

FINAL DRAINAGE REPORT
FOR
GRANDWOOD RANCH

Prepared for:
EL PASO COUNTY
Engineering Development Review Team
2880 International Circle
Colorado Springs, CO 80910

On Behalf of:
Sylvan Vista, Inc.
14160 Gleneagle Drive
Colorado Springs, CO 80921



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Project No. 20.1120.003

PCD File No. SF-20-026

Engineer's Statement:

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



Corey A. Petersen
Registered Professional Engineer
State of Colorado
No. 56571

Date

Developer's Statement:

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

Sylvan Vista, Inc.

Business Name

By: _____

Bill Herebic

Date

Title: Owner/Developer

Address: 14160 Gleanagle Drive
Colorado Springs, CO 80921

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.
County Engineer / ECM Administrator

Date

Conditions:

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I. Introduction

The Grandwood Ranch subdivision is within El Paso County jurisdiction and is comprised of a total of 147 acres of 2.5-acre single-family residential (121 acres), open space (18 acres), and public right-of-way (5920 feet).

A. PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to identify and evaluate the offsite and onsite drainage patterns associated with the Grandwood Ranch development and to provide updated hydrologic and hydraulic analyses of this area to ensure compliance with the El Paso County Drainage Criteria Manual (DCM) and the approved Preliminary Drainage Report, as well as provide effective, safe routing to downstream outfalls.

There are no previous applicable DBPS or MDDP reports covering the proposed development.

B. DBPS-RELATED INVESTIGATIONS

The proposed development is located within the Jackson Creek Drainage basin. No Drainage Basin Planning Study (DBPS) has been completed for this drainage basin.

C. AGENCY JURISDICTIONS

This project is located within El Paso County and is subject to the design criteria set forth in the *City of Colorado Springs & El Paso County Drainage Criteria Manual, Volumes I and II, dated May 2014 (DCM)* as well as the *El Paso County DCM, El Paso County Engineering Criteria Manual (ECM)* and *El Paso County Resolutions 15-042 and 19-245*.

D. GENERAL PROJECT DESCRIPTION

Grandwood Ranch extends from Higby Road on the south boundary north approximately ¼ mile to the north boundary. East to west the site is just under a mile (5136 feet) in length. The approximately 147-acre site is currently made up of sparsely grassed areas and areas of mature conifers/pine trees. The site slopes to the south with slopes from 2 percent up to in excess of 30 percent. The site is divided near the middle by a natural ridge with two locations with large and has two non-draining small basins along Higby Road on the downhill portion of the ridge dividing the site.

More specifically, the study area is located as follows:

1. General Location: The south half of the north half of Section 19, Township 11 South, Range 66 West of the 6th P.M. in the County of El Paso, State of Colorado.
2. Surrounding Streets and Developments:
 - a. North: The properties to the north are within several different developments. These developments from west to east include: Timberview Subdivision Filings No. 2 and 3, Mills Timber Subdivision, Arrowood I, and Bent Tree III at the northeast corner.
 - b. East: This boundary of the development adjoins Bent Tree III for the entire length

- c. South: Higby Road: Undeveloped property for the majority of the length and Higby Estates Filing No. 2 for the east roughly 20% of the border.
- d. West: Fairplay Drive: Woodmoor Summit makes up the entire length of the west boundary

Refer to Appendix D for the Vicinity Map.

E. DATA SOURCES

Topographical information for the site was found using a combination of *United States Geological Survey* (USGS) LIDAR as well as field surveying. The *Web Soil Survey* created by the *Natural Resources Conservation Service* was utilized to investigate the existing general soil types within the site and the USGS *StreamStats* website was used to determine the overall drainage basins.

EXISTING DRAINAGE STUDIES

There are two adjacent developments with drainage studies and the approved Preliminary Drainage Report for Grandwood Ranch:

Final Drainage Report for Timberview Subdivision Phase II, by Premier Engineering Inc., June 5, 2001.

Final Drainage Report for Bent Tree Subdivision Filing No. 3, by RTW Professional Engineers and Consultants, Inc. March 1993.

Mills Timber Subdivision – Drainage Letter, by MVE, Inc. June 2002.

Grandwood Ranch Preliminary Drainage Report, by Matrix Design Group, June 2020.

F. APPLICABLE CRITERIA AND STANDARDS

This report has been prepared in accordance to the criteria set forth in the City of Colorado Springs and El Paso County DCM, El Paso County Engineering Criteria Manual (ECM) and El Paso County Resolutions 15-042 and 19-245. In addition to the DCM, the *Urban Storm Drainage Criteria Manuals, Volumes 1 through 3*, dated 2016 have been used to supplement the County's Criteria Manual.

II. Project Characteristics

A. BASIN LOCATION AND FLOWS

As mentioned in Section I. E. 3., the Grandwood Ranch project is divided between two major drainage basins and one minor basin.

1. Jackson Creek:

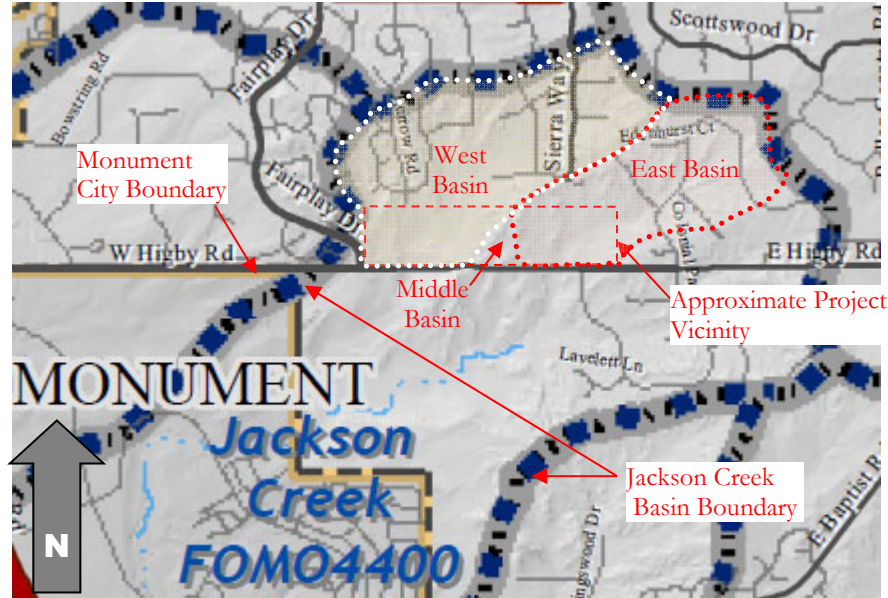


Figure 1 - Project Vicinity: Jackson Creek Drainage Basin

- a. West Basin: The 361-acre West Basin is made up of undeveloped land and 1 or 2-acre single family developments. Upstream of the proposed development this basin is divided into two other drainage basins. Runoff from the basin sheet flows off the residential lots and drains via grassed road ditches towards the site. The westernmost of the two basins drains into an existing detention pond in the Timberview development. This basin is conveyed through the proposed development area via a broad undefined drainage way and crosses Higby Road via a 15-inch culvert. The second basin drains to a large open area upstream of Minglewood Trail and discharges via a 30-inch crossroad pipe to a broad undefined drainage way running through the site. The flows are eventually discharged to a wetland area and from there conveyed across Higby Road via a 29-inch x 42-inch elliptical culvert.

Runoff from the second basin to the east, sheet flows off residential lots to several vegetated swales. The swales direct the runoff south and into the proposed development. A short section of Drainage Easement in the Mills Timber Subdivision exists just north of the property boundary. According to the Drainage Letter for Mills Timber Subdivision, the 100-foot wide section corresponds with a natural spring and associated pond. This pond does not appear to have any embankment, so breach analysis was not required. The narrower section of easement appears to be intended for one of the swales through the Mills Timber Subdivision, but, according to the 2018 LIDAR used in this report to identify the offsite basins, the drainage easement no longer appears to follow a defined swale. Once reaching the site, flows from this drainage area are

directed south via natural swales. The offsite flows will be conveyed under the proposed roadway and will eventually discharge to the natural wetland on the south end of the project. As much as possible, the offsite and 2.5-acre lot runoff will not be allowed to mix with runoff from the proposed streets in order to reduce the detention requirements for the proposed development.

- b. East Basin: The 266-acre East Basin is made up of undeveloped land and 1-acre plus single-family development. Much of the offsite portion of this basin is within the Bent Tree III subdivision. Bent Tree III is required to detain and discharge runoff from the development at rates as indicated in the Drainage Criteria governing in 1993 when the drainage report for the site was approved. Once reaching the site offsite flows in this basin are conveyed by grassed swales to a wetland area which discharges across Higby Road via a 48-inch CMP culvert.

c. Minor Central Basin

The Minor Central Basin is 6.4 acres. This basin is on the front side of the ridge dividing the Grandwood Ranch development. Flows in this basin sheet flow south towards Higby Road and into an existing 18-inch culvert crossing Higby Road. Some flow is captured in two low spots adjacent to Higby Road. There do not appear to be any culverts draining the two low spots. The soils in this area (described in the following section) are highly permeable and runoff to the low spots will infiltrate quickly. A site visit did not note any signs of ponding or wetland plants in these low points, so it is likely that the highly permeable soil removes runoff faster than it can accumulate. If the low areas did happen to fill up beyond the natural infiltration capacity, the surcharge would continue west along the Higby Road ditch to an existing culvert.

B. GEOLOGY

Soils can be classified in four different hydrologic groups, A, B, C, or D to help predict stormwater runoff rates. Hydrologic group “A” is characterized by deep, well-drained coarse-grained soils with a rapid infiltration rate when thoroughly wet and having a low runoff potential. Group “D” typically has a clay layer at or near the surface, or a very shallow depth to impervious bedrock and has a very slow infiltration rate and a high runoff potential. See Soils Map; Appendix C. The following soil types are present in the development area:

Table 1.1 – NRCS Soil Survey for El Paso County

<i>SOIL ID NUMBER</i>	<i>SOIL</i>	<i>HYDROLOGIC CLASSIFICATION</i>	<i>SATURATED CONDUCTIVITY (IN/HR)</i>	<i>PERCENT ON SITE</i>
1	Alamosa loam, 1 to 3 percent slopes	D	1.28	6.4%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	13.04	57.5%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	3.97	20.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	B	13.04	15.2%

C. LAND USES

The site was previously zoned RR5 (min. 5-acre lot sizes) but has been rezoned to RR2.5 to allow the development to provide 48 single-family lots of at least 2.5 acres.

III. Hydrologic Analysis

A. MAJOR BASINS AND SUBBASINS

As mentioned in previous sections, the Grandwood Ranch development must be broken into two major basins and one minor basin to reflect areas within three general drainage paths through the site. These basins are all within the larger Jackson Creek Drainage Basin which is tributary to Fountain Creek.

Generally, under proposed conditions, offsite flows will be routed around or under the proposed roads. Culvert sizing for each lot will be provided so that drainage is maintained as the individual lots are developed. More channelized flow paths through the proposed lots have had drainage easements defined to maintain the drainage. Lots receiving these flows, but not currently possessing a defined flow path for a drainage easement to follow will require engineered site plans.

B. METHODOLOGY

The DCM requires SCS runoff method for drainage areas larger than 130 acres. Additionally, for these larger areas, two different storm durations must be considered (2-hour and 24-hour), and the more conservative of the two options will be utilized for design of infrastructure. In this case the 24-hour event was the more conservative.

The hypothetical rainfall depths for the 1-hour storm duration were derived using Table 2.1 of the DCM (shown below). These 1-hour rainfall depths were used to calculate the 2-hour design storm using Table 6-2 from the DCM which lists the “2-Hour Storm Distribution” (see Appendix B). This design storm is input to HEC-HMS via a time-series relationship. 24-hour storm events are modeled using a Type II storm distribution under the “Hypothetical Storm” option in HEC-HMS. Rainfall depths for this event were taken from Table 6-2 of the DCM.

Table 6-2. Rainfall Depths for Colorado Springs

Return Period	1-Hour Depth	6-Hour Depth	24-Hour Depth
2	1.19	1.70	2.10
5	1.50	2.10	2.70
10	1.75	2.40	3.20
25	2.00	2.90	3.60
50	2.25	3.20	4.20
100	2.52	3.50	4.60

Where $Z = 6,840 \text{ ft}/100$

Water quality and storm detention for the proposed roads is modeled in UD-Detention. Detention ponds are placed throughout the site to balance the use of space with the need to treat and detain runoff from the proposed streets and, also, maintain the historic discharge from the property. Runoff

Reduction calculations for street areas which were infeasible to detain were performed using the MHFD UD-BMP runoff reduction spreadsheet. Areas used for runoff reduction are illustrated in the appendices and are protected from development by either a drainage easement or road right of way.

Site permeability is based on Tables 5-4 through 5-6 of the DCM and/or Table 6-10 of the Colorado Springs DCM. The proposed site will have an estimated 11% impervious for the 2.5-acre lots, however, the runoff calculations are slightly more conservative and use the 12% impervious SCS curve number for 2-acre lots which is provided in the Colorado Springs DCM Table 6-10 and the NRCS SCS Method publication. Offsite areas upstream are modeled as approximately 1 or 2 acre lots.

Under proposed conditions, the portions of the development treated and detained within the proposed detention ponds is addressed in the HMS models by inputting an outflow hydrograph derived from the MHFD-Detention model of each proposed pond.

Existing detention ponds are modeled within HEC-HMS by stage-area relationship information and the model uses the discharge structure for the pond described in the associated historical drainage report. The modeling of surface runoff matched fairly closely with the original for the tributary undetained Q100 flow value (135.7 cfs vs 136.7 cfs), and, since the model included with this report allowed for roughly double the value indicated in the Bent Tree III FDR (129.0 cfs vs 51.2 cfs), the modeling is very conservative relative to the previous report.

C. BASIN HYDROLOGY

- a. The ***undeveloped conditions*** for the site have been analyzed and are presented by design points (Table 3.2) and are described as follows:

1. West Basin:

Under existing conditions, the developments directly north of Grandwood Ranch have several discharge points onto the proposed development. One of these is an existing detention pond for Timberview Subdivision Phase II (DP 1: $Q_5 = 13.3$ cfs, $Q_{100} = 29.1$ cfs). The next development to the east, Timberview Subdivision Filing No. 3, provides a second discharge point at DP 2 with $Q_{100} = 45.6$ cfs. Additionally, a swale runs along the south boundary of Arrowwood Filing No. 1 and past Mills Timber Subdivision and discharges ($Q_5 = 44.9$ cfs, $Q_{100} = 114.3$ cfs) to this same basin at DP 3. These three areas combine at DP 3a discharging a combined $Q_5 = 55.3$ cfs and $Q_{100} = 136.6$ cfs onto the subject property. The total existing discharge from the adjacent and proposed developments at Higby Road (DP EX 2 & DP EX 3 combined) is approximately 67.0 cfs for the Q_5 event and 179.5 cfs for the Q_{100} event.

2. East Basin:

This basin also has a significant drainage area upstream of the proposed development site. Flows from the Bent Tree Subdivision discharge to the Grandwood Ranch property. These flows include the discharge from the Bent Tree III detention pond as well as undetained flows from other portions of the subdivision. Offsite flows tributary to this sub-basin are approximately: $Q_5 = 53.1$ cfs, $Q_{100} = 135.7$ cfs. The existing detention pond reduces these flows to $Q_5 = 44.8$ cfs, $Q_{100} = 129.0$ cfs.

Total discharge from the East Basin across Higby Road at DP EX-1 is approximately 47.2 cfs for the Q_5 event and 136.1 cfs for the Q_{100} event.

3. Minor Central Basin:

Under existing conditions this basin has a total discharge of $Q_5 = 2.5$ cfs, $Q_{100} = 10.0$ cfs at DP EX-4. This basin is not affected by offsite flows.

Existing conditions consider all the on-site areas as undeveloped. Sub-basins and Design Points are summarized in the following tables:

Table 3.1 Grandwood Ranch Existing Conditions Sub-Basin Summary Table			
Area ID	Area (Acres)	Q5 (cfs)	Q100 (cfs)
EX-1A	82.1	10.4	26.8
EX-1B	8.0	1.7	5.2
EX-1C	5.8	2.3	6.0
EX-1D	24.7	9.6	24.5
EX-1E	37.0	13	33.2
EX-1F	52.7	16.6	42.7
EX-1G	62.5	20.9	53.2
EX-2A	14.36	5.7	14.6
EX-2B	34.14	0.6	5.8
EX-2C1	13.28	5.2	13.1
EX-2C2	33.24	0.2	3.9
EX-2C3	6.04	0.1	1.0
EX-2D	21.51	8.7	20.8
EX-2D1	14.40	11.2	19.3
EX-2D2	12.65	5.2	13.2
EX-2D3	16.40	6.2	15.9
EX-2E	12.37	5.3	13.4
EX-2F	19.74	6.3	16.1
EX-2G	12.42	4.5	11.5
EX-2H	31.60	11.5	29.2
EX-2I	13.29	4.8	12.3
EX-2J	48.38	16.5	42.0
EX-3	19.40	3.7	12.1
EX-3A	40.57	14.9	37.8
EX-4	8.2	5.2	13.2

Table 3.2 Grandwood Ranch Existing Design Point Summary				
Design Point	Sub-Basins	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
1	EX-3A	40.6	13.3	29.1
2	EX-2D1, EX-2D2, EX-2D	48.8	21.9	45.6
3	EX-2E, EX-2F, EX-2G, EX-2H, EX-2I, EX-2J	137.6	44.9	114.3
3a	EX-3A, EX-2D1, EX-2D2, EX-2D, EX-2E, EX-2F, EX-2G, EX-2H, EX-2I, EX-2J	227.0	55.3	136.6
4	Design Point 5, EX-1B, EX-1C	190.9	45.6	130.7
5	Design Point 6	177.0	44.9	128.9
6	EX-1D, EX-1E, EX-1F, EX-1G	177.0	53.1	135.7
EX-1	Design Point 4, EX-3	270.9	47.3	136.6
EX-2	EX-2A, EX-2B, Design Point 2, EX-2D3, Design Point 3, EX-2C1, EX-2C2, EX-2C3	303.9	56.4	145.5
EX-3	Design Point 1, EX-3	59.9	10.6	34.0
EX-4	EX-4	8.2	2.5	10

HEC-HMS outfall values for the Predevelopment Q₅ and Q₁₀₀ storms are shown below:

Q5 Runoff

Project: GWR 5 YR Final Simulation Run: EX - 5 YR 24HR				
Start of Run: 01Jan2020, 00:00		Basin Model: EX GWR		
End of Run: 02Jan2020, 00:05		Meteorologic Model: 24 HR 5 YR		
Compute Time:29Jun2020, 17:18:31		Control Specifications:GR Control		
Show Elements: <div>All Elements</div>		Volume Units: <div><input checked="" type="radio"/> IN <input type="radio"/> AC-FT</div>		Sorting: <div>Alphabetic</div>
Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin EX-1B	0.0126	1.7	01Jan2020, 12:45	0.56
Basin EX-1C	0.0091	2.3	01Jan2020, 12:35	0.86
Basin EX-1D	0.0390	9.6	01Jan2020, 12:35	0.85
Basin EX-1E	0.0579	13.0	01Jan2020, 12:40	0.85
Basin EX-1F	0.0810	16.6	01Jan2020, 12:50	0.85
Basin EX-1G	0.0977	20.9	01Jan2020, 12:45	0.85
Design Point 4	0.2973	45.5	01Jan2020, 14:50	0.77
DP 3a	0.3169	55.3	01Jan2020, 14:15	0.91
EX-1A	0.1260	6.0	01Jan2020, 12:50	0.25
EX-2A	0.0220	5.7	01Jan2020, 12:30	0.86
EX-2B	0.0530	0.6	01Jan2020, 13:00	0.09
EX-2C1	0.0210	5.2	01Jan2020, 12:35	0.85
EX-2C2	0.0520	0.2	01Jan2020, 14:05	0.04
EX-2C3	0.0100	0.1	01Jan2020, 13:25	0.06
EX-2D	0.0340	8.7	01Jan2020, 12:45	0.99
EX-2D1	0.0225	11.2	01Jan2020, 12:35	1.76
EX-2D2	0.0198	5.2	01Jan2020, 12:30	0.86
EX-2D3	0.0256	6.2	01Jan2020, 12:35	0.85
EX-2E	0.0190	5.3	01Jan2020, 12:30	0.86
EX-2F	0.0310	6.3	01Jan2020, 12:50	0.85
EX-2G	0.0190	4.5	01Jan2020, 12:40	0.85
EX-2H	0.0490	11.5	01Jan2020, 12:40	0.85
EX-2I	0.0210	4.8	01Jan2020, 12:40	0.85
EX-2J	0.0760	16.5	01Jan2020, 12:45	0.85
EX-3	0.0302	3.7	01Jan2020, 12:45	0.51
EX-3A	0.0634	14.9	01Jan2020, 12:40	0.85
EX-4	0.0100	1.9	01Jan2020, 12:05	0.35
Junction EX-2D	0.0763	21.9	01Jan2020, 13:15	1.18
Reservoir OS-1	0.0634	13.3	01Jan2020, 12:55	0.85
Reservoir OS-5	0.2756	44.8	01Jan2020, 14:00	0.80
Route DP 1	0.0190	5.3	01Jan2020, 14:05	0.83
Route DP 2	0.0310	6.3	01Jan2020, 13:40	0.84
Route DP 3	0.0190	4.5	01Jan2020, 14:15	0.83
Route DP 5	0.0210	4.8	01Jan2020, 14:15	0.83
Route DP 6	0.0760	16.4	01Jan2020, 14:25	0.82
Route ex	0.0490	11.5	01Jan2020, 14:20	0.82
Route EX-1E	0.0579	13.0	01Jan2020, 13:30	0.84
Route EX-1F	0.0810	16.5	01Jan2020, 13:45	0.83
Route EX-1G	0.0977	20.9	01Jan2020, 13:40	0.84
Route EX-2A	0.0220	5.7	01Jan2020, 13:15	0.84
Route EX-2C1	0.0210	5.1	01Jan2020, 13:30	0.84
Route EX-2C2	0.0520	0.2	01Jan2020, 14:55	0.04
Route EX-2D1	0.0225	11.2	01Jan2020, 13:20	1.74
Route EX-2D2	0.0198	5.2	01Jan2020, 13:20	0.84
Route EX-2D3	0.0256	6.2	01Jan2020, 13:20	0.84
Route Res OS-1	0.0634	13.3	01Jan2020, 13:40	0.84
Route Res OS-5	0.2756	44.8	01Jan2020, 14:50	0.78
Route Upper Basin	0.2973	45.5	01Jan2020, 15:40	0.75
Route Upper Junction	0.3169	55.3	01Jan2020, 15:00	0.90
R-EX-1	0.4233	47.2	01Jan2020, 15:40	0.60
R-EX-2	0.4749	56.4	01Jan2020, 15:05	0.69
R-EX-3	0.0936	10.6	01Jan2020, 14:15	0.73
Sink EX-1	0.4233	47.2	01Jan2020, 15:35	0.60
Sink EX-2	0.4749	56.4	01Jan2020, 15:00	0.69
Sink EX-3	0.0936	10.6	01Jan2020, 14:10	0.73
Sink EX-4	0.0100	1.9	01Jan2020, 12:00	0.35
Upper Junction	0.2150	44.9	01Jan2020, 14:15	0.83

Q100 Runoff

Project: GWR 100 YR Final Simulation Run: EX - 100 YR 24HR				
Start of Run: 01Jan2020, 00:00		Basin Model: EX GWR		
End of Run: 02Jan2020, 00:05		Meteorologic Model: 24 HR 100 YR		
Compute Time: 30Jun2020, 15:15:04		Control Specifications: GR Control		
Show Elements:	All Elements	Volume Units:	<input checked="" type="radio"/> IN <input type="radio"/> AC-FT	Sorting: <input type="text" value="Alphabetic"/>
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin EX-1B	0.0126	5.2	01Jan2020, 12:40	1.51
Basin EX-1C	0.0091	6.0	01Jan2020, 12:30	2.06
Basin EX-1D	0.0390	24.5	01Jan2020, 12:35	2.06
Basin EX-1E	0.0579	33.2	01Jan2020, 12:40	2.05
Basin EX-1F	0.0810	42.2	01Jan2020, 12:50	2.05
Basin EX-1G	0.0977	53.2	01Jan2020, 12:45	2.05
Design Point 4	0.2973	130.1	01Jan2020, 14:40	1.87
DP 3a	0.3169	136.6	01Jan2020, 14:15	2.10
EX-1A	0.1260	26.8	01Jan2020, 12:50	0.89
EX-2A	0.0220	14.6	01Jan2020, 12:30	2.06
EX-2B	0.0530	5.8	01Jan2020, 12:50	0.50
EX-2C1	0.0210	13.1	01Jan2020, 12:35	2.06
EX-2C2	0.0520	3.9	01Jan2020, 12:50	0.38
EX-2C3	0.0100	1.0	01Jan2020, 12:40	0.43
EX-2D	0.0340	20.8	01Jan2020, 12:45	2.27
EX-2D1	0.0225	19.3	01Jan2020, 12:35	3.04
EX-2D2	0.0198	13.2	01Jan2020, 12:30	2.06
EX-2D3	0.0256	15.9	01Jan2020, 12:35	2.06
EX-2E	0.0190	13.4	01Jan2020, 12:30	2.06
EX-2F	0.0310	16.1	01Jan2020, 12:50	2.05
EX-2G	0.0190	11.5	01Jan2020, 12:35	2.06
EX-2H	0.0490	29.2	01Jan2020, 12:40	2.06
EX-2I	0.0210	12.3	01Jan2020, 12:40	2.05
EX-2J	0.0760	42.0	01Jan2020, 12:45	2.05
EX-3	0.0302	12.1	01Jan2020, 12:45	1.48
EX-3A	0.0634	37.8	01Jan2020, 12:40	2.06
EX-4	0.0100	7.5	01Jan2020, 12:05	1.19
Junction EX-2D	0.0763	45.6	01Jan2020, 13:15	2.42
Reservoir OS-1	0.0634	29.1	01Jan2020, 13:00	2.05
Reservoir OS-5	0.2756	128.3	01Jan2020, 13:50	1.91
Route DP 1	0.0190	13.4	01Jan2020, 14:05	2.00
Route DP 2	0.0310	16.0	01Jan2020, 13:35	2.02
Route DP 3	0.0190	11.5	01Jan2020, 14:10	2.00
Route DP 5	0.0210	12.3	01Jan2020, 14:15	1.99
Route DP 6	0.0760	41.9	01Jan2020, 14:25	1.99
Route ex	0.0490	29.2	01Jan2020, 14:20	1.99
Route EX-1E	0.0579	33.2	01Jan2020, 13:30	2.02
Route EX-1F	0.0810	42.1	01Jan2020, 13:40	2.01
Route EX-1G	0.0977	53.1	01Jan2020, 13:40	2.02
Route EX-2A	0.0220	14.6	01Jan2020, 13:15	2.03
Route EX-2C1	0.0210	13.0	01Jan2020, 13:30	2.02
Route EX-2C2	0.0520	3.9	01Jan2020, 13:40	0.37
Route EX-2D1	0.0225	19.3	01Jan2020, 13:20	3.01
Route EX-2D2	0.0198	13.2	01Jan2020, 13:20	2.03
Route EX-2D3	0.0256	15.8	01Jan2020, 13:20	2.03
Route Res OS-1	0.0634	29.1	01Jan2020, 13:50	2.02
Route Res OS-5	0.2756	128.3	01Jan2020, 14:40	1.88
Route Upper Basin	0.2973	130.1	01Jan2020, 15:30	1.84
Route Upper Junction	0.3169	136.6	01Jan2020, 15:00	2.07
R-EX-1	0.4233	136.1	01Jan2020, 15:30	1.55
R-EX-2	0.4749	145.5	01Jan2020, 15:00	1.67
R-EX-3	0.0936	34.0	01Jan2020, 13:45	1.84
Sink EX-1	0.4233	136.1	01Jan2020, 15:25	1.55
Sink EX-2	0.4749	145.5	01Jan2020, 14:55	1.67
Sink EX-3	0.0936	34.0	01Jan2020, 13:40	1.84
Sink EX-4	0.0100	7.5	01Jan2020, 12:00	1.19
Upper Junction	0.2150	114.3	01Jan2020, 14:15	1.99

b. The **fully developed conditions** for the site are as follows:

Generally, runoff will sheet flow off of the various highpoints within each sub-basin. These flows will sheet flow towards natural swales and/or road ditches. More specific flow descriptions can be found in the Design Point description tables in the following sections. A feature of the drainage for most of these areas is that the peak runoff from the proposed development arrives at Higby Road earlier and its peak is thus mostly offset from the peak flows from upstream contributors of runoff. This reduces the effects of development on the overall peak discharge across Higby Road. To further reduce the effects of undetained development, the proposed detention ponds will over-detain as much as practical given the space available. This generally leads to a small decrease for the Q50 and Q100 events and negligible increases for the higher probability storms within tolerances considered allowable by the MHFD-Detention spreadsheet parameters. Additional discussion regarding the offsetting of peak flows throughout the basins is available in Appendix A. Natural detention created by Higby Road also buffers increases in runoff from the proposed development.

• **West Basin:**

Section I.7.1.B.5 of the county Engineering Criteria Manual excludes low density Large Lot Single-Family development from permanent water quality treatment, as such, the residential areas are only detained as necessary to prevent an increase in the total flow discharge from the property. The proposed streets, however, do require detention and this is provided for the majority of the proposed streets. However, it is impractical to detain flows from the two cul-de-sacs resulting in 0.55 acres of impervious streets undetained (0.28 AC in Sub-basin W-1 & 0.27 acres in Sub-basin W-7). Per ECM Section I.7.1.C.3 the UD-BMP Runoff Reduction calculation has been used to determine that the flows from these two cul-de-sacs are treated via infiltration of the entire WQ volume prior to entering the wetland tract. The flow path will be protected from development by a combination of road Right of Way and Drainage Easements designed to maintain the pervious footprint indicated in the UD-BMP runoff reduction spreadsheet. This spreadsheet can be found in the appendices. Sub-basins and Design Points within this major basin are summarized in Tables 3.3, 3.4, and 3.5 below:

Table 3.3a <u>Grandwood Ranch</u> West Basin Proposed Conditions - Sub-basin Summary			
Basin	Area	Q5	Q100
	acres	cfs	cfs
OS-1	40.6	14.9	37.8
OS-2A	14.4	5.7	14.6
OS-2B	6.4	5.5	14.0
OS-3A	21.5	5.5	14.0
OS-3B	16.4	11.0	26.4
OS-3C	12.7	5.2	13.2
OS-4A	12.7	6.2	15.9
OS-4B	12.4	5.3	13.4
OS-4C	19.7	6.3	16.1
OS-4D	12.4	4.5	11.5
Table 3.3 b			

Grandwood Ranch West Basin Proposed Conditions - Sub-basin Summary			
OS-4E	31.6	11.5	29.2
OS-4F	13.3	4.8	12.3
OS-4G	48.4	16.5	42.0
OS-4H	13.3	5.2	13.1
W-1	19.3	7.0	17.4
W-2	3.1	0.2	1.2
W-3	7.3	3.0	7.6
W-4	3.9	1.3	3.3
W-5	9.3	2.1	5.4
W-6	1.8	0.8	2.1
W-7	16.4	6.3	15.8
W-8	2.5	1.0	2.7
W-9	2.0	0.7	1.7
D-1	10.8	6.7	15.1
D-2	8.2	4.5	9.5

Table 3.4 Grandwood Ranch West Basin Proposed Design Point Summary					
Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
1	OS-1	EX-3	40.6	13.3	29.1
2	OS-3A, OS-3B, OS-3C	C-2	48.8	14.4	36
3	OS-4B, OS-4C, OS-4D, OS-4E, OS-4F, OS-4G	C-2	137.6	44.9	114.3
C-1	OS-2A, OS-2B, W-3	C-3	33.2	9.5	23.9
C-2	W-4, Design Point 2, OS-4A, Design Point 3, OS-4H, W-5	C-3	225.9	53.6	135.1
C-3	W-8, Design Point C-1, Design Point C-2, W-6, W-7	EX-2	280.7	57.0	142.9
C-4	D-1	EX-2	12.8	6.7	15.1
C-5	D-1	EX-2	12.8	6.7	15.1
C-6	D-2	EX-2	6.4	4.5	9.5
C-7	W-9	EX-2	1.9	0.7	1.7
EX-2	W-2, Pond 1, Design Point C-3, Pond 2, W-9	N/A	305.0	54.6	143.2
EX-3	Design Point 1, W-1	N/A	59.9	11.2	35.7
Total West Basin Discharge Across Higby Road				65.8	178.9

Table 3.5
Grandwood Ranch
West Basin
Proposed Design Point Flow Description

Design Point	Description
1	Flows from this Design Point originate from the offsite detention basin located on Timberview Subdivision Phase II. These flows are conveyed onsite through overland flows through sub-basin W-1 and proceed to drain into culvert EX-3. Flow for this Design Point does not follow a defined channel through the site.
2	The flows at this point represent the offsite flows from a series of sub-basins concentrating at an existing drainage easement. These sub-basins are consistent between the pre- and post-development conditions. As the flows proceed onsite, there is some existing channelization on the boundary of sub-basins W-3 and W-4, towards culvert C-2, however the predominant flow mechanism is overland flow.
3	This Design Point captures the overland flows for a series of offsite sub-basins that are consistent between the pre- and post- development conditions. These flows travel overland to the culvert at Design Point C-2 and avoid the existing drainage easement.
C-1	This design point crosses the proposed east-west road. Flows follow the existing site topology and road embankment to concentrate at this location. Flows will be discharged into sub-basin W-8.
C-2	This design point is a culvert crossing the east-west road. Flows come from Design Points 2 and 3, across sub-basin W-4. Culvert C-2 discharges into sub-basin W-8 where flow proceeds as overland flow.
C-3	This design point captures the overland flows from the majority of the south-east area of the West Basin as well as the incoming flows from culverts C-1 and C-2 and conveys them across the north-south road and into sub-basin W-2 for discharge from the site.
C-4	This Design Point captures the overland flow from a section of sub-basin D-1 and the runoff from a section of the road for routing to Pond 1. The culvert passes these flows under a small section of road that does not require detention.
C-5	This Design Point captures the overland flow from sub-basin D-1 for transport under the east-west road to Pond 1.
C-6	This Design Point captures the overland flow from a section of sub-basin D-2 and the runoff from the east-west road for conveyance across a small section of roadway (0.27 ac.) that does not require detention.
C-7	This design point captures the overland flow from basin W-9 for passage through a culvert under the north-south road and into sub-basin W-2 for discharge from the site.

Drawings of these sub-basins and design points are illustrated in Drawing DR-02 in Appendix D.

- **East Basin:**

Section I.7.1.B.5 of the county Engineering Criteria Manual excludes low density Large Lot Single-Family development from permanent water quality treatment, as such, the residential areas are only detained as necessary to prevent an increase in the total flow discharge from the property. The proposed streets, however, do require detention. Per ECM Section I.7.1.C.3 the UD-BMP Runoff Reduction calculation has been used to determine that these flows are treated via infiltration of the entire WQ volume prior to entering the drainage tract. Sub-basins and Design Points within this major basin are summarized in Q₅ and Q₁₀₀ HMS tables and Tables 3.6, 3.7, and 3.8 on the following pages:

Table 3.6 <u>Grandwood Ranch</u> East Basin Proposed Conditions - Sub-basin Summary			
Basin	Area	Q5	Q100
	acres	cfs	cfs
OS-5	15.6	4.2	10.6
OS-6A	24.7	9.5	24.3
OS-6B	37.0	13.0	33.2
OS-6C	52.7	16.8	42.7
OS-6D	62.5	20.9	53.2
E-1	5.0	2.1	5.3
E-2	8.5	3.1	7.2
E-3	21.5	3.1	9.9
E-4A	8.0	2.8	7.2
E-4B	6.6	2.3	6.0
D-3	19.2	4.5	14.2
D-4A	4.4	1.3	3.4
D-4B	6.6	2.7	6.8

<p>Table 3.7 Grandwood Ranch East Basin Proposed Design Point Summary</p>					
Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
4	OS-6A, OS-6B, OS-6C, OS-6D	5	177.0	44.9	128.8
5	Design Point 4 (Offsite reservoir)	C-10	177.0	53.1	135.7
C-8	E-1	EX-3	13.2	2.1	5.3
C-9	D-3	EX-3	19.2	4.5	14.2
C-10	OS-5, E-2	EX-3	22.5	7.3	17.8
C-11	Design Point 4, E-4A, E-4B	EX-3	191.0	45.7	130.9
C-12	D-4A, D-4B	EX-3	6.6	4.0	10.2
EX-1	E-1, Pond 3, Pond 4, E-3	N/A	270.9	49.5	140.6

<p>Table 3.8 Grandwood Ranch East Basin Proposed Design Point Flow Description</p>	
Design Point	Description
4	This Design Point measures the outflow from the offsite detention basin in sub-basin OS-6A. Flows discharged from the reservoir travel overland onto the site to Design Point C-10.
5	The Design Point measures the incoming flow to the offsite reservoir on basin OS-6A. These flows are described in the Bent Tree III Drainage Report. Once detained in the offsite detention basin, their peak is attenuated, and the detention basin discharges to Design Point 4.
C-8	This Design Point measures the overland flow from sub-basin E-1 and into culvert C-8. This culvert directs flows across the road, around Pond 3, and into sub-basin E-3 for discharge off site.
C-9	This Design Point measures the overland flow from sub-basin D-3 and into the culvert. This flow is directed across the road where it flows into Pond 3.
C-10	This Design Point measures the overland flow from sub-basin E-2 and directs the flow across the road and into sub-basin E-3. Sub-basin E-2 includes a small section of road (0.41 ac.) that does not require detention and is discharged into sub-basin E-3.
C-11	This Design Point measures the flow from the offsite detention basin in Bent Tree III and overland flow from two onsite sub-basins. This flow is conducted through a culvert and into sub-basin E-3 for discharge from the site.
C-12	This design point describes a low point in the roadside swale in sub-basin D-4B. Runoff will sheet flow from this sub-basin until it is captured in the roadside swale and directed to the 18-inch culvert.

- **Minor Central Basin:**

Section I.7.1.B.5 of the county Engineering Criteria Manual excludes low density Large Lot Single-Family development from permanent water quality treatment, as such, the residential areas are only detained as necessary to prevent an increase in the total flow discharge from the property. Under proposed conditions flows for this small basin towards the middle of the study area will sheet flow towards two low points near Higby Road. Sub-basins and Design Points within this major basin are summarized and described in Tables 3.9, 3.10, and 3.11 on the following pages:

Table 3.9 Grandwood Ranch Minor Central Basin Proposed Conditions - Sub-basin Summary			
Basin	Area	Q5	Q100
	(ac.)	(cfs)	(cfs)
W-10	8.2	3.6	12.7

Table 3.10 Grandwood Ranch Minor Central Basin Proposed Design Point Summary					
Design Point	Sub-Basins	Downstream Design Point	Total Area (ac.)	Q5 (cfs)	Q100 (cfs)
MHFD: UD Detention	Basin W-10	N/A	8.2	2.6	10.1

Note: Detention for this basin is provided by extending a small berm across the drainage swale just outside the Higby Road Right-of-Way. Two outlet pipes through the berm are staged to provide a discharge compliant with El Paso County and MHFD criteria. Please see the MHFD-Detention sheet in the appendix.

c. Summary of Site Discharges

Table 3.11 Grand Wood Ranch Comparison of Site Discharges						
Design Point	Pre Development		Post Development		Ratio Pre vs Post	
	Q5	Q100	Q5	Q100	Q5	Q100
EX-1	47.3	136.6	49.5	140.6	1.05	1.03
EX-2	56.4	145.5	54.6	143.2	0.97	0.98
EX-3	10.6	34	11.2	35.7	1.06	1.05
EX-4 UD Detention Analysis	2.5	10	2.6	10.1	1.04	1.01

Note: UD-Detention Allows for a ratio up to 1.10 without highlighting the Ratio Cell Red.

d. Detention

A summation of the proposed detention and water quality ponds is found below. UD-Detention spreadsheets for each detention pond can be found in Appendix A. Detention ponds will be privately owned and maintained by the HOA. Please note that significant over detention is provided.

Table 3.12 Pond Summary Table Jackson Creek										
Major Basin	Pond ID	Analysis Method	Contributing Basins	Approximate Detention Volumes			EX	PR	EX	PR
				WQCV	EURV	Q100	5-YR	5-YR	100 YR	100 YR
				Ac.-Ft.	Ac.-Ft.	Ac.-Ft.	(CFS)	(CFS)	(CFS)	(CFS)
West	Pond 1	MHFD-Detention (EDB)	D-1	R:0.082 P:0.083	R:0.169 P:0.170	R:0.445 P:0.670	1.5	0.7	6.9	4.9
West	Pond 2	MHFD-Detention (EDB)	D-2	R:0.138 P:0.138	R:0.430 P:0.432	R:0.752 P:0.754	3.4	1.1	14.1	7.4
East	Pond 3	MHFD-Detention (EDB)	D-3	R:0.195 P:0.197	R:0.365 P:0.368	R:1.130 P:1.249	7.0	5.0	30.1	24.4
East	Pond 4	MHFD-Detention (EDB)	D-4	R:0.059 P:0.059	R:0.106 P:0.106	R:0.357 P:0.433	3.2	0.8	13.1	7.9
Middle	W-10 Release	MHFD-Detention	W10	N/A	5-Year R:0.094 P: 0.092	R:0.236 P: 0.270	2.5	2.5	10.0	9.5

R: Required (as indicated in MHFD-Detention)

P: Provided

Emergency Overflows

Table 3.13 Emergency Overflow Weirs		
Major Basin	Pond ID	Description of Emergency Overflow Weir
West	Pond 1	In the case of blockage, the emergency overflow weir will direct flows into the adjacent wetland area. From here flows will continue to follow historic paths.
West	Pond 2	In the case of blockage, the emergency overflow weir will direct flows into the adjacent wetland area. From here flows will continue to follow historic paths.
East	Pond 3	Overflows for this pond will flow via the emergency spillway to the adjacent Higby Road ditch. From here flows are directed into the adjacent wetland area. Flows will continue to follow historic paths.
East	Pond 4	In the case of blockage, the emergency overflow weir will direct flows into the adjacent wetland area. From here flows will continue to follow historic paths.
Middle	Pond 5	In the case of blockage, the emergency overflow weir will direct flows into the Higby Road ditch. From this point flows will follow historic paths.

Outfall Analysis

Outfall analysis will be completed with the Final Drainage report. The discharges will need to comply with the criteria indicated for erosive soils in Table 12-3 (shown below) of the DCM regarding Hydraulic Design Criteria for natural unlined channels.

Table 12-3. Hydraulic Design Criteria for Natural Unlined Channels

Design Parameter	Erosive Soils or Poor Vegetation	Erosion Resistant Soils and Vegetation
Maximum Low-flow Velocity (ft/sec)	3.5 ft/sec	5.0 ft/sec
Maximum 100-year Velocity (ft/sec)	5.0 ft/sec	7.0 ft/sec
Froude No., Low-flow	0.5	0.7
Froude No., 100-year	0.6	0.8
Maximum Tractive Force, 100-year	0.60 lb/sf	1.0 lb/sf

¹ Velocities, Froude numbers and tractive force values listed are average values for the cross section.

² “Erosion resistant” soils are those with 30% or greater clay content. Soils with less than 30% clay content shall be considered “erosive soils.”

The Web Soil Survey for the site indicates that the Soils for the receiving swale are are classified as gravelly or sandy loams which are erosive soils.

Jurisdictional Dam Determination-On Site:

All proposed detention ponds have been specifically designed to be under the criteria for a jurisdictional Dam.

Analysis of Off-site Upstream Dams:

There are two existing detention ponds upstream of the proposed development within Timberview Subdivision Phase II and Bent Tree Filing No. 3. Hazard and breach analysis of the two offsite dams. In summary, the detention pond with Timberview Subdivision was found as a “No Public Hazard” dam and the detention pond within Bent Tree Filing No. 3 was found as a “Low Hazard” dam.

Timberview Subdivision Phase II: This detention pond is located near the northwest corner of the proposed development. This pond is briefly described in the FDR for Timberview Subdivision Phase II. Based on the anticipated discharge from the pond and the contours shown in the Phase II FDR drainage map the pond is estimated to detain water at a depth of approximately 3 feet and a volume of approximately 0.5 Acrefeet. Using these values in the Colorado Division of Water Resources “Estimation of Dam Breach Parameters Using the Froehlich 2008 Method”, the peak discharge during a breach event is estimated to be approximately 73 cfs. This flow is small enough that downstream infrastructure, including driveway culverts will be able to handle the flow with little to no damage and no loss or endangerment of life is anticipated. Therefore, the embankment of this pond should be considered a “No Public Hazard” Dam (NPH)

Bent Tree Filing No. 3:

Detention for Bent Tree Filing No. 3 is provided in a detention pond just east of the proposed development. According to the FDR the Bent Tree Filing No. 3 the detention pond is anticipated to be approximately 10.07 feet deep (just over Jurisdictional Dam Criteria) with a volume of 3.8 Acre- Feet. Using these values in the Colorado Division of Water Resources “Estimation of Dam Breach Parameters Using the Froehlich 2008 Method”, a peak discharge during a breach event is estimated to be approximately 807 cfs. To accommodate this flow and minimize the hazard of the embankment, proposed lots (Lot 9) within the Grandwood Ranch development have been configured to allow the natural swale currently carrying the pond discharge to fall close to the lot lines. This swale will terminate just before the proposed roadway at an inlet or FES where normal flows will be captured and directed across the proposed road and back into natural drainage ways. The proposed roadway at this location will receive armoring to prevent failure in the case of an upstream dam breach. Lot 9 will have a designated “No Build” area at least 90 feet wide along the north property line to provide a clear conveyance and reduce the likelihood of damage to private property in the case of a breach. The above factors allow the offsite basin hazard classification to remain at “Low Hazard.” Correspondence with the State of Colorado Division of Water Resources regarding hazard.

IV. Drainage Facilities

A roadside ditch capacity calculation is included in the appendix. The swale calculation has been applied to the most critical swale scenarios for the Site. The two scenarios provided are Furrow Road with a longitudinal slope of 9.9% and Grandwood Drive seeing the largest flows at 27.7 cfs. Both scenarios remain within the limits of maximum velocities for erosive soils at 5 ft/sec. More detailed Swale and roadside ditch capacities will be included in the FDR. Crossroad culvert sizing is summarized in the table below:

Cross Road Culvert Sizing

Manning's n	0.013	(reinforced concrete)	<u>Allowable Velocities in Culverts</u>	
Min Diameter	18	inches	Min v	3 fps
			max V	18 fps

*Dam breach flow used

	Design Point	Peak Discharge (cfs)	Max Slope (%)	Culvert Diameter (ft)	Velocity (ft/s)	Stormwater Treatment	
West Basin	C-1	23.9	6	1.5	16.5	Bypass of Historic Flow	
	C-1	11.5	7.5	2	14.8	Treated Developed Flow	(Basin D-2)
	C-2	135.1	3.5	3	18	Bypass of Historic Flow	(2 culverts, 69 cfs each)
	C-3	142.9	3.5	3	18	Bypass of Historic Flow	(2 culverts, 72.8 cfs each)
	C-4	15.1	2	1.5	14.71	Treated Developed Flow	
	C-5	15.1	2	3	14.71	Treated Developed Flow	
	C-6	9.5	4.5	1.5	11.9	Treated Developed Flow	
East Basin	C-7	1.7	6.5	1.5	8.3	Bypass of Historic Flow	
	C-8	5.3	7	1.5	11.9	Bypass of Historic Flow	
	C-9	14.2	6.5	2	15	Treated Developed Flow	
	C-10	17.8	3.3	1.5	12.2	Bypass of Historic Flow	
	C-11	130.9	2.5	2.5	15	Bypass of Historic Flow	(2 culverts, 65.6 cfs each)
	C-12	10.2	10	1.5	14.75	Treated Developed Flow	

The Final Plat and Construction Documents for this development lays out several proposed drainage easements along areas of defined or concentrated flow. The proposed conditions Drawings DR-02 through DR-04 indicate where an engineered site plan will be required. This will require the consideration of these flows in the design of each lot and will allow the builder to choose the optimal solution to convey these flows through each lot.

V. STRUCTURE IMPROVEMENTS

Because all flows from Grandwood Ranch, which require treatment, are to be treated for water quality and detention onsite and the proposed project will not increase peak flows from the property, additional construction in any downstream Regional Detention Pond and/or improvements to the channel downstream will not be required.

Existing Infrastructure:

EX-1: 48-inch CMP

Condition Fair. Some rust in the bottom third of the culvert.

Improvement: None required

	Minor Event	Major Event	
Flow	49.4	140.4	CFS
Velocity	4.81	10.49	Ft/s
PR Depth Over Higby	N/A	0.26	Ft
EX Depth Over Higby	N/A	0.23	Ft

EX-2: 29-inch by 42-inch Elliptical CMP

Condition: Fair. Minor rust in floor of culvert. Minor sediment accumulation in upstream end of pipe.

Improvement: Please note that the Grandwood Ranch Preliminary Drainage Report stated improvements required for an additional 1-19-inch by 30-inch HERCP to reduce Q100 discharge across Higby Rd. After further analysis with this FDR, the additional culvert is no longer required. Final design of the ponds resulted in additional over-detention with Pond 1 and Pond 2, ultimately resulting in reduced flows to Design Point EX-2 from calculations performed with the PDR. The proposed culvert shown within all preliminary documents has been removed in all final documents.

	Minor Event	Major Event	
Flow	54.5	142.8	CFS
Velocity (Existing 29"x 42")	17.01	28.26	Ft/s (Note: Improved over EX)
PR Depth Over Higby	N/A	0.16	Ft
EX Depth Over Higby	N/A	0.22	Ft

EX-3: 15-inch CMP

Condition Fair. Some rust and sediment accumulation.

Improvement: Remove sediment

	Minor Event	Major Event	
Flow	11.2	35.7	CFS
Velocity	9.16	9.28	Ft/s
PR Depth Over Higby	N/A	0.12	Ft
EX Depth Over Higby	N/A	0.11	Ft

EX-4: 18-inch CMP

Condition Fair. Some rust and sediment accumulation.

Improvement: Remove sediment

	Minor Event	Major Event	
Flow	2.7	5.7	CFS
Velocity	3.89	5.01	Ft/s
PR Depth Over Higby	N/A	N/A	Ft
EX Depth Over Higby	N/A	N/A	Ft

VI. FLOODPLAINS

Per the ***Flood Insurance Rate Map (FIRM) 08041C 0279-G***, effective date December 7, 2018, published by the Federal Emergency Management Agency (FEMA), no portion of Grandwood Ranch (Waterview East) lies within any designated 100-year floodplain. This map can be found in Appendix C.

VII. Environmental Evaluations

A. WETLAND IMPACTS

Wetlands and protected wildlife habitats within the project area will not be affected by the proposed development.

B. STORMWATER QUALITY

All on-site detention facilities shall be designed to accommodate water quality requirements. As the development of each parcel progresses, the detention guidelines outlined in this report are to be upheld.

Per Chapter 1, Section 4, of the El Paso County DCM, the DCM requires the UDFCD Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

Step 1: Employ Runoff Reduction Practices

- The low-density nature of this development and the fact that, with a minor exception along a retaining wall, none of the streets will have curb and gutter, means that most, if not all, runoff from impervious surfaces will sheet flow across pervious areas to grass lined swales.

Step 2: Stabilize Drainageways.

- The site is in the Jackson Creek Drainage Fee Basin. Drainage fees, to be paid by the relevant Grandwood Ranch developers at the time of platting, will help fund proposed channel improvements. Information on planned future improvements to the Jackson Creek channel was unavailable for this report.

Step 3: Provide Water Quality Capture Volume

- As required by the DCM, runoff from the proposed streets which is feasible to detain, is directed into proposed detention ponds. Each pond, or series of ponds, will be designed to meet the DCM standards for the release rates of Full Spectrum Detention Ponds for Water Quality Capture Volumes.

Step 4: Consider Need for Industrial and Commercial BMPs

- There are no commercial or industrial components of this development, therefore no BMPs of this nature are required. The Full Spectrum Detention BMP is provided for the proposed Development by the East Pond.

A. PERMITTING REQUIREMENTS

No additional permitting requirements are expected at this time.

VIII. Fee Development

A. UNDEVELOPED PLATTABLE LAND

The Grandwood Ranch Subdivision is made up entirely of undeveloped and unplatted land. Jackson Creek is included within the El Paso County Drainage Basin Fee program. The Drainage Fee has been calculated as part of the Final Drainage Report and must be paid at the time of plat recordation.

IX. Construction Cost Opinion

An estimated opinion of probable cost for proposed improvements has been provided below as well as drainage fees based on 2020 County drainage fees provided in section IX-A.

Engineer's Estimate of Probable Construction Costs				
Grandwood Ranch				
Public Non-Reimbursable				
Item	Unit	Quantity	Unit Cost	Extension
18" RCP	LF	1,285	\$65.00	\$83,525.00
24" RCP	LF	33	\$78.00	\$2,574.00
36" RCP	LF	525	\$120.00	\$63,000.00
14" x 23" HERCP	LF	168	\$130.00	\$21,840.00
34" x 53" HERCP	LF	405	\$320.00	\$129,600.00
29" x 42" HACMP	LF	9	\$294.00	\$2,646.00
TYPE II MANHOLE (Box Base)	EA	5	\$11,627.00	\$58,135.00
Type C Inlet	EA	8	\$4,640.00	\$37,120.00
Type D Inlet	EA	5	\$5,731.00	\$28,655.00
14"x23" FES	EA	8	\$780.00	\$6,240.00
18" FES	EA	13	\$390.00	\$5,070.00
24" FES	EA	1	\$468.00	\$468.00
29"x42" FES	EA	1	\$1,764.00	\$1,764.00
36" FES	EA	7	\$720.00	\$5,040.00
			Sub Total	\$445,677.00
Private Facilities, Detention/Water Quality Pond Non-Reimbursable				
Private Detention/WQ Ponds	LS	1	\$218,210.00	\$218,210.00
8" HDPE Pipe	LF	52	\$45.00	\$2,340.00
14" x 23" HERCP	LF	32	\$130.00	\$4,160.00
15" RCP	LF	40	\$55.00	\$2,200.00
18" RCP	LF	198	\$65.00	\$12,870.00
24" RCP	LF	238	\$78.00	\$18,564.00
TYPE I MANHOLE (Box Base)	EA	2	\$11,672.00	\$23,254.00
Type C Inlet	EA	3	\$4,640.00	\$13,920.00
15" FES	EA	2	\$330.00	\$660.00
14" x 23" HEFES	EA	2	\$780.00	\$1,560.00
18" FES	EA	1	\$390.00	\$390.00
			Sub Total	\$298,128.00
			Total Estimated Construction Costs	\$743,805.00
			10% Contingency	\$74,380.50
			TOTAL:	\$818,185.50

A. REIMBURSABLE COSTS AND FEES

The site is located within the Jackson Creek Drainage Fee Basin. The fees are based upon the platted impervious acreage and will be detailed in the FDR. Jackson Creek is described in the El Paso County Drainage Basin Fee Schedule as an Interim Drainage Basin. Fees will be based on the appropriate version of this Fee Schedule in the FDR.

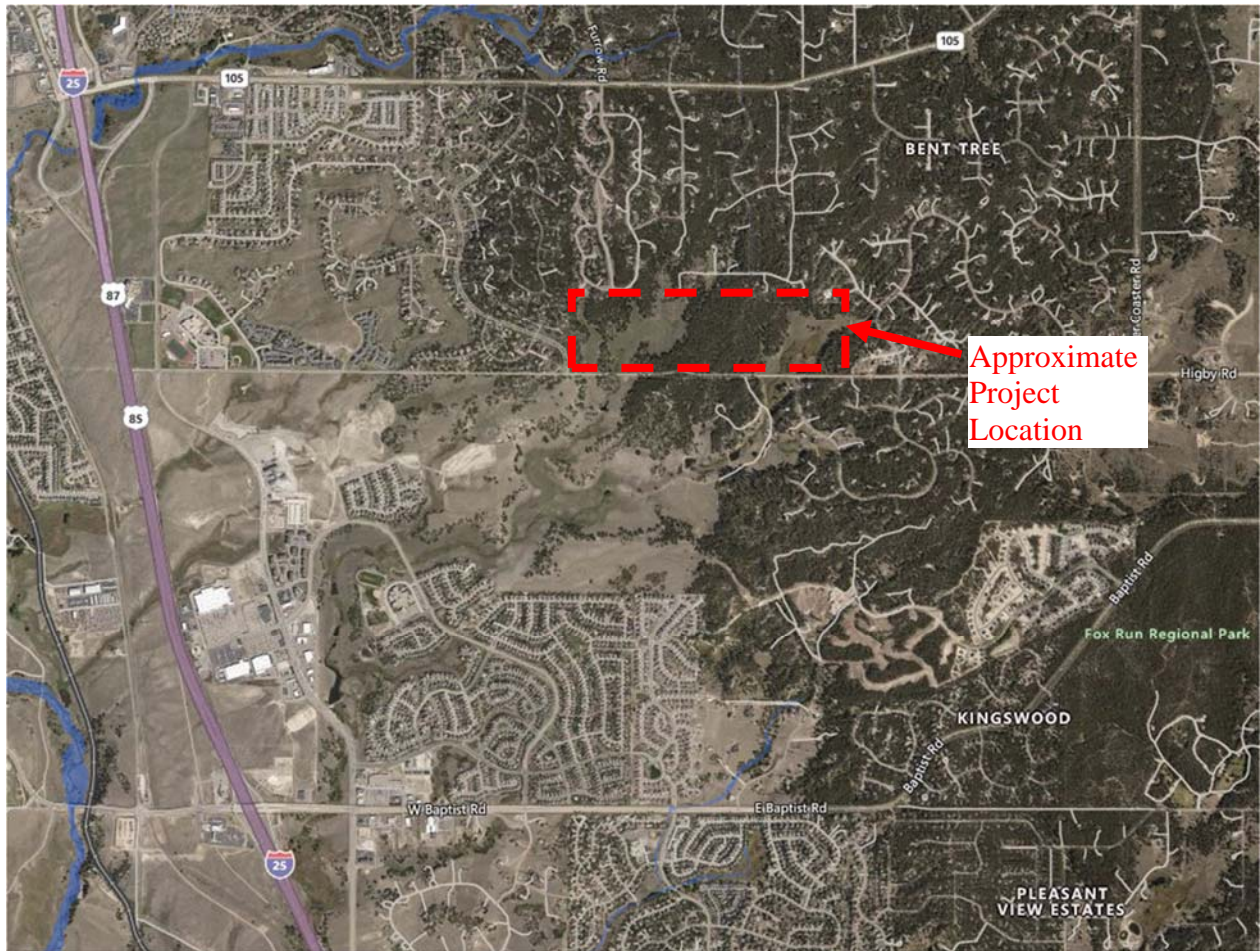
In addition, the County ECM in appendix L, Section 3.10.2a allows for reduction on drainage fees for low density lot development. As stated, the Grandwood Ranch development consists of 2.5 acre lots qualifying the developer for a 25-percent reduction in drainage basin fees. Total drainage fees sum to \$113,469.01 which equates to a \$28,367.25 reduction and a revised drainage fee of \$85,101.76 to be paid.

GRANDWOOD RANCH Final Drainage Report 2020 Drainage and Bridge Fees						
	Impervious Area (ac.)	Fee/ Imp. Acre	Fee Due	Fee Reduction	Fee Due at Platting	Drainage Fee Credit
Jackson Creek						
Drainage Fee	15.021	\$7,554.00	\$113,469.01	At 25% \$28,367.25	\$85,101.76	\$0.00
Bridge Fee	-	-	-	-	-	-
\$28,367.25					\$85,101.76	\$0.00

X. References

1. ***El Paso County and City of Colorado Springs Drainage Criteria Manual, Volume 1 & 2***, El Paso County, May 2014
2. ***El Paso County Engineering Criteria Manual***, El Paso County, Rev. December 2016
3. ***Web Soil Survey of El Paso County Area, Colorado. Unites States Department of Agriculture Soil Conservation Service.***
4. ***Flood Insurance Rate Maps for El Paso County, Colorado and Incorporated Areas, Panel 279 of 1275, Federal Emergency Management Agency***, Effective Date December 7, 2018.
5. ***Urban Storm Drainage Criteria Manual, Vol. 1-3*** by Urban Drainage and Flood Control District (UDFCD), January 2016
6. ***Final Drainage Report for Timberview Subdivision Phase II***, by Premier Engineering Inc., June 5, 2001.
7. ***Final Drainage Report for Bent Tree Subdivision Filing No. 3***, by RTW Professional Engineers and Consultants, Inc. March 1993.
8. ***Grandwood Ranch Preliminary Drainage Report***, by Matrix Design Group, Inc. June 2020.

XI. Appendices



Vicinity Map
Grandwood Ranch Subdivision

APPENDIX A

HYDROLOGIC AND HYDRAULIC CALCULATIONS

SCS Composite Curve Number

Existing Conditions

Basin	Land Type	Area (AC)	CN	% I	Weighted CN	Weighted % I	Initial Abstraction, I _a
EX-1A	2 AC Residential	19.3	65	12	46.64	2.82	1.14
	Pinyon-Juniper-Good	62.8	41	0			
EX-1B	2 AC Residential	5.2	65	12	56.65	7.83	0.77
	Pinyon-Juniper-Good	2.8	41	0			
EX-1C	2 AC Residential	5.8	65	12			0.54
EX-1D	2 AC Residential	24.7	65	12			0.54
EX-1E	2 AC Residential	37.0	65	12			0.54
EX-1F	2 AC Residential	52.7	65	12			0.54
EX-1G	2 AC Residential	62.5	65	12			0.54
EX-2A	2 AC Residential	14.4	65	12			0.54
EX-2B	Woods, good	18.3	55	0	38.70	0.7	1.58
	Pinyon-Juniper-Good	13.8	41	0			
	2 AC Residential	2.1	65	12			
EX-2C1	2 AC Residential	13.3	65	12			0.54
EX-2C2	Woods, good	23.2	55	0	36.10	0	1.77
	Pinyon-Juniper-Good	10.1	41	0			
EX-2C3	Woods, good	3.0	55	0	37.50	0	1.67
	Pinyon-Juniper-Good	3.1	41	0			
EX-2D	2 AC Residential	20.4	65	12	66.74	16.64	0.50
	Road	1.1	98	100			
EX-2D1	2 AC Residential	14.4	65	12			0.54
EX-2D2	2 AC Residential	12.7	65	12			0.54
EX-2D3	2 AC Residential	16.4	65	12			0.54
EX-2E	2 AC Residential	12.4	65	12			0.54
EX-2F	2 AC Residential	19.7	65	12			0.54
EX-2G	2 AC Residential	12.4	65	12			0.54
EX-2H	2 AC Residential	31.6	65	12			0.54
EX-2I	2 AC Residential	13.3	65	12			0.54
EX-2J	2 AC Residential	48.4	65	12			0.54
EX-3	2 AC Residential	4.2	65	12	59.5	2.6	0.68
	Meadow	15.2	58	0			
EX-3A	2 AC Residential	40.6	65	12			0.54
EX-4	Woods, good	8.17	55	0			0.82

Lag Time Calculations

Existing Conditions

	Flow Lengths				Initial Flow				Channel Flow							
Basin	Initial	True Initial Length	Channel	True Channel Length	High Point	Low Point	Average	Initial	High Point	Low Point	Average	Velocity	Channel	Time of Concentration	Time of Concentration	Lag Time
	ft	ft	ft	ft	Elevation	Elevation	Slope	Tt (hr)	Elevation	Elevation	Slope	(ft/s)	Tt (hr)	Tc (hr)	Tc (min)	t lag (min)
EX-1A	2600.8	300	0	2301	7409	7269	0.05	1.2	7409	7269	0.07	4.3	0.1	1.4	83.8	50.3
EX-1B	1746.9	300	0	1447	7426	7323	0.06	1.2	7426	7323	0.08	4.6	0.1	1.3	77.4	46.4
EX-1C	1099.9	300	0	800	7401	7303	0.09	1.0	7401	7303	0.13	5.8	0.0	1.1	63.4	38.1
EX-1D	1334.2	300	0	1034	7432	7329	0.08	1.1	7432	7329	0.10	5.1	0.1	1.1	68.1	40.8
EX-1E	2105.6	300	0	1806	7484	7354	0.06	1.2	7484	7354	0.08	4.6	0.1	1.3	77.4	46.5
EX-1F	2718.3	300	0	2418	7505	7375	0.05	1.3	7505	7375	0.06	4.0	0.2	1.5	88.6	53.2
EX-1G	2446.8	300	0	2147	7506	7375	0.05	1.2	7506	7375	0.07	4.3	0.1	1.4	83.3	50.0
EX-2A	1451.2	300	0	1151	7409	7269	0.10	1.0	7409	7269	0.13	5.8	0.1	1.0	62.5	37.5
EX-2B	1720.2	300	0	1420	7264	7159	0.06	1.2	7264	7159	0.08	4.6	0.1	1.3	76.5	45.9
EX-2C1	1391.1	300	0	1091	7365	7258	0.08	1.1	7365	7258	0.10	5.1	0.1	1.1	68.5	41.1
EX-2C2	2561.1	300	0	2261	7350	7182	0.07	1.2	7350	7182	0.08	4.6	0.1	1.3	77.4	46.4
EX-2C3	882.9	300	0	583	7235	7156	0.09	1.0	7235	7156	0.14	6.0	0.0	1.0	62.7	37.6
EX-2D	2587.1	300	0	2287	7400	7248	0.06	1.2	7400	7248	0.07	4.3	0.1	1.4	81.2	48.7
EX-2D1	1285.8	300	0	986	7411	7316	0.07	1.1	7411	7316	0.10	5.1	0.1	1.2	69.1	41.4
EX-2D2	1192.4	300	0	892	7430	7317	0.10	1.0	7430	7317	0.13	5.8	0.0	1.0	62.1	37.3
EX-2D3	1794.6	300	0	1495	7429	7289	0.08	1.1	7429	7289	0.10	5.1	0.1	1.2	69.4	41.6
EX-2E	1338.1	300	0	1038	7410	7249	0.12	0.9	7410	7249	0.16	6.5	0.0	0.9	57.0	34.2
EX-2F	2590.9	300	0	2291	7379	7259	0.05	1.3	7379	7259	0.06	4.0	0.2	1.5	89.1	53.5
EX-2G	1700.5	300	0	1400	7432	7309	0.07	1.1	7432	7309	0.09	4.8	0.1	1.2	71.3	42.8
EX-2H	2113.0	300	0	1813	7477	7328	0.07	1.1	7477	7328	0.09	4.8	0.1	1.2	73.4	44.0
EX-2I	1793.7	300	0	1494	7425	7309	0.06	1.2	7425	7309	0.08	4.6	0.1	1.2	75.0	45.0
EX-2J	1636.1	300	0	1336	7466	7382	0.05	1.3	7466	7382	0.07	4.3	0.1	1.4	81.4	48.9
EX-3	1543.1	300	0	1243	7251	7171	0.05	1.3	7251	7171	0.07	4.3	0.1	1.3	81.0	48.6
EX-3A	2132.5	300	0	1832	7403	7251	0.07	1.1	7403	7251	0.09	4.8	0.1	1.2	73.2	43.9
EX-4	1094.6	300	0	795	7340	7244	0.09	1.0	7340	7244	0.13	5.8	0.0	1.1	63.8	38.3

Note: Maximum True Initial = 300 LF

Blue Shading indicates inputs to the spreadsheet

Unshaded indicates Calculations performed by the spreadsheet

Flowpath Routing

Existing Conditions

Routing calculations were completed through a combination of flow path calculations and known flow path lengths through sub-basins. These methods are noted below.

By Basin Path	Flow Path	Lag Time
EX-1A		
DP 4 to DP EX-1	EX-1A	50.3
EX-1D		
EX-1E	EX-1D	40.8
EX-1F	Flow Path 6	54.5
EX-1G	Flow Path 6	54.5
EX-2A	EX-2B	45.9
EX-2B		
EX-2C1	Flow Path 3	53.1
EX-2C2	Flow Path 4	50.1
EX-2C3		
EX-2D	EX-2B	45.9
EX-2D1	EX-2D	48.7
EX-2D2	EX-2D	48.7
EX-2D3		90.0
EX-2E		96.2
EX-2F	These basins match proposed basins and routing calculations	48.3
EX-2G		95.6
EX-2H		100.1
EX-2I		95.6
EX-2J		102.7
EX-3		
EX-3A	EX-3	48.6
EX-4		

By Path Length

Flow Path Number	Description	Flow Lengths				Initial Flow				Channel Flow					Time of Concentration	Time of Concentration	Lag Time
		Initial	True Initial Length	Channel	True Channel Length	High Point	Low Point	Average	Initial	High Point	Low Point	Average	Velocity	Channel			
		ft	ft	ft	ft	Elevation	Elevation	Slope	Tt (hr)	Elevation	Elevation	Slope	(ft/s)	Tt (hr)	Tc (hr)	Tc (min)	t lag (min)
1	Design Point 5 to Design Point 4	461	300	0	161	7323	7304	0.04	1.40	7323	7304	0.12	5.6	0.0	1.4	84.5	50.7
2	EX-1F/EX-1G to DP 6	1231.3	300	0	931	7375	7329	0.04	1.44	7375	7329	0.05	3.6	0.1	1.5	90.9	54.5
3	EX-2C1 to Culvert C-2	2198.7	300	0	1899	7258.61	7160	0.04	1.34	7259	7160	0.06	4.0	0.1	1.5	88.5	53.1
4	EX-2C2 to Culvert C-2	528.2	300	0	228	7182.147	7160	0.04	1.38	7182	7160	0.10	5.1	0.0	1.4	83.5	50.1
5	DP 3 to EX-2B	720	300	0	420	7298	7249.39	0.07	1.14	7298	7249	0.12	5.6	0.0	1.2	69.6	41.7
6	Junction of EX-1F/EX-1G to Reservoir OS-6	1231.3	300	0	931	7375	7329	0.04	1.44	7375	7329	0.05	3.6	0.1	1.5	90.9	54.5

Note: Maximum True Initial = 300 LF

SCS Composite Curve Number

Proposed Conditions

Basin	Land Type	Area (AC)	CN	% I	Weighted CN	Weighted % I	Initial Abstraction, I _a
W-1	2 ac Residential	18.9	65	12	65.6	13.6	0.52
	Road	0.4	98	100			
W-2	Wetland	0.3	86	0	45.4	0.0	1.20
	Pinyon-Juniper-Good	2.8	41	0			
W-3	2 ac Residential	7.3	65	12			0.54
W-4	2 ac Residential	3.9	65	12			0.54
W-5	2 ac Residential	9.3	65	12			0.54
W-6	2 ac Residential	1.8	65	12			0.54
W-7	2 ac Residential	16.1	65	12	65.5	13.4	0.53
	Road	0.3	98	100			
W-8	2 ac Residential	2.5	65	12			0.54
W-9	2 ac Residential	2.0	65	12			0.54
W-10	2 ac Residential	8.2	65	12			0.54
OS-1	2 ac Residential	40.6	65	12			0.54
OS-2A	2 ac Residential	14.4	65	12			0.54
OS-2B	2 ac Residential	6.4	65	12			0.54
OS-3A	2 ac Residential	14.4	65	12	65.0	12.0	0.54
	Road	0.0	98	100			
OS-3B	2 ac Residential	20.4	65	12	66.7	16.5	0.50
	Road	1.1	98	100			
OS-3C	2 ac Residential	12.7	65	12			0.54
OS-4A	2 ac Residential	16.4	65	12			0.54
OS-4B	2 ac Residential	12.4	65	12			0.54
OS-4C	2 ac Residential	19.7	65	12			0.54
OS-4D	2 ac Residential	12.4	65	12			0.54
OS-4E	2 ac Residential	31.6	65	12			0.54
OS-4F	2 ac Residential	13.3	65	12			0.54
OS-4G	2 ac Residential	48.4	65	12			0.54
OS-4H	2 ac Residential	13.3	65	12			0.54
D-1	Road	1.3	98	100	68.4	22.3	0.46
	Pinyon-Juniper-Good	0.3	41	0			
	2 ac Residential	9.2	65	12			
D-2	2 ac Residential	6.4	65	12	72.4	31.7	0.38
	Road	1.8	98	100			
D-3	Road	0.4	98	100	64.0	12.9	0.56
	2 ac Residential	18.4	65	12			
	Pinyon-Juniper-Good	1.4	41	0			

Basin	Land Type	Area (AC)	CN	% I	Weighted CN	Weighted % I	Initial Abstraction, Ia
D-4A	2 ac Residential	4.4	65	12			0.54
D-4B	2 ac Residential	6.6	65	12			0.54
E-1	Road	0.0	98	100	68.1	12.0	0.47
	2 ac Residential	5.0	65	12			
E-2	2 ac Residential	6.8	65	12	68.1	20.2	0.47
	Road	0.7	98	100			
E-3	Wetland	0.037	86	0	54.5	6.7	0.83
	Pinyon-Juniper-Good	9.4	41	0			
	2 ac Residential	12.0	65	12			
E-4A	2 ac Residential	8.0	65	12			0.54
E-4B	2 ac Residential	5.8	65	12			0.54
E-5A	2 ac Residential	8.0	65	12			0.54
E-5B	2 ac Residential	5.8	65	12			0.54
OS-5	2 ac Residential	15.6	65	12			0.54
OS-6A	2 ac Residential	24.7	65	12			0.54
OS-6B	2 ac Residential	37.0	65	12			0.54
OS-6C	2 ac Residential	52.7	65	12			0.54
OS-6D	2 ac Residential	62.5	65	12			0.54

Lag Time Calculations

Proposed Conditions - West and Central Basins

Basin	Flow Lengths				Initial Flow				Channel Flow					Time of Concentration	Time of Concentration	Lag Time
	Initial	True Initial Length	Channel	True Channel Length	High Point	Low Point	Average	Initial	High Point	Low Point	Average	Velocity	Channel			
	ft	ft	ft	ft	Elevation	Elevation	Slope	Tt (hr)	Elevation	Elevation	Slope	(ft/s)	Tt (hr)			
W-1	1536.2	300	0	1236.2	7251	7172	0.051	1.270	7251	7172	0.07	4.3	0.1	1.4	81.0	48.6
W-2	279.0	279.0	207.3	207.3	7202	7169	0.117	0.862	7202	7156	0.23	7.7	0.0	0.9	52.2	31.3
W-3	490.2	300	0	190.2	7274	7205	0.141	0.849	7274	7205	0.37	9.8	0.0	0.9	51.3	30.8
W-4	525.6	300	0	225.6	7245	7221	0.046	1.330	7245	7221	0.11	5.4	0.0	1.3	80.5	48.3
W-5	1368.1	300	179.9	1248.0	7356	7276	0.058	1.206	7276	7272	0.01	1.6	0.2	1.4	85.3	51.2
W-6	723.5	300	0	423.5	7338	7261	0.107	0.949	7338	7261	0.19	7.0	0.0	1.0	57.9	34.8
W-7	1679.1	300	0	1379.1	7281	7186	0.056	1.223	7281	7186	0.07	4.3	0.1	1.3	78.8	47.3
W-8	584.0	300	0	284.0	7228	7169	0.100	0.972	7228	7169	0.21	7.4	0.0	1.0	59.0	35.4
W-9	503.4	300	0	203.4	7213	7186	0.053	1.256	7213	7186	0.14	6.0	0.0	1.3	75.9	45.6
W-10	1094.6	300	0	794.6	7340	7244	0.088	0.146	7340	7244	0.087703	1.2	0.2	0.3	19.9	11.9
D-1	1089.2	300	166.7	955.9	7287	7200	0.080	1.066	7200	7170	0.04	3.2	0.1	1.1	68.9	41.3
D-2	538.2	300	644.3	882.5	7262	7206	0.104	0.959	7206	7161	0.06	4.0	0.1	1.0	61.3	36.8
OS-1	2132.5	300	0	1832.5	7403	7251	0.071	1.115	7403	7251	0.09	4.8	0.1	1.2	73.2	43.9
OS-2A	1451.2	300	0	1151.2	7409	7269	0.096	0.987	7409	7269	0.13	5.8	0.1	1.0	62.5	37.5
OS-2B	300.0	300	0	0.0	7274	7238	0.121	0.902	7274	7238	0	0.0	0.0	0.9	54.1	32.5
OS-3A	1285.8	300	0	985.8	7411	7316	0.074	1.097	7411	7316	0.1	5.1	0.1	1.2	69.1	41.4
OS-3B	2587.1	300	0	2287.1	7400	7248	0.059	1.204	7400	7248	0.07	4.3	0.1	1.4	81.2	48.7
OS-3C	1192.4	300	0	892.4	7430	7317	0.095	0.993	7430	7317	0.13	5.8	0.0	1.0	62.1	37.3
OS-4A	1794.6	300	0	1494.6	7429	7289	0.078	1.075	7429	7289	0.1	5.1	0.1	1.2	69.4	41.6
OS-4B	1338.1	300	0	1038.1	7410	7249	0.120	0.905	7410	7249	0.16	6.5	0.0	0.9	57.0	34.2
OS-4C	1192.4	300	0	892.4	7430	7317	0.095	0.993	7430	7317	0.13	5.8	0.0	1.0	62.1	37.3
OS-4D	1700.5	300	0	1400.5	7432	7309	0.072	1.108	7432	7309	0.09	4.8	0.1	1.2	71.3	42.8
OS-4E	2113.0	300	0	1813.0	7477	7328	0.071	1.119	7477	7328	0.09	4.8	0.1	1.2	73.4	44.0
OS-4F	1793.7	300	0	1493.7	7425	7309	0.065	1.158	7425	7309	0.08	4.6	0.1	1.2	75.0	45.0
OS-4G	1636.1	300	0	1336.1	7466	7382	0.051	1.270	7466	7382	0.07	4.3	0.1	1.4	81.4	48.9
OS-4H	1391.1	300	0	1091	7365	7258	0.08	1.1	7365	7258	0.10	5.1	0.1	1.1	68.5	41.1

Note: Maximum True Initial = 300 LF

Blue Shading indicates inputs to the spreadsheet

Unshaded indicates Calculations performed by the spreadsheet

Lag Time Calculations

Proposed Conditions - East Basin

Basin	Flow Lengths				Initial Flow				Channel Flow					Time of Concentration	Time of Concentration	Lag Time
	Initial	True Initial Length	Channel	True Channel Length	High Point	Low Point	Average	Initial	High Point	Low Point	Average	Velocity	Channel			
	ft	ft	ft	ft	Elevation	Elevation	Slope	Tt (hr)	Elevation	Elevation	Slope	(ft/s)	Tt (hr)	Tc (hr)	Tc (min)	t lag (min)
E-1	632.6	300	1052.6	1385.133	7357	7302	0.087	1.0	7304	7270	0.03	2.8	0.1	1.2	70.0	42.0
E-2	613.8	300	0	313.823	7339	7300	0.063	1.2	7339	7300	0.13	5.8	0.0	1.2	71.1	42.7
E-3	1502.6	300	0	1202.637	7339	7300	0.026	1.7	7339	7300	0.04	3.2	0.1	1.8	106.6	64.0
E-4A	1746.9	300	0	1446.865	7426	7323	0.059	1.2	7426	7323	0.08	4.6	0.1	1.3	77.4	46.4
E-4B	1099.9	300	0	799.911	7401	7303	0.089	1.0	7401	7303	0.13	5.8	0.0	1.1	63.4	38.1
D-3	885.3	300	0	585.281	7299	7251	0.055	1.2	7299	7251	0.09	4.8	0.0	1.3	76.3	45.8
D-4A	1168.3	300	0	868.343	7339	7300	0.033	1.5	7339	7300	0.05	3.6	0.1	1.6	94.8	56.9
D-4B	1052.9	300	0	752.923	7394	7300	0.089	1.0	7394	7300	0.13	5.8	0.0	1.1	63.3	38.0
OS-5	3949.9	300	0	3649.897	7423	7308	0.029	1.6	7423	7308	0.04	3.2	0.3	1.9	114.5	68.7
OS-6A	1334.2	300	0	1034.166	7432	7329	0.077	1.1	7432	7329	0.10	5.1	0.1	1.1	68.1	40.8
OS-6B	2105.6	300	0	1805.604	7484	7354	0.062	1.2	7484	7354	0.08	4.6	0.1	1.3	77.4	46.5
OS-6C	2718.3	300	0	2418.312	7505	7375	0.048	1.3	7505	7375	0.06	4.0	0.2	1.5	88.6	53.2
OS-6D	2446.8	300	0	2146.783	7506	7375	0.054	1.2	7506	7375	0.07	4.3	0.1	1.4	83.3	50.0

Note: Maximum True Initial = 300 LF

Blue Shading indicates inputs to the spreadsheet

Unshaded indicates Calculations performed by the spreadsheet

Flowpath Routing

Existing Conditions

Routing calculations were completed through a combination of flow path calculations and known flow path lengths through sub-basins. These methods are noted below.

