	98.47	114.87	252.18
	42	8.12	24.15	40	70.07
E1	50	32.34	46.88	157.99	178.04
	51	32.34	18.7	157.99	164.75
F1	60	9.7	16.28	49.45	58.95
F2	61	16.46	60.11	86.73	170.9
F3	62	3.65	11.36	18.42	32.93
F4	63	12.98	42.32	67.82	124.89

Basin	Design Point	5 Year Pre Devlopment	5 Year Post Development	100 Year Pre Development	100 Year Post Development
	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	170.9
	67	51.47	23.06	269.52	270.41
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	9.42	9.05	48.48	42.13
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	15.6
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	15.6
	Outfall1	13.03	5.43	66.8	53.95
	Outfall2	26.96	34.45	317.41	256.11
	Outfall3	30	2.52	154.35	160.7
	Outfall4	100.05	35.27	523.77	478.86



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) 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 4000
2000

HRGreen

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

PROPOSED DR1

FIG.DR1

EASTONVILLE ROAD

EAST FORK TRIBUTARY

MAIN STEM TRIBUTARY NUMBER 2

MAIN STEM TRIBUTARY PROPOSED REALIGNMENT

SEE DR3

SEE SHEET DR3

SEE SHEET DR5

2.6%

2.2%

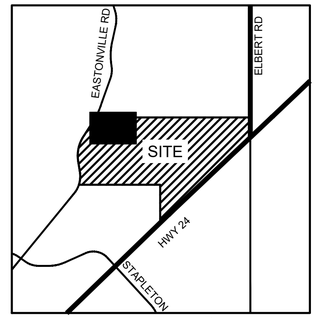
2.3%

C1
77.83
0.36
0.50

234
30

300
234

177
22



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 XX / BASIN DESIGNATION / % IMPERVIOUSNESS)

LAND USE

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

NOTES:

NORTH

0 100
50

HRGreen

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

PROPOSED DR2

FIG.DR2

IGEL, TREVOR, 4/16/2020 2:53 PM

SEE SHEET DR2

SEE SHEET DR4

SEE SHEET DR6

E1
88.60
0.15
0.52

50

178

F1
33.73
0.19
0.54

60

59

G1
20.13
0.28
0.60

70

44

700

500

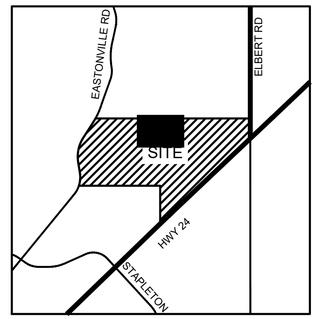
603

2645.09'

EAST FORK TRIBUTARY

Pond E
Tributary Area: 88.60
WQ Vol: 0.81 ac-ft
EURV Vol: 1.70 ac-ft
5 Year Vol: 1.99 ac-ft
100 Year Vol: 2.91 ac-ft

1.9%
2.2%
2.6%
3.1%
3.5%



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 (A)
- 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

IGEL, TREVOR, 4/16/2020 2:54 PM

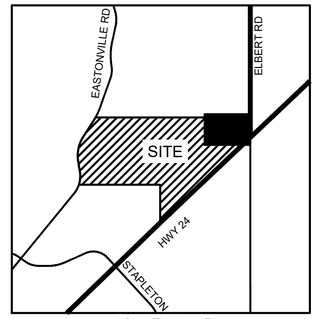
SEE SHEET DR3

EAST FORK

Pond G
Tributary Area: 35.27
WQ Vol: 0.47 ac-ft
EURV Vol: 1.15 ac-ft
5 Year Vol: 1.24 ac-ft
100 Year Vol: 1.85 ac-ft

G2 15.14 | 0.19 | 0.54
H1 20.71 | 0.15 | 0.30
H2 18.55 | 0.35 | 0.63
F3 12.84 | 0.42 | 0.64
H3 6.01 | 0.32 | 0.61
H4 27.65 | 0.30 | 0.60

SEE SHEET DR7



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

SEE SHEET DR2

EASTONVILLE ROAD

97

20

B1
37.00 | 0.31 | 0.46

200

97

MAIN STEM TRIBUTARY NUMBER 2

Pond C
Tributary Area: 77.63
WQ Vol: 1.36 ac-ft
EURV Vol: 4.79 ac-ft
5 Year Vol: 4.07 ac-ft
100 Year Vol: 6.91 ac-ft