By Basin Path	Flow Path	Lag Time
OS-1		
OS-2A	Flow Path 6	43.9
OS-2B	W-3	30.8
OS-3A	W-4	48.3
OS-3B	W-4, Flow Path 5	90.0
OS-3C	OS-3A	46.4
OS-4A	OS-3A	46.4
OS-4B	W-4, Flow Path 4	96.2
OS-4C	W-4	48.3
OS-4D	W-4, Flow Path 1	95.6
OS-4E	W-4, Flow Path 3	100.1
OS-4F	W-4, Flow Path 1	95.6
OS-4G	W-4, Flow Path 2	102.7
OS-4H	W-4	48.3
OS-5	E-2, E-3	106.6
OS-6A		
OS-6B	OS-6A	40.8
OS-6C	Flow Path 7	54.5
OS-6D	Flow Path 7	54.5
W-1		
W-2		
W-3		
W-4		
W-5		
W-6	W-7	47.3
W-7		
W-8		
W-9	W-2	31.3
C-1		
E-1	D-3	45.8
E-2	E-3	64.0
E-3		
E-4A		
E-4B		
Pond 1	W-2	31.3
Pond 2	W-2	31.3
Pond 3	E-3	64.0
Pond 4	E-3	64.0

Flow Path

Flow Path Number	Description	Flow Lengths				Initial Flow			Channel Flow						Time of Concentration	Time of Concentration	Lag Time
		Initial	True Initial Length	Channel	True Channel Length	High Point	Low Point	Average	Initial	High Point	Low Point	Average	Velocity	Channel			
		ft	ft	ft	ft	Elevation	Elevation	Slope	Tt (hr)	Elevation	Elevation	Slope	(ft/s)	Tt (hr)	Tc (hr)	Tc (min)	t lag (min)
1	Junction of OS-3D/OS-3F to DP 3	1159.7	300	0	860	7310	7249	0.05	1.3	7310	7249	0.08	4.6	0.1	1.3	78.8	47.3
2	OS-4G to W-4	2891.0	300	0	2591	7382.02	7249	0.05	1.3	7382	7249	0.06	4.0	0.2	1.5	90.7	54.4
3	OS-4E to DP	1959.6	300	0	1660	7340	7249	0.05	1.3	7340	7249	0.06	4.0	0.1	1.4	86.4	51.8
4	OS-4B to W-4	981.1	300	0	681	7298	7249	0.05	1.3	7298	7249	0.08	4.6	0.0	1.3	79.8	47.9
5	DP 3 to W-4	720.0	300	0	420	7298	7249	0.07	1.1	7298	7249	0.12	5.6	0.0	1.2	69.6	41.7
6	OS-2A to Culvert 2	1483.1	300	0	1183	7274	7177	0.07	1.2	7274	7177	0.09	4.8	0.1	1.2	73.2	43.9
7	Junction of OS-6C/OS-6D to Reservoir OS-6	1231.3	300	0	931	7375	7329	0.04	1.4	7375	7329	0.05	3.6	0.1	1.5	90.9	54.5
8	Reservoir OS-6 to C-10	484.9	300	0	185	7332	7305	0.06	1.2	7332	7305	0.15	6.2	0.0	1.2	74.2	44.5
9	OS-6B to Reservoir OS-6	398.4	300	0	98	7353	7329	0.06	1.2	7353	7329	0.25	8.1	0.0	1.2	71.8	43.1

Note: Maximum True Initial = 300 LF

Project Name:

Project Location:

Designer

Notes:

GRANDWOOD RANCH

EL PASO COUNTY

CAP

Proposed Condition , Sub-Basins

Average Channel Velocity

Average Slope for Initial Flow

4

0.04

ft/s

ft/ft

(If specific channel vel is used, this will be ignored)

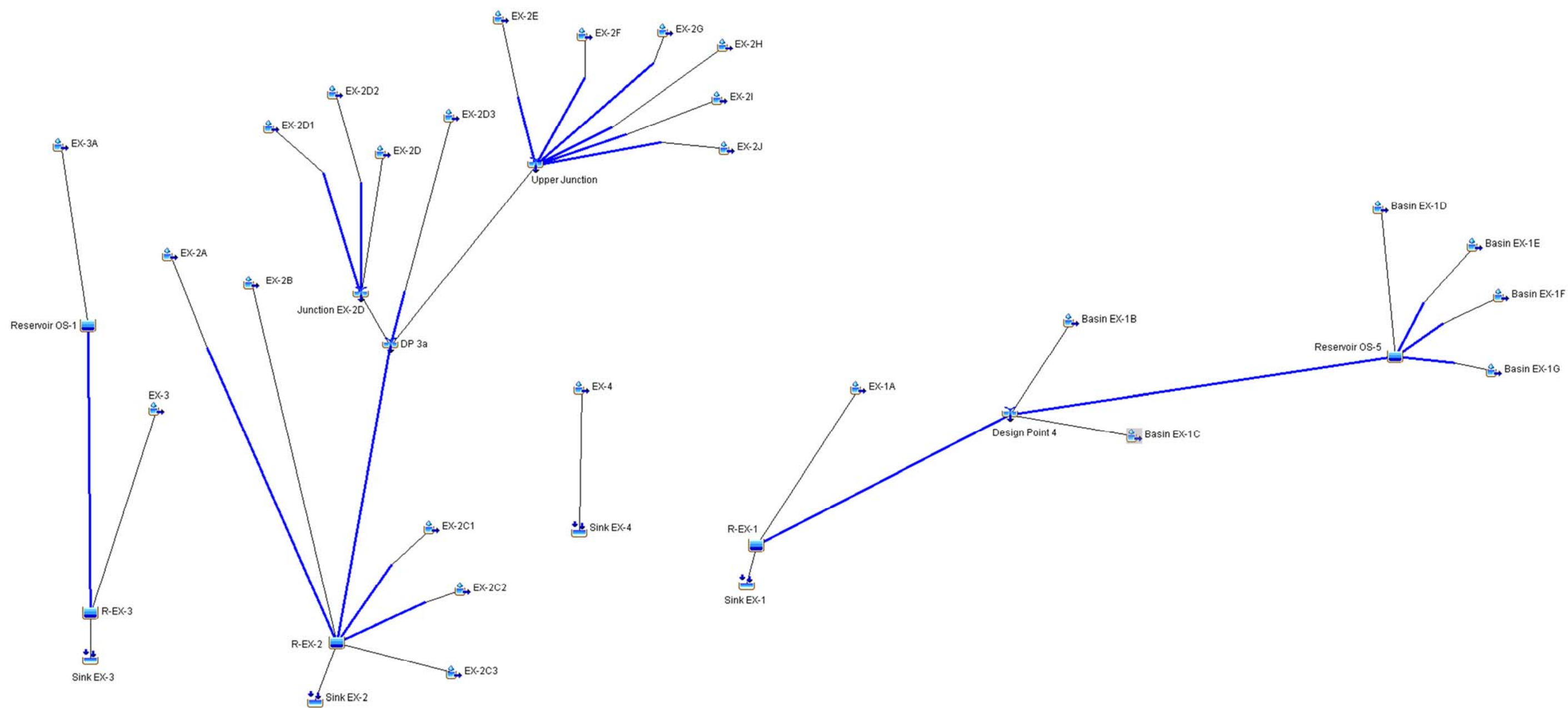
(If Elevations are used, this will be ignored)

Channel Flow Type Key	
Heavy Meadow	2
Tillage/Field	3
Short Pasture and Lawns	4
Nearly Bare Ground	5
Grassed Waterway	6
Paved Areas	7

Basin	Area		Rational 'C' Values										Flow Lengths				Initial Flow		Channel Flow					Tc	Rainfall Intensity & Rational Flow Rate					
	sf	acres	Surface Type 1 Residential 1/8 or less (11% Imp.)			Surface Type 2 Pavement (100% Imp.)			Surface Type 4 Undeveloped (2% Imp.)			Composite		Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i2	Q2	i5	Q5	i100	Q100
			C5	C100	Area (SF)	C5	C100	Area (SF)	C5	C100	Area	C5	C100	ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	in/hr	cfs
D-1A, Trib. to DP C-4	17,200	0.39	0.15	0.40	10596	0.90	0.96	6604	0.09	0.36		0.60	1.13	90.00	90.00	245.00	245.00	0.02	6.83	5.00	7	4.5	0.9	7.7	3.6	0.8	4.5	1.07	7.5	3.39
D-2A, Trib. to DP C-2a	108,093	2.48	0.15	0.40	72598	0.90	0.96	35495	0.09	0.36		0.42	0.67	202.00	202.00	1217.00	1217.00	0.07	9.08	3.50	7	3.7	5.4	14.5	2.8	2.9	3.5	3.71	5.9	9.84
D-2B, Trib. to DP C-6	112,659	2.59	0.15	0.40	104046	0.90	0.96	8613	0.09	0.36		0.23	0.52	300.00	300.00	648.00	648.00	0.33	8.44	6.00	7	4.9	2.2	10.6	3.2	1.9	4.0	2.42	6.7	9.14
D-2C, Trib. to DP C-2b	30,409	0.70	0.15	0.40	15180	0.90	0.96	15229	0.09	0.36		0.61	0.97	30.00	30.00	708.00	708.00	0.02	3.80	4.00	6	3.0	3.9	7.7	3.6	1.5	4.5	1.95	7.6	5.16
	143,068	3.28	0.15	0.40	119,226	0.90	0.96	23,842	0.09	0.36		0.27	0.49	300.00	300.00	1356.00	1356.00	0.02	20.42	4.00	6	3.0	7.5	27.9	2.0	1.8	2.5	2.30	4.2	6.92
D-2D, Trib. to DP C-2d	15,761	0.36	0.15	0.40		0.90	0.96	6464	0.09	0.36	9297	0.59	1.17	65.00	65.00	345.00	345.00	0.02	5.82	8.00	6	4.2	1.4	7.2	3.7	0.8	4.6	1.00	7.7	3.29
D-2E, Trib. to DP C-2e	48,475	1.11	0.15	0.40	39094	0.90	0.96	9381	0.09	0.36		0.35	0.69	76.00	76.00	608.00	608.00	0.03	8.15	8.00	6	4.2	2.4	10.5	3.2	1.3	4.0	1.58	6.8	5.23
D-3A, Trib. to DP C-9	570,338	13.09	0.15	0.40	550177	0.90	0.96	20161	0.09	0.36		0.18	0.44	300.00	300.00	1465.00	1465.00	0.10	13.29	3.50	6	2.8	8.7	22.0	2.3	5.4	2.9	6.87	4.8	27.70
D-3B, Trib. to DP C-9	37,025	0.85	0.15	0.40	20680	0.90	0.96	16345	0.09	0.36		0.55	0.89	30.00	30.00	571.00	1108.00	0.02	4.27	3.50	6	2.8	6.6	10.8	3.2	1.5	4.0	1.89	6.7	5.07
D-4C, Trib. to DP C-12	14,097	0.32	0.15	0.40	7394	0.90	0.96	6703	0.09	0.36		0.70	1.29	30.00	30.00	571.00	278.00	0.02	3.14	3.00	6	2.6	1.8	5.0	4.0	0.9	5.1	1.16	8.6	3.62

Impervious Calculations	1,097,125	25.19	938,991	148,837	9,297	% Impervious	Impervious Acreage
			11.00	100.00	2.00	23.58	5.94

Note: Q2, Q5 & Q10 are based on C5; Q25, Q50 & Q100 are based on C100



EXISTING CONDITIONS HEC-HMS BASIN LAYOUT

PR_East_Basin_GWR.basin

Basin: PR East Basin GWR

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:07

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: Yes

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -1883.90357366932

From Canvas Y: 2571.1693652962567

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 106.6

Channel Loss: None

End:

Subbasin: Basin OS-6C

Description: OS-5C

Last Modified Date: 1 July 2020

Last Modified Time: 17:59:36

Canvas X: 1862.9572697904414

Canvas Y: 2655.2453780700125

From Canvas X: 1862.9572697904414

From Canvas Y: 2655.2453780700125

Area: 0.082

Downstream: Route OS-6C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_East_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 53.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-6B

Description: OS-5B

Last Modified Date: 11 June 2020

Last Modified Time: 22:02:51

Canvas X: 1574.7803926437246

Canvas Y: 2809.314217301934

From Canvas X: 1597.8529604137002

From Canvas Y: 2830.682053392856

Area: 0.0579

Downstream: Route OS-6B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.5

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Reservoir Route

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: 1336.12273862665

From Canvas Y: 2299.4395669498244

Downstream: C-10

PR_East_Basin_GWR.basin

Route: Lag
Initial Variable: Combined Inflow
Lag: 44.5
Channel Loss: None

End:

Reach: Route OS-6B

Last Modified Date: 30 June 2020
Last Modified Time: 20:53:15
Canvas X: 1336.12273862665
Canvas Y: 2299.4395669498244
From Canvas X: 1416.7680854049777
From Canvas Y: 2520.167052110427
Downstream: Reservoir OS-5

Route: Lag
Initial Variable: Combined Inflow
Lag: 50
Channel Loss: None

End:

Subbasin: Basin OS-6A

Description: OS-5A
Last Modified Date: 8 April 2020
Last Modified Time: 14:59:46
Canvas X: 1037.832248645193
Canvas Y: 2834.180904913291
From Canvas X: 1044.252784950505
From Canvas Y: 2822.884867822952
Area: 0.0387
Downstream: Reservoir OS-5

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 40.8
Unitgraph Type: STANDARD

PR_East_Basin_GWR.basin

Baseflow: None

End:

Subbasin: Basin E-4A

Last Modified Date: 12 June 2020

Last Modified Time: 15:39:13

Canvas X: 715.0129745073164

Canvas Y: 2323.649069557905

From Canvas X: 676.6773862670857

From Canvas Y: 2255.6209566399502

Area: 0.0125

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.4

Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: C-10

Last Modified Date: 29 June 2020

Last Modified Time: 16:20:17

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: -84.11606967854232

From Canvas Y: 1597.0236365676153

Downstream: Route E-7

End:

Reach: Route OS-6C

Last Modified Date: 30 June 2020

Last Modified Time: 20:53:15

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1437.8523078061583

From Canvas Y: 2396.139930551316

PR_East_Basin_GWR.basin

Downstream: Reservoir OS-5

Route: Lag

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Subbasin: Basin E-4B

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:50

Canvas X: 1165.3342353785638

Canvas Y: 1932.9953623431986

From Canvas X: 1312.564453923134

From Canvas Y: 1483.4723744861783

Label X: 3.0

Label Y: -7.0

Area: 0.0091

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 38.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-6D

Last Modified Date: 29 June 2020

Last Modified Time: 16:24:28

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1594.6242279570024

From Canvas Y: 2355.412855055983

Downstream: Reservoir OS-5

Route: Lag

PR_East_Basin_GWR.basin

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Reservoir: Reservoir OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1258.6753881228692

From Canvas Y: 2210.8058005854755

Label X: 1.0

Label Y: -7.0

Downstream: Reservoir Route

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: OS-5

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 0.545

Centerline Elevation: 7324.42

Number Barrels: 1

End Conduit:

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 7.06

Centerline Elevation: 7331

Number Barrels: 1

End Conduit:

Spillway: Broad-Crested Spillway

Spillway Outlet: Main

Spillway Crest Length: 20

Spillway Crest Elevation: 7334

Spillway Coefficient: 2.6

End Spillway:

Evaporation Method: Zero Evaporation

PR_East_Basin_GWR.basin

End Evaporation:

End:

Subbasin: Basin OS-6D

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:42

Canvas X: 1883.632123721196

Canvas Y: 2418.0452279029837

From Canvas X: 1874.6530481452974

From Canvas Y: 2417.431218187936

Area: 0.0977

Downstream: Route OS-6D

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 50

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route E-7

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: 324.24823149222857

From Canvas Y: 1424.908662565677

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-1

Last Modified Date: 25 June 2020

PR_East_Basin_GWR.basin

Last Modified Time: 22:22:08
Canvas X: -1999.417346470526
Canvas Y: 1455.897133923738
From Canvas X: -2463.015010284649
From Canvas Y: 2073.938937309651
Label X: 0.0
Label Y: 1.0
Area: 0.0079
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.0
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-3

Last Modified Date: 12 June 2020
Last Modified Time: 15:38:21
Canvas X: -1818.3597961754886
Canvas Y: 1593.6807966465158
From Canvas X: -1639.7683601942304
From Canvas Y: 944.1038795993522
Label X: 0.0
Label Y: 1.0
Area: 0.03
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.56

PR_East_Basin_GWR.basin

Curve Number: 64
Initial Abstraction: 0.6

Transform: SCS
Lag: 45.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 3

Last Modified Date: 29 June 2020
Last Modified Time: 23:19:49
Canvas X: -1589.9080337438222
Canvas Y: 1243.8534768484221
From Canvas X: -1511.7339678911565
From Canvas Y: 640.2004812966065
Label X: 0.0
Label Y: 1.0
Downstream: R-EX-1

Route: Specified Outflow
Routing Curve: Elevation-Storage
Initial Elevation: 0
Elevation-Storage Table: Pond 3
Outflow Gage Name: Pond 3 - Q5

End:

Subbasin: E-3

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:38
Canvas X: -850.7849400791165
Canvas Y: 993.9331280597039
From Canvas X: -1009.5588556422545
From Canvas Y: 1006.5570737441426
Area: 0.0336
Downstream: R-EX-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 6.7
Curve Number: 54.5
Initial Abstraction: 0.83

PR_East_Basin_GWR.basin

Transform: SCS
Lag: 64
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4B

Last Modified Date: 8 April 2020
Last Modified Time: 14:57:45
Canvas X: 77.17075639610812
Canvas Y: 2378.1178945307097
From Canvas X: 778.873522140379
From Canvas Y: 773.7769864771967
Area: 0.0103
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 38
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4A

Last Modified Date: 8 April 2020
Last Modified Time: 14:56:57
Canvas X: -360.964130568138
Canvas Y: 2409.983054835778
From Canvas X: 18.080066194750998
From Canvas Y: 2352.1395294091717
Area: 0.0069
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No

PR_East_Basin_GWR.basin

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 56.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 4

Last Modified Date: 29 June 2020

Last Modified Time: 23:20:00

Canvas X: -260.0285318811434

Canvas Y: 1875.104502058163

From Canvas X: 539.8540713480625

From Canvas Y: 1066.6296604004497

Downstream: Route C-8

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 4

Outflow Gage Name: Pond 4 - Q5

End:

Reach: Route C-8

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -260.0285318811434

From Canvas Y: 1875.104502058163

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-2

PR_East_Basin_GWR.basin

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:42
Canvas X: -1197.4448419312953
Canvas Y: 1642.9984762084644
From Canvas X: -1372.9228943028534
From Canvas Y: 2108.004315934082
Area: 0.010
Downstream: Route C-6

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 20.2
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.7
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-6

Last Modified Date: 29 June 2020
Last Modified Time: 21:03:25
Canvas X: -861.7276411671855
Canvas Y: 285.5041412301971
From Canvas X: -1160.5661289682976
From Canvas Y: 1491.7957530601734
Downstream: R-EX-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 64
Channel Loss: None

End:

Subbasin: Basin OS-5

Last Modified Date: 8 April 2020
Last Modified Time: 15:05:02
Canvas X: -1910.9889810178615
Canvas Y: 2730.049713289869
From Canvas X: -1895.2586998774636

PR_East_Basin_GWR.basin

From Canvas Y: 2743.89138359013

Area: 0.0244

Downstream: Route OS-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 68.7

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-1

Last Modified Date: 29 June 2020

Last Modified Time: 21:44:46

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -616.7135794014512

From Canvas Y: 410.34175233158203

Downstream: Sink EX-1

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-1

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Culvert

Conduit Outlet: Main

Culvert Shape: Circular

Chart Number: 2

Scale Number: 3

Solution Control: Automatic

Diameter: 4

Number Barrels: 1

Culvert Length: 48

PR_East_Basin_GWR.basin

Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7235.6
Outlet Invert Elevation: 7235.2
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 71
Spillway Crest Elevation: 7242
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Sink: Sink EX-1

Last Modified Date: 25 June 2020
Last Modified Time: 14:58:26
Canvas X: -890.526833152149
Canvas Y: 101.46827435515797
From Canvas X: -1043.6242342666856
From Canvas Y: 370.67000608809485
Label X: 3.0
Label Y: -12.0

End:

Basin Layer Properties:

Element Layer:
Name: Icons
Layer shown: Yes
End Layer:

End:

Basin Spatial Properties:

End:

Basin Schematic Properties:

Last View N: 3600.2886002886
Last View S: 829.7258297258295
Last View W: -1868.6868686868684
Last View E: 1233.766233766235
Maximum View N: 3600.2886002886
Maximum View S: 829.7258297258295
Maximum View W: -1868.6868686868684
Maximum View E: 1233.766233766235

PR_East_Basin_GWR.basin

Extent Method: Manual

Buffer: 0

Draw Icons: Yes

Draw Icon Labels: Name

Draw Map Objects: No

Draw Gridlines: No

Draw Flow Direction: No

Draw HillShade Layer: Yes

Draw Elevation Layer: Yes

Elevation Layer Color Palette: Default

Ignore Elevation Color Ramp Scale: No

Use Interpolated Color Ramp for Elevation Layer: Yes

Color Ramp Opacity Level for Elevation Layer: 33.0

Fix Element Locations: No

Fix Hydrologic Order: No

End:

Project: GWR PR Q5 - FDR Simulation Run: PR East - 5 YR 24HR

Start of Run: 01Jan2020, 00:00

Basin Model: PR East Basin GWI

End of Run: 02Jan2020, 00:05

Meteorologic Model: 24 HR 5 YR

Compute Time: 15Sep2020, 15:58:53

Control Specifications: GR Control - PR

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin D-3	0.0300	4.5	01Jan2020, 12:45	0.57
Basin D-4A	0.0069	1.3	01Jan2020, 12:55	0.85
Basin D-4B	0.0103	2.7	01Jan2020, 12:35	0.86
Basin E-4A	0.0125	2.8	01Jan2020, 12:40	0.85
Basin E-4B	0.0091	2.3	01Jan2020, 12:35	0.86
Basin OS-5	0.0244	4.2	01Jan2020, 13:05	0.84
Basin OS-6A	0.0387	9.5	01Jan2020, 12:35	0.85
Basin OS-6B	0.0579	13.0	01Jan2020, 12:40	0.85
Basin OS-6C	0.0820	16.8	01Jan2020, 12:50	0.85
Basin OS-6D	0.0977	20.9	01Jan2020, 12:45	0.85
C-10	0.2979	45.7	01Jan2020, 14:45	0.79
E-1	0.0079	2.1	01Jan2020, 12:35	0.94
E-2	0.0100	3.1	01Jan2020, 12:35	1.10
E-3	0.0336	3.1	01Jan2020, 13:05	0.49
Pond 3	0.0379	5.0	01Jan2020, 01:15	0.36
Pond 4	0.0172	0.8	01Jan2020, 01:35	0.26
Reservoir OS-5	0.2763	44.9	01Jan2020, 14:00	0.80
Reservoir Route	0.2763	44.8	01Jan2020, 14:45	0.78
Route C-6	0.0100	3.1	01Jan2020, 13:40	1.08
Route C-8	0.0172	0.8	01Jan2020, 02:40	0.26
Route E-7	0.2979	45.6	01Jan2020, 15:45	0.75
Route OS-5	0.0244	4.1	01Jan2020, 14:55	0.81
Route OS-6B	0.0579	13.0	01Jan2020, 13:30	0.84
Route OS-6C	0.0820	16.7	01Jan2020, 13:45	0.83
Route OS-6D	0.0977	20.9	01Jan2020, 13:40	0.84
R-EX-1	0.4210	49.4	01Jan2020, 15:50	0.69
Sink EX-1	0.4210	49.4	01Jan2020, 15:45	0.69

PR_West_Basin_GWR.basin

Basin: PR West Basin GWR

Last Modified Date: 23 June 2020

Last Modified Time: 21:06:18

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: No

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route W-9

Last Modified Date: 15 September 2020

Last Modified Time: 20:37:12

Canvas X: 3190836.976908943

Canvas Y: 1454234.159285771

From Canvas X: 3190941.0482914834

From Canvas Y: 1454172.086088502

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 1

Last Modified Date: 15 September 2020

Last Modified Time: 20:37:12

Canvas X: 3190836.976908943

Canvas Y: 1454234.159285771

From Canvas X: 3190788.6775098434

From Canvas Y: 1454841.7546350043

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 2

Last Modified Date: 15 September 2020

Last Modified Time: 20:37:12

PR_West_Basin_GWR.basin

Canvas X: 3190836.976908943
Canvas Y: 1454234.159285771
From Canvas X: 3191285.843830595
From Canvas Y: 1454369.28601614
Downstream: R-EX-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: W-7

Last Modified Date: 25 June 2020
Last Modified Time: 22:00:54
Canvas X: 3191588.062197299
Canvas Y: 1454558.061469289
From Canvas X: 3191726.0696871458
From Canvas Y: 1454578.2102340478
Label X: 0.0
Label Y: -3.0
Area: 0.027
Downstream: Junction C-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.45
Curve Number: 65.5
Initial Abstraction: 0.53

Transform: SCS
Lag: 47.3
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-6

Last Modified Date: 7 April 2020
Last Modified Time: 17:50:28
Canvas X: 3191787.2788931862
Canvas Y: 1454806.7233097618
From Canvas X: 3192492.046785609

PR_West_Basin_GWR.basin

From Canvas Y: 1454929.1016958833

Area: 0.003

Downstream: Route W-6

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-8

Description: Drainage Easement across lot

Last Modified Date: 16 June 2020

Last Modified Time: 22:12:19

Canvas X: 3191046.9812794775

Canvas Y: 1454826.8102695316

From Canvas X: 3191390.648482099

From Canvas Y: 1454613.8680979477

Area: 0.00386

Downstream: Junction C-3

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35.4

Unitgraph Type: STANDARD

PR_West_Basin_GWR.basin

Baseflow: None

End:

Reach: Route to C-3

Description: Combined junction C-1 and C-2 to Junction C-3

Last Modified Date: 6 April 2020

Last Modified Time: 22:00:34

Canvas X: 3191125.8142608823

Canvas Y: 1454636.8944506934

From Canvas X: 3191740.132405288

From Canvas Y: 1455102.301558766

Downstream: Junction C-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4A

Last Modified Date: 8 April 2020

Last Modified Time: 15:10:30

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3191821.555858512

From Canvas Y: 1455495.3148196193

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47.3

Channel Loss: None

End:

Junction: Upper Junction

Description: Combining design points into final basin flow

Last Modified Date: 6 April 2020

Last Modified Time: 16:04:39

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192059.549422635

From Canvas Y: 1455656.9537690468

Downstream: Route OS-3B

End:

Reach: Route W-5

Last Modified Date: 6 April 2020

Last Modified Time: 16:05:38

PR_West_Basin_GWR.basin

Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3192053.9995084023
From Canvas Y: 1455254.1730524607
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Reach: Route W-6

Last Modified Date: 16 June 2020
Last Modified Time: 22:40:46
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191596.658030947
From Canvas Y: 1454785.3109359604
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 47
Channel Loss: None

End:

Reach: Route OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191610.741291508
From Canvas Y: 1455715.037744202
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Junction: Junction C-1

Last Modified Date: 6 April 2020
Last Modified Time: 20:34:48
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191049.172513107

PR_West_Basin_GWR.basin

From Canvas Y: 1455596.382345375

Label X: -84.0

Label Y: -3.0

Downstream: Route C-1

End:

Subbasin: Basin OS-3C

Last Modified Date: 1 July 2020

Last Modified Time: 19:43:56

Canvas X: 3191732.837927499

Canvas Y: 1455795.0234726786

From Canvas X: 3191732.837927499

From Canvas Y: 1455795.0234726786

Area: 0.0198

Downstream: Route OS-3C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 37.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-3B

Last Modified Date: 6 April 2020

Last Modified Time: 22:18:54

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192064.58176487

From Canvas Y: 1455689.0141506763

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Reach: Route OS-3C

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191701.8574730195
From Canvas Y: 1455717.8851248743
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Subbasin: Basin OS-3B

Last Modified Date: 16 June 2020
Last Modified Time: 22:21:02
Canvas X: 3191454.1353545357
Canvas Y: 1455638.1584660518
From Canvas X: 3191808.881599231
From Canvas Y: 1455981.4348019836
Label X: -51.0
Label Y: 27.0
Area: 0.034
Downstream: Junction OS-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 16.5
Curve Number: 66.7
Initial Abstraction: 0.5

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-3A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:43:44
Canvas X: 3191585.114865458
Canvas Y: 1455846.0172551244
From Canvas X: 3191525.184704565
From Canvas Y: 1455763.7332610039
Area: 0.0225
Downstream: Route OS-3A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.4
Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: Junction C-3

Last Modified Date: 6 April 2020
Last Modified Time: 18:40:14
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191239.226172219
From Canvas Y: 1454613.8680979477
Downstream: Route C-3

End:

Junction: Junction C-2

Last Modified Date: 6 April 2020
Last Modified Time: 16:05:38
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191601.3307882836
From Canvas Y: 1454899.3142550313
Downstream: Route to C-3

End:

Subbasin: Basin OS-4A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:44:06
Canvas X: 3191816.144480269
Canvas Y: 1455608.9537627215
From Canvas X: 3191816.144480269
From Canvas Y: 1455608.9537627215
Area: 0.0256
Downstream: Route OS-4A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2B

Description: Overland flow. Flows into basin W-3
Last Modified Date: 18 June 2020
Last Modified Time: 19:50:47
Canvas X: 3191192.176332691
Canvas Y: 1455473.0103870628
From Canvas X: 3191079.159717601
From Canvas Y: 1455778.8719525808
Area: 0.0198
Downstream: Route OS-2B

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2A

Description: Existing Basin on Timberview Filing 1. All flow routed to Culvert

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Last Modified Date: 1 July 2020
Last Modified Time: 19:42:47
Canvas X: 3191075.43372513
Canvas Y: 1455652.395369413
From Canvas X: 3190635.01570008
From Canvas Y: 1456266.8411205618
Area: 0.022
Downstream: Route OS-2A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 37.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-1

Last Modified Date: 6 April 2020
Last Modified Time: 22:00:20
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191197.8710940355
From Canvas Y: 1455077.2244736233
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow

PR_West_Basin_GWR.basin

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:14

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192097.536148903

From Canvas Y: 1455817.2918250756

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 96.2

Channel Loss: None

End:

Subbasin: Basin OS-4E

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:01

Canvas X: 3192707.2299209572

Canvas Y: 1455857.660741784

From Canvas X: 3193024.4086084175

From Canvas Y: 1456017.9537466252

Area: 0.049

Downstream: Route OS-4E

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 44

Unitgraph Type: STANDARD

Baseflow: None

End:

PR_West_Basin_GWR.basin

Reach: Route Basin OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191620.2620947743
From Canvas Y: 1455576.2974092974
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48
Channel Loss: None

End:

Reach: Route OS-4C

Last Modified Date: 8 April 2020
Last Modified Time: 15:11:56
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192259.8774961918
From Canvas Y: 1455863.288540141
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Subbasin: Basin OS-4D

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:12:22
Canvas X: 3192731.2547275363
Canvas Y: 1455991.5132355825
From Canvas X: 3192803.614351975
From Canvas Y: 1456110.2858902286
Area: 0.019
Downstream: Route OS-4D

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_West_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 42.8

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-2A

Last Modified Date: 6 April 2020

Last Modified Time: 20:34:48

Canvas X: 3191197.8710940355

Canvas Y: 1455077.2244736233

From Canvas X: 3191121.592686727

From Canvas Y: 1455311.9544209125

Downstream: Junction C-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 63.2

Channel Loss: None

End:

Subbasin: Basin OS-4C

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:32

Canvas X: 3192549.3526205793

Canvas Y: 1456056.7234248691

From Canvas X: 3192434.285777561

From Canvas Y: 1456074.1559209926

Area: 0.031

Downstream: Route OS-4C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 53.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4D

Last Modified Date: 8 April 2020
Last Modified Time: 15:12:43
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192408.6358963293
From Canvas Y: 1455885.1176635888
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Reach: Route OS-2B

Last Modified Date: 6 April 2020
Last Modified Time: 21:56:42
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191198.059764327
From Canvas Y: 1455243.1779213208
Downstream: Junction C-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: Basin OS-4B

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:10:53
Canvas X: 3192160.285761248
Canvas Y: 1456065.2655668857
From Canvas X: 3192165.318228803
From Canvas Y: 1456058.0981568876
Label X: 0.0
Label Y: 1.0
Area: 0.019

PR_West_Basin_GWR.basin

Downstream: Route OS-4B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 34.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4E

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:32

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192392.4562631445

From Canvas Y: 1455779.412177375

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 100.1

Channel Loss: None

End:

Junction: Junction OS-3

Last Modified Date: 8 April 2020

Last Modified Time: 20:02:16

Canvas X: 3191620.2620947743

Canvas Y: 1455576.2974092974

From Canvas X: 3191030.2304471615

From Canvas Y: 1455857.6038960286

Downstream: Route Basin OS-3A

End:

Reach: Route OS-4F

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:06

PR_West_Basin_GWR.basin

Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192563.0810814817
From Canvas Y: 1455734.104593662
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Subbasin: W-3

Last Modified Date: 16 June 2020
Last Modified Time: 22:25:18
Canvas X: 3191274.205299845
Canvas Y: 1455232.9233677052
From Canvas X: 3191024.0629101307
From Canvas Y: 1455607.9918769917
Area: 0.01
Downstream: Junction C-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 30.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4H

Last Modified Date: 1 July 2020
Last Modified Time: 21:36:49
Canvas X: 3192191.6069486425
Canvas Y: 1455441.6891996684
From Canvas X: 3192188.156768472
From Canvas Y: 1455449.7392372065
Area: 0.021

PR_West_Basin_GWR.basin

Downstream: Route OS-4H

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 41.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4G

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:46

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192316.0300185457

From Canvas Y: 1455651.1617253919

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 102.7

Channel Loss: None

End:

Reach: Route OS-4H

Last Modified Date: 8 April 2020

Last Modified Time: 15:15:37

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192057.7800570475

From Canvas Y: 1455344.8782568125

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 48

Channel Loss: None

PR_West_Basin_GWR.basin

End:

Subbasin: W-5

Description: All overland flow for watershed. Used to size swale DP 5-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:01

Canvas X: 3192181.679638902

Canvas Y: 1455275.5631039173

From Canvas X: 3192157.565279063

From Canvas Y: 1455254.8641652972

Label X: 1.0

Label Y: 0.0

Area: 0.01

Downstream: Route W-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 51.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4G

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:25

Canvas X: 3192660.319486171

Canvas Y: 1455549.4286020491

From Canvas X: 3193180.971808441

From Canvas Y: 1455688.769582474

Area: 0.076

Downstream: Route OS-4G

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

PR_West_Basin_GWR.basin

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 48.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4F

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:48

Canvas X: 3192736.0787815726

Canvas Y: 1455736.1211514312

From Canvas X: 3193108.7118699686

From Canvas Y: 1455873.4338696809

Area: 0.021

Downstream: Route OS-4F

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 45

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:06

Canvas X: 3191593.657007475

Canvas Y: 1455287.930643368

PR_West_Basin_GWR.basin

From Canvas X: 3191663.9790399233
From Canvas Y: 1455200.9491771364
Label X: 0.0
Label Y: 1.0
Area: 0.006
Downstream: Junction C-2

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 48.3
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-3

Last Modified Date: 15 September 2020
Last Modified Time: 20:37:12
Canvas X: 3190836.976908943
Canvas Y: 1454234.159285771
From Canvas X: 3191125.8142608823
From Canvas Y: 1454636.8944506934
Downstream: R-EX-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 32
Channel Loss: None

End:

Reservoir: Pond 2

Last Modified Date: 15 September 2020
Last Modified Time: 21:56:15
Canvas X: 3191285.843830595
Canvas Y: 1454369.28601614
From Canvas X: 3191195.8916458623
From Canvas Y: 1454392.14754045
Label X: -6.0

PR_West_Basin_GWR.basin

Label Y: -16.0

Downstream: Route Pond 2

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 2

Outflow Gage Name: Pond 2 - Q5

End:

Reservoir: Pond 1

Last Modified Date: 15 September 2020

Last Modified Time: 21:54:48

Canvas X: 3190788.6775098434

Canvas Y: 1454841.7546350043

From Canvas X: 3190512.093450769

From Canvas Y: 1455477.2407319362

Downstream: Route Pond 1

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 1

Outflow Gage Name: Pond 1 - Q5

End:

Reservoir: R-EX-2

Description: Note: Outlet 1 is reduced in size from the existing condition to represent a 3-5/8 inch depth restrictor plate installed on pipe to reduce flows for Q5 event

Last Modified Date: 15 September 2020

Last Modified Time: 20:37:14

Canvas X: 3190836.976908943

Canvas Y: 1454234.159285771

From Canvas X: 3190778.306968433

From Canvas Y: 1454050.976266697

Label X: -78.0

Label Y: 71.0

Downstream: Sink-2

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-2

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

PR_West_Basin_GWR.basin

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Elliptical
Chart Number: 29
Scale Number: 3
Solution Control: Automatic
Rise: 2.33
Span: 3.5
Diameter: 2.5
Number Barrels: 1
Culvert Length: 48.5
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7154.7
Outlet Invert Elevation: 7149.5
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 174.3
Spillway Crest Elevation: 7162
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: W-2

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:53
Canvas X: 3190671.1056696735
Canvas Y: 1454493.511435817
From Canvas X: 3190858.8970014188
From Canvas Y: 1454517.375669532
Area: 0.005
Downstream: R-EX-2

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 45.4

PR_West_Basin_GWR.basin

Initial Abstraction: 1.2

Transform: SCS

Lag: 31

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-9

Last Modified Date: 6 April 2020

Last Modified Time: 23:21:10

Canvas X: 3191400.0351217636

Canvas Y: 1454154.673135822

From Canvas X: 3191046.078595636

From Canvas Y: 1454207.1248628749

Area: 0.003

Downstream: Route W-9

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-2

Last Modified Date: 25 June 2020

Last Modified Time: 22:00:51

Canvas X: 3191663.866892373

Canvas Y: 1454378.4190795475

From Canvas X: 3191628.3381642886

From Canvas Y: 1454443.6292688341

Area: 0.01

Downstream: Pond 2

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 31.7

Curve Number: 72.4

Initial Abstraction: 0.38

Transform: SCS

Lag: 37

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-1

Last Modified Date: 7 April 2020

Last Modified Time: 17:50:40

Canvas X: 3190762.221851185

Canvas Y: 1455062.9875702623

From Canvas X: 3190677.102419148

From Canvas Y: 1455211.3929495476

Area: 0.02

Downstream: Pond 1

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 22.31

Curve Number: 68.37

Initial Abstraction: 0.46

Transform: SCS

Lag: 41.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-2

Description: Wetlands. Central drainage.

Last Modified Date: 23 June 2020

PR_West_Basin_GWR.basin

Last Modified Time: 21:07:21
Canvas X: 3190748.0295129814
Canvas Y: 1454016.9141293145
From Canvas X: 3190880.4929359066
From Canvas Y: 1454338.8286808033
Label X: -28.0
Label Y: -25.0

End:

Subbasin: W-1

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:36
Canvas X: 3190301.437045076
Canvas Y: 1454554.338963574
From Canvas X: 3190143.3967487137
From Canvas Y: 1454903.4863893862
Area: 0.0302
Downstream: R-EX-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.6
Curve Number: 65.6
Initial Abstraction: 0.52

Transform: SCS
Lag: 48.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-3

Last Modified Date: 23 June 2020
Last Modified Time: 21:32:34
Canvas X: 3190274.944271556
Canvas Y: 1454085.0384040799
From Canvas X: 3190274.944271556
From Canvas Y: 1454085.0384040799
Downstream: Sink-3

Route: Controlled Outflow
Routing Curve: Elevation-Area

PR_West_Basin_GWR.basin

Initial Outflow Equals Inflow: Yes
Elevation-Area Table: EX-3
Adaptive Control: On
Main Tailwater Condition: None
Auxiliary Tailwater Condition: None

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Circular
Chart Number: 2
Scale Number: 3
Solution Control: Automatic
Rise: 1.25
Diameter: 1.25
Number Barrels: 1
Culvert Length: 43.1
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7168.6
Outlet Invert Elevation: 7167.3
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 237.06
Spillway Crest Elevation: 7174
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: OS-1

Description: Part of Timberview. Fully detained in sedimentation basin
Last Modified Date: 26 June 2020
Last Modified Time: 19:56:00
Canvas X: 3189944.377164344
Canvas Y: 1454944.7180917726
From Canvas X: 3189604.487770659
From Canvas Y: 1455611.2295709252
Label X: -24.0
Label Y: 15.0
Area: 0.0634
Downstream: Reservoir OS-1

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 43.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Reservoir OS-1

Description: All flows from OS-1 are collected by and detained by a sedimentation pond on Timberview. Reservoir table are available in this report.

Last Modified Date: 26 June 2020

Last Modified Time: 19:55:52

Canvas X: 3190016.0388309094

Canvas Y: 1454678.4260555971

From Canvas X: 3189388.7751533836

From Canvas Y: 1455874.4720869225

Downstream: Route OS-1

Route: Modified Puls

Routing Curve: Storage-Outflow

Initial Outflow: 0

Storage-Outflow Table: EX OS-1

End:

Reach: Route OS-1

Last Modified Date: 26 June 2020

Last Modified Time: 19:55:52

Canvas X: 3190274.944271556

Canvas Y: 1454085.0384040799

From Canvas X: 3190016.0388309094

From Canvas Y: 1454678.4260555971

Downstream: R-EX-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 48.6

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Sink: Sink-3

Description: West-most drainage - Culvert 3
Last Modified Date: 23 June 2020
Last Modified Time: 21:29:08
Canvas X: 3190290.6604908723
Canvas Y: 1453988.5970195946
From Canvas X: 3190265.471714283
From Canvas Y: 1454199.949087816
Label X: -31.0
Label Y: -20.0

End:

Subbasin: W-10

Last Modified Date: 16 June 2020
Last Modified Time: 22:56:37
Canvas X: 3192674.484371266
Canvas Y: 1454778.6071245822
From Canvas X: 3192832.9140338055
From Canvas Y: 1454753.0347040498
Area: 0.01
Downstream: Sink-4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 11.9
Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-4

Description: EX culvert 4
Last Modified Date: 25 March 2020
Last Modified Time: 18:50:24
Canvas X: 3192640.4035706962
Canvas Y: 1454413.8496023817
From Canvas X: 3192640.4035706962

```

PR_West_Basin_GWR.basin
From Canvas Y: 1454413.8496023817
End:

Basin Layer Properties:
  Element Layer:
    Name: Icons
    Layer shown: Yes
  End Layer:
End:

Basin Spatial Properties:
End:

Basin Schematic Properties:
  Last View N: 1455607.9918769917
  Last View S: 1454940.6937600982
  Last View W: 3191024.0629101307
  Last View E: 3191102.8411600417
  Maximum View N: 1455607.9918769917
  Maximum View S: 1454940.6937600982
  Maximum View W: 3191024.0629101307
  Maximum View E: 3191102.8411600417
  Extent Method: Manual
  Buffer: 0
  Draw Icons: Yes
  Draw Icon Labels: Name
  Draw Map Objects: No
  Draw Gridlines: No
  Draw Flow Direction: No
  Draw HillShade Layer: Yes
  Draw Elevation Layer: Yes
  Elevation Layer Color Palette: Default
  Ignore Elevation Color Ramp Scale: No
  Use Interpolated Color Ramp for Elevation Layer: Yes
  Color Ramp Opacity Level for Elevation Layer: 33.0
  Fix Element Locations: No
  Fix Hydrologic Order: No
End:

```

Project: GWR PR Q5 - FDR Simulation Run: PR West - 5 YR 24HR

Start of Run: 01Jan2020, 00:00

Basin Model: PR West Basin GW

End of Run: 02Jan2020, 00:05

Meteorologic Model: 24 HR 5 YR

Compute Time: 15Sep2020, 15:57:43

Control Specifications: GR Control - PR

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin OS-3A	0.02250	5.5	01Jan2020, 12:35	0.85
Basin OS-3B	0.03400	11.0	01Jan2020, 12:30	1.00
Basin OS-3C	0.01980	5.2	01Jan2020, 12:30	0.86
Basin OS-4A	0.02560	6.2	01Jan2020, 12:35	0.85
Basin OS-4B	0.01900	5.3	01Jan2020, 12:30	0.86
Basin OS-4C	0.03100	6.3	01Jan2020, 12:50	0.85
Basin OS-4D	0.01900	4.5	01Jan2020, 12:40	0.85
Basin OS-4E	0.04900	11.5	01Jan2020, 12:40	0.85
Basin OS-4F	0.02100	4.8	01Jan2020, 12:40	0.85
Basin OS-4G	0.07600	16.5	01Jan2020, 12:45	0.85
Basin OS-4H	0.02100	5.2	01Jan2020, 12:35	0.85
D-1	0.02000	6.7	01Jan2020, 12:35	1.15
D-2	0.01000	4.5	01Jan2020, 12:30	1.44
Junction C-1	0.05180	9.5	01Jan2020, 13:25	0.85
Junction C-2	0.35390	53.6	01Jan2020, 15:00	0.84
Junction C-3	0.43956	57.0	01Jan2020, 15:35	0.83
Junction OS-3	0.07630	14.5	01Jan2020, 13:15	0.91
OS-1	0.06340	14.9	01Jan2020, 12:40	0.85
OS-2A	0.02200	5.7	01Jan2020, 12:30	0.86
OS-2B	0.01980	5.5	01Jan2020, 12:30	0.86
Pond 1	0.02000	0.7	01Jan2020, 01:40	0.26
Pond 2	0.01000	1.1	01Jan2020, 02:00	0.92
Reservoir OS-1	0.06340	13.3	01Jan2020, 12:55	0.85
Route Basin OS-3A	0.07630	14.4	01Jan2020, 14:05	0.90
Route C-1	0.05180	9.5	01Jan2020, 14:00	0.84
Route C-3	0.43956	56.8	01Jan2020, 16:10	0.82
Route OS-1	0.06340	13.3	01Jan2020, 13:40	0.84

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Route OS-2A	0.02200	5.7	01Jan2020, 13:35	0.84
Route OS-2B	0.01980	5.5	01Jan2020, 13:00	0.85
Route OS-3A	0.02250	5.5	01Jan2020, 13:20	0.84
Route OS-3B	0.21500	44.8	01Jan2020, 15:05	0.81
Route OS-3C	0.01980	5.2	01Jan2020, 13:20	0.84
Route OS-4A	0.02560	6.2	01Jan2020, 13:25	0.84
Route OS-4B	0.01900	5.3	01Jan2020, 14:05	0.83
Route OS-4C	0.03100	6.3	01Jan2020, 13:40	0.84
Route OS-4D	0.01900	4.5	01Jan2020, 14:15	0.83
Route OS-4E	0.04900	11.5	01Jan2020, 14:20	0.82
Route OS-4F	0.02100	4.8	01Jan2020, 14:15	0.83
Route OS-4G	0.07600	16.4	01Jan2020, 14:25	0.82
Route OS-4H	0.02100	5.1	01Jan2020, 13:25	0.84
Route Pond 1	0.02000	0.7	01Jan2020, 02:10	0.25
Route Pond 2	0.01000	1.1	01Jan2020, 02:35	0.92
Route to C-3	0.35390	53.6	01Jan2020, 15:35	0.82
Route W-5	0.01000	2.1	01Jan2020, 13:35	0.84
Route W-6	0.00300	0.8	01Jan2020, 13:15	0.84
Route W-9	0.00300	0.7	01Jan2020, 13:10	0.84
R-EX-2	0.47756	54.5	01Jan2020, 16:20	0.79
R-EX-3	0.09360	11.2	01Jan2020, 14:15	0.85
Sink-2	0.47756	54.5	01Jan2020, 16:15	0.79
Sink-3	0.09360	11.2	01Jan2020, 14:10	0.85
Sink-4	0.01000	5.2	01Jan2020, 12:00	0.87
Upper Junction	0.21500	44.9	01Jan2020, 14:15	0.83
W-1	0.03020	7.0	01Jan2020, 12:45	0.90
W-10	0.01000	5.2	01Jan2020, 12:05	0.87
W-2	0.00500	0.2	01Jan2020, 12:35	0.16
W-3	0.01000	3.0	01Jan2020, 12:25	0.86
W-4	0.00600	1.3	01Jan2020, 12:45	0.85
W-5	0.01000	2.1	01Jan2020, 12:45	0.85

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
W-6	0.00300	0.8	01Jan2020, 12:30	0.86
W-7	0.02700	6.3	01Jan2020, 12:45	0.89
W-8	0.00386	1.0	01Jan2020, 12:30	0.86
W-9	0.00300	0.7	01Jan2020, 12:40	0.85

PR_East_Basin_GWR.basin

Basin: PR East Basin GWR

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:07

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: Yes

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -1883.90357366932

From Canvas Y: 2571.1693652962567

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 106.6

Channel Loss: None

End:

Subbasin: Basin OS-6C

Description: OS-5C

Last Modified Date: 1 July 2020

Last Modified Time: 17:56:17

Canvas X: 1862.9572697904414

Canvas Y: 2655.2453780700125

From Canvas X: 1862.9572697904414

From Canvas Y: 2655.2453780700125

Area: 0.082

Downstream: Route OS-6C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_East_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 53.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-6B

Description: OS-5B

Last Modified Date: 11 June 2020

Last Modified Time: 22:02:51

Canvas X: 1574.7803926437246

Canvas Y: 2809.314217301934

From Canvas X: 1597.8529604137002

From Canvas Y: 2830.682053392856

Area: 0.0579

Downstream: Route OS-6B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.5

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Reservoir Route

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: 1336.12273862665

From Canvas Y: 2299.4395669498244

Downstream: C-10

PR_East_Basin_GWR.basin

Route: Lag
Initial Variable: Combined Inflow
Lag: 44.5
Channel Loss: None

End:

Reach: Route OS-6B

Last Modified Date: 30 June 2020
Last Modified Time: 20:54:51
Canvas X: 1336.12273862665
Canvas Y: 2299.4395669498244
From Canvas X: 1416.7680854049777
From Canvas Y: 2520.167052110427
Downstream: Reservoir OS-5

Route: Lag
Initial Variable: Combined Inflow
Lag: 50
Channel Loss: None

End:

Subbasin: Basin OS-6A

Description: OS-5A
Last Modified Date: 8 April 2020
Last Modified Time: 14:59:46
Canvas X: 1037.832248645193
Canvas Y: 2834.180904913291
From Canvas X: 1044.252784950505
From Canvas Y: 2822.884867822952
Area: 0.0387
Downstream: Reservoir OS-5

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 40.8
Unitgraph Type: STANDARD

PR_East_Basin_GWR.basin

Baseflow: None

End:

Subbasin: Basin E-4A

Last Modified Date: 12 June 2020

Last Modified Time: 15:39:13

Canvas X: 715.0129745073164

Canvas Y: 2323.649069557905

From Canvas X: 676.6773862670857

From Canvas Y: 2255.6209566399502

Area: 0.0125

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.4

Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: C-10

Last Modified Date: 29 June 2020

Last Modified Time: 16:20:17

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: -84.11606967854232

From Canvas Y: 1597.0236365676153

Downstream: Route E-7

End:

Reach: Route OS-6C

Last Modified Date: 29 June 2020

Last Modified Time: 16:24:28

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1491.2771662334803

From Canvas Y: 2451.188221151665

PR_East_Basin_GWR.basin

Downstream: Reservoir OS-5

Route: Lag

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Subbasin: Basin E-4B

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:50

Canvas X: 1165.3342353785638

Canvas Y: 1932.9953623431986

From Canvas X: 1312.564453923134

From Canvas Y: 1483.4723744861783

Label X: 3.0

Label Y: -7.0

Area: 0.0091

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 38.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-6D

Last Modified Date: 29 June 2020

Last Modified Time: 16:24:28

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1594.6242279570024

From Canvas Y: 2355.412855055983

Downstream: Reservoir OS-5

Route: Lag

PR_East_Basin_GWR.basin

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Reservoir: Reservoir OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1258.6753881228692

From Canvas Y: 2210.8058005854755

Label X: 1.0

Label Y: -7.0

Downstream: Reservoir Route

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: OS-5

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 0.545

Centerline Elevation: 7324.42

Number Barrels: 1

End Conduit:

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 7.06

Centerline Elevation: 7331

Number Barrels: 1

End Conduit:

Spillway: Broad-Crested Spillway

Spillway Outlet: Main

Spillway Crest Length: 20

Spillway Crest Elevation: 7334

Spillway Coefficient: 2.6

End Spillway:

Evaporation Method: Zero Evaporation

PR_East_Basin_GWR.basin

End Evaporation:

End:

Subbasin: Basin OS-6D

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:42

Canvas X: 1883.632123721196

Canvas Y: 2418.0452279029837

From Canvas X: 1874.6530481452974

From Canvas Y: 2417.431218187936

Area: 0.0977

Downstream: Route OS-6D

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 50

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route E-7

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: 324.24823149222857

From Canvas Y: 1424.908662565677

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-1

Last Modified Date: 25 June 2020

PR_East_Basin_GWR.basin

Last Modified Time: 22:22:08
Canvas X: -1999.417346470526
Canvas Y: 1455.897133923738
From Canvas X: -2463.015010284649
From Canvas Y: 2073.938937309651
Label X: 0.0
Label Y: 1.0
Area: 0.0079
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.0
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-3

Last Modified Date: 12 June 2020
Last Modified Time: 15:38:21
Canvas X: -1818.3597961754886
Canvas Y: 1593.6807966465158
From Canvas X: -1639.7683601942304
From Canvas Y: 944.1038795993522
Label X: 0.0
Label Y: 1.0
Area: 0.03
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.56

PR_East_Basin_GWR.basin

Curve Number: 64
Initial Abstraction: 0.6

Transform: SCS
Lag: 45.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 3

Last Modified Date: 15 September 2020
Last Modified Time: 22:02:40
Canvas X: -1589.9080337438222
Canvas Y: 1243.8534768484221
From Canvas X: -1511.7339678911565
From Canvas Y: 640.2004812966065
Label X: 0.0
Label Y: 1.0
Downstream: R-EX-1

Route: Specified Outflow
Routing Curve: Elevation-Storage
Initial Elevation: 0
Elevation-Storage Table: Pond 3
Outflow Gage Name: Pond 3 - Q10

End:

Subbasin: E-3

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:38
Canvas X: -850.7849400791165
Canvas Y: 993.9331280597039
From Canvas X: -1009.5588556422545
From Canvas Y: 1006.5570737441426
Area: 0.0336
Downstream: R-EX-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 6.7
Curve Number: 54.5
Initial Abstraction: 0.83

PR_East_Basin_GWR.basin

Transform: SCS
Lag: 64
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4B

Last Modified Date: 8 April 2020
Last Modified Time: 14:57:45
Canvas X: 77.17075639610812
Canvas Y: 2378.1178945307097
From Canvas X: 778.873522140379
From Canvas Y: 773.7769864771967
Area: 0.0103
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 38
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4A

Last Modified Date: 8 April 2020
Last Modified Time: 14:56:57
Canvas X: -360.964130568138
Canvas Y: 2409.983054835778
From Canvas X: 18.080066194750998
From Canvas Y: 2352.1395294091717
Area: 0.0069
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No

PR_East_Basin_GWR.basin

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 56.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 4

Last Modified Date: 15 September 2020

Last Modified Time: 22:03:56

Canvas X: -260.0285318811434

Canvas Y: 1875.104502058163

From Canvas X: 539.8540713480625

From Canvas Y: 1066.6296604004497

Downstream: Route C-8

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 4

Outflow Gage Name: Pond 4 Q10

End:

Reach: Route C-8

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -260.0285318811434

From Canvas Y: 1875.104502058163

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-2

PR_East_Basin_GWR.basin

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:42
Canvas X: -1197.4448419312953
Canvas Y: 1642.9984762084644
From Canvas X: -1372.9228943028534
From Canvas Y: 2108.004315934082
Area: 0.010
Downstream: Route C-6

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 20.2
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.7
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-6

Last Modified Date: 29 June 2020
Last Modified Time: 21:03:25
Canvas X: -861.7276411671855
Canvas Y: 285.5041412301971
From Canvas X: -1160.5661289682976
From Canvas Y: 1491.7957530601734
Downstream: R-EX-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 64
Channel Loss: None

End:

Subbasin: Basin OS-5

Last Modified Date: 8 April 2020
Last Modified Time: 15:05:02
Canvas X: -1910.9889810178615
Canvas Y: 2730.049713289869
From Canvas X: -1895.2586998774636

PR_East_Basin_GWR.basin

From Canvas Y: 2743.89138359013

Area: 0.0244

Downstream: Route OS-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 68.7

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-1

Last Modified Date: 29 June 2020

Last Modified Time: 21:44:46

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -616.7135794014512

From Canvas Y: 410.34175233158203

Downstream: Sink EX-1

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-1

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Culvert

Conduit Outlet: Main

Culvert Shape: Circular

Chart Number: 2

Scale Number: 3

Solution Control: Automatic

Diameter: 4

Number Barrels: 1

Culvert Length: 48

PR_East_Basin_GWR.basin

Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7235.6
Outlet Invert Elevation: 7235.2
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 71
Spillway Crest Elevation: 7242
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Sink: Sink EX-1

Last Modified Date: 25 June 2020
Last Modified Time: 14:58:26
Canvas X: -890.526833152149
Canvas Y: 101.46827435515797
From Canvas X: -1043.6242342666856
From Canvas Y: 370.67000608809485
Label X: 3.0
Label Y: -12.0

End:

Basin Layer Properties:

Element Layer:
Name: Icons
Layer shown: Yes
End Layer:

End:

Basin Spatial Properties:

End:

Basin Schematic Properties:

Last View N: 3600.2886002886
Last View S: 829.7258297258295
Last View W: -1868.6868686868684
Last View E: 1233.766233766235
Maximum View N: 3600.2886002886
Maximum View S: 829.7258297258295
Maximum View W: -1868.6868686868684
Maximum View E: 1233.766233766235

PR_East_Basin_GWR.basin

Extent Method: Manual

Buffer: 0

Draw Icons: Yes

Draw Icon Labels: Name

Draw Map Objects: No

Draw Gridlines: No

Draw Flow Direction: No

Draw HillShade Layer: Yes

Draw Elevation Layer: Yes

Elevation Layer Color Palette: Default

Ignore Elevation Color Ramp Scale: No

Use Interpolated Color Ramp for Elevation Layer: Yes

Color Ramp Opacity Level for Elevation Layer: 33.0

Fix Element Locations: No

Fix Hydrologic Order: No

End:

Project: GWR PR Q10 - FDR Simulation Run: PR East - 10 YR 24HR

Start of Run: 01Jan2020, 00:00

Basin Model: PR East Ba

End of Run: 02Jan2020, 00:05

Meteorologic Model: 24 HR - 10-

Compute Time: DATA CHANGED, RECOMPUTE Control Specifications:GR Control

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin D-3	0.0300	6.7	01Jan2020, 12:45	0.82
Basin D-4A	0.0069	1.8	01Jan2020, 12:55	1.13
Basin D-4B	0.0103	3.6	01Jan2020, 12:30	1.14
Basin E-4A	0.0125	3.8	01Jan2020, 12:40	1.14
Basin E-4B	0.0091	3.2	01Jan2020, 12:30	1.14
Basin OS-5	0.0244	5.7	01Jan2020, 13:05	1.13
Basin OS-6A	0.0387	13.0	01Jan2020, 12:35	1.14
Basin OS-6B	0.0579	17.8	01Jan2020, 12:40	1.14
Basin OS-6C	0.0820	22.9	01Jan2020, 12:50	1.13
Basin OS-6D	0.0977	28.5	01Jan2020, 12:45	1.14
C-10	0.2979	59.7	01Jan2020, 14:45	1.04
E-1	0.0079	2.9	01Jan2020, 12:35	1.25
E-2	0.0100	4.1	01Jan2020, 12:35	1.43
E-3	0.0336	4.6	01Jan2020, 13:05	0.68
Pond 3	0.0379	9.3	01Jan2020, 01:05	0.56
Pond 4	0.0172	2.1	01Jan2020, 01:15	0.41
Reservoir OS-5	0.2763	58.6	01Jan2020, 14:00	1.06
Reservoir Route	0.2763	58.5	01Jan2020, 14:45	1.03
Route C-6	0.0100	4.1	01Jan2020, 13:40	1.40
Route C-8	0.0172	2.1	01Jan2020, 02:20	0.41
Route E-7	0.2979	59.6	01Jan2020, 15:50	1.00
Route OS-5	0.0244	5.7	01Jan2020, 14:50	1.09
Route OS-6B	0.0579	17.8	01Jan2020, 13:30	1.12
Route OS-6C	0.0820	22.8	01Jan2020, 13:45	1.11
Route OS-6D	0.0977	28.5	01Jan2020, 13:40	1.12
R-EX-1	0.4210	64.6	01Jan2020, 15:50	0.93
Sink EX-1	0.4210	64.6	01Jan2020, 15:45	0.93

PR_West_Basin_GWR.basin

Basin: PR West Basin GWR

Last Modified Date: 23 June 2020

Last Modified Time: 21:06:18

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: No

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route W-9

Last Modified Date: 24 June 2020

Last Modified Time: 13:14:26

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190941.0482914834

From Canvas Y: 1454172.086088502

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 1

Last Modified Date: 24 June 2020

Last Modified Time: 13:14:26

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190788.6775098434

From Canvas Y: 1454841.7546350043

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 2

Last Modified Date: 26 June 2020

Last Modified Time: 20:51:50

PR_West_Basin_GWR.basin

Canvas X: 3190827.266021038
Canvas Y: 1454214.7415360329
From Canvas X: 3191285.843830595
From Canvas Y: 1454369.28601614
Downstream: R-EX-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: W-7

Last Modified Date: 25 June 2020
Last Modified Time: 22:00:54
Canvas X: 3191588.062197299
Canvas Y: 1454558.061469289
From Canvas X: 3191726.0696871458
From Canvas Y: 1454578.2102340478
Label X: 0.0
Label Y: -3.0
Area: 0.027
Downstream: Junction C-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.45
Curve Number: 65.5
Initial Abstraction: 0.53

Transform: SCS
Lag: 47.3
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-6

Last Modified Date: 7 April 2020
Last Modified Time: 17:50:28
Canvas X: 3191787.2788931862
Canvas Y: 1454806.7233097618
From Canvas X: 3192492.046785609

PR_West_Basin_GWR.basin

From Canvas Y: 1454929.1016958833

Area: 0.003

Downstream: Route W-6

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-8

Description: Drainage Easement across lot

Last Modified Date: 16 June 2020

Last Modified Time: 22:12:19

Canvas X: 3191046.9812794775

Canvas Y: 1454826.8102695316

From Canvas X: 3191390.648482099

From Canvas Y: 1454613.8680979477

Area: 0.00386

Downstream: Junction C-3

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35.4

Unitgraph Type: STANDARD

PR_West_Basin_GWR.basin

Baseflow: None

End:

Reach: Route to C-3

Description: Combined junction C-1 and C-2 to Junction C-3

Last Modified Date: 6 April 2020

Last Modified Time: 22:00:34

Canvas X: 3191125.8142608823

Canvas Y: 1454636.8944506934

From Canvas X: 3191740.132405288

From Canvas Y: 1455102.301558766

Downstream: Junction C-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4A

Last Modified Date: 8 April 2020

Last Modified Time: 15:10:30

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3191821.555858512

From Canvas Y: 1455495.3148196193

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47.3

Channel Loss: None

End:

Junction: Upper Junction

Description: Combining design points into final basin flow

Last Modified Date: 6 April 2020

Last Modified Time: 16:04:39

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192059.549422635

From Canvas Y: 1455656.9537690468

Downstream: Route OS-3B

End:

Reach: Route W-5

Last Modified Date: 6 April 2020

Last Modified Time: 16:05:38

PR_West_Basin_GWR.basin

Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3192053.9995084023
From Canvas Y: 1455254.1730524607
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Reach: Route W-6

Last Modified Date: 16 June 2020
Last Modified Time: 22:40:46
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191596.658030947
From Canvas Y: 1454785.3109359604
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 47
Channel Loss: None

End:

Reach: Route OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191610.741291508
From Canvas Y: 1455715.037744202
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Junction: Junction C-1

Last Modified Date: 6 April 2020
Last Modified Time: 20:34:48
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191049.172513107

PR_West_Basin_GWR.basin

From Canvas Y: 1455596.382345375

Label X: -84.0

Label Y: -3.0

Downstream: Route C-1

End:

Subbasin: Basin OS-3C

Last Modified Date: 1 July 2020

Last Modified Time: 19:41:18

Canvas X: 3191732.837927499

Canvas Y: 1455795.0234726786

From Canvas X: 3191732.837927499

From Canvas Y: 1455795.0234726786

Area: 0.0198

Downstream: Route OS-3C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 37.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-3B

Last Modified Date: 6 April 2020

Last Modified Time: 22:18:54

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192064.58176487

From Canvas Y: 1455689.0141506763

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Reach: Route OS-3C

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191701.8574730195
From Canvas Y: 1455717.8851248743
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Subbasin: Basin OS-3B

Last Modified Date: 16 June 2020
Last Modified Time: 22:21:02
Canvas X: 3191454.1353545357
Canvas Y: 1455638.1584660518
From Canvas X: 3191808.881599231
From Canvas Y: 1455981.4348019836
Label X: -51.0
Label Y: 27.0
Area: 0.034
Downstream: Junction OS-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 16.5
Curve Number: 66.7
Initial Abstraction: 0.5

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-3A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:41:09
Canvas X: 3191585.114865458
Canvas Y: 1455846.0172551244
From Canvas X: 3191525.184704565
From Canvas Y: 1455763.7332610039
Area: 0.0225
Downstream: Route OS-3A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.4
Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: Junction C-3

Last Modified Date: 6 April 2020
Last Modified Time: 18:40:14
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191239.226172219
From Canvas Y: 1454613.8680979477
Downstream: Route C-3

End:

Junction: Junction C-2

Last Modified Date: 6 April 2020
Last Modified Time: 16:05:38
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191601.3307882836
From Canvas Y: 1454899.3142550313
Downstream: Route to C-3

End:

Subbasin: Basin OS-4A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:41:31
Canvas X: 3191816.144480269
Canvas Y: 1455608.9537627215
From Canvas X: 3191816.144480269
From Canvas Y: 1455608.9537627215
Area: 0.0256
Downstream: Route OS-4A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2B

Description: Overland flow. Flows into basin W-3
Last Modified Date: 18 June 2020
Last Modified Time: 19:50:47
Canvas X: 3191192.176332691
Canvas Y: 1455473.0103870628
From Canvas X: 3191079.159717601
From Canvas Y: 1455778.8719525808
Area: 0.0198
Downstream: Route OS-2B

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2A

Description: Existing Basin on Timberview Filing 1. All flow routed to Culvert

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Last Modified Date: 1 July 2020
Last Modified Time: 19:41:01
Canvas X: 3191056.6975808926
Canvas Y: 1455666.7904212803
From Canvas X: 3190635.01570008
From Canvas Y: 1456266.8411205618
Area: 0.022
Downstream: Route OS-2A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 37.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-1

Last Modified Date: 6 April 2020
Last Modified Time: 22:00:20
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191197.8710940355
From Canvas Y: 1455077.2244736233
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow

PR_West_Basin_GWR.basin

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:14

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192097.536148903

From Canvas Y: 1455817.2918250756

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 96.2

Channel Loss: None

End:

Subbasin: Basin OS-4E

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:01

Canvas X: 3192707.2299209572

Canvas Y: 1455857.660741784

From Canvas X: 3193024.4086084175

From Canvas Y: 1456017.9537466252

Area: 0.049

Downstream: Route OS-4E

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 44

Unitgraph Type: STANDARD

Baseflow: None

End:

PR_West_Basin_GWR.basin

Reach: Route Basin OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191620.2620947743
From Canvas Y: 1455576.2974092974
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48
Channel Loss: None

End:

Reach: Route OS-4C

Last Modified Date: 8 April 2020
Last Modified Time: 15:11:56
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192259.8774961918
From Canvas Y: 1455863.288540141
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Subbasin: Basin OS-4D

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:12:22
Canvas X: 3192731.2547275363
Canvas Y: 1455991.5132355825
From Canvas X: 3192803.614351975
From Canvas Y: 1456110.2858902286
Area: 0.019
Downstream: Route OS-4D

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_West_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 42.8

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-2A

Last Modified Date: 6 April 2020

Last Modified Time: 20:34:48

Canvas X: 3191197.8710940355

Canvas Y: 1455077.2244736233

From Canvas X: 3191121.592686727

From Canvas Y: 1455311.9544209125

Downstream: Junction C-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 63.2

Channel Loss: None

End:

Subbasin: Basin OS-4C

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:32

Canvas X: 3192549.3526205793

Canvas Y: 1456056.7234248691

From Canvas X: 3192434.285777561

From Canvas Y: 1456074.1559209926

Area: 0.031

Downstream: Route OS-4C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 53.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4D

Last Modified Date: 8 April 2020
Last Modified Time: 15:12:43
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192408.6358963293
From Canvas Y: 1455885.1176635888
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Reach: Route OS-2B

Last Modified Date: 6 April 2020
Last Modified Time: 21:56:42
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191198.059764327
From Canvas Y: 1455243.1779213208
Downstream: Junction C-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: Basin OS-4B

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:10:53
Canvas X: 3192160.285761248
Canvas Y: 1456065.2655668857
From Canvas X: 3192165.318228803
From Canvas Y: 1456058.0981568876
Label X: 0.0
Label Y: 1.0
Area: 0.019

PR_West_Basin_GWR.basin

Downstream: Route OS-4B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 34.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4E

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:32

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192392.4562631445

From Canvas Y: 1455779.412177375

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 100.1

Channel Loss: None

End:

Junction: Junction OS-3

Last Modified Date: 8 April 2020

Last Modified Time: 20:02:16

Canvas X: 3191620.2620947743

Canvas Y: 1455576.2974092974

From Canvas X: 3191030.2304471615

From Canvas Y: 1455857.6038960286

Downstream: Route Basin OS-3A

End:

Reach: Route OS-4F

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:06

PR_West_Basin_GWR.basin

Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192563.0810814817
From Canvas Y: 1455734.104593662
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Subbasin: W-3

Last Modified Date: 16 June 2020
Last Modified Time: 22:25:18
Canvas X: 3191274.205299845
Canvas Y: 1455232.9233677052
From Canvas X: 3191024.0629101307
From Canvas Y: 1455607.9918769917
Area: 0.01
Downstream: Junction C-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 30.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4H

Last Modified Date: 1 July 2020
Last Modified Time: 21:38:41
Canvas X: 3192191.6069486425
Canvas Y: 1455441.6891996684
From Canvas X: 3192188.156768472
From Canvas Y: 1455449.7392372065
Area: 0.021

PR_West_Basin_GWR.basin

Downstream: Route OS-4H

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 41.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4G

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:46

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192316.0300185457

From Canvas Y: 1455651.1617253919

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 102.7

Channel Loss: None

End:

Reach: Route OS-4H

Last Modified Date: 8 April 2020

Last Modified Time: 15:15:37

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192057.7800570475

From Canvas Y: 1455344.8782568125

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 48

Channel Loss: None

PR_West_Basin_GWR.basin

End:

Subbasin: W-5

Description: All overland flow for watershed. Used to size swale DP 5-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:01

Canvas X: 3192181.679638902

Canvas Y: 1455275.5631039173

From Canvas X: 3192157.565279063

From Canvas Y: 1455254.8641652972

Label X: 1.0

Label Y: 0.0

Area: 0.01

Downstream: Route W-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 51.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4G

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:25

Canvas X: 3192660.319486171

Canvas Y: 1455549.4286020491

From Canvas X: 3193180.971808441

From Canvas Y: 1455688.769582474

Area: 0.076

Downstream: Route OS-4G

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

PR_West_Basin_GWR.basin

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 48.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4F

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:48

Canvas X: 3192736.0787815726

Canvas Y: 1455736.1211514312

From Canvas X: 3193108.7118699686

From Canvas Y: 1455873.4338696809

Area: 0.021

Downstream: Route OS-4F

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 45

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:06

Canvas X: 3191593.657007475

Canvas Y: 1455287.930643368

PR_West_Basin_GWR.basin

From Canvas X: 3191663.9790399233
From Canvas Y: 1455200.9491771364
Label X: 0.0
Label Y: 1.0
Area: 0.006
Downstream: Junction C-2

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 48.3
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-3

Last Modified Date: 24 June 2020
Last Modified Time: 13:14:26
Canvas X: 3190827.266021038
Canvas Y: 1454214.7415360329
From Canvas X: 3191125.8142608823
From Canvas Y: 1454636.8944506934
Downstream: R-EX-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 32
Channel Loss: None

End:

Reservoir: Pond 2

Last Modified Date: 29 June 2020
Last Modified Time: 23:13:33
Canvas X: 3191285.843830595
Canvas Y: 1454369.28601614
From Canvas X: 3191195.8916458623
From Canvas Y: 1454392.14754045
Label X: -6.0

PR_West_Basin_GWR.basin

Label Y: -16.0

Downstream: Route Pond 2

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 2

Outflow Gage Name: Pond 2 - Q10

End:

Reservoir: Pond 1

Last Modified Date: 29 June 2020

Last Modified Time: 23:13:22

Canvas X: 3190788.6775098434

Canvas Y: 1454841.7546350043

From Canvas X: 3190512.093450769

From Canvas Y: 1455477.2407319362

Downstream: Route Pond 1

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 1

Outflow Gage Name: Pond 1 - Q10

End:

Reservoir: R-EX-2

Description: Note: Outlet 1 is reduced in size from the existing condition to represent a 3-5/8 inch depth restrictor plate installed on pipe to reduce flows for Q5 event

Last Modified Date: 15 September 2020

Last Modified Time: 20:34:01

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190778.306968433

From Canvas Y: 1454050.976266697

Label X: -78.0

Label Y: 71.0

Downstream: Sink-2

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-2

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

PR_West_Basin_GWR.basin

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Elliptical
Chart Number: 29
Scale Number: 3
Solution Control: Automatic
Rise: 2.33
Span: 3.5
Diameter: 2.5
Number Barrels: 1
Culvert Length: 48.5
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7154.7
Outlet Invert Elevation: 7149.5
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 174.3
Spillway Crest Elevation: 7162
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: W-2

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:53
Canvas X: 3190671.1056696735
Canvas Y: 1454493.511435817
From Canvas X: 3190858.8970014188
From Canvas Y: 1454517.375669532
Area: 0.005
Downstream: R-EX-2

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 45.4

PR_West_Basin_GWR.basin

Initial Abstraction: 1.2

Transform: SCS

Lag: 31

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-9

Last Modified Date: 6 April 2020

Last Modified Time: 23:21:10

Canvas X: 3191400.0351217636

Canvas Y: 1454154.673135822

From Canvas X: 3191046.078595636

From Canvas Y: 1454207.1248628749

Area: 0.003

Downstream: Route W-9

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-2

Last Modified Date: 25 June 2020

Last Modified Time: 22:00:51

Canvas X: 3191663.866892373

Canvas Y: 1454378.4190795475

From Canvas X: 3191628.3381642886

From Canvas Y: 1454443.6292688341

Area: 0.01

Downstream: Pond 2

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 31.7

Curve Number: 72.4

Initial Abstraction: 0.38

Transform: SCS

Lag: 37

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-1

Last Modified Date: 7 April 2020

Last Modified Time: 17:50:40

Canvas X: 3190762.221851185

Canvas Y: 1455062.9875702623

From Canvas X: 3190677.102419148

From Canvas Y: 1455211.3929495476

Area: 0.02

Downstream: Pond 1

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 22.31

Curve Number: 68.37

Initial Abstraction: 0.46

Transform: SCS

Lag: 41.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-2

Description: Wetlands. Central drainage.

Last Modified Date: 23 June 2020

PR_West_Basin_GWR.basin

Last Modified Time: 21:07:21
Canvas X: 3190748.0295129814
Canvas Y: 1454016.9141293145
From Canvas X: 3190880.4929359066
From Canvas Y: 1454338.8286808033
Label X: -28.0
Label Y: -25.0

End:

Subbasin: W-1

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:36
Canvas X: 3190301.437045076
Canvas Y: 1454554.338963574
From Canvas X: 3190143.3967487137
From Canvas Y: 1454903.4863893862
Area: 0.0302
Downstream: R-EX-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.6
Curve Number: 65.6
Initial Abstraction: 0.52

Transform: SCS
Lag: 48.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-3

Last Modified Date: 23 June 2020
Last Modified Time: 21:32:34
Canvas X: 3190274.944271556
Canvas Y: 1454085.0384040799
From Canvas X: 3190274.944271556
From Canvas Y: 1454085.0384040799
Downstream: Sink-3

Route: Controlled Outflow
Routing Curve: Elevation-Area

PR_West_Basin_GWR.basin

Initial Outflow Equals Inflow: Yes
Elevation-Area Table: EX-3
Adaptive Control: On
Main Tailwater Condition: None
Auxiliary Tailwater Condition: None

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Circular
Chart Number: 2
Scale Number: 3
Solution Control: Automatic
Rise: 1.25
Diameter: 1.25
Number Barrels: 1
Culvert Length: 43.1
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7168.6
Outlet Invert Elevation: 7167.3
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 237.06
Spillway Crest Elevation: 7174
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: OS-1

Description: Part of Timberview. Fully detained in sedimentation basin
Last Modified Date: 26 June 2020
Last Modified Time: 19:56:00
Canvas X: 3189944.377164344
Canvas Y: 1454944.7180917726
From Canvas X: 3189604.487770659
From Canvas Y: 1455611.2295709252
Label X: -24.0
Label Y: 15.0
Area: 0.0634
Downstream: Reservoir OS-1

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 43.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Reservoir OS-1

Description: All flows from OS-1 are collected by and detained by a sedimentation pond on Timberview. Reservoir table are available in this report.

Last Modified Date: 26 June 2020

Last Modified Time: 19:55:52

Canvas X: 3190016.0388309094

Canvas Y: 1454678.4260555971

From Canvas X: 3189388.7751533836

From Canvas Y: 1455874.4720869225

Downstream: Route OS-1

Route: Modified Puls

Routing Curve: Storage-Outflow

Initial Outflow: 0

Storage-Outflow Table: EX OS-1

End:

Reach: Route OS-1

Last Modified Date: 26 June 2020

Last Modified Time: 19:55:52

Canvas X: 3190274.944271556

Canvas Y: 1454085.0384040799

From Canvas X: 3190016.0388309094

From Canvas Y: 1454678.4260555971

Downstream: R-EX-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 48.6

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Sink: Sink-3

Description: West-most drainage - Culvert 3
Last Modified Date: 23 June 2020
Last Modified Time: 21:29:08
Canvas X: 3190290.6604908723
Canvas Y: 1453988.5970195946
From Canvas X: 3190265.471714283
From Canvas Y: 1454199.949087816
Label X: -31.0
Label Y: -20.0

End:

Subbasin: W-10

Last Modified Date: 16 June 2020
Last Modified Time: 22:56:37
Canvas X: 3192674.484371266
Canvas Y: 1454778.6071245822
From Canvas X: 3192832.9140338055
From Canvas Y: 1454753.0347040498
Area: 0.01
Downstream: Sink-4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 11.9
Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-4

Description: EX culvert 4
Last Modified Date: 25 March 2020
Last Modified Time: 18:50:24
Canvas X: 3192640.4035706962
Canvas Y: 1454413.8496023817
From Canvas X: 3192640.4035706962

```

PR_West_Basin_GWR.basin
From Canvas Y: 1454413.8496023817
End:

Basin Layer Properties:
  Element Layer:
    Name: Icons
    Layer shown: Yes
  End Layer:
End:

Basin Spatial Properties:
End:

Basin Schematic Properties:
  Last View N: 1455607.9918769917
  Last View S: 1454940.6937600982
  Last View W: 3191024.0629101307
  Last View E: 3191102.8411600417
  Maximum View N: 1455607.9918769917
  Maximum View S: 1454940.6937600982
  Maximum View W: 3191024.0629101307
  Maximum View E: 3191102.8411600417
  Extent Method: Manual
  Buffer: 0
  Draw Icons: Yes
  Draw Icon Labels: Name
  Draw Map Objects: No
  Draw Gridlines: No
  Draw Flow Direction: No
  Draw HillShade Layer: Yes
  Draw Elevation Layer: Yes
  Elevation Layer Color Palette: Default
  Ignore Elevation Color Ramp Scale: No
  Use Interpolated Color Ramp for Elevation Layer: Yes
  Color Ramp Opacity Level for Elevation Layer: 33.0
  Fix Element Locations: No
  Fix Hydrologic Order: No
End:

```

Project: GWR PR Q10 - FDR Simulation Run: PR West - 10 YR 24HR

Start of Run: 01Jan2020, 00:00
 End of Run: 02Jan2020, 00:05
 Compute Time: 15Sep2020, 16:04:01

Basin Model: PR West Basin GW
 Meteorologic Model: 24 HR - 10-YR
 Control Specifications: GR Control - PR

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Route W-9	0.00300	0.9	01Jan2020, 13:10	1.13
Route Pond 1	0.02000	2.6	01Jan2020, 01:45	0.39
Route Pond 2	0.01000	1.3	01Jan2020, 02:40	1.20
W-7	0.02700	8.5	01Jan2020, 12:40	1.19
W-6	0.00300	1.1	01Jan2020, 12:30	1.14
W-8	0.00386	1.4	01Jan2020, 12:30	1.14
Route to C-3	0.35390	72.9	01Jan2020, 15:35	1.10
Route OS-4A	0.02560	8.4	01Jan2020, 13:25	1.12
Upper Junction	0.21500	61.2	01Jan2020, 14:15	1.10
Route W-5	0.01000	2.9	01Jan2020, 13:35	1.12
Route W-6	0.00300	1.1	01Jan2020, 13:15	1.13
Route OS-3A	0.02250	7.5	01Jan2020, 13:20	1.12
Junction C-1	0.05180	12.9	01Jan2020, 13:25	1.13
Basin OS-3C	0.01980	7.1	01Jan2020, 12:30	1.14
Route OS-3B	0.21500	61.1	01Jan2020, 15:05	1.08
Route OS-3C	0.01980	7.0	01Jan2020, 13:20	1.13
Basin OS-3B	0.03400	14.7	01Jan2020, 12:30	1.30
Basin OS-3A	0.02250	7.5	01Jan2020, 12:35	1.14
Junction C-3	0.43956	77.4	01Jan2020, 15:35	1.11
Junction C-2	0.35390	72.9	01Jan2020, 15:00	1.11
Basin OS-4A	0.02560	8.5	01Jan2020, 12:35	1.14
OS-2B	0.01980	7.5	01Jan2020, 12:30	1.14
OS-2A	0.02200	7.8	01Jan2020, 12:30	1.14
Route C-1	0.05180	12.9	01Jan2020, 14:00	1.12
Route OS-4B	0.01900	7.2	01Jan2020, 14:05	1.11
Basin OS-4E	0.04900	15.6	01Jan2020, 12:40	1.14
Route Basin OS-3A	0.07630	19.5	01Jan2020, 14:00	1.19

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Route OS-4C	0.03100	8.6	01Jan2020, 13:35	1.12
Basin OS-4D	0.01900	6.2	01Jan2020, 12:40	1.14
Route OS-2A	0.02200	7.8	01Jan2020, 13:35	1.12
Basin OS-4C	0.03100	8.6	01Jan2020, 12:50	1.13
Route OS-4D	0.01900	6.2	01Jan2020, 14:15	1.10
Route OS-2B	0.01980	7.5	01Jan2020, 13:00	1.13
Basin OS-4B	0.01900	7.2	01Jan2020, 12:30	1.14
Route OS-4E	0.04900	15.6	01Jan2020, 14:20	1.10
Junction OS-3	0.07630	19.7	01Jan2020, 13:15	1.20
Route OS-4F	0.02100	6.6	01Jan2020, 14:15	1.10
W-3	0.01000	4.1	01Jan2020, 12:25	1.15
Basin OS-4H	0.02100	7.0	01Jan2020, 12:35	1.14
Route OS-4G	0.07600	22.5	01Jan2020, 14:25	1.10
Route OS-4H	0.02100	7.0	01Jan2020, 13:25	1.12
W-5	0.01000	2.9	01Jan2020, 12:45	1.14
Basin OS-4G	0.07600	22.5	01Jan2020, 12:45	1.14
Basin OS-4F	0.02100	6.6	01Jan2020, 12:40	1.14
W-4	0.00600	1.8	01Jan2020, 12:45	1.14
Route C-3	0.43956	77.0	01Jan2020, 16:10	1.09
Pond 2	0.01000	1.3	01Jan2020, 02:05	1.20
Pond 1	0.02000	2.6	01Jan2020, 01:15	0.39
R-EX-2	0.47756	71.3	01Jan2020, 16:25	1.06
W-2	0.00500	0.4	01Jan2020, 12:30	0.28
W-9	0.00300	0.9	01Jan2020, 12:40	1.14
D-2	0.01000	5.8	01Jan2020, 12:30	1.81
D-1	0.02000	8.7	01Jan2020, 12:35	1.49
Sink-2	0.47756	71.3	01Jan2020, 16:20	1.06
W-1	0.03020	9.5	01Jan2020, 12:45	1.20
R-EX-3	0.09360	21.8	01Jan2020, 13:40	1.14
OS-1	0.06340	20.3	01Jan2020, 12:40	1.14
Reservoir OS-1	0.06340	17.9	01Jan2020, 12:55	1.14

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Route OS-1	0.06340	17.8	01Jan2020, 13:40	1.12
Sink-3	0.09360	21.8	01Jan2020, 13:35	1.14
W-10	0.01000	7.0	01Jan2020, 12:05	1.15
Sink-4	0.01000	7.0	01Jan2020, 12:00	1.15

PR_East_Basin_GWR.basin

Basin: PR East Basin GWR

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:07

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: Yes

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -1883.90357366932

From Canvas Y: 2571.1693652962567

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 106.6

Channel Loss: None

End:

Subbasin: Basin OS-6C

Description: OS-5C

Last Modified Date: 1 July 2020

Last Modified Time: 17:52:06

Canvas X: 1862.9572697904414

Canvas Y: 2655.2453780700125

From Canvas X: 1862.9572697904414

From Canvas Y: 2655.2453780700125

Area: 0.082

Downstream: Route OS-6C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_East_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 53.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-6B

Description: OS-5B

Last Modified Date: 11 June 2020

Last Modified Time: 22:02:51

Canvas X: 1574.7803926437246

Canvas Y: 2809.314217301934

From Canvas X: 1597.8529604137002

From Canvas Y: 2830.682053392856

Area: 0.0579

Downstream: Route OS-6B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.5

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Reservoir Route

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: 1336.12273862665

From Canvas Y: 2299.4395669498244

Downstream: C-10

PR_East_Basin_GWR.basin

Route: Lag
Initial Variable: Combined Inflow
Lag: 44.5
Channel Loss: None

End:

Reach: Route OS-6B

Last Modified Date: 30 June 2020
Last Modified Time: 20:55:49
Canvas X: 1336.12273862665
Canvas Y: 2299.4395669498244
From Canvas X: 1416.7680854049777
From Canvas Y: 2520.167052110427
Downstream: Reservoir OS-5

Route: Lag
Initial Variable: Combined Inflow
Lag: 50
Channel Loss: None

End:

Subbasin: Basin OS-6A

Description: OS-5A
Last Modified Date: 8 April 2020
Last Modified Time: 14:59:46
Canvas X: 1037.832248645193
Canvas Y: 2834.180904913291
From Canvas X: 1044.252784950505
From Canvas Y: 2822.884867822952
Area: 0.0387
Downstream: Reservoir OS-5

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 40.8
Unitgraph Type: STANDARD

PR_East_Basin_GWR.basin

Baseflow: None

End:

Subbasin: Basin E-4A

Last Modified Date: 12 June 2020

Last Modified Time: 15:39:13

Canvas X: 715.0129745073164

Canvas Y: 2323.649069557905

From Canvas X: 676.6773862670857

From Canvas Y: 2255.6209566399502

Area: 0.0125

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.4

Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: C-10

Last Modified Date: 29 June 2020

Last Modified Time: 16:20:17

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: -84.11606967854232

From Canvas Y: 1597.0236365676153

Downstream: Route E-7

End:

Reach: Route OS-6C

Last Modified Date: 29 June 2020

Last Modified Time: 16:24:28

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1491.2771662334803

From Canvas Y: 2451.188221151665

PR_East_Basin_GWR.basin

Downstream: Reservoir OS-5

Route: Lag

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Subbasin: Basin E-4B

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:50

Canvas X: 1165.3342353785638

Canvas Y: 1932.9953623431986

From Canvas X: 1312.564453923134

From Canvas Y: 1483.4723744861783

Label X: 3.0

Label Y: -7.0

Area: 0.0091

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 38.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-6D

Last Modified Date: 29 June 2020

Last Modified Time: 16:24:28

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1594.6242279570024

From Canvas Y: 2355.412855055983

Downstream: Reservoir OS-5

Route: Lag

PR_East_Basin_GWR.basin

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Reservoir: Reservoir OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1258.6753881228692

From Canvas Y: 2210.8058005854755

Label X: 1.0

Label Y: -7.0

Downstream: Reservoir Route

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: OS-5

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 0.545

Centerline Elevation: 7324.42

Number Barrels: 1

End Conduit:

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 7.06

Centerline Elevation: 7331

Number Barrels: 1

End Conduit:

Spillway: Broad-Crested Spillway

Spillway Outlet: Main

Spillway Crest Length: 20

Spillway Crest Elevation: 7334

Spillway Coefficient: 2.6

End Spillway:

Evaporation Method: Zero Evaporation

PR_East_Basin_GWR.basin

End Evaporation:

End:

Subbasin: Basin OS-6D

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:42

Canvas X: 1883.632123721196

Canvas Y: 2418.0452279029837

From Canvas X: 1874.6530481452974

From Canvas Y: 2417.431218187936

Area: 0.0977

Downstream: Route OS-6D

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 50

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route E-7

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: 324.24823149222857

From Canvas Y: 1424.908662565677

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-1

Last Modified Date: 25 June 2020

PR_East_Basin_GWR.basin

Last Modified Time: 22:22:08
Canvas X: -1999.417346470526
Canvas Y: 1455.897133923738
From Canvas X: -2463.015010284649
From Canvas Y: 2073.938937309651
Label X: 0.0
Label Y: 1.0
Area: 0.0079
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.0
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-3

Last Modified Date: 12 June 2020
Last Modified Time: 15:38:21
Canvas X: -1818.3597961754886
Canvas Y: 1593.6807966465158
From Canvas X: -1639.7683601942304
From Canvas Y: 944.1038795993522
Label X: 0.0
Label Y: 1.0
Area: 0.03
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.56

PR_East_Basin_GWR.basin

Curve Number: 64
Initial Abstraction: 0.6

Transform: SCS
Lag: 45.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 3

Last Modified Date: 29 June 2020
Last Modified Time: 22:56:58
Canvas X: -1589.9080337438222
Canvas Y: 1243.8534768484221
From Canvas X: -1511.7339678911565
From Canvas Y: 640.2004812966065
Label X: 0.0
Label Y: 1.0
Downstream: R-EX-1

Route: Specified Outflow
Routing Curve: Elevation-Storage
Initial Elevation: 0
Elevation-Storage Table: Pond 3
Outflow Gage Name: Pond 3 - Q25

End:

Subbasin: E-3

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:38
Canvas X: -850.7849400791165
Canvas Y: 993.9331280597039
From Canvas X: -1009.5588556422545
From Canvas Y: 1006.5570737441426
Area: 0.0336
Downstream: R-EX-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 6.7
Curve Number: 54.5
Initial Abstraction: 0.83

PR_East_Basin_GWR.basin

Transform: SCS
Lag: 64
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4B

Last Modified Date: 8 April 2020
Last Modified Time: 14:57:45
Canvas X: 77.17075639610812
Canvas Y: 2378.1178945307097
From Canvas X: 778.873522140379
From Canvas Y: 773.7769864771967
Area: 0.0103
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 38
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4A

Last Modified Date: 8 April 2020
Last Modified Time: 14:56:57
Canvas X: -360.964130568138
Canvas Y: 2409.983054835778
From Canvas X: 18.080066194750998
From Canvas Y: 2352.1395294091717
Area: 0.0069
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No

PR_East_Basin_GWR.basin

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 56.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 4

Last Modified Date: 29 June 2020

Last Modified Time: 22:57:08

Canvas X: -260.0285318811434

Canvas Y: 1875.104502058163

From Canvas X: 539.8540713480625

From Canvas Y: 1066.6296604004497

Downstream: Route C-8

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 4

Outflow Gage Name: Pond 4 - Q25

End:

Reach: Route C-8

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -260.0285318811434

From Canvas Y: 1875.104502058163

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-2

PR_East_Basin_GWR.basin

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:42
Canvas X: -1197.4448419312953
Canvas Y: 1642.9984762084644
From Canvas X: -1372.9228943028534
From Canvas Y: 2108.004315934082
Area: 0.010
Downstream: Route C-6

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 20.2
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.7
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-6

Last Modified Date: 29 June 2020
Last Modified Time: 21:03:25
Canvas X: -861.7276411671855
Canvas Y: 285.5041412301971
From Canvas X: -1160.5661289682976
From Canvas Y: 1491.7957530601734
Downstream: R-EX-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 64
Channel Loss: None

End:

Subbasin: Basin OS-5

Last Modified Date: 8 April 2020
Last Modified Time: 15:05:02
Canvas X: -1910.9889810178615
Canvas Y: 2730.049713289869
From Canvas X: -1895.2586998774636

PR_East_Basin_GWR.basin

From Canvas Y: 2743.89138359013

Area: 0.0244

Downstream: Route OS-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 68.7

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-1

Last Modified Date: 29 June 2020

Last Modified Time: 21:44:46

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -616.7135794014512

From Canvas Y: 410.34175233158203

Downstream: Sink EX-1

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-1

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Culvert

Conduit Outlet: Main

Culvert Shape: Circular

Chart Number: 2

Scale Number: 3

Solution Control: Automatic

Diameter: 4

Number Barrels: 1

Culvert Length: 48

PR_East_Basin_GWR.basin

Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7235.6
Outlet Invert Elevation: 7235.2
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 71
Spillway Crest Elevation: 7242
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Sink: Sink EX-1

Last Modified Date: 25 June 2020
Last Modified Time: 14:58:26
Canvas X: -890.526833152149
Canvas Y: 101.46827435515797
From Canvas X: -1043.6242342666856
From Canvas Y: 370.67000608809485
Label X: 3.0
Label Y: -12.0

End:

Basin Layer Properties:

Element Layer:
Name: Icons
Layer shown: Yes
End Layer:

End:

Basin Spatial Properties:

End:

Basin Schematic Properties:

Last View N: 3600.2886002886
Last View S: 829.7258297258295
Last View W: -1868.6868686868684
Last View E: 1233.766233766235
Maximum View N: 3600.2886002886
Maximum View S: 829.7258297258295
Maximum View W: -1868.6868686868684
Maximum View E: 1233.766233766235

PR_East_Basin_GWR.basin

Extent Method: Manual

Buffer: 0

Draw Icons: Yes

Draw Icon Labels: Name

Draw Map Objects: No

Draw Gridlines: No

Draw Flow Direction: No

Draw HillShade Layer: Yes

Draw Elevation Layer: Yes

Elevation Layer Color Palette: Default

Ignore Elevation Color Ramp Scale: No

Use Interpolated Color Ramp for Elevation Layer: Yes

Color Ramp Opacity Level for Elevation Layer: 33.0

Fix Element Locations: No

Fix Hydrologic Order: No

End:

Project: GWR PR Q25 - FDR Simulation Run: PR East - 25 YR 24HR

Start of Run: 01Jan2020, 00:00

Basin Model: PR East Basin GWI

End of Run: 02Jan2020, 00:05

Meteorologic Model: 24HR - 25YR

Compute Time: 15Sep2020, 16:10:13

Control Specifications: GR Control - PR

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin D-3	0.0300	8.7	01Jan2020, 12:40	1.04
Basin D-4A	0.0069	2.3	01Jan2020, 12:55	1.38
Basin D-4B	0.0103	4.5	01Jan2020, 12:30	1.39
Basin E-4A	0.0125	4.7	01Jan2020, 12:40	1.38
Basin E-4B	0.0091	3.9	01Jan2020, 12:30	1.39
Basin OS-5	0.0244	7.0	01Jan2020, 13:05	1.37
Basin OS-6A	0.0387	16.0	01Jan2020, 12:35	1.39
Basin OS-6B	0.0579	21.9	01Jan2020, 12:40	1.38
Basin OS-6C	0.0820	28.2	01Jan2020, 12:50	1.38
Basin OS-6D	0.0977	35.1	01Jan2020, 12:45	1.38
C-10	0.2979	72.3	01Jan2020, 14:45	1.26
E-1	0.0079	3.5	01Jan2020, 12:35	1.51
E-2	0.0100	4.9	01Jan2020, 12:35	1.70
E-3	0.0336	6.0	01Jan2020, 13:05	0.86
Pond 3	0.0379	19.1	01Jan2020, 00:55	0.91
Pond 4	0.0172	6.4	01Jan2020, 01:00	0.67
Reservoir OS-5	0.2763	70.9	01Jan2020, 14:00	1.28
Reservoir Route	0.2763	70.9	01Jan2020, 14:45	1.25
Route C-6	0.0100	4.9	01Jan2020, 13:40	1.67
Route C-8	0.0172	6.3	01Jan2020, 02:00	0.67
Route E-7	0.2979	72.2	01Jan2020, 15:50	1.22
Route OS-5	0.0244	7.0	01Jan2020, 14:50	1.32
Route OS-6B	0.0579	21.9	01Jan2020, 13:30	1.36
Route OS-6C	0.0820	28.1	01Jan2020, 13:45	1.36
Route OS-6D	0.0977	35.0	01Jan2020, 13:40	1.36
R-EX-1	0.4210	77.6	01Jan2020, 15:50	1.16
Sink EX-1	0.4210	77.6	01Jan2020, 15:45	1.16

PR_West_Basin_GWR.basin

Basin: PR West Basin GWR

Last Modified Date: 23 June 2020

Last Modified Time: 21:06:18

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: No

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route W-9

Last Modified Date: 24 June 2020

Last Modified Time: 13:14:26

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190941.0482914834

From Canvas Y: 1454172.086088502

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 1

Last Modified Date: 24 June 2020

Last Modified Time: 13:14:26

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190788.6775098434

From Canvas Y: 1454841.7546350043

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 2

Last Modified Date: 26 June 2020

Last Modified Time: 20:51:50

PR_West_Basin_GWR.basin

Canvas X: 3190827.266021038
Canvas Y: 1454214.7415360329
From Canvas X: 3191285.843830595
From Canvas Y: 1454369.28601614
Downstream: R-EX-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: W-7

Last Modified Date: 25 June 2020
Last Modified Time: 22:00:54
Canvas X: 3191588.062197299
Canvas Y: 1454558.061469289
From Canvas X: 3191726.0696871458
From Canvas Y: 1454578.2102340478
Label X: 0.0
Label Y: -3.0
Area: 0.027
Downstream: Junction C-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.45
Curve Number: 65.5
Initial Abstraction: 0.53

Transform: SCS
Lag: 47.3
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-6

Last Modified Date: 7 April 2020
Last Modified Time: 17:50:28
Canvas X: 3191787.2788931862
Canvas Y: 1454806.7233097618
From Canvas X: 3192492.046785609

PR_West_Basin_GWR.basin

From Canvas Y: 1454929.1016958833

Area: 0.003

Downstream: Route W-6

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-8

Description: Drainage Easement across lot

Last Modified Date: 16 June 2020

Last Modified Time: 22:12:19

Canvas X: 3191046.9812794775

Canvas Y: 1454826.8102695316

From Canvas X: 3191390.648482099

From Canvas Y: 1454613.8680979477

Area: 0.00386

Downstream: Junction C-3

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35.4

Unitgraph Type: STANDARD

PR_West_Basin_GWR.basin

Baseflow: None

End:

Reach: Route to C-3

Description: Combined junction C-1 and C-2 to Junction C-3

Last Modified Date: 6 April 2020

Last Modified Time: 22:00:34

Canvas X: 3191125.8142608823

Canvas Y: 1454636.8944506934

From Canvas X: 3191740.132405288

From Canvas Y: 1455102.301558766

Downstream: Junction C-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4A

Last Modified Date: 8 April 2020

Last Modified Time: 15:10:30

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3191821.555858512

From Canvas Y: 1455495.3148196193

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47.3

Channel Loss: None

End:

Junction: Upper Junction

Description: Combining design points into final basin flow

Last Modified Date: 6 April 2020

Last Modified Time: 16:04:39

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192059.549422635

From Canvas Y: 1455656.9537690468

Downstream: Route OS-3B

End:

Reach: Route W-5

Last Modified Date: 6 April 2020

Last Modified Time: 16:05:38

PR_West_Basin_GWR.basin

Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3192053.9995084023
From Canvas Y: 1455254.1730524607
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Reach: Route W-6

Last Modified Date: 16 June 2020
Last Modified Time: 22:40:46
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191596.658030947
From Canvas Y: 1454785.3109359604
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 47
Channel Loss: None

End:

Reach: Route OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191610.741291508
From Canvas Y: 1455715.037744202
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Junction: Junction C-1

Last Modified Date: 6 April 2020
Last Modified Time: 20:34:48
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191049.172513107

PR_West_Basin_GWR.basin

From Canvas Y: 1455596.382345375

Label X: -84.0

Label Y: -3.0

Downstream: Route C-1

End:

Subbasin: Basin OS-3C

Last Modified Date: 1 July 2020

Last Modified Time: 19:39:46

Canvas X: 3191732.837927499

Canvas Y: 1455795.0234726786

From Canvas X: 3191732.837927499

From Canvas Y: 1455795.0234726786

Area: 0.0198

Downstream: Route OS-3C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 37.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-3B

Last Modified Date: 6 April 2020

Last Modified Time: 22:18:54

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192064.58176487

From Canvas Y: 1455689.0141506763

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Reach: Route OS-3C

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191701.8574730195
From Canvas Y: 1455717.8851248743
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Subbasin: Basin OS-3B

Last Modified Date: 16 June 2020
Last Modified Time: 22:21:02
Canvas X: 3191454.1353545357
Canvas Y: 1455638.1584660518
From Canvas X: 3191808.881599231
From Canvas Y: 1455981.4348019836
Label X: -51.0
Label Y: 27.0
Area: 0.034
Downstream: Junction OS-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 16.5
Curve Number: 66.7
Initial Abstraction: 0.5

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-3A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:39:37
Canvas X: 3191585.114865458
Canvas Y: 1455846.0172551244
From Canvas X: 3191525.184704565
From Canvas Y: 1455763.7332610039
Area: 0.0225
Downstream: Route OS-3A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.4
Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: Junction C-3

Last Modified Date: 6 April 2020
Last Modified Time: 18:40:14
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191239.226172219
From Canvas Y: 1454613.8680979477
Downstream: Route C-3

End:

Junction: Junction C-2

Last Modified Date: 6 April 2020
Last Modified Time: 16:05:38
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191601.3307882836
From Canvas Y: 1454899.3142550313
Downstream: Route to C-3

End:

Subbasin: Basin OS-4A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:39:56
Canvas X: 3191816.144480269
Canvas Y: 1455608.9537627215
From Canvas X: 3191816.144480269
From Canvas Y: 1455608.9537627215
Area: 0.0256
Downstream: Route OS-4A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2B

Description: Overland flow. Flows into basin W-3
Last Modified Date: 18 June 2020
Last Modified Time: 19:50:47
Canvas X: 3191192.176332691
Canvas Y: 1455473.0103870628
From Canvas X: 3191079.159717601
From Canvas Y: 1455778.8719525808
Area: 0.0198
Downstream: Route OS-2B

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2A

Description: Existing Basin on Timberview Filing 1. All flow routed to Culvert
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Last Modified Date: 1 July 2020
Last Modified Time: 19:39:31
Canvas X: 3191075.43372513
Canvas Y: 1455652.395369413
From Canvas X: 3190635.01570008
From Canvas Y: 1456266.8411205618
Area: 0.022
Downstream: Route OS-2A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 37.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-1

Last Modified Date: 6 April 2020
Last Modified Time: 22:00:20
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191197.8710940355
From Canvas Y: 1455077.2244736233
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow

PR_West_Basin_GWR.basin

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:14

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192097.536148903

From Canvas Y: 1455817.2918250756

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 96.2

Channel Loss: None

End:

Subbasin: Basin OS-4E

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:01

Canvas X: 3192707.2299209572

Canvas Y: 1455857.660741784

From Canvas X: 3193024.4086084175

From Canvas Y: 1456017.9537466252

Area: 0.049

Downstream: Route OS-4E

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 44

Unitgraph Type: STANDARD

Baseflow: None

End:

PR_West_Basin_GWR.basin

Reach: Route Basin OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191620.2620947743
From Canvas Y: 1455576.2974092974
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48
Channel Loss: None

End:

Reach: Route OS-4C

Last Modified Date: 8 April 2020
Last Modified Time: 15:11:56
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192259.8774961918
From Canvas Y: 1455863.288540141
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Subbasin: Basin OS-4D

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:12:22
Canvas X: 3192731.2547275363
Canvas Y: 1455991.5132355825
From Canvas X: 3192803.614351975
From Canvas Y: 1456110.2858902286
Area: 0.019
Downstream: Route OS-4D

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_West_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 42.8

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-2A

Last Modified Date: 6 April 2020

Last Modified Time: 20:34:48

Canvas X: 3191197.8710940355

Canvas Y: 1455077.2244736233

From Canvas X: 3191121.592686727

From Canvas Y: 1455311.9544209125

Downstream: Junction C-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 63.2

Channel Loss: None

End:

Subbasin: Basin OS-4C

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:32

Canvas X: 3192549.3526205793

Canvas Y: 1456056.7234248691

From Canvas X: 3192434.285777561

From Canvas Y: 1456074.1559209926

Area: 0.031

Downstream: Route OS-4C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 53.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4D

Last Modified Date: 8 April 2020
Last Modified Time: 15:12:43
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192408.6358963293
From Canvas Y: 1455885.1176635888
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Reach: Route OS-2B

Last Modified Date: 6 April 2020
Last Modified Time: 21:56:42
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191198.059764327
From Canvas Y: 1455243.1779213208
Downstream: Junction C-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: Basin OS-4B

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:10:53
Canvas X: 3192160.285761248
Canvas Y: 1456065.2655668857
From Canvas X: 3192165.318228803
From Canvas Y: 1456058.0981568876
Label X: 0.0
Label Y: 1.0
Area: 0.019

PR_West_Basin_GWR.basin

Downstream: Route OS-4B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 34.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4E

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:32

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192392.4562631445

From Canvas Y: 1455779.412177375

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 100.1

Channel Loss: None

End:

Junction: Junction OS-3

Last Modified Date: 8 April 2020

Last Modified Time: 20:02:16

Canvas X: 3191620.2620947743

Canvas Y: 1455576.2974092974

From Canvas X: 3191030.2304471615

From Canvas Y: 1455857.6038960286

Downstream: Route Basin OS-3A

End:

Reach: Route OS-4F

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:06

PR_West_Basin_GWR.basin

Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192563.0810814817
From Canvas Y: 1455734.104593662
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Subbasin: W-3

Last Modified Date: 16 June 2020
Last Modified Time: 22:25:18
Canvas X: 3191274.205299845
Canvas Y: 1455232.9233677052
From Canvas X: 3191024.0629101307
From Canvas Y: 1455607.9918769917
Area: 0.01
Downstream: Junction C-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 30.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4H

Last Modified Date: 1 July 2020
Last Modified Time: 21:39:58
Canvas X: 3192191.6069486425
Canvas Y: 1455441.6891996684
From Canvas X: 3192188.156768472
From Canvas Y: 1455449.7392372065
Area: 0.021

PR_West_Basin_GWR.basin

Downstream: Route OS-4H

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 41.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4G

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:46

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192316.0300185457

From Canvas Y: 1455651.1617253919

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 102.7

Channel Loss: None

End:

Reach: Route OS-4H

Last Modified Date: 8 April 2020

Last Modified Time: 15:15:37

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192057.7800570475

From Canvas Y: 1455344.8782568125

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 48

Channel Loss: None

PR_West_Basin_GWR.basin

End:

Subbasin: W-5

Description: All overland flow for watershed. Used to size swale DP 5-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:01

Canvas X: 3192181.679638902

Canvas Y: 1455275.5631039173

From Canvas X: 3192157.565279063

From Canvas Y: 1455254.8641652972

Label X: 1.0

Label Y: 0.0

Area: 0.01

Downstream: Route W-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 51.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4G

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:25

Canvas X: 3192660.319486171

Canvas Y: 1455549.4286020491

From Canvas X: 3193180.971808441

From Canvas Y: 1455688.769582474

Area: 0.076

Downstream: Route OS-4G

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

PR_West_Basin_GWR.basin

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 48.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4F

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:48

Canvas X: 3192736.0787815726

Canvas Y: 1455736.1211514312

From Canvas X: 3193108.7118699686

From Canvas Y: 1455873.4338696809

Area: 0.021

Downstream: Route OS-4F

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 45

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:06

Canvas X: 3191593.657007475

Canvas Y: 1455287.930643368

PR_West_Basin_GWR.basin

From Canvas X: 3191663.9790399233
From Canvas Y: 1455200.9491771364
Label X: 0.0
Label Y: 1.0
Area: 0.006
Downstream: Junction C-2

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 48.3
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-3

Last Modified Date: 24 June 2020
Last Modified Time: 13:14:26
Canvas X: 3190827.266021038
Canvas Y: 1454214.7415360329
From Canvas X: 3191125.8142608823
From Canvas Y: 1454636.8944506934
Downstream: R-EX-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 32
Channel Loss: None

End:

Reservoir: Pond 2

Last Modified Date: 29 June 2020
Last Modified Time: 22:58:20
Canvas X: 3191285.843830595
Canvas Y: 1454369.28601614
From Canvas X: 3191195.8916458623
From Canvas Y: 1454392.14754045
Label X: -6.0

PR_West_Basin_GWR.basin

Label Y: -16.0

Downstream: Route Pond 2

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 2

Outflow Gage Name: Pond 2 - Q25

End:

Reservoir: Pond 1

Last Modified Date: 29 June 2020

Last Modified Time: 22:58:12

Canvas X: 3190788.6775098434

Canvas Y: 1454841.7546350043

From Canvas X: 3190512.093450769

From Canvas Y: 1455477.2407319362

Downstream: Route Pond 1

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 1

Outflow Gage Name: Pond 1 - Q25

End:

Reservoir: R-EX-2

Description: Note: Outlet 1 is reduced in size from the existing condition to represent a 3-5/8 inch depth restrictor plate installed on pipe to reduce flows for Q5 event

Last Modified Date: 15 September 2020

Last Modified Time: 22:28:30

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190778.306968433

From Canvas Y: 1454050.976266697

Label X: -78.0

Label Y: 71.0

Downstream: Sink-2

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-2

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

PR_West_Basin_GWR.basin

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Elliptical
Chart Number: 29
Scale Number: 3
Solution Control: Automatic
Rise: 2.33
Span: 3.5
Diameter: 2.5
Number Barrels: 1
Culvert Length: 48.5
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7154.7
Outlet Invert Elevation: 7149.5
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 174.3
Spillway Crest Elevation: 7162
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: W-2

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:53
Canvas X: 3190671.1056696735
Canvas Y: 1454493.511435817
From Canvas X: 3190858.8970014188
From Canvas Y: 1454517.375669532
Area: 0.005
Downstream: R-EX-2

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 45.4

PR_West_Basin_GWR.basin

Initial Abstraction: 1.2

Transform: SCS

Lag: 31

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-9

Last Modified Date: 6 April 2020

Last Modified Time: 23:21:10

Canvas X: 3191400.0351217636

Canvas Y: 1454154.673135822

From Canvas X: 3191046.078595636

From Canvas Y: 1454207.1248628749

Area: 0.003

Downstream: Route W-9

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-2

Last Modified Date: 25 June 2020

Last Modified Time: 22:00:51

Canvas X: 3191663.866892373

Canvas Y: 1454378.4190795475

From Canvas X: 3191628.3381642886

From Canvas Y: 1454443.6292688341

Area: 0.01

Downstream: Pond 2

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 31.7

Curve Number: 72.4

Initial Abstraction: 0.38

Transform: SCS

Lag: 37

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-1

Last Modified Date: 7 April 2020

Last Modified Time: 17:50:40

Canvas X: 3190762.221851185

Canvas Y: 1455062.9875702623

From Canvas X: 3190677.102419148

From Canvas Y: 1455211.3929495476

Area: 0.02

Downstream: Pond 1

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 22.31

Curve Number: 68.37

Initial Abstraction: 0.46

Transform: SCS

Lag: 41.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-2

Description: Wetlands. Central drainage.

Last Modified Date: 23 June 2020

PR_West_Basin_GWR.basin

Last Modified Time: 21:07:21
Canvas X: 3190748.0295129814
Canvas Y: 1454016.9141293145
From Canvas X: 3190880.4929359066
From Canvas Y: 1454338.8286808033
Label X: -28.0
Label Y: -25.0

End:

Subbasin: W-1

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:36
Canvas X: 3190301.437045076
Canvas Y: 1454554.338963574
From Canvas X: 3190143.3967487137
From Canvas Y: 1454903.4863893862
Area: 0.0302
Downstream: R-EX-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.6
Curve Number: 65.6
Initial Abstraction: 0.52

Transform: SCS
Lag: 48.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-3

Last Modified Date: 23 June 2020
Last Modified Time: 21:32:34
Canvas X: 3190274.944271556
Canvas Y: 1454085.0384040799
From Canvas X: 3190274.944271556
From Canvas Y: 1454085.0384040799
Downstream: Sink-3

Route: Controlled Outflow
Routing Curve: Elevation-Area

PR_West_Basin_GWR.basin

Initial Outflow Equals Inflow: Yes
Elevation-Area Table: EX-3
Adaptive Control: On
Main Tailwater Condition: None
Auxiliary Tailwater Condition: None

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Circular
Chart Number: 2
Scale Number: 3
Solution Control: Automatic
Rise: 1.25
Diameter: 1.25
Number Barrels: 1
Culvert Length: 43.1
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7168.6
Outlet Invert Elevation: 7167.3
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 237.06
Spillway Crest Elevation: 7174
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: OS-1

Description: Part of Timberview. Fully detained in sedimentation basin
Last Modified Date: 26 June 2020
Last Modified Time: 19:56:00
Canvas X: 3189944.377164344
Canvas Y: 1454944.7180917726
From Canvas X: 3189604.487770659
From Canvas Y: 1455611.2295709252
Label X: -24.0
Label Y: 15.0
Area: 0.0634
Downstream: Reservoir OS-1

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 43.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Reservoir OS-1

Description: All flows from OS-1 are collected by and detained by a sedimentation pond on Timberview. Reservoir table are available in this report.

Last Modified Date: 26 June 2020

Last Modified Time: 19:55:52

Canvas X: 3190016.0388309094

Canvas Y: 1454678.4260555971

From Canvas X: 3189388.7751533836

From Canvas Y: 1455874.4720869225

Downstream: Route OS-1

Route: Modified Puls

Routing Curve: Storage-Outflow

Initial Outflow: 0

Storage-Outflow Table: EX OS-1

End:

Reach: Route OS-1

Last Modified Date: 26 June 2020

Last Modified Time: 19:55:52

Canvas X: 3190274.944271556

Canvas Y: 1454085.0384040799

From Canvas X: 3190016.0388309094

From Canvas Y: 1454678.4260555971

Downstream: R-EX-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 48.6

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Sink: Sink-3

Description: West-most drainage - Culvert 3
Last Modified Date: 23 June 2020
Last Modified Time: 21:29:08
Canvas X: 3190290.6604908723
Canvas Y: 1453988.5970195946
From Canvas X: 3190265.471714283
From Canvas Y: 1454199.949087816
Label X: -31.0
Label Y: -20.0

End:

Subbasin: W-10

Last Modified Date: 16 June 2020
Last Modified Time: 22:56:37
Canvas X: 3192674.484371266
Canvas Y: 1454778.6071245822
From Canvas X: 3192832.9140338055
From Canvas Y: 1454753.0347040498
Area: 0.01
Downstream: Sink-4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 11.9
Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-4

Description: EX culvert 4
Last Modified Date: 25 March 2020
Last Modified Time: 18:50:24
Canvas X: 3192640.4035706962
Canvas Y: 1454413.8496023817
From Canvas X: 3192640.4035706962

```

PR_West_Basin_GWR.basin
From Canvas Y: 1454413.8496023817
End:

Basin Layer Properties:
  Element Layer:
    Name: Icons
    Layer shown: Yes
  End Layer:
End:

Basin Spatial Properties:
End:

Basin Schematic Properties:
  Last View N: 1455607.9918769917
  Last View S: 1454940.6937600982
  Last View W: 3191024.0629101307
  Last View E: 3191102.8411600417
  Maximum View N: 1455607.9918769917
  Maximum View S: 1454940.6937600982
  Maximum View W: 3191024.0629101307
  Maximum View E: 3191102.8411600417
  Extent Method: Manual
  Buffer: 0
  Draw Icons: Yes
  Draw Icon Labels: Name
  Draw Map Objects: No
  Draw Gridlines: No
  Draw Flow Direction: No
  Draw HillShade Layer: Yes
  Draw Elevation Layer: Yes
  Elevation Layer Color Palette: Default
  Ignore Elevation Color Ramp Scale: No
  Use Interpolated Color Ramp for Elevation Layer: Yes
  Color Ramp Opacity Level for Elevation Layer: 33.0
  Fix Element Locations: No
  Fix Hydrologic Order: No
End:

```

Project: GWR PR Q25 - FDR Simulation Run: PR West - 25 YR 24HR

Start of Run: 01Jan2020, 00:00

Basin Model: PR West Basin GW

End of Run: 02Jan2020, 00:05

Meteorologic Model: 24HR - 25YR

Compute Time: 15Sep2020, 16:28:57

Control Specifications: GR Control - PR

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin OS-3A	0.02250	9.2	01Jan2020, 12:35	1.39
Basin OS-3B	0.03400	17.8	01Jan2020, 12:30	1.57
Basin OS-3C	0.01980	8.7	01Jan2020, 12:30	1.39
Basin OS-4A	0.02560	10.5	01Jan2020, 12:35	1.39
Basin OS-4B	0.01900	8.8	01Jan2020, 12:30	1.39
Basin OS-4C	0.03100	10.6	01Jan2020, 12:50	1.38
Basin OS-4D	0.01900	7.6	01Jan2020, 12:35	1.39
Basin OS-4E	0.04900	19.2	01Jan2020, 12:40	1.38
Basin OS-4F	0.02100	8.1	01Jan2020, 12:40	1.38
Basin OS-4G	0.07600	27.7	01Jan2020, 12:45	1.38
Basin OS-4H	0.02100	8.7	01Jan2020, 12:35	1.39
D-1	0.02000	10.5	01Jan2020, 12:35	1.77
D-2	0.01000	6.8	01Jan2020, 12:30	2.12
Junction C-1	0.05180	15.8	01Jan2020, 13:25	1.37
Junction C-2	0.35390	89.6	01Jan2020, 15:00	1.35
Junction C-3	0.43956	94.9	01Jan2020, 15:35	1.35
Junction OS-3	0.07630	24.1	01Jan2020, 13:15	1.46
OS-1	0.06340	24.9	01Jan2020, 12:40	1.39
OS-2A	0.02200	9.6	01Jan2020, 12:30	1.39
OS-2B	0.01980	9.2	01Jan2020, 12:30	1.39
Pond 1	0.02000	4.8	01Jan2020, 01:05	0.60
Pond 2	0.01000	3.1	01Jan2020, 01:45	1.59
Reservoir OS-1	0.06340	20.6	01Jan2020, 13:00	1.38
Route Basin OS-3A	0.07630	23.9	01Jan2020, 14:00	1.43
Route C-1	0.05180	15.8	01Jan2020, 14:00	1.36
Route C-3	0.43956	94.5	01Jan2020, 16:10	1.33
Route OS-1	0.06340	20.6	01Jan2020, 13:45	1.36

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Route OS-2A	0.02200	9.6	01Jan2020, 13:35	1.36
Route OS-2B	0.01980	9.2	01Jan2020, 13:00	1.38
Route OS-3A	0.02250	9.2	01Jan2020, 13:20	1.37
Route OS-3B	0.21500	75.2	01Jan2020, 15:05	1.32
Route OS-3C	0.01980	8.7	01Jan2020, 13:15	1.37
Route OS-4A	0.02560	10.4	01Jan2020, 13:25	1.37
Route OS-4B	0.01900	8.8	01Jan2020, 14:05	1.35
Route OS-4C	0.03100	10.6	01Jan2020, 13:35	1.36
Route OS-4D	0.01900	7.6	01Jan2020, 14:10	1.34
Route OS-4E	0.04900	19.2	01Jan2020, 14:20	1.34
Route OS-4F	0.02100	8.1	01Jan2020, 14:15	1.34
Route OS-4G	0.07600	27.7	01Jan2020, 14:25	1.34
Route OS-4H	0.02100	8.6	01Jan2020, 13:25	1.37
Route Pond 1	0.02000	4.8	01Jan2020, 01:40	0.60
Route Pond 2	0.01000	3.1	01Jan2020, 02:15	1.58
Route to C-3	0.35390	89.6	01Jan2020, 15:35	1.34
Route W-5	0.01000	3.5	01Jan2020, 13:35	1.36
Route W-6	0.00300	1.4	01Jan2020, 13:15	1.37
Route W-9	0.00300	1.1	01Jan2020, 13:10	1.37
R-EX-2	0.47756	82.6	01Jan2020, 16:30	1.29
R-EX-3	0.09360	25.4	01Jan2020, 13:40	1.38
Sink-2	0.47756	82.6	01Jan2020, 16:25	1.29
Sink-3	0.09360	25.4	01Jan2020, 13:35	1.38
Sink-4	0.01000	8.7	01Jan2020, 12:00	1.40
Upper Junction	0.21500	75.4	01Jan2020, 14:15	1.34
W-1	0.03020	11.6	01Jan2020, 12:45	1.45
W-10	0.01000	8.7	01Jan2020, 12:05	1.40
W-2	0.00500	0.6	01Jan2020, 12:30	0.39
W-3	0.01000	5.0	01Jan2020, 12:25	1.39
W-4	0.00600	2.2	01Jan2020, 12:45	1.38
W-5	0.01000	3.5	01Jan2020, 12:45	1.38

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
W-6	0.00300	1.4	01Jan2020, 12:30	1.39
W-7	0.02700	10.5	01Jan2020, 12:40	1.44
W-8	0.00386	1.8	01Jan2020, 12:30	1.39
W-9	0.00300	1.1	01Jan2020, 12:40	1.38

PR_East_Basin_GWR.basin

Basin: PR East Basin GWR

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:07

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: Yes

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -1883.90357366932

From Canvas Y: 2571.1693652962567

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 106.6

Channel Loss: None

End:

Subbasin: Basin OS-6C

Description: OS-5C

Last Modified Date: 1 July 2020

Last Modified Time: 17:46:10

Canvas X: 1862.9572697904414

Canvas Y: 2655.2453780700125

From Canvas X: 1862.9572697904414

From Canvas Y: 2655.2453780700125

Area: 0.082

Downstream: Route OS-6C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_East_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 53.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-6B

Description: OS-5B

Last Modified Date: 11 June 2020

Last Modified Time: 22:02:51

Canvas X: 1574.7803926437246

Canvas Y: 2809.314217301934

From Canvas X: 1597.8529604137002

From Canvas Y: 2830.682053392856

Area: 0.0579

Downstream: Route OS-6B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.5

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Reservoir Route

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: 1336.12273862665

From Canvas Y: 2299.4395669498244

Downstream: C-10

PR_East_Basin_GWR.basin

Route: Lag
Initial Variable: Combined Inflow
Lag: 44.5
Channel Loss: None

End:

Reach: Route OS-6B

Last Modified Date: 30 June 2020
Last Modified Time: 21:04:41
Canvas X: 1336.12273862665
Canvas Y: 2299.4395669498244
From Canvas X: 1416.7680854049777
From Canvas Y: 2520.167052110427
Downstream: Reservoir OS-5

Route: Lag
Initial Variable: Combined Inflow
Lag: 50
Channel Loss: None

End:

Subbasin: Basin OS-6A

Description: OS-5A
Last Modified Date: 8 April 2020
Last Modified Time: 14:59:46
Canvas X: 1037.832248645193
Canvas Y: 2834.180904913291
From Canvas X: 1044.252784950505
From Canvas Y: 2822.884867822952
Area: 0.0387
Downstream: Reservoir OS-5

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 40.8
Unitgraph Type: STANDARD

PR_East_Basin_GWR.basin

Baseflow: None

End:

Subbasin: Basin E-4A

Last Modified Date: 12 June 2020

Last Modified Time: 15:39:13

Canvas X: 715.0129745073164

Canvas Y: 2323.649069557905

From Canvas X: 676.6773862670857

From Canvas Y: 2255.6209566399502

Area: 0.0125

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.4

Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: C-10

Last Modified Date: 29 June 2020

Last Modified Time: 16:20:17

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: -84.11606967854232

From Canvas Y: 1597.0236365676153

Downstream: Route E-7

End:

Reach: Route OS-6C

Last Modified Date: 29 June 2020

Last Modified Time: 16:24:28

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1491.2771662334803

From Canvas Y: 2451.188221151665

PR_East_Basin_GWR.basin

Downstream: Reservoir OS-5

Route: Lag

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Subbasin: Basin E-4B

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:50

Canvas X: 1165.3342353785638

Canvas Y: 1932.9953623431986

From Canvas X: 1312.564453923134

From Canvas Y: 1483.4723744861783

Label X: 3.0

Label Y: -7.0

Area: 0.0091

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 38.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-6D

Last Modified Date: 29 June 2020

Last Modified Time: 16:24:28

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1594.6242279570024

From Canvas Y: 2355.412855055983

Downstream: Reservoir OS-5

Route: Lag

PR_East_Basin_GWR.basin

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Reservoir: Reservoir OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1258.6753881228692

From Canvas Y: 2210.8058005854755

Label X: 1.0

Label Y: -7.0

Downstream: Reservoir Route

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: OS-5

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 0.545

Centerline Elevation: 7324.42

Number Barrels: 1

End Conduit:

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 7.06

Centerline Elevation: 7331

Number Barrels: 1

End Conduit:

Spillway: Broad-Crested Spillway

Spillway Outlet: Main

Spillway Crest Length: 20

Spillway Crest Elevation: 7334

Spillway Coefficient: 2.6

End Spillway:

Evaporation Method: Zero Evaporation

PR_East_Basin_GWR.basin

End Evaporation:

End:

Subbasin: Basin OS-6D

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:42

Canvas X: 1883.632123721196

Canvas Y: 2418.0452279029837

From Canvas X: 1874.6530481452974

From Canvas Y: 2417.431218187936

Area: 0.0977

Downstream: Route OS-6D

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 50

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route E-7

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: 324.24823149222857

From Canvas Y: 1424.908662565677

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-1

Last Modified Date: 25 June 2020

PR_East_Basin_GWR.basin

Last Modified Time: 22:22:08
Canvas X: -1999.417346470526
Canvas Y: 1455.897133923738
From Canvas X: -2463.015010284649
From Canvas Y: 2073.938937309651
Label X: 0.0
Label Y: 1.0
Area: 0.0079
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.0
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-3

Last Modified Date: 12 June 2020
Last Modified Time: 15:38:21
Canvas X: -1818.3597961754886
Canvas Y: 1593.6807966465158
From Canvas X: -1639.7683601942304
From Canvas Y: 944.1038795993522
Label X: 0.0
Label Y: 1.0
Area: 0.03
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.56

PR_East_Basin_GWR.basin

Curve Number: 64
Initial Abstraction: 0.6

Transform: SCS
Lag: 45.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 3

Last Modified Date: 29 June 2020
Last Modified Time: 22:49:51
Canvas X: -1577.2955854501724
Canvas Y: 1237.332633615489
From Canvas X: -1511.7339678911565
From Canvas Y: 640.2004812966065
Label X: 0.0
Label Y: 1.0
Downstream: R-EX-1

Route: Specified Outflow
Routing Curve: Elevation-Storage
Initial Elevation: 0
Elevation-Storage Table: Pond 3
Outflow Gage Name: Pond 3 - Q50

End:

Subbasin: E-3

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:38
Canvas X: -850.7849400791165
Canvas Y: 993.9331280597039
From Canvas X: -1009.5588556422545
From Canvas Y: 1006.5570737441426
Area: 0.0336
Downstream: R-EX-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 6.7
Curve Number: 54.5
Initial Abstraction: 0.83

PR_East_Basin_GWR.basin

Transform: SCS
Lag: 64
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4B

Last Modified Date: 8 April 2020
Last Modified Time: 14:57:45
Canvas X: 77.17075639610812
Canvas Y: 2378.1178945307097
From Canvas X: 778.873522140379
From Canvas Y: 773.7769864771967
Area: 0.0103
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 38
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4A

Last Modified Date: 8 April 2020
Last Modified Time: 14:56:57
Canvas X: -360.964130568138
Canvas Y: 2409.983054835778
From Canvas X: 18.080066194750998
From Canvas Y: 2352.1395294091717
Area: 0.0069
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No

PR_East_Basin_GWR.basin

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 56.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 4

Last Modified Date: 29 June 2020

Last Modified Time: 22:45:02

Canvas X: -260.0285318811434

Canvas Y: 1875.104502058163

From Canvas X: 539.8540713480625

From Canvas Y: 1066.6296604004497

Downstream: Route C-8

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 4

Outflow Gage Name: Pond 4 - Q50

End:

Reach: Route C-8

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -260.0285318811434

From Canvas Y: 1875.104502058163

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-2

PR_East_Basin_GWR.basin

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:42
Canvas X: -1197.4448419312953
Canvas Y: 1642.9984762084644
From Canvas X: -1372.9228943028534
From Canvas Y: 2108.004315934082
Area: 0.010
Downstream: Route C-6

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 20.2
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.7
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-6

Last Modified Date: 29 June 2020
Last Modified Time: 21:03:25
Canvas X: -861.7276411671855
Canvas Y: 285.5041412301971
From Canvas X: -1160.5661289682976
From Canvas Y: 1491.7957530601734
Downstream: R-EX-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 64
Channel Loss: None

End:

Subbasin: Basin OS-5

Last Modified Date: 8 April 2020
Last Modified Time: 15:05:02
Canvas X: -1910.9889810178615
Canvas Y: 2730.049713289869
From Canvas X: -1895.2586998774636

PR_East_Basin_GWR.basin

From Canvas Y: 2743.89138359013

Area: 0.0244

Downstream: Route OS-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 68.7

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-1

Last Modified Date: 29 June 2020

Last Modified Time: 21:44:46

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -616.7135794014512

From Canvas Y: 410.34175233158203

Downstream: Sink EX-1

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-1

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Culvert

Conduit Outlet: Main

Culvert Shape: Circular

Chart Number: 2

Scale Number: 3

Solution Control: Automatic

Diameter: 4

Number Barrels: 1

Culvert Length: 48

PR_East_Basin_GWR.basin

Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7235.6
Outlet Invert Elevation: 7235.2
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 71
Spillway Crest Elevation: 7242
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Sink: Sink EX-1

Last Modified Date: 25 June 2020
Last Modified Time: 14:58:26
Canvas X: -890.526833152149
Canvas Y: 101.46827435515797
From Canvas X: -1043.6242342666856
From Canvas Y: 370.67000608809485
Label X: 3.0
Label Y: -12.0

End:

Basin Layer Properties:

Element Layer:
Name: Icons
Layer shown: Yes
End Layer:

End:

Basin Spatial Properties:

End:

Basin Schematic Properties:

Last View N: 3600.2886002886
Last View S: 829.7258297258295
Last View W: -1868.6868686868684
Last View E: 1233.766233766235
Maximum View N: 3600.2886002886
Maximum View S: 829.7258297258295
Maximum View W: -1868.6868686868684
Maximum View E: 1233.766233766235

PR_East_Basin_GWR.basin

Extent Method: Manual

Buffer: 0

Draw Icons: Yes

Draw Icon Labels: Name

Draw Map Objects: No

Draw Gridlines: No

Draw Flow Direction: No

Draw HillShade Layer: Yes

Draw Elevation Layer: Yes

Elevation Layer Color Palette: Default

Ignore Elevation Color Ramp Scale: No

Use Interpolated Color Ramp for Elevation Layer: Yes

Color Ramp Opacity Level for Elevation Layer: 33.0

Fix Element Locations: No

Fix Hydrologic Order: No

End:

Project: GWR-Q50-FDR Simulation Run: PR East - 50 YR 24HR

Start of Run: 01Jan2020, 00:00

Basin Model: PR East Basin GWI

End of Run: 02Jan2020, 00:05

Meteorologic Model: 24HR - 50YR

Compute Time: 15Sep2020, 16:15:30

Control Specifications: GR Control - PR

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin D-3	0.0300	11.9	01Jan2020, 12:40	1.39
Basin D-4A	0.0069	2.9	01Jan2020, 12:50	1.77
Basin D-4B	0.0103	5.8	01Jan2020, 12:30	1.78
Basin E-4A	0.0125	6.2	01Jan2020, 12:40	1.78
Basin E-4B	0.0091	5.1	01Jan2020, 12:30	1.78
Basin OS-5	0.0244	9.1	01Jan2020, 13:05	1.76
Basin OS-6A	0.0387	20.9	01Jan2020, 12:35	1.78
Basin OS-6B	0.0579	28.5	01Jan2020, 12:40	1.78
Basin OS-6C	0.0820	36.7	01Jan2020, 12:50	1.77
Basin OS-6D	0.0977	45.7	01Jan2020, 12:45	1.77
C-10	0.2979	108.9	01Jan2020, 14:35	1.63
E-1	0.0079	4.6	01Jan2020, 12:35	1.93
E-2	0.0100	6.3	01Jan2020, 12:35	2.14
E-3	0.0336	8.2	01Jan2020, 13:00	1.15
Pond 3	0.0379	22.2	01Jan2020, 01:00	1.16
Pond 4	0.0172	7.3	01Jan2020, 01:00	0.85
Reservoir OS-5	0.2763	107.1	01Jan2020, 13:50	1.65
Reservoir Route	0.2763	107.0	01Jan2020, 14:35	1.62
Route C-6	0.0100	6.3	01Jan2020, 13:40	2.10
Route C-8	0.0172	7.3	01Jan2020, 02:05	0.85
Route E-7	0.2979	108.6	01Jan2020, 15:40	1.59
Route OS-5	0.0244	9.1	01Jan2020, 14:50	1.70
Route OS-6B	0.0579	28.5	01Jan2020, 13:30	1.75
Route OS-6C	0.0820	36.6	01Jan2020, 13:40	1.74
Route OS-6D	0.0977	45.6	01Jan2020, 13:40	1.74
R-EX-1	0.4210	115.5	01Jan2020, 15:45	1.50
Sink EX-1	0.4210	115.5	01Jan2020, 15:40	1.50

PR_West_Basin_GWR.basin

Basin: PR West Basin GWR

Last Modified Date: 23 June 2020

Last Modified Time: 21:06:18

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: No

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route W-9

Last Modified Date: 24 June 2020

Last Modified Time: 13:14:26

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190941.0482914834

From Canvas Y: 1454172.086088502

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 1

Last Modified Date: 24 June 2020

Last Modified Time: 13:14:26

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190788.6775098434

From Canvas Y: 1454841.7546350043

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 2

Last Modified Date: 26 June 2020

Last Modified Time: 20:51:50

PR_West_Basin_GWR.basin

Canvas X: 3190827.266021038
Canvas Y: 1454214.7415360329
From Canvas X: 3191285.843830595
From Canvas Y: 1454369.28601614
Downstream: R-EX-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: W-7

Last Modified Date: 25 June 2020
Last Modified Time: 22:00:54
Canvas X: 3191588.062197299
Canvas Y: 1454558.061469289
From Canvas X: 3191726.0696871458
From Canvas Y: 1454578.2102340478
Label X: 0.0
Label Y: -3.0
Area: 0.027
Downstream: Junction C-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.45
Curve Number: 65.5
Initial Abstraction: 0.53

Transform: SCS
Lag: 47.3
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-6

Last Modified Date: 7 April 2020
Last Modified Time: 17:50:28
Canvas X: 3191787.2788931862
Canvas Y: 1454806.7233097618
From Canvas X: 3192492.046785609

PR_West_Basin_GWR.basin

From Canvas Y: 1454929.1016958833

Area: 0.003

Downstream: Route W-6

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-8

Description: Drainage Easement across lot

Last Modified Date: 16 June 2020

Last Modified Time: 22:12:19

Canvas X: 3191046.9812794775

Canvas Y: 1454826.8102695316

From Canvas X: 3191390.648482099

From Canvas Y: 1454613.8680979477

Area: 0.00386

Downstream: Junction C-3

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35.4

Unitgraph Type: STANDARD

PR_West_Basin_GWR.basin

Baseflow: None

End:

Reach: Route to C-3

Description: Combined junction C-1 and C-2 to Junction C-3

Last Modified Date: 6 April 2020

Last Modified Time: 22:00:34

Canvas X: 3191125.8142608823

Canvas Y: 1454636.8944506934

From Canvas X: 3191740.132405288

From Canvas Y: 1455102.301558766

Downstream: Junction C-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4A

Last Modified Date: 8 April 2020

Last Modified Time: 15:10:30

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3191821.555858512

From Canvas Y: 1455495.3148196193

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47.3

Channel Loss: None

End:

Junction: Upper Junction

Description: Combining design points into final basin flow

Last Modified Date: 6 April 2020

Last Modified Time: 16:04:39

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192059.549422635

From Canvas Y: 1455656.9537690468

Downstream: Route OS-3B

End:

Reach: Route W-5

Last Modified Date: 6 April 2020

Last Modified Time: 16:05:38

PR_West_Basin_GWR.basin

Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3192053.9995084023
From Canvas Y: 1455254.1730524607
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Reach: Route W-6

Last Modified Date: 16 June 2020
Last Modified Time: 22:40:46
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191596.658030947
From Canvas Y: 1454785.3109359604
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 47
Channel Loss: None

End:

Reach: Route OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191610.741291508
From Canvas Y: 1455715.037744202
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Junction: Junction C-1

Last Modified Date: 6 April 2020
Last Modified Time: 20:34:48
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191049.172513107

PR_West_Basin_GWR.basin

From Canvas Y: 1455596.382345375

Label X: -84.0

Label Y: -3.0

Downstream: Route C-1

End:

Subbasin: Basin OS-3C

Last Modified Date: 1 July 2020

Last Modified Time: 19:38:04

Canvas X: 3191732.837927499

Canvas Y: 1455795.0234726786

From Canvas X: 3191732.837927499

From Canvas Y: 1455795.0234726786

Area: 0.0198

Downstream: Route OS-3C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 37.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-3B

Last Modified Date: 6 April 2020

Last Modified Time: 22:18:54

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192064.58176487

From Canvas Y: 1455689.0141506763

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Reach: Route OS-3C

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191701.8574730195
From Canvas Y: 1455717.8851248743
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Subbasin: Basin OS-3B

Last Modified Date: 16 June 2020
Last Modified Time: 22:21:02
Canvas X: 3191454.1353545357
Canvas Y: 1455638.1584660518
From Canvas X: 3191808.881599231
From Canvas Y: 1455981.4348019836
Label X: -51.0
Label Y: 27.0
Area: 0.034
Downstream: Junction OS-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 16.5
Curve Number: 66.7
Initial Abstraction: 0.5

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-3A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:37:56
Canvas X: 3191585.114865458
Canvas Y: 1455846.0172551244
From Canvas X: 3191525.184704565
From Canvas Y: 1455763.7332610039
Area: 0.0225
Downstream: Route OS-3A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.4
Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: Junction C-3

Last Modified Date: 6 April 2020
Last Modified Time: 18:40:14
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191239.226172219
From Canvas Y: 1454613.8680979477
Downstream: Route C-3

End:

Junction: Junction C-2

Last Modified Date: 6 April 2020
Last Modified Time: 16:05:38
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191601.3307882836
From Canvas Y: 1454899.3142550313
Downstream: Route to C-3

End:

Subbasin: Basin OS-4A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:38:17
Canvas X: 3191816.144480269
Canvas Y: 1455608.9537627215
From Canvas X: 3191816.144480269
From Canvas Y: 1455608.9537627215
Area: 0.0256
Downstream: Route OS-4A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2B

Description: Overland flow. Flows into basin W-3
Last Modified Date: 18 June 2020
Last Modified Time: 19:50:47
Canvas X: 3191192.176332691
Canvas Y: 1455473.0103870628
From Canvas X: 3191079.159717601
From Canvas Y: 1455778.8719525808
Area: 0.0198
Downstream: Route OS-2B

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2A

Description: Existing Basin on Timberview Filing 1. All flow routed to Culvert

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Last Modified Date: 1 July 2020
Last Modified Time: 19:37:48
Canvas X: 3191075.43372513
Canvas Y: 1455652.395369413
From Canvas X: 3190635.01570008
From Canvas Y: 1456266.8411205618
Area: 0.022
Downstream: Route OS-2A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 37.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-1

Last Modified Date: 6 April 2020
Last Modified Time: 22:00:20
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191197.8710940355
From Canvas Y: 1455077.2244736233
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow

PR_West_Basin_GWR.basin

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:14

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192097.536148903

From Canvas Y: 1455817.2918250756

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 96.2

Channel Loss: None

End:

Subbasin: Basin OS-4E

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:01

Canvas X: 3192707.2299209572

Canvas Y: 1455857.660741784

From Canvas X: 3193024.4086084175

From Canvas Y: 1456017.9537466252

Area: 0.049

Downstream: Route OS-4E

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 44

Unitgraph Type: STANDARD

Baseflow: None

End:

PR_West_Basin_GWR.basin

Reach: Route Basin OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191620.2620947743
From Canvas Y: 1455576.2974092974
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48
Channel Loss: None

End:

Reach: Route OS-4C

Last Modified Date: 8 April 2020
Last Modified Time: 15:11:56
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192259.8774961918
From Canvas Y: 1455863.288540141
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Subbasin: Basin OS-4D

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:12:22
Canvas X: 3192731.2547275363
Canvas Y: 1455991.5132355825
From Canvas X: 3192803.614351975
From Canvas Y: 1456110.2858902286
Area: 0.019
Downstream: Route OS-4D

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_West_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 42.8

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-2A

Last Modified Date: 6 April 2020

Last Modified Time: 20:34:48

Canvas X: 3191197.8710940355

Canvas Y: 1455077.2244736233

From Canvas X: 3191121.592686727

From Canvas Y: 1455311.9544209125

Downstream: Junction C-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 63.2

Channel Loss: None

End:

Subbasin: Basin OS-4C

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:32

Canvas X: 3192549.3526205793

Canvas Y: 1456056.7234248691

From Canvas X: 3192434.285777561

From Canvas Y: 1456074.1559209926

Area: 0.031

Downstream: Route OS-4C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 53.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4D

Last Modified Date: 8 April 2020
Last Modified Time: 15:12:43
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192408.6358963293
From Canvas Y: 1455885.1176635888
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Reach: Route OS-2B

Last Modified Date: 6 April 2020
Last Modified Time: 21:56:42
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191198.059764327
From Canvas Y: 1455243.1779213208
Downstream: Junction C-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: Basin OS-4B

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:10:53
Canvas X: 3192160.285761248
Canvas Y: 1456065.2655668857
From Canvas X: 3192165.318228803
From Canvas Y: 1456058.0981568876
Label X: 0.0
Label Y: 1.0
Area: 0.019

PR_West_Basin_GWR.basin

Downstream: Route OS-4B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 34.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4E

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:32

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192392.4562631445

From Canvas Y: 1455779.412177375

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 100.1

Channel Loss: None

End:

Junction: Junction OS-3

Last Modified Date: 8 April 2020

Last Modified Time: 20:02:16

Canvas X: 3191620.2620947743

Canvas Y: 1455576.2974092974

From Canvas X: 3191030.2304471615

From Canvas Y: 1455857.6038960286

Downstream: Route Basin OS-3A

End:

Reach: Route OS-4F

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:06

PR_West_Basin_GWR.basin

Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192563.0810814817
From Canvas Y: 1455734.104593662
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Subbasin: W-3

Last Modified Date: 16 June 2020
Last Modified Time: 22:25:18
Canvas X: 3191274.205299845
Canvas Y: 1455232.9233677052
From Canvas X: 3191024.0629101307
From Canvas Y: 1455607.9918769917
Area: 0.01
Downstream: Junction C-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 30.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4H

Last Modified Date: 1 July 2020
Last Modified Time: 21:34:52
Canvas X: 3192191.6069486425
Canvas Y: 1455441.6891996684
From Canvas X: 3192188.156768472
From Canvas Y: 1455449.7392372065
Area: 0.021

PR_West_Basin_GWR.basin

Downstream: Route OS-4H

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 41.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4G

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:46

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192316.0300185457

From Canvas Y: 1455651.1617253919

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 102.7

Channel Loss: None

End:

Reach: Route OS-4H

Last Modified Date: 8 April 2020

Last Modified Time: 15:15:37

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192057.7800570475

From Canvas Y: 1455344.8782568125

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 48

Channel Loss: None

PR_West_Basin_GWR.basin

End:

Subbasin: W-5

Description: All overland flow for watershed. Used to size swale DP 5-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:01

Canvas X: 3192181.679638902

Canvas Y: 1455275.5631039173

From Canvas X: 3192157.565279063

From Canvas Y: 1455254.8641652972

Label X: 1.0

Label Y: 0.0

Area: 0.01

Downstream: Route W-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 51.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4G

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:25

Canvas X: 3192660.319486171

Canvas Y: 1455549.4286020491

From Canvas X: 3193180.971808441

From Canvas Y: 1455688.769582474

Area: 0.076

Downstream: Route OS-4G

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

PR_West_Basin_GWR.basin

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 48.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4F

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:48

Canvas X: 3192736.0787815726

Canvas Y: 1455736.1211514312

From Canvas X: 3193108.7118699686

From Canvas Y: 1455873.4338696809

Area: 0.021

Downstream: Route OS-4F

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 45

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:06

Canvas X: 3191593.657007475

Canvas Y: 1455287.930643368

PR_West_Basin_GWR.basin

From Canvas X: 3191663.9790399233
From Canvas Y: 1455200.9491771364
Label X: 0.0
Label Y: 1.0
Area: 0.006
Downstream: Junction C-2

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 48.3
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-3

Last Modified Date: 24 June 2020
Last Modified Time: 13:14:26
Canvas X: 3190827.266021038
Canvas Y: 1454214.7415360329
From Canvas X: 3191125.8142608823
From Canvas Y: 1454636.8944506934
Downstream: R-EX-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 32
Channel Loss: None

End:

Reservoir: Pond 2

Last Modified Date: 26 June 2020
Last Modified Time: 20:51:57
Canvas X: 3191285.843830595
Canvas Y: 1454369.28601614
From Canvas X: 3191195.8916458623
From Canvas Y: 1454392.14754045
Label X: -6.0

PR_West_Basin_GWR.basin

Label Y: -16.0

Downstream: Route Pond 2

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 2

Outflow Gage Name: Pond 2 - Q50

End:

Reservoir: Pond 1

Last Modified Date: 26 June 2020

Last Modified Time: 20:51:50

Canvas X: 3190788.6775098434

Canvas Y: 1454841.7546350043

From Canvas X: 3190512.093450769

From Canvas Y: 1455477.2407319362

Downstream: Route Pond 1

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 1

Outflow Gage Name: Pond 1 - Q50

End:

Reservoir: R-EX-2

Description: Note: Outlet 1 is reduced in size from the existing condition to represent a 3-5/8 inch depth restrictor plate installed on pipe to reduce flows for Q5 event

Last Modified Date: 15 September 2020

Last Modified Time: 20:25:12

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190778.306968433

From Canvas Y: 1454050.976266697

Label X: -78.0

Label Y: 71.0

Downstream: Sink-2

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-2

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

PR_West_Basin_GWR.basin

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Elliptical
Chart Number: 29
Scale Number: 3
Solution Control: Automatic
Rise: 2.33
Span: 3.5
Diameter: 2.5
Number Barrels: 1
Culvert Length: 48.5
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7154.7
Outlet Invert Elevation: 7149.5
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 174.3
Spillway Crest Elevation: 7162
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: W-2

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:53
Canvas X: 3190671.1056696735
Canvas Y: 1454493.511435817
From Canvas X: 3190858.8970014188
From Canvas Y: 1454517.375669532
Area: 0.005
Downstream: R-EX-2

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 45.4

PR_West_Basin_GWR.basin

Initial Abstraction: 1.2

Transform: SCS

Lag: 31

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-9

Last Modified Date: 6 April 2020

Last Modified Time: 23:21:10

Canvas X: 3191400.0351217636

Canvas Y: 1454154.673135822

From Canvas X: 3191046.078595636

From Canvas Y: 1454207.1248628749

Area: 0.003

Downstream: Route W-9

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-2

Last Modified Date: 25 June 2020

Last Modified Time: 22:00:51

Canvas X: 3191663.866892373

Canvas Y: 1454378.4190795475

From Canvas X: 3191628.3381642886

From Canvas Y: 1454443.6292688341

Area: 0.01

Downstream: Pond 2

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 31.7

Curve Number: 72.4

Initial Abstraction: 0.38

Transform: SCS

Lag: 37

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-1

Last Modified Date: 7 April 2020

Last Modified Time: 17:50:40

Canvas X: 3190762.221851185

Canvas Y: 1455062.9875702623

From Canvas X: 3190677.102419148

From Canvas Y: 1455211.3929495476

Area: 0.02

Downstream: Pond 1

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 22.31

Curve Number: 68.37

Initial Abstraction: 0.46

Transform: SCS

Lag: 41.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-2

Description: Wetlands. Central drainage.

Last Modified Date: 23 June 2020

PR_West_Basin_GWR.basin

Last Modified Time: 21:07:21
Canvas X: 3190748.0295129814
Canvas Y: 1454016.9141293145
From Canvas X: 3190880.4929359066
From Canvas Y: 1454338.8286808033
Label X: -28.0
Label Y: -25.0

End:

Subbasin: W-1

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:36
Canvas X: 3190301.437045076
Canvas Y: 1454554.338963574
From Canvas X: 3190143.3967487137
From Canvas Y: 1454903.4863893862
Area: 0.0302
Downstream: R-EX-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.6
Curve Number: 65.6
Initial Abstraction: 0.52

Transform: SCS
Lag: 48.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-3

Last Modified Date: 23 June 2020
Last Modified Time: 21:32:34
Canvas X: 3190274.944271556
Canvas Y: 1454085.0384040799
From Canvas X: 3190274.944271556
From Canvas Y: 1454085.0384040799
Downstream: Sink-3

Route: Controlled Outflow
Routing Curve: Elevation-Area

PR_West_Basin_GWR.basin

Initial Outflow Equals Inflow: Yes
Elevation-Area Table: EX-3
Adaptive Control: On
Main Tailwater Condition: None
Auxiliary Tailwater Condition: None

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Circular
Chart Number: 2
Scale Number: 3
Solution Control: Automatic
Rise: 1.25
Diameter: 1.25
Number Barrels: 1
Culvert Length: 43.1
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7168.6
Outlet Invert Elevation: 7167.3
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 237.06
Spillway Crest Elevation: 7174
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: OS-1

Description: Part of Timberview. Fully detained in sedimentation basin
Last Modified Date: 26 June 2020
Last Modified Time: 19:56:00
Canvas X: 3189944.377164344
Canvas Y: 1454944.7180917726
From Canvas X: 3189604.487770659
From Canvas Y: 1455611.2295709252
Label X: -24.0
Label Y: 15.0
Area: 0.0634
Downstream: Reservoir OS-1

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 43.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Reservoir OS-1

Description: All flows from OS-1 are collected by and detained by a sedimentation pond on Timberview. Reservoir table are available in this report.

Last Modified Date: 15 September 2020

Last Modified Time: 22:17:37

Canvas X: 3190036.6258191844

Canvas Y: 1454697.999121881

From Canvas X: 3189388.7751533836

From Canvas Y: 1455874.4720869225

Downstream: Route OS-1

Route: Modified Puls

Routing Curve: Storage-Outflow

Initial Outflow: 0

Storage-Outflow Table: EX OS-1

End:

Reach: Route OS-1

Last Modified Date: 15 September 2020

Last Modified Time: 22:17:37

Canvas X: 3190274.944271556

Canvas Y: 1454085.0384040799

From Canvas X: 3190036.6258191844

From Canvas Y: 1454697.999121881

Downstream: R-EX-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 48.6

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Sink: Sink-3

Description: West-most drainage - Culvert 3
Last Modified Date: 23 June 2020
Last Modified Time: 21:29:08
Canvas X: 3190290.6604908723
Canvas Y: 1453988.5970195946
From Canvas X: 3190265.471714283
From Canvas Y: 1454199.949087816
Label X: -31.0
Label Y: -20.0

End:

Subbasin: W-10

Last Modified Date: 16 June 2020
Last Modified Time: 22:56:37
Canvas X: 3192674.484371266
Canvas Y: 1454778.6071245822
From Canvas X: 3192832.9140338055
From Canvas Y: 1454753.0347040498
Area: 0.01
Downstream: Sink-4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 11.9
Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-4

Description: EX culvert 4
Last Modified Date: 25 March 2020
Last Modified Time: 18:50:24
Canvas X: 3192640.4035706962
Canvas Y: 1454413.8496023817
From Canvas X: 3192640.4035706962

PR_West_Basin_GWR.basin
From Canvas Y: 1454413.8496023817
End:

Basin Layer Properties:
 Element Layer:
 Name: Icons
 Layer shown: Yes
 End Layer:
End:

Basin Spatial Properties:
End:

Basin Schematic Properties:
 Last View N: 1455607.9918769917
 Last View S: 1454940.6937600982
 Last View W: 3191024.0629101307
 Last View E: 3191102.8411600417
 Maximum View N: 1455607.9918769917
 Maximum View S: 1454940.6937600982
 Maximum View W: 3191024.0629101307
 Maximum View E: 3191102.8411600417
 Extent Method: Manual
 Buffer: 0
 Draw Icons: Yes
 Draw Icon Labels: Name
 Draw Map Objects: No
 Draw Gridlines: No
 Draw Flow Direction: No
 Draw HillShade Layer: Yes
 Draw Elevation Layer: Yes
 Elevation Layer Color Palette: Default
 Ignore Elevation Color Ramp Scale: No
 Use Interpolated Color Ramp for Elevation Layer: Yes
 Color Ramp Opacity Level for Elevation Layer: 33.0
 Fix Element Locations: No
 Fix Hydrologic Order: No
End:

Project: GWR-Q50-FDR Simulation Run: PR West - 50 YR 24HR

Start of Run: 01Jan2020, 00:00

Basin Model: PR West Basin

End of Run: 02Jan2020, 00:05

Meteorologic Model: 24HR - 50Y

Compute Time: DATA CHANGED, RECOMPUTE Control Specifications:GR Control

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin OS-3A	0.02250	12.0	01Jan2020, 12:35	1.78
Basin OS-3B	0.03400	22.9	01Jan2020, 12:25	1.99
Basin OS-3C	0.01980	11.4	01Jan2020, 12:30	1.78
Basin OS-4A	0.02560	13.6	01Jan2020, 12:35	1.78
Basin OS-4B	0.01900	11.5	01Jan2020, 12:30	1.79
Basin OS-4C	0.03100	13.8	01Jan2020, 12:50	1.77
Basin OS-4D	0.01900	9.9	01Jan2020, 12:35	1.78
Basin OS-4E	0.04900	25.1	01Jan2020, 12:40	1.78
Basin OS-4F	0.02100	10.6	01Jan2020, 12:40	1.78
Basin OS-4G	0.07600	36.1	01Jan2020, 12:45	1.78
Basin OS-4H	0.02100	11.3	01Jan2020, 12:35	1.78
D-1	0.02000	13.2	01Jan2020, 12:35	2.21
D-2	0.01000	8.4	01Jan2020, 12:30	2.61
Junction C-1	0.05180	20.6	01Jan2020, 13:25	1.76
Junction C-2	0.35390	116.3	01Jan2020, 15:00	1.74
Junction C-3	0.43956	123.1	01Jan2020, 15:35	1.73
Junction OS-3	0.07630	31.2	01Jan2020, 13:15	1.86
OS-1	0.06340	32.5	01Jan2020, 12:40	1.78
OS-2A	0.02200	12.6	01Jan2020, 12:30	1.78
OS-2B	0.01980	12.0	01Jan2020, 12:30	1.79
Pond 1	0.02000	5.1	01Jan2020, 01:10	0.76
Pond 2	0.01000	5.4	01Jan2020, 01:25	1.90
Reservoir OS-1	0.06340	25.5	01Jan2020, 13:00	1.78
Route Basin OS-3A	0.07630	31.0	01Jan2020, 14:00	1.83
Route C-1	0.05180	20.6	01Jan2020, 14:00	1.74
Route C-3	0.43956	122.5	01Jan2020, 16:05	1.71
Route OS-1	0.06340	25.5	01Jan2020, 13:50	1.75

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Route OS-2A	0.02200	12.5	01Jan2020, 13:35	1.75
Route OS-2B	0.01980	12.0	01Jan2020, 13:00	1.77
Route OS-3A	0.02250	12.0	01Jan2020, 13:20	1.76
Route OS-3B	0.21500	97.9	01Jan2020, 15:05	1.70
Route OS-3C	0.01980	11.3	01Jan2020, 13:15	1.76
Route OS-4A	0.02560	13.5	01Jan2020, 13:25	1.75
Route OS-4B	0.01900	11.5	01Jan2020, 14:05	1.73
Route OS-4C	0.03100	13.8	01Jan2020, 13:35	1.75
Route OS-4D	0.01900	9.9	01Jan2020, 14:10	1.73
Route OS-4E	0.04900	25.1	01Jan2020, 14:20	1.72
Route OS-4F	0.02100	10.6	01Jan2020, 14:15	1.72
Route OS-4G	0.07600	36.0	01Jan2020, 14:25	1.72
Route OS-4H	0.02100	11.2	01Jan2020, 13:25	1.75
Route Pond 1	0.02000	5.1	01Jan2020, 01:45	0.76
Route Pond 2	0.01000	5.3	01Jan2020, 01:55	1.90
Route to C-3	0.35390	116.3	01Jan2020, 15:35	1.72
Route W-5	0.01000	4.6	01Jan2020, 13:35	1.75
Route W-6	0.00300	1.8	01Jan2020, 13:15	1.76
Route W-9	0.00300	1.5	01Jan2020, 13:10	1.76
R-EX-2	0.47756	123.0	01Jan2020, 16:10	1.66
R-EX-3	0.09360	31.3	01Jan2020, 13:45	1.78
Sink-2	0.47756	123.0	01Jan2020, 16:05	1.66
Sink-3	0.09360	31.3	01Jan2020, 13:40	1.78
Sink-4	0.01000	11.3	01Jan2020, 12:00	1.80
Upper Junction	0.21500	98.2	01Jan2020, 14:15	1.73
W-1	0.03020	15.0	01Jan2020, 12:45	1.85
W-10	0.01000	11.3	01Jan2020, 12:05	1.80
W-2	0.00500	0.9	01Jan2020, 12:30	0.59
W-3	0.01000	6.5	01Jan2020, 12:25	1.79
W-4	0.00600	2.9	01Jan2020, 12:45	1.78
W-5	0.01000	4.6	01Jan2020, 12:45	1.77

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
W-6	0.00300	1.8	01Jan2020, 12:30	1.79
W-7	0.02700	13.6	01Jan2020, 12:40	1.84
W-8	0.00386	2.3	01Jan2020, 12:30	1.78
W-9	0.00300	1.5	01Jan2020, 12:40	1.78

PR_East_Basin_GWR.basin

Basin: PR East Basin GWR

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:07

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: Yes

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -1883.90357366932

From Canvas Y: 2571.1693652962567

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 106.6

Channel Loss: None

End:

Subbasin: Basin OS-6C

Description: OS-5C

Last Modified Date: 1 July 2020

Last Modified Time: 17:52:06

Canvas X: 1862.9572697904414

Canvas Y: 2655.2453780700125

From Canvas X: 1862.9572697904414

From Canvas Y: 2655.2453780700125

Area: 0.082

Downstream: Route OS-6C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_East_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 53.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-6B

Description: OS-5B

Last Modified Date: 11 June 2020

Last Modified Time: 22:02:51

Canvas X: 1574.7803926437246

Canvas Y: 2809.314217301934

From Canvas X: 1597.8529604137002

From Canvas Y: 2830.682053392856

Area: 0.0579

Downstream: Route OS-6B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.5

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Reservoir Route

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: 1336.12273862665

From Canvas Y: 2299.4395669498244

Downstream: C-10

PR_East_Basin_GWR.basin

Route: Lag
Initial Variable: Combined Inflow
Lag: 44.5
Channel Loss: None

End:

Reach: Route OS-6B

Last Modified Date: 30 June 2020
Last Modified Time: 20:55:49
Canvas X: 1336.12273862665
Canvas Y: 2299.4395669498244
From Canvas X: 1416.7680854049777
From Canvas Y: 2520.167052110427
Downstream: Reservoir OS-5

Route: Lag
Initial Variable: Combined Inflow
Lag: 50
Channel Loss: None

End:

Subbasin: Basin OS-6A

Description: OS-5A
Last Modified Date: 8 April 2020
Last Modified Time: 14:59:46
Canvas X: 1037.832248645193
Canvas Y: 2834.180904913291
From Canvas X: 1044.252784950505
From Canvas Y: 2822.884867822952
Area: 0.0387
Downstream: Reservoir OS-5

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 40.8
Unitgraph Type: STANDARD

PR_East_Basin_GWR.basin

Baseflow: None

End:

Subbasin: Basin E-4A

Last Modified Date: 12 June 2020

Last Modified Time: 15:39:13

Canvas X: 715.0129745073164

Canvas Y: 2323.649069557905

From Canvas X: 676.6773862670857

From Canvas Y: 2255.6209566399502

Area: 0.0125

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46.4

Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: C-10

Last Modified Date: 29 June 2020

Last Modified Time: 16:20:17

Canvas X: 324.24823149222857

Canvas Y: 1424.908662565677

From Canvas X: -84.11606967854232

From Canvas Y: 1597.0236365676153

Downstream: Route E-7

End:

Reach: Route OS-6C

Last Modified Date: 29 June 2020

Last Modified Time: 16:24:28

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1491.2771662334803

From Canvas Y: 2451.188221151665

PR_East_Basin_GWR.basin

Downstream: Reservoir OS-5

Route: Lag

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Subbasin: Basin E-4B

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:50

Canvas X: 1165.3342353785638

Canvas Y: 1932.9953623431986

From Canvas X: 1312.564453923134

From Canvas Y: 1483.4723744861783

Label X: 3.0

Label Y: -7.0

Area: 0.0091

Downstream: C-10

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 38.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-6D

Last Modified Date: 29 June 2020

Last Modified Time: 16:24:28

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1594.6242279570024

From Canvas Y: 2355.412855055983

Downstream: Reservoir OS-5

Route: Lag

PR_East_Basin_GWR.basin

Initial Variable: Combined Inflow

Lag: 54.5

Channel Loss: None

End:

Reservoir: Reservoir OS-5

Last Modified Date: 29 June 2020

Last Modified Time: 18:33:11

Canvas X: 1336.12273862665

Canvas Y: 2299.4395669498244

From Canvas X: 1258.6753881228692

From Canvas Y: 2210.8058005854755

Label X: 1.0

Label Y: -7.0

Downstream: Reservoir Route

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: OS-5

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 0.545

Centerline Elevation: 7324.42

Number Barrels: 1

End Conduit:

Conduit: Orifice

Conduit Outlet: Main

Orifice Coefficient: 0.6

Orifice Area: 7.06

Centerline Elevation: 7331

Number Barrels: 1

End Conduit:

Spillway: Broad-Crested Spillway

Spillway Outlet: Main

Spillway Crest Length: 20

Spillway Crest Elevation: 7334

Spillway Coefficient: 2.6

End Spillway:

Evaporation Method: Zero Evaporation

PR_East_Basin_GWR.basin

End Evaporation:

End:

Subbasin: Basin OS-6D

Last Modified Date: 25 June 2020

Last Modified Time: 22:29:42

Canvas X: 1883.632123721196

Canvas Y: 2418.0452279029837

From Canvas X: 1874.6530481452974

From Canvas Y: 2417.431218187936

Area: 0.0977

Downstream: Route OS-6D

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 50

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route E-7

Last Modified Date: 29 June 2020

Last Modified Time: 21:03:25

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: 324.24823149222857

From Canvas Y: 1424.908662565677

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-1

Last Modified Date: 25 June 2020

PR_East_Basin_GWR.basin

Last Modified Time: 22:22:08
Canvas X: -1999.417346470526
Canvas Y: 1455.897133923738
From Canvas X: -2463.015010284649
From Canvas Y: 2073.938937309651
Label X: 0.0
Label Y: 1.0
Area: 0.0079
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.0
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-3

Last Modified Date: 12 June 2020
Last Modified Time: 15:38:21
Canvas X: -1818.3597961754886
Canvas Y: 1593.6807966465158
From Canvas X: -1639.7683601942304
From Canvas Y: 944.1038795993522
Label X: 0.0
Label Y: 1.0
Area: 0.03
Downstream: Pond 3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.56

PR_East_Basin_GWR.basin

Curve Number: 64
Initial Abstraction: 0.6

Transform: SCS
Lag: 45.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 3

Last Modified Date: 15 September 2020
Last Modified Time: 22:21:08
Canvas X: -1589.9080337438222
Canvas Y: 1243.8534768484221
From Canvas X: -1511.7339678911565
From Canvas Y: 640.2004812966065
Label X: 0.0
Label Y: 1.0
Downstream: R-EX-1

Route: Specified Outflow
Routing Curve: Elevation-Storage
Initial Elevation: 0
Elevation-Storage Table: Pond 3
Outflow Gage Name: Pond 3 - Q100

End:

Subbasin: E-3

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:38
Canvas X: -850.7849400791165
Canvas Y: 993.9331280597039
From Canvas X: -1009.5588556422545
From Canvas Y: 1006.5570737441426
Area: 0.0336
Downstream: R-EX-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 6.7
Curve Number: 54.5
Initial Abstraction: 0.83

PR_East_Basin_GWR.basin

Transform: SCS
Lag: 64
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4B

Last Modified Date: 8 April 2020
Last Modified Time: 14:57:45
Canvas X: 77.17075639610812
Canvas Y: 2378.1178945307097
From Canvas X: 778.873522140379
From Canvas Y: 773.7769864771967
Area: 0.0103
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 38
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin D-4A

Last Modified Date: 8 April 2020
Last Modified Time: 14:56:57
Canvas X: -360.964130568138
Canvas Y: 2409.983054835778
From Canvas X: 18.080066194750998
From Canvas Y: 2352.1395294091717
Area: 0.0069
Downstream: Pond 4

Canopy: None
Allow Simultaneous Precip Et: No

PR_East_Basin_GWR.basin

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 56.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Pond 4

Last Modified Date: 15 September 2020

Last Modified Time: 22:21:17

Canvas X: -261.35004810235114

Canvas Y: 1896.6809513641506

From Canvas X: 539.8540713480625

From Canvas Y: 1066.6296604004497

Downstream: Route C-8

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 4

Outflow Gage Name: Pond 4 - Q100

End:

Reach: Route C-8

Last Modified Date: 15 September 2020

Last Modified Time: 22:21:08

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -261.35004810235114

From Canvas Y: 1896.6809513641506

Downstream: R-EX-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 64

Channel Loss: None

End:

Subbasin: E-2

PR_East_Basin_GWR.basin

Last Modified Date: 29 June 2020
Last Modified Time: 16:25:42
Canvas X: -1197.4448419312953
Canvas Y: 1642.9984762084644
From Canvas X: -1372.9228943028534
From Canvas Y: 2108.004315934082
Area: 0.010
Downstream: Route C-6

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 20.2
Curve Number: 68.1
Initial Abstraction: 0.47

Transform: SCS
Lag: 42.7
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-6

Last Modified Date: 29 June 2020
Last Modified Time: 21:03:25
Canvas X: -861.7276411671855
Canvas Y: 285.5041412301971
From Canvas X: -1160.5661289682976
From Canvas Y: 1491.7957530601734
Downstream: R-EX-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 64
Channel Loss: None

End:

Subbasin: Basin OS-5

Last Modified Date: 8 April 2020
Last Modified Time: 15:05:02
Canvas X: -1910.9889810178615
Canvas Y: 2730.049713289869
From Canvas X: -1895.2586998774636

PR_East_Basin_GWR.basin

From Canvas Y: 2743.89138359013

Area: 0.0244

Downstream: Route OS-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 68.7

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-1

Last Modified Date: 29 June 2020

Last Modified Time: 21:44:46

Canvas X: -861.7276411671855

Canvas Y: 285.5041412301971

From Canvas X: -616.7135794014512

From Canvas Y: 410.34175233158203

Downstream: Sink EX-1

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-1

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

Conduit: Culvert

Conduit Outlet: Main

Culvert Shape: Circular

Chart Number: 2

Scale Number: 3

Solution Control: Automatic

Diameter: 4

Number Barrels: 1

Culvert Length: 48

PR_East_Basin_GWR.basin

Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7235.6
Outlet Invert Elevation: 7235.2
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 71
Spillway Crest Elevation: 7242
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Sink: Sink EX-1

Last Modified Date: 25 June 2020
Last Modified Time: 14:58:26
Canvas X: -890.526833152149
Canvas Y: 101.46827435515797
From Canvas X: -1043.6242342666856
From Canvas Y: 370.67000608809485
Label X: 3.0
Label Y: -12.0

End:

Basin Layer Properties:

Element Layer:
Name: Icons
Layer shown: Yes
End Layer:

End:

Basin Spatial Properties:

End:

Basin Schematic Properties:

Last View N: 3600.2886002886
Last View S: 829.7258297258295
Last View W: -1868.6868686868684
Last View E: 1233.766233766235
Maximum View N: 3600.2886002886
Maximum View S: 829.7258297258295
Maximum View W: -1868.6868686868684
Maximum View E: 1233.766233766235

PR_East_Basin_GWR.basin

Extent Method: Manual

Buffer: 0

Draw Icons: Yes

Draw Icon Labels: Name

Draw Map Objects: No

Draw Gridlines: No

Draw Flow Direction: No

Draw HillShade Layer: Yes

Draw Elevation Layer: Yes

Elevation Layer Color Palette: Default

Ignore Elevation Color Ramp Scale: No

Use Interpolated Color Ramp for Elevation Layer: Yes

Color Ramp Opacity Level for Elevation Layer: 33.0

Fix Element Locations: No

Fix Hydrologic Order: No

End:

Project: GWR PR Q100 - FDR Simulation Run: PR East - 100 YR 24HR

Start of Run: 01Jan2020, 00:00

Basin Model: PR East Basin GWI

End of Run: 02Jan2020, 00:05

Meteorologic Model: 24 HR 100 YR

Compute Time: 15Sep2020, 16:21:18

Control Specifications: GR Control - PR

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin D-3	0.0300	14.2	01Jan2020, 12:40	1.65
Basin D-4A	0.0069	3.4	01Jan2020, 12:50	2.04
Basin D-4B	0.0103	6.8	01Jan2020, 12:30	2.06
Basin E-4A	0.0125	7.2	01Jan2020, 12:40	2.05
Basin E-4B	0.0091	6.0	01Jan2020, 12:30	2.06
Basin OS-5	0.0244	10.6	01Jan2020, 13:05	2.04
Basin OS-6A	0.0387	24.3	01Jan2020, 12:35	2.06
Basin OS-6B	0.0579	33.2	01Jan2020, 12:40	2.05
Basin OS-6C	0.0820	42.7	01Jan2020, 12:50	2.05
Basin OS-6D	0.0977	53.2	01Jan2020, 12:45	2.05
C-10	0.2979	130.9	01Jan2020, 14:30	1.90
E-1	0.0079	5.3	01Jan2020, 12:35	2.22
E-2	0.0100	7.2	01Jan2020, 12:35	2.44
E-3	0.0336	9.9	01Jan2020, 13:00	1.36
Pond 3	0.0379	24.4	01Jan2020, 01:10	1.50
Pond 4	0.0172	7.9	01Jan2020, 01:10	1.11
Reservoir OS-5	0.2763	128.8	01Jan2020, 13:50	1.91
Reservoir Route	0.2763	128.7	01Jan2020, 14:30	1.89
Route C-6	0.0100	7.2	01Jan2020, 13:40	2.40
Route C-8	0.0172	7.9	01Jan2020, 02:15	1.11
Route E-7	0.2979	130.8	01Jan2020, 15:35	1.85
Route OS-5	0.0244	10.6	01Jan2020, 14:50	1.97
Route OS-6B	0.0579	33.2	01Jan2020, 13:30	2.02
Route OS-6C	0.0820	42.6	01Jan2020, 13:40	2.01
Route OS-6D	0.0977	53.1	01Jan2020, 13:40	2.02
R-EX-1	0.4210	140.4	01Jan2020, 15:40	1.77
Sink EX-1	0.4210	140.4	01Jan2020, 15:35	1.77

PR_West_Basin_GWR.basin

Basin: PR West Basin GWR

Last Modified Date: 23 June 2020

Last Modified Time: 21:06:18

Version: 4.3

Filepath Separator: \

Unit System: English

Missing Flow To Zero: No

Enable Flow Ratio: No

Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No

End:

Reach: Route W-9

Last Modified Date: 24 June 2020

Last Modified Time: 13:14:26

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190941.0482914834

From Canvas Y: 1454172.086088502

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 1

Last Modified Date: 24 June 2020

Last Modified Time: 13:14:26

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190788.6775098434

From Canvas Y: 1454841.7546350043

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 31

Channel Loss: None

End:

Reach: Route Pond 2

Last Modified Date: 26 June 2020

Last Modified Time: 20:51:50

PR_West_Basin_GWR.basin

Canvas X: 3190827.266021038
Canvas Y: 1454214.7415360329
From Canvas X: 3191285.843830595
From Canvas Y: 1454369.28601614
Downstream: R-EX-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: W-7

Last Modified Date: 25 June 2020
Last Modified Time: 22:00:54
Canvas X: 3191588.062197299
Canvas Y: 1454558.061469289
From Canvas X: 3191726.0696871458
From Canvas Y: 1454578.2102340478
Label X: 0.0
Label Y: -3.0
Area: 0.027
Downstream: Junction C-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.45
Curve Number: 65.5
Initial Abstraction: 0.53

Transform: SCS
Lag: 47.3
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-6

Last Modified Date: 7 April 2020
Last Modified Time: 17:50:28
Canvas X: 3191787.2788931862
Canvas Y: 1454806.7233097618
From Canvas X: 3192492.046785609

PR_West_Basin_GWR.basin

From Canvas Y: 1454929.1016958833

Area: 0.003

Downstream: Route W-6

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-8

Description: Drainage Easement across lot

Last Modified Date: 16 June 2020

Last Modified Time: 22:12:19

Canvas X: 3191046.9812794775

Canvas Y: 1454826.8102695316

From Canvas X: 3191390.648482099

From Canvas Y: 1454613.8680979477

Area: 0.00386

Downstream: Junction C-3

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 35.4

Unitgraph Type: STANDARD

PR_West_Basin_GWR.basin

Baseflow: None

End:

Reach: Route to C-3

Description: Combined junction C-1 and C-2 to Junction C-3

Last Modified Date: 6 April 2020

Last Modified Time: 22:00:34

Canvas X: 3191125.8142608823

Canvas Y: 1454636.8944506934

From Canvas X: 3191740.132405288

From Canvas Y: 1455102.301558766

Downstream: Junction C-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4A

Last Modified Date: 8 April 2020

Last Modified Time: 15:10:30

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3191821.555858512

From Canvas Y: 1455495.3148196193

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47.3

Channel Loss: None

End:

Junction: Upper Junction

Description: Combining design points into final basin flow

Last Modified Date: 6 April 2020

Last Modified Time: 16:04:39

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192059.549422635

From Canvas Y: 1455656.9537690468

Downstream: Route OS-3B

End:

Reach: Route W-5

Last Modified Date: 6 April 2020

Last Modified Time: 16:05:38

PR_West_Basin_GWR.basin

Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3192053.9995084023
From Canvas Y: 1455254.1730524607
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Reach: Route W-6

Last Modified Date: 16 June 2020
Last Modified Time: 22:40:46
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191596.658030947
From Canvas Y: 1454785.3109359604
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 47
Channel Loss: None

End:

Reach: Route OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191610.741291508
From Canvas Y: 1455715.037744202
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Junction: Junction C-1

Last Modified Date: 6 April 2020
Last Modified Time: 20:34:48
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191049.172513107

PR_West_Basin_GWR.basin

From Canvas Y: 1455596.382345375

Label X: -84.0

Label Y: -3.0

Downstream: Route C-1

End:

Subbasin: Basin OS-3C

Last Modified Date: 1 July 2020

Last Modified Time: 19:39:46

Canvas X: 3191732.837927499

Canvas Y: 1455795.0234726786

From Canvas X: 3191732.837927499

From Canvas Y: 1455795.0234726786

Area: 0.0198

Downstream: Route OS-3C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 37.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-3B

Last Modified Date: 6 April 2020

Last Modified Time: 22:18:54

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192064.58176487

From Canvas Y: 1455689.0141506763

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 47

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Reach: Route OS-3C

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191620.2620947743
Canvas Y: 1455576.2974092974
From Canvas X: 3191701.8574730195
From Canvas Y: 1455717.8851248743
Downstream: Junction OS-3

Route: Lag
Initial Variable: Combined Inflow
Lag: 46.4
Channel Loss: None

End:

Subbasin: Basin OS-3B

Last Modified Date: 16 June 2020
Last Modified Time: 22:21:02
Canvas X: 3191454.1353545357
Canvas Y: 1455638.1584660518
From Canvas X: 3191808.881599231
From Canvas Y: 1455981.4348019836
Label X: -51.0
Label Y: 27.0
Area: 0.034
Downstream: Junction OS-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 16.5
Curve Number: 66.7
Initial Abstraction: 0.5

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-3A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:39:37
Canvas X: 3191585.114865458
Canvas Y: 1455846.0172551244
From Canvas X: 3191525.184704565
From Canvas Y: 1455763.7332610039
Area: 0.0225
Downstream: Route OS-3A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.4
Unitgraph Type: STANDARD

Baseflow: None

End:

Junction: Junction C-3

Last Modified Date: 6 April 2020
Last Modified Time: 18:40:14
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191239.226172219
From Canvas Y: 1454613.8680979477
Downstream: Route C-3

End:

Junction: Junction C-2

Last Modified Date: 6 April 2020
Last Modified Time: 16:05:38
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191601.3307882836
From Canvas Y: 1454899.3142550313
Downstream: Route to C-3

End:

Subbasin: Basin OS-4A

Last Modified Date: 1 July 2020

PR_West_Basin_GWR.basin

Last Modified Time: 19:39:56
Canvas X: 3191816.144480269
Canvas Y: 1455608.9537627215
From Canvas X: 3191816.144480269
From Canvas Y: 1455608.9537627215
Area: 0.0256
Downstream: Route OS-4A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 41.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2B

Description: Overland flow. Flows into basin W-3
Last Modified Date: 18 June 2020
Last Modified Time: 19:50:47
Canvas X: 3191192.176332691
Canvas Y: 1455473.0103870628
From Canvas X: 3191079.159717601
From Canvas Y: 1455778.8719525808
Area: 0.0198
Downstream: Route OS-2B

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 34.2
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: OS-2A

Description: Existing Basin on Timberview Filing 1. All flow routed to Culvert
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Last Modified Date: 1 July 2020
Last Modified Time: 19:39:31
Canvas X: 3191075.43372513
Canvas Y: 1455652.395369413
From Canvas X: 3190635.01570008
From Canvas Y: 1456266.8411205618
Area: 0.022
Downstream: Route OS-2A

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12.0
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 37.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-1

Last Modified Date: 6 April 2020
Last Modified Time: 22:00:20
Canvas X: 3191125.8142608823
Canvas Y: 1454636.8944506934
From Canvas X: 3191197.8710940355
From Canvas Y: 1455077.2244736233
Downstream: Junction C-3

Route: Lag
Initial Variable: Combined Inflow

PR_West_Basin_GWR.basin

Lag: 35.4

Channel Loss: None

End:

Reach: Route OS-4B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:14

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192097.536148903

From Canvas Y: 1455817.2918250756

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 96.2

Channel Loss: None

End:

Subbasin: Basin OS-4E

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:01

Canvas X: 3192707.2299209572

Canvas Y: 1455857.660741784

From Canvas X: 3193024.4086084175

From Canvas Y: 1456017.9537466252

Area: 0.049

Downstream: Route OS-4E

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 44

Unitgraph Type: STANDARD

Baseflow: None

End:

PR_West_Basin_GWR.basin

Reach: Route Basin OS-3A

Last Modified Date: 8 April 2020
Last Modified Time: 20:02:16
Canvas X: 3191740.132405288
Canvas Y: 1455102.301558766
From Canvas X: 3191620.2620947743
From Canvas Y: 1455576.2974092974
Downstream: Junction C-2

Route: Lag
Initial Variable: Combined Inflow
Lag: 48
Channel Loss: None

End:

Reach: Route OS-4C

Last Modified Date: 8 April 2020
Last Modified Time: 15:11:56
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192259.8774961918
From Canvas Y: 1455863.288540141
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 48.3
Channel Loss: None

End:

Subbasin: Basin OS-4D

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:12:22
Canvas X: 3192731.2547275363
Canvas Y: 1455991.5132355825
From Canvas X: 3192803.614351975
From Canvas Y: 1456110.2858902286
Area: 0.019
Downstream: Route OS-4D

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS

PR_West_Basin_GWR.basin

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 42.8

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-2A

Last Modified Date: 6 April 2020

Last Modified Time: 20:34:48

Canvas X: 3191197.8710940355

Canvas Y: 1455077.2244736233

From Canvas X: 3191121.592686727

From Canvas Y: 1455311.9544209125

Downstream: Junction C-1

Route: Lag

Initial Variable: Combined Inflow

Lag: 63.2

Channel Loss: None

End:

Subbasin: Basin OS-4C

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:11:32

Canvas X: 3192549.3526205793

Canvas Y: 1456056.7234248691

From Canvas X: 3192434.285777561

From Canvas Y: 1456074.1559209926

Area: 0.031

Downstream: Route OS-4C

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

PR_West_Basin_GWR.basin

Transform: SCS
Lag: 53.5
Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4D

Last Modified Date: 8 April 2020
Last Modified Time: 15:12:43
Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192408.6358963293
From Canvas Y: 1455885.1176635888
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Reach: Route OS-2B

Last Modified Date: 6 April 2020
Last Modified Time: 21:56:42
Canvas X: 3191197.8710940355
Canvas Y: 1455077.2244736233
From Canvas X: 3191198.059764327
From Canvas Y: 1455243.1779213208
Downstream: Junction C-1

Route: Lag
Initial Variable: Combined Inflow
Lag: 31
Channel Loss: None

End:

Subbasin: Basin OS-4B

Description: OS-3B
Last Modified Date: 8 April 2020
Last Modified Time: 15:10:53
Canvas X: 3192160.285761248
Canvas Y: 1456065.2655668857
From Canvas X: 3192165.318228803
From Canvas Y: 1456058.0981568876
Label X: 0.0
Label Y: 1.0
Area: 0.019

PR_West_Basin_GWR.basin

Downstream: Route OS-4B

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 34.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4E

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:32

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192392.4562631445

From Canvas Y: 1455779.412177375

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 100.1

Channel Loss: None

End:

Junction: Junction OS-3

Last Modified Date: 8 April 2020

Last Modified Time: 20:02:16

Canvas X: 3191620.2620947743

Canvas Y: 1455576.2974092974

From Canvas X: 3191030.2304471615

From Canvas Y: 1455857.6038960286

Downstream: Route Basin OS-3A

End:

Reach: Route OS-4F

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:06

PR_West_Basin_GWR.basin

Canvas X: 3192064.58176487
Canvas Y: 1455689.0141506763
From Canvas X: 3192563.0810814817
From Canvas Y: 1455734.104593662
Downstream: Upper Junction

Route: Lag
Initial Variable: Combined Inflow
Lag: 95.6
Channel Loss: None

End:

Subbasin: W-3

Last Modified Date: 16 June 2020
Last Modified Time: 22:25:18
Canvas X: 3191274.205299845
Canvas Y: 1455232.9233677052
From Canvas X: 3191024.0629101307
From Canvas Y: 1455607.9918769917
Area: 0.01
Downstream: Junction C-1

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 30.8
Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4H

Last Modified Date: 1 July 2020
Last Modified Time: 21:39:58
Canvas X: 3192191.6069486425
Canvas Y: 1455441.6891996684
From Canvas X: 3192188.156768472
From Canvas Y: 1455449.7392372065
Area: 0.021

PR_West_Basin_GWR.basin

Downstream: Route OS-4H

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 41.1

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route OS-4G

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:46

Canvas X: 3192064.58176487

Canvas Y: 1455689.0141506763

From Canvas X: 3192316.0300185457

From Canvas Y: 1455651.1617253919

Downstream: Upper Junction

Route: Lag

Initial Variable: Combined Inflow

Lag: 102.7

Channel Loss: None

End:

Reach: Route OS-4H

Last Modified Date: 8 April 2020

Last Modified Time: 15:15:37

Canvas X: 3191740.132405288

Canvas Y: 1455102.301558766

From Canvas X: 3192057.7800570475

From Canvas Y: 1455344.8782568125

Downstream: Junction C-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 48

Channel Loss: None

PR_West_Basin_GWR.basin

End:

Subbasin: W-5

Description: All overland flow for watershed. Used to size swale DP 5-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:01

Canvas X: 3192181.679638902

Canvas Y: 1455275.5631039173

From Canvas X: 3192157.565279063

From Canvas Y: 1455254.8641652972

Label X: 1.0

Label Y: 0.0

Area: 0.01

Downstream: Route W-5

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 51.2

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4G

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:14:25

Canvas X: 3192660.319486171

Canvas Y: 1455549.4286020491

From Canvas X: 3193180.971808441

From Canvas Y: 1455688.769582474

Area: 0.076

Downstream: Route OS-4G

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

PR_West_Basin_GWR.basin

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 48.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: Basin OS-4F

Description: OS-3B

Last Modified Date: 8 April 2020

Last Modified Time: 15:13:48

Canvas X: 3192736.0787815726

Canvas Y: 1455736.1211514312

From Canvas X: 3193108.7118699686

From Canvas Y: 1455873.4338696809

Area: 0.021

Downstream: Route OS-4F

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 45

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-4

Last Modified Date: 6 April 2020

Last Modified Time: 21:51:06

Canvas X: 3191593.657007475

Canvas Y: 1455287.930643368

PR_West_Basin_GWR.basin

From Canvas X: 3191663.9790399233

From Canvas Y: 1455200.9491771364

Label X: 0.0

Label Y: 1.0

Area: 0.006

Downstream: Junction C-2

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 48.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Reach: Route C-3

Last Modified Date: 24 June 2020

Last Modified Time: 13:14:26

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3191125.8142608823

From Canvas Y: 1454636.8944506934

Downstream: R-EX-2

Route: Lag

Initial Variable: Combined Inflow

Lag: 32

Channel Loss: None

End:

Reservoir: Pond 2

Last Modified Date: 15 September 2020

Last Modified Time: 22:22:25

Canvas X: 3191285.843830595

Canvas Y: 1454369.28601614

From Canvas X: 3191195.8916458623

From Canvas Y: 1454392.14754045

Label X: -6.0

PR_West_Basin_GWR.basin

Label Y: -16.0

Downstream: Route Pond 2

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 2

Outflow Gage Name: Pond 2 - Q100

End:

Reservoir: Pond 1

Last Modified Date: 15 September 2020

Last Modified Time: 22:22:20

Canvas X: 3190788.6775098434

Canvas Y: 1454841.7546350043

From Canvas X: 3190512.093450769

From Canvas Y: 1455477.2407319362

Downstream: Route Pond 1

Route: Specified Outflow

Routing Curve: Elevation-Storage

Initial Elevation: 0

Elevation-Storage Table: Pond 1

Outflow Gage Name: Pond 1 - Q100

End:

Reservoir: R-EX-2

Description: Note: Outlet 1 is reduced in size from the existing condition to represent a 3-5/8 inch depth restrictor plate installed on pipe to reduce flows for Q5 event

Last Modified Date: 15 September 2020

Last Modified Time: 20:28:22

Canvas X: 3190827.266021038

Canvas Y: 1454214.7415360329

From Canvas X: 3190778.306968433

From Canvas Y: 1454050.976266697

Label X: -78.0

Label Y: 71.0

Downstream: Sink-2

Route: Controlled Outflow

Routing Curve: Elevation-Area

Initial Outflow Equals Inflow: Yes

Elevation-Area Table: EX-2

Adaptive Control: On

Main Tailwater Condition: None

Auxiliary Tailwater Condition: None

PR_West_Basin_GWR.basin

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Elliptical
Chart Number: 29
Scale Number: 3
Solution Control: Automatic
Rise: 2.33
Span: 3.5
Diameter: 2.5
Number Barrels: 1
Culvert Length: 48.5
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7154.7
Outlet Invert Elevation: 7149.5
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 174.3
Spillway Crest Elevation: 7162
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: W-2

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:53
Canvas X: 3190671.1056696735
Canvas Y: 1454493.511435817
From Canvas X: 3190858.8970014188
From Canvas Y: 1454517.375669532
Area: 0.005
Downstream: R-EX-2

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 45.4

PR_West_Basin_GWR.basin

Initial Abstraction: 1.2

Transform: SCS

Lag: 31

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: W-9

Last Modified Date: 6 April 2020

Last Modified Time: 23:21:10

Canvas X: 3191400.0351217636

Canvas Y: 1454154.673135822

From Canvas X: 3191046.078595636

From Canvas Y: 1454207.1248628749

Area: 0.003

Downstream: Route W-9

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 46

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-2

Last Modified Date: 25 June 2020

Last Modified Time: 22:00:51

Canvas X: 3191663.866892373

Canvas Y: 1454378.4190795475

From Canvas X: 3191628.3381642886

From Canvas Y: 1454443.6292688341

Area: 0.01

Downstream: Pond 2

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 31.7

Curve Number: 72.4

Initial Abstraction: 0.38

Transform: SCS

Lag: 37

Unitgraph Type: STANDARD

Baseflow: None

End:

Subbasin: D-1

Last Modified Date: 7 April 2020

Last Modified Time: 17:50:40

Canvas X: 3190762.221851185

Canvas Y: 1455062.9875702623

From Canvas X: 3190677.102419148

From Canvas Y: 1455211.3929495476

Area: 0.02

Downstream: Pond 1

Canopy: None

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 22.31

Curve Number: 68.37

Initial Abstraction: 0.46

Transform: SCS

Lag: 41.3

Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-2

Description: Wetlands. Central drainage.