C

114

301

MAIN STEM

101

10

A1
45.38 | 0.27 | 0.59

B2
24.89 | 0.39 | 0.44

21

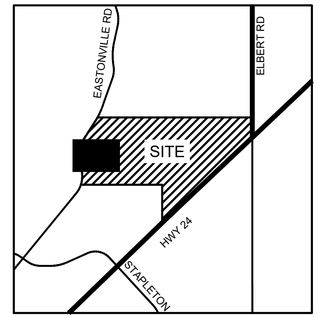
42

200

97

SEE SHEET DR6

SEE SHEET DR9



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

0 100
50

HRGreen

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

PROPOSED DR5

FIG.DR5

SEE SHEET DR3

SEE SHEET DR5

SEE SHEET DR7

SEE SHEET DR10

EAST FORK TRIBUTARY

MAIN STEM TRIBUTARY NUMBER 2

204
177

203
114

501
165

205
267

401
69

400
70

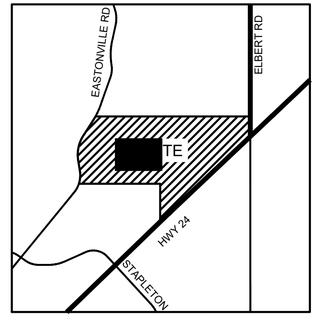
E

D1
24.33
0.31
0.46

B3
118.90
0.15
0.30

31
24
51
40
42

2.0%
1.8%
2.5%
1.9%
1.5%



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) % IMPERVIOUSNESS (XX)

LAND USE

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

NOTES:

NORTH

0 100
50

HRGreen

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

PROPOSED DR6

FIG.DR6

IGEL, TREVOR, 4/16/2020 2:56 PM

SEE SHEET DR2

SEE SHEET DR3

SEE SHEET DR6

SEE SHEET DR8

SEE SHEET DR11

EAST FORK TRIBUTARY

EAST FORK

EAST FORK TRIBUTARY

F4
51.81 | 0.11 / 0.50

F2
67.64 | 0.41 / 0.67

64 85 63 65 61 66

74 91 74 171 171 171

605 606 607 162 600 164 601 602

1.9% 2.0% 2.3% 1.9%

Pond F
Tributary Area: 165.72
WQ Vol: 2.62 ac-ft
EURV Vol: 5.94 ac-ft
5 Year Vol: 6.82 ac-ft
100 Year Vol: 10.70 ac-ft

EASTONVILLE RD
ELBERT RD
SITE
HWY 24
STAPLETON

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 XX / BASIN DESIGNATION / % 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

SEE SHEET DR3

SEE SHEET DR7

SEE SHEET DR11

82

H3
6.01 | 0.32 | 0.61
3%

804
16

83
65

H4
27.65 | 0.30 | 0.60
1.5%

803
74

85

806
65

805
15

F4
51.81 | 0.11 | 0.50

605
91

EAST FORK

Pond H
Tributary Area: 72.92
WQ Vol: 1.03 ac-ft
EURV Vol: 2.73 ac-ft
5 Year Vol: 2.90 ac-ft
100 Year Vol: 4.65 ac-ft

H

807
80

74

606

65

607
162

67
258

808
218

O4
467

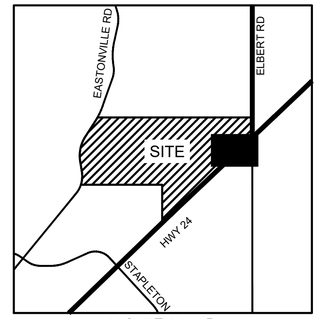
Pond F
Tributary Area: 165.72
WQ Vol: 2.62 ac-ft
EURV Vol: 5.94 ac-ft
5 Year Vol: 6.82 ac-ft
100 Year Vol: 10.70 ac-ft

F
608

2.3%

EAST FORK
TRIBUTARY

602
171



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 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