Last Modified Date: 23 June 2020

PR_West_Basin_GWR.basin

Last Modified Time: 21:07:21
Canvas X: 3190748.0295129814
Canvas Y: 1454016.9141293145
From Canvas X: 3190880.4929359066
From Canvas Y: 1454338.8286808033
Label X: -28.0
Label Y: -25.0

End:

Subbasin: W-1

Last Modified Date: 23 June 2020
Last Modified Time: 21:06:36
Canvas X: 3190301.437045076
Canvas Y: 1454554.338963574
From Canvas X: 3190143.3967487137
From Canvas Y: 1454903.4863893862
Area: 0.0302
Downstream: R-EX-3

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 13.6
Curve Number: 65.6
Initial Abstraction: 0.52

Transform: SCS
Lag: 48.6
Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: R-EX-3

Last Modified Date: 23 June 2020
Last Modified Time: 21:32:34
Canvas X: 3190274.944271556
Canvas Y: 1454085.0384040799
From Canvas X: 3190274.944271556
From Canvas Y: 1454085.0384040799
Downstream: Sink-3

Route: Controlled Outflow
Routing Curve: Elevation-Area

PR_West_Basin_GWR.basin

Initial Outflow Equals Inflow: Yes
Elevation-Area Table: EX-3
Adaptive Control: On
Main Tailwater Condition: None
Auxiliary Tailwater Condition: None

Conduit: Culvert
Conduit Outlet: Main
Culvert Shape: Circular
Chart Number: 2
Scale Number: 3
Solution Control: Automatic
Rise: 1.25
Diameter: 1.25
Number Barrels: 1
Culvert Length: 43.1
Entrance Loss Coefficient: 0.2
Exit Loss Coefficient: 1
Top Manning's n: 0.02
Inlet Invert Elevation: 7168.6
Outlet Invert Elevation: 7167.3
End Conduit:

Spillway: Broad-Crested Spillway
Spillway Outlet: Main
Spillway Crest Length: 237.06
Spillway Crest Elevation: 7174
Spillway Coefficient: 2.6
End Spillway:

Evaporation Method: Zero Evaporation
End Evaporation:

End:

Subbasin: OS-1

Description: Part of Timberview. Fully detained in sedimentation basin
Last Modified Date: 26 June 2020
Last Modified Time: 19:56:00
Canvas X: 3189944.377164344
Canvas Y: 1454944.7180917726
From Canvas X: 3189604.487770659
From Canvas Y: 1455611.2295709252
Label X: -24.0
Label Y: 15.0
Area: 0.0634
Downstream: Reservoir OS-1

Canopy: None

PR_West_Basin_GWR.basin

Allow Simultaneous Precip Et: No

Plant Uptake Method: None

Surface: None

LossRate: SCS

Percent Impervious Area: 12.0

Curve Number: 65

Initial Abstraction: 0.54

Transform: SCS

Lag: 43.9

Unitgraph Type: STANDARD

Baseflow: None

End:

Reservoir: Reservoir OS-1

Description: All flows from OS-1 are collected by and detained by a sedimentation pond on Timberview. Reservoir table are available in this report.

Last Modified Date: 26 June 2020

Last Modified Time: 19:55:52

Canvas X: 3190016.0388309094

Canvas Y: 1454678.4260555971

From Canvas X: 3189388.7751533836

From Canvas Y: 1455874.4720869225

Downstream: Route OS-1

Route: Modified Puls

Routing Curve: Storage-Outflow

Initial Outflow: 0

Storage-Outflow Table: EX OS-1

End:

Reach: Route OS-1

Last Modified Date: 26 June 2020

Last Modified Time: 19:55:52

Canvas X: 3190274.944271556

Canvas Y: 1454085.0384040799

From Canvas X: 3190016.0388309094

From Canvas Y: 1454678.4260555971

Downstream: R-EX-3

Route: Lag

Initial Variable: Combined Inflow

Lag: 48.6

Channel Loss: None

End:

PR_West_Basin_GWR.basin

Sink: Sink-3

Description: West-most drainage - Culvert 3
Last Modified Date: 23 June 2020
Last Modified Time: 21:29:08
Canvas X: 3190290.6604908723
Canvas Y: 1453988.5970195946
From Canvas X: 3190265.471714283
From Canvas Y: 1454199.949087816
Label X: -31.0
Label Y: -20.0

End:

Subbasin: W-10

Last Modified Date: 16 June 2020
Last Modified Time: 22:56:37
Canvas X: 3192674.484371266
Canvas Y: 1454778.6071245822
From Canvas X: 3192832.9140338055
From Canvas Y: 1454753.0347040498
Area: 0.01
Downstream: Sink-4

Canopy: None
Allow Simultaneous Precip Et: No
Plant Uptake Method: None

Surface: None

LossRate: SCS
Percent Impervious Area: 12
Curve Number: 65
Initial Abstraction: 0.54

Transform: SCS
Lag: 11.9
Unitgraph Type: STANDARD

Baseflow: None

End:

Sink: Sink-4

Description: EX culvert 4
Last Modified Date: 25 March 2020
Last Modified Time: 18:50:24
Canvas X: 3192640.4035706962
Canvas Y: 1454413.8496023817
From Canvas X: 3192640.4035706962

PR_West_Basin_GWR.basin
From Canvas Y: 1454413.8496023817
End:

Basin Layer Properties:
 Element Layer:
 Name: Icons
 Layer shown: Yes
 End Layer:
End:

Basin Spatial Properties:
End:

Basin Schematic Properties:
 Last View N: 1455607.9918769917
 Last View S: 1454940.6937600982
 Last View W: 3191024.0629101307
 Last View E: 3191102.8411600417
 Maximum View N: 1455607.9918769917
 Maximum View S: 1454940.6937600982
 Maximum View W: 3191024.0629101307
 Maximum View E: 3191102.8411600417
 Extent Method: Manual
 Buffer: 0
 Draw Icons: Yes
 Draw Icon Labels: Name
 Draw Map Objects: No
 Draw Gridlines: No
 Draw Flow Direction: No
 Draw HillShade Layer: Yes
 Draw Elevation Layer: Yes
 Elevation Layer Color Palette: Default
 Ignore Elevation Color Ramp Scale: No
 Use Interpolated Color Ramp for Elevation Layer: Yes
 Color Ramp Opacity Level for Elevation Layer: 33.0
 Fix Element Locations: No
 Fix Hydrologic Order: No
End:

Project: GWR PR Q100 - FDR Simulation Run: PR West - 100 YR 24HR

Start of Run: 01Jan2020, 00:00

Basin Model: PR West Basin GW

End of Run: 02Jan2020, 00:05

Meteorologic Model: 24 HR 100 YR

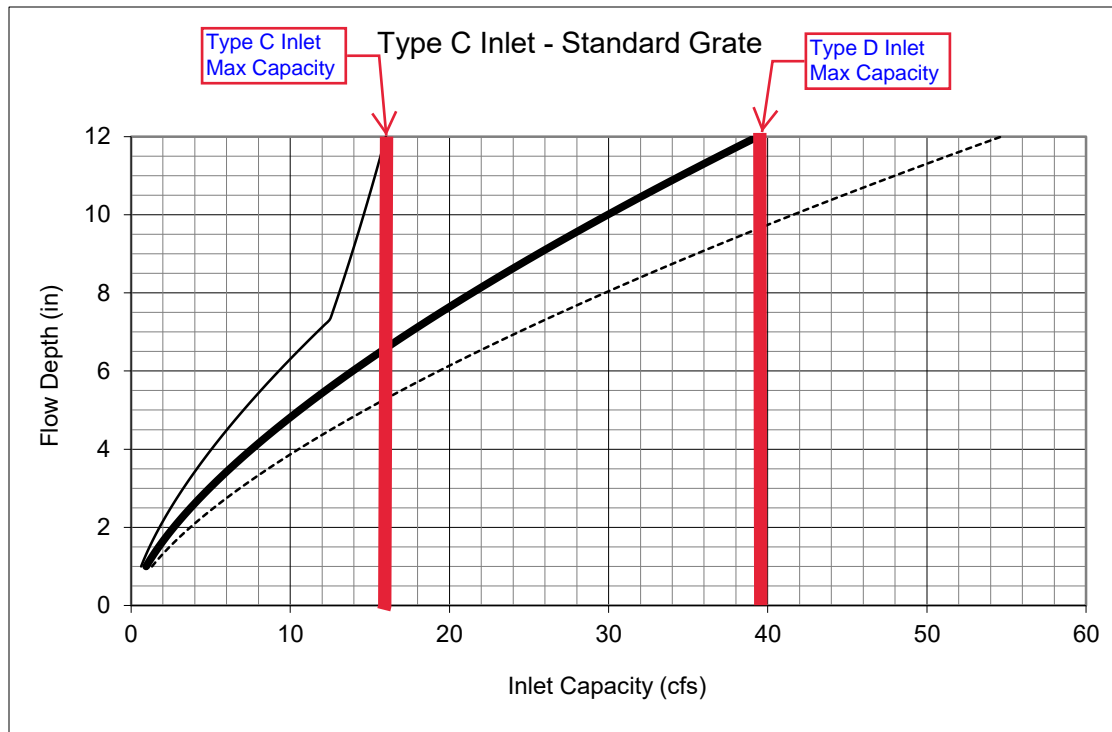
Compute Time: 15Sep2020, 16:22:25

Control Specifications:GR Control

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Basin OS-3A	0.02250	14.0	01Jan2020, 12:35	2.06
Basin OS-3B	0.03400	26.4	01Jan2020, 12:25	2.28
Basin OS-3C	0.01980	13.2	01Jan2020, 12:30	2.06
Basin OS-4A	0.02560	15.9	01Jan2020, 12:35	2.06
Basin OS-4B	0.01900	13.4	01Jan2020, 12:30	2.06
Basin OS-4C	0.03100	16.1	01Jan2020, 12:50	2.05
Basin OS-4D	0.01900	11.5	01Jan2020, 12:35	2.06
Basin OS-4E	0.04900	29.2	01Jan2020, 12:40	2.06
Basin OS-4F	0.02100	12.3	01Jan2020, 12:40	2.05
Basin OS-4G	0.07600	42.0	01Jan2020, 12:45	2.05
Basin OS-4H	0.02100	13.1	01Jan2020, 12:35	2.06
D-1	0.02000	15.1	01Jan2020, 12:35	2.51
D-2	0.01000	9.5	01Jan2020, 12:30	2.94
Junction C-1	0.05180	23.9	01Jan2020, 13:25	2.04
Junction C-2	0.35390	135.1	01Jan2020, 15:00	2.01
Junction C-3	0.43956	142.9	01Jan2020, 15:35	2.00
Junction OS-3	0.07630	36.2	01Jan2020, 13:15	2.14
OS-1	0.06340	37.8	01Jan2020, 12:40	2.06
OS-2A	0.02200	14.6	01Jan2020, 12:30	2.06
OS-2B	0.01980	14.0	01Jan2020, 12:30	2.06
Pond 1	0.02000	5.5	01Jan2020, 01:15	0.97
Pond 2	0.01000	7.4	01Jan2020, 01:15	2.30
Reservoir OS-1	0.06340	29.1	01Jan2020, 13:00	2.05
Route Basin OS-3A	0.07630	36.0	01Jan2020, 14:00	2.11
Route C-1	0.05180	23.9	01Jan2020, 14:00	2.02
Route C-3	0.43956	142.3	01Jan2020, 16:05	1.97
Route OS-1	0.06340	29.1	01Jan2020, 13:50	2.02

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Route OS-2A	0.02200	14.6	01Jan2020, 13:35	2.02
Route OS-2B	0.01980	13.9	01Jan2020, 13:00	2.04
Route OS-3A	0.02250	13.9	01Jan2020, 13:20	2.03
Route OS-3B	0.21500	113.9	01Jan2020, 15:05	1.96
Route OS-3C	0.01980	13.1	01Jan2020, 13:15	2.03
Route OS-4A	0.02560	15.7	01Jan2020, 13:25	2.03
Route OS-4B	0.01900	13.4	01Jan2020, 14:05	2.00
Route OS-4C	0.03100	16.0	01Jan2020, 13:35	2.02
Route OS-4D	0.01900	11.5	01Jan2020, 14:10	2.00
Route OS-4E	0.04900	29.2	01Jan2020, 14:20	1.99
Route OS-4F	0.02100	12.3	01Jan2020, 14:15	1.99
Route OS-4G	0.07600	41.9	01Jan2020, 14:25	1.99
Route OS-4H	0.02100	13.0	01Jan2020, 13:25	2.03
Route Pond 1	0.02000	5.5	01Jan2020, 01:50	0.97
Route Pond 2	0.01000	7.4	01Jan2020, 01:50	2.29
Route to C-3	0.35390	135.1	01Jan2020, 15:35	1.98
Route W-5	0.01000	5.3	01Jan2020, 13:35	2.02
Route W-6	0.00300	2.1	01Jan2020, 13:15	2.03
Route W-9	0.00300	1.7	01Jan2020, 13:10	2.03
R-EX-2	0.47756	142.8	01Jan2020, 16:10	1.92
R-EX-3	0.09360	35.7	01Jan2020, 13:45	2.05
Sink-2	0.47756	142.8	01Jan2020, 16:05	1.92
Sink-3	0.09360	35.7	01Jan2020, 13:40	2.05
Sink-4	0.01000	13.1	01Jan2020, 12:00	2.08
Upper Junction	0.21500	114.3	01Jan2020, 14:15	1.99
W-1	0.03020	17.4	01Jan2020, 12:45	2.13
W-10	0.01000	13.1	01Jan2020, 12:05	2.08
W-2	0.00500	1.2	01Jan2020, 12:30	0.74
W-3	0.01000	7.6	01Jan2020, 12:25	2.07
W-4	0.00600	3.3	01Jan2020, 12:45	2.05
W-5	0.01000	5.4	01Jan2020, 12:45	2.05

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
W-6	0.00300	2.1	01Jan2020, 12:30	2.06
W-7	0.02700	15.8	01Jan2020, 12:40	2.12
W-8	0.00386	2.7	01Jan2020, 12:30	2.06
W-9	0.00300	1.7	01Jan2020, 12:40	2.05

Figure 8-10. Inlet Capacity Chart Sump Conditions, Area (Type C) Inlet**Inlet Summary:**

Please note, a double grate Type C Inlet equates to a Type D Inlet

Inlet 1, Type C: 5.2 cfs < 16 cfs Capacity
 Inlet 2, Type C: 3.3 cfs < 16 cfs Capacity
 Inlet 3, Type C: 6.9 cfs < 16 cfs Capacity
 Inlet 4, Type C: 3.3 cfs < 16 cfs Capacity
 Inlet 5, Type C: 12.1 cfs < 16 cfs Capacity
 Inlet 6, Type C : 15.1 cfs < 16 cfs Capacity
 Inlet 7, Type C: 3.0 cfs < 16 cfs Capacity
 Inlet 8&9 - See inlet calculations below.
 Inlet 10, Type C: 5.3 cfs < 16 cfs Capacity
 Inlet 11, Type D: 27.7 cfs < 40 cfs Capacity
 Inlet 12, Type C: 5.1 cfs < 16 cfs Capacity
 Inlet 13, Type C: 9.2 cfs < 16 cfs Capacity
 Inlet 14, Type C: 1.0 cfs < 16 cfs Capacity
 Inlet 15&16 - See inlet calculations below.
 Inlet 17, Type C: 2.0 cfs < 16 cfs Capacity

— One Grate — Two Grates - - - - - Three Grates

Notes:

1. The standard inlet parameters must apply to use these charts.

CDOT TYPE D INLET CAPACITY CALCULATIONS

BELOW IS THE INLET CALCULATION PROVIDING REQUIRED GRATE OPEN AREA FOR GIVEN FLOW AT THE PROVIDED ROADSIDE SWALE DEPTH OF 18-INCHES.

PLEASE NOTE: THE CITY OF COLORADO SPRINGS TYPE C INLET NOMOGRAPH PROVIDES CAPACITY AT A MAXIMUM 12-INCH PONDING DEPTH.

Inlet 8&9, Type D Inlet (double grate Type C Inlet): 69.0 cfs per inlet @ 18-inch ponding depth

Grate area of Type D Inlet: 2535.75 square inches > required grate area of 1505.8



Orifice Flow Calculator

What do you need to calculate?

FLOW

GRATE OPEN AREA

Enter flow (CFS)

69

CFS

Enter water depth (inches)

18

in

RESET

CALCULATE RESULTS

GRATE OPEN AREA (IN²):

1505.8

View our complete list of [EJ drainage grates](#).

The provided flow capacity calculators are theoretical calculations and are provided for your guidance. The calculators do not take into account the many variables that occur in the field. For any questions, please [contact us](#).

Inlet 15&16 Type D Inlet (double grate Type C Inlet): 65.6 cfs per inlet @ 18-inch ponding depth

Grate area of Type D Inlet: 2535.75 square inches > required grate area of 1431.6



Orifice Flow Calculator

What do you need to calculate?

FLOW

GRATE OPEN AREA

Enter flow (CFS)

65.6

CFS

Enter water depth (inches)

18

in

RESET

CALCULATE RESULTS

GRATE OPEN AREA (IN²):

1431.6

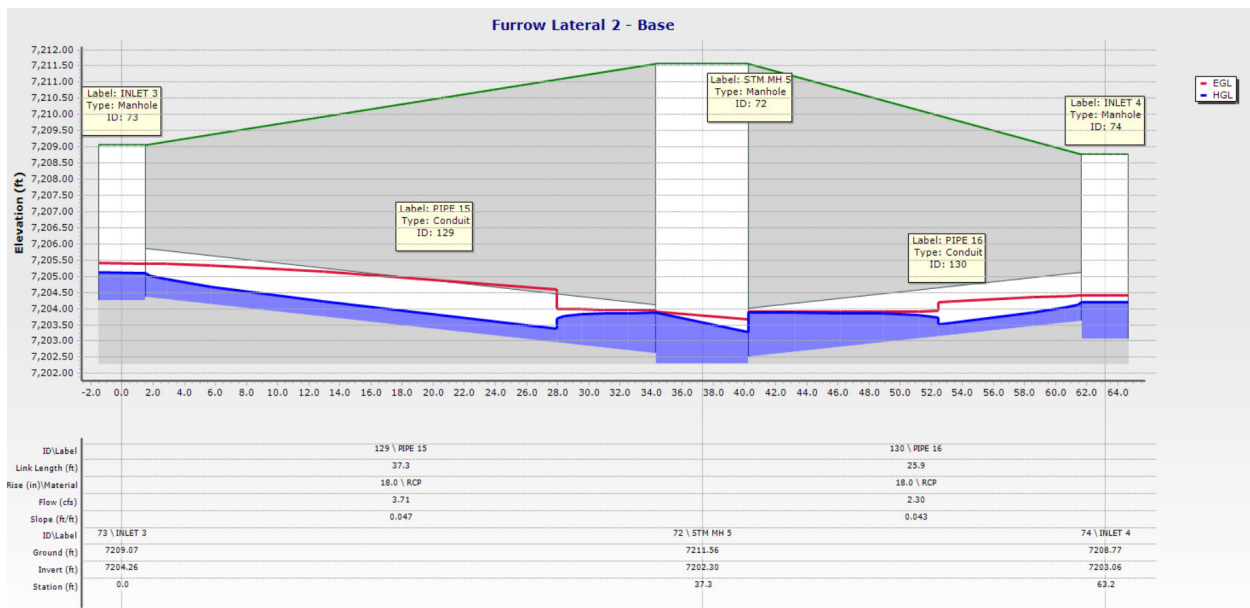
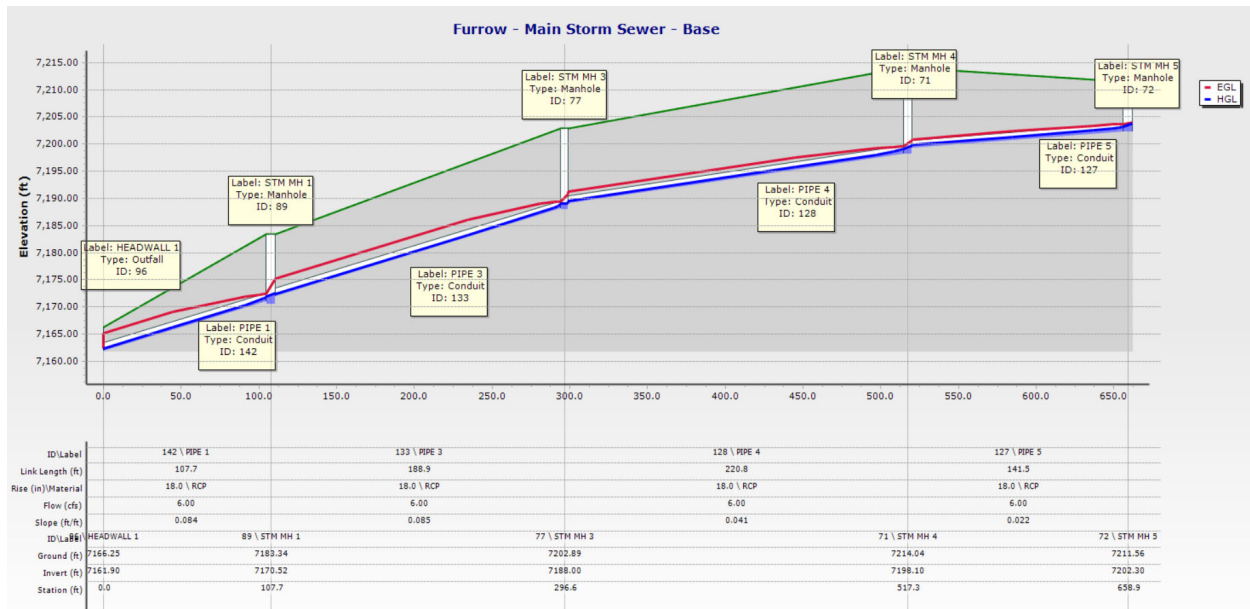
View our complete list of [EJ drainage grates](#).

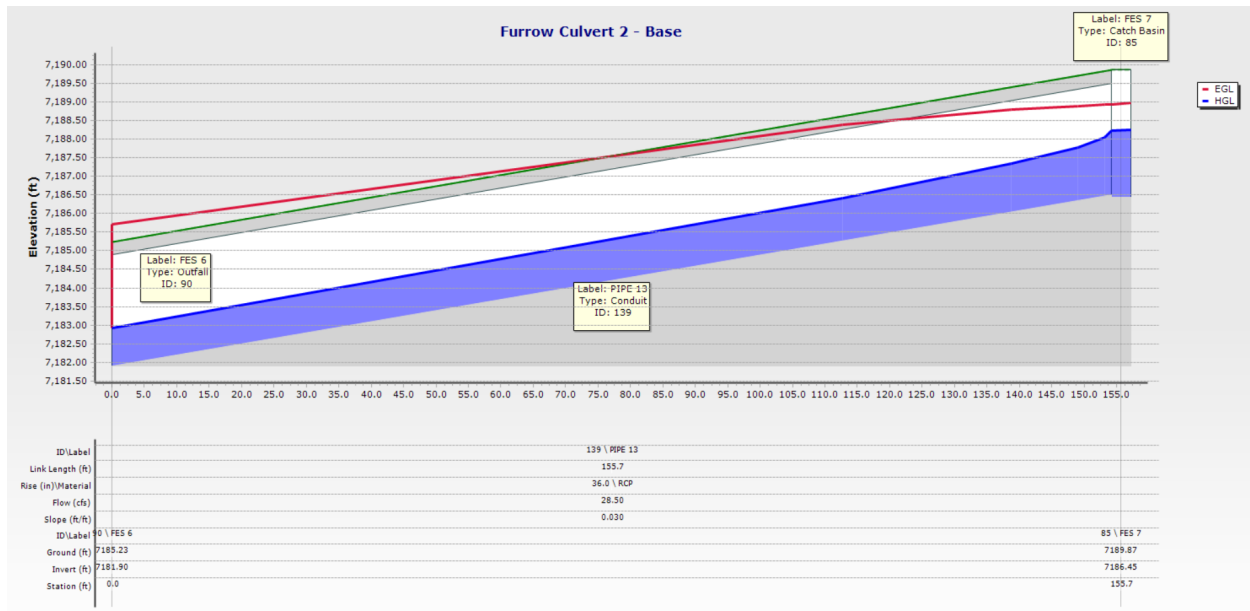
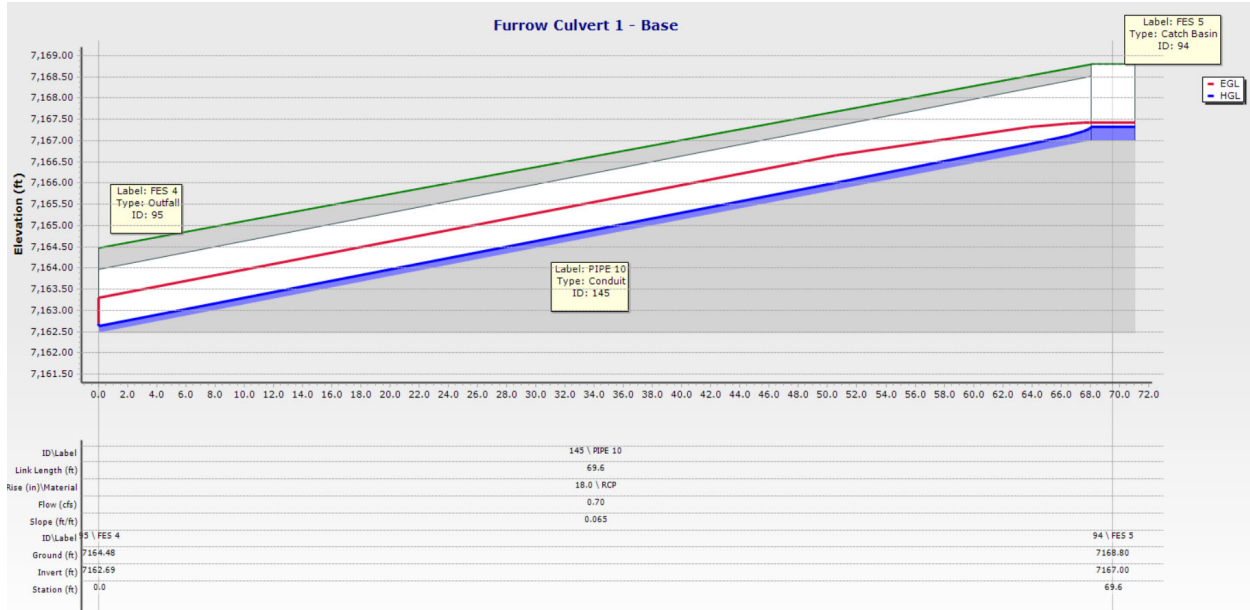
The provided flow capacity calculators are theoretical calculations and are provided for your guidance. The calculators do not take into account the many variables that occur in the field. For any questions, please [contact us](#).

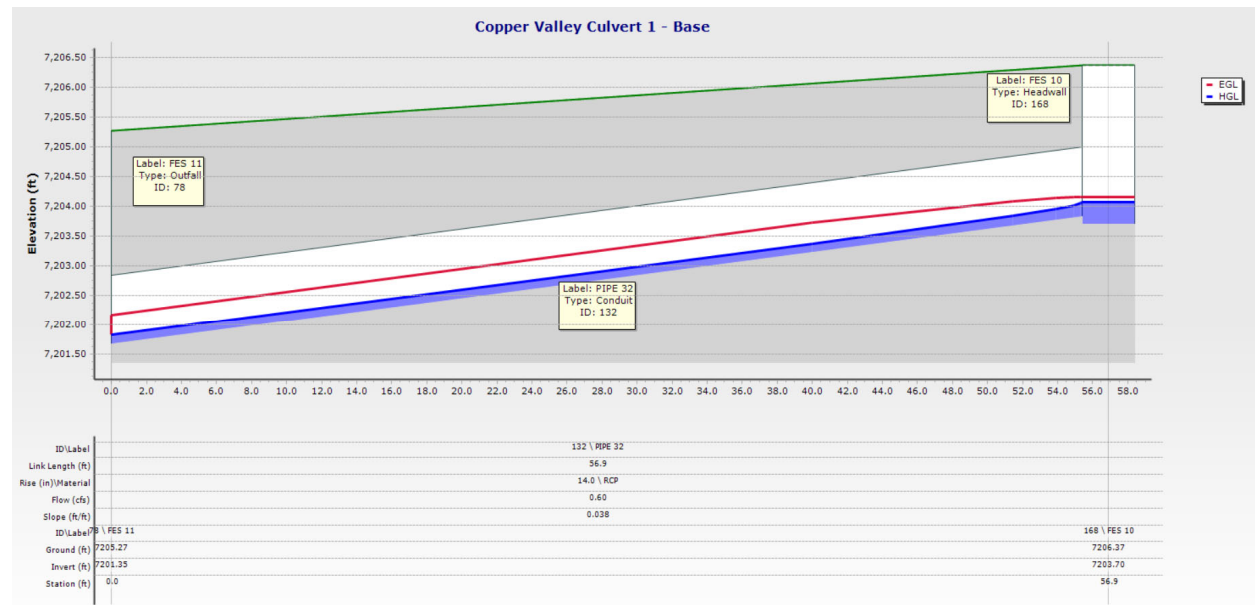
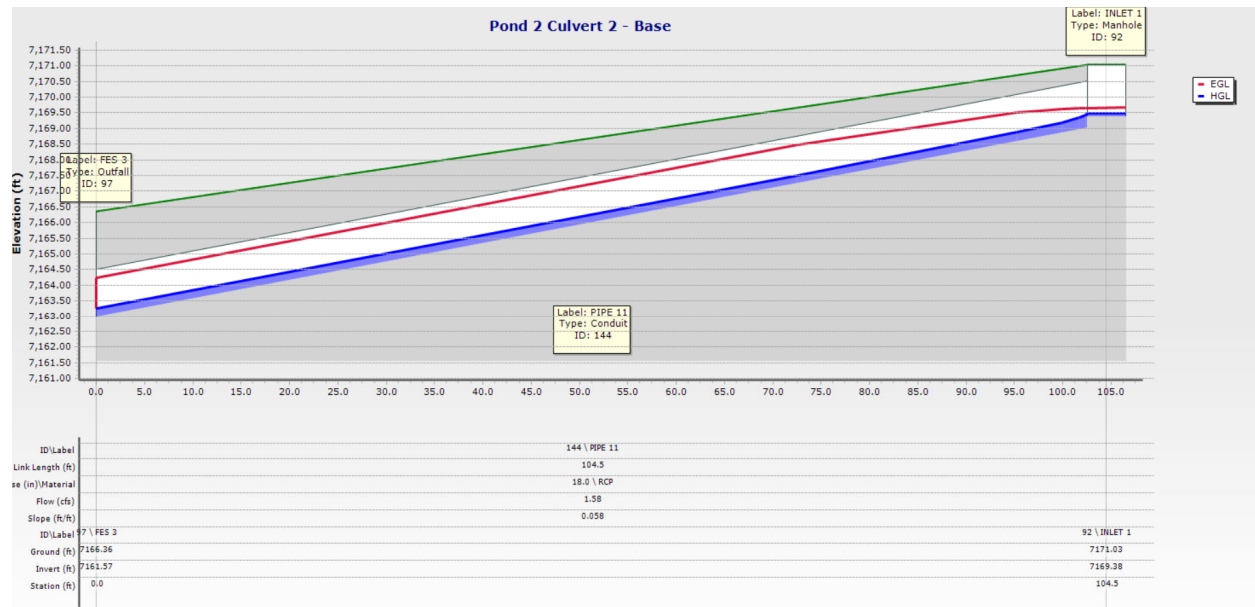
5 – YEAR HYDRAULIC GRADE LINE PROFILES

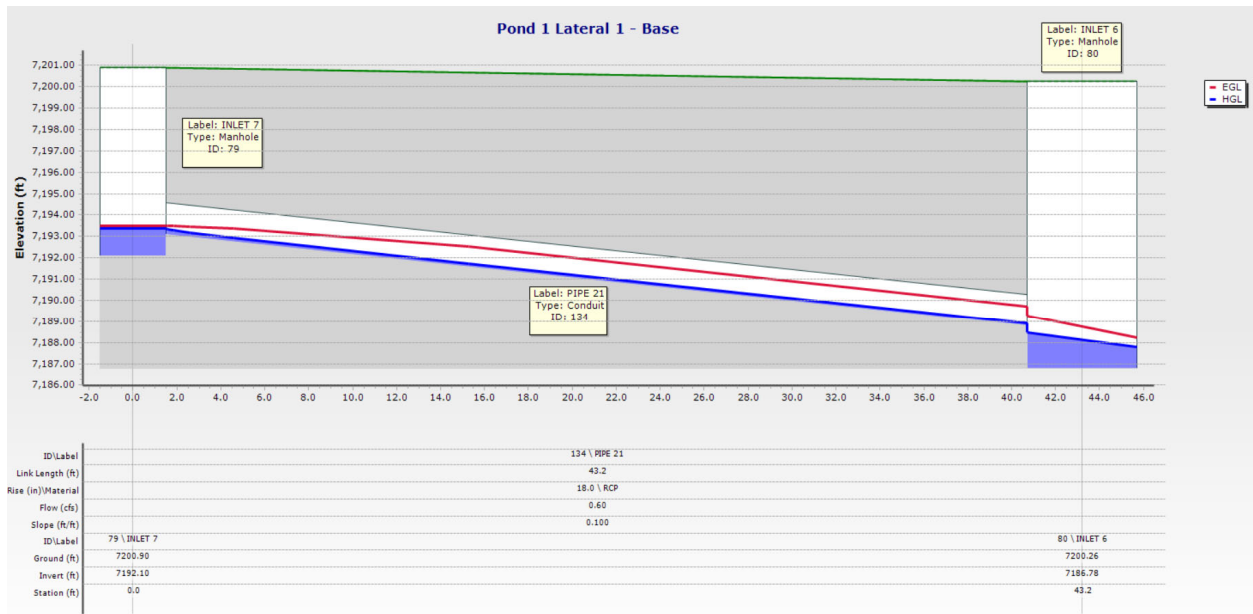
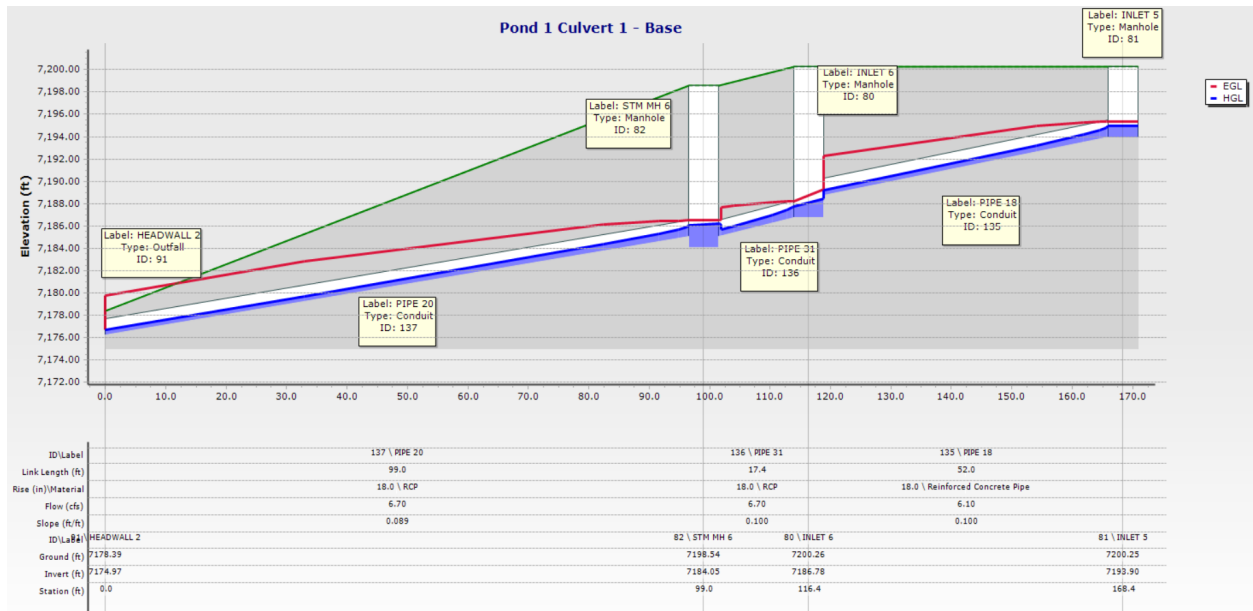
	ID	Label	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Headloss Coefficient (Standard)
44: INLET 14	44	INLET 14	7,299.80	3.00	7,297.46	Standard	7,297.47	0.050
45: INLET 13	45	INLET 13	7,299.42	4.00	7,296.97	Standard	7,296.97	0.000
50: INLET 17	50	INLET 17	7,293.75	3.00	7,290.61	Standard	7,290.63	0.050
56: INLET 10	56	INLET 10	7,270.32	2.10	7,267.37	Standard	7,267.38	0.050
58: INLET 11	58	INLET 11	7,267.12	6.87	7,264.37	Standard	7,264.39	0.050
59: INLET 12	59	INLET 12	7,267.00	8.76	7,260.34	Standard	7,260.36	0.050
61: STM MH 8	61	STM MH 8	7,257.70	8.76	7,247.86	Standard	7,247.88	0.050
67: INLET 9	67	INLET 9	7,219.00	26.80	7,216.18	Standard	7,216.22	0.050
68: INLET 8	68	INLET 8	7,219.05	26.80	7,216.18	Standard	7,216.22	0.050
71: STM MH 4	71	STM MH 4	7,214.04	6.00	7,199.13	Standard	7,199.66	1.320
72: STM MH 5	72	STM MH 5	7,211.56	6.00	7,203.27	Standard	7,203.88	1.520
73: INLET 3	73	INLET 3	7,209.07	3.71	7,205.11	Standard	7,205.12	0.050
74: INLET 4	74	INLET 4	7,208.77	2.30	7,204.19	Standard	7,204.20	0.050
77: STM MH 3	77	STM MH 3	7,202.89	6.00	7,188.98	Standard	7,189.02	0.100
79: INLET 7	79	INLET 7	7,200.90	0.60	7,193.39	Standard	7,193.39	0.050
80: INLET 6	80	INLET 6	7,200.26	6.70	7,187.78	Standard	7,188.46	1.520
81: INLET 5	81	INLET 5	7,200.25	6.10	7,194.93	Standard	7,194.96	0.050
82: STM MH 6	82	STM MH 6	7,198.54	6.70	7,186.05	Standard	7,186.23	0.400
89: STM MH 1	89	STM MH 1	7,183.34	6.00	7,171.93	Standard	7,172.46	1.320
92: INLET 1	92	INLET 1	7,173.03	1.58	7,170.27	Standard	7,170.28	0.050
148: INLET 15	148	INLET 15	7,302.24	22.85	7,297.24	Standard	7,297.26	0.050
165: INLET 16	165	INLET 16	7,301.67	22.85	7,297.25	Standard	7,297.27	0.050
178: DF-1	178	DF-1	7,178.00	0.70	7,174.48	Standard	7,174.49	0.050
185: DF-2	185	DF-2	7,166.00	0.70	7,161.31	Standard	7,161.32	0.050
189: DF-3	189	DF-3	7,248.40	5.00	7,244.79	Standard	7,244.80	0.050
195: DF-4	195	DF-4	7,298.60	0.50	7,295.26	Standard	7,295.27	0.050
256: MH-20	256	MH-20	7,159.21	33.00	7,150.08	Standard	7,150.15	0.100
259: MH-21	259	MH-21	7,261.75	8.76	7,253.51	Standard	7,253.53	0.050

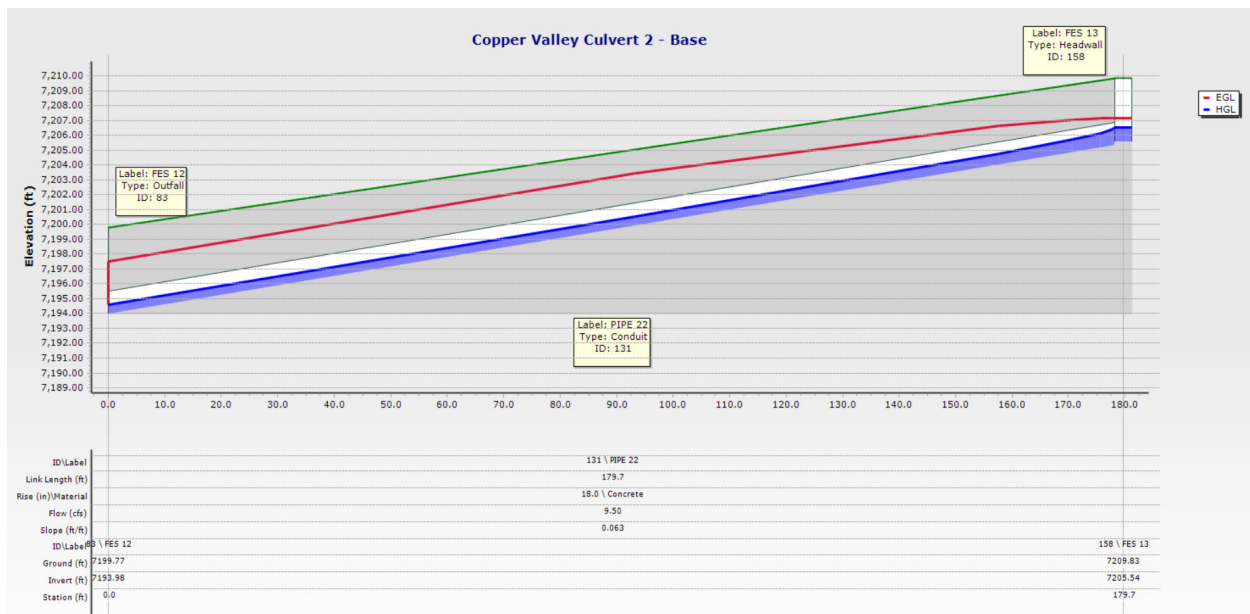
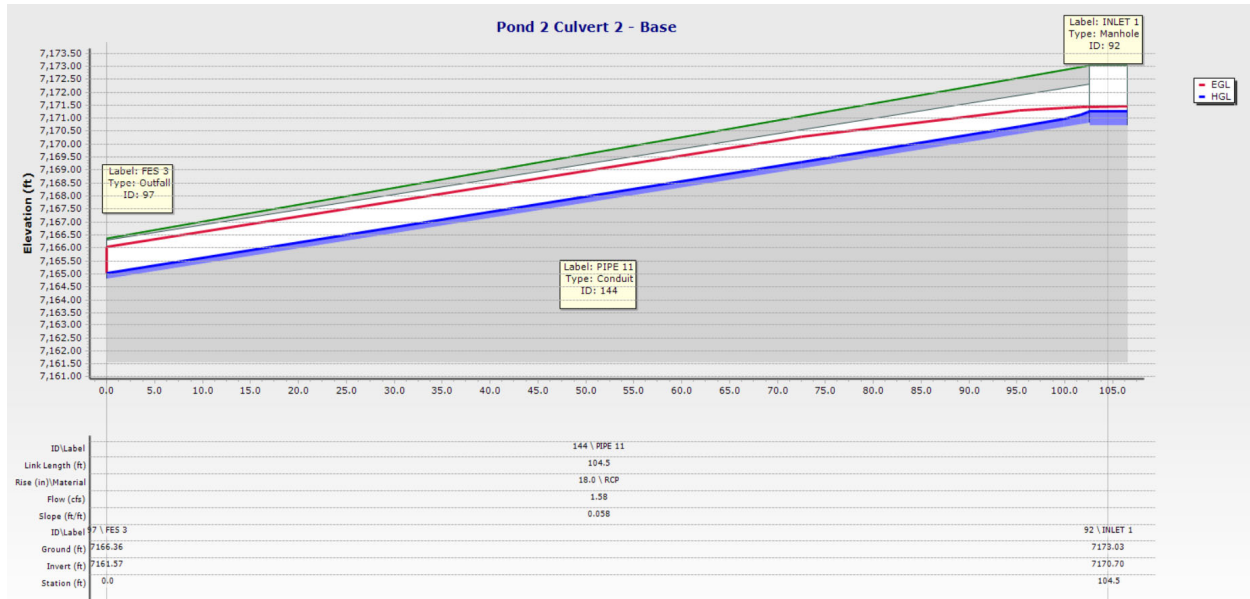
	ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Rise (ft)	Span (ft)	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
112: PIPE 33	112	PIPE 33	FES 24	7,300.36	FES 23	7,300.19	0.009		1.2	1.9	1.16	3.44	7,300.70	7,300.48
113: PIPE 41	113	PIPE 41	INLET 14	7,296.80	INLET 13	7,296.40	0.008	18.0			3.00	4.66	7,297.46	7,296.99
114: PIPE 40	114	PIPE 40	INLET 13	7,296.20	HEADWALL 4	7,296.00	0.010	18.0			4.00	5.46	7,296.97	7,296.66
115: PIPE 36	115	PIPE 36	FES 25	7,292.97	INLET 17	7,290.16	0.060	18.0			7.30	12.53	7,294.01	7,290.73
116: PIPE 37	116	PIPE 37	INLET 17	7,289.95	FES 26	7,287.64	0.020	18.0			3.00	6.55	7,290.61	7,288.10
117: PIPE 39	117	PIPE 39	FES 30	7,289.17	FES 39	7,287.76	0.036		1.2	1.9	3.60	7.99	7,289.77	7,288.12
118: PIPE 29	118	PIPE 29	FES 17	7,268.85	FES 18	7,268.12	0.023		1.2	1.9	1.89	5.68	7,269.28	7,268.41
119: PIPE 28	119	PIPE 28	INLET 10	7,266.83	FES 16	7,263.33	0.035	18.0			2.10	7.25	7,267.37	7,263.66
120: PIPE 25	120	PIPE 25	INLET 11	7,263.36	INLET 12	7,260.28	0.060	18.0			6.87	12.35	7,264.37	7,260.83
122: PIPE 27	122	PIPE 27	STM MH 8	7,246.80	HEADWALL 3	7,246.00	0.029	24.0			8.76	9.88	7,247.86	7,246.72
123: PIPE 38	123	PIPE 38	FES 28	7,250.01	FES 27	7,245.91	0.111	15.0			2.60	11.83	7,250.66	7,246.21
124: PIPE 30	124	PIPE 30	FES 20	7,233.22	FES 19	7,231.10	0.041		1.2	1.9	2.42	7.45	7,233.71	7,231.75
125: PIPE 24	125	PIPE 24	INLET 9	7,214.51	FES 15	7,213.11	0.015	36.0			26.80	10.42	7,216.18	7,214.32
126: PIPE 23	126	PIPE 23	INLET 8	7,214.51	FES 14	7,213.12	0.015	36.0			26.80	10.40	7,216.18	7,214.33
127: PIPE 5	127	PIPE 5	STM MH 5	7,202.32	STM MH 4	7,199.19	0.022	18.0			6.00	8.26	7,203.27	7,199.83
128: PIPE 4	128	PIPE 4	STM MH 4	7,198.18	STM MH 3	7,189.03	0.041	18.0			6.00	10.39	7,199.13	7,189.57
129: PIPE 15	129	PIPE 15	INLET 3	7,204.37	STM MH 5	7,202.62	0.047	18.0			3.71	9.49	7,205.11	7,203.88
130: PIPE 16	130	PIPE 16	INLET 4	7,203.62	STM MH 5	7,202.51	0.043	18.0			2.30	8.00	7,204.19	7,203.88
131: PIPE 22	131	PIPE 22	FES 13	7,205.34	FES 12	7,193.98	0.063	18.0			9.50	13.72	7,206.53	7,194.60
132: PIPE 32	132	PIPE 32	FES 10	7,203.83	FES 11	7,201.37	0.043		1.2	1.9	0.60	5.01	7,204.07	7,201.51
133: PIPE 3	133	PIPE 3	STM MH 3	7,188.03	STM MH 1	7,171.98	0.085	18.0			6.00	13.45	7,188.98	7,172.43
134: PIPE 21	134	PIPE 21	INLET 7	7,193.10	INLET 6	7,188.78	0.100	18.0			0.60	7.24	7,193.39	7,188.92
135: PIPE 18	135	PIPE 18	INLET 5	7,193.98	INLET 6	7,188.78	0.100	18.0			6.10	14.32	7,194.93	7,189.22
136: PIPE 31	136	PIPE 31	INLET 6	7,186.78	STM MH 6	7,185.05	0.100	18.0			6.70	14.68	7,187.78	7,186.23
137: PIPE 20	137	PIPE 20	STM MH 6	7,185.05	HEADWALL 2	7,176.23	0.089	18.0			6.70	14.11	7,186.05	7,176.70
138: PIPE 14	138	PIPE 14	FES 9	7,186.51	FES 8	7,181.90	0.030	36.0			28.50	13.48	7,188.24	7,182.92
139: PIPE 13	139	PIPE 13	FES 7	7,186.50	FES 6	7,181.90	0.030	36.0			28.50	13.46	7,188.23	7,182.92
142: PIPE 1	142	PIPE 1	STM MH 1	7,170.98	HEADWALL 1	7,161.90	0.084	18.0			6.00	13.41	7,171.93	7,162.35
144: PIPE 11	144	PIPE 11	INLET 1	7,169.80	FES 3	7,163.00	0.065	18.0			1.58	8.30	7,170.27	7,163.25
145: PIPE 10	145	PIPE 10	FES 5	7,166.99	FES 4	7,162.47	0.065	18.0			0.70	6.50	7,167.30	7,162.64
150: PIPE 35	150	PIPE 35	INLET 15	7,296.00	FES 21	7,295.00	0.005		2.8	4.4	22.85	6.31	7,297.24	7,296.12
167: PIPE 34	167	PIPE 34	INLET 16	7,296.01	FES 22	7,295.01	0.005		2.8	4.4	22.85	6.32	7,297.25	7,296.14
180: PIPE 54	180	PIPE 54	DF-1	7,174.17	FES 31	7,174.00	0.006	18.0			0.70	2.86	7,174.48	7,174.29
187: PIPE 55	187	PIPE 55	DF-2	7,161.00	FES 32	7,160.74	0.005	18.0			0.70	2.64	7,161.31	7,161.05
191: PIPE 56	191	PIPE 56	DF-3	7,244.00	O-9	7,243.82	0.005	24.0			5.00	4.48	7,244.79	7,244.59
197: PIPE 57	197	PIPE 57	DF-4	7,295.00	O-10	7,294.86	0.006	18.0			0.50	2.50	7,295.26	7,295.12
257: PIPE 7(1)	257	PIPE 7(1)	FES 1	7,155.59	MH-20	7,149.50	0.107		2.4	3.8	33.00	20.98	7,157.18	7,150.23
258: PIPE 7(2)	258	PIPE 7(2)	MH-20	7,148.50	O-3	7,147.00	0.045		2.4	3.8	33.00	15.57	7,150.08	7,148.98
260: PIPE 26(1)	260	PIPE 26(1)	INLET 12	7,259.28	MH-21	7,253.45	0.050	24.0			8.76	12.07	7,260.34	7,254.01
261: PIPE 26(2)	261	PIPE 26(2)	MH-21	7,252.45	STM MH 8	7,247.81	0.047	24.0			8.76	11.81	7,253.51	7,248.38

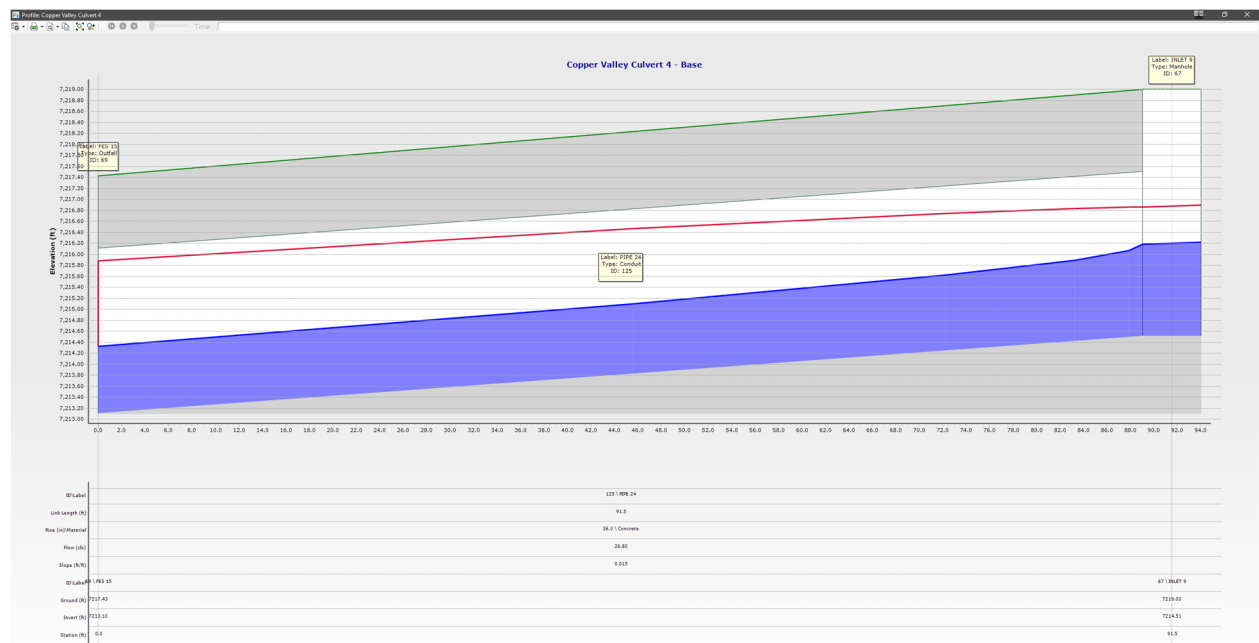
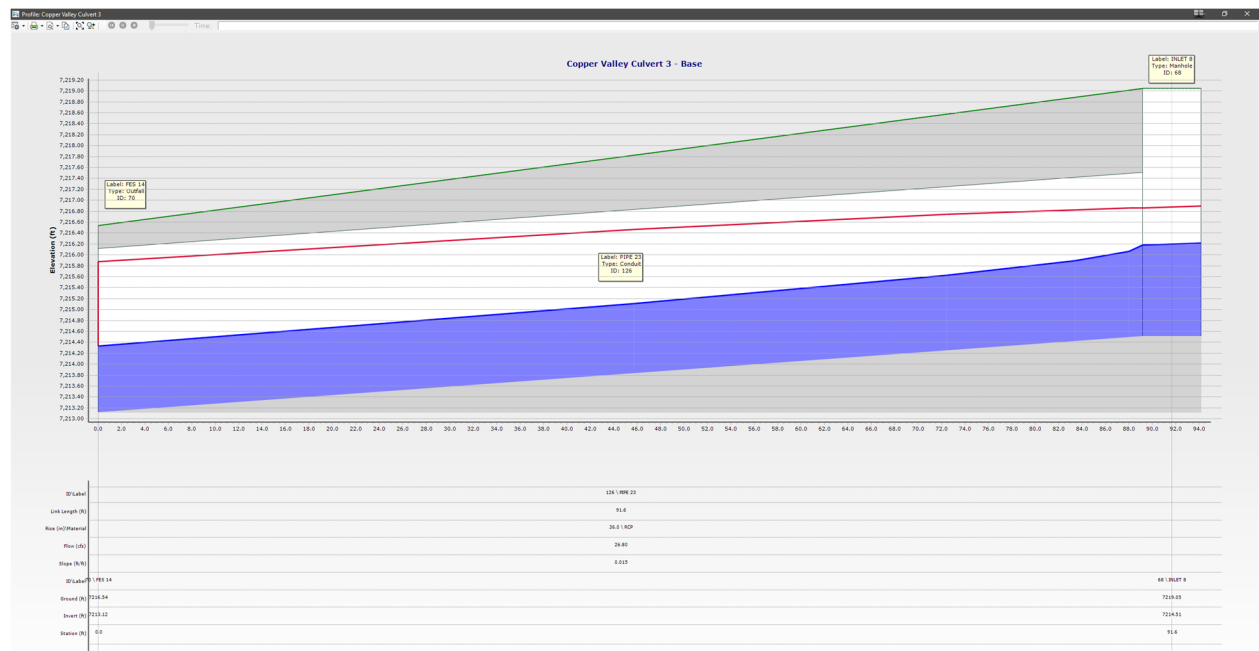


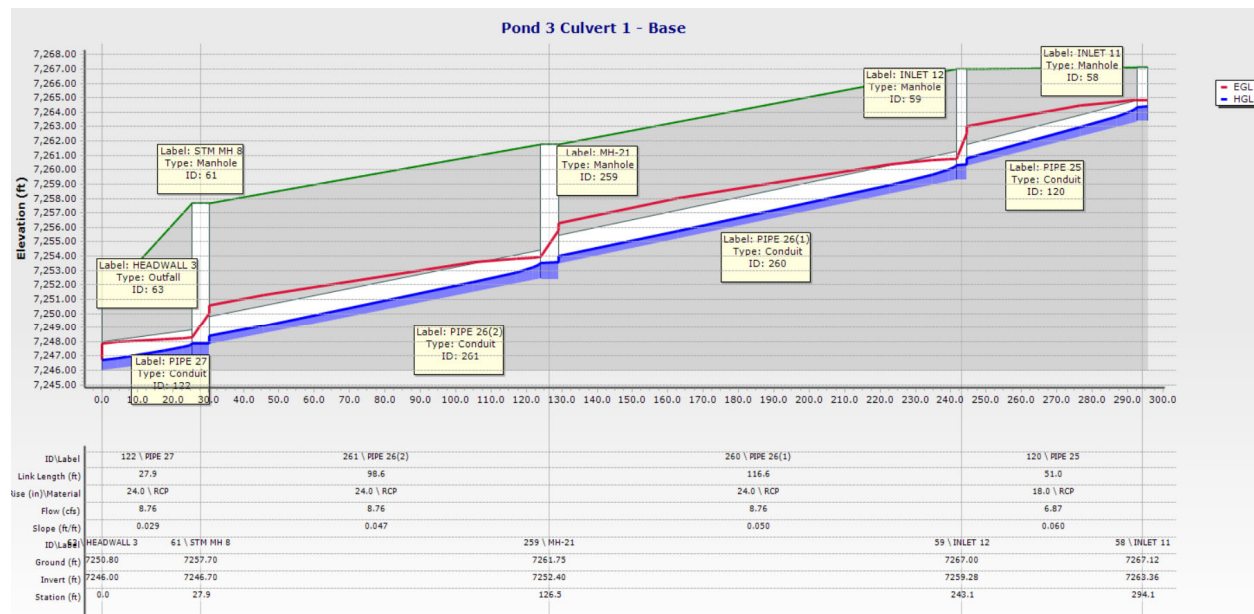
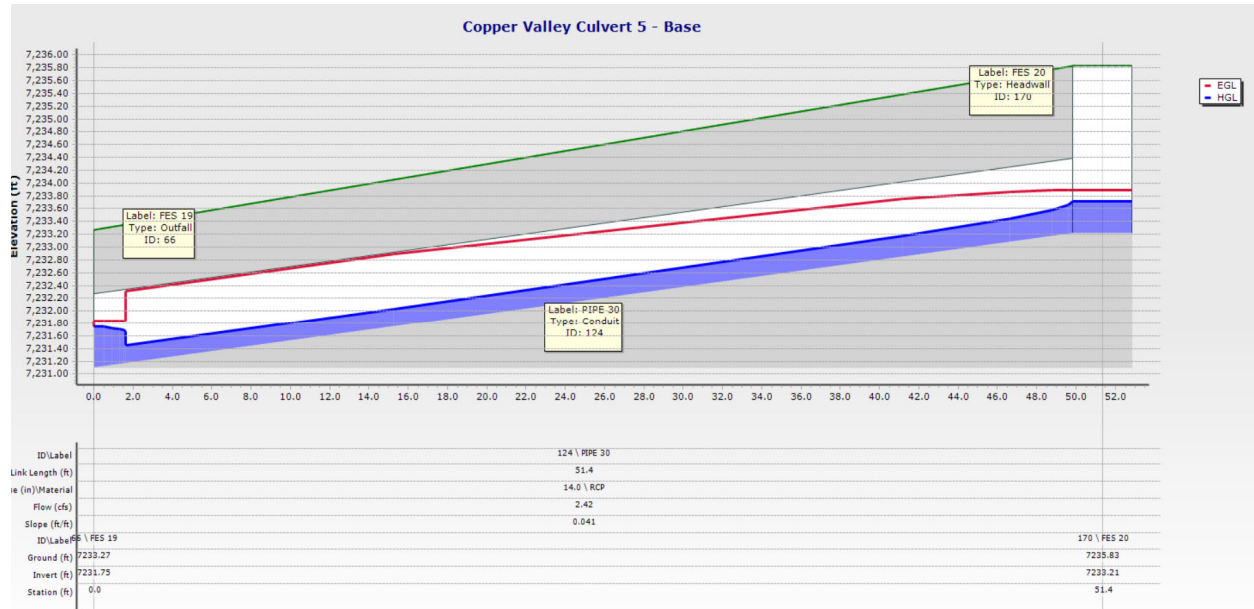


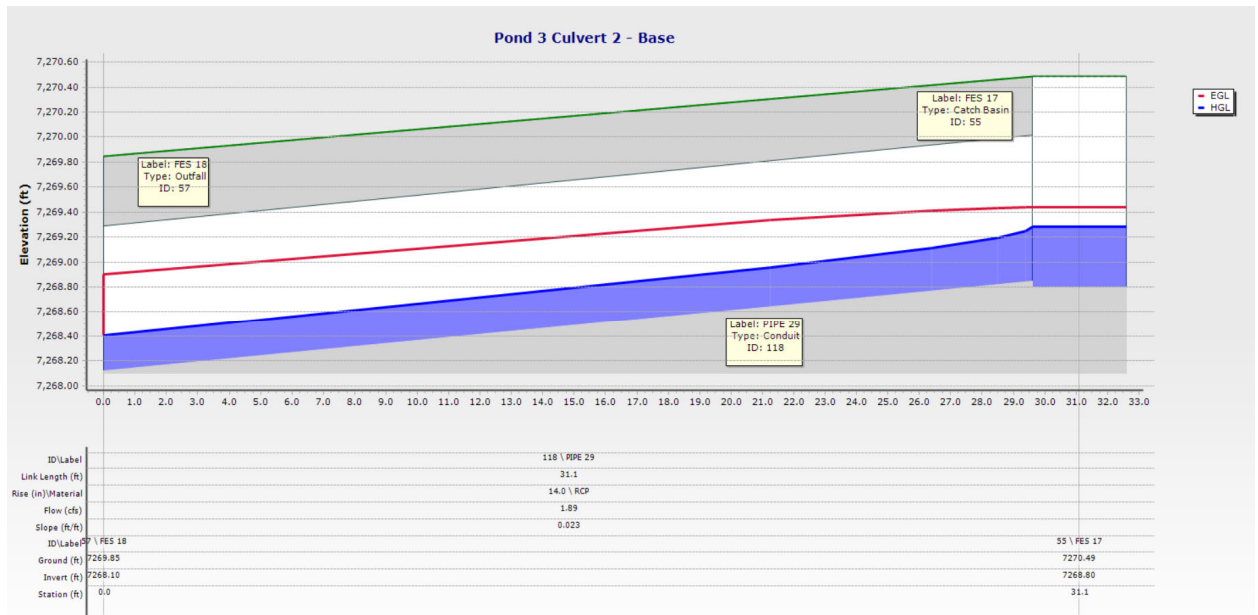
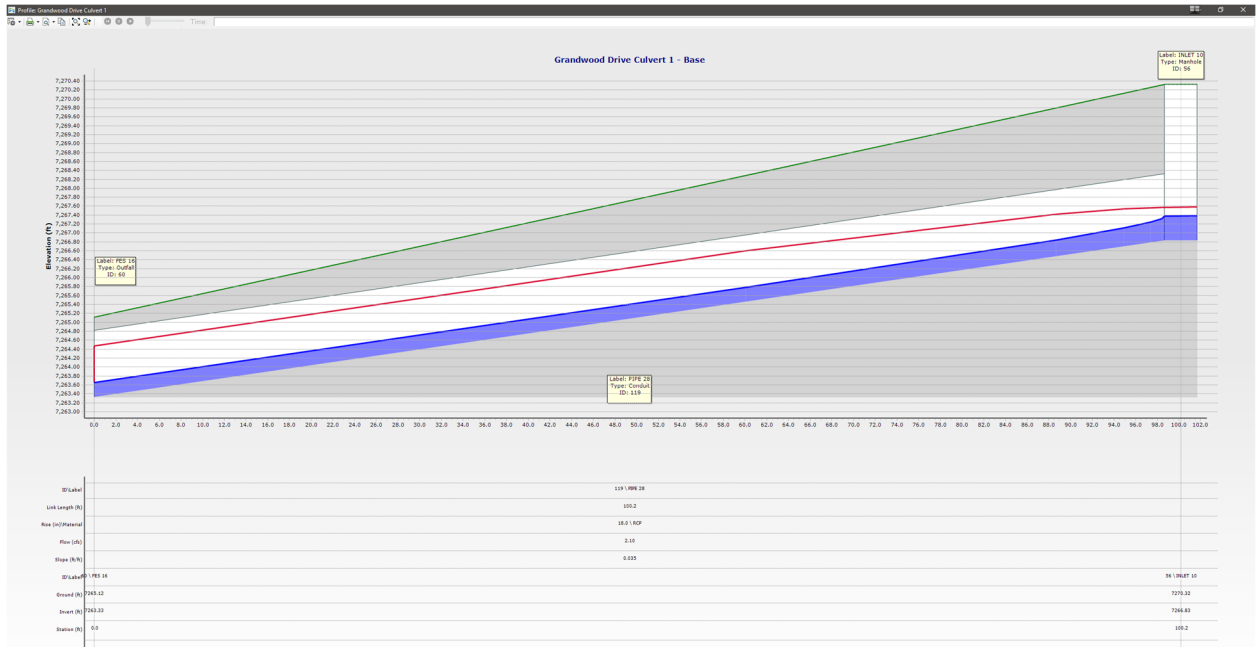


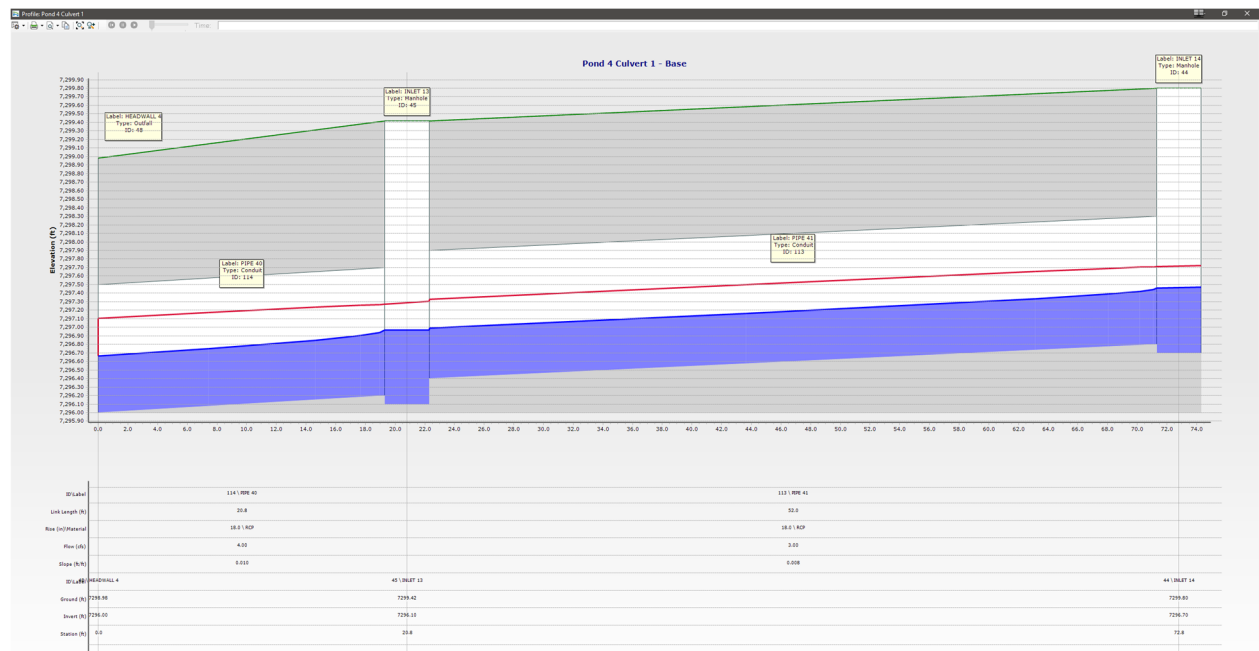
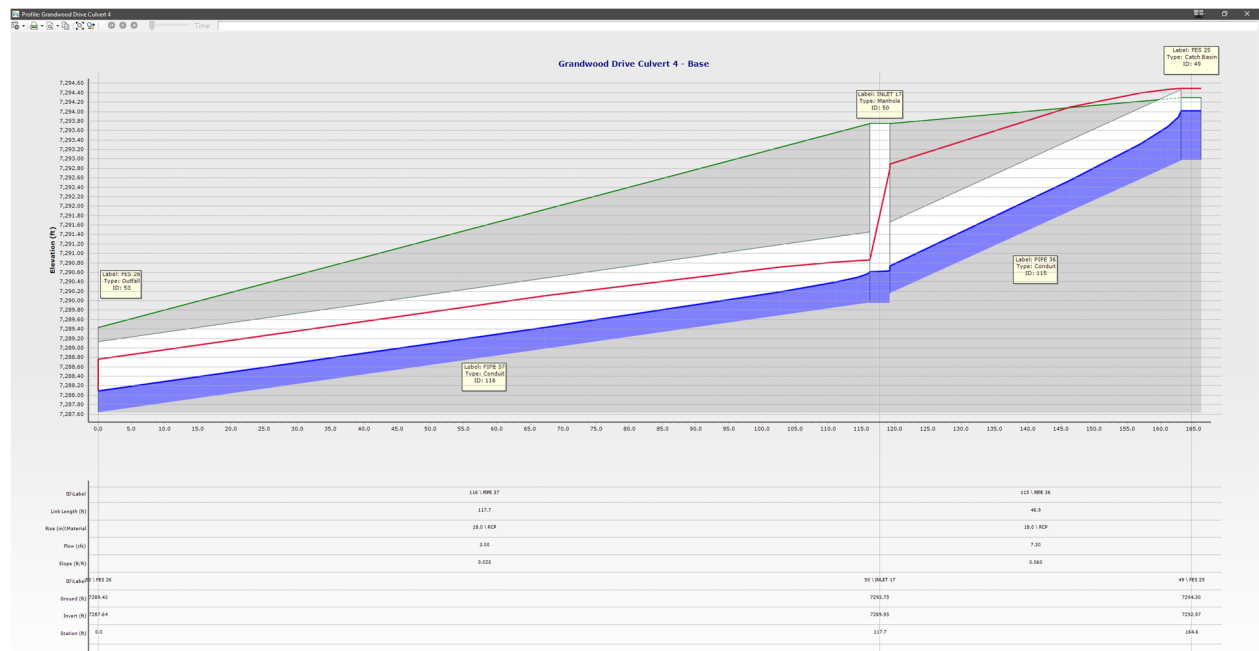


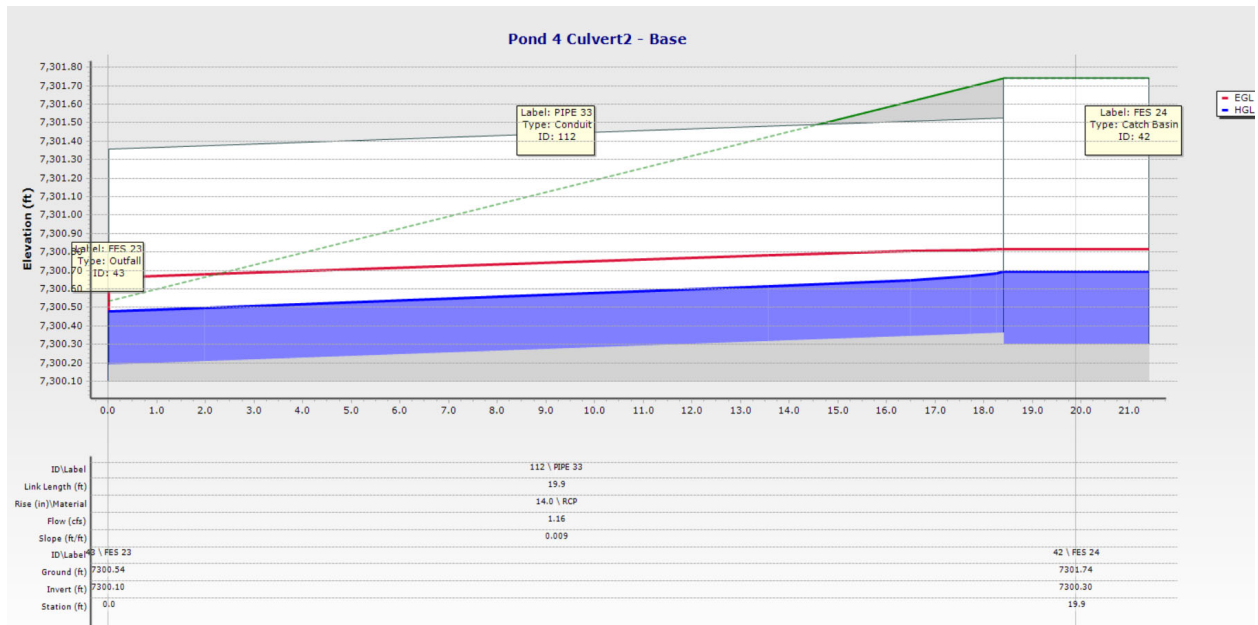
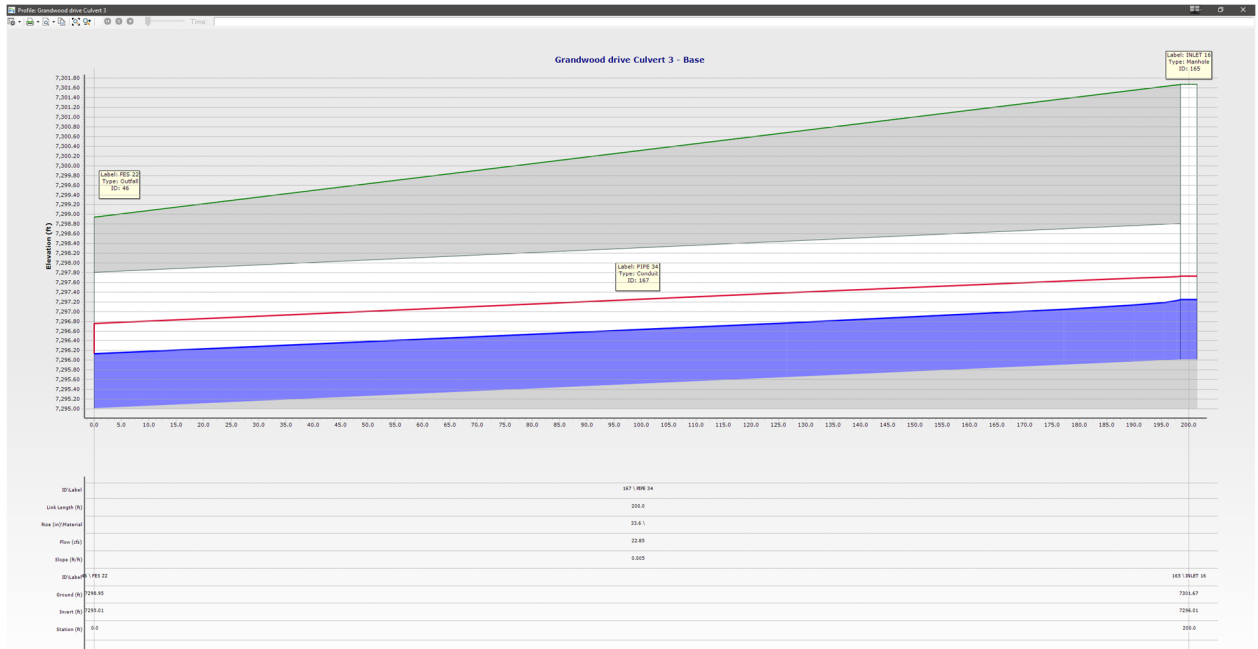


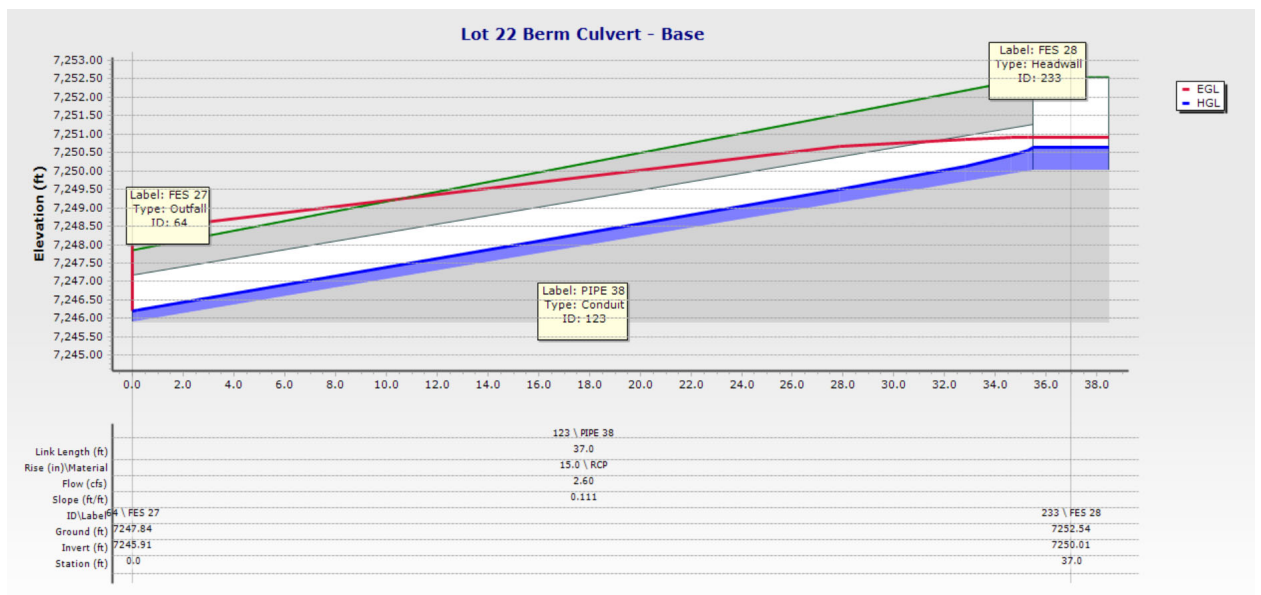
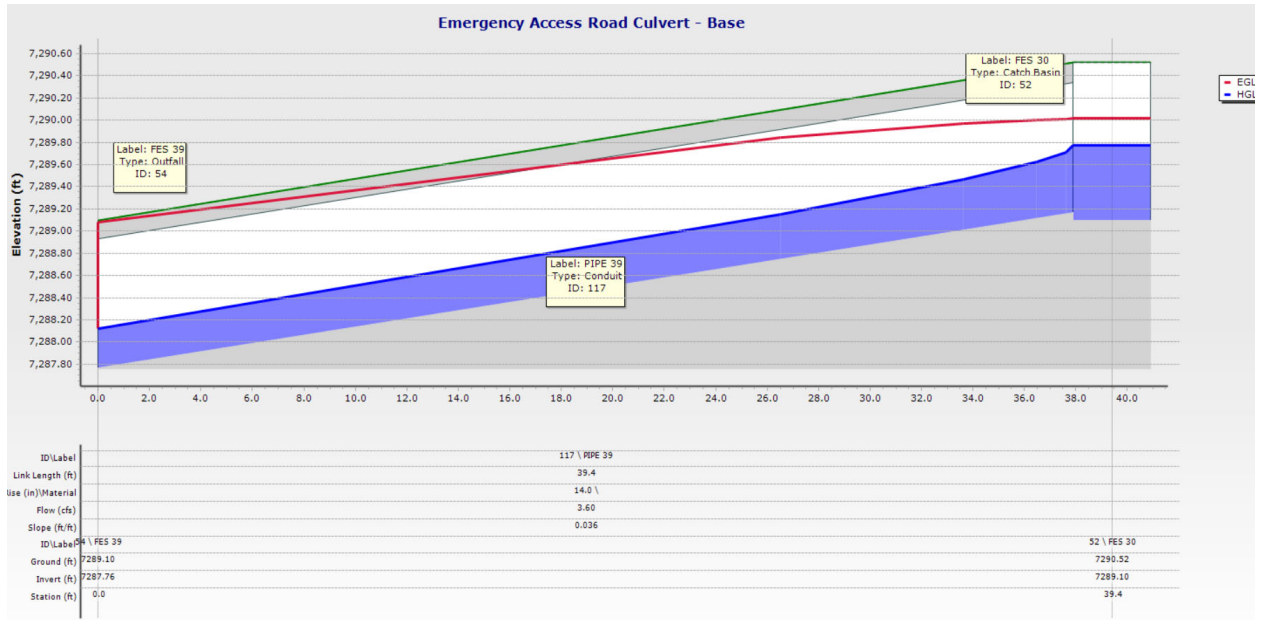


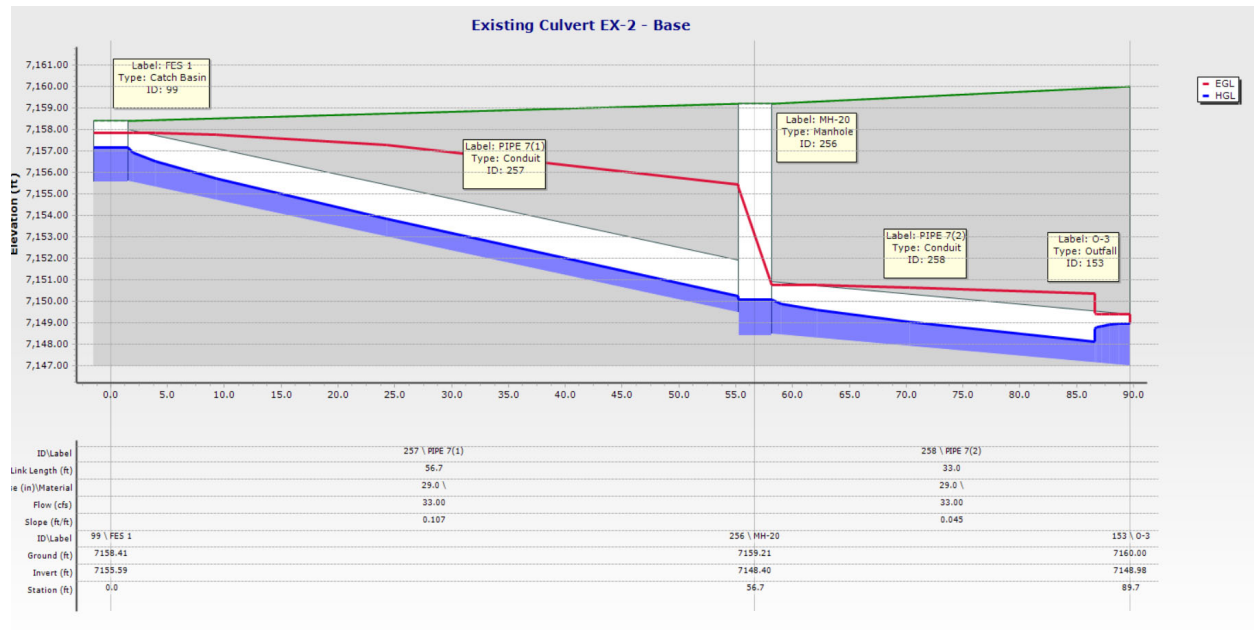








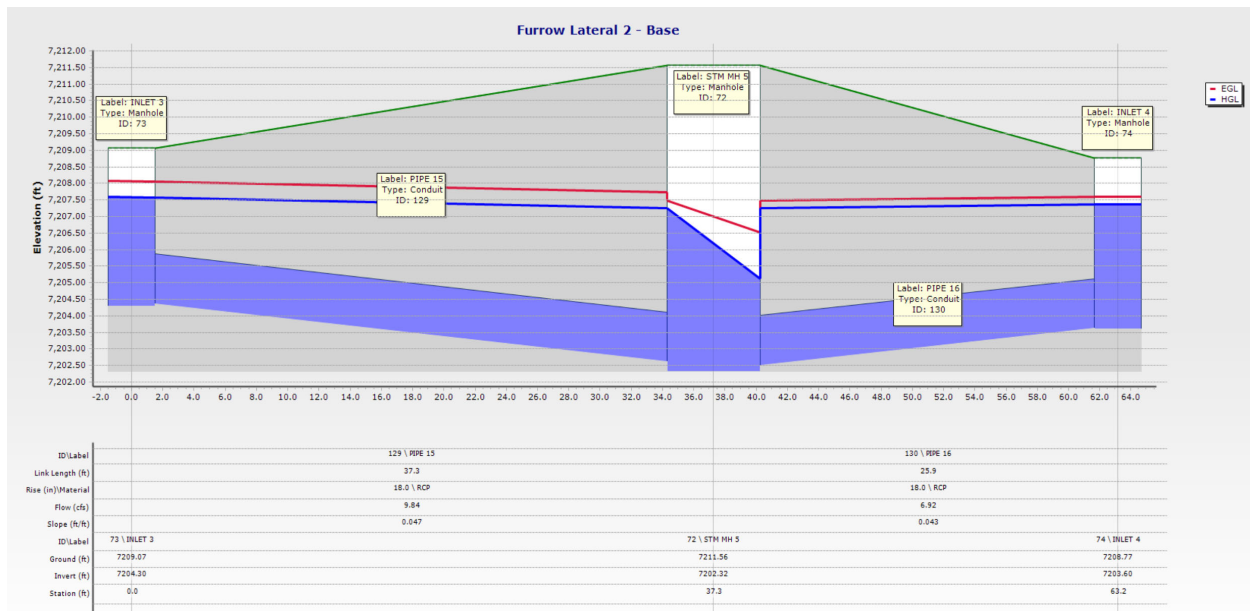
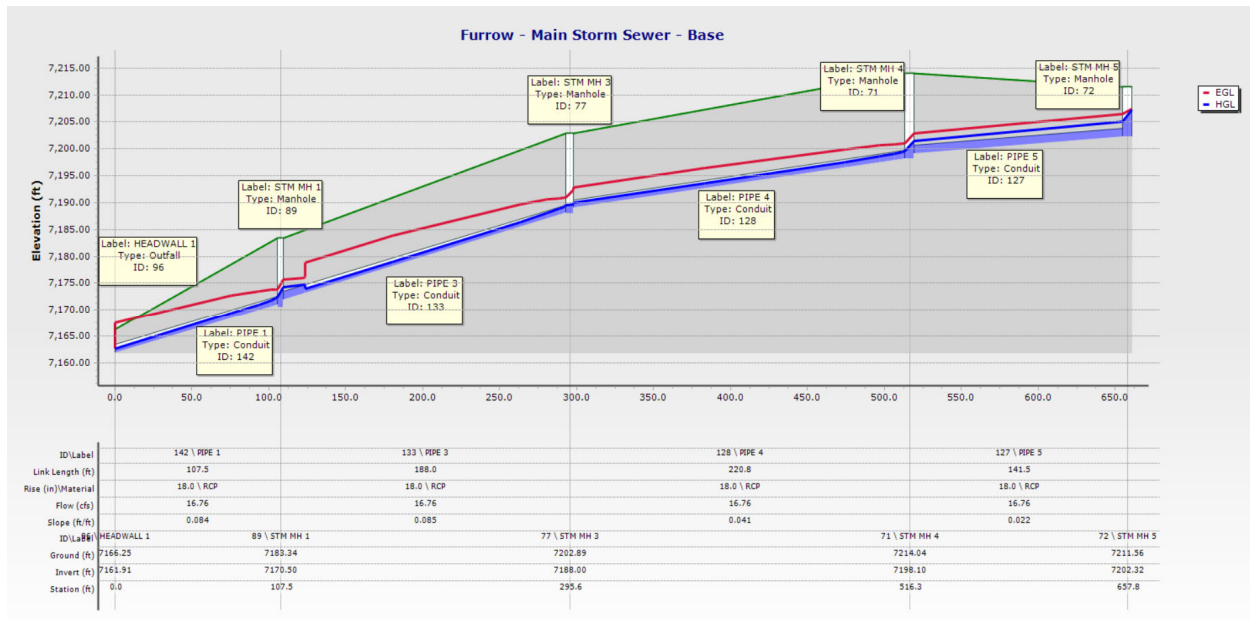


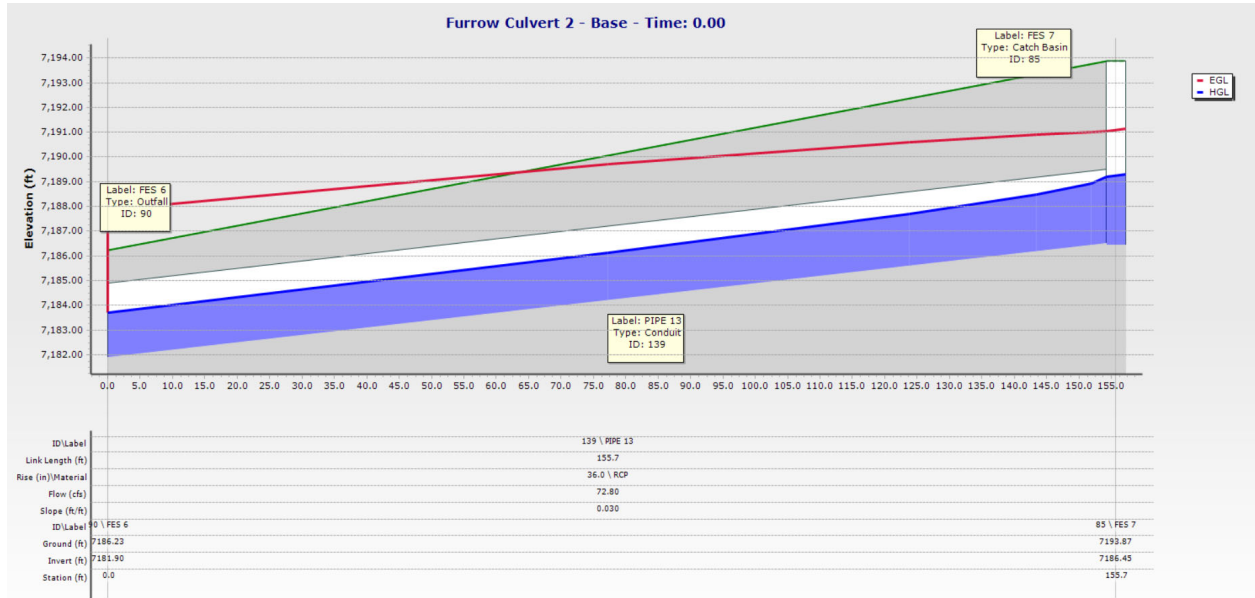
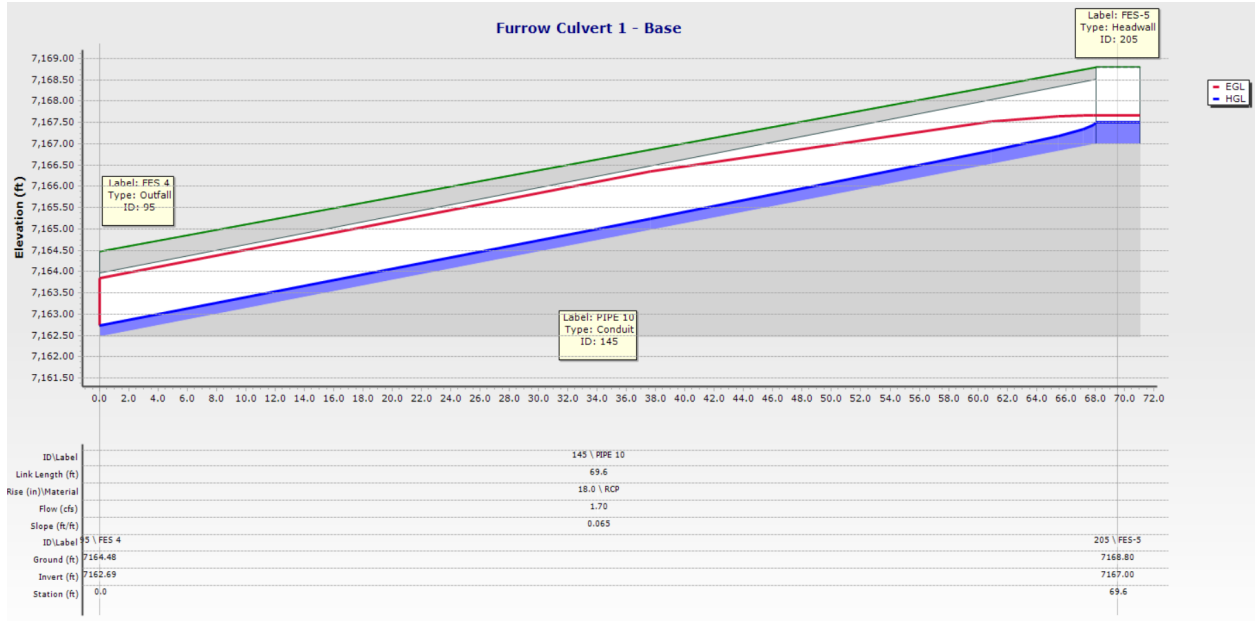


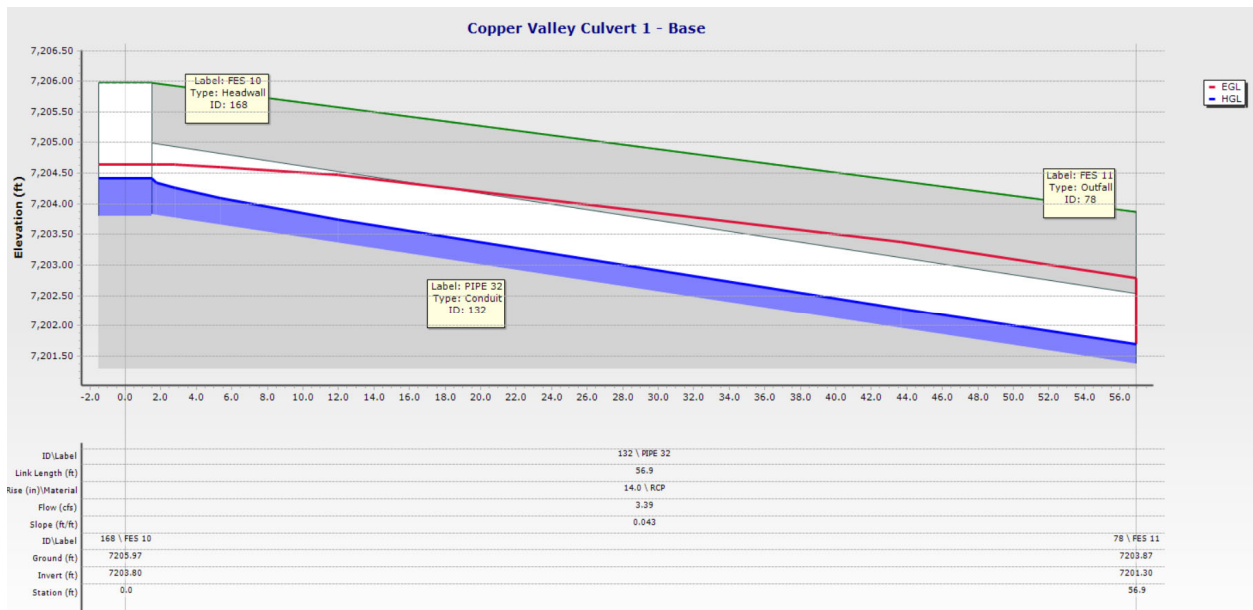
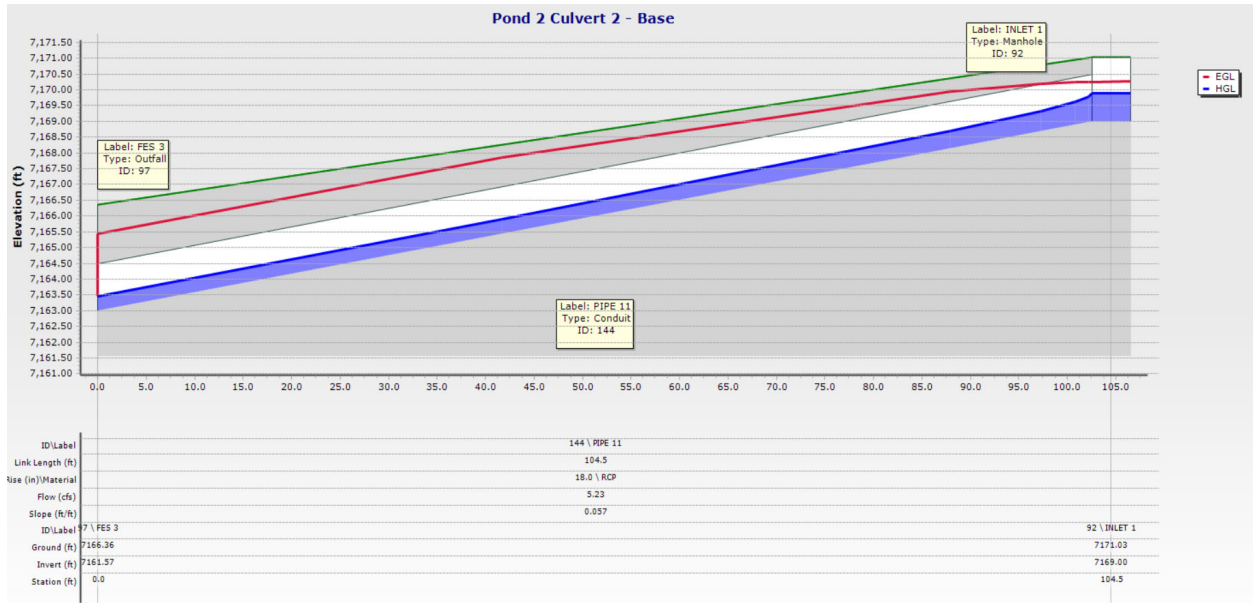
100 – YEAR HYDRAULIC GRADE LINE PROFILES

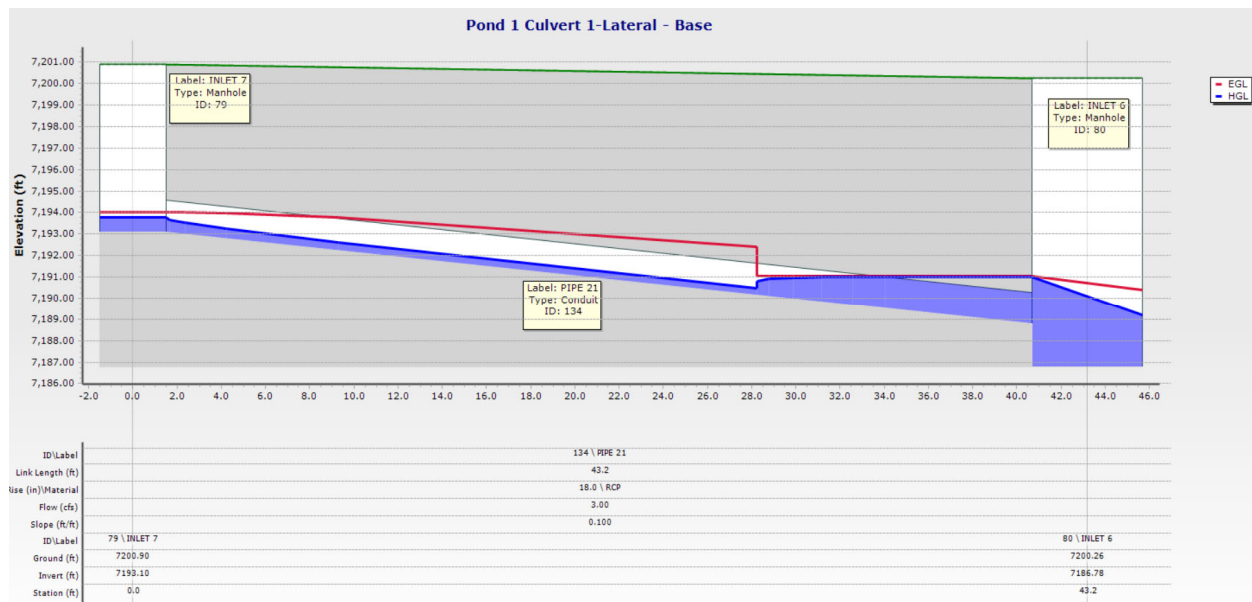
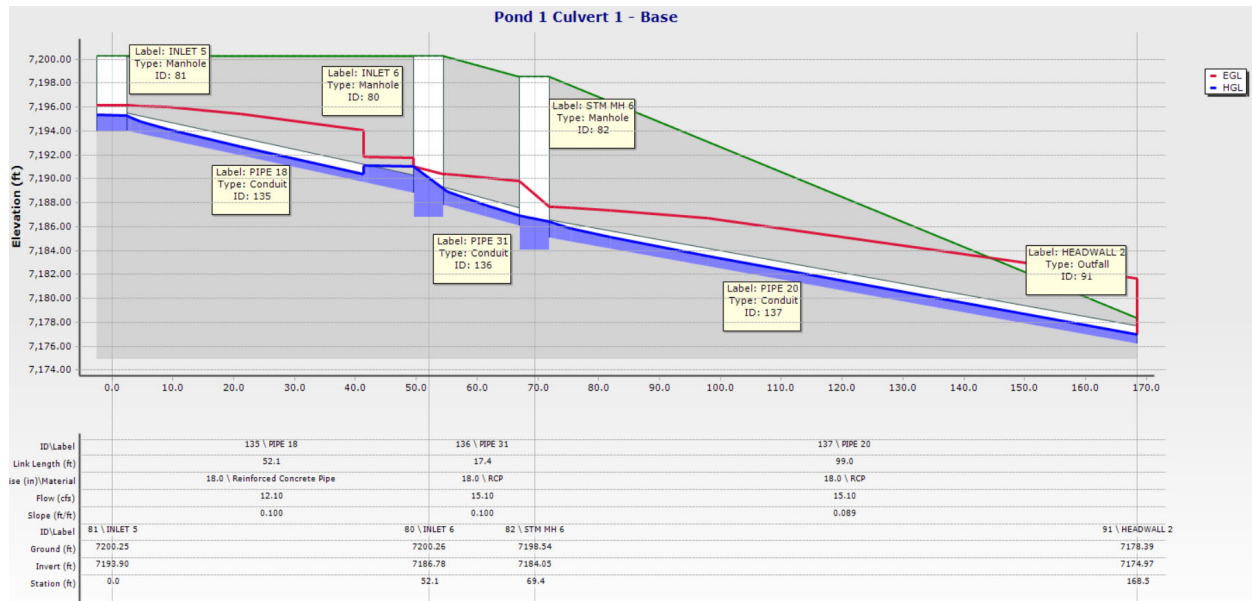
	ID	Label	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Headloss Coefficient (Standard)
44: INLET 14	44	INLET 14	7,299.80	9.20	7,298.03	Standard	7,298.06	0.050
45: INLET 13	45	INLET 13	7,299.42	10.20	7,297.43	Standard	7,297.50	0.100
50: INLET 17	50	INLET 17	7,293.75	17.80	7,292.49	Standard	7,292.65	0.100
56: INLET 10	56	INLET 10	7,270.32	5.30	7,267.71	Standard	7,267.73	0.050
58: INLET 11	58	INLET 11	7,267.12	27.70	7,264.74	Standard	7,264.94	0.050
59: INLET 12	59	INLET 12	7,267.00	32.77	7,261.18	Standard	7,261.35	0.100
61: STM MH 8	61	STM MH 8	7,257.70	32.77	7,248.70	Standard	7,248.87	0.100
67: INLET 9	67	INLET 9	7,219.00	69.00	7,217.15	Standard	7,217.24	0.050
68: INLET 8	68	INLET 8	7,219.05	69.00	7,217.15	Standard	7,217.24	0.050
71: STM MH 4	71	STM MH 4	7,214.04	16.76	7,199.62	Standard	7,201.52	1.320
72: STM MH 5	72	STM MH 5	7,211.56	16.76	7,205.12	Standard	7,207.24	1.520
73: INLET 3	73	INLET 3	7,209.07	9.84	7,207.57	Standard	7,207.60	0.050
74: INLET 4	74	INLET 4	7,208.77	6.92	7,207.36	Standard	7,207.37	0.050
77: STM MH 3	77	STM MH 3	7,202.89	16.76	7,189.47	Standard	7,189.61	0.100
79: INLET 7	79	INLET 7	7,200.90	3.00	7,193.76	Standard	7,193.77	0.050
80: INLET 6	80	INLET 6	7,200.26	15.10	7,189.19	Standard	7,191.00	1.520
81: INLET 5	81	INLET 5	7,200.25	12.10	7,195.30	Standard	7,195.34	0.050
82: STM MH 6	82	STM MH 6	7,198.54	15.10	7,186.46	Standard	7,186.94	0.400
89: STM MH 1	89	STM MH 1	7,183.34	16.76	7,172.42	Standard	7,174.32	1.320
92: INLET 1	92	INLET 1	7,171.03	5.23	7,169.88	Standard	7,169.90	0.050
148: INLET 15	148	INLET 15	7,302.24	65.60	7,298.14	Standard	7,298.19	0.050
165: INLET 16	165	INLET 16	7,301.67	65.60	7,298.15	Standard	7,298.20	0.050
178: DF-1	178	DF-1	7,178.00	6.80	7,175.20	Standard	7,175.22	0.050
185: DF 2	185	DF 2	7,166.00	7.50	7,162.21	Standard	7,162.23	0.050
189: DF-3	189	DF-3	7,248.40	24.30	7,246.12	Standard	7,246.17	0.050
195: DF-4	195	DF-4	7,298.60	12.30	7,296.62	Standard	7,296.66	0.050
235: MH-12	235	MH-12	7,262.15	32.77	7,254.35	Standard	7,254.44	0.050
238: MH-13	238	MH-13	7,155.71	86.50	7,150.82	Standard	7,151.05	0.100

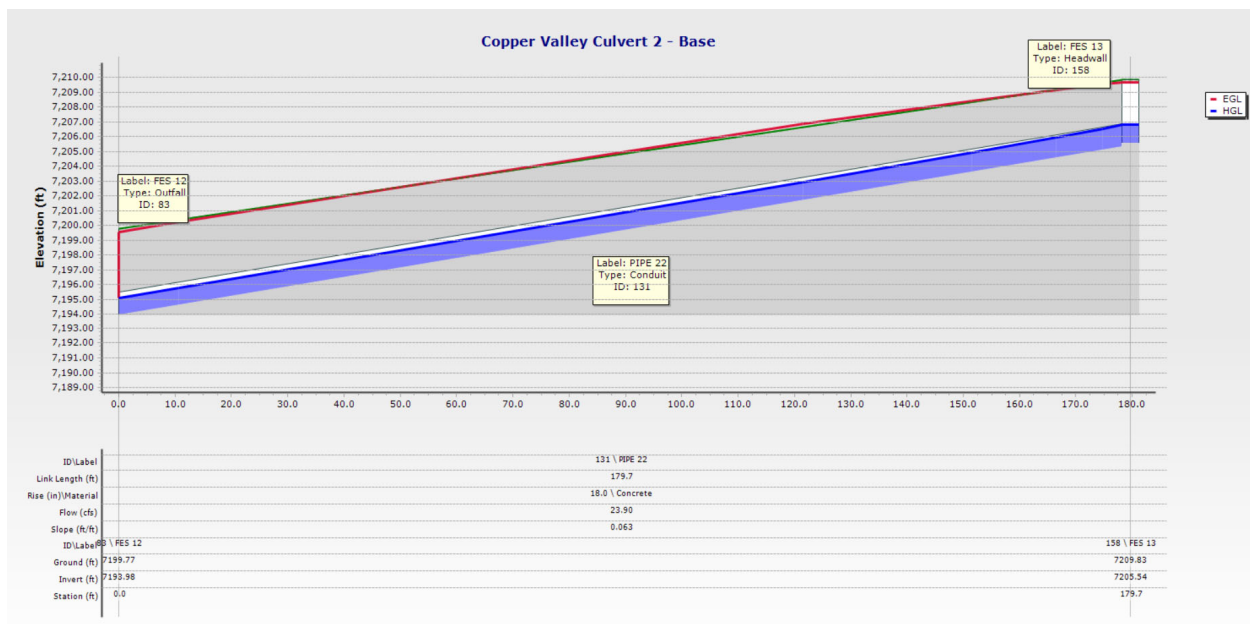
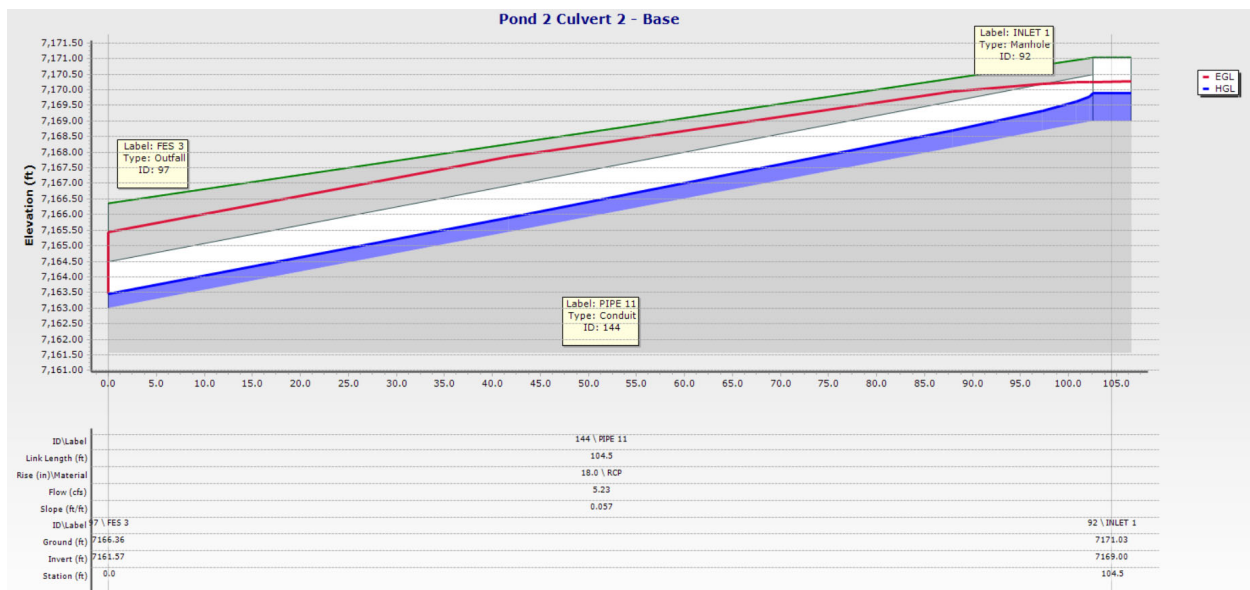
	ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Rise (ft)	Span (ft)	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
105: PIPE - 33	105	PIPE - 33 (...)	StartNullStruct2	-1.25	EndNullStr...	0.00	-0.013	30.0			(N/A)	(N/A)	(N/A)	(N/A)
112: PIPE 33	112	PIPE 33	FES-24	7,300.36	FES 23	7,300.19	0.009		1.2	1.9	3.62	4.91	7,300.97	7,300.71
113: PIPE 41	113	PIPE 41	INLET 14	7,296.80	INLET 13	7,296.40	0.008	18.0			9.20	5.94	7,298.03	7,297.57
114: PIPE 40	114	PIPE 40	INLET 13	7,296.20	HEADWALL 4	7,296.00	0.010	18.0			10.20	6.64	7,297.43	7,297.22
115: PIPE 36	115	PIPE 36	FES 25	7,292.97	INLET 17	7,290.16	0.060	18.0			15.80	15.29	7,294.39	7,292.65
116: PIPE 37	116	PIPE 37	INLET 17	7,289.95	FES 26	7,287.64	0.020	18.0			17.80	10.07	7,292.49	7,289.09
117: PIPE 39	117	PIPE 39	FES 30	7,288.28	FES 39	7,286.90	0.035		1.2	1.9	3.60	7.94	7,288.88	7,287.26
118: PIPE 29	118	PIPE 29	FES 17	7,268.86	FES 18	7,268.12	0.024		1.2	1.9	5.07	7.75	7,269.58	7,268.61
119: PIPE 28	119	PIPE 28	INLET 10	7,266.83	FES 16	7,263.33	0.035	18.0			5.30	9.43	7,267.71	7,263.86
120: PIPE 25	120	PIPE 25	INLET 11	7,263.36	INLET 12	7,260.28	0.060	18.0			27.70	16.27	7,264.74	7,261.66
122: PIPE 27	122	PIPE 27	STM MH 8	7,246.80	HEADWALL 3	7,246.00	0.029	24.0			32.77	13.70	7,248.70	7,247.60
123: PIPE 38	123	PIPE 38	FES 28	7,250.01	FES 27	7,245.91	0.111	15.0			10.00	17.21	7,251.19	7,246.57
124: PIPE 30	124	PIPE 30	FES 20	7,233.22	FES 19	7,231.10	0.041		1.2	1.9	9.50	11.41	7,234.20	7,231.68
125: PIPE 24	125	PIPE 24	INLET 9	7,214.51	FES 15	7,213.11	0.015	36.0			69.00	13.07	7,217.15	7,215.30
126: PIPE 23	126	PIPE 23	INLET 8	7,214.51	FES 14	7,213.12	0.015	36.0			69.00	13.02	7,217.15	7,215.31
127: PIPE 5	127	PIPE 5	STM MH 5	7,202.32	STM MH 4	7,199.18	0.022	18.0			16.76	9.48	7,205.12	7,201.52
128: PIPE 4	128	PIPE 4	STM MH 4	7,198.18	STM MH 3	7,189.03	0.041	18.0			16.76	13.40	7,199.62	7,190.03
129: PIPE 15	129	PIPE 15	INLET 3	7,204.37	STM MH 5	7,202.62	0.047	18.0			9.84	5.57	7,207.57	7,207.24
130: PIPE 16	130	PIPE 16	INLET 4	7,203.62	STM MH 5	7,202.51	0.043	18.0			6.92	3.92	7,207.36	7,207.24
131: PIPE 22	131	PIPE 22	FES 13	7,205.34	FES 12	7,193.98	0.063	18.0			23.90	16.93	7,206.82	7,195.10
132: PIPE 32	132	PIPE 32	FES 10	7,203.83	FES 11	7,201.37	0.043		1.2	1.9	3.39	8.39	7,204.42	7,201.70
133: PIPE 3	133	PIPE 3	STM MH 3	7,188.03	STM MH 1	7,171.98	0.085	18.0			16.76	17.75	7,189.47	7,174.32
134: PIPE 21	134	PIPE 21	INLET 7	7,193.10	INLET 6	7,188.78	0.100	18.0			3.00	11.67	7,193.76	7,191.00
135: PIPE 18	135	PIPE 18	INLET 5	7,193.98	INLET 6	7,188.78	0.100	18.0			12.10	17.32	7,195.30	7,191.00
136: PIPE 31	136	PIPE 31	INLET 6	7,187.78	STM MH 6	7,186.05	0.100	18.0			15.10	18.32	7,189.19	7,186.95
137: PIPE 20	137	PIPE 20	STM MH 6	7,185.05	HEADWALL 2	7,176.23	0.089	18.0			15.10	17.58	7,186.46	7,176.97
138: PIPE 14	138	PIPE 14	FES 9	7,186.51	FES 8	7,181.90	0.029	36.0			72.80	17.16	7,189.21	7,183.71
139: PIPE 13	139	PIPE 13	FES 7	7,186.50	FES 6	7,181.90	0.030	36.0			72.80	17.17	7,189.19	7,183.71
142: PIPE 1	142	PIPE 1	STM MH 1	7,170.98	HEADWALL 1	7,161.90	0.084	18.0			16.76	17.68	7,172.42	7,162.70
144: PIPE 11	144	PIPE 11	INLET 1	7,169.00	FES 3	7,163.00	0.057	18.0			5.23	11.24	7,169.88	7,163.46
145: PIPE 10	145	PIPE 10	FES-5	7,167.00	FES 4	7,162.47	0.065	18.0			1.70	8.49	7,167.49	7,162.73
150: PIPE 35	150	PIPE 35	INLET 15	7,296.00	FES 21	7,295.00	0.005		2.8	4.4	65.60	8.46	7,298.14	7,297.09
167: PIPE 34	167	PIPE 34	INLET 16	7,296.01	FES 22	7,295.01	0.005		2.8	4.4	65.60	8.46	7,298.15	7,297.11
180: PIPE 54	180	PIPE 54	DF-1	7,174.17	FES 31	7,174.00	0.006	18.0			6.80	5.24	7,175.20	7,175.01
187: PIPE 55	187	PIPE 55	DF 2	7,161.00	FES 32	7,160.74	0.005	18.0			7.50	4.79	7,162.21	7,161.80
191: PIPE 56	191	PIPE 56	DF-3	7,244.00	O-9	7,243.82	0.005	24.0			24.30	7.73	7,246.12	7,245.56
197: PIPE 57	197	PIPE 57	DF-4	7,295.00	O-10	7,294.86	0.006	18.0			12.30	6.96	7,296.62	7,296.19
236: PIPE 26(1)	236	PIPE 26(1)	INLET 12	7,259.28	MH-12	7,253.45	0.050	24.0			32.77	17.12	7,261.18	7,254.66
237: PIPE 26(2)	237	PIPE 26(2)	MH-12	7,252.45	STM MH 8	7,247.10	0.054	24.0			32.77	17.68	7,254.35	7,248.30
239: PIPE 7(1)	239	PIPE 7(1)	FES 1	7,155.58	MH-13	7,149.50	0.107		2.4	3.8	86.50	28.26	7,157.90	7,150.81
240: PIPE 7(2)	240	PIPE 7(2)	MH-13	7,148.50	O-3	7,147.00	0.045		2.4	3.8	86.50	20.97	7,150.82	7,148.74

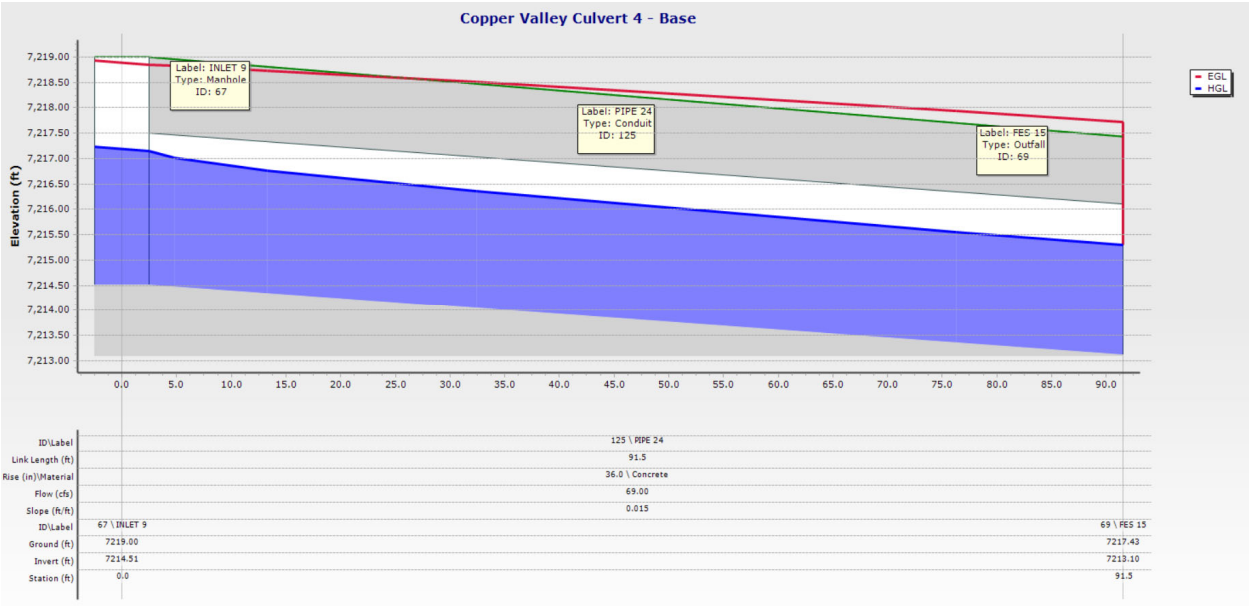
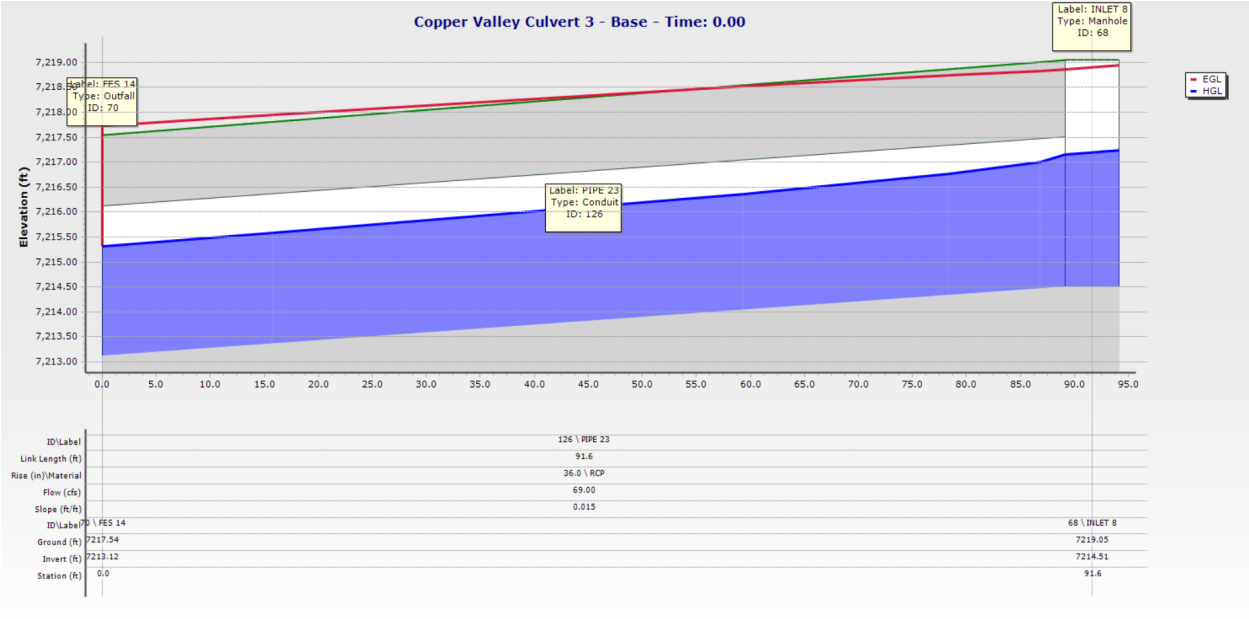


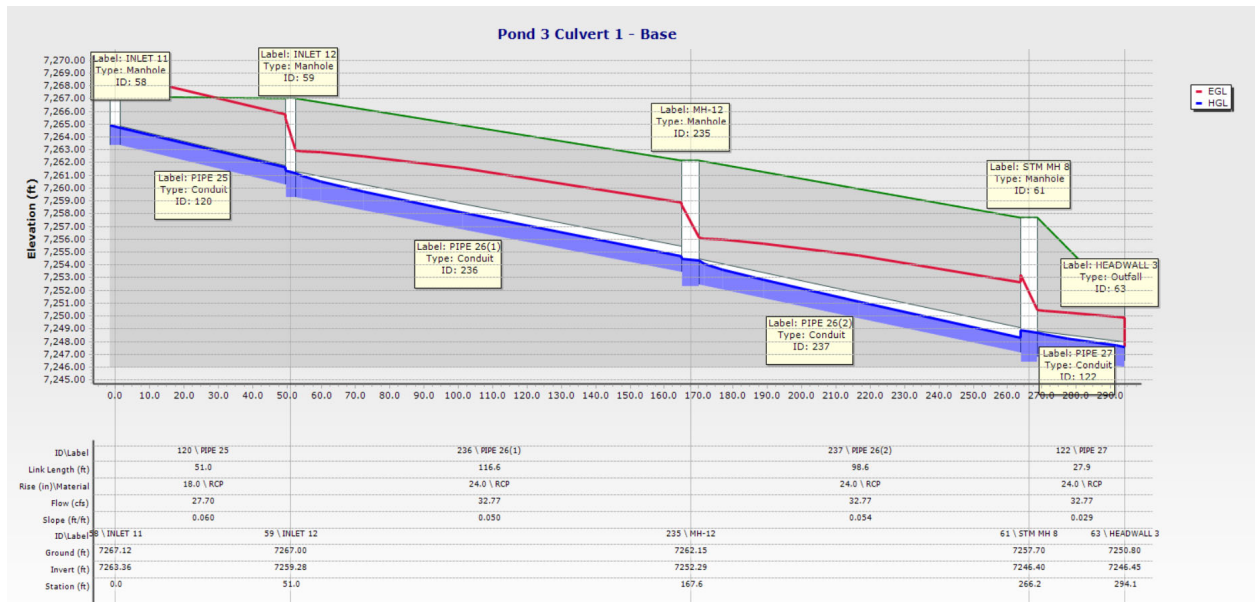
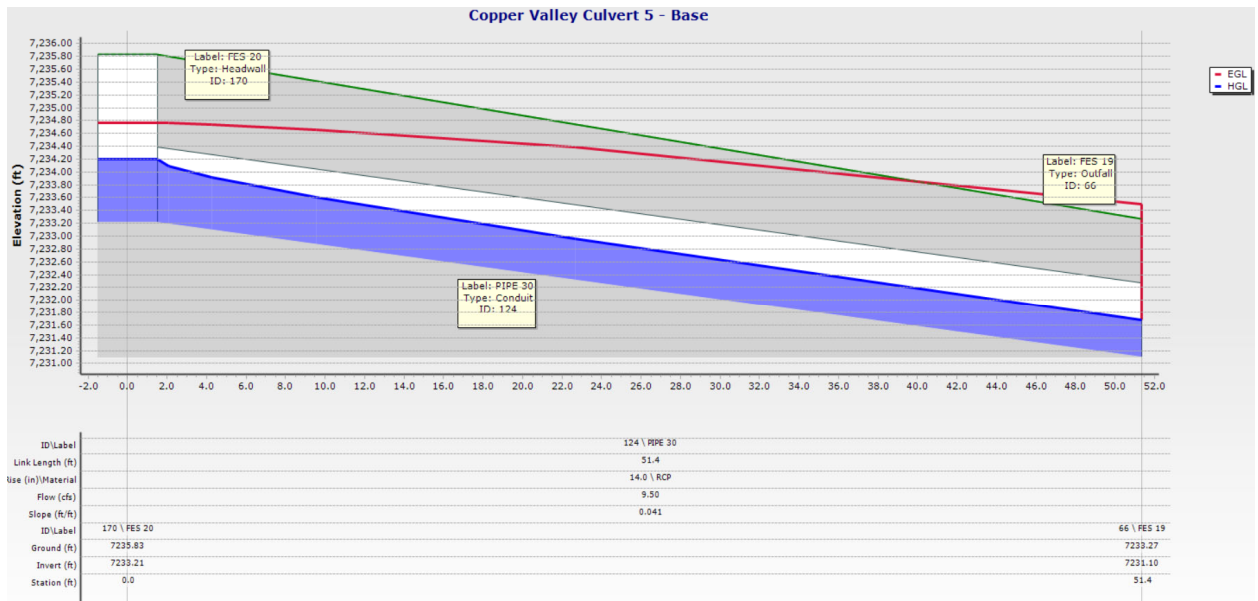


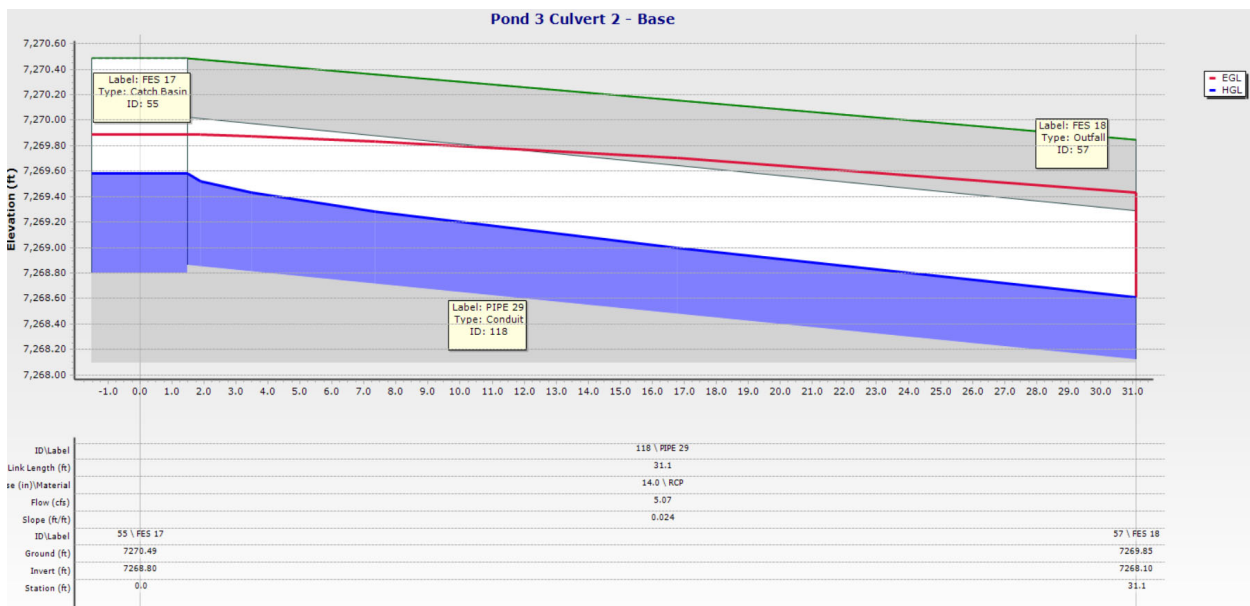
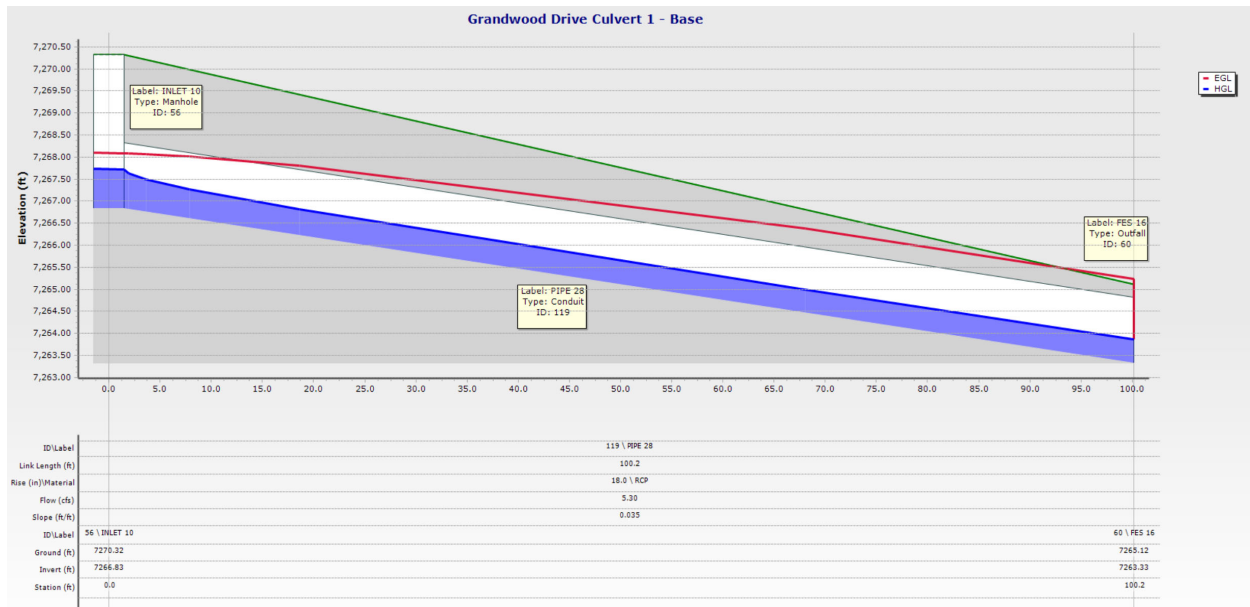


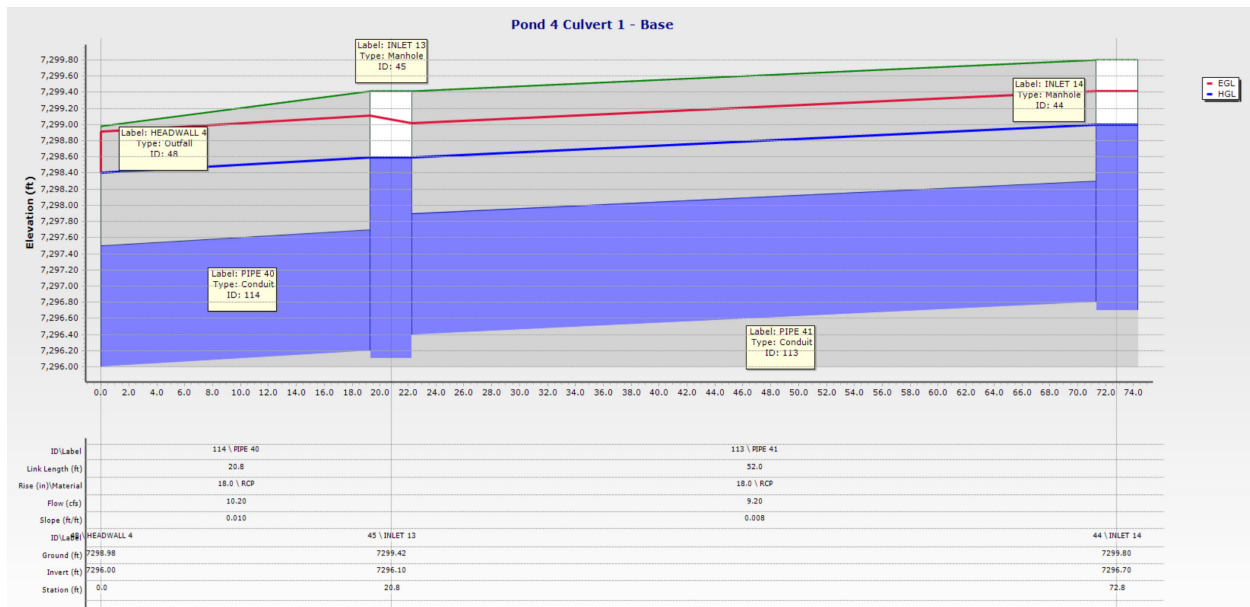
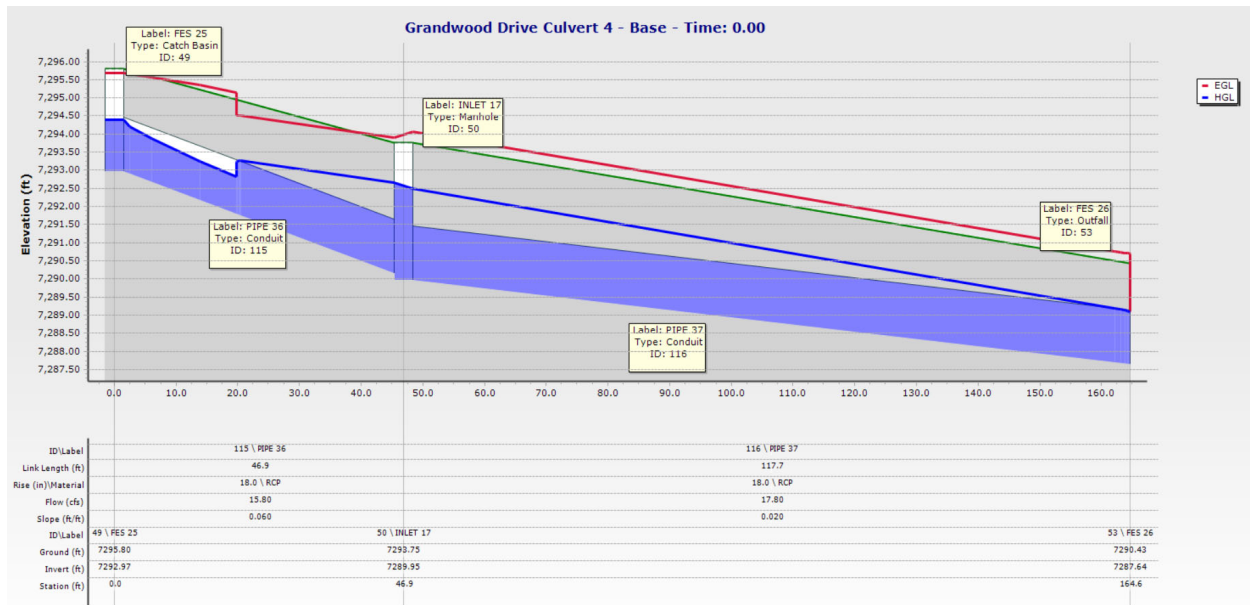


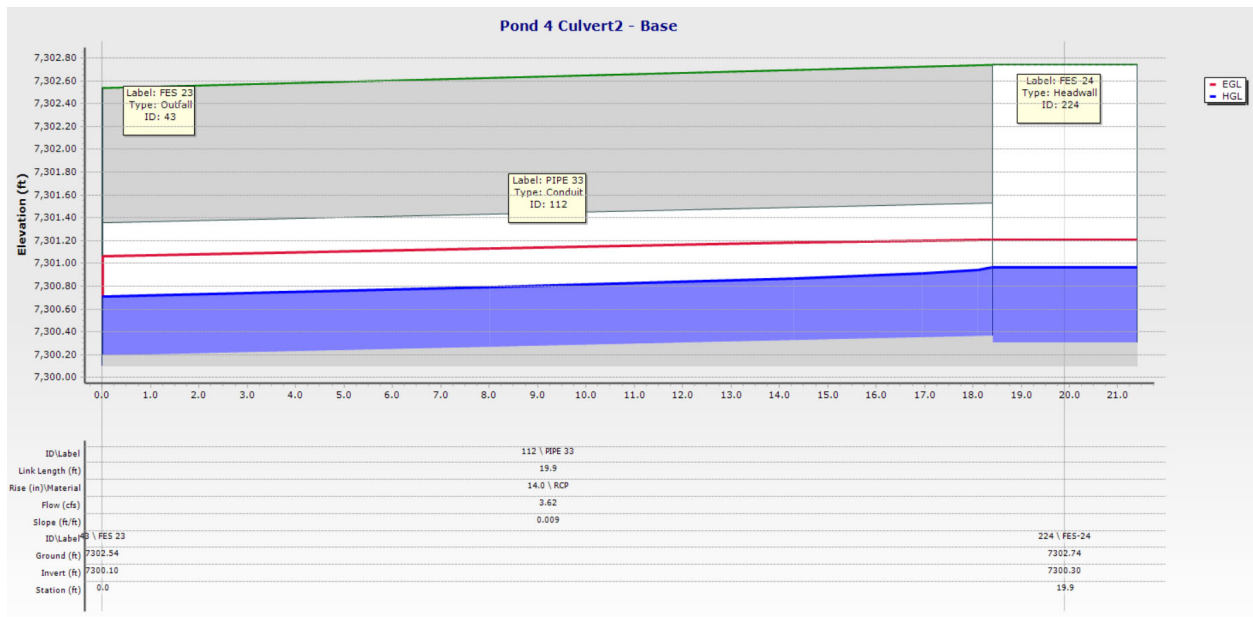
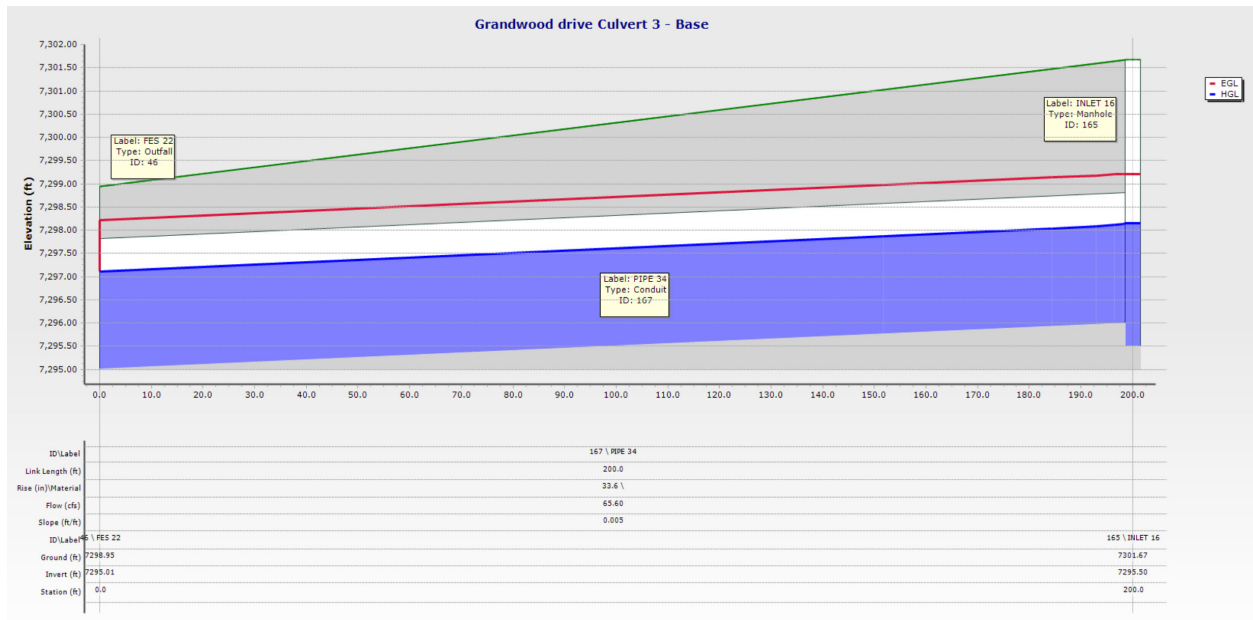


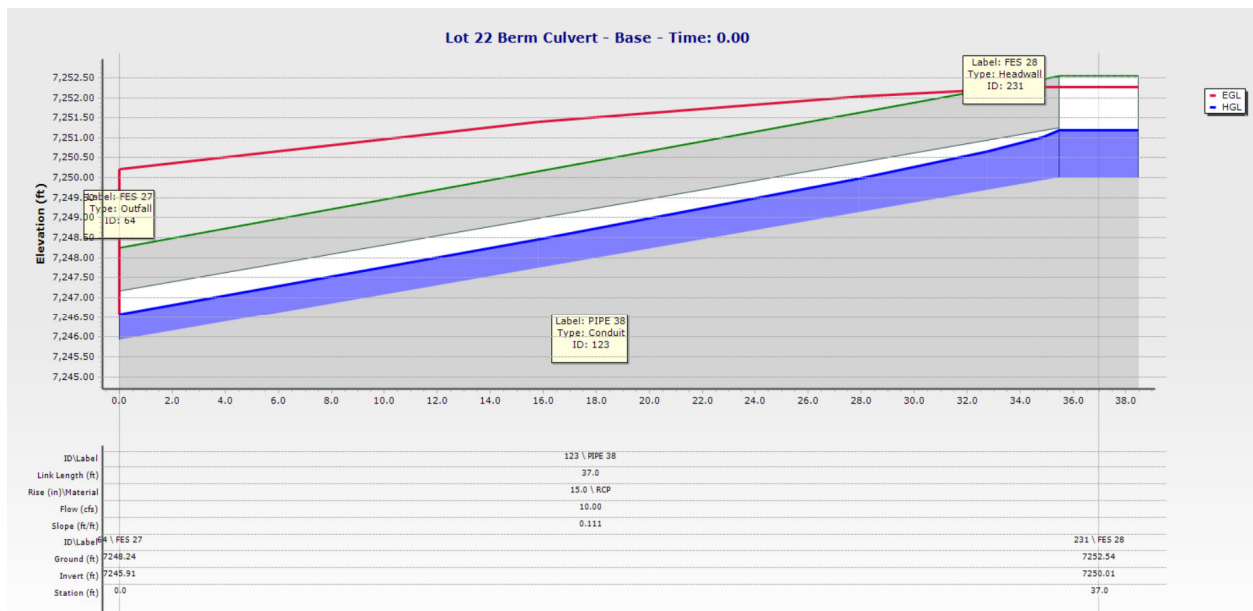
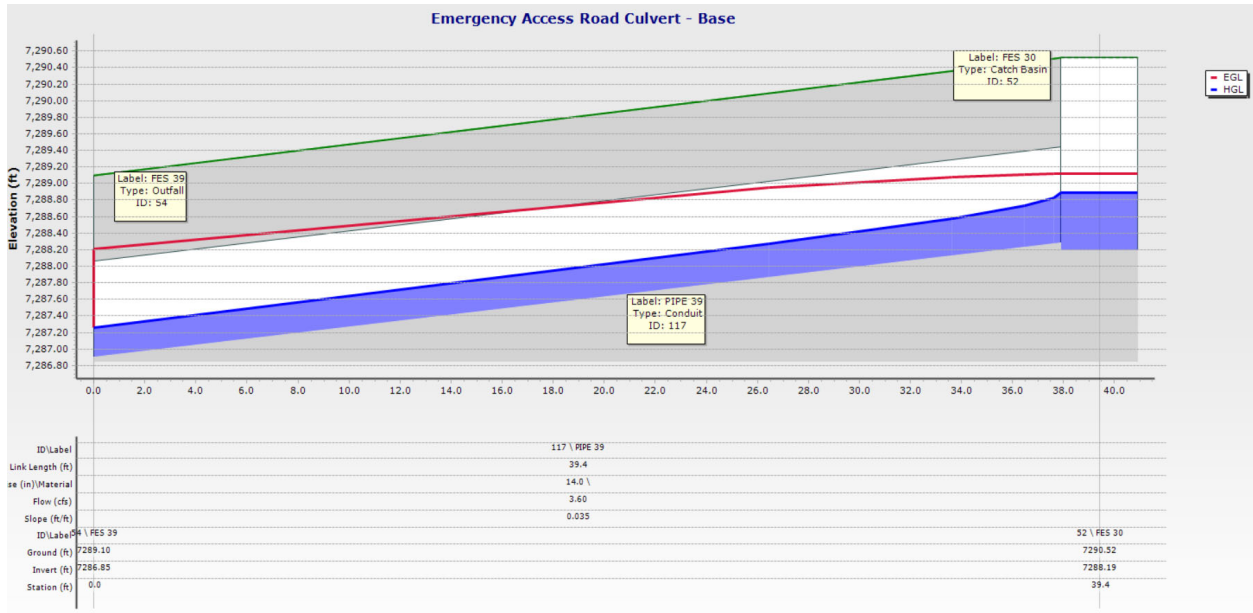


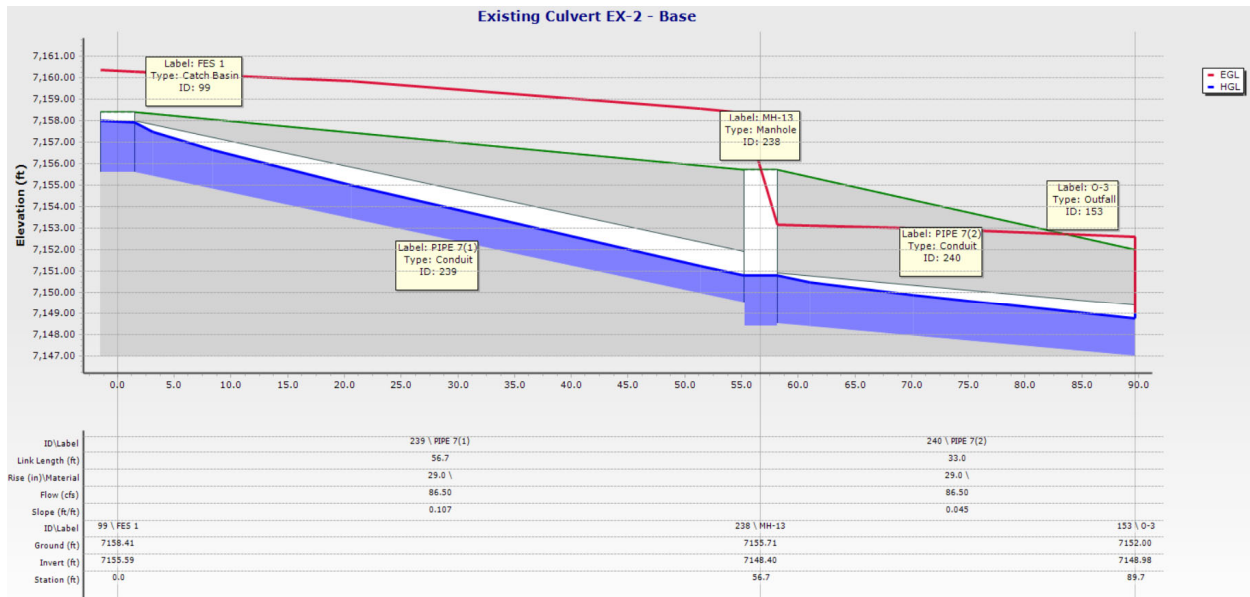






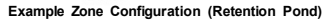






MHFD-Detention, Version 4.02 (February 2020)

Basin ID: Pond 1 (Lot 41)



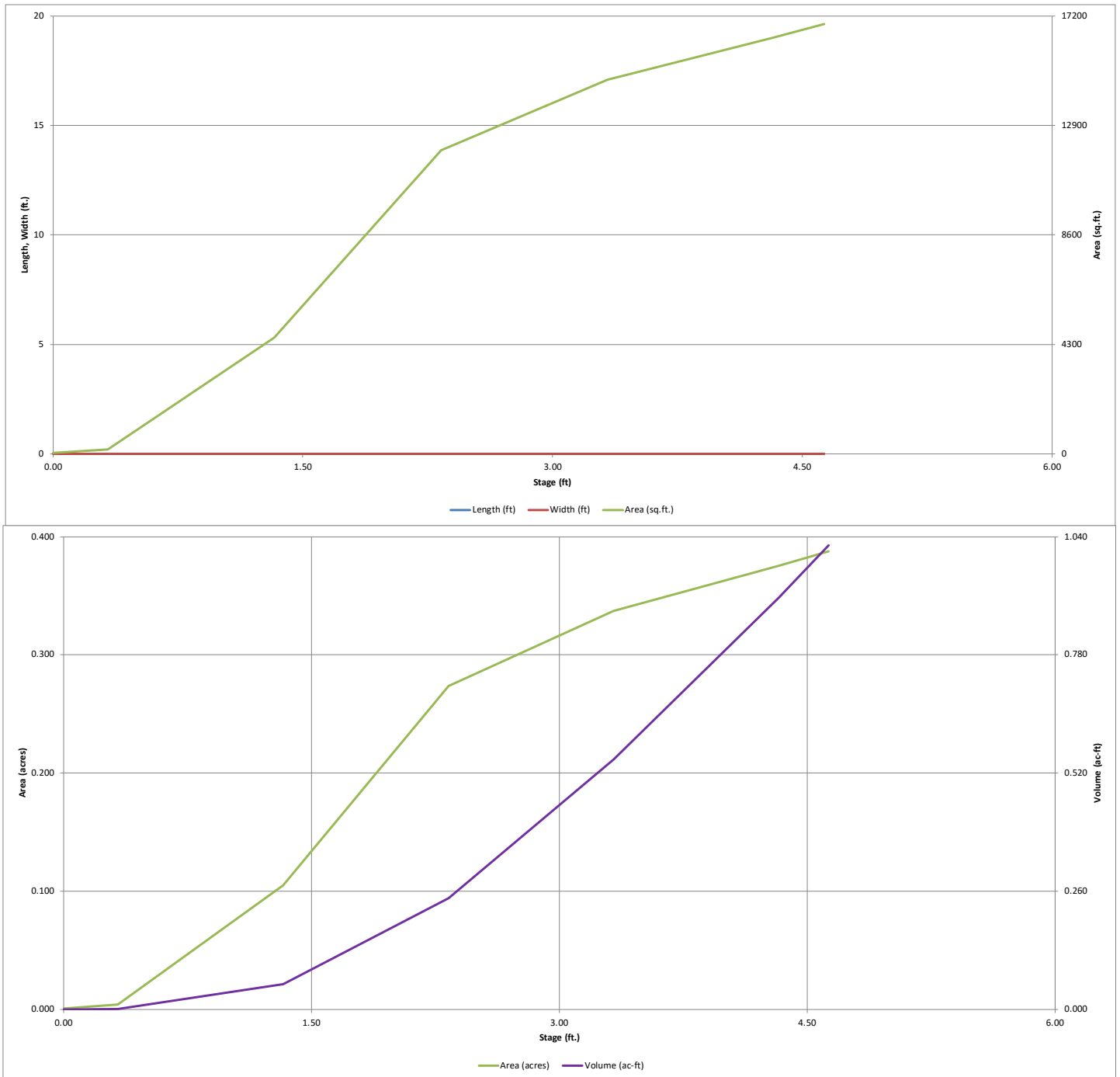
	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Calculated Total Basin Volume (V_{total}) = **user** acre-feet

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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

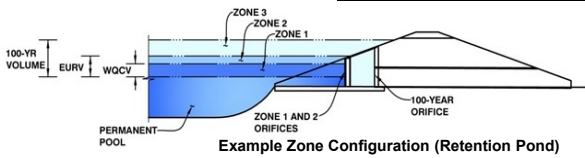


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **Grandwood Ranch**

Basin ID: **Pond 1 (Lot 41)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.55	0.082	Orifice Plate
Zone 2 (EURV)	2.03	0.087	Circular Orifice
Zone 3 (100-year)	3.01	0.276	Weir&Pipe (Restrict)
Total (all zones)		0.445	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 3/4 inch)

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.70	1.40					
Orifice Area (sq. inches)	0.45	0.45	0.45					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.55	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	2.03	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	4.00	N/A	inches

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.09	N/A	ft ²
Vertical Orifice Centroid =	0.17	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	2.40	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	% , grate open area/total area
Debris Clogging % =	50%	N/A	%

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _u =	2.40	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	20.32	N/A	
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft ²
Overflow Grate Open Area w/ Debris =	5.60	N/A	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	6.30		inches

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.55	N/A	ft ²
Outlet Orifice Centroid =	0.31	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.27	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	3.70	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	50.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Spillway Design Flow Depth =	0.22	feet
Stage at Top of Freeboard =	4.92	feet
Basin Area at Top of Freeboard =	0.39	acres
Basin Volume at Top of Freeboard =	1.02	acre-ft

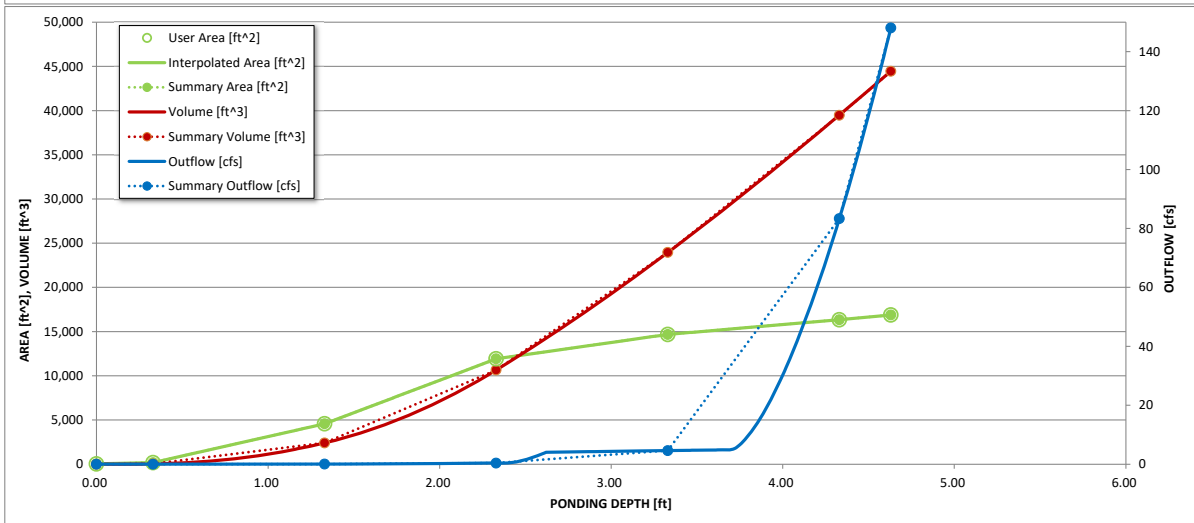
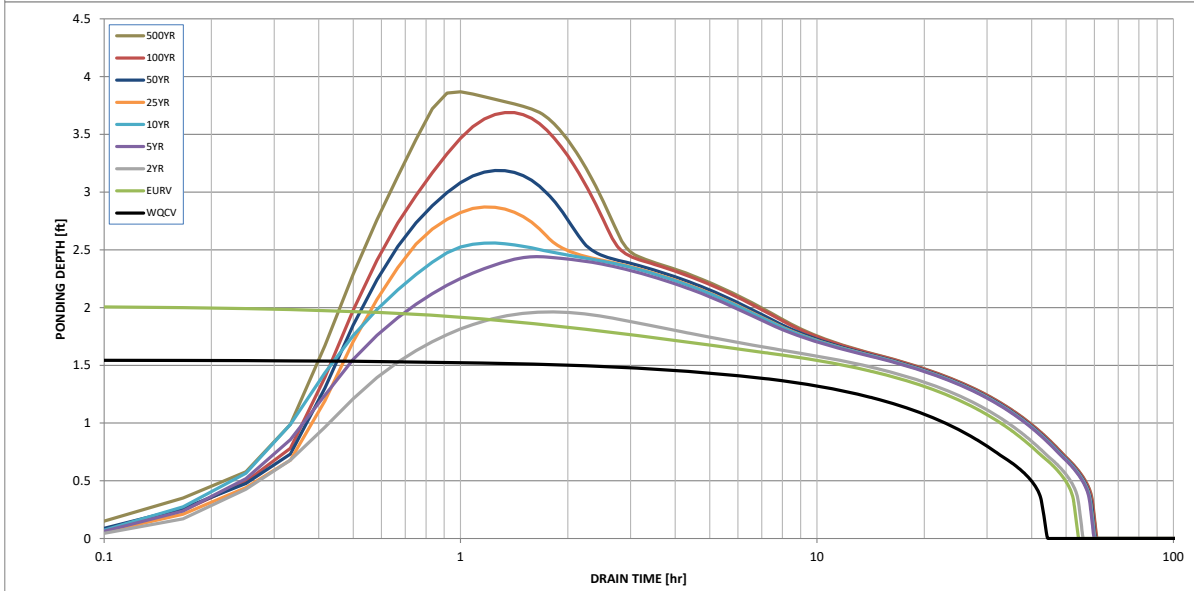
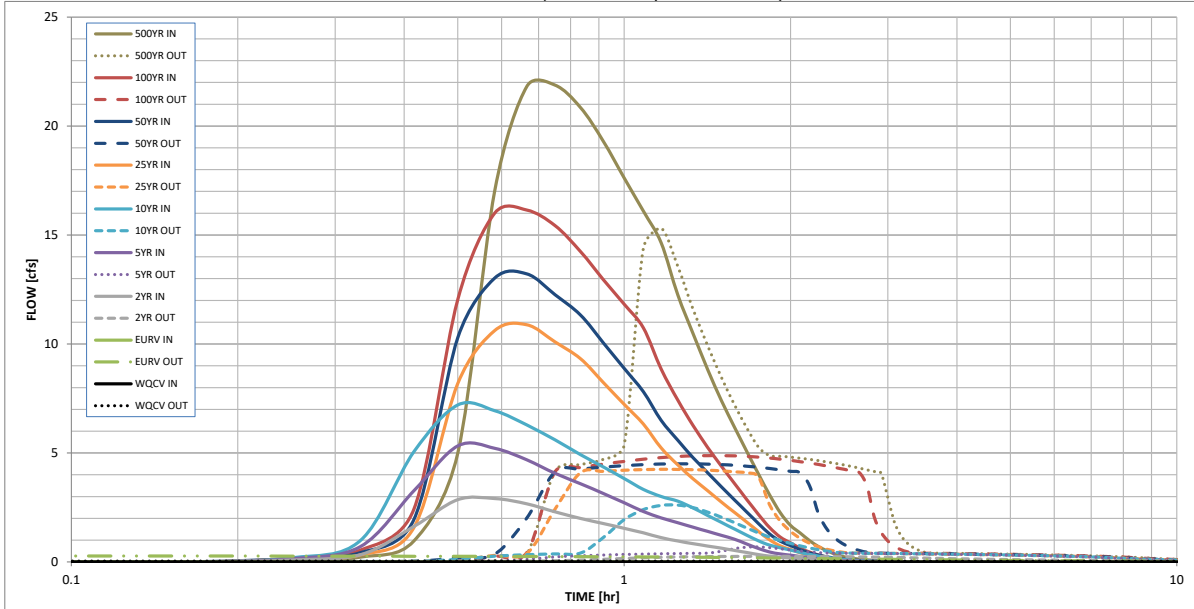
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.082	0.168	0.181	0.330	0.471	0.702	0.867	1.096	1.525
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.181	0.330	0.471	0.702	0.867	1.096	1.525
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.3	3.4	5.1	9.0	11.3	14.1	19.6
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.15	0.41	0.60	1.06	1.33	1.66	2.31
Peak Inflow Q (cfs) =	N/A	N/A	2.9	5.3	7.2	10.9	13.2	16.1	21.9
Peak Outflow Q (cfs) =	0.0	0.3	0.3	0.7	2.6	4.2	4.5	4.9	15.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.5	0.5	0.4	0.3	0.8
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.2	0.3	0.4	0.4	0.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	41	48	49	49	46	42	39	36	30
Time to Drain 99% of Inflow Volume (hours) =	43	51	53	55	54	52	50	49	46
Maximum Ponding Depth (ft) =	1.55	2.03	1.96	2.44	2.56	2.87	3.19	3.69	3.87
Area at Maximum Ponding Depth (acres) =	0.14	0.22	0.21	0.28	0.29	0.31	0.33	0.35	0.36
Maximum Volume Stored (acre-ft) =	0.083	0.170	0.155	0.272	0.306	0.402	0.500	0.670	0.734

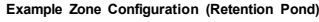
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



MHFD-Detention, Version 4.02 (February 2020)

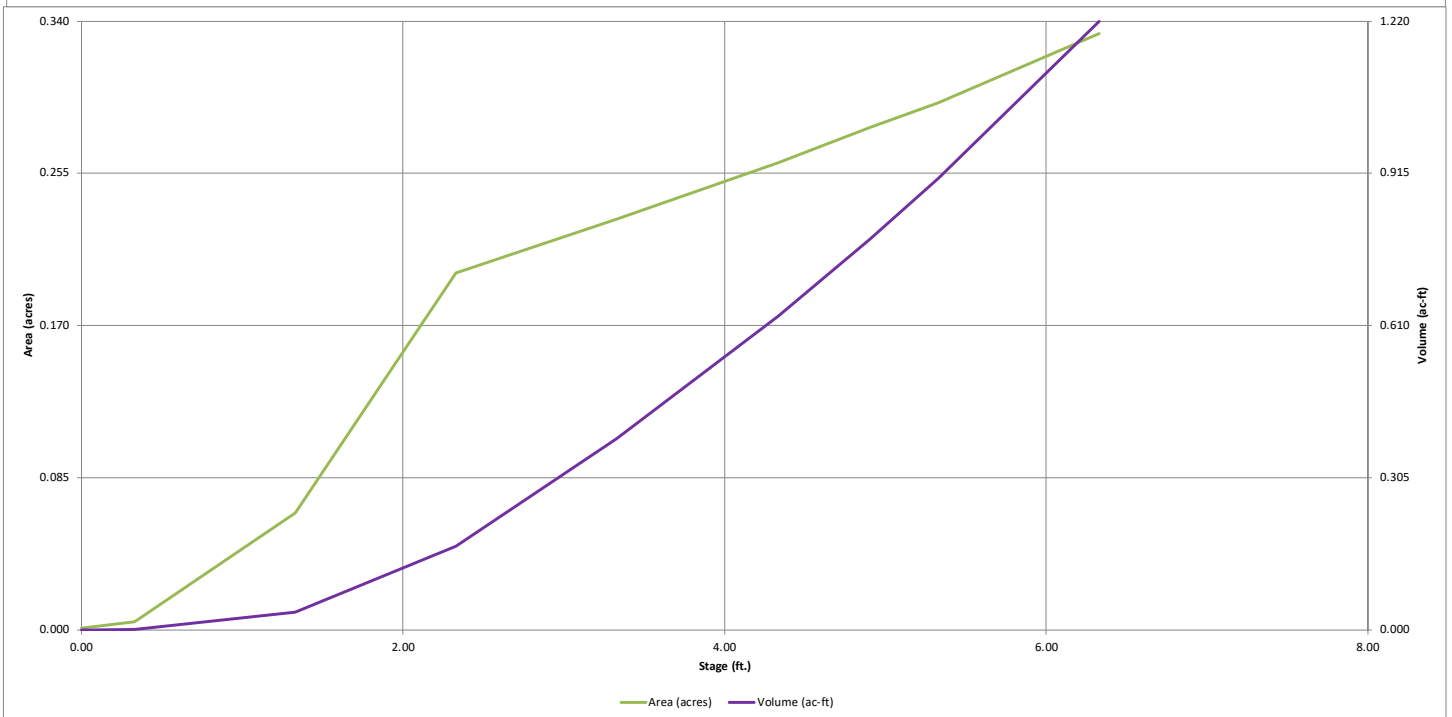
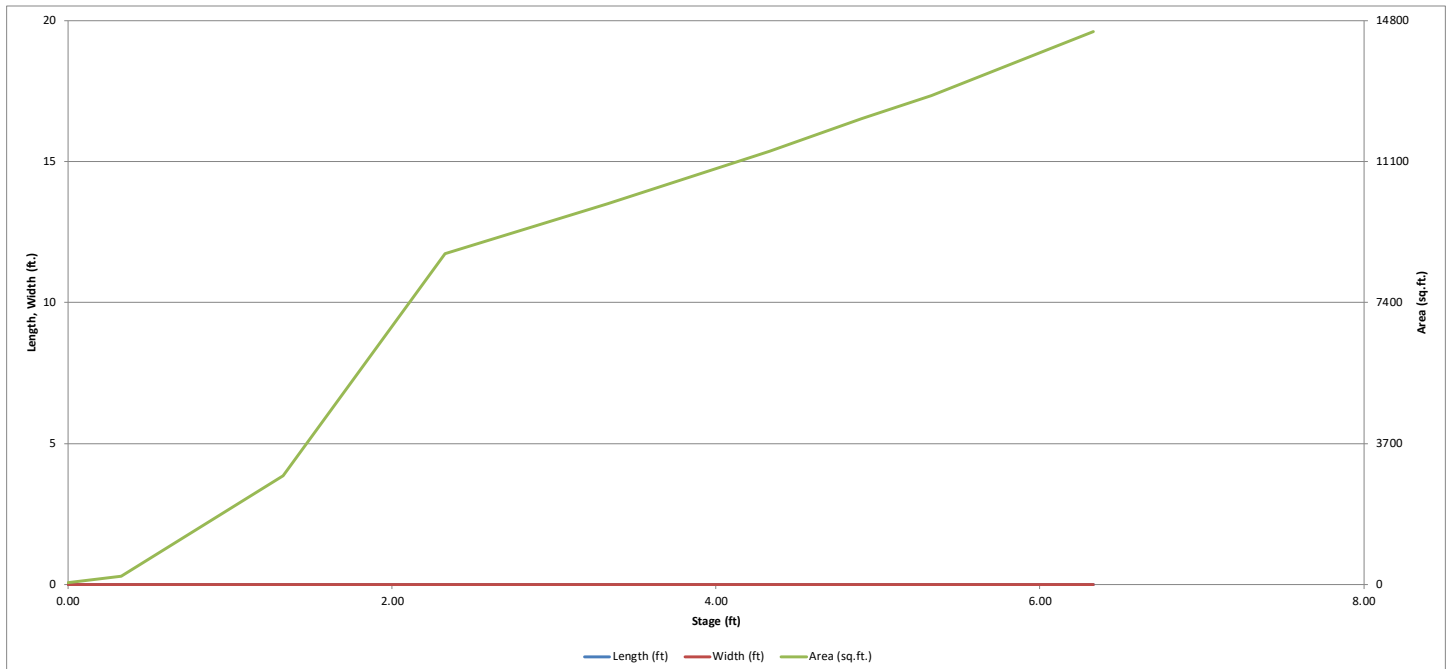
Basin ID: Pond 2 (West)