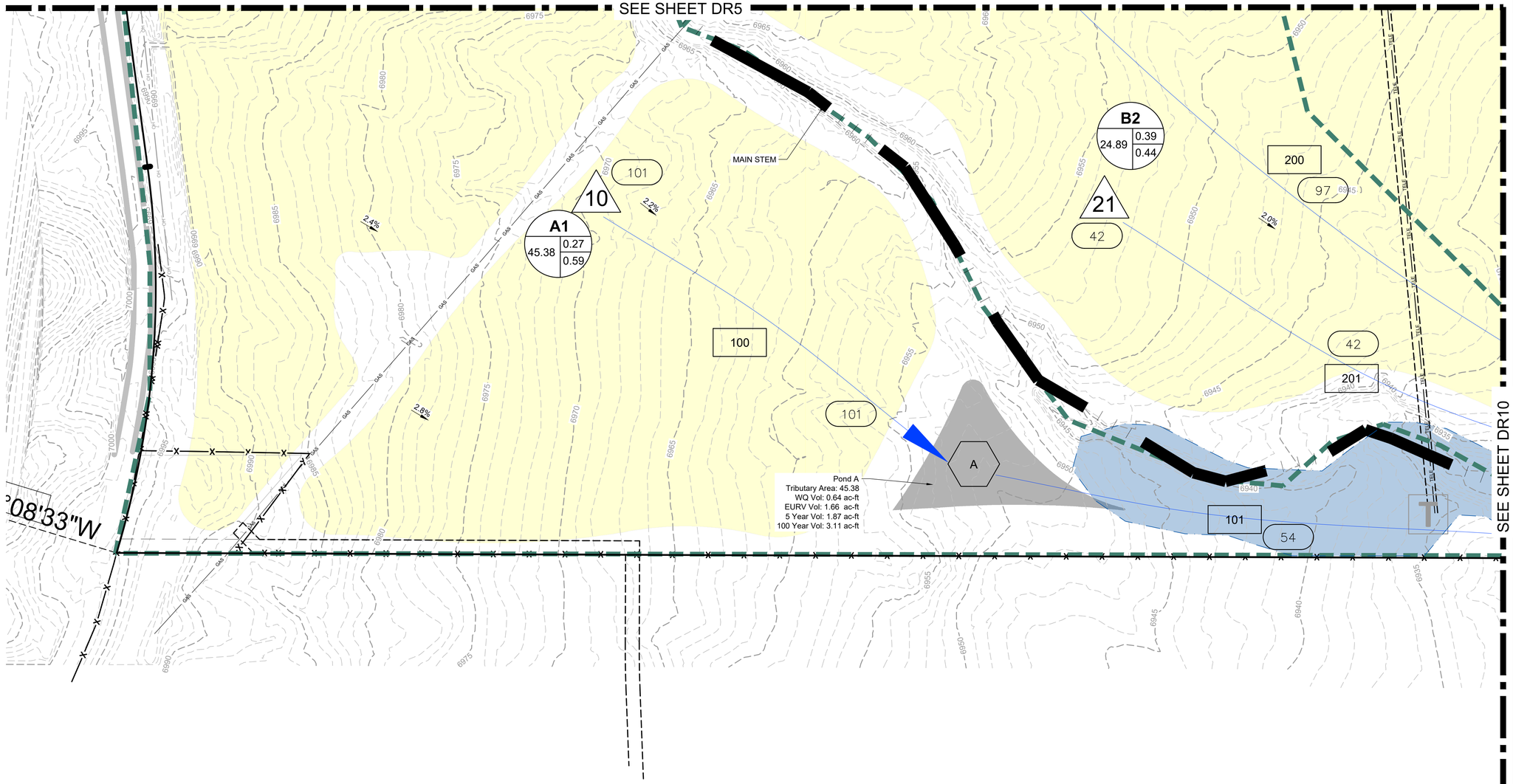
Job No.:	191897.01
Prepared By:	TBI
Date:	04/14/2020

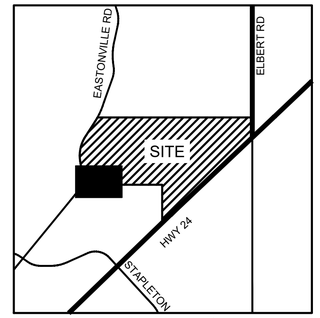
PROPOSED DR8

FIG.DR8

SEE SHEET DR5

SEE SHEET DR10





VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
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- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
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- 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

0 100

50

HRGreen

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

PROPOSED DR9

FIG.DR9

SEE SHEET DR6

SEE SHEET DR9

SEE SHEET DR11

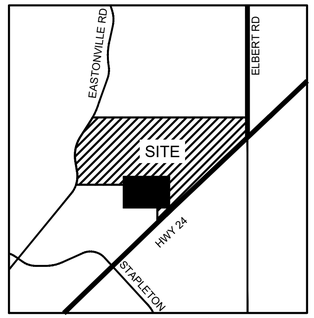
MAIN STEM TRIBUTARY NUMBER 2

Pond B
Tributary Area: 180.79
WQ Vol: 2.41 ac-ft
EURV Vol: 5.73 ac-ft
5 Year Vol: 6.04 ac-ft
100 Year Vol: 15.28 ac-ft

205
267
200
42
97
201
202
136
23
O1
54
B
164
206
O2
101
401
69
402
252

1.5%
2.2%
1.8%
1.7%

6935 6930 6925 6920 6915 6910 6905 6900 6895 6890 6885



VICINITY MAP

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- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
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- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
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- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
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- 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 — A
- PROPOSED BASIN LABEL — XX (BASIN DESIGNATION); AREA (AC.) XX; XX % IMPERVIOUSNESS

LAND USE

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- MEDIUM DENSITY
- HIGH/MED DENSITY
- HIGH DENSITY
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- 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

SEE SHEET DR8

SEE SHEET DR10

STATE HIGHWAY 24

D2
77.90 | 0.47 | 0.60

41
252

402
252

401
69

161
403

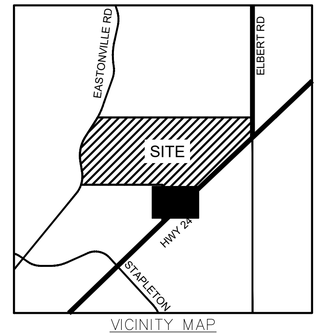
O3
161

D

Pond D
Tributary Area: 102.23
WQ Vol: 1.96 ac-ft
EURV Vol: 6.56 ac-ft
5 Year Vol: 6.59 ac-ft
100 Year Vol: 10.13 ac-ft

1.7%
1.9%
1.8%
1.7%
1.8%

6890 6895 6885 6880 6875 6870



VICINITY MAP

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- EXISTING MINOR CONTOUR
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- 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

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

NOTES:

NORTH
0 100
50

HRGreen

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

PROPOSED DR11

FIG.DR11