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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

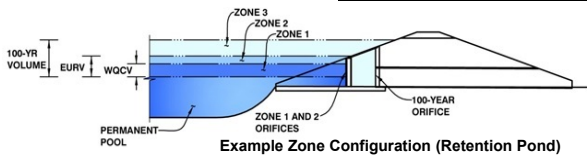


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: Grandwood Ranch

Basin ID: Pond 2 (West)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.17	0.138	Orifice Plate
Zone 2 (EURV)	3.54	0.292	Circular Orifice
Zone 3 (100-year)	4.80	0.322	Weir&Pipe (Restrict)
Total (all zones)		0.752	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = N/A ft (distance below the filtration media surface)
Underdrain Orifice Diameter = N/A inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = N/A ft²
Underdrain Orifice Centroid = N/A feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 21.70 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 12.00 inches
Orifice Plate: Orifice Area per Row = 0.60 sq. inches (diameter = 7/8 inch)

WQ Orifice Area per Row = 4.167E-03 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00					
Orifice Area (sq. inches)	0.60	0.60	0.60					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.17	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.54	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	6.00	N/A	inches

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.20	N/A	ft ²
Vertical Orifice Centroid =	0.25	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	4.40	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	% , grate open area/total area
Debris Clogging % =	50%	N/A	%

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _u =	4.40	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	15.26	N/A	
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft ²
Overflow Grate Open Area w/ Debris =	5.60	N/A	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	7.80		inches

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.73	N/A	ft ²
Outlet Orifice Centroid =	0.38	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.44	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	4.81	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	45.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Spillway Design Flow Depth =	0.22	feet
Stage at Top of Freeboard =	6.03	feet
Basin Area at Top of Freeboard =	0.32	acres
Basin Volume at Top of Freeboard =	1.12	acre-ft

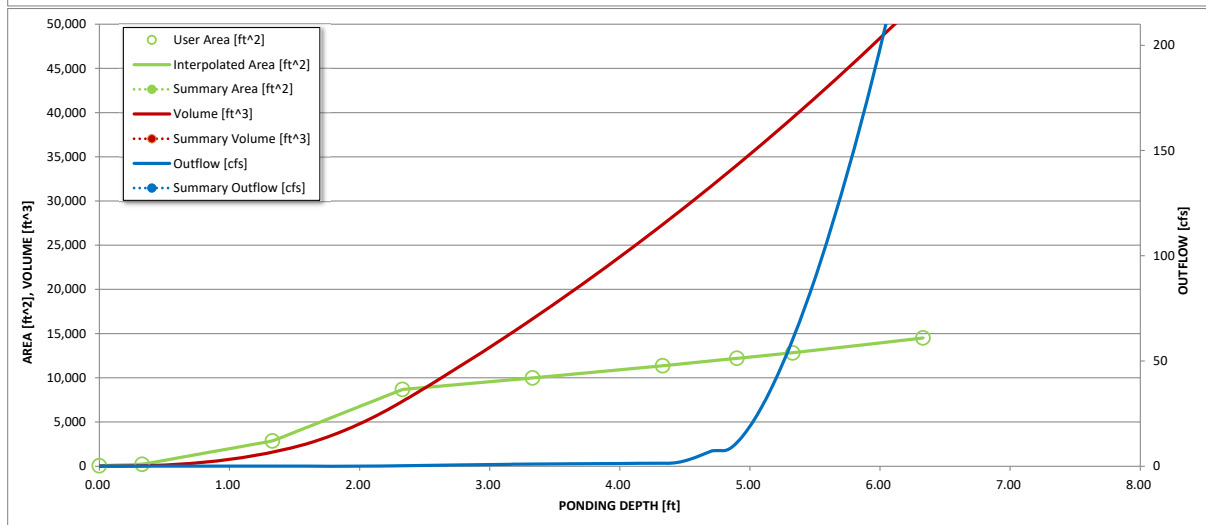
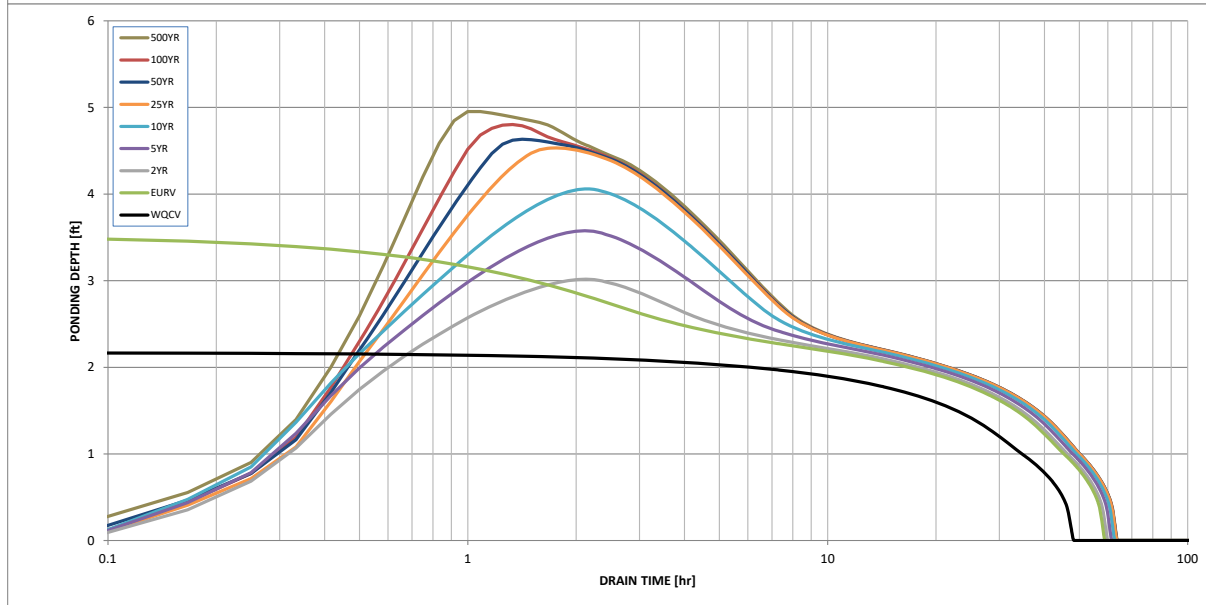
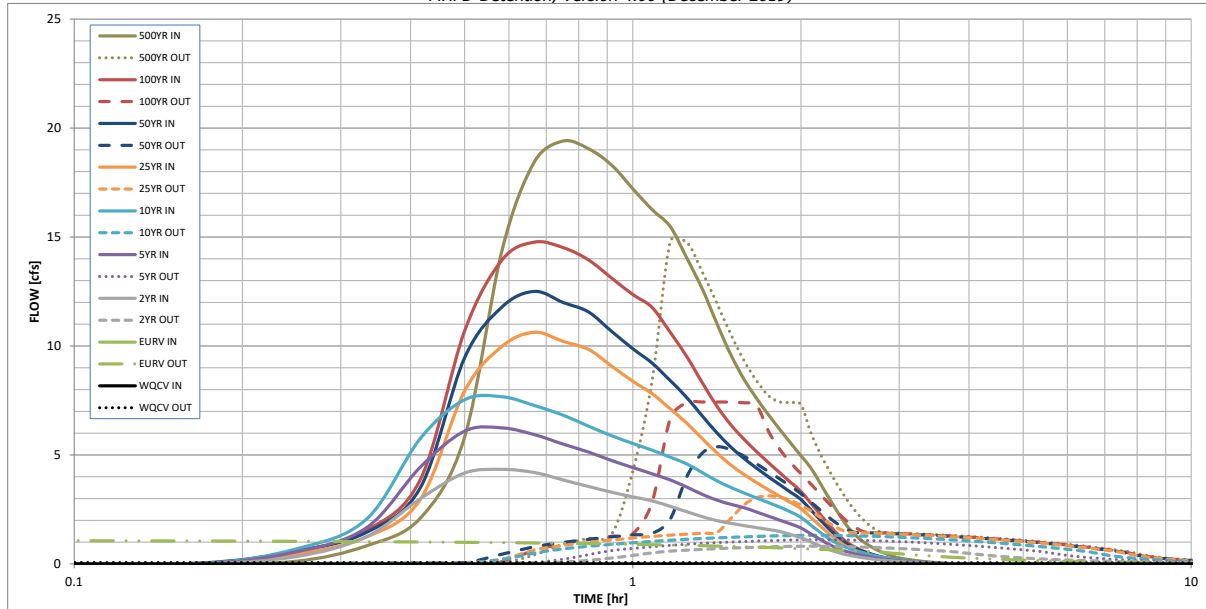
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.138	0.430	0.409	0.584	0.738	0.945	1.113	1.325	1.758
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.409	0.584	0.738	0.945	1.113	1.325	1.758
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.5	1.5	2.3	4.3	5.3	6.9	9.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.07	0.18	0.28	0.53	0.66	0.85	1.20
Peak Inflow Q (cfs) =	N/A	N/A	4.3	6.2	7.7	10.6	12.5	14.8	19.4
Peak Outflow Q (cfs) =	0.1	1.1	0.8	1.1	1.3	3.1	5.4	7.4	14.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.6	0.7	1.0	1.1	1.5
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.3	0.5	0.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	44	49	50	48	47	45	44	41	37
Time to Drain 99% of Inflow Volume (hours) =	46	55	56	56	55	55	54	53	50
Maximum Ponding Depth (ft) =	2.17	3.54	3.02	3.58	4.06	4.53	4.63	4.80	4.95
Area at Maximum Ponding Depth (acres) =	0.18	0.24	0.22	0.24	0.25	0.27	0.27	0.28	0.28
Maximum Volume Stored (acre-ft) =	0.138	0.432	0.311	0.439	0.556	0.681	0.707	0.754	0.796

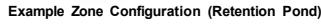
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Depotion, Version 4.00 (December 2019)



MHFD-Detention, Version 4.02 (February 2020)

Basin ID: Pond 3 (Adjacent to Lot 1) (Includes Sub-basins E-1 and D-3)

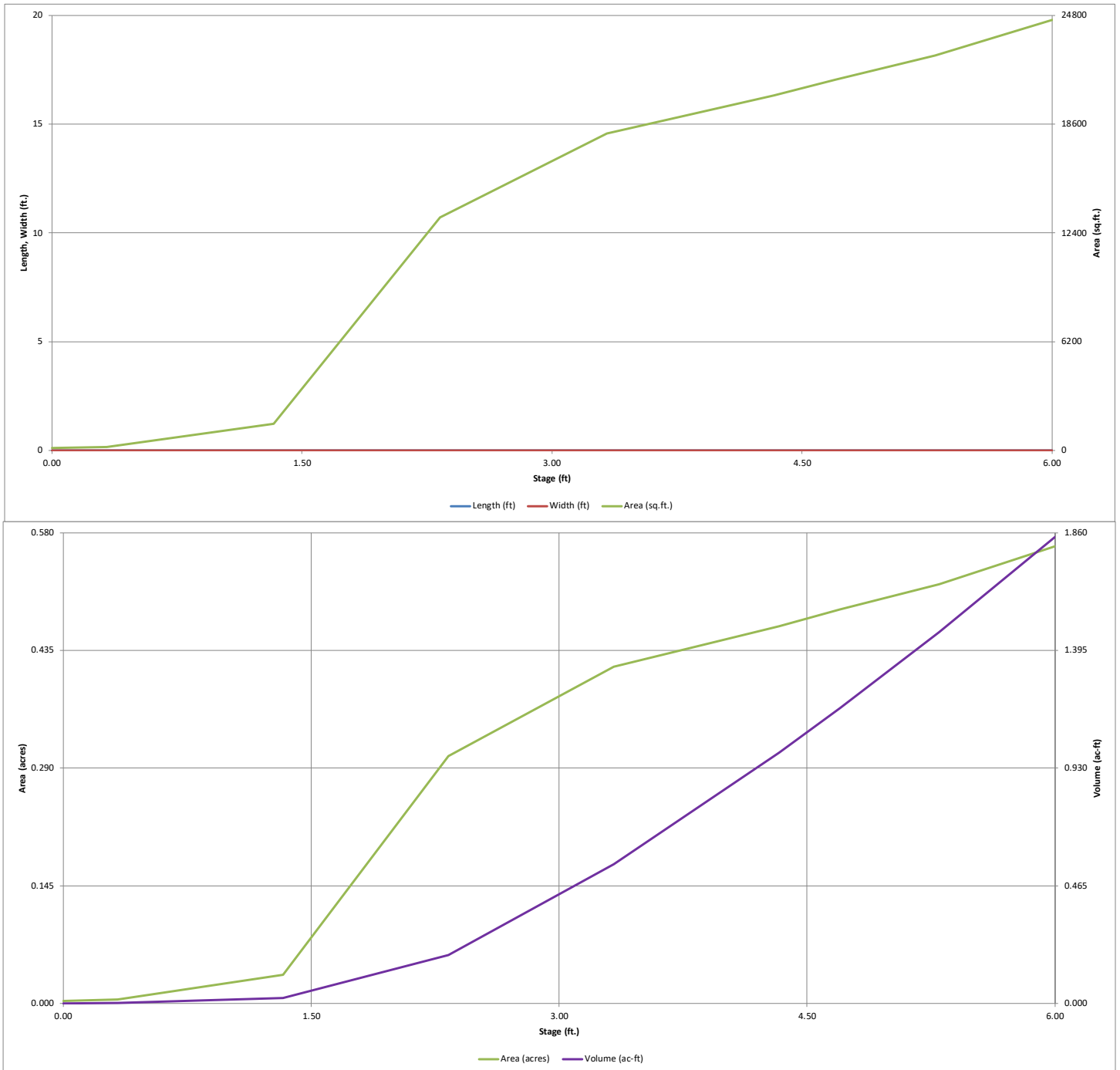


	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

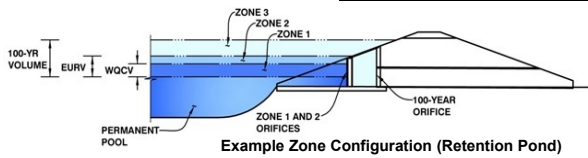


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: Grandwood Ranch

Basin ID: Pond 3 (Adjacent to Lot 1) (Includes Sub-basins E-1 and D-3)



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.35	0.195	Orifice Plate
Zone 2 (EURV)	2.86	0.170	Circular Orifice
Zone 3 (100-year)	4.60	0.764	Weir&Pipe (Restrict)
Total (all zones)		1.130	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = N/A ft (distance below the filtration media surface)
Underdrain Orifice Diameter = N/A inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = N/A ft²
Underdrain Orifice Centroid = N/A feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 2.35 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 12.00 inches
Orifice Plate: Orifice Area per Row = 0.70 sq. inches (diameter = 15/16 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row = 4.861E-03 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00					
Orifice Area (sq. inches)	0.70	0.70	0.70					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.35	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	2.86	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	5.00	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.14	N/A	ft ²
Vertical Orifice Centroid =	0.21	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H ₁ =	3.00	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	4.20	N/A	
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft ²
Overflow Grate Open Area w/ Debris =	5.60	N/A	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	19.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	2.67	N/A	ft ²
Outlet Orifice Centroid =	0.87	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.19	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.50	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	60.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.35	feet
Stage at Top of Freeboard =	5.85	feet
Basin Area at Top of Freeboard =	0.57	acres
Basin Volume at Top of Freeboard =	1.80	acre-ft

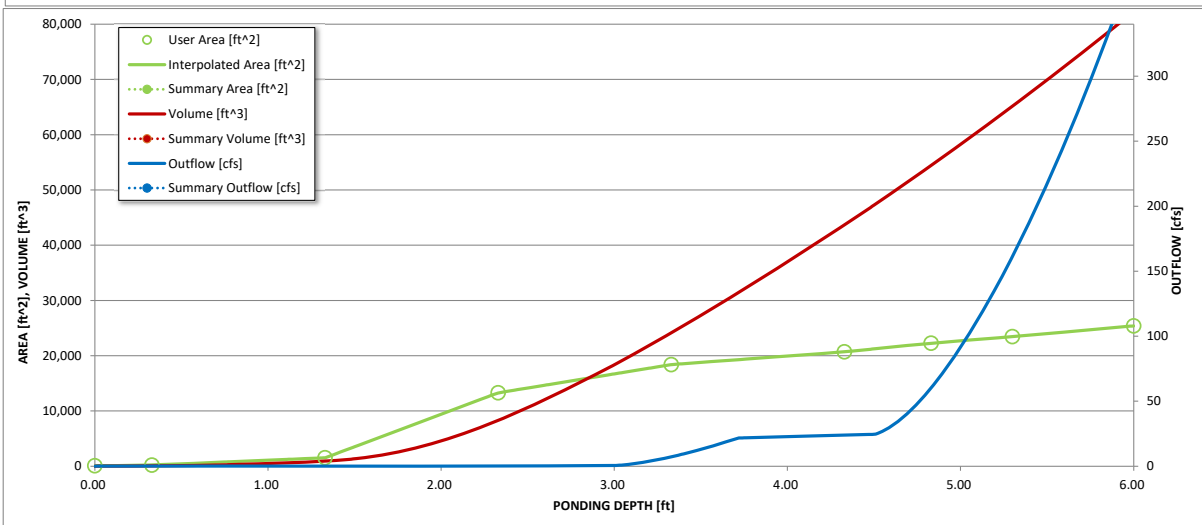
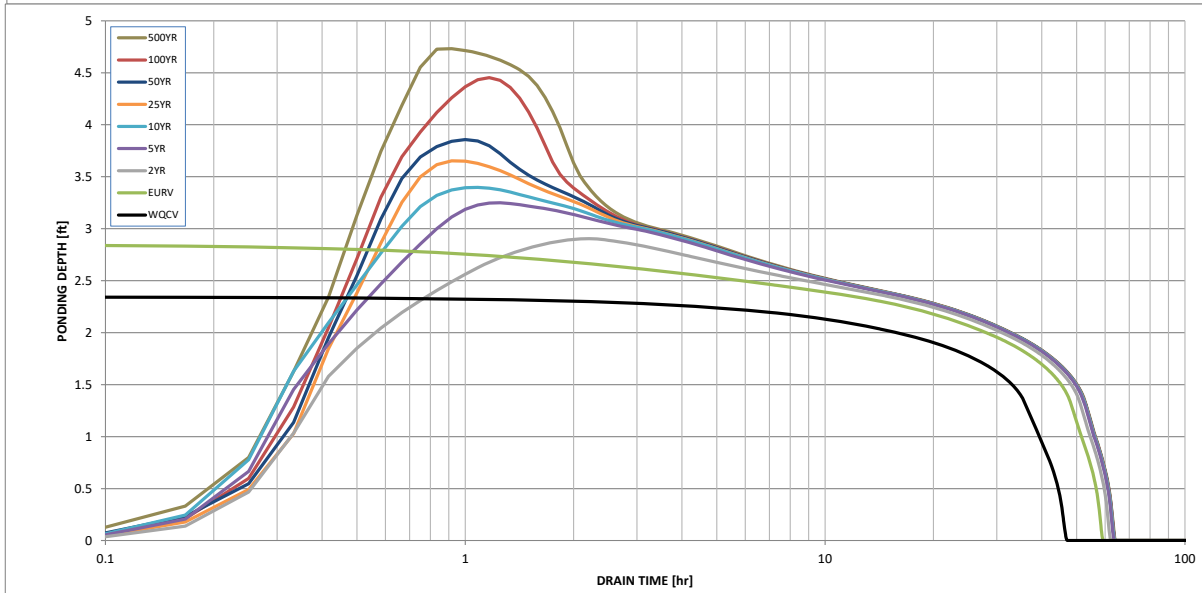
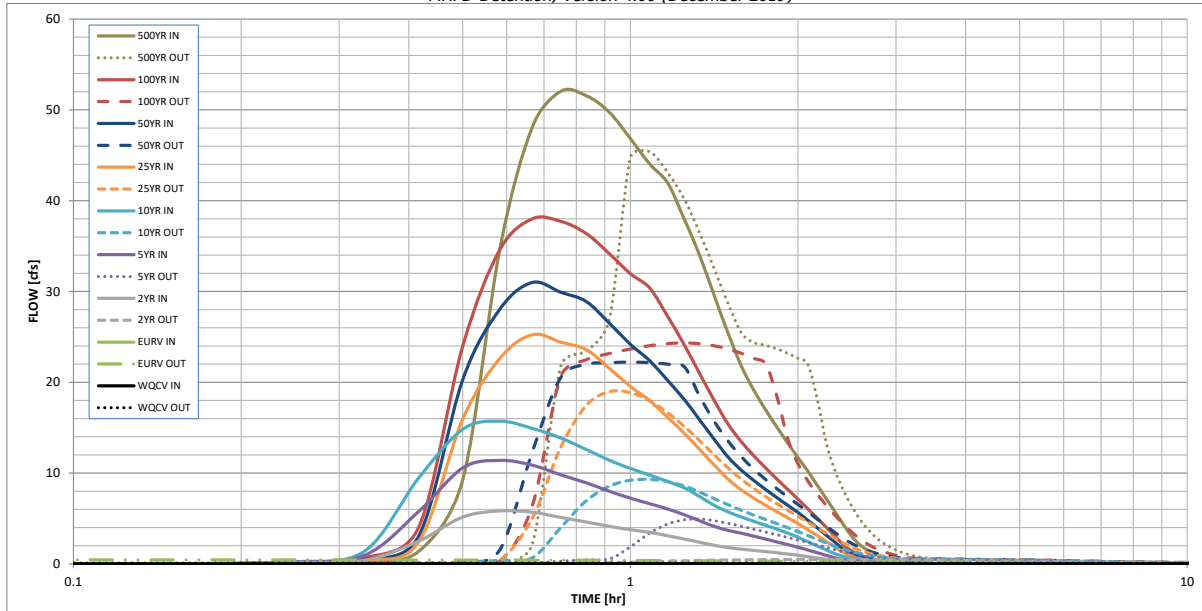
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	0.439	0.867	1.284	1.992	2.487	3.187	4.480
CUHP Runoff Volume (acre-ft) =	0.195	0.366	0.439	0.867	1.284	1.992	2.487	3.187	4.480
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.439	0.867	1.284	1.992	2.487	3.187	4.480
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.9	8.1	12.3	21.6	27.2	34.5	48.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.12	0.32	0.49	0.86	1.08	1.38	1.92
Peak Inflow Q (cfs) =	N/A	N/A	5.8	11.4	15.7	25.2	31.0	38.0	52.0
Peak Outflow Q (cfs) =	0.1	0.4	0.5	4.9	9.3	19.0	22.2	24.3	45.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.8	0.9	0.8	0.7	0.9
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.4	0.8	1.6	1.9	2.1	2.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	42	52	54	51	48	43	39	35	27
Time to Drain 99% of Inflow Volume (hours) =	45	56	58	57	55	53	52	50	47
Maximum Ponding Depth (ft) =	2.35	2.86	2.90	3.25	3.40	3.65	3.86	4.45	4.73
Area at Maximum Ponding Depth (acres) =	0.31	0.37	0.37	0.41	0.43	0.44	0.45	0.48	0.50
Maximum Volume Stored (acre-ft) =	0.197	0.369	0.384	0.517	0.580	0.692	0.781	1.060	1.199

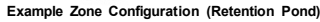
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



MHFD-Detention, Version 4.02 (February 2020)

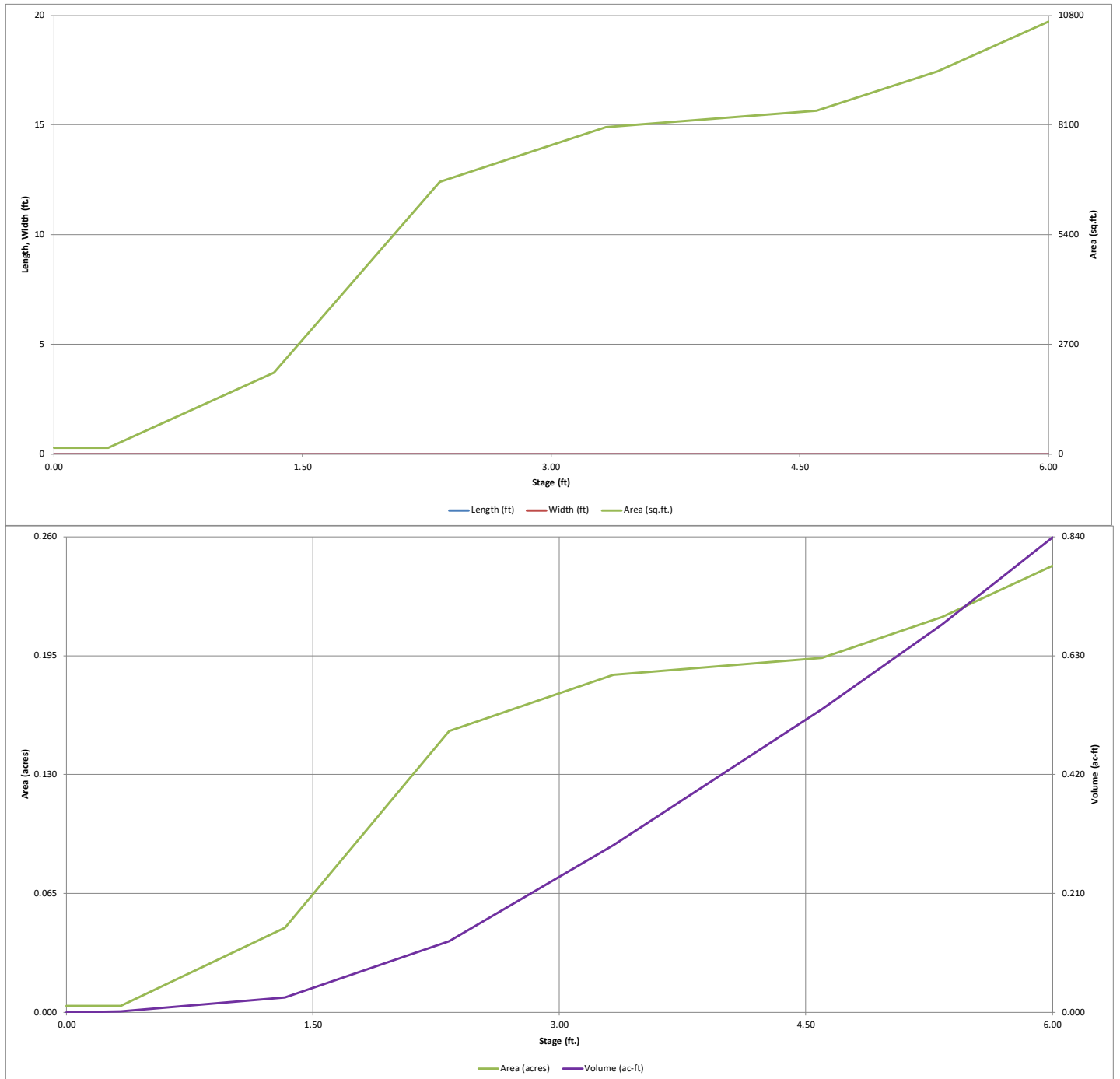
Basin ID: Pond 4 (East)



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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

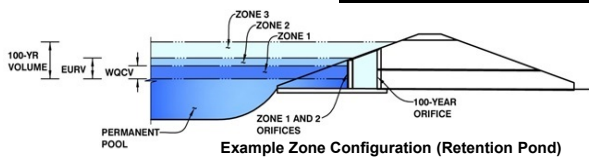


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **Grandwood Ranch**

Basin ID: **Pond 4 (East)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.77	0.059	Orifice Plate
Zone 2 (EURV)	2.17	0.047	Circular Orifice
Zone 3 (100-year)	3.63	0.251	Weir&Pipe (Restrict)
Total (all zones)		0.357	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 5/8 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.80	1.60					
Orifice Area (sq. inches)	0.30	0.30	0.30					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.78	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	2.18	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	6.00	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.20	N/A	ft ²
Vertical Orifice Centroid =	0.25	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	3.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Gate Open Area % =	70%	N/A	% , gate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Gate Upper Edge, H _u =	3.00	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Gate Open Area / 100-yr Orifice Area =	12.86	N/A	
Overflow Gate Open Area w/o Debris =	11.20	N/A	ft ²
Overflow Gate Open Area w/ Debris =	5.60	N/A	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	8.90		inches

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.87	N/A	ft ²
Outlet Orifice Centroid =	0.43	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.56	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	4.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	30.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Spillway Design Flow Depth =	0.28 feet
Stage at Top of Freeboard =	5.28 feet
Basin Area at Top of Freeboard =	0.22 acres
Basin Volume at Top of Freeboard =	0.72 acre-ft

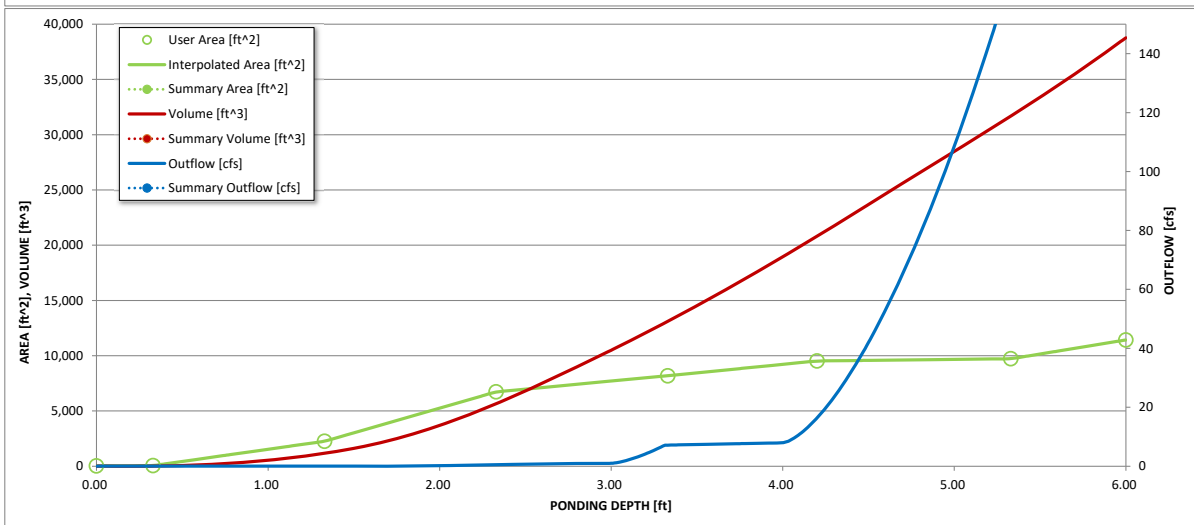
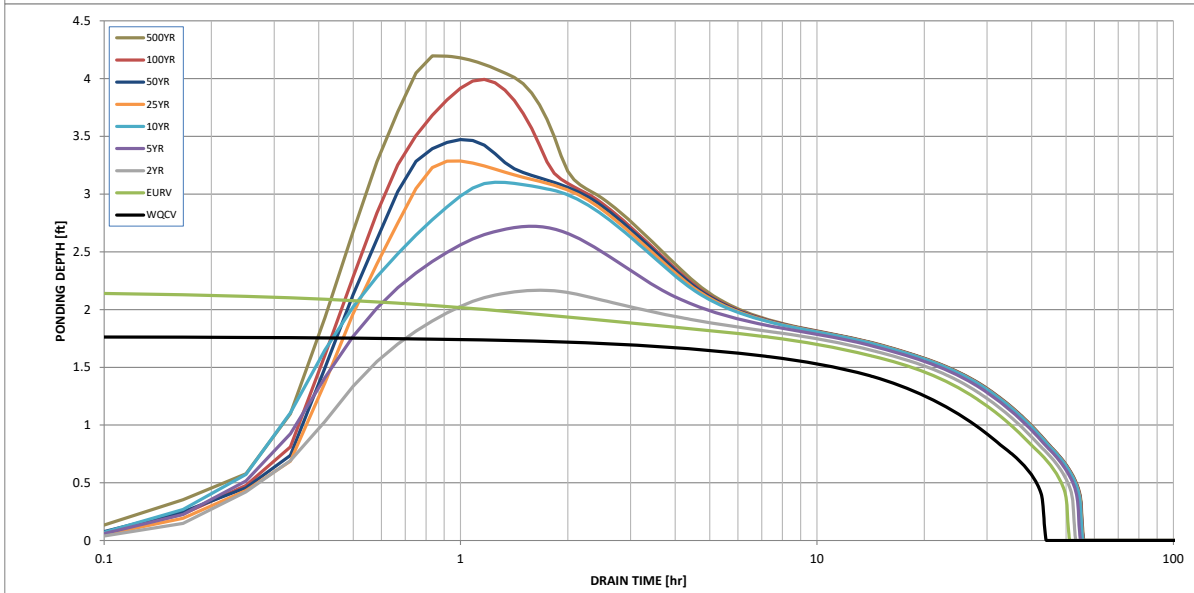
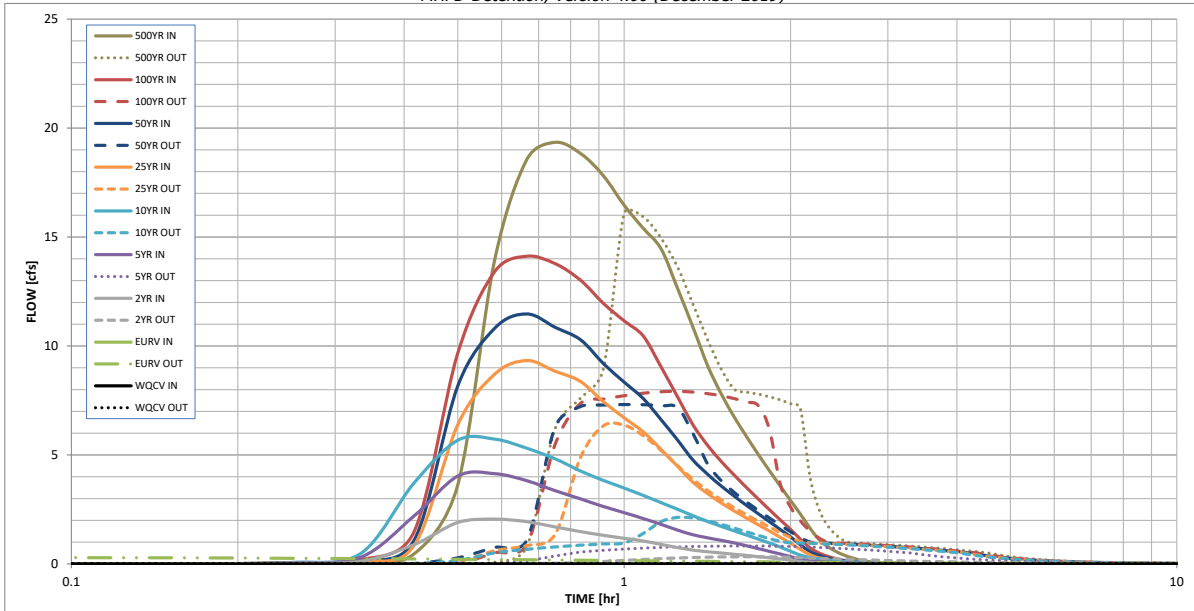
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.059	0.106	0.133	0.273	0.411	0.650	0.816	1.051	1.483
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.133	0.273	0.411	0.650	0.816	1.051	1.483
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.1	3.2	4.7	8.4	10.5	13.1	18.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.13	0.37	0.55	0.98	1.23	1.54	2.14
Peak Inflow Q (cfs) =	N/A	N/A	2.1	4.1	5.7	9.3	11.5	14.1	19.3
Peak Outflow Q (cfs) =	0.0	0.3	0.3	0.8	2.1	6.4	7.3	7.9	16.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.5	0.8	0.7	0.6	0.9
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.5	0.5	0.6	0.6
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	46	46	43	40	34	31	27	19
Time to Drain 99% of Inflow Volume (hours) =	42	49	50	50	49	45	44	41	38
Maximum Ponding Depth (ft) =	1.77	2.17	2.17	2.72	3.10	3.29	3.47	3.99	4.20
Area at Maximum Ponding Depth (acres) =	0.10	0.14	0.14	0.17	0.18	0.19	0.19	0.21	0.22
Maximum Volume Stored (acre-ft) =	0.059	0.106	0.105	0.191	0.259	0.292	0.328	0.433	0.476

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)

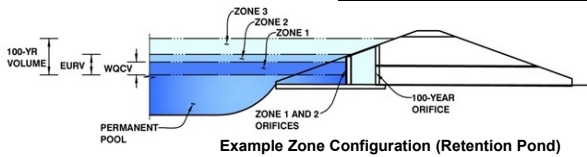


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: Grandwood Ranch

Basin ID: Sub-basin W-10 post-development - Berm



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (5-year)	3.56	0.094	Circular Orifice
Zone 2 (100-year)	5.70	0.236	Circular Orifice
Zone 3			
Total (all zones)		0.330	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Orifice Area (sq. inches)	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Orifice Area (sq. inches)	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 1 Circular	Zone 2 Circular
Invert of Vertical Orifice =	<input type="text" value="0.00"/>	<input type="text" value="3.50"/>
Depth at top of Zone using Vertical Orifice =	<input type="text" value="4.00"/>	<input type="text" value="5.93"/>
Vertical Orifice Diameter =	<input type="text" value="8.00"/>	<input type="text" value="15.00"/>

ft (relative to basin bottom at Stage = 0 ft)
ft (relative to basin bottom at Stage = 0 ft)
inches

Calculated Parameters for Vertical Orifice

	Zone 1 Circular	Zone 2 Circular
Vertical Orifice Area =	<input type="text" value="0.35"/>	<input type="text" value="1.23"/>
Vertical Orifice Centroid =	<input type="text" value="0.33"/>	<input type="text" value="0.63"/>

ft²
feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Not Selected	Not Selected
Overflow Weir Front Edge Height, H _o =	<input type="text"/>	<input type="text"/>
Overflow Weir Front Edge Length =	<input type="text"/>	<input type="text"/>
Overflow Weir Gate Slope =	<input type="text"/>	<input type="text"/>
Horiz. Length of Weir Sides =	<input type="text"/>	<input type="text"/>
Overflow Gate Open Area % =	<input type="text"/>	<input type="text"/>
Debris Clogging % =	<input type="text"/>	<input type="text"/>

ft (relative to basin bottom at Stage = 0 ft)
feet
H:V
feet
%, gate open area/total area
%

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected
Height of Gate Upper Edge, H _g =	<input type="text"/>	<input type="text"/>
Overflow Weir Slope Length =	<input type="text"/>	<input type="text"/>
Gate Open Area / 100-yr Orifice Area =	<input type="text"/>	<input type="text"/>
Overflow Gate Open Area w/o Debris =	<input type="text"/>	<input type="text"/>
Overflow Gate Open Area w/ Debris =	<input type="text"/>	<input type="text"/>

feet
feet

ft²
ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected
Depth to Invert of Outlet Pipe =	<input type="text"/>	<input type="text"/>
Circular Orifice Diameter =	<input type="text"/>	<input type="text"/>

ft (distance below basin bottom at Stage = 0 ft)
inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected
Outlet Orifice Area =	<input type="text"/>	<input type="text"/>
Outlet Orifice Centroid =	<input type="text"/>	<input type="text"/>
Half-Central Angle of Restrictor Plate on Pipe =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>

ft²
feet
radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	<input type="text" value="6.00"/>	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	<input type="text" value="40.00"/>	feet
Spillway End Slopes =	<input type="text" value="16.00"/>	H:V
Freeboard above Max Water Surface =	<input type="text" value="1.00"/>	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	<input type="text" value="0.20"/>	feet
Stage at Top of Freeboard =	<input type="text" value="7.20"/>	feet
Basin Area at Top of Freeboard =	<input type="text" value="0.17"/>	acres
Basin Volume at Top of Freeboard =	<input type="text" value="0.38"/>	acre-ft

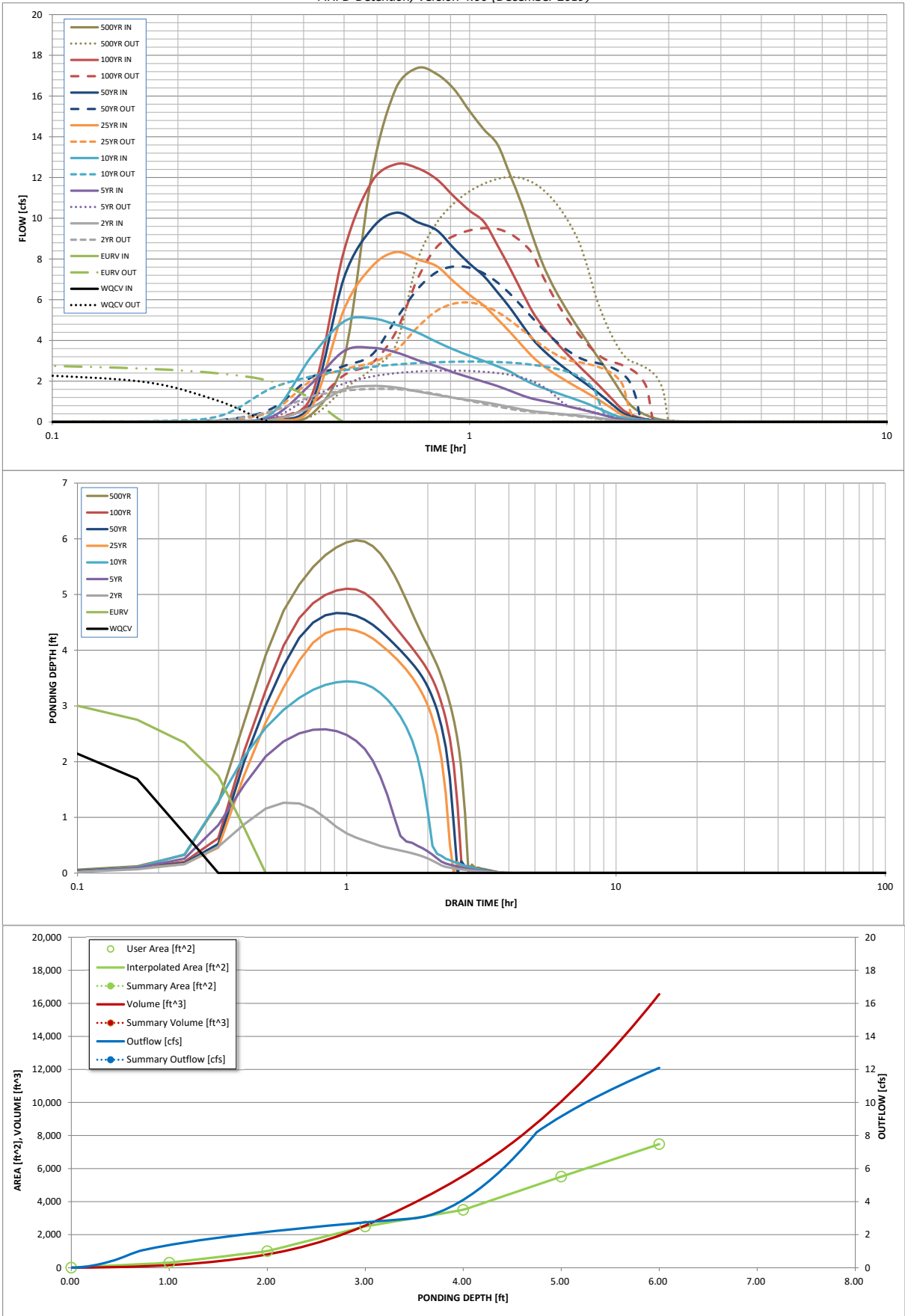
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="1.19"/>	<input type="text" value="1.50"/>	<input type="text" value="1.75"/>	<input type="text" value="2.00"/>	<input type="text" value="2.25"/>	<input type="text" value="2.52"/>	<input type="text" value="3.14"/>
CUHP Runoff Volume (acre-ft) =	<input type="text" value="0.053"/>	<input type="text" value="0.094"/>	<input type="text" value="0.121"/>	<input type="text" value="0.255"/>	<input type="text" value="0.387"/>	<input type="text" value="0.618"/>	<input type="text" value="0.778"/>	<input type="text" value="1.005"/>	<input type="text" value="1.422"/>
Inflow Hydrograph Volume (acre-ft) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="0.121"/>	<input type="text" value="0.255"/>	<input type="text" value="0.387"/>	<input type="text" value="0.618"/>	<input type="text" value="0.778"/>	<input type="text" value="1.005"/>	<input type="text" value="1.422"/>
CUHP Predevelopment Peak Q (cfs) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="1.0"/>	<input type="text" value="2.8"/>	<input type="text" value="4.3"/>	<input type="text" value="7.5"/>	<input type="text" value="9.4"/>	<input type="text" value="11.8"/>	<input type="text" value="16.5"/>
OPTIONAL Override Predevelopment Peak Q (cfs) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>						<input type="text" value="10.0"/>	
Predevelopment Unit Peak Flow, q (cfs/acre) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="0.12"/>	<input type="text" value="0.35"/>	<input type="text" value="0.52"/>	<input type="text" value="0.92"/>	<input type="text" value="1.15"/>	<input type="text" value="1.22"/>	<input type="text" value="2.01"/>
Peak Inflow Q (cfs) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="1.8"/>	<input type="text" value="3.6"/>	<input type="text" value="5.1"/>	<input type="text" value="8.3"/>	<input type="text" value="10.3"/>	<input type="text" value="12.7"/>	<input type="text" value="17.4"/>
Peak Outflow Q (cfs) =	<input type="text" value="2.6"/>	<input type="text" value="2.9"/>	<input type="text" value="1.6"/>	<input type="text" value="2.5"/>	<input type="text" value="3.0"/>	<input type="text" value="5.9"/>	<input type="text" value="7.6"/>	<input type="text" value="9.5"/>	<input type="text" value="12.0"/>
Ratio Peak Outflow to Predevelopment Q =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="0.9"/>	<input type="text" value="0.7"/>	<input type="text" value="0.8"/>	<input type="text" value="0.8"/>	<input type="text" value="1.0"/>	<input type="text" value="0.7"/>
Structure Controlling Flow =	<input type="text" value="Vertical Orifice 1"/>	<input type="text" value="Vertical Orifice 2"/>	<input type="text" value="Vertical Orifice 1"/>	<input type="text" value="Vertical Orifice 1"/>	<input type="text" value="Vertical Orifice 1"/>	<input type="text" value="Vertical Orifice 2"/>	<input type="text" value="Vertical Orifice 2"/>	<input type="text" value="Vertical Orifice 2"/>	<input type="text" value="Vertical Orifice 2"/>
Max Velocity through Gate 1 (fps) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Max Velocity through Gate 2 (fps) =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Time to Drain 97% of Inflow Volume (hours) =	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="2"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="3"/>
Time to Drain 99% of Inflow Volume (hours) =	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="2"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="3"/>	<input type="text" value="3"/>
Maximum Ponding Depth (ft) =	<input type="text" value="2.90"/>	<input type="text" value="3.56"/>	<input type="text" value="1.26"/>	<input type="text" value="2.58"/>	<input type="text" value="3.44"/>	<input type="text" value="4.38"/>	<input type="text" value="4.67"/>	<input type="text" value="5.10"/>	<input type="text" value="5.97"/>
Area at Maximum Ponding Depth (acres) =	<input type="text" value="0.05"/>	<input type="text" value="0.07"/>	<input type="text" value="0.01"/>	<input type="text" value="0.04"/>	<input type="text" value="0.07"/>	<input type="text" value="0.10"/>	<input type="text" value="0.11"/>	<input type="text" value="0.13"/>	<input type="text" value="0.17"/>
Maximum Volume Stored (acre-ft) =	<input type="text" value="0.053"/>	<input type="text" value="0.094"/>	<input type="text" value="0.006"/>	<input type="text" value="0.038"/>	<input type="text" value="0.086"/>	<input type="text" value="0.161"/>	<input type="text" value="0.191"/>	<input type="text" value="0.244"/>	<input type="text" value="0.375"/>

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.00 (December 2019)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

Designer: Corey Petersen
 Company: Matrix Design Group
 Date: September 14, 2020
 Project: Grandwood Ranch - Pond 1
 Location: El Paso County

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) NRCS Hydrologic Soil Groups of Tributary Watershed
 i) Percentage of Watershed consisting of Type A Soils
 ii) Percentage of Watershed consisting of Type B Soils
 iii) Percentage of Watershed consisting of Type C/D Soils
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume
(Only if a different EURV Design Volume is desired)

$I_a =$ %

$i =$

Area = ac

$d_6 =$

Choose One

- ☒ Water Quality Capture Volume (WQCV)
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} =$ ac-ft

$V_{DESIGN\ OTHER} =$

$V_{DESIGN\ USER} =$

HSG $_A =$ %

HSG $_B =$ %

HSG $_{C/D} =$ %

$EURV_{DESIGN} =$ ac-ft

$EURV_{DESIGN\ USER} =$ ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = : 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

- A) Minimum Forebay Volume
($V_{MIN} =$ % of the WQCV)

- B) Actual Forebay Volume

- C) Forebay Depth
($D_F =$ inch maximum)

- D) Forebay Discharge

- i) Undetained 100-year Peak Discharge

- ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)

- E) Forebay Discharge Design

- F) Discharge Pipe Size (minimum 8-inches)

- G) Rectangular Notch Width

$V_{MIN} =$ ac-ft

$V_F =$ ac-ft

$D_F =$ in

$Q_{100} =$ cfs

$Q_F =$ cfs

Choose One

- ☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

Flow too small for berm w/ pipe

Calculated $D_P =$ in

Calculated $W_N =$ in

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer:	Corey Petersen
Company:	Matrix Design Group
Date:	September 14, 2020
Project:	Grandwood Ranch - Pond 1
Location:	El Paso County

<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<div>Choose One</div> <div> <input checked="" type="radio"/> Concrete <input type="radio"/> Soft Bottom </div> <p>S = <input type="text" value="0.0050"/> ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-feet minimum)</p> <p>B) Surface Area of Micropool (10 ft² minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<div>D_M = <input type="text" value="2.5"/> ft</div> <div>A_M = <input type="text" value="10"/> sq ft</div> <div>Choose One</div> <div> <input checked="" type="radio"/> Orifice Plate <input type="radio"/> Other (Describe): </div> <hr/> <hr/> <hr/> <div>D_{orifice} = <input type="text"/> inches</div> <div>A_{ot} = <input type="text"/> square inches</div>
<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<div>D_{IS} = <input type="text" value="4"/> in</div> <div>V_{IS} = <input type="text"/> cu ft</div> <div>V_s = <input type="text" value="3.3"/> cu ft</div>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5 * (e^{-0.095D})$</p> <p>B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open area to the total screen area for the material specified.)</p> <p>Other (Y/N): <input type="text" value="N"/></p> <p>C) Ratio of Total Open Area to Total Area (only for type 'Other')</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H_{TR})</p> <p>G) Width of Water Quality Screen Opening (W_{opening}) (Minimum of 12 inches is recommended)</p>	<div>A_t = <input type="text"/> square inches</div> <div><input type="text"/></div> <hr/> <hr/> <hr/> <div>User Ratio = <input type="text"/></div> <div>A_{total} = <input type="text"/> sq. in.</div> <div>H = <input type="text"/> feet</div> <div>H_{TR} = <input type="text"/> inches</div> <div>W_{opening} = <input type="text"/> inches</div>

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

Designer: Corey Petersen
 Company: Matrix Design Group
 Date: September 14, 2020
 Project: Grandwood Ranch - Pond 2-North Forebay
 Location: El Paso County

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) NRCS Hydrologic Soil Groups of Tributary Watershed
 i) Percentage of Watershed consisting of Type A Soils
 ii) Percentage of Watershed consisting of Type B Soils
 iii) Percentage of Watershed consisting of Type C/D Soils
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume
(Only if a different EURV Design Volume is desired)

$I_a =$ %

$i =$

Area = ac

$d_6 =$

Choose One

- ☒ Water Quality Capture Volume (WQCV)
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} =$ ac-ft

$V_{DESIGN\ OTHER} =$

$V_{DESIGN\ USER} =$

HSG $_A =$ %

HSG $_B =$ %

HSG $_{C/D} =$ %

$EURV_{DESIGN} =$ ac-ft

$EURV_{DESIGN\ USER} =$ ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = : 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

- A) Minimum Forebay Volume
($V_{MIN} =$ of the WQCV)

- B) Actual Forebay Volume

- C) Forebay Depth
($D_F =$ inch maximum)

- D) Forebay Discharge

- i) Undetained 100-year Peak Discharge

- ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)

- E) Forebay Discharge Design

- F) Discharge Pipe Size (minimum 8-inches)

- G) Rectangular Notch Width

$V_{MIN} =$ ac-ft

$V_F =$ ac-ft

$D_F =$ in

$Q_{100} =$ cfs

$Q_F =$ cfs

Choose One

- ☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

Flow too small for berm w/ pipe

Calculated $D_P =$ in

Calculated $W_N =$ in

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer: Corey Petersen
Company: Matrix Design Group
Date: September 14, 2020
Project: Grandwood Ranch - Pond 2-North Forebay
Location: El Paso County

6. Trickle Channel

A) Type of Trickle Channel

F) Slope of Trickle Channel

Choose One

☐ Concrete

☐ Soft Bottom

S = ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-foot minimum)

B) Surface Area of Micropool (10 ft² minimum)

C) Outlet Type

D_M = ft

A_M = sq ft

Choose One

☐ Orifice Plate

☐ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)

D_{orifice} = inches

E) Total Outlet Area

A_{orifice} = square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)

C) Initial Surcharge Provided Above Micropool

D_{IS} = in

V_{IS} = cu ft

V_s = cu ft

9. Trash Rack

A) Water Quality Screen Open Area: A_t = A_{orifice} * 38.5 * (e^{-0.095D})

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open area to the total screen area for the material specified.)

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other')

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H_{TR})

G) Width of Water Quality Screen Opening (W_{opening}) (Minimum of 12 inches is recommended)

A_t = square inches

User Ratio =

A_{total} = sq. in.

H = feet

H_{TR} = inches

W_{opening} = inches

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

Designer: Corey Petersen
Company: Matrix Design Group
Date: September 14, 2020
Project: Grandwood Ranch - Pond 3
Location: El Paso County

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) NRCS Hydrologic Soil Groups of Tributary Watershed
 i) Percentage of Watershed consisting of Type A Soils
 ii) Percentage of Watershed consisting of Type B Soils
 iii) Percentage of Watershed consisting of Type C/D Soils
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume
(Only if a different EURV Design Volume is desired)

$I_a = 15.0$ %

$i = 0.150$

Area = 25.100 ac

$d_6 =$ in

Choose One

- ☒ Water Quality Capture Volume (WQCV)
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 0.195$ ac-ft

$V_{DESIGN\ OTHER} =$ ac-ft

$V_{DESIGN\ USER} =$ ac-ft

HSG A = %

HSG B = %

HSG C/D = %

$EURV_{DESIGN} =$ ac-ft

$EURV_{DESIGN\ USER} =$ ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = : 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

- A) Minimum Forebay Volume
($V_{MIN} = 2\%$ of the WQCV)

- B) Actual Forebay Volume

- C) Forebay Depth
($D_F = 18$ inch maximum)

- D) Forebay Discharge

- i) Undetained 100-year Peak Discharge

- ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)

- E) Forebay Discharge Design

- F) Discharge Pipe Size (minimum 8-inches)

- G) Rectangular Notch Width

$V_{MIN} = 0.004$ ac-ft

$V_F = 0.004$ ac-ft

$D_F = 18.0$ in

$Q_{100} = 34.50$ cfs

$Q_F = 0.69$ cfs

Choose One

- ☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

Flow too small for berm w/ pipe

Calculated $D_P =$ in

Calculated $W_N = 5.0$ in

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer: Corey Petersen
Company: Matrix Design Group
Date: September 14, 2020
Project: Grandwood Ranch - Pond 3
Location: El Paso County

6. Trickle Channel

A) Type of Trickle Channel

F) Slope of Trickle Channel

Choose One

- ☐ Concrete
☐ Soft Bottom

S = ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-foot minimum)

B) Surface Area of Micropool (10 ft² minimum)

C) Outlet Type

D_M = ft

A_M = sq ft

Choose One

- ☐ Orifice Plate
☐ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)

E) Total Outlet Area

D_{orifice} = inches

A_{orifice} = square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)

C) Initial Surcharge Provided Above Micropool

D_{IS} = in

V_{IS} = cu ft

V_s = cu ft

9. Trash Rack

A) Water Quality Screen Open Area: A_t = A_{orifice} * 38.5 * (e^{-0.095D})

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open area to the total screen area for the material specified.)

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other')

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H_{TR})

G) Width of Water Quality Screen Opening (W_{opening}) (Minimum of 12 inches is recommended)

A_t = square inches

User Ratio =

A_{total} = sq. in.

H = feet

H_{TR} = inches

W_{opening} = inches

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

Designer: Corey Petersen
 Company: Matrix Design Group
 Date: September 14, 2020
 Project: Grandwood Ranch - Pond 4
 Location: El Paso County

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) NRCS Hydrologic Soil Groups of Tributary Watershed
 i) Percentage of Watershed consisting of Type A Soils
 ii) Percentage of Watershed consisting of Type B Soils
 iii) Percentage of Watershed consisting of Type C/D Soils
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume
(Only if a different EURV Design Volume is desired)

$I_a =$ 13.0 %

$i =$ 0.130

Area = 8.530 ac

$d_6 =$ in

Choose One

- ☒ Water Quality Capture Volume (WQCV)
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} =$ 0.059 ac-ft

$V_{DESIGN\ OTHER} =$ ac-ft

$V_{DESIGN\ USER} =$ ac-ft

HSG $_A =$ %

HSG $_B =$ %

HSG $_{C/D} =$ %

$EURV_{DESIGN} =$ ac-ft

$EURV_{DESIGN\ USER} =$ ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = : 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

- A) Minimum Forebay Volume
($V_{FMIN} =$ 1 % of the WQCV)
- B) Actual Forebay Volume
- C) Forebay Depth
($D_F =$ 12 inch maximum)
- D) Forebay Discharge
 i) Undetained 100-year Peak Discharge
 ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)
- E) Forebay Discharge Design

$V_{FMIN} =$ 0.001 ac-ft

$V_F =$ 0.001 ac-ft

$D_F =$ 12.0 in

$Q_{100} =$ 13.10 cfs

$Q_F =$ 0.26 cfs

Choose One

- ☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches)

Calculated $D_P =$ in

G) Rectangular Notch Width

Calculated $W_N =$ 3.3 in

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer: Corey Petersen
 Company: Matrix Design Group
 Date: September 14, 2020
 Project: Grandwood Ranch - Pond 4
 Location: El Paso County

6. Trickle Channel

A) Type of Trickle Channel

F) Slope of Trickle Channel

Choose One
☐ Concrete
☐ Soft Bottom

S = ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

B) Surface Area of Micropool (10 ft² minimum)

C) Outlet Type

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)

E) Total Outlet Area

D_M = ft

A_M = sq ft

Choose One
☐ Orifice Plate
☐ Other (Describe):

D_{orifice} = inches

A_{orifice} = square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)

C) Initial Surcharge Provided Above Micropool

D_{IS} = in

V_{IS} = cu ft

V_s = cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5 * (e^{-0.095D})$

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open area to the total screen area for the material specified.)

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other')

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H_{TR})

G) Width of Water Quality Screen Opening (W_{opening}) (Minimum of 12 inches is recommended)

A_t = square inches

User Ratio =

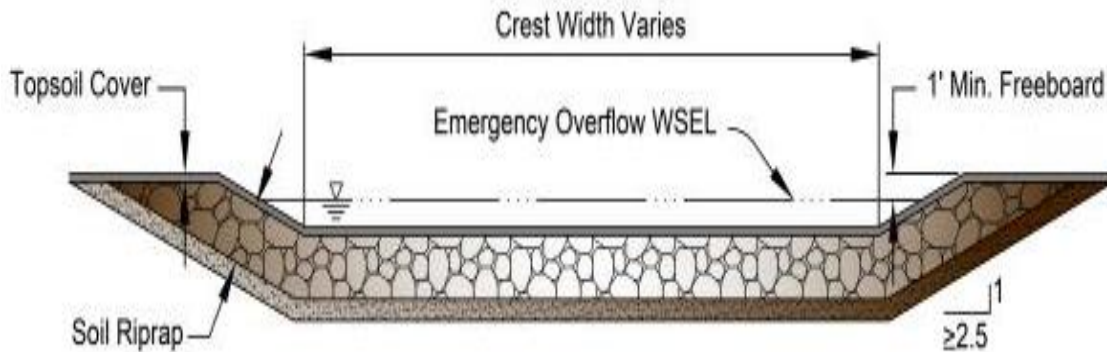
A_{total} = sq. in.

H = feet

H_{TR} = inches

W_{opening} = inches

Figure 13-12c. Emergency Spillway Protection



14.1 CFS / 50 FT = 0.28 CFS/FT
TYPE VL RIPRAP REQUIRED

Figure 13-12d. Riprap Types for Emergency Spillway Protection

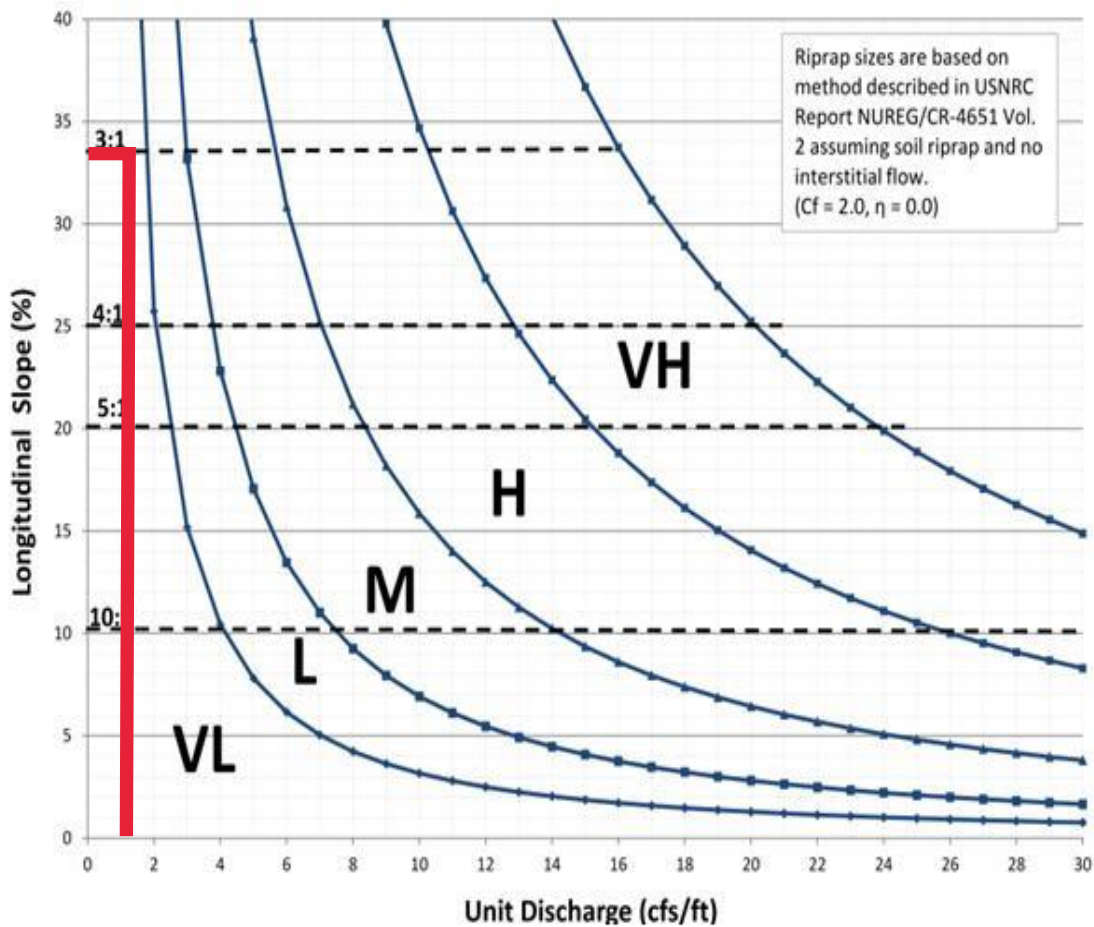
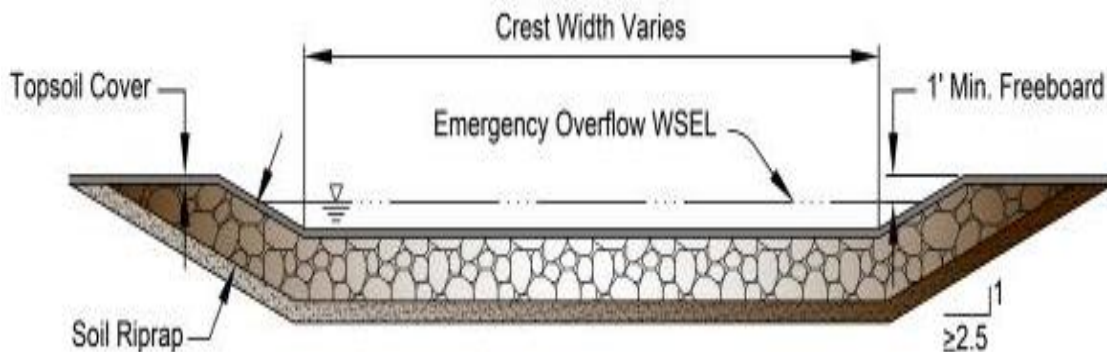


Figure 13-12c. Emergency Spillway Protection



14.8 CFS / 45 FT = 0.33 CFS/FT
TYPE VL RIPRAP REQUIRED

Figure 13-12d. Riprap Types for Emergency Spillway Protection

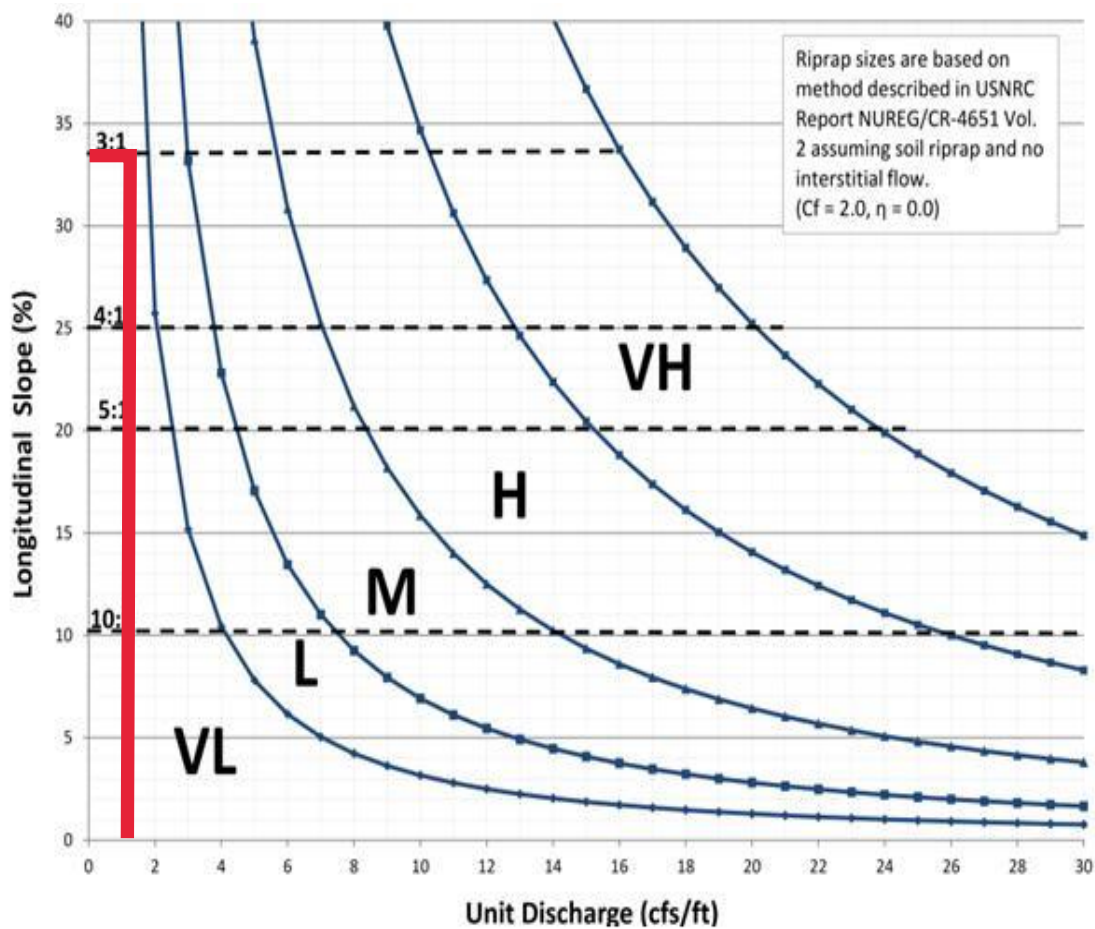
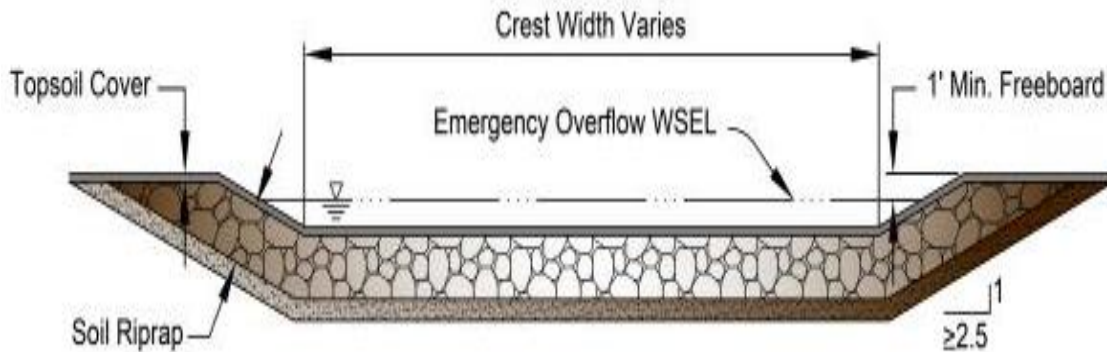


Figure 13-12c. Emergency Spillway Protection



38.0 CFS / 60 FT = 0.63 CFS/FT
TYPE VL RIPRAP REQUIRED

Figure 13-12d. Riprap Types for Emergency Spillway Protection

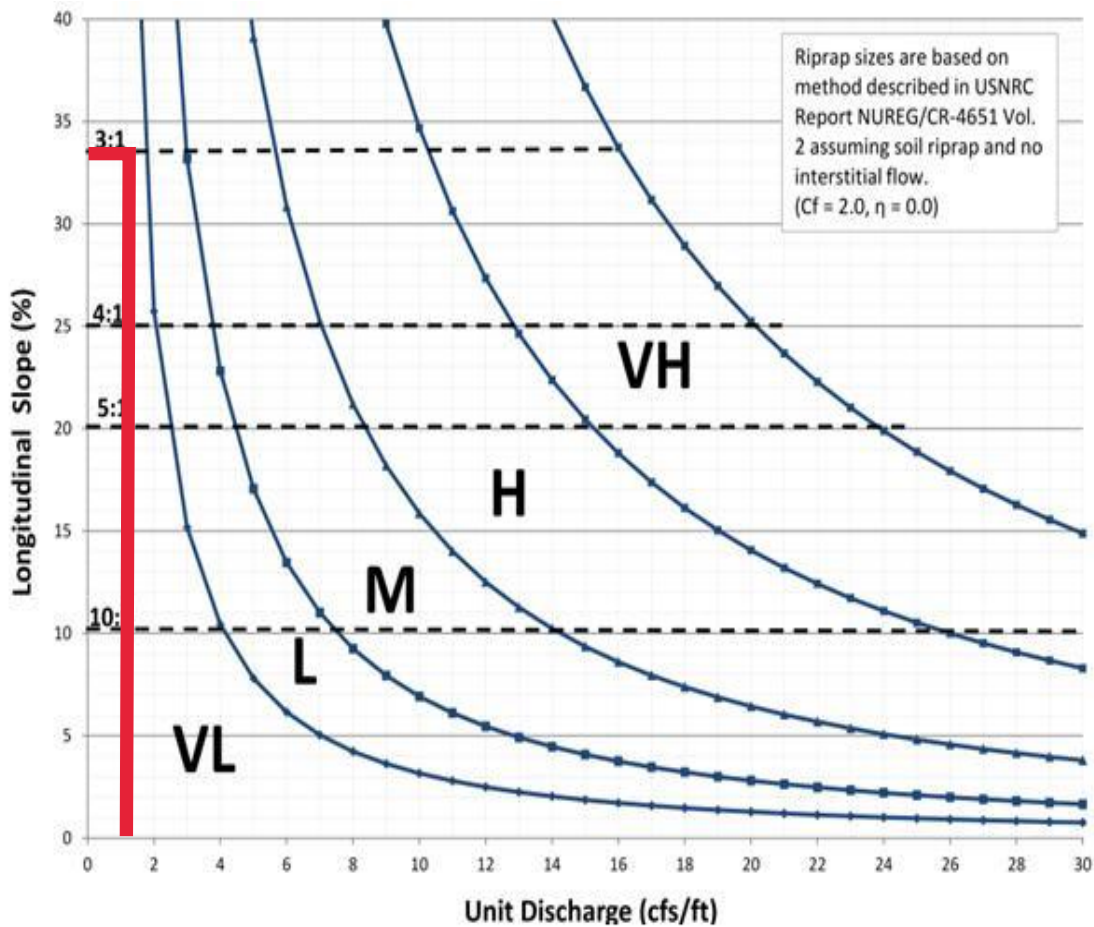
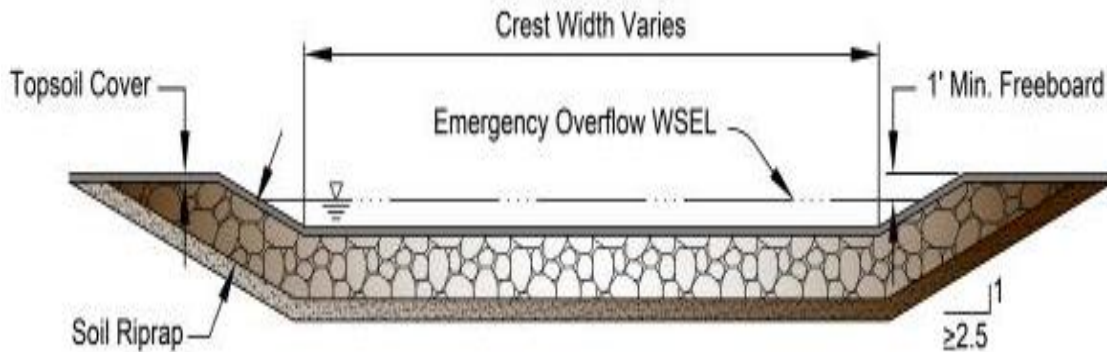


Figure 13-12c. Emergency Spillway Protection



14.1 CFS / 30 FT = 0.47 CFS/FT
TYPE VL RIPRAP REQUIRED

Figure 13-12d. Riprap Types for Emergency Spillway Protection

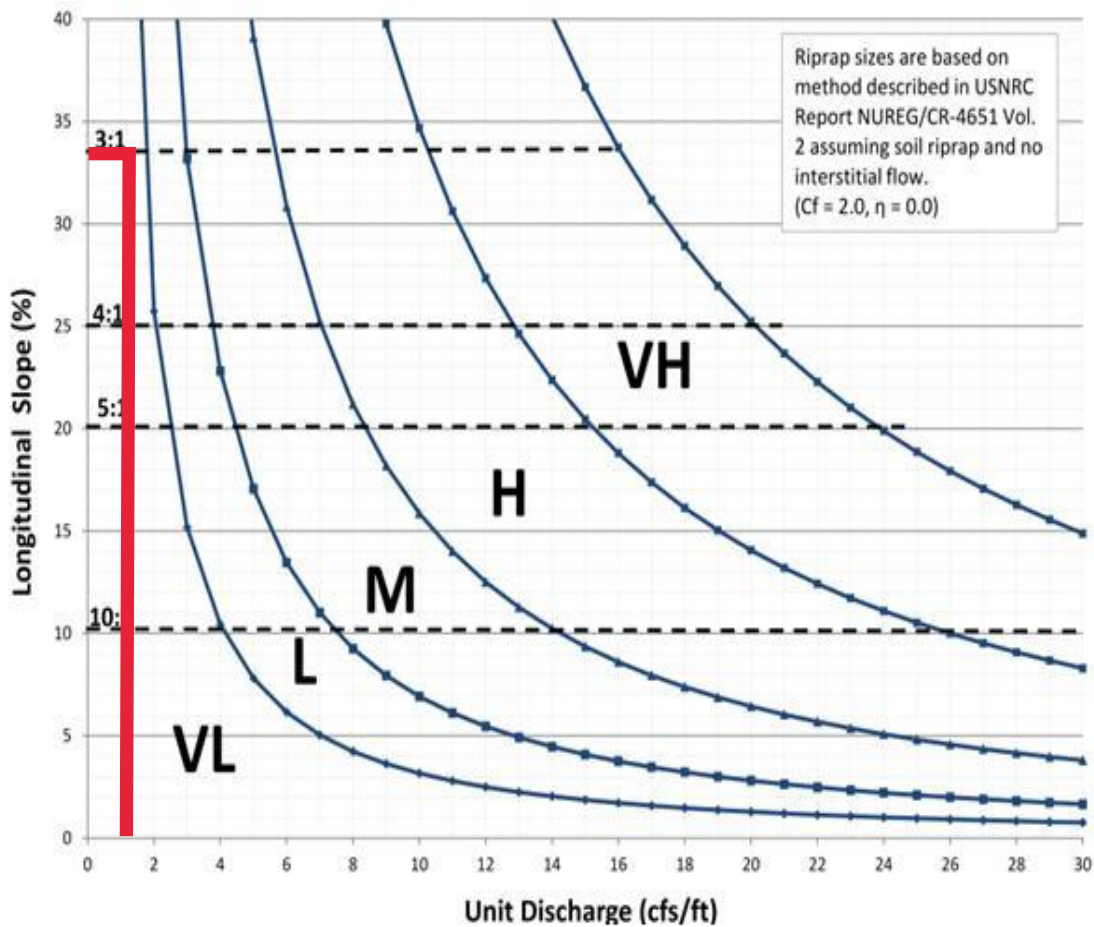
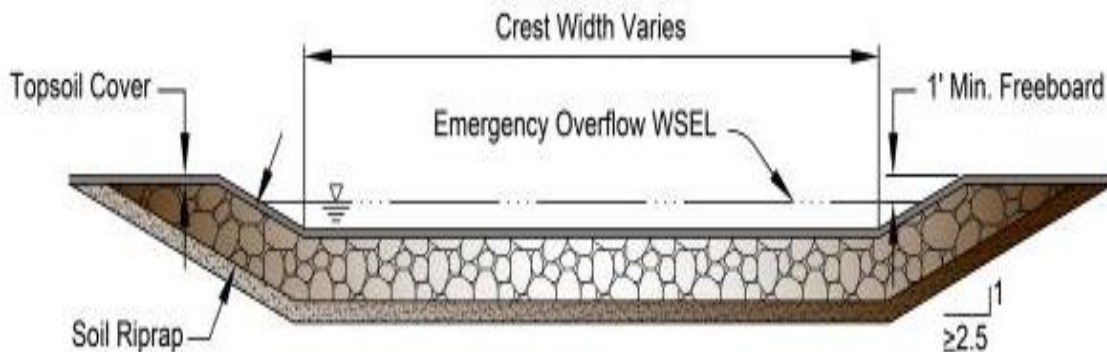


Figure 13-12c. Emergency Spillway Protection



3.3 CFS / 16 FT = 0.2 CFS/FT
TYPE VL RIPRAP REQUIRED

Figure 13-12d. Riprap Types for Emergency Spillway Protection

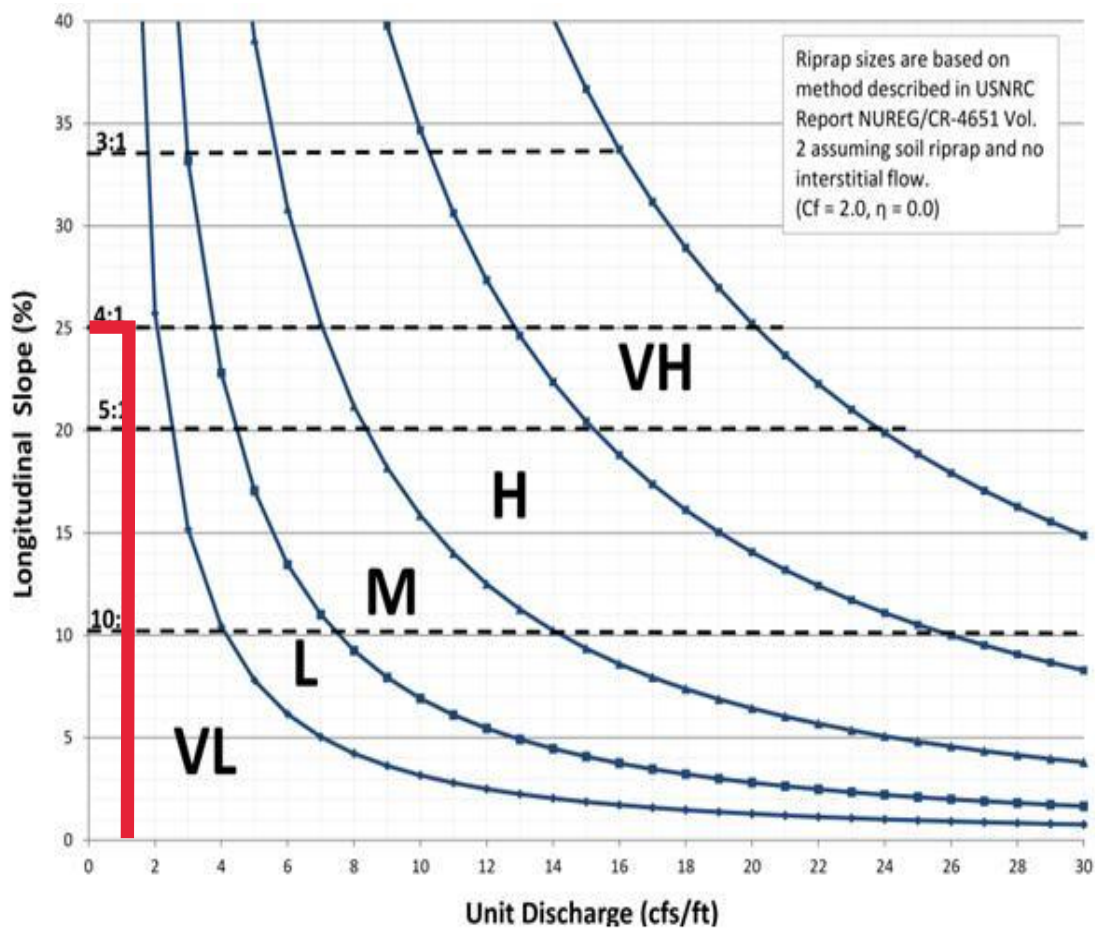


Figure 13-12b. Emergency Spillway Profile at Embankment

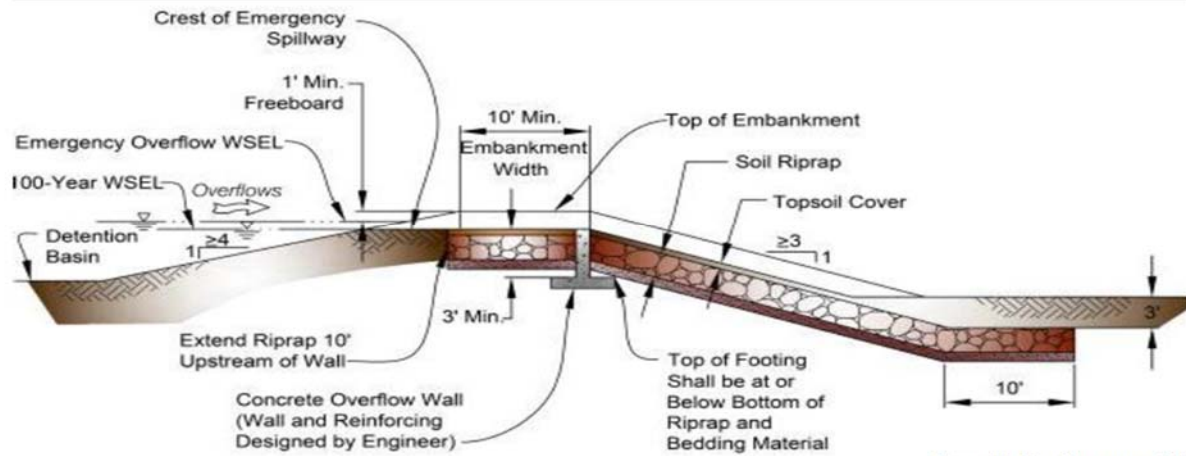
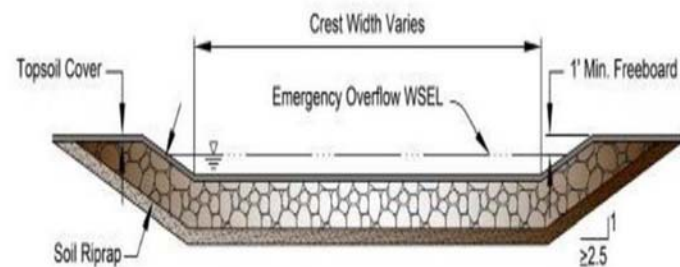


Figure 13-12c. Emergency Spillway Protection



ROAD EMBANKMENT PROTECTION CALCULATION

Q=807 CFS

LENGTH=115

UNIT FLOW RATE: 7.0 CFS/FT

=> TYPE M RIP RAP

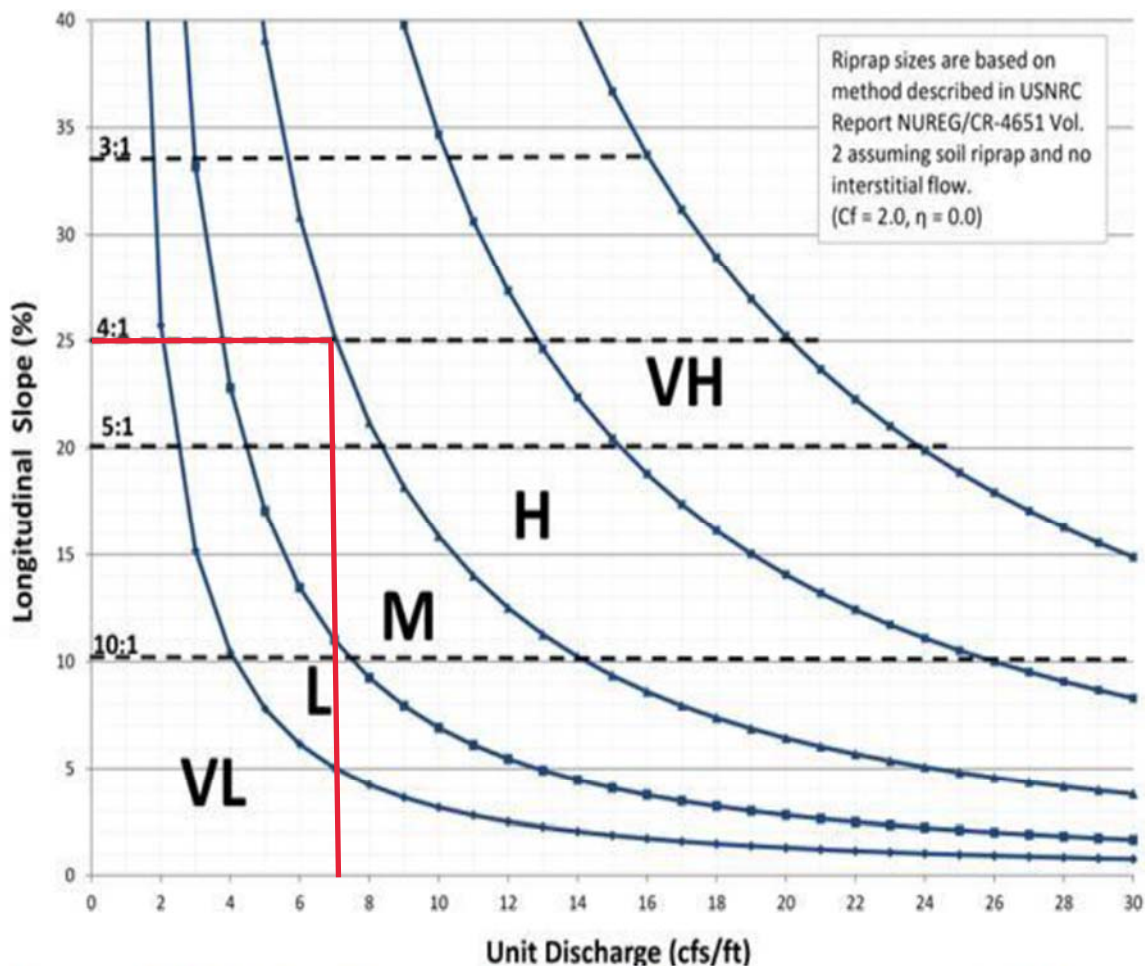
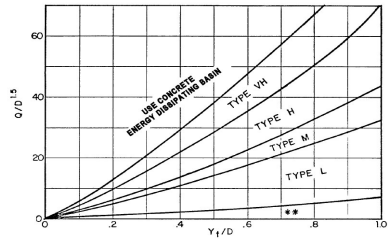


Figure 13-12d. Riprap Types for Emergency Spillway Protection

Cross Road Culverts - Outfall Protection

	C-1		POND 2		C-2		C-3		C-4		POND 1		C-6		C-7		C-8		POND 3		C-10		C-12		C-12-A		POND 4		LOT 22 BERM		EX-2	
Pipe Size (D)	18	Inches	18	Inches	18	Inches	36	Inches	15	Inches	18	Inches	15	Inches	18	Inches	18	Inches	24	Inches	18	Inches	36	Inches	15	Inches	18	Inches	20	Inches	36	Inches
Q	23.9	cfs	7.5	cfs	67.55	cfs	72.8	cfs	3.4	cfs	6.8	cfs	9.5	cfs	1.7	cfs	5.3	cfs	24.3	cfs	17.8	cfs	65.6	cfs	3.6	cfs	12.3	cfs	9.6	cfs	143.2	cfs
L	4.5	Feet	4.5	Feet	15	Feet	20	Feet	3.75	Feet	4.5	Feet	3.75	Feet	4.5	Feet	4.5	Feet	6	Feet	4.5	Feet	9	Feet	3.75	Feet	4.5	Feet	5	Feet	20	Feet
W	4.5	Feet	4.5	Feet	4	Feet	6	Feet	3.75	Feet	4.5	Feet	3.75	Feet	4.5	Feet	4.5	Feet	6	Feet	4.5	Feet	9	Feet	3.75	Feet	4.5	Feet	5	Feet	6	Feet
D	0	Feet	0	Feet	1	Feet	1.5	Feet	0	Feet	0	Feet	0	Feet	0	Feet	0	Feet	0	Feet	0	Feet	0	Feet	0	Feet	0	Feet	0	Feet	1.5	Feet
d50	0.42	Feet	0.14	Feet	0.53	Feet	0.61	Feet	0.20	Feet	0.14	Feet	0.27	Feet	0.17	Feet	0.23	Feet	0.23	Feet	0.23	Feet	0.45	Feet	0.12	Feet	0.12	Feet	0.18	Feet	0.25	Feet
	5.10	Inches	1.63	Inches	6.41	Inches	7.28	Inches	2.35	Inches	1.66	Inches	3.21	Inches	2.09	Inches	2.77	Inches	2.80	Inches	2.79	Inches	5.38	Inches	1.48	Inches	2.13	Inches	2.97	Inches	9.94	Inches
Depth of Flow	1.12	Feet	1.1	Feet	2.2	Feet	1.8	Feet	0.4	Feet	1.0	Feet	0.8	Feet	0.3	Feet	0.5	Feet	1.7	Feet	1.5	Feet	2.1	Feet	0.7	Feet	1.3	Feet	0.8	Feet	2.4	Feet
Q/D ^{1.5}	13.01		4.08		36.77		14.01		2.43		3.70		6.80		0.93		2.88		8.59		9.69		12.62		2.58		6.70		4.46		27.56	
Y/D	0.747		0.733		1.467		0.590		0.352		0.66666667		0.64		0.17333333		0.35333333		0.87		0.96666667		0.69666667		0.544		0.88666667		0.48		0.8	
Rip Rap	Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L		Type L		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type L for 3 x Pipe Dia Downstream		Type M	
Length of Rock	4.5	Feet	4.5	Feet	15	Feet	20	Feet	3.75	Feet	4.5	Feet	3.75	Feet	4.5	Feet	4.5	Feet	6	Feet	4.5	Feet	9	Feet	3.75	Feet	4.5	Feet	5	Feet	20	Feet
Width of Rock	4.5	Feet	4.5	Feet	10.0	Feet	15.0	Feet	3.8	Feet	4.5	Feet	3.8	Feet	4.5	Feet	4.5	Feet	6.0	Feet	4.5	Feet	9.0	Feet	3.8	Feet	4.5	Feet	5.0	Feet	15.0	Feet

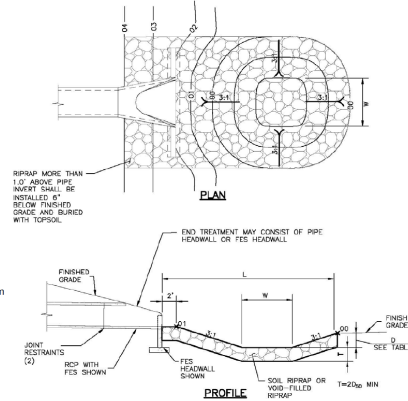


Use D_{50} instead of D whenever flow is supercritical in the barrel.
 ** Use Type L for a distance of $3D$ downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for $Q/D^{1.5} \leq 6.0$)

CLASSIFICATION AND GRADATION OF ORDINARY RIP RAP			
Rip Rap Designation by Weight	% Smaller Than Given Size (inches)	Intermediate Rock Dimension	d50* (inches)
Type VL	70 - 100	12	6**
	50 - 70	9	
	35 - 50	6	
Type L	70 - 100	15	9**
	50 - 70	12	
	35 - 50	9	
Type M	70 - 100	21	12
	50 - 70	18	
	35 - 50	12	
Type H	70 - 100	30	18
	50 - 70	24	
	35 - 50	18	
Type VH	70 - 100	42	24
	50 - 70	33	
	35 - 50	24	

* d50 = Mean particle size
 ** Bury types VL and L with native top soil and revegetate to protect from vandalism.



PIPE SIZE OR BOX HEIGHT	B	WS	L
18" - 24"	1'-0"	4'	15'
30" - 36"	1'-6"	6'	20'
42" - 48"	2'-0"	7'	24'
54" - 60"	2'-6"	8'	28'
66" - 72"	3'-0"	9'	32'

* IF OUTLET PIPE IS A BOX CULVERT WITH A WIDTH GREATER THAN W , THEN W = CULVERT WIDTH

Figure 9-37. Low tailwater riprap basin

Cross Road Culverts - Outfall Protection

3.2.3 Rock Sizing for Riprap Apron and Low Tailwater Basin

Scour resulting from highly turbulent, rapidly decelerating flow is a common problem at conduit outlets. The following section summarizes the method for sizing riprap protection for both riprap aprons (Section 3.2.1) and low tailwater basins (Section 3.2.2).

Use Figure 9-38 to determine the required rock size for circular conduits and Figure 9-39 for rectangular conduits. Figure 9-38 is valid for $Q/D_c^{2.5}$ of 6.0 or less and Figure 9-39 is valid for $Q/WH^{1.5}$ of 8.0 or less. The parameters in these two figures are:

1. $Q/D_c^{1.5}$ or $Q/WH^{0.5}$ in which Q is the design discharge in cfs, D_c is the diameter of a circular conduit in feet, and W and H are the width and height of a rectangular conduit in feet.
2. Y_t/D_c or Y_t/H in which Y_t is the tailwater depth in feet, D_c is the diameter of a circular conduit in feet, and H is the height of a rectangular conduit in feet. In cases where Y_t is unknown or a hydraulic jump is suspected downstream of the outlet, use $Y_t/D_c = Y_t/H = 0.40$ when using Figures 9-38 and 9-39.
3. The riprap size requirements in Figures 9-38 and 9-39 are based on the non-dimensional parametric Equations 9-16 and 9-17 (Steven, Simons, and Watts 1971 and Smith 1975).

Circular culvert:

$$d_{50} = \frac{0.023Q}{Y_t^{1.2} D_c^{0.3}}$$

Equation 9-16

Rectangular culvert:

$$d_{50} = \frac{0.014H^{0.4}Q}{Y_t W}$$

Equation 9-17

3.2.2 Low Tailwater Basin

The design of low tailwater riprap basins is necessary when the receiving channel may have little or no flow or tailwater at time when the pipe or culvert is in operation. Figure 9-37 provides a plan and profile view of a typical low tailwater riprap basin.

By providing a low tailwater basin at the end of a storm drain conduit or culvert, the kinetic energy of the discharge dissipates under controlled conditions without causing scour at the channel bottom.

Low tailwater is defined as being equal to or less than 1/3 of the height of the storm drain, that is:

$$y_t \leq \frac{D}{3} \quad \text{or} \quad y_t \leq \frac{H}{3}$$

Where:

y_t = tailwater depth at design flow (feet)

D = diameter of circular pipe (feet)

H = height of rectangular pipe (feet)

Rock Size

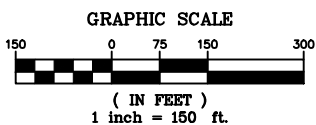
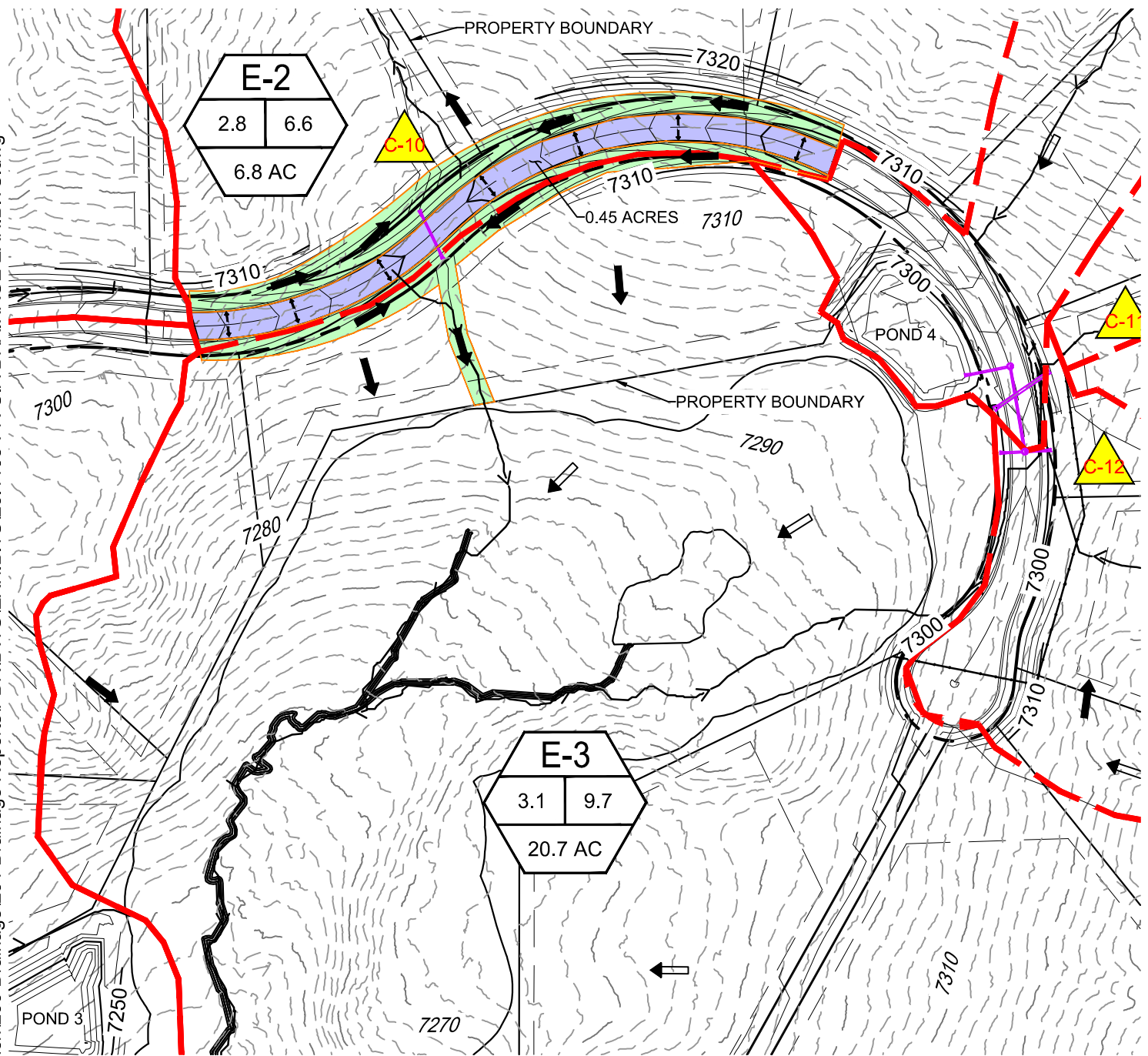
The procedure for determining the required riprap size downstream of a conduit outlet is in Section 3.2.3.

After selecting the riprap size, the minimum thickness of the riprap layer, T , in feet, in the basin is defined as:

$$T = 2D_{50}$$

Equation 9-15

Total Area (ft ²)	151,753
Total Impervious Area (ft ²)	52,526
WQCV (ft ³)	2,189
WQCV Reduction (ft ³)	2,189
WQCV Reduction (%)	100%
Untreated WQCV (ft ³)	0



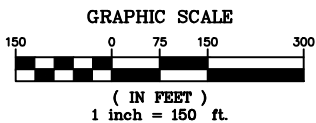
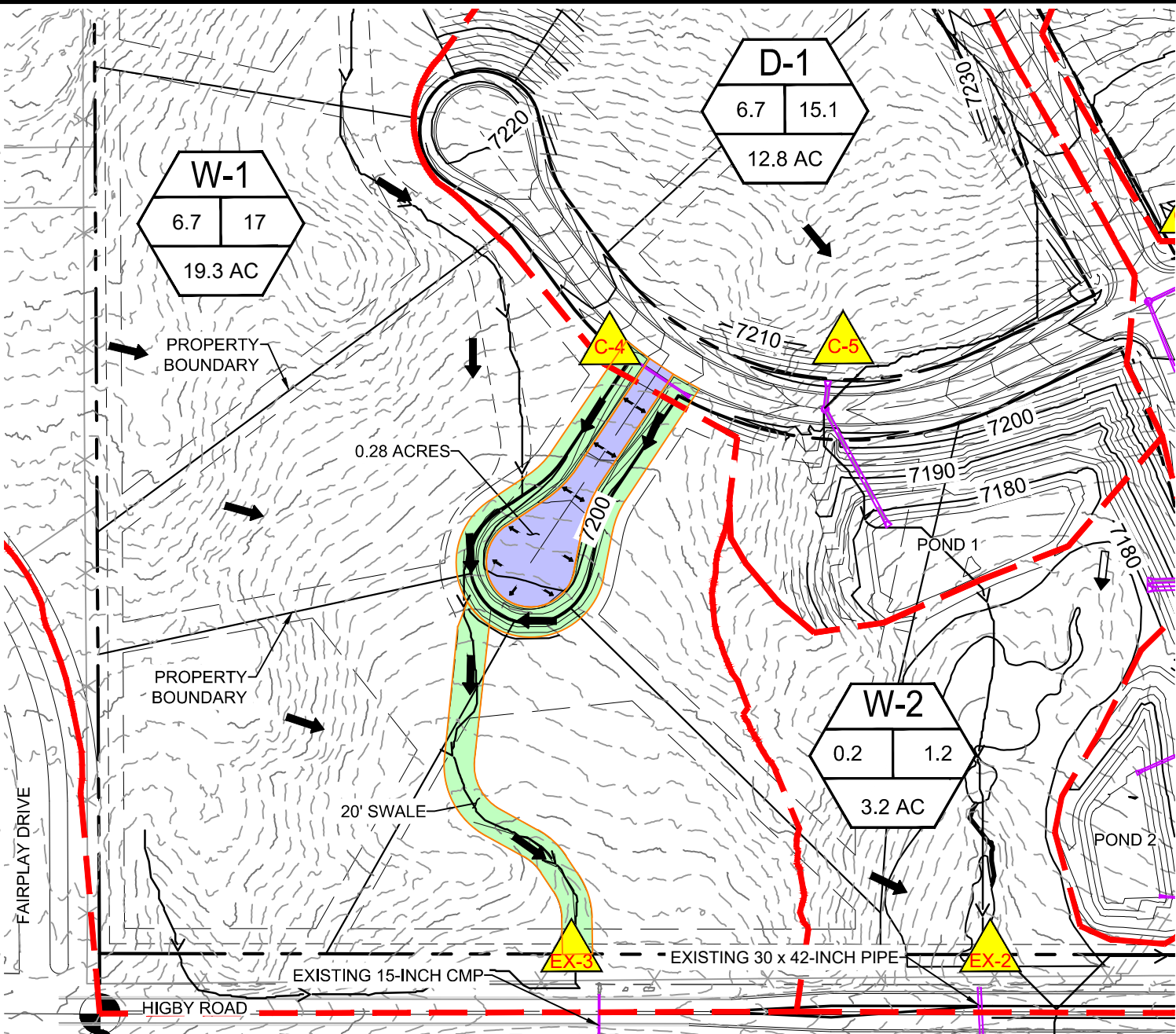
SURFACE TYPES	
UNCONNECTED IMPERVIOUS AREA (UIA)	
RECEIVING PERVIOUS AREA (RPA)	
DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA)	
SEPARATE PERVIOUS AREA (SPA)	

LEGEND	
DESIGN POINT IDENTIFIER	
BASIN IDENTIFICATION	
BASIN FLOWS	
BASIN AREA	
BASIN BOUNDARY	
FLOW PATH	
EXISTING CONTOURS	
PROPOSED CONTOURS	

BASIN E-3 UIA RUNOFF CONFIGURATION

Matrix
Excellence by Design

2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208



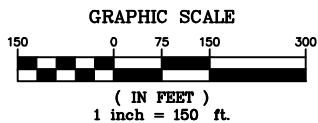
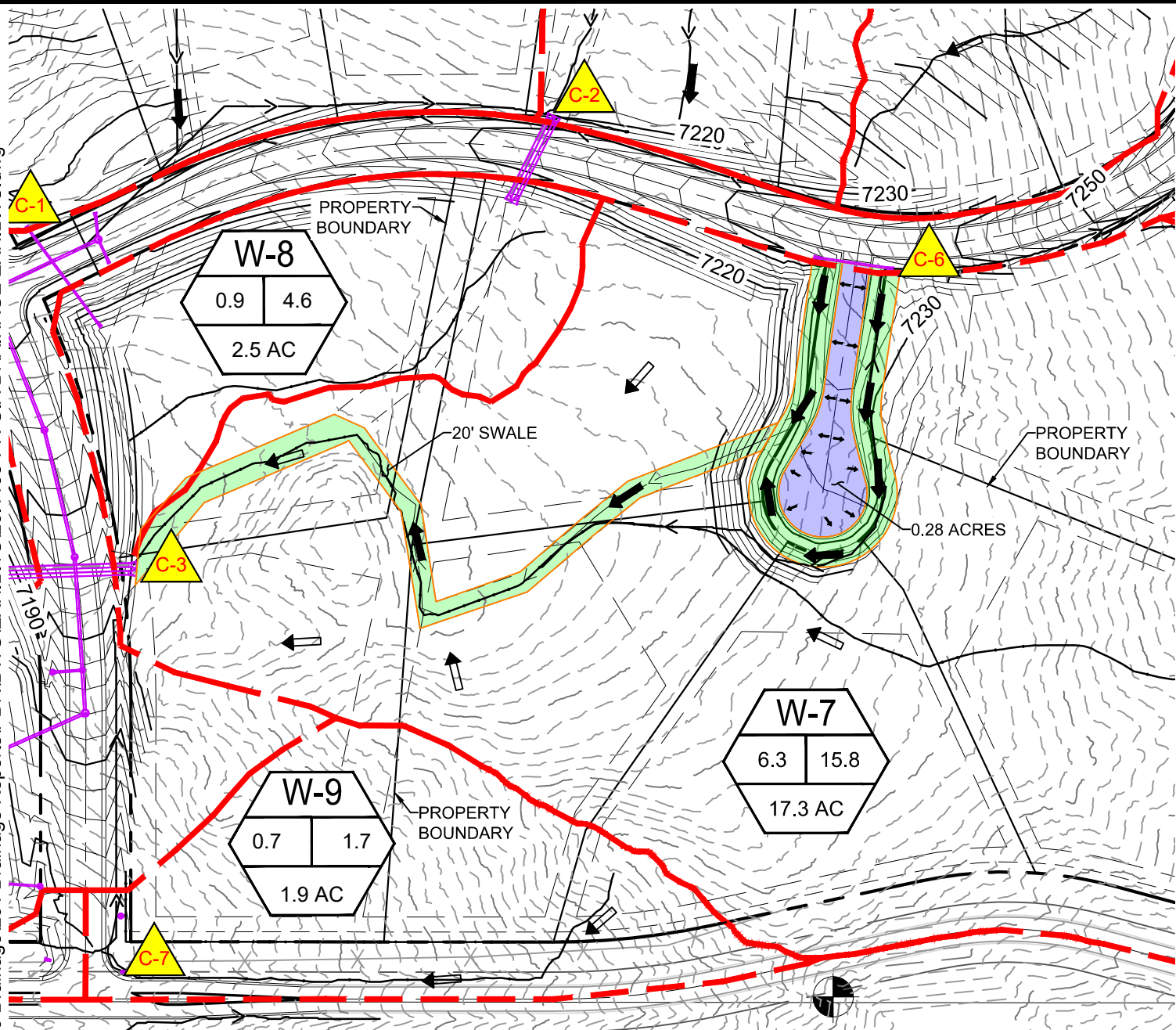
SURFACE TYPES	
UNCONNECTED IMPERVIOUS AREA (UIA)	
RECEIVING PERVIOUS AREA (RPA)	
DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA)	
SEPARATE PERVIOUS AREA (SPA)	

LEGEND	
DESIGN POINT IDENTIFIER	
BASIN IDENTIFICATION	
BASIN FLOWS	
BASIN AREA	
BASIN BOUNDARY	
FLOW PATH	
EXISTING CONTOURS	
PROPOSED CONTOURS	

BASIN W-1 UIA RUNOFF CONFIGURATION

Matrix
Excellence by Design

2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208



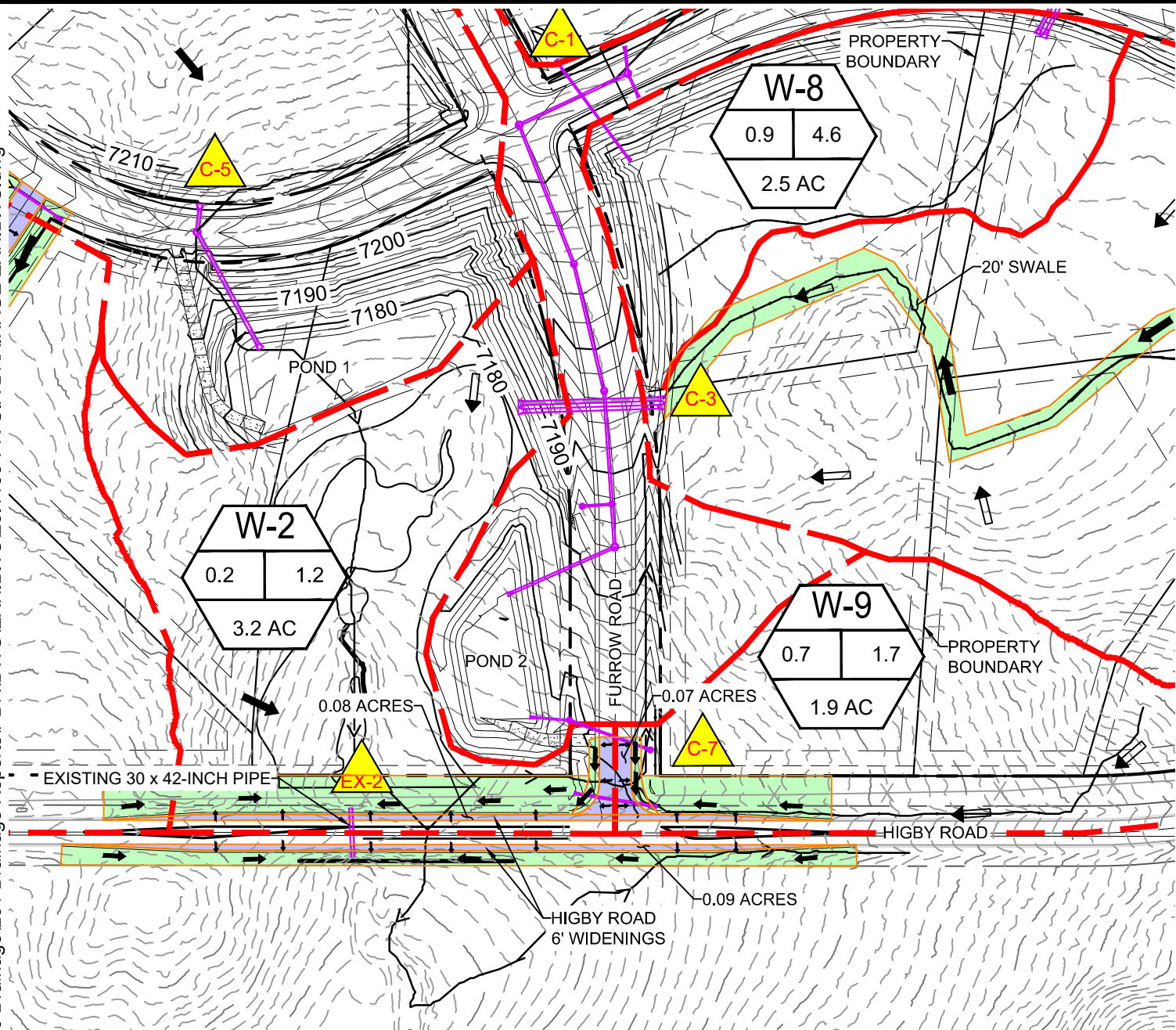
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UNCONNECTED IMPERVIOUS AREA (UIA)	
RECEIVING PERVIOUS AREA (RPA)	
DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA)	
SEPARATE PERVIOUS AREA (SPA)	

LEGEND	
DESIGN POINT IDENTIFIER	
BASIN IDENTIFICATION	
BASIN FLOWS	
BASIN AREA	
BASIN BOUNDARY	
FLOW PATH	
EXISTING CONTOURS	
PROPOSED CONTOURS	

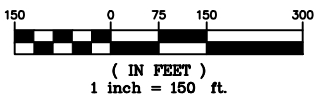
BASIN W-7 UIA RUNOFF CONFIGURATION

Matrix
Excellence by Design

2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208



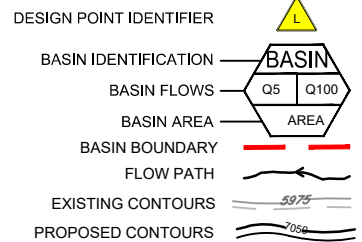
GRAPHIC SCALE



SURFACE TYPES

UNCONNECTED IMPERVIOUS AREA (UIA)	
RECEIVING PERVIOUS AREA (RPA)	
DIRECTLY CONNECTED IMPERVIOUS AREA (DCIA)	
SEPARATE PERVIOUS AREA (SPA)	

LEGEND



Matrix
Excellence by Design

2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

HIGBY ROAD UJA RUNOFF CONFIGURATION

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Sep 23 2020

Suitable Outfall - Furrow Road Storm Culvert 1 - Pipe 10

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 1.50

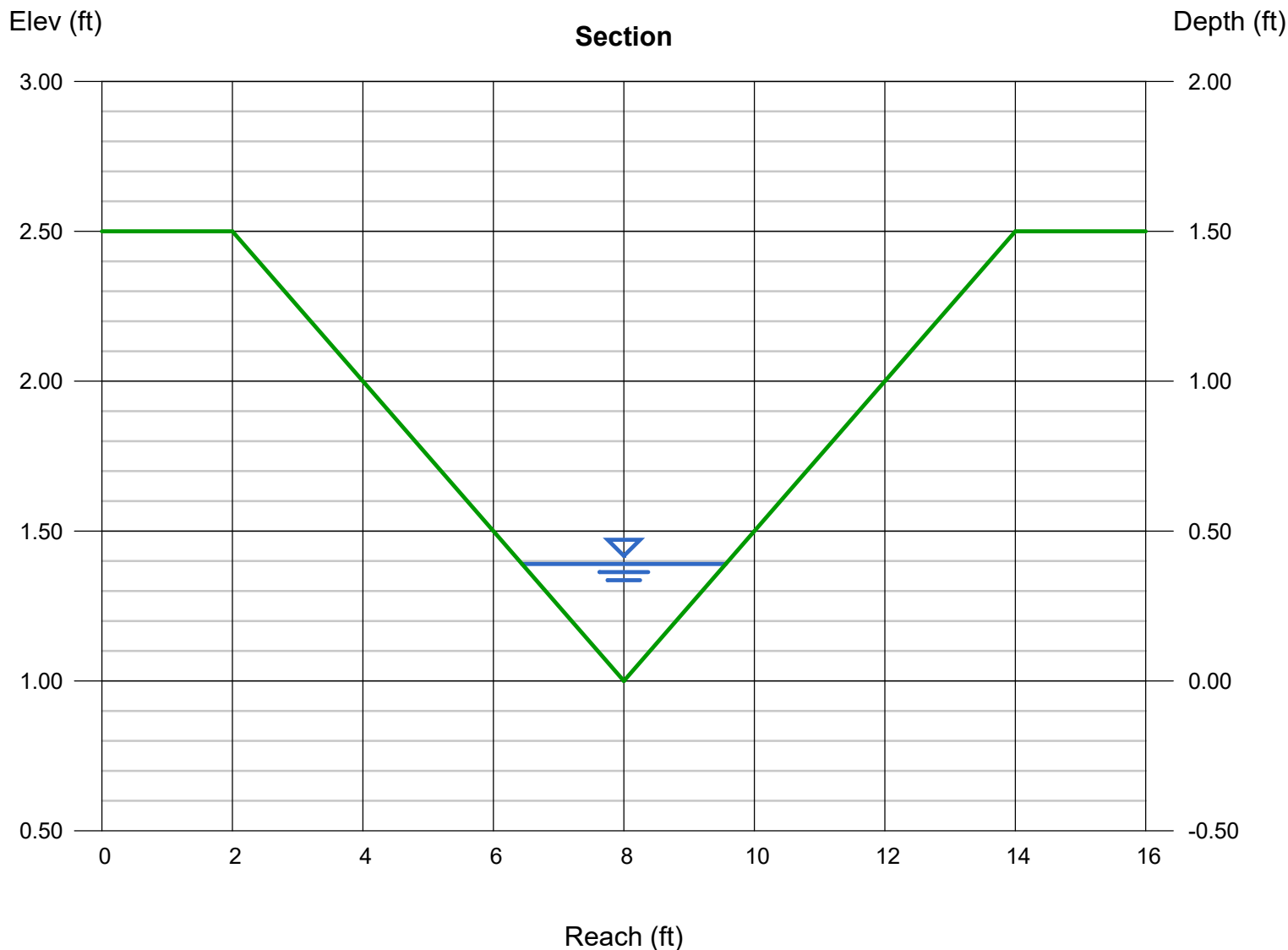
Invert Elev (ft) = 1.00
Slope (%) = 3.00
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 1.70

Highlighted

Depth (ft) = 0.39
Q (cfs) = 1.700
Area (sqft) = 0.61
Velocity (ft/s) = 2.79
Wetted Perim (ft) = 3.22
Crit Depth, Yc (ft) = 0.41
Top Width (ft) = 3.12
EGL (ft) = 0.51



Channel Report

Suitable Outfall - Pond Storm Culvert 2 - Pipe 11

Triangular

Side Slopes (z:1) = 4.00, 50.00
Total Depth (ft) = 3.00

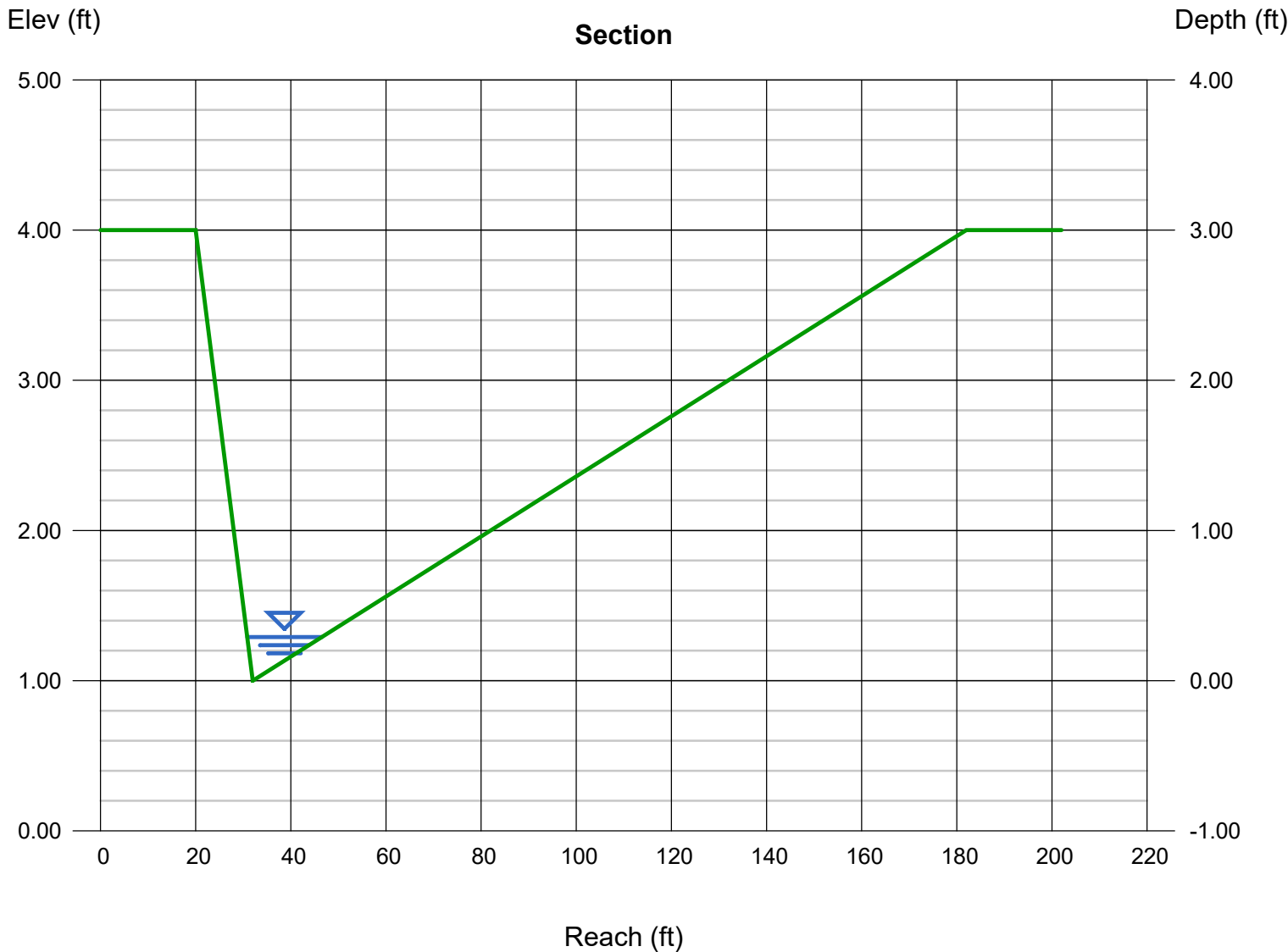
Invert Elev (ft) = 1.00
Slope (%) = 3.00
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 5.23

Highlighted

Depth (ft) = 0.29
Q (cfs) = 5.230
Area (sqft) = 2.27
Velocity (ft/s) = 2.30
Wetted Perim (ft) = 15.70
Crit Depth, Yc (ft) = 0.30
Top Width (ft) = 15.66
EGL (ft) = 0.37



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Friday, Sep 25 2020

Suitable Outfall - Furrow Road Storm Culvert 2 - Pipe 13

Triangular

Side Slopes (z:1) = 50.00, 50.00
Total Depth (ft) = 1.00

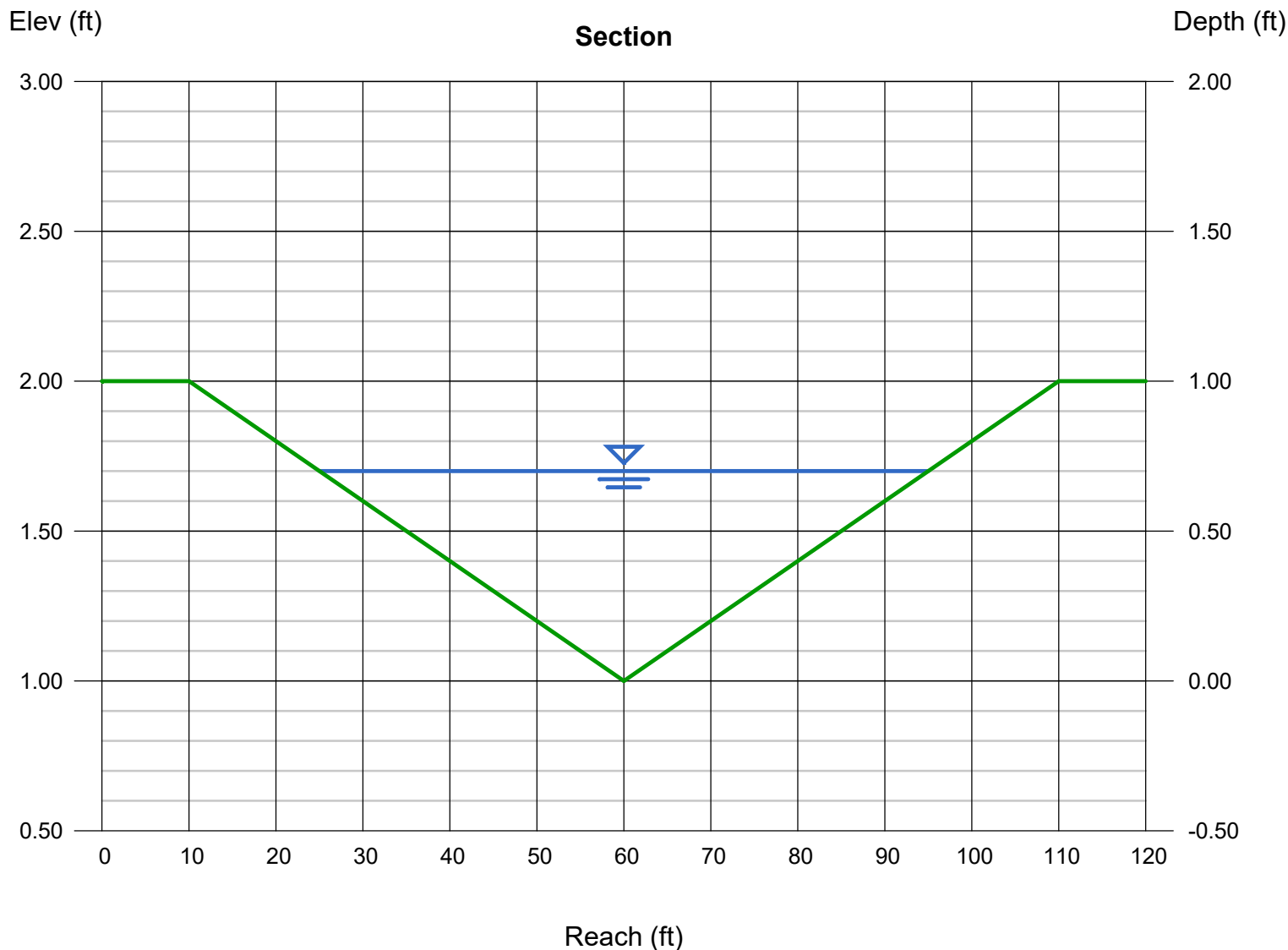
Invert Elev (ft) = 1.00
Slope (%) = 6.00
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 145.60

Highlighted

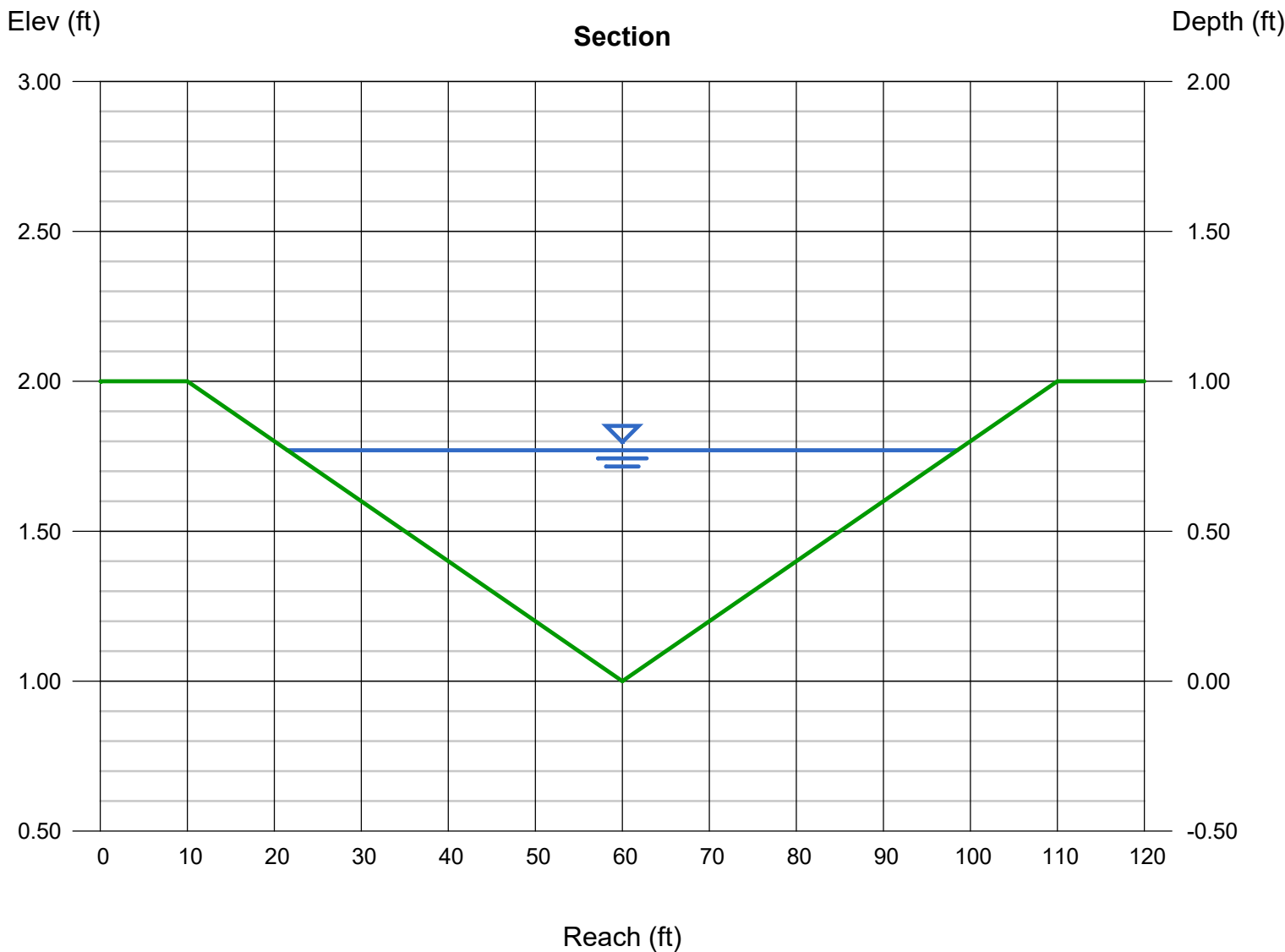
Depth (ft) = 0.70
Q (cfs) = 145.60
Area (sqft) = 24.50
Velocity (ft/s) = 5.94
Wetted Perim (ft) = 70.01
Crit Depth, Yc (ft) = 0.88
Top Width (ft) = 70.00
EGL (ft) = 1.25



Channel Report

Suitable Outfall - Furrow Road Storm Culvert 2 - Pipe 13 - Resulting Riprap Section

Triangular		Highlighted	
Side Slopes (z:1)	= 50.00, 50.00	Depth (ft)	= 0.77
Total Depth (ft)	= 1.00	Q (cfs)	= 145.00
		Area (sqft)	= 29.64
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 4.89
Slope (%)	= 25.00	Wetted Perim (ft)	= 77.02
N-Value	= 0.080	Crit Depth, Yc (ft)	= 0.88
		Top Width (ft)	= 77.00
		EGL (ft)	= 1.14
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 145.00		



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Sep 23 2020

Suitable Outfall - Copper Valley Court Storm Culvert 1 - Pipe 32

Triangular

Side Slopes (z:1) = 3.00, 4.00
Total Depth (ft) = 1.50

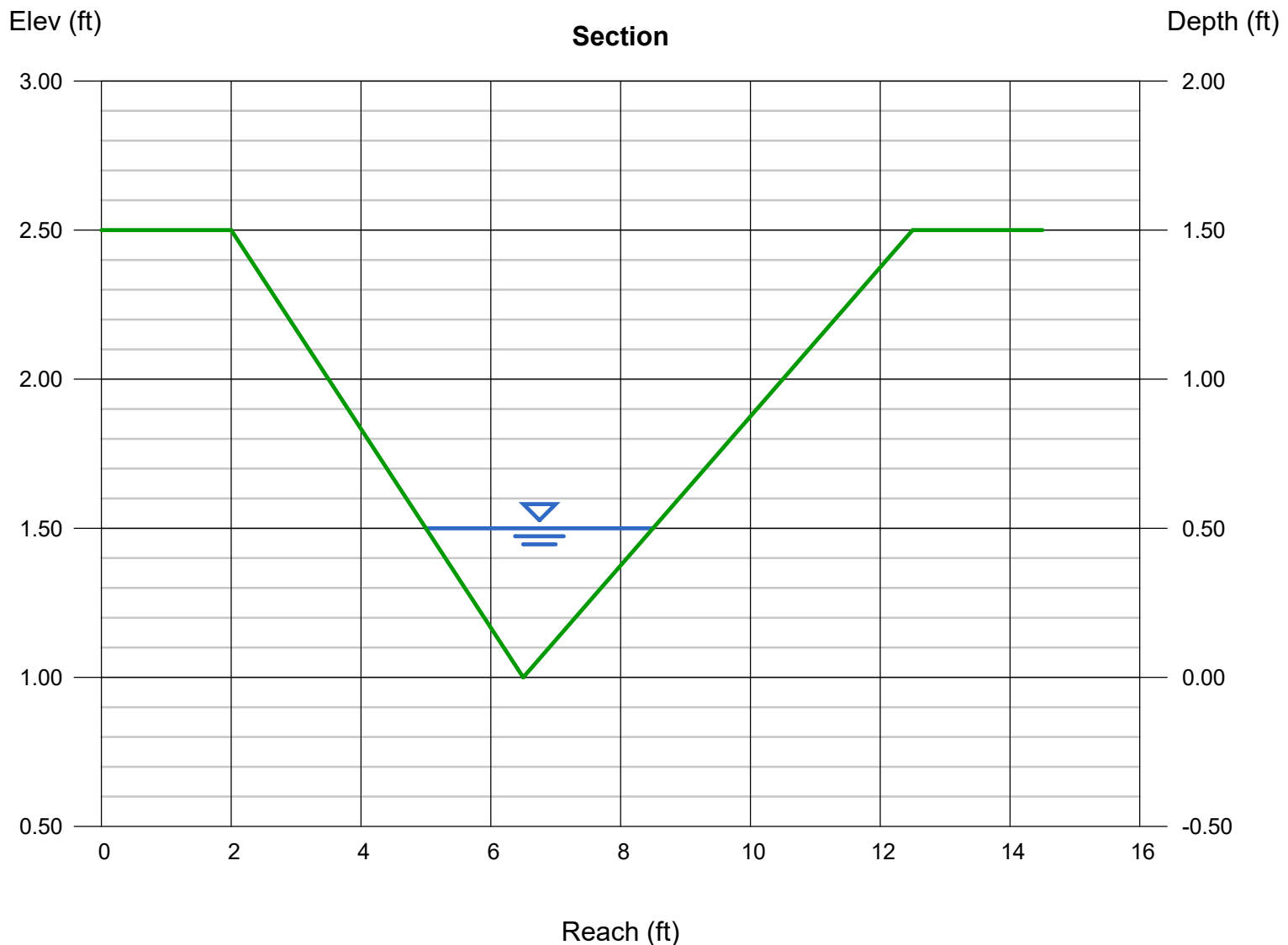
Invert Elev (ft) = 1.00
Slope (%) = 4.40
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 3.39

Highlighted

Depth (ft) = 0.50
Q (cfs) = 3.390
Area (sqft) = 0.87
Velocity (ft/s) = 3.87
Wetted Perim (ft) = 3.64
Crit Depth, Yc (ft) = 0.57
Top Width (ft) = 3.50
EGL (ft) = 0.73



Channel Report

Suitable Outfall - Copper Valley Court Storm Culvert 2 - Pipe 22

Triangular

Side Slopes (z:1) = 4.00, 50.00
Total Depth (ft) = 1.00

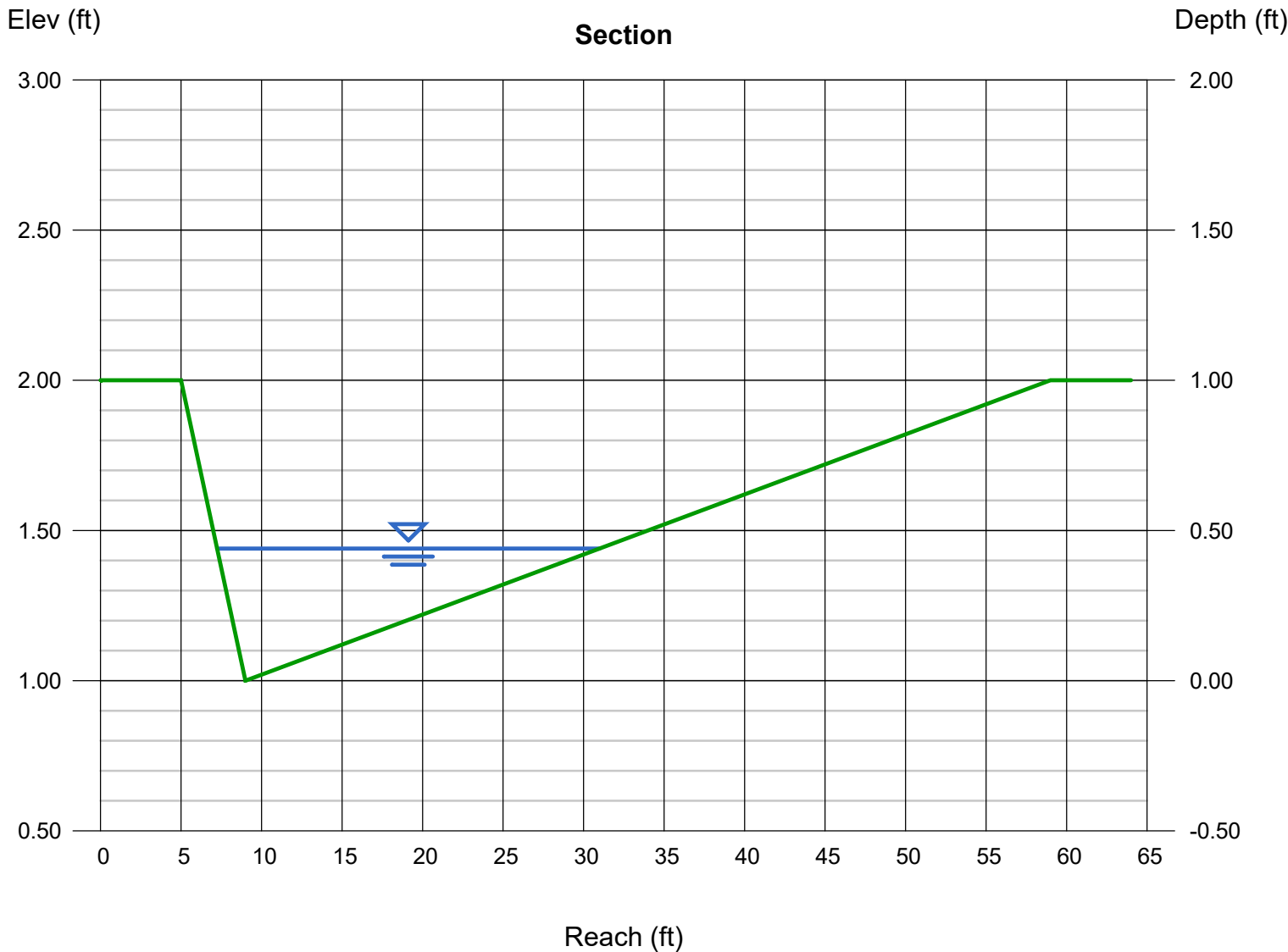
Invert Elev (ft) = 1.00
Slope (%) = 7.00
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 23.90

Highlighted

Depth (ft) = 0.44
Q (cfs) = 23.90
Area (sqft) = 5.23
Velocity (ft/s) = 4.57
Wetted Perim (ft) = 23.82
Crit Depth, Yc (ft) = 0.55
Top Width (ft) = 23.76
EGL (ft) = 0.77



Channel Report

Suitable Outfall - Copper Valley Court Storm Culvert 3 - Pipe 23 - Resulting Riprap Section

Triangular

Side Slopes (z:1) = 50.00, 50.00
Total Depth (ft) = 1.00

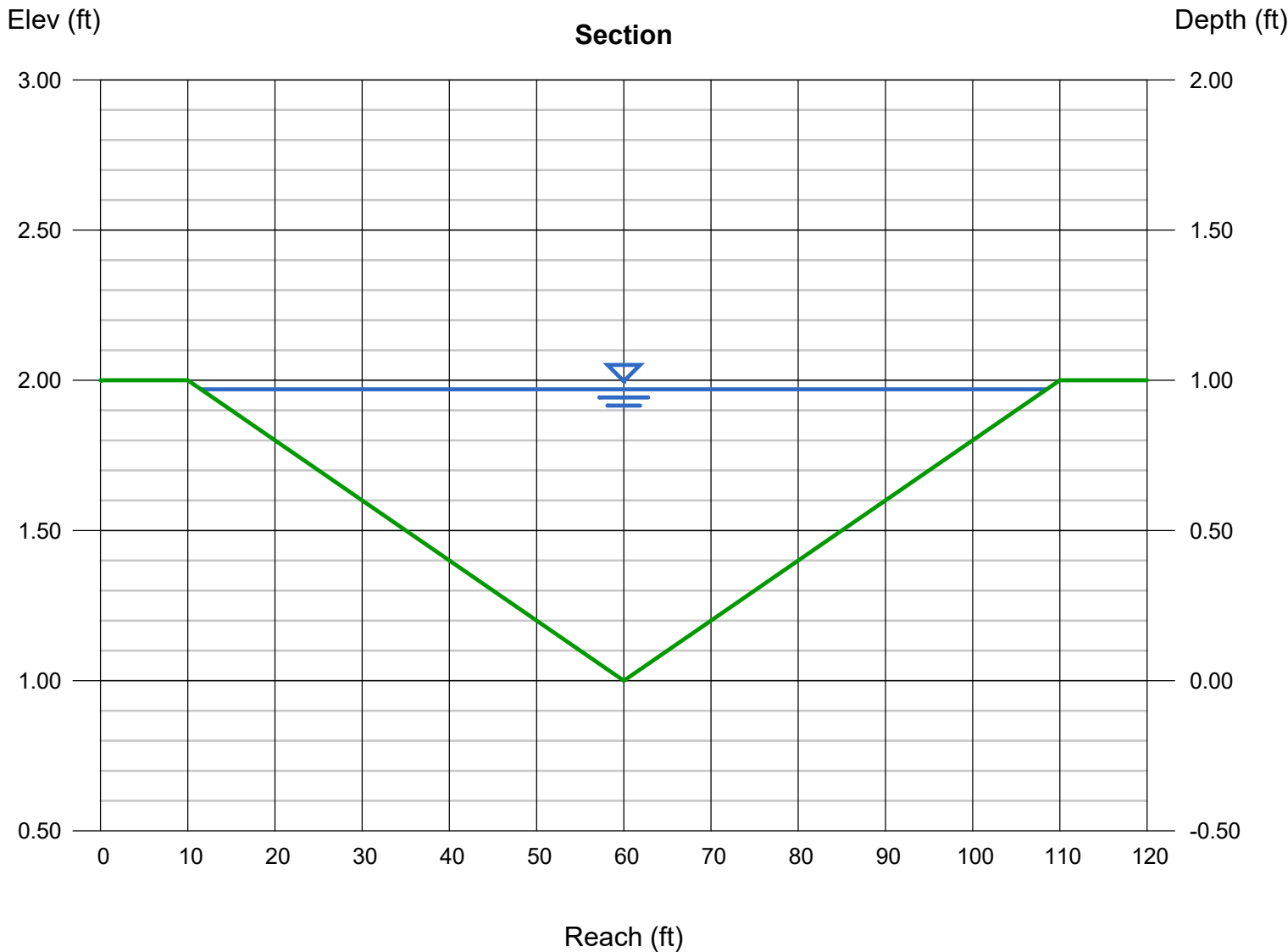
Invert Elev (ft) = 1.00
Slope (%) = 7.00
N-Value = 0.080

Calculations

Compute by: Known Q
Known Q (cfs) = 140.00

Highlighted

Depth (ft) = 0.97
Q (cfs) = 140.00
Area (sqft) = 47.04
Velocity (ft/s) = 2.98
Wetted Perim (ft) = 97.02
Crit Depth, Yc (ft) = 0.87
Top Width (ft) = 97.00
EGL (ft) = 1.11



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Sep 23 2020

Suitable Outfall - Copper Valley Court Storm Culvert 4 - Pipe 30

Triangular

Side Slopes (z:1) = 3.00, 4.00
Total Depth (ft) = 1.00

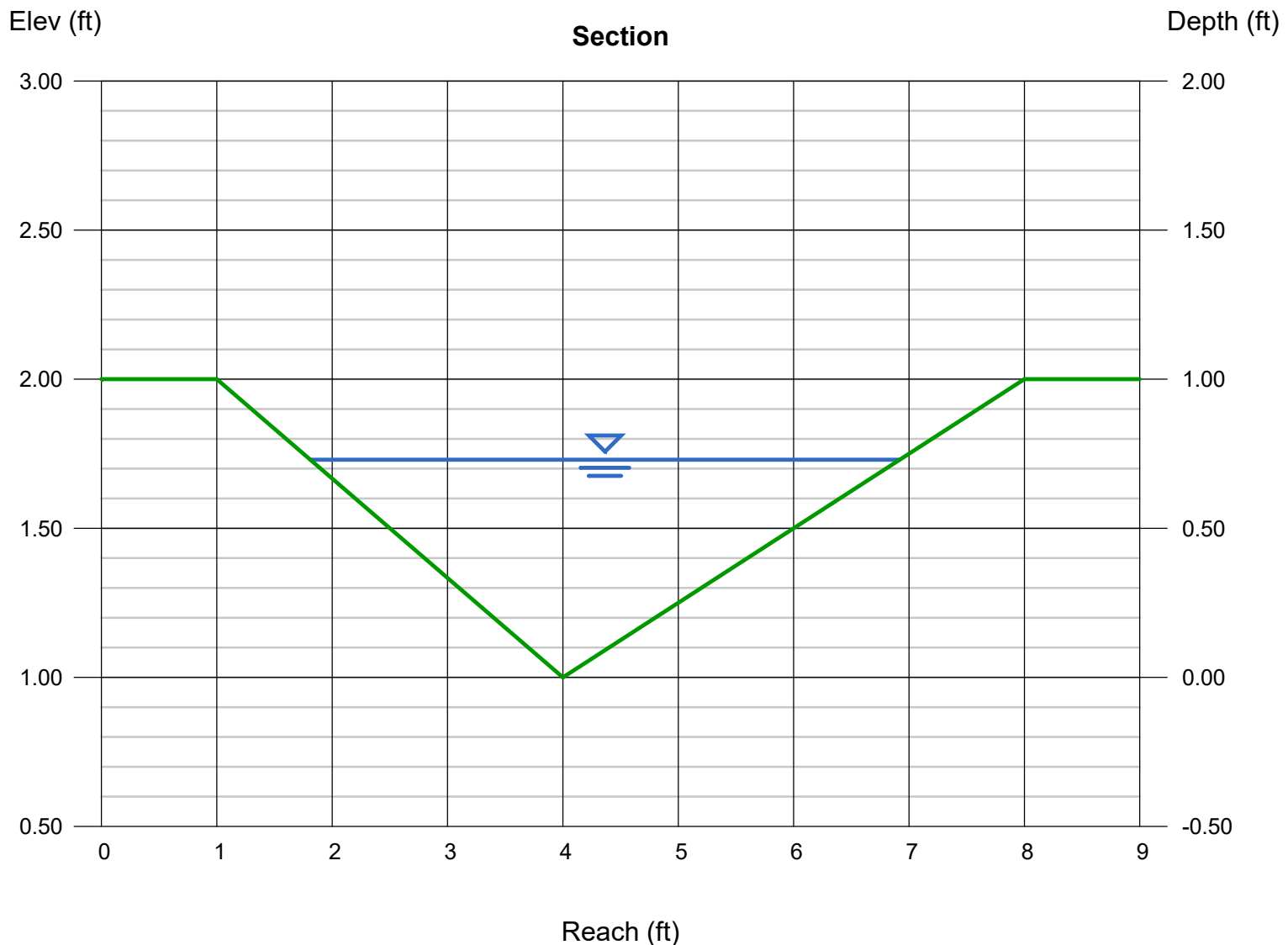
Invert Elev (ft) = 1.00
Slope (%) = 4.50
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 9.50

Highlighted

Depth (ft) = 0.73
Q (cfs) = 9.500
Area (sqft) = 1.87
Velocity (ft/s) = 5.09
Wetted Perim (ft) = 5.32
Crit Depth, Yc (ft) = 0.86
Top Width (ft) = 5.11
EGL (ft) = 1.13



Channel Report

Suitable Outfall - Grandwood Drive Storm Culvert 1 - Pipe 28

Triangular

Side Slopes (z:1) = 20.00, 20.00
Total Depth (ft) = 1.00

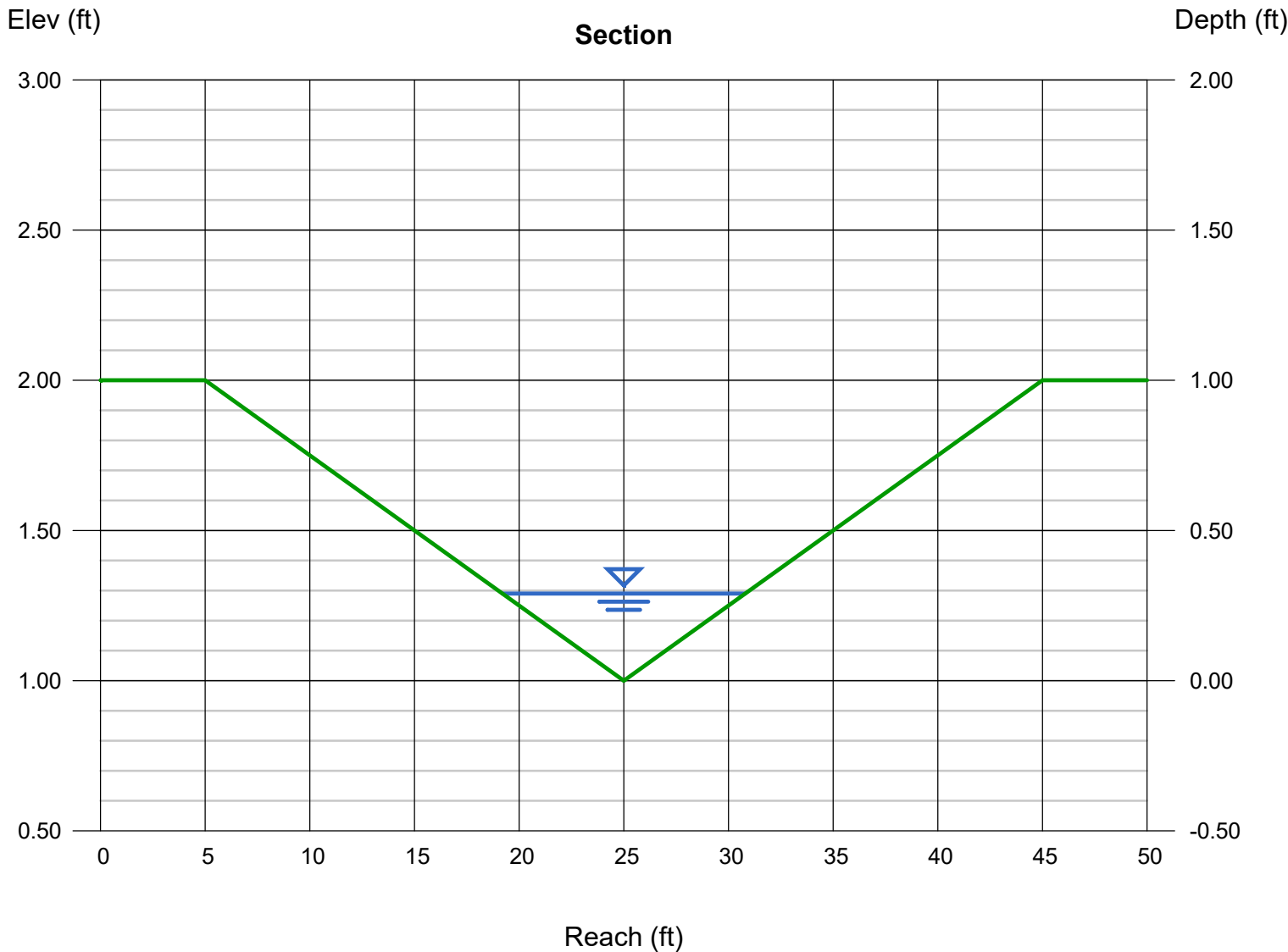
Invert Elev (ft) = 1.00
Slope (%) = 6.00
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 5.30

Highlighted

Depth (ft) = 0.29
Q (cfs) = 5.300
Area (sqft) = 1.68
Velocity (ft/s) = 3.15
Wetted Perim (ft) = 11.61
Crit Depth, Yc (ft) = 0.34
Top Width (ft) = 11.60
EGL (ft) = 0.44



Channel Report

Suitable Outfall - Grandwood Drive Storm Culvert 2 - Pipe 37

Triangular

Side Slopes (z:1) = 50.00, 50.00
Total Depth (ft) = 1.00

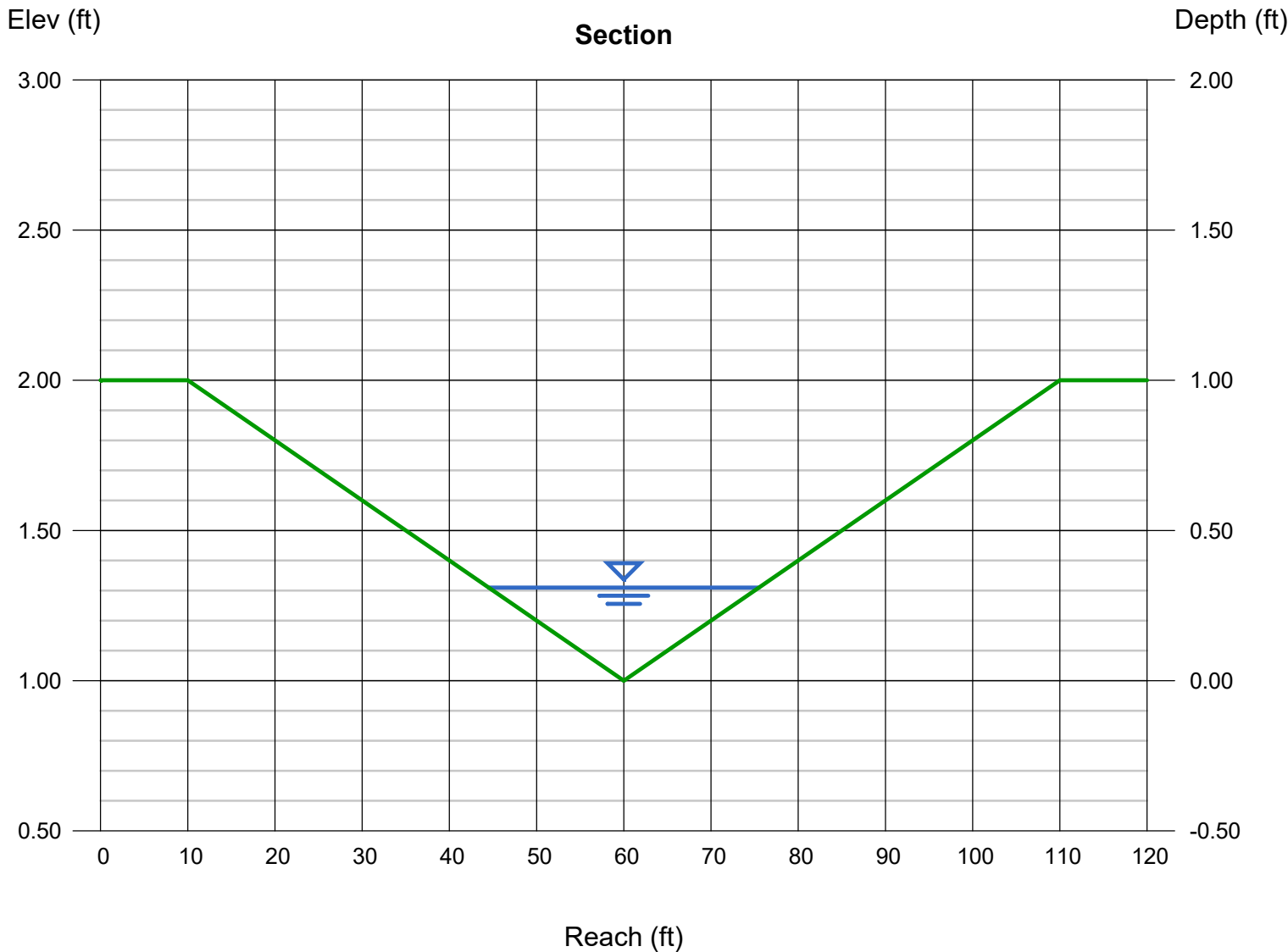
Invert Elev (ft) = 1.00
Slope (%) = 7.00
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 17.80

Highlighted

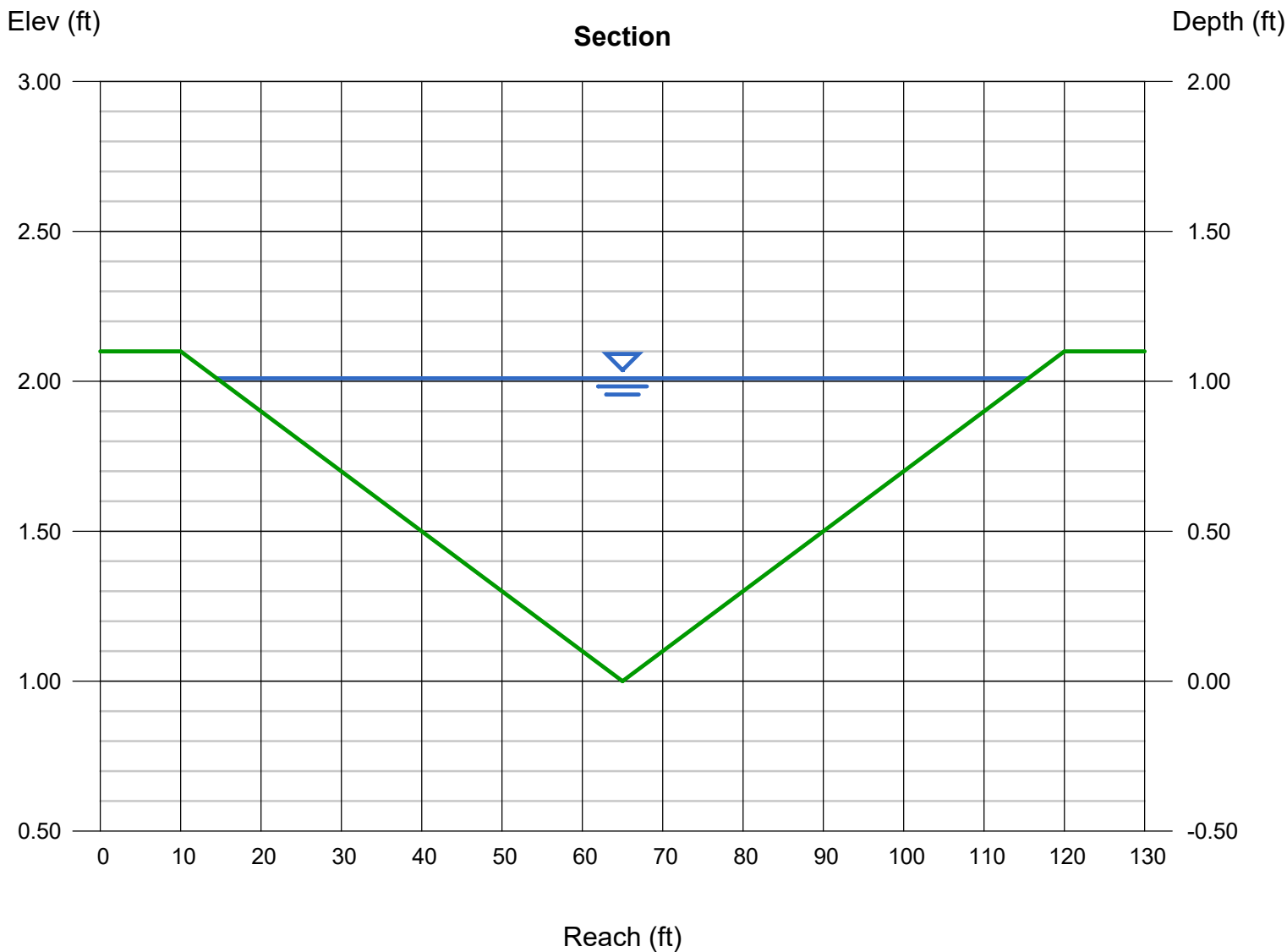
Depth (ft) = 0.31
Q (cfs) = 17.80
Area (sqft) = 4.80
Velocity (ft/s) = 3.70
Wetted Perim (ft) = 31.01
Crit Depth, Yc (ft) = 0.38
Top Width (ft) = 31.00
EGL (ft) = 0.52



Channel Report

Suitable Outfall - Grandwood Drive Storm Culvert 3 - Pipe 34 - Resulting Riprap Section

Triangular		Highlighted	
Side Slopes (z:1)	= 50.00, 50.00	Depth (ft)	= 1.01
Total Depth (ft)	= 1.10	Q (cfs)	= 131.20
		Area (sqft)	= 51.00
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.57
Slope (%)	= 5.00	Wetted Perim (ft)	= 101.02
N-Value	= 0.080	Crit Depth, Yc (ft)	= 0.85
		Top Width (ft)	= 101.00
		EGL (ft)	= 1.11
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 131.20		



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Sep 23 2020

Suitable Outfall - Emergency Access Storm Culvert - Pipe 39

Triangular

Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 1.00

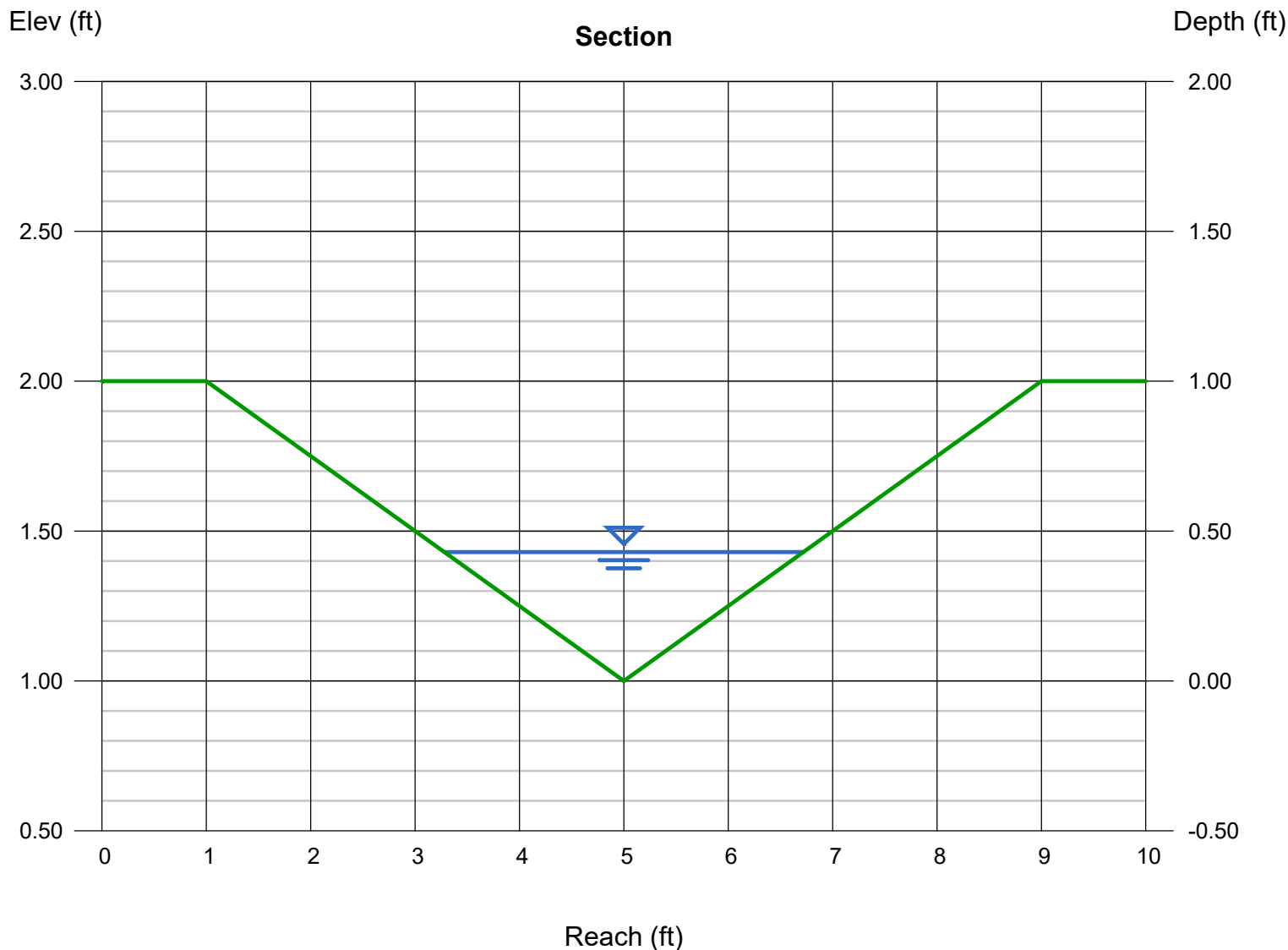
Invert Elev (ft) = 1.00
Slope (%) = 8.00
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 3.60

Highlighted

Depth (ft) = 0.43
Q (cfs) = 3.600
Area (sqft) = 0.74
Velocity (ft/s) = 4.87
Wetted Perim (ft) = 3.55
Crit Depth, Yc (ft) = 0.56
Top Width (ft) = 3.44
EGL (ft) = 0.80



Channel Report

Suitable Outfall - Lot 22 Detention Outfall - Pipe 38

Triangular

Side Slopes (z:1) = 20.00, 20.00
Total Depth (ft) = 1.00

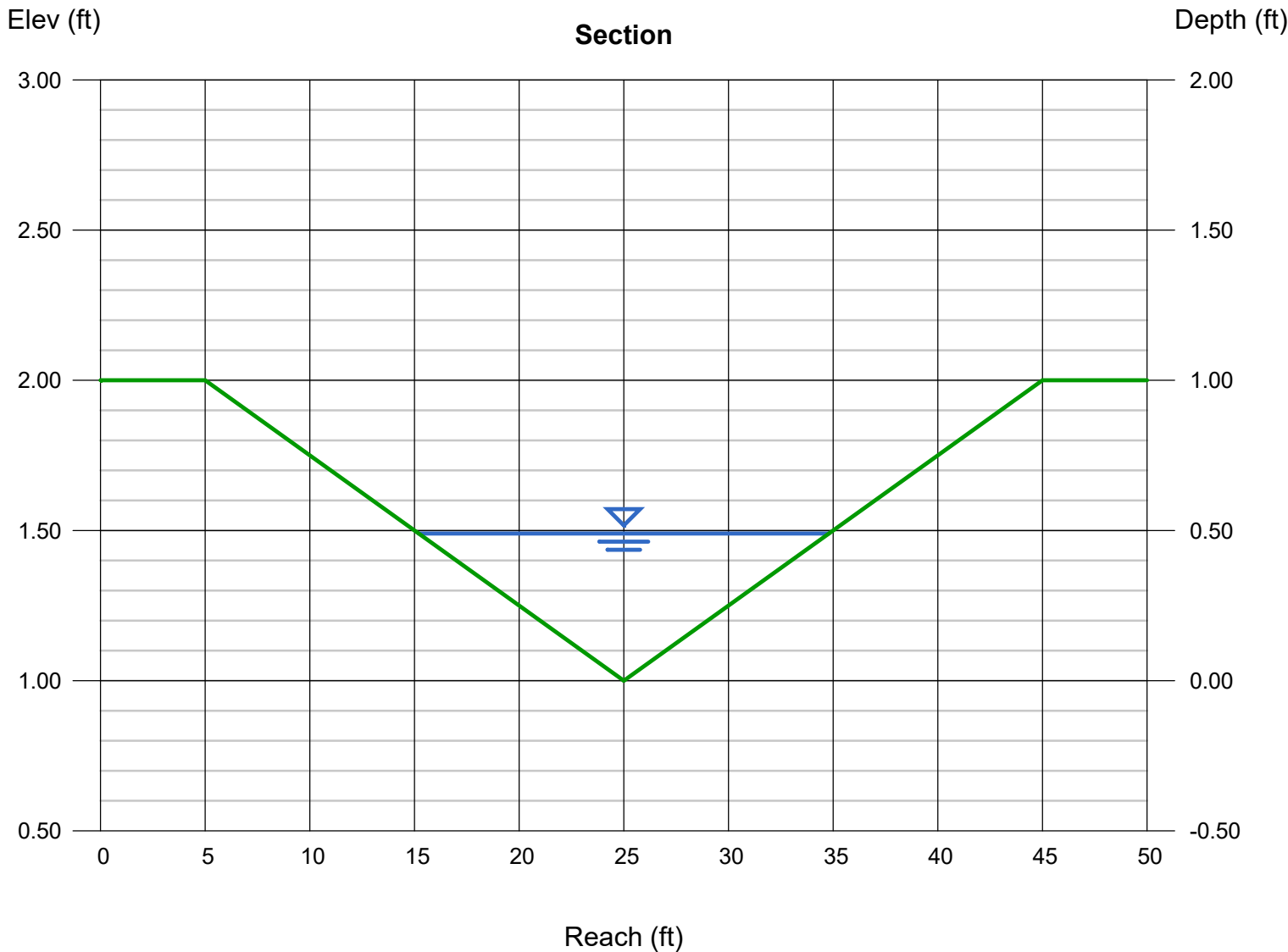
Invert Elev (ft) = 1.00
Slope (%) = 2.00
N-Value = 0.030

Calculations

Compute by: Known Q
Known Q (cfs) = 13.00

Highlighted

Depth (ft) = 0.49
Q (cfs) = 13.00
Area (sqft) = 4.80
Velocity (ft/s) = 2.71
Wetted Perim (ft) = 19.62
Crit Depth, Yc (ft) = 0.49
Top Width (ft) = 19.60
EGL (ft) = 0.60



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Friday, Dec 18 2020

DP C-2D Riprap Rundown Swale

Triangular

Side Slopes (z:1) = 3.00, 3.00

Total Depth (ft) = 2.00

Invert Elev (ft) = 1.00

Slope (%) = 20.00

N-Value = 0.350

Calculations

Compute by: Known Q

Known Q (cfs) = 3.30

Highlighted

Depth (ft) = 0.99

Q (cfs) = 3.300

Area (sqft) = 2.94

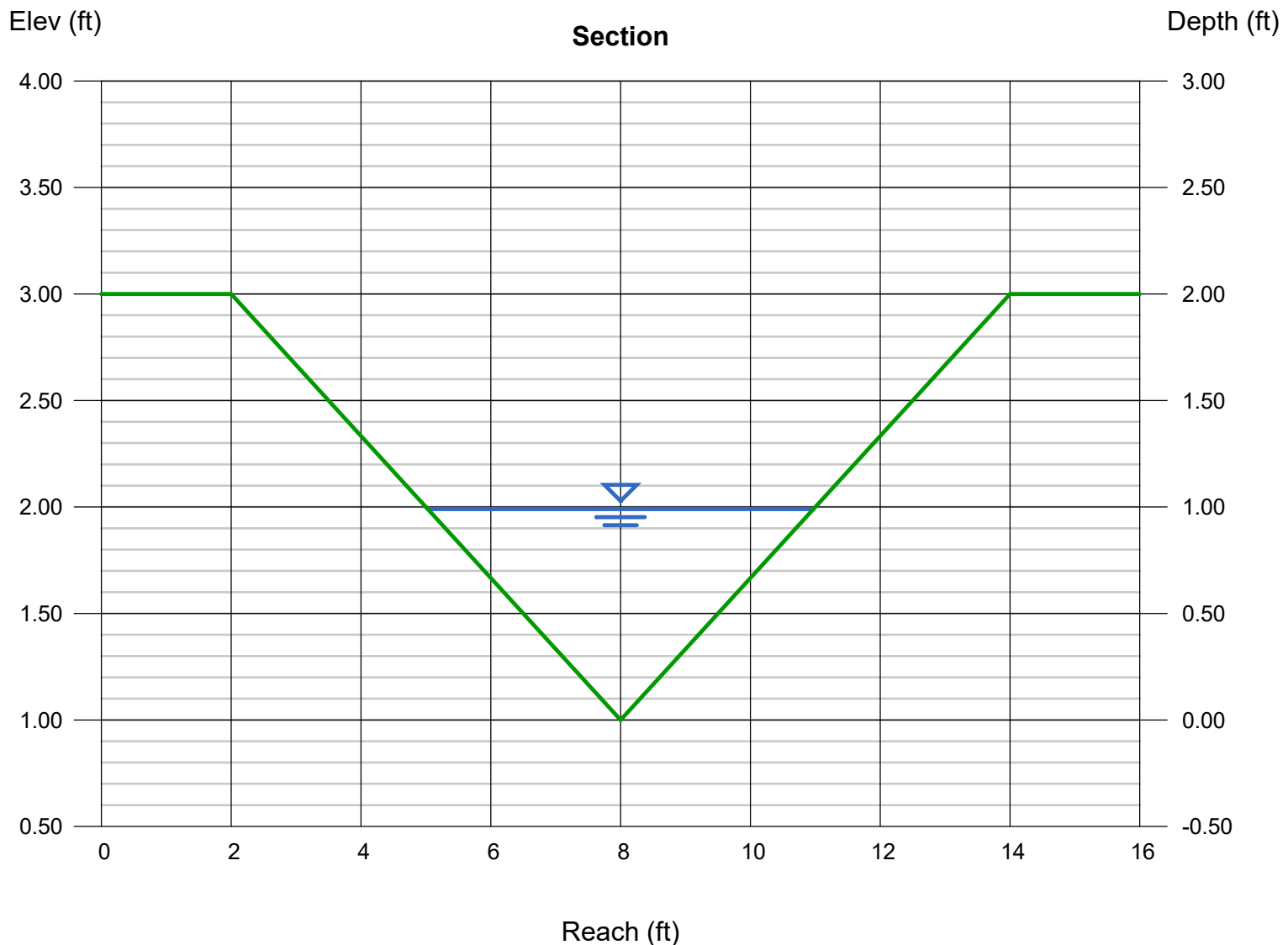
Velocity (ft/s) = 1.12

Wetted Perim (ft) = 6.26

Crit Depth, Yc (ft) = 0.60

Top Width (ft) = 5.94

EGL (ft) = 1.01



Hydraulic Analysis Report

Project Data

Project Title:

Grandwood Ranch - Furrow Road Roadside Ditch Calculation

Designer:

Project Date: Tuesday, March 31, 2020

Project Units: U.S. Customary Units

Notes:

Channel Analysis: Channel Analysis Furrow Road

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Longitudinal Slope: 0.0990 ft/ft

Manning's n: 0.0350

Flow: 2.5000 cfs

Note: The maximum acreage contributing to one roadside swale along Furrow Road is approximately 1.3 acres at roughly 16% of the total acreage of Basin D-2. Applying this proportion to flows, the resulting 16% of the total runoff of Basin D-2 equates to approximately 1.5 cfs. To be conservative, adding an additional 15% results in 1.75 cfs within the roadside swale at the 100-year event. As shown in the channel report, a maximum of 2.5 cfs can be seen while remaining under the maximum swale velocity of 5 ft/sec.

Result Parameters

Depth: 0.4005 ft

Area of Flow: 0.5615 ft²

Wetted Perimeter: 2.9180 ft

Hydraulic Radius: 0.1924 ft

Average Velocity: 4.4525 ft/s

Top Width: 2.8037 ft

Froude Number: 1.7534

Critical Depth: 0.5035 ft

Critical Velocity: 2.8179 ft/s

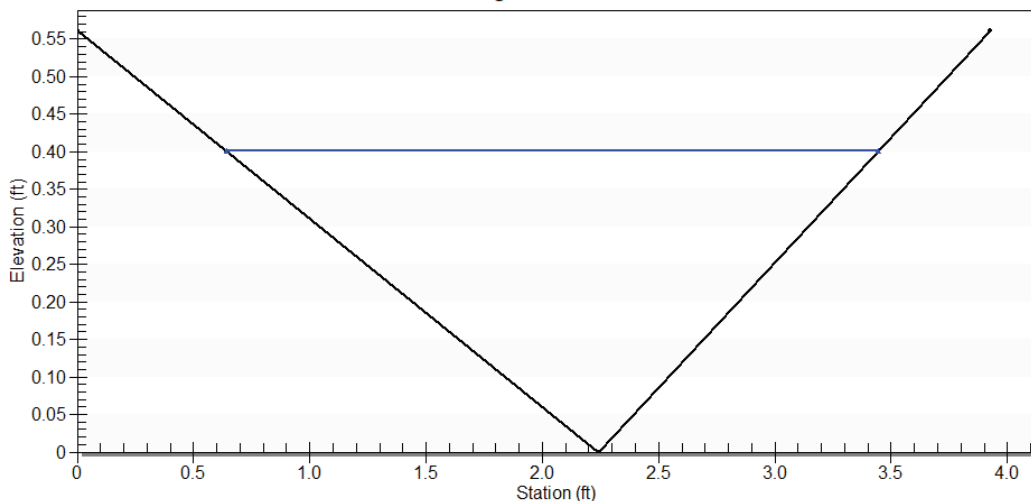
Critical Slope: 0.0292 ft/ft

Critical Top Width: 3.60 ft

Calculated Max Shear Stress: 2.4743 lb/ft²

Calculated Avg Shear Stress: 1.1887 lb/ft²

Triangular Channel



Hydraulic Analysis Report

Project Data

Project Title: Grandwood Ranch - Grandwood Drive Roadside Ditch Calculation

Designer:

Project Date: Tuesday, March 31, 2020

Project Units: U.S. Customary Units

Notes:

Channel Analysis: Channel Analysis Grandwood Drive

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Longitudinal Slope: 0.0230 ft/ft

Manning's n: 0.0350

Flow: 27.7000 cfs

Result Parameters

Depth: 1.2978 ft

Area of Flow: 5.8946 ft²

Wetted Perimeter: 9.4547 ft

Hydraulic Radius: 0.6235 ft

Average Velocity: 4.6992 ft/s

Top Width: 9.0843 ft

Froude Number: 1.0280

Critical Depth: 1.3176 ft

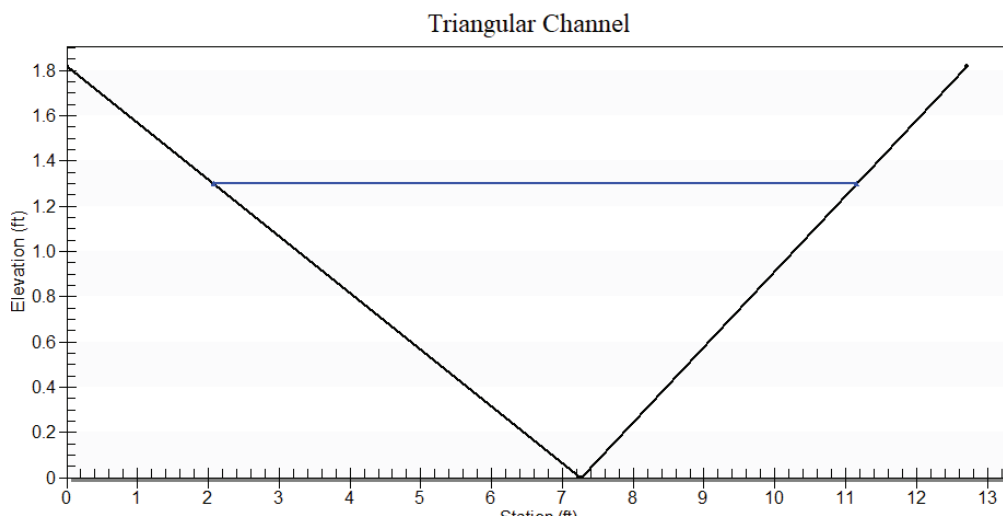
Critical Velocity: 4.5586 ft/s

Critical Slope: 0.0212 ft/ft

Critical Top Width: 9.42 ft

Calculated Max Shear Stress: 1.8625 lb/ft²

Calculated Avg Shear Stress: 0.8948 lb/ft²



APPENDIX B

STANDARD DESIGN CHARTS AND TABLES

El Paso County Drainage Basin Fees

Resolution No. 19-441

Basin Number	Receiving Waters	Year Studied	Drainage Basin Name	2020 Drainage Fee (per Impervious Acre)	2020 Bridge Fee (per Impervious Acre)
<u>Drainage Basins with DBPS's:</u>					
CHMS0200	Chico Creek	2013	Haegler Ranch	\$10,737	\$1,585
CHWS1200	Chico Creek	2001	Bennett Ranch	\$12,020	\$4,611
CHWS1400	Chico Creek	2013	Falcon	\$30,807	\$4,232
FOFO2000	Fountain Creek	2001	West Fork Jimmy Camp Creek	\$13,066	\$3,866
FOFO2600	Fountain Creek	1991*	Big Johnson / Crews Gulch	\$19,084	\$2,464
FOFO2800	Fountain Creek	1988*	Widefield	\$19,084	\$0
FOFO2900	Fountain Creek	1988*	Security	\$19,084	\$0
FOFO3000	Fountain Creek	1991*	Windmill Gulch	\$19,084	\$286
FOFO3100 / FOFO3200	Fountain Creek	1988*	Carson Street / Little Johnson	\$11,640	\$0
FOFO3400	Fountain Creek	1984*	Peterson Field	\$13,764	\$1,044
FOFO3600	Fountain Creek	1991*	Fisher's Canyon	\$19,084	\$0
FOFO4000	Fountain Creek	1996	Sand Creek	\$19,698	\$8,057
FOFO4200	Fountain Creek	1977	Spring Creek	\$9,897	\$0
FOFO4600	Fountain Creek	1984*	Southwest Area	\$19,084	\$0
FOFO4800	Fountain Creek	1991	Bear Creek	\$19,084	\$1,044
FOFO5400	Fountain Creek	1977	21st Street	\$5,742	\$0
FOFO5600	Fountain Creek	1964	19th Street	\$3,756	\$0
FOFO5800	Fountain Creek	1964	Camp Creek	\$2,115	\$0
FOMO0400	Monument Creek	1986*	Mesa	\$9,982	\$0
FOMO1000	Monument Creek	1981	Douglas Creek	\$12,001	\$265
FOMO1200	Monument Creek	1977	Templeton Gap	\$12,320	\$286
FOMO1400	Monument Creek	1976	Pope's Bluff	\$3,823	\$652
FOMO1600	Monument Creek	1976	South Rockrimmon	\$4,486	\$0
FOMO1800	Monument Creek	1973	North Rockrimmon	\$5,742	\$0
FOMO2000	Monument Creek	1971	Pulpit Rock	\$6,328	\$0
FOMO2200	Monument Creek	1994	Cottonwood Creek / S. Pine	\$19,084	\$1,044
FOMO2400	Monument Creek	1966	Dry Creek	\$15,065	\$545
FOMO3600	Monument Creek	1989*	Black Squirrel Creek	\$8,664	\$545
FOMO3700	Monument Creek	1987*	Middle Tributary	\$15,925	\$0
FOMO3800	Monument Creek	1987*	Monument Branch	\$19,084	\$0
FOMO4000	Monument Creek	1996	Smith Creek	\$7,780	\$1,044
FOMO4200	Monument Creek	1989*	Black Forest	\$19,084	\$520
FOMO5200	Monument Creek	1993*	Dirty Woman Creek	\$19,084	\$1,044
FOMO5300	Fountain Creek	1993*	Crystal Creek	\$19,084	\$1,044
<u>Miscellaneous Drainage Basins: ¹</u>					
CHBS0800	Chico Creek		Book Ranch	\$17,906	\$2,592
CHEC0400	Chico Creek		Upper East Chico	\$9,755	\$283
CHWS0200	Chico Creek		Telephone Exchange	\$10,718	\$251
CHWS0400	Chico Creek		Livestock Company	\$17,655	\$210
CHWS0600	Chico Creek		West Squirrel	\$9,203	\$3,819
CHWS0800	Chico Creek		Solberg Ranch	\$19,084	\$0
FOFO1200	Fountain Creek		Crooked Canyon	\$5,761	\$0
FOFO1400	Fountain Creek		Calhan Reservoir	\$4,810	\$280
FOFO1600	Fountain Creek		Sand Canyon	\$3,475	\$0
FOFO2000	Fountain Creek		Jimmy Camp Creek ³	\$19,084	\$893
FOFO2200	Fountain Creek		Fort Carson	\$15,065	\$545
FOFO2700	Fountain Creek		West Little Johnson	\$1,257	\$0
FOFO3800	Fountain Creek		Stratton	\$9,154	\$409
FOFO5000	Fountain Creek		Midland	\$15,065	\$545
FOFO6000	Fountain Creek		Palmer Trail	\$15,065	\$545
FOFO6800	Fountain Creek		Black Canyon	\$15,065	\$545
FOMO4600	Monument Creek		Beaver Creek	\$11,409	\$0
FOMO3000	Monument Creek		Kettle Creek	\$10,305	\$0
FOMO3400	Monument Creek		Elkhorn	\$1,731	\$0
FOMO5000	Monument Creek		Monument Rock	\$8,272	\$0
FOMO5400	Monument Creek		Palmer Lake	\$13,226	\$0
FOMO5600	Monument Creek		Raspberry Mountain	\$4,449	\$0
PLPL0200	Monument Creek		Bald Mountain	\$9,481	\$0
<u>Interim Drainage Basins: ²</u>					
FOFO1800	Fountain Creek		Little Fountain Creek	\$2,440	\$0
FOMO4400	Monument Creek		Jackson Creek	\$7,554	\$0
FOMO4800	Monument Creek		Teachout Creek	\$5,245	\$788

1. The miscellaneous drainage fee previous to September 1999 resolution was the average of all drainage fees for basins with Basin Planning Studies performed within the last 14 years.

2. Interim Drainage Fees are based upon draft Drainage Basin Planning Studies or the Drainage Basin Identification and Fee Estimation Report. (Best available information suitable for setting a fee.)

3. This is an interim fee and will be adjusted when a DBPS is completed. In addition to the Drainage Fee a surety in the amount of \$7,285 per impervious acre shall be provided to secure payment of additional fees in the event that the DBPS results in a fee greater than the current fee. Fees paid in excess of the future revised fee will be reimbursed. See Resolution 06-326 (9/14/06) and Resolution 16-320 (9/07/16).

depths over the duration of the storm as a fraction of the 1-hour depth and is also shown in Figure 6-19. By applying the 1-hour depths shown in Table 6-2 to the values shown in Table 6-3, a short-duration project design storm can be developed for any return period storm from a 2-year up to 100-year frequency. By applying the appropriate 1-hour depth for other project locations, a project design storm can be created for any location.

Table 6-3. 2-Hour Design Storm Distribution, $\leq 1 \text{ mi}^2$

Time (minutes)	Fraction of 1-Hour Rainfall Depth	Time (minutes)	Fraction of 1-Hour Rainfall Depth
5	0.014	65	1.004
10	0.046	70	1.018
15	0.079	75	1.030
20	0.120	80	1.041
25	0.179	85	1.052
30	0.258	90	1.063
35	0.421	95	1.072
40	0.712	100	1.082
45	0.824	105	1.091
50	0.892	110	1.100
55	0.935	115	1.109
60	0.972	120	1.119

- **Frontal Storms:** The characteristics of longer-duration “frontal storms” (general) is less well understood than the shorter duration thunderstorms and should be studied further. However, some events of this nature have been observed, such as the April 1999 storm which produced flooding on Fountain Creek, showing that these types of events do occur and tend to produce hazardous flood flows. In addition, modeling of the Jimmy Camp Creek drainage basin using the 24-hour, Type II distribution shows that it produces results reasonably comparably to recorded flow data. Therefore, the NRCS 24-hour Type II distribution has replaced the Type IIa distribution as the standard, long-duration design storm. This distribution can be applied to drainage basins up to 10 square miles without a DARF correction and is shown in Table 6-4. This distribution is included as a standard storm option in the HEC-HMS program.

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

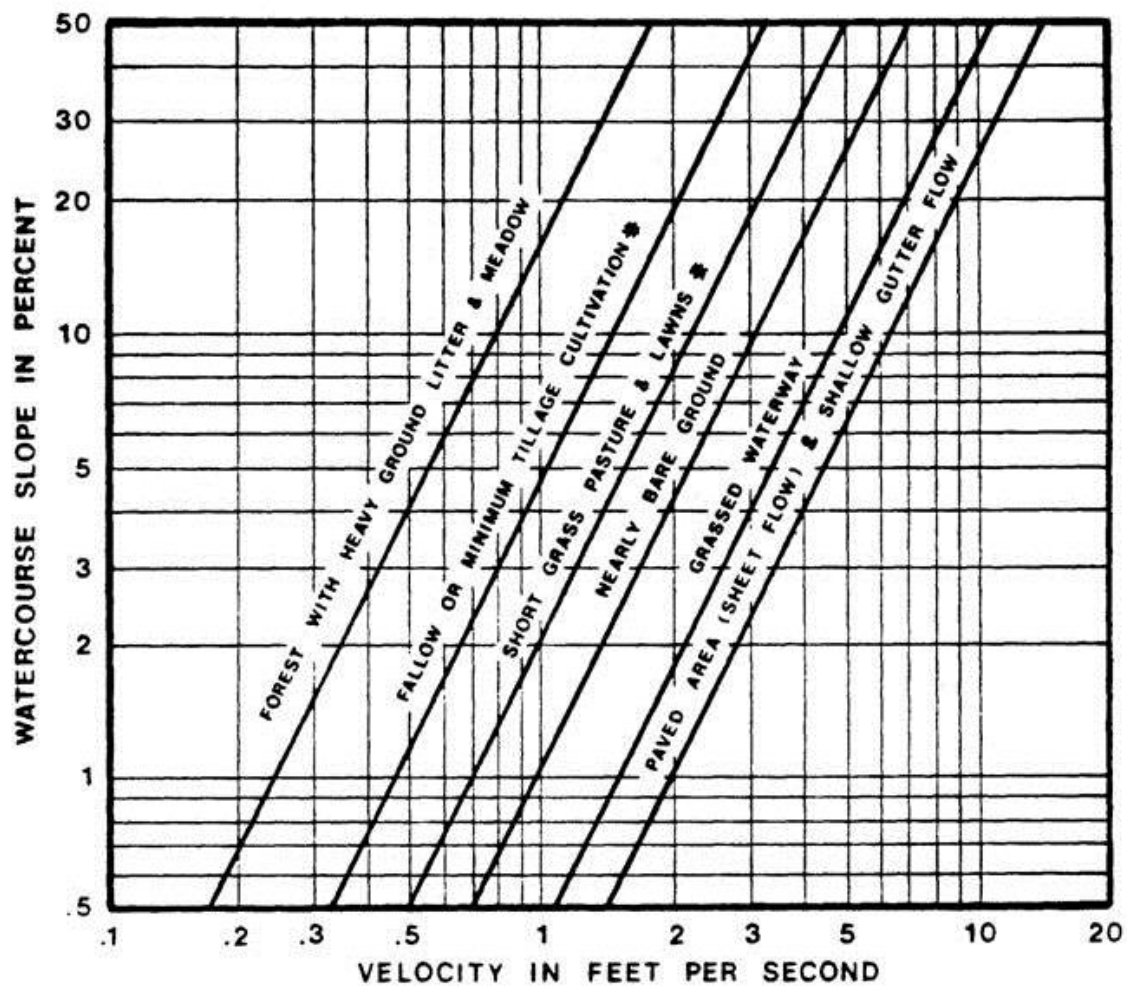
Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_r) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_r) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

Figure 6-25. Estimate of Average Concentrated Shallow Flow



**Table 6-9. NRCS Curve Numbers for Pre-Development
Thunderstorms Conditions (ARC I)**

Fully Developed Urban Areas (vegetation established) ¹	Treatment	Hydrologic Condition	% I	Pre-Development CN			
				HSG A	HSG B	HSG C	HSG D
Open space (lawns, parks, golf courses, cemeteries, etc.):							
Poor condition (grass cover < 50%)	-----	-----	---	47	61	72	77
Fair condition (grass cover 50% to 75%)	-----	-----	---	29	48	61	69
Good condition (grass cover > 75%)	-----	-----	---	21	40	54	63
Impervious areas:							
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	-----	-----	---	95	95	95	95
Streets and roads:							
Paved; curbs and storm sewers (excluding right-of-way)	-----	-----	---	95	95	95	95
Paved; open ditches (including right-of-way)	-----	-----	---	67	77	83	85
Gravel (including right-of-way)	-----	-----	---	57	70	77	81
Dirt (including right-of-way)	-----	-----	---	52	66	74	77
Western desert urban areas:							
Natural desert landscaping (pervious areas only)	-----	-----	---	42	58	70	75
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)	-----	-----	---	91	91	91	91
Developing Urban Areas¹	Treatment²	Hydrologic Condition³	% I	HSG A	HSG B	HSG C	HSG D
Newly graded areas (pervious areas only, no vegetation)	-----	-----	---	58	72	81	87
Cultivated Agricultural Lands¹	Treatment	Hydrologic Condition	% I	HSG A	HSG B	HSG C	HSG D
Fallow	Bare soil	-----	---	58	72	81	87
	Crop residue cover (CR)	Poor	---	57	70	79	85
		Good	---	54	67	75	79
Row crops	Straight row (SR)	Poor	---	52	64	75	81
		Good	---	46	60	70	77
	SR + CR	Poor	---	51	63	74	79
		Good	---	43	56	66	70
	Contoured (C)	Poor	---	49	61	69	75
		Good	---	44	56	66	72
	C + CR	Poor	---	48	60	67	74
		Good	---	43	54	64	70
	Contoured & terraced (C&T)	Poor	---	45	54	63	66
		Good	---	41	51	60	64
	C&T+ CR	Poor	---	44	53	61	64
		Good	---	40	49	58	63
Small grain	SR	Poor	---	44	57	69	75
		Good	---	42	56	67	74
	SR + CR	Poor	---	43	56	67	72
		Good	---	39	52	63	69
	C	Poor	---	42	54	66	70
		Good	---	40	53	64	69
	C + CR Poor	Poor	---	41	53	64	69
		Good	---	39	52	63	67
	C&T	Poor	---	40	52	61	66
		Good	---	38	49	60	64
	C&T+ CR	Poor	---	39	51	60	64
		Good	---	37	48	58	63
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	---	45	58	70	77
		Good	---	37	52	64	70
	C	Poor	---	43	56	67	70
		Good	---	34	48	60	67
	C&T	Poor	---	42	53	63	67
		Good	---	30	46	57	63

Table 6-9. (continued)

Other Agricultural Lands¹	Treatment	Hydrologic Condition	% I	HSG A	HSG B	HSG C	HSG D
Pasture, grassland, or range—continuous forage for grazing ⁴	-----	Poor	---	47	61	72	77
	-----	Fair	---	29	48	61	69
	-----	Good	---	21	40	54	63
Meadow—continuous grass, protected from grazing and generally mowed for hay	-----	-----	---	15	37	51	60
Brush—brush-weed-grass mixture with brush the major element ⁵	-----	Poor	---	28	46	58	67
	-----	Fair	---	18	35	49	58
	-----	Good	---	15	28	44	53
Woods—grass combination (orchard or tree farm) ⁶	-----	Poor	---	36	53	66	72
	-----	Fair	---	24	44	57	66
	-----	Good	---	17	37	52	61
Woods ⁷	-----	Poor	---	26	45	58	67
	-----	Fair	---	19	39	53	61
	-----	Good	---	15	34	49	58
Farmsteads—buildings, lanes, driveways, and surrounding lots	-----	-----	---	38	54	66	72
Arid and Semi-arid Rangelands¹	Treatment	Hydrologic Condition⁸	% I	HSG A	HSG B	HSG C	HSG D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element	-----	Poor	---	-----	63	74	85
	-----	Fair	---	-----	51	64	77
	-----	Good	---	-----	41	54	70
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	-----	Poor	---	-----	45	54	61
	-----	Fair	---	-----	28	36	42
	-----	Good	---	-----	15	23	28
Pinyon-juniper—pinyon, juniper, or both; grass understory	-----	Poor	---	-----	56	70	77
	-----	Fair	---	-----	37	53	63
	-----	Good	---	-----	23	40	51
Sagebrush with grass understory	-----	Poor	---	-----	46	63	70
	-----	Fair	---	-----	30	42	49
	-----	Good	---	-----	18	27	34
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus	-----	Poor	---	42	58	70	75
	-----	Fair	---	34	52	64	72
	-----	Good	---	29	47	61	69

¹ Average runoff condition, and Ia = 0.1S.² Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.³ Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness. Poor: Factors impair infiltration and tend to increase runoff. Good: Factors encourage average and better than average infiltration and tend to decrease runoff.⁴ Poor: <50% ground cover or heavily grazed with no mulch. Fair: 50 to 75% ground cover and not heavily grazed. Good: > 75% ground cover and lightly or only occasionally grazed.⁵ Poor: <50% ground cover. Fair: 50 to 75% ground cover. Good: >75% ground cover.⁶ CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.⁷ Poor: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning. Fair: Woods are grazed but not burned, and some forest litter covers the soil. Good: Woods are protected from grazing, and litter and brush adequately cover the soil.⁸ Poor: <30% ground cover (litter, grass, and brush overstory). Fair: 30 to 70% ground cover. Good: > 70% ground cover.

**Table 6-10. NRCS Curve Numbers for Frontal Storms & Thunderstorms for
Developed Conditions (ARCII)**

Fully Developed Urban Areas (vegetation established) ¹	Treatment	Hydrologic Condition	% I	Pre-Development CN			
				HSG A	HSG B	HSG C	HSG D
Open space (lawns, parks, golf courses, cemeteries, etc.):							
Poor condition (grass cover < 50%)	-----	-----	---	68	79	86	89
Fair condition (grass cover 50% to 75%)	-----	-----	---	49	69	79	84
Good condition (grass cover > 75%)	-----	-----	---	39	61	74	80
Impervious areas:							
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	-----	-----	---	98	98	98	98
Streets and roads:							
Paved; curbs and storm sewers (excluding right-of-way)	-----	-----	---	98	98	98	98
Paved; open ditches (including right-of-way)	-----	-----	---	83	89	92	93
Gravel (including right-of-way)	-----	-----	---	76	85	89	91
Dirt (including right-of-way)	-----	-----	---	72	82	87	89
Western desert urban areas:							
Natural desert landscaping (pervious areas only)	-----	-----	---	63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)	-----	-----	---	96	96	96	96
Urban districts:							
Commercial and business	-----	-----	85	89	92	94	95
Industrial	-----	-----	72	81	88	91	93
Residential districts by average lot size:							
1/8 acre or less (town houses)	-----	-----	65	77	85	90	92
1/4 acre	-----	-----	38	61	75	83	87
1/3 acre	-----	-----	30	57	72	81	86
1/2 acre	-----	-----	25	54	70	80	85
1 acre	-----	-----	20	51	68	79	84
2 acres	-----	-----	12	46	65	77	82
Developing Urban Areas¹	Treatment²	Hydrologic Condition³	% I	HSG A	HSG B	HSG C	HSG D
Newly graded areas (pervious areas only, no vegetation)	-----	-----	---	77	86	91	94
Cultivated Agricultural Lands¹	Treatment	Hydrologic Condition	% I	HSG A	HSG B	HSG C	HSG D
Fallow	Bare soil	-----	---	77	86	91	94
	Crop residue cover (CR)	Poor	---	76	85	90	93
		Good	---	74	83	88	90
Row crops	Straight row (SR)	Poor	---	72	81	88	91
		Good	---	67	78	85	89
	SR + CR	Poor	---	71	80	87	90
		Good	---	64	75	82	85
	Contoured (C)	Poor	---	70	79	84	88
		Good	---	65	75	82	86
	C + CR	Poor	---	69	78	83	87
		Good	---	64	74	81	85
	Contoured & terraced (C&T)	Poor	---	66	74	80	82
		Good	---	62	71	78	81
	C&T+ CR	Poor	---	65	73	79	81
		Good	---	61	70	77	80
Small grain	SR	Poor	---	65	76	84	88
		Good	---	63	75	83	87
	SR + CR	Poor	---	64	75	83	86
		Good	---	60	72	80	84
	C	Poor	---	63	74	82	85
		Good	---	61	73	81	84
	C + CR Poor	Poor	---	62	73	81	84
		Good	---	60	72	80	83
	C&T	Poor	---	61	72	79	82
		Good	---	59	70	78	81
	C&T+ CR	Poor	---	60	71	78	81
		Good	---	58	69	77	80

Table 6-10. (continued)

Other Agricultural Lands ¹	Treatment	Hydrologic Condition	% I	HSG A	HSG B	HSG C	HSG D
Pasture, grassland, or range—continuous forage for grazing ⁴	-----	Poor	---	68	79	86	89
	-----	Fair	---	49	69	79	84
	-----	Good	---	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay	-----	-----	---	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element ⁵	-----	Poor	---	48	67	77	83
	-----	Fair	---	35	56	70	77
	-----	Good	---	30	48	65	73
Woods—grass combination (orchard or tree farm) ⁶	-----	Poor	---	57	73	82	86
	-----	Fair	---	43	65	76	82
	-----	Good	---	32	58	72	79
Woods ⁷	-----	Poor	---	45	66	77	83
	-----	Fair	---	36	60	73	79
	-----	Good	---	30	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots	-----	-----	---	59	74	82	86
Arid and Semi-arid Rangelands ¹	Treatment	Hydrologic Condition ⁸	% I	HSG A	HSG B	HSG C	HSG D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element	-----	Poor	---	-----	80	87	93
	-----	Fair	---	-----	71	81	89
	-----	Good	---	-----	62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	-----	Poor	---	-----	66	74	79
	-----	Fair	---	-----	48	57	63
	-----	Good	---	-----	30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory	-----	Poor	---	-----	75	85	89
	-----	Fair	---	-----	58	73	80
	-----	Good	---	-----	41	61	71
Sagebrush with grass understory	-----	Poor	---	-----	67	80	85
	-----	Fair	---	-----	51	63	70
	-----	Good	---	-----	35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus	-----	Poor	---	63	77	85	88
	-----	Fair	---	55	72	81	86
	-----	Good	---	49	68	79	84

1. Ia = 0.1 S

2. Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

3. Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness. Poor: Factors impair infiltration and tend to increase runoff. Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

4. Poor: <50% ground cover or heavily grazed with no mulch. Fair: 50 to 75% ground cover and not heavily grazed. Good: > 75% ground cover and lightly or only occasionally grazed.

5. Poor: <50% ground cover. Fair: 50 to 75% ground cover. Good: >75% ground cover.

6. CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and grass.

7. Poor: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning. Fair: Woods are grazed but not burned, and some forest litter covers the soil. Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

8. Poor: <30% ground cover (litter, grass, and brush overstory). Fair: 30 to 70% ground cover. Good: > 70% ground cover.

4.6 Lag Time

While the NRCS curve numbers are used to calculate the volume of runoff and magnitude of losses, to transform the volume of runoff into a hydrograph using the NRCS dimensionless unit hydrograph, the lag time must be specified. The lag time is defined as the time from the centroid of the rainfall distribution of a storm to the peak discharge produced by the watershed. For this Manual, the lag time is defined as a fraction of the time of concentration (t_c) as shown in Equation 6-13.

$$t_{lag} = 0.6 \cdot t_c \quad (\text{Eq. 6-13})$$

TABLE 5-4
RUNOFF CURVE NUMBERS FOR HYDROLOGIC SOIL
COVER COMPLEXES - RURAL CONDITIONS
(Antecedent Moisture Condition II, and Ia = 0.2 S)
(From: U.S. Dept. of Agriculture,
Soil Conservation Service, 1977)

<u>Land Use</u>	<u>Cover Treatment or Practice</u>	<u>Hydrologic Condition</u>	<u>Runoff Curve Number by Hydrologic Soil Group</u>			
			<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Fallow	Straight Row	----	77	86	91	94
Row Crops	Straight Row	Poor	72	81	88	91
	Straight Row	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	Contoured	Good	65	75	82	86
	Cont. & Terraced	Poor	66	74	80	82
	Cont. & Terraced	Good	62	71	78	81
Small Grain	Straight Row	Poor	65	76	84	88
	Straight Row	Good	63	75	83	87
	Contoured	Poor	63	74	82	85
	Contoured	Good	61	73	81	84
	Cont. & Terraced	Poor	61	72	79	82
	Cont. & Terraced	Good	59	70	78	81
Close-seeded legumes <u>1</u> / or rotation meadow	Straight Row	Poor	66	77	85	89
	Straight Row	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	Contoured	Good	55	69	78	83
	Cont. & Terraced	Poor	63	73	80	83
	Cont. & Terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	Contoured	Poor	47	67	81	88
	Contoured	Fair	25	59	75	83
	Contoured	Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Roads (dirt) <u>2</u> / (hard surface) <u>2</u> /		----	72	82	87	89
		----	74	84	90	92

1/ Close-drilled or broadcast

2/ Including right-of-way

TABLE 5-5
RUNOFF CURVE NUMBERS FOR HYDROLOGIC SOIL
COVER COMPLEXES - URBAN AND SUBURBAN CONDITIONS 1/
(Antecedent Moisture Condition II)
(From: U.S. Dept. of Agriculture,
Soil Conservation Service, 1977)

<u>Land Use</u>	<u>Hydrologic Soil Group</u>			
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Open spaces, lawns, parks, golf courses, cemeteries, etc.				
Good condition: grass cover on 75% or more of the area	39*	61	74	80
Fair condition: grass cover on 50% to 75% of the area	49*	69	79	84
Commercial and Business areas (85% Impervious)	89*	92	94	95
Industrial Districts 72% Impervious)	81*	88	91	93
Residential: <u>2/</u>				
<u>Acres per Dwelling Unit</u>	<u>Average %</u>	<u>Impervious</u> ^{3/}		
1/8 acre or less	65	77*	85	90
1/4 acre	38	61*	75	83
1/3 acre	30	57*	72	81
1/2 acre	25	54*	70	80
1 acre	20	51*	68	79
Paved parking lots, roofs, driveways, etc.	98	98	98	98
Streets and Roads:				
paved with curbs and storm sewers	98	98	98	98
gravel	76*	85	89	91
dirt	72*	82	87	89

1/ For a more detailed description of agricultural land use curve numbers, refer to the National Engineering Handbook (U.S. Dept. of Agriculture, Soil Conservation Service, 1972).

2/ Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

3/ The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

* Not to be used wherever overlot grading or filling is to occur.

TABLE 5-6
RUNOFF CURVE NUMBERS FOR HYDROLOGIC SOIL
COVER COMPLEXES - RURAL CONDITIONS
(Antecedent Moisture Condition III, and Ia = 0.2 S)
(From: U.S. Dept. of Agriculture,
Soil Conservation Service, 1977)

NOTE: THIS TABLE TO BE USED FOR INFORMATION ONLY

<u>Land Use</u>	<u>Cover Treatment or Practice</u>	<u>Hydrologic Condition</u>	<u>Runoff Curve Number by Hydrologic Soil Group</u>			
			<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Fallow	Straight Row	----	89	94	97	98
Row Crops	Straight Row	Poor	86	92	95	97
	Straight Row	Good	83	90	94	96
	Contoured	Poor	85	91	93	95
	Contoured	Good	82	88	92	94
	Cont. & Terraced	Poor	82	88	91	92
	Cont. & Terraced	Good	79	86	90	92
Small Grain	Straight Row	Poor	82	89	93	95
	Straight Row	Good	80	88	93	95
	Contoured	Poor	80	88	92	94
	Contoured	Good	78	87	92	93
	Cont. & Terraced	Poor	78	86	91	92
	Cont. & Terraced	Good	77	85	90	92
Close-seeded legumes <u>1/</u> or rotation meadow	Straight Row	Poor	82	89	94	96
	Straight Row	Good	76	86	92	94
	Contoured	Poor	81	88	93	94
	Contoured	Good	74	84	90	93
	Cont. & Terraced	Poor	80	87	91	93
	Cont. & Terraced	Good	70	83	89	91
Pasture or range		Poor	84	91	94	96
		Fair	69	84	91	93
		Good	59	78	88	91
	Contoured	Poor	67	83	92	95
	Contoured	Fair	64	77	88	93
	Contoured	Good	15	55	85	91
Meadow		Good	50	76	86	90
Woods		Poor	65	82	89	93
		Fair	56	78	87	91
		Good	43	74	85	89
Farmsteads		----	77	88	92	94
Roads (dirt) <u>2/</u> (hard surface) <u>2/</u>		----	86	92	95	96
		----	88	93	96	97

1/ Close-drilled or broadcast

2/ Including right-of-way

TABLE 5-7
RUNOFF CURVE NUMBERS FOR HYDROLOGIC SOIL
COVER COMPLEXES - URBAN AND SUBURBAN CONDITIONS 1/
(Antecedent Moisture Condition III)
 (From: U.S. Dept. of Agriculture,
 Soil Conservation Service, 1977)

NOTE: THIS TABLE TO BE USED FOR INFORMATION ONLY

<u>Land Use</u>	<u>Hydrologic Soil Group</u>			
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Open spaces, lawns, parks, golf courses, cemeteries, etc.				
Good condition: grass cover on 75% or more of the area	59*	78	88	91
Fair condition: grass cover on 50% to 75% of the area	69*	84	91	93
Commercial and Business areas (85% Impervious)	96*	97	98	98
Industrial Districts 72% Impervious)	92*	95	97	98
Residential: <u>2/</u>				
<u>Acres per Dwelling Unit</u>	<u>Average %</u>			
	<u>Impervious</u> ^{3/}			
1/8 acre or less	65	89*	94	96
1/4 acre	38	78*	88	93
1/3 acre	30	75*	86	92
1/2 acre	25	73*	85	91
1 acre	20	70*	84	91
Paved parking lots, roofs, driveways, etc.	99	99	99	99
Streets and Roads:				
paved with curbs and storm sewers	99	99	99	99
gravel	89*	94	96	97
dirt	86*	92	95	96

1/ For a more detailed description of agricultural land use curve numbers, refer to the National Engineering Handbook (U.S. Dept. of Agriculture, Soil Conservation Service, 1972).

2/ Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

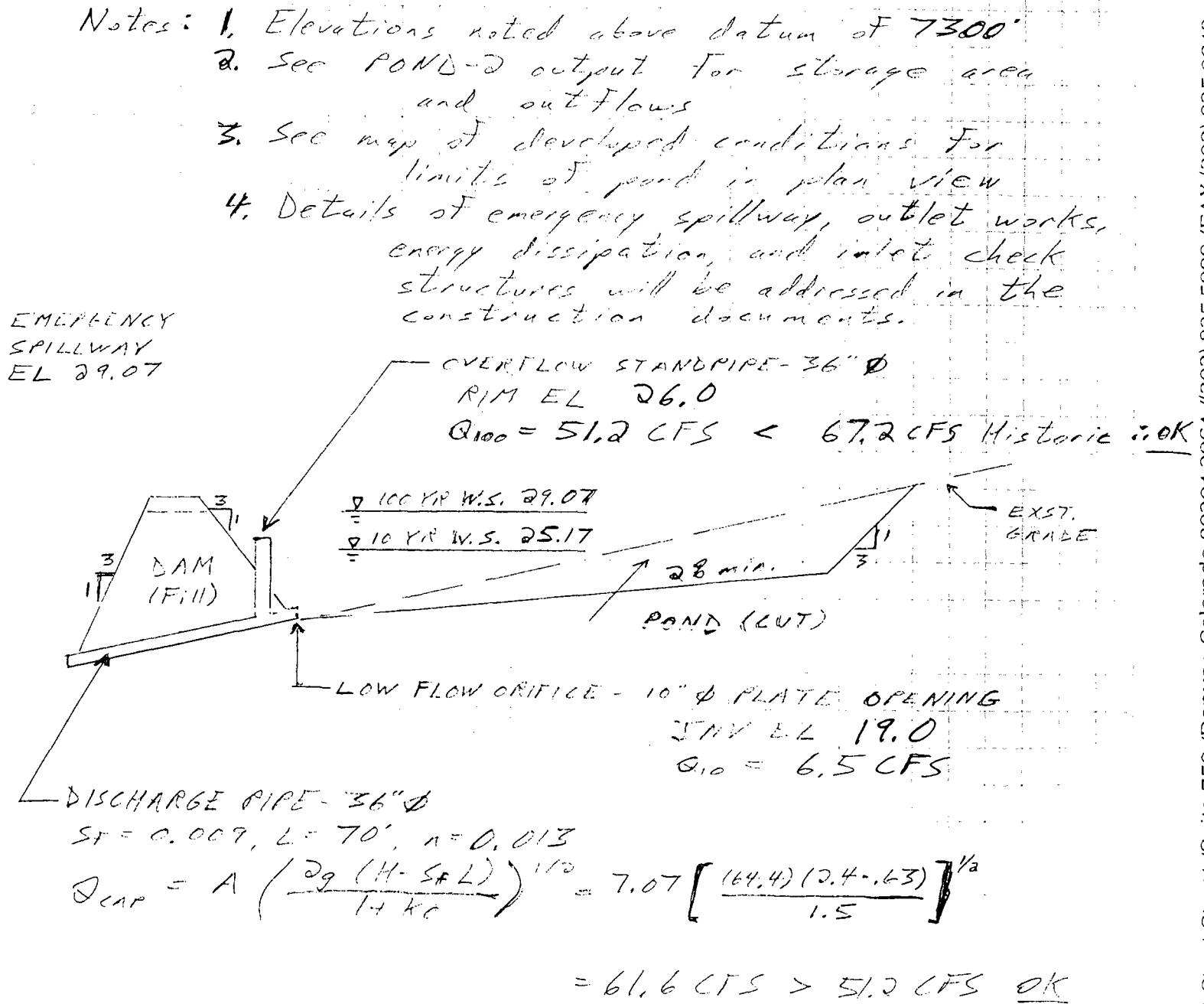
3/ The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

* Not to be used wherever overlot grading or filling is to occur.

APPENDIX C

REPORT REFERENCES

Project: Bent Tree III - Drainage Report
Work: Detention Pond Section - Revised 4/2/93



Page 1

English

Pond Data

Pond storage is based on known values

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	7243.50	00	0	0
0.50	7244.00	00	0	575
1.50	7245.00	00	0	3,150
2.50	7246.00	00	0	12,600
6.50	7250.00	00	0	80,600

Weir Structures

	[A]	[B]	[C]	[D]		[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0	Crest Len ft	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0	Crest El. ft	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0	Weir Coeff.	= 0.00	0.00	0.00	0.00
Invert El. ft	= 0.00	0.00	0.00	0.00	Eqn. Exp.	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0	Multi-Stage	= No	No	No	No
Slope %	= 0.00	0.00	0.00	0.00					
N-Value	= .000	.000	.000	.000					
Orif. Coeff.	= 0.00	0.00	0.00	0.00					
Multi-Stage	= —	No	No	No	Tailwater Elevation	= 0.00 ft			

Note: All outflows have been analyzed under inlet and outlet control.

[illegible]

TIMBERVIEW
FINAL DRAINAGE BASIN MAP
PROPOSED CONDITIONS

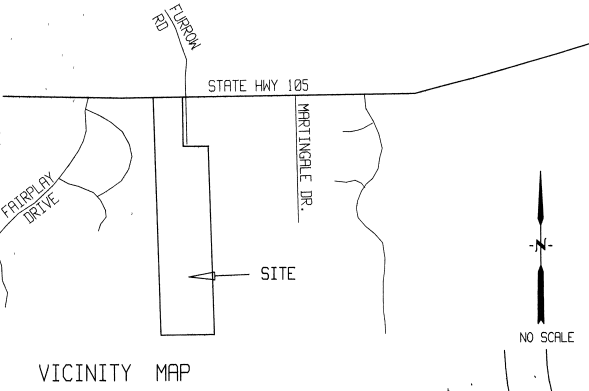
PHASE II

Peak Flow Rate Summary Table

Proposed Conditions

Peak Flow Rate

Sub-basin	Design Point	5 Year	100 Year
		cfs	cfs
OS 5		3.4	7.5
OS 6		1.4	3.1
OS 7		3.4	7.3
OS 8		2.2	4.8
OS 9		4.8	10.5
E 1		3.9	7.6
E 2		3.8	7.9
E 3		3.3	6.8
E 4		3.2	6.6
E 5		1.0	2.2
E 6		2.8	5.9
F 1		2.1	4.5
F 2		3.5	7.7
F 3		1.1	2.5
F 4		0.6	1.4
F 5		2.6	6.0
G 1		2.2	4.6
G 2		2.3	4.8
G 3		1.3	2.6
G 4		1.1	2.2
G 5		2.1	4.3
OS 10		1.0	2.2
I 1		1.0	2.0
J 1		2.6	6.0
	13	7.2	14.5
	14	14.0	28.8
	15	7.6	16.0
	16	10.5	22.5
	17	16.8	34.6
	18	16.7	38.1
	19	34.4	72.4
	20	19.3	31.9
	21	8.1	17.7
	22	10.4	23.0
	23	12.5	23.4
	24	3.0	6.9



VICINITY MAP

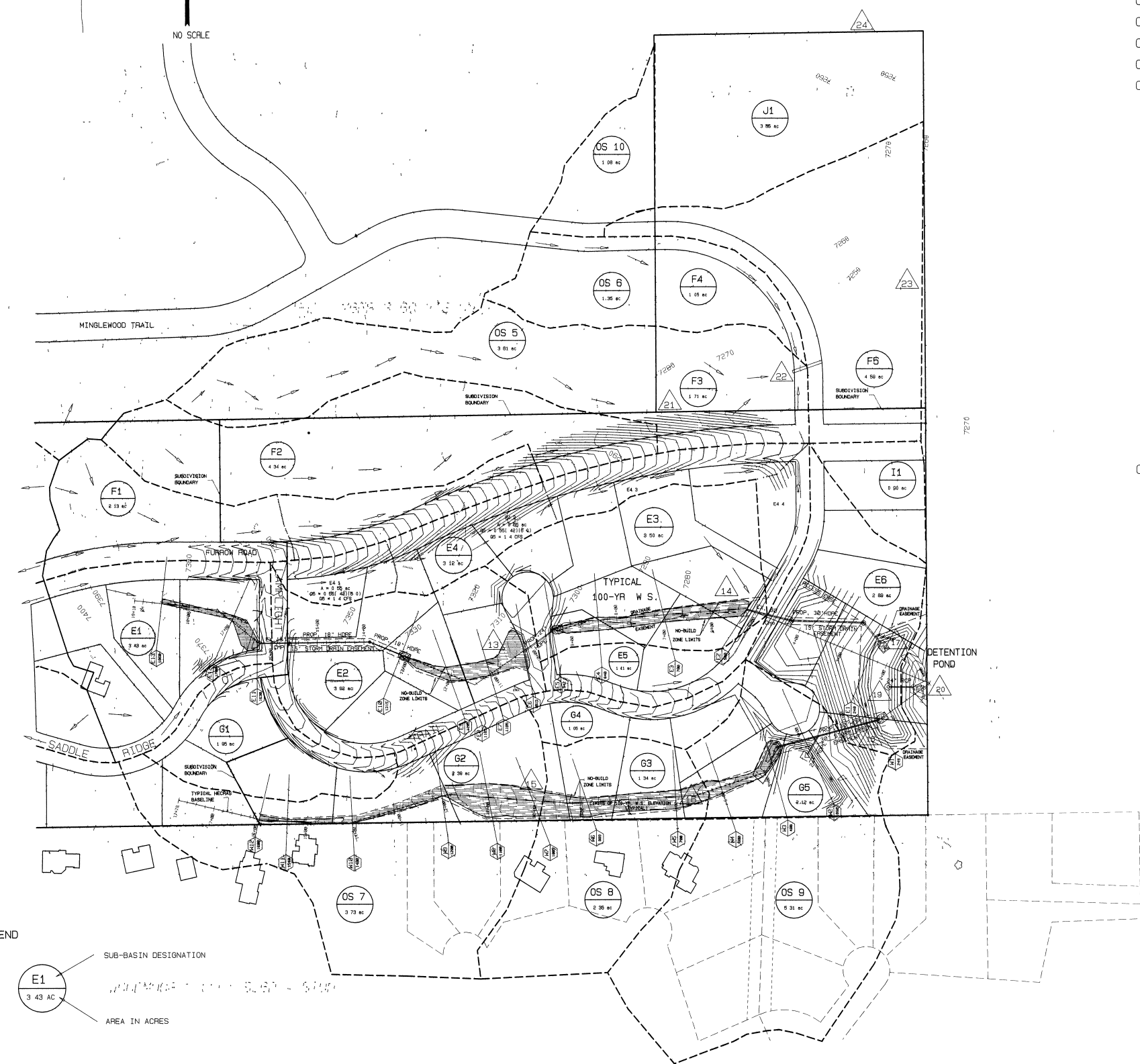
NO SCALE

SCALE 1" = 100'



LEGEND

- PROPOSED BASIN BOUNDARY
- DIRECTION OF FLOW
- EXISTING CONTOUR (7290)
- DESIGN POINT
- PROPOSED CMP CULVERT
- BASILINE FOR HECRAS ANALYSIS
- SUB-BASIN DESIGNATION
- AREA IN ACRES



TIMBERVIEW SUBDIVISION
PHASE II
FINAL DRAINAGE BASIN MAP
PROPOSED CONDITIONS

PREMIER ENGINEERING, INC.
Professional Civil Engineers
2110 Vickers Drive
Colorado Springs, CO 80918
(719) 598-6951
PremierEng@aol.com

Jesse Sullivan

From: Hunyadi - DNR, John <john.hunyadi@state.co.us>
Sent: Tuesday, March 31, 2020 1:27 PM
To: Jesse Sullivan
Cc: Corey Petersen
Subject: Re: Grandwood Ranch: Existing Offsite Detention Embankments and Proposed Onsite Detention

Hi Jesse,

Sorry for not getting back to you sooner. I concur with your analyses and conclusions for the off-site detention ponds Bent Tree III (Low haz) and Timberview II (NPH). I agree with your initial discussions for the ones that will be part of the Grandwood Ranch and look forward to the submittal package when those become available.

I truly appreciate your efforts to work with the County and myself to plan the development with these dam safety concerns in mind!

Thank you .

John H.
John Hunyadi, PE
Dam Safety Engineer



COLORADO
Division of Water Resources
Department of Natural Resources

T: 719.227.5294 | C: 719.258.0859
4255 Sinton Road, Colorado Springs, CO 80907
john.hunyadi@state.co.us

On Tue, Mar 31, 2020 at 12:11 PM Jesse Sullivan <jesse_sullivan@matrixdesigngroup.com> wrote:

John,

Just checking in to see if you received the memo regarding the offsite detention upstream of the Grandwood Ranch subdivision. The file size may have been a bit large, so I wanted to confirm it made it through.

If you received it and have any questions feel free to contact me.

Thanks,

Matrix Design Group
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Ph: (719) 575-0100

Date: March 26, 2020

To: John Hunyadi
Dam Safety Engineer
State of Colorado
4255 Sinton Road
Colorado Springs, CO 80919

From: Jesse Sullivan, P.E.

Subject: Existing Embankment Hazard Classification
Bent Tree III Detention Pond &
Timberview Phase II Detention Pond

Introduction:

We are providing a Hazard Classification for the two subject detention ponds in order to provide safe design for the proposed, downstream, Grandwood Ranch development. The two subject ponds are located just offsite of the proposed development. For the purposes of this memorandum the ponds are referred to as the Bent Tree III Pond and the Timberview II Pond.

Criteria:

The State of Colorado DWR publication “Guidelines for Hazard Classification” dated January 21, 2019 were utilized in determining the hazard classification for the two embankments. The study also utilized the state of Colorado DWR “Spreadsheet for Estimating Dam Breach Parameters Using the Froehlich Method” to estimate dam breach flows and designate “no-build” regions where necessary to maintain as minimal hazard from the existing embankments as possible.

Bent Tree III Pond (Existing & Offsite):

This existing detention pond is located in Lots 158 and 159 of the Bent Tree III subdivision just east of the proposed Grandwood Ranch development. The Grandwood Ranch lot lines have been adjusted so that the discharge of the pond and the potential breach flow will run just inside the north boundary of Lot 9 within the development within a designated “No-Build” area. Once passing through Lot 9, the breach flow will surcharge the proposed road and follow historic flow patterns to dissipate within an existing wetland. From this point waters will cross Higby Road via the existing culverts and eventually discharge to Jackson Creek.

Detention Basin Data:

Drainage Area:	162.9	Acres
Max Storage Depth:	8.1	Feet
Max Storage Volume:	3.7	Acre-Feet
Est. Breach Discharge Q:	807	CFS
Crest Width of Embankment:	8	Feet

Vertical Fall from Spillway to Exterior Toe of Embankment:	11	Feet
Exterior Embankment Slope:	2.5:1	Feet Horizontal : Feet Vertical
Interior Embankment Slope:	4:1	Feet Horizontal : Feet Vertical
Width of Breach Flow:	90	Feet
Dam Size Class:	Minor	

Hazard Classification:

Relevant Information:

- Breach flows will be conveyed through the adjacent residential, 2.5-acre, Lot 9 via a “No-Build” area centered on the natural flow path which the breach flow would be anticipated to follow.
- The downstream road will be armored at the location the breach flow is anticipated to cross.
 - The armoring should minimize damage to the road.
- Emergency access is provided for the lots possibly cut off from the primary road in the unlikely case of failure of both the armoring and the primary road.
- No developed lots across the road from the “No-Build” conveyance area.
- Downstream detention pond proposed for Grandwood Ranch has been located such that the direct Breach Flow should not impact the detention
 - It is possible that some dispersed waters could reach the detention.
 - Such flows will have lost much of the original energy from the Breach and are not anticipated to cause issues within the Grandwood Ranch detention pond.
 - The Grandwood Detention Pond does not utilize embankment and is thus not a failure risk.
 - No developed parcels downstream of the Grandwood Ranch Detention Pond.
- Past the Grandwood Ranch Detention Pond a natural, heavily vegetated water way will disperse the remaining energy of the breach.
- The above factors minimize the likelihood of loss of human life associated with a Breach.

Based on the above factors, this existing offsite detention pond is classified as “Low Hazard”

Timberview II Pond (Existing & Offsite):

This existing pond is located north of the northwestern corner of the proposed Grandwood Ranch development within Lots 47 and 48 of the Timberview Subdivision Phase II. the breach flow will surcharge the proposed road and follow historic flow patterns to dissipate within an existing wetland. From this point waters will cross Higby Road via the existing culverts and eventually discharge to Jackson Creek.

Detention Basin Data:

Drainage Area:	36	Acres
Max Depth:	3	Feet
Max Storage Volume:	0.5	Acre-Feet
Est. Breach Discharge Q:	73	CFS
Crest Width of Embankment:	50	Feet

Vertical Fall from Spillway to Exterior Toe of Embankment:	3	Feet
Exterior Embankment Slope:	4:1	Feet Horizontal : Feet Vertical
Interior Embankment Slope:	3:1	Feet Horizontal : Feet Vertical
Width of Breach Flow:	35	Feet
Dam Size Class:	Minor	

Hazard Classification:

Relevant Information:

- Very minimal Breach Flow of 73 CFS
- Driveway Culvert Sizing will accommodate 73 cfs discharge flow
- Natural Discharge Path will route around proposed roads
- No/minimal anticipated damage from Breach
 - Possibly minor erosion associated with Breach flow
- Broad, heavily vegetated drainage way receiving Breach flows
- Very Small detained volume of 0.5 Acre-Feet
- Due to very minor flows no loss of human life is anticipated
- Conveyance through driveways via 30” culvert.

Based on the above factors this embankment is classified as No Public Hazard (NPH). No or very minor damage is anticipated as a result of a breach and no loss of human life is anticipated either.

Grandwood Ranch Detention Ponds (Proposed & Onsite):

The Grandwood Ranch Subdivision will have several of its own detention ponds to provide treatment and detention for the roads associated with the proposed development. These ponds will all be below the jurisdictional dam criteria.

Detention Basin Data:

Drainage Area:	8.5-22.3	Acres
Max Storage Depth:	10	Feet
Max Storage Volume:	3.7	Acre-Feet
Max Breach Discharge Q:	317	CFS
Crest Width of Embankment:	8	Feet

Vertical Fall from Spillway to Exterior Toe of Embankment:	<7	Feet
Exterior Embankment Slope:	3:1	Feet Horizontal : Feet Vertical
Interior Embankment Slope:	3:1	Feet Horizontal : Feet Vertical
Dam Size Class:	Minor	

Hazard Classification:

The Grandwood Ranch ponds will all fall in either No Public Hazard or Low Hazard because they will all be located downhill of the developed areas. In the case of a breach flows from the ponds will

discharge to an undeveloped, heavily vegetated low-lying area where the velocities will decrease to below 7 ft/s. The low-lying areas then drain to Higby Road crossroad culverts, surcharge the paved road and from there channel flow through the undeveloped downstream areas towards Jackson Creek. Further information will be submitted on the proposed ponds (including the SDI sheet) after the design process has been completed.

ESTIMATION OF DAM BREACH PARAMETERS USING THE FROEHLICH 2008 METHOD

PROJECT: Timberview Subdivision Phase II Detention Pond Embankment

BREACH INPUT PARAMETERS:

Select Failure Mode From Drop-Down Menu: **OVERTOPPING**

Height of water over base elevation of breach (H_w) =	3.0	Feet
Volume of water in the reservoir at the time of failure (V_w) =	0.5	Acre-Feet
Reservoir Surface Area at H_w (A_w) =	0.4	Acres
Height of breach (H_b) =	3.0	Feet
Failure Mode Factor (K_b) =	1.3	
Breach Side-Slope Ratio (Z_b) =	0.7	Z(H):1(V)
Dam Size Class:	Minor	Assumes Full Reservoir At Time of Breach.

CALCULATED BREACH CHARACTERISTICS:

Average Breach Width (B_{avg}) =	8.9	Feet
Bottom Width of Breach (B_b) =	6.8	Feet
Breach Formation Time (T_f) =	0.15	Hours
Storage Intensity (SI) =	0.2	Acre Feet/Foot
Predicted Peak Flow (Q_p) =	73	Cubic Feet per Second

RESULTS CHECK:

Average Breach Width Divided by Height of Breach (B_{avg}/H_b) =	2.96	If (B_{avg}/H_b) > 0.6, Full Breach Development is Anticipated
Erosion Rate (ER), Calculated as (B_{avg}/T_f) =	59.2	
Erosion Rate Divided by Height of Water Over Base of Breach (ER/H_w) =	19.7	If $1.6 < (ER/H_w) < 21$, Erosion Rate is Assumed Reasonable

Note: Storage volume of reservoir is outside the data set used to generate the empirical equations used in the Froehlich Method

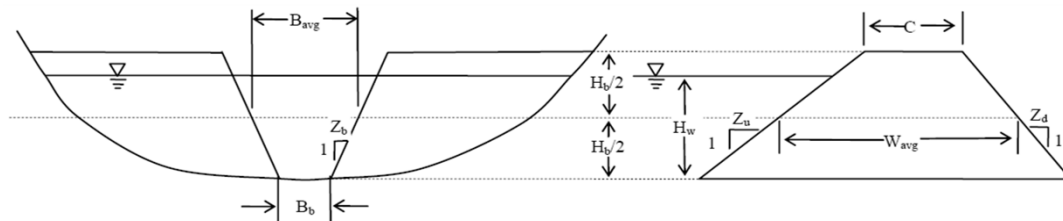


Figure 1- Breach Variable Definition Sketch

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Tuesday, Mar 24 2020

Timberview Breach Flow into Grandwood drainage easement

User-defined

Invert Elev (ft) = 7241.60
Slope (%) = 5.00
N-Value = 0.030

Calculations

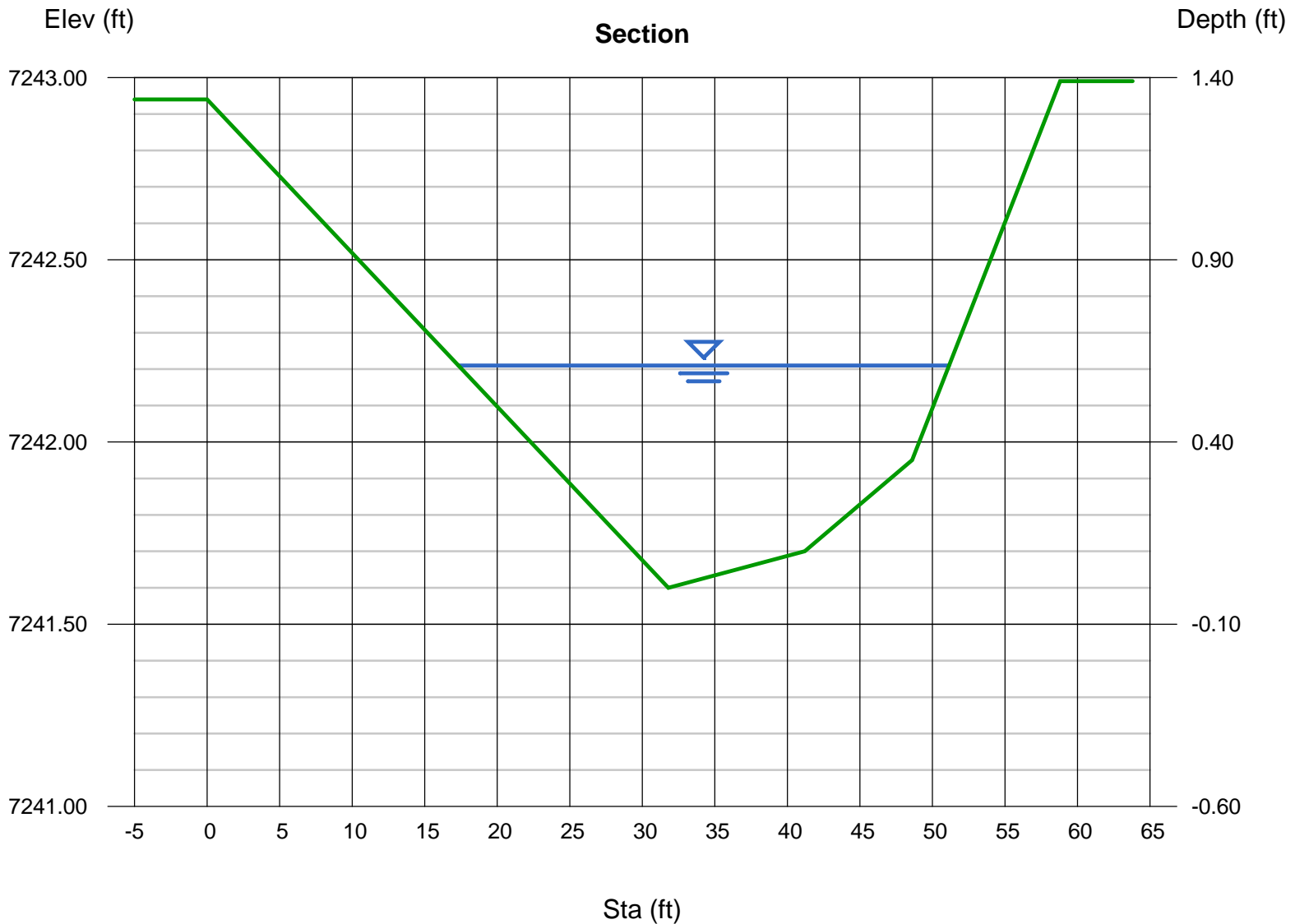
Compute by: Known Q
Known Q (cfs) = 73.00

Highlighted

Depth (ft) = 0.61
Q (cfs) = 73.00
Area (sqft) = 12.85
Velocity (ft/s) = 5.68
Wetted Perim (ft) = 33.85
Crit Depth, Yc (ft) = 0.77
Top Width (ft) = 33.82
EGL (ft) = 1.11

(Sta, El, n)-(Sta, El, n)...

(0.00, 7242.94)-(31.80, 7241.60, 0.030)-(41.20, 7241.70, 0.030)-(48.60, 7241.95, 0.030)-(58.80, 7242.99, 0.030)



ESTIMATION OF DAM BREACH PARAMETERS USING THE FROELICH 2008 METHOD

PROJECT: Bent Tree III Detention Pond

BREACH INPUT PARAMETERS:

Select Failure Mode From Drop-Down Menu: **OVERTOPPING**

Height of water over base elevation of breach (H_w) =	10.1	Feet
Volume of water in the reservoir at the time of failure (V_w) =	3.8	Acre-Feet
Reservoir Surface Area at H_w (A_w) =	1.0	Acres
Height of breach (H_b) =	10.1	Feet
Failure Mode Factor (K_b) =	1.3	
Breach Side-Slope Ratio (Z_b) =	0.7	Z(H):1(V)
Dam Size Class:	Minor	Assumes Full Reservoir At Time of Breach.

CALCULATED BREACH CHARACTERISTICS:

Average Breach Width (B_{avg}) =	18.0	Feet
Bottom Width of Breach (B_b) =	10.9	Feet
Breach Formation Time (T_f) =	0.12	Hours
Storage Intensity (SI) =	0.4	Acre Feet/Foot
Predicted Peak Flow (Q_p) =	807	Cubic Feet per Second

RESULTS CHECK:

Average Breach Width Divided by Height of Breach (B_{avg}/H_b) =	1.78	If (B_{avg}/H_b) > 0.6, Full Breach Development is Anticipated
Erosion Rate (ER), Calculated as (B_{avg}/T_f) =	144.5	
Erosion Rate Divided by Height of Water Over Base of Breach (ER/H_w) =	14.3	If $1.6 < (ER/H_w) < 21$, Erosion Rate is Assumed Reasonable

Note: Storage volume of reservoir is outside the data set used to generate the empirical equations used in the Froehlich Method

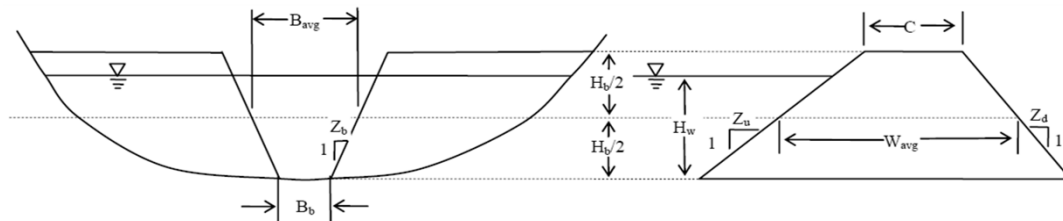


Figure 1- Breach Variable Definition Sketch

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Monday, Mar 23 2020

Bent Tree III Dam Breach - No Build Width in Lot 9 Based on Natural Flow Path

User-defined

Invert Elev (ft) = 7306.00
Slope (%) = 4.20
N-Value = 0.040

Calculations

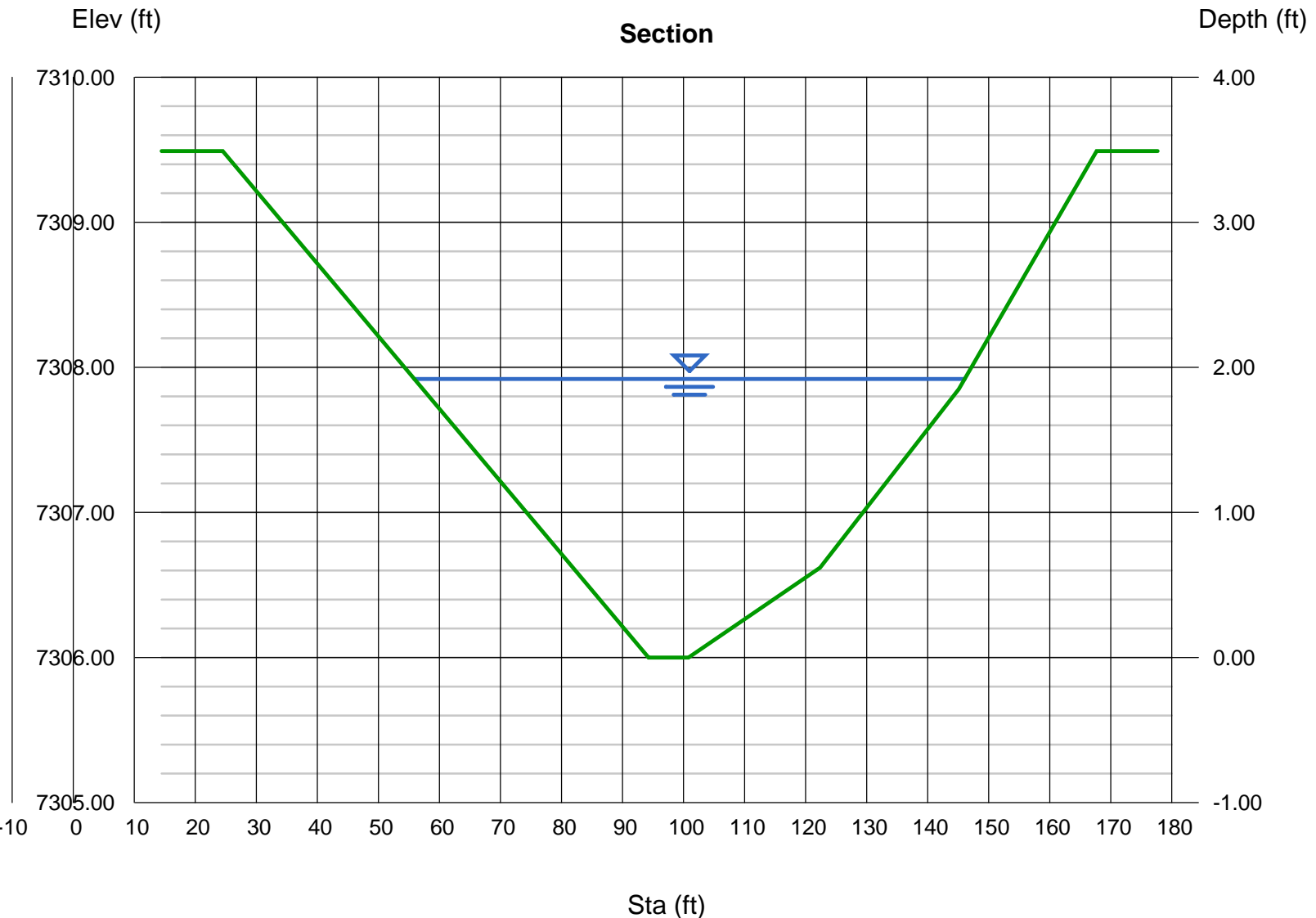
Compute by: Known Q
Known Q (cfs) = 807.00

Highlighted

Depth (ft) = 1.92
Q (cfs) = 807.00
Area (sqft) = 99.72
Velocity (ft/s) = 8.09
Wetted Perim (ft) = 90.27
Crit Depth, Yc (ft) = 2.21
Top Width (ft) = 90.18
EGL (ft) = 2.94

(Sta, El, n)-(Sta, El, n)...

(24.49, 7309.49)-(94.27, 7306.00, 0.040)-(100.80, 7306.00, 0.040)-(122.38, 7306.62, 0.040)-(145.10, 7307.85, 0.040)-(167.68, 7309.49, 0.040)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Tuesday, Mar 24 2020

Bewnt Tree III - Downstream Road Crossing

User-defined

Invert Elev (ft) = 7302.00
Slope (%) = 2.00
N-Value = 0.013

Calculations

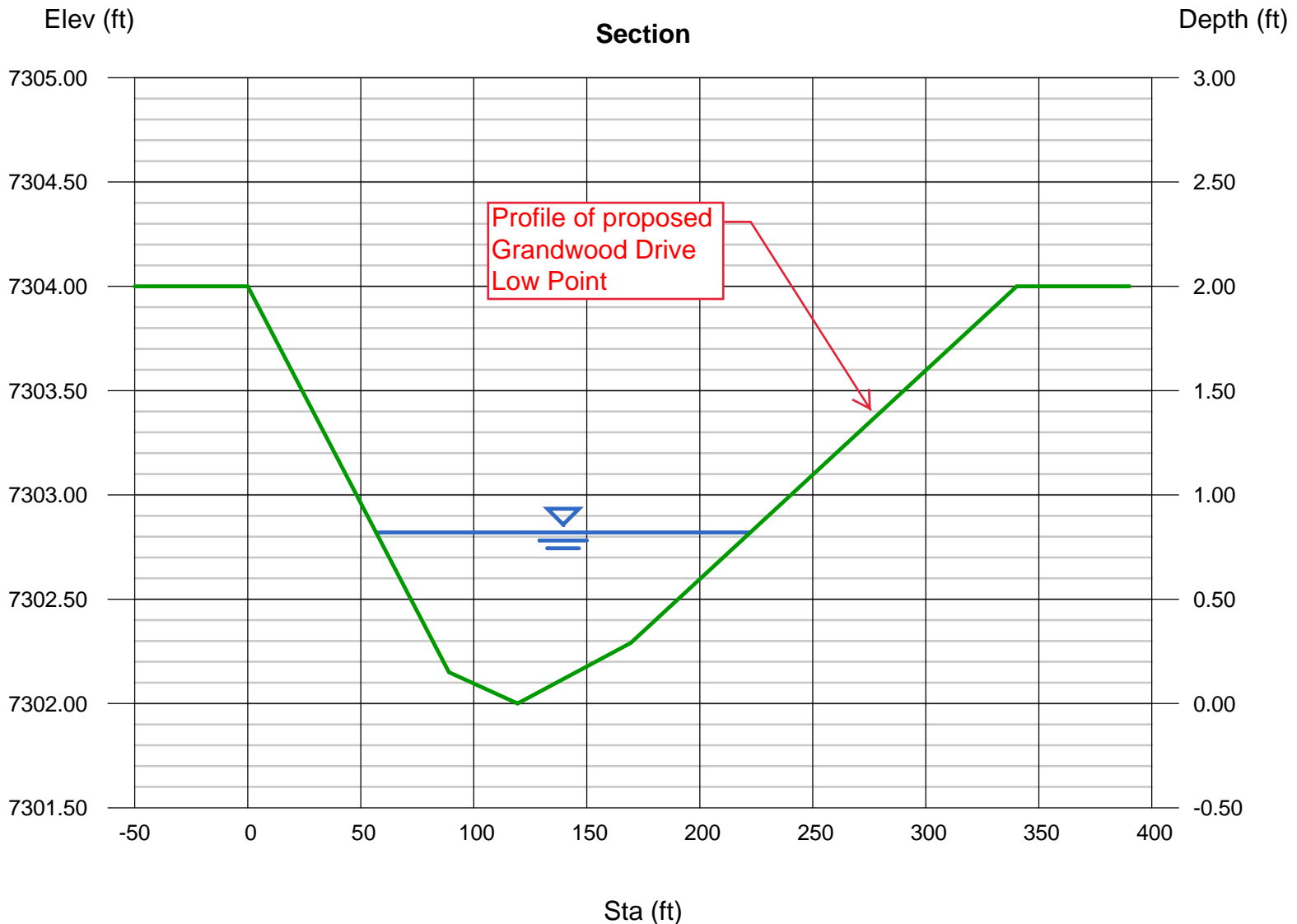
Compute by: Known Q
Known Q (cfs) = 807.00

Highlighted

Depth (ft) = 0.82
Q (cfs) = 807.00
Area (sqft) = 81.20
Velocity (ft/s) = 9.94
Wetted Perim (ft) = 165.56
Crit Depth, Yc (ft) = 1.26
Top Width (ft) = 165.54
EGL (ft) = 2.36

(Sta, El, n)-(Sta, El, n)...

(0.00, 7304.00)-(89.00, 7302.15, 0.013)-(119.40, 7302.00, 0.013)-(169.40, 7302.29, 0.013)-(340.20, 7304.00, 0.013)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Tuesday, Mar 24 2020

Bent Tree III Dam Breach -Wetland Flow

User-defined

Invert Elev (ft) = 7242.00
Slope (%) = 3.30
N-Value = 0.048

Calculations

Compute by: Known Q
Known Q (cfs) = 807.00

Highlighted

Depth (ft) = 3.24
Q (cfs) = 807.00
Area (sqft) = 99.92
Velocity (ft/s) = 8.08
Wetted Perim (ft) = 58.47
Crit Depth, Yc (ft) = 3.36
Top Width (ft) = 57.98
EGL (ft) = 4.25

(Sta, El, n)-(Sta, El, n)...

(12.60, 7247.44)-(52.51, 7245.88, 0.040)-(91.95, 7245.60, 0.040)-(112.00, 7244.00, 0.050)-(122.00, 7242.00, 0.050)-(128.00, 7242.00, 0.050)-(136.00, 7242.96, 0.050)-(141.00, 7243.00, 0.050)-(159.00, 7246.00, 0.040)-(178.40, 7247.57, 0.040)

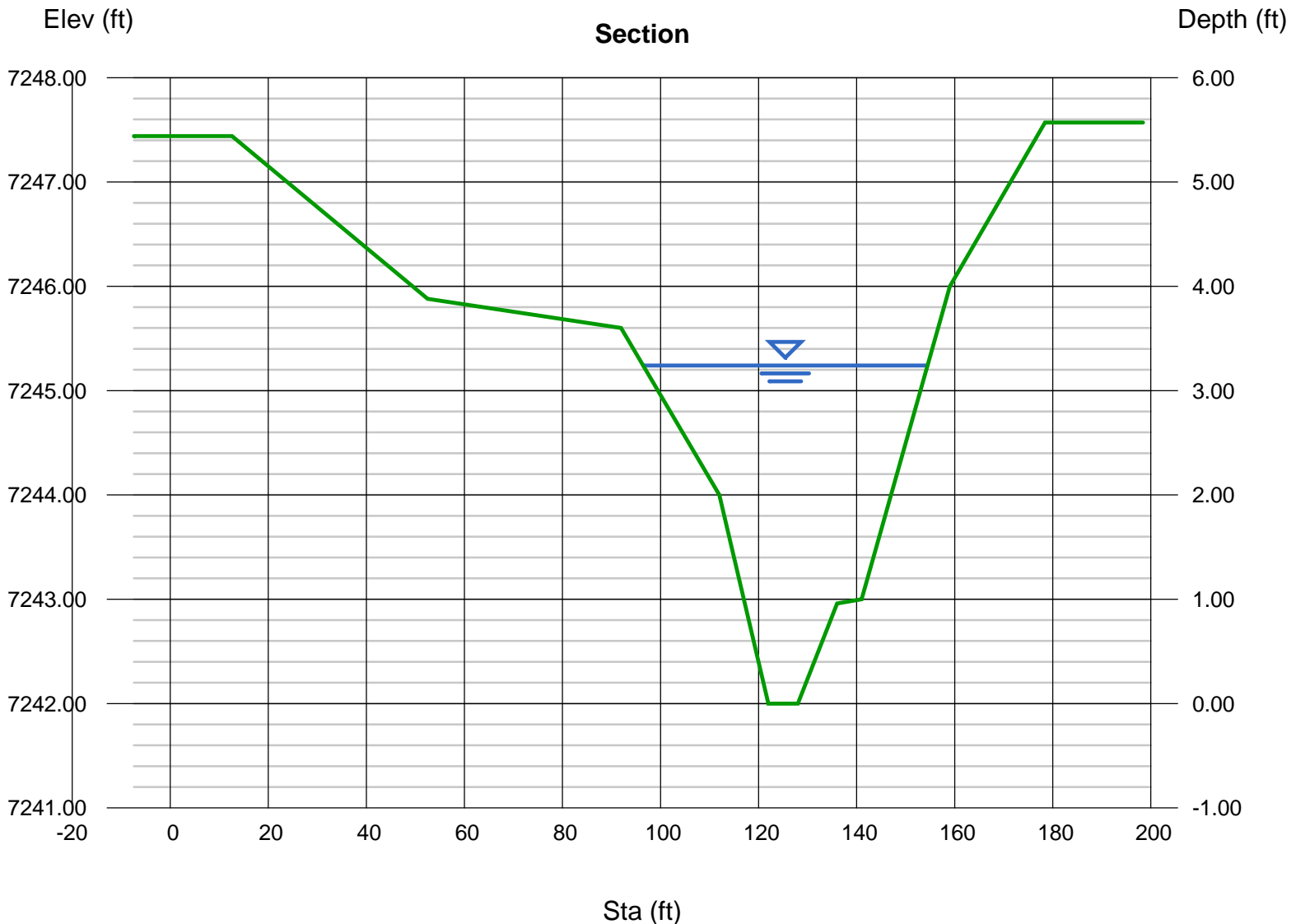


Figure 13-12b. Emergency Spillway Profile at Embankment

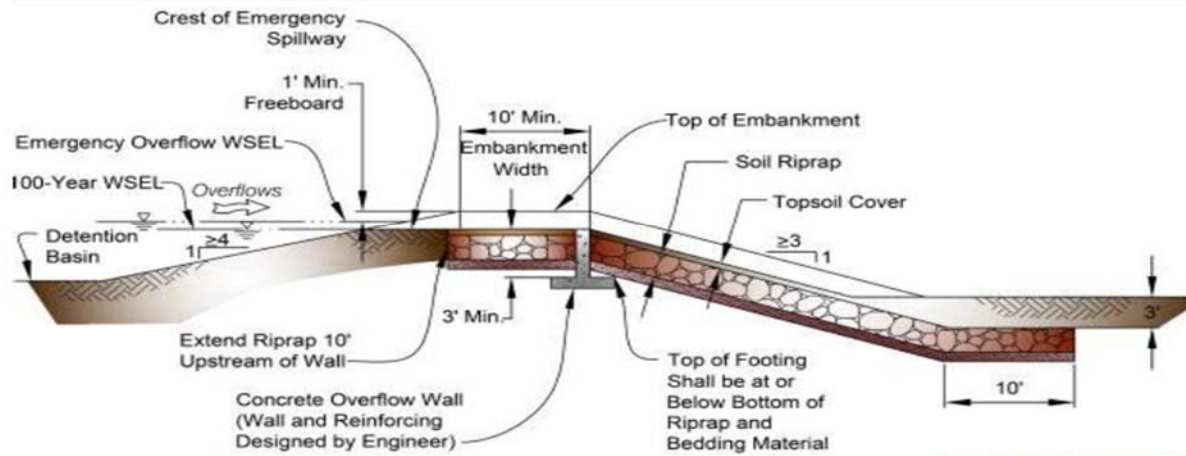
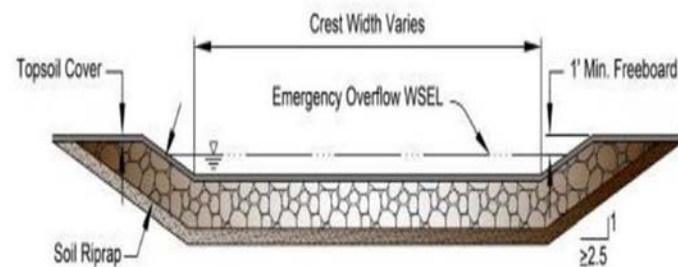


Figure 13-12c. Emergency Spillway Protection



ROAD EMBANKMENT PROTECTION CALCULATION

Q=807 CFS

LENGTH=167

UNIT FLOW RATE: 4.8 CFS/FT

=> TYPE M RIP RAP

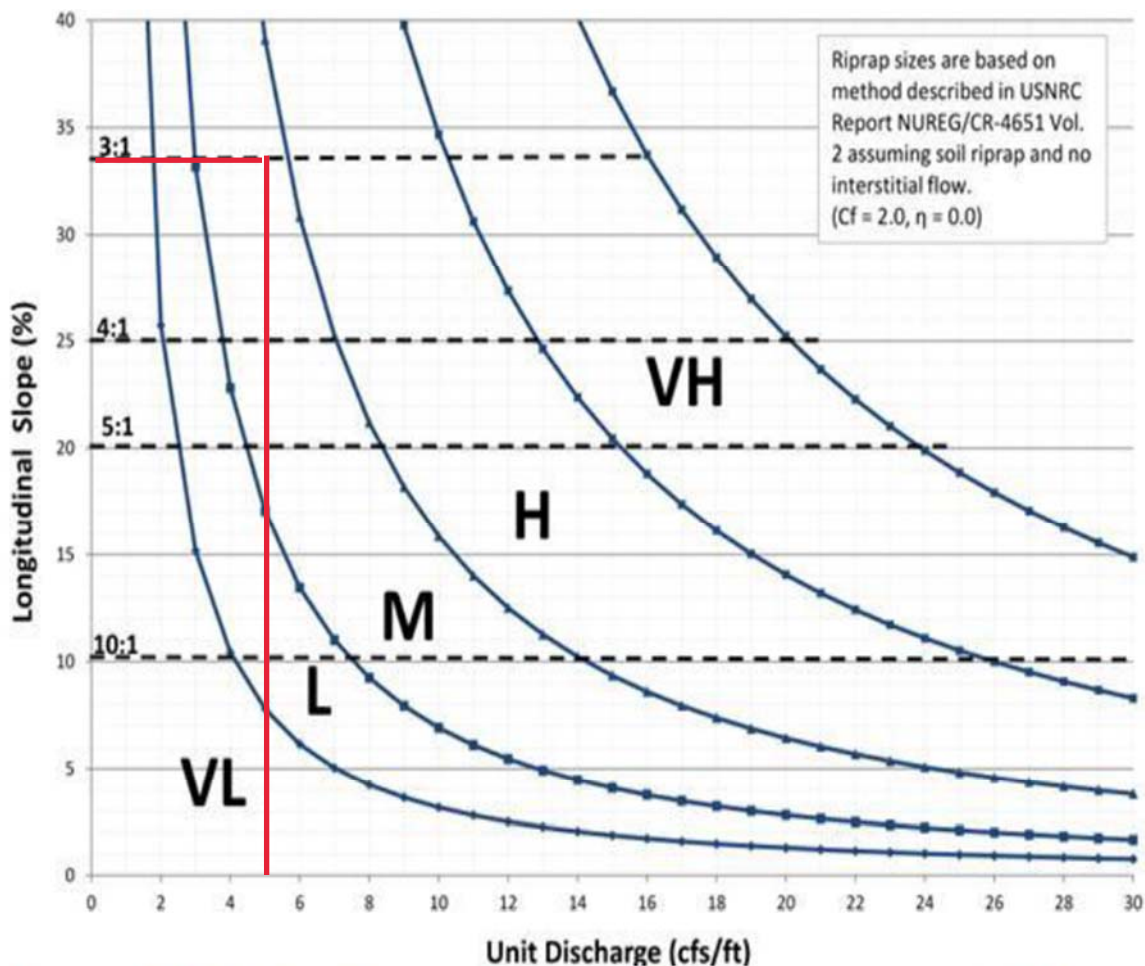


Figure 13-12d. Riprap Types for Emergency Spillway Protection

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Tuesday, Mar 24 2020

Onsite Worst Case Dam Breach - Wetland Flow

User-defined

Invert Elev (ft) = 7242.00
Slope (%) = 3.30
N-Value = 0.048

Calculations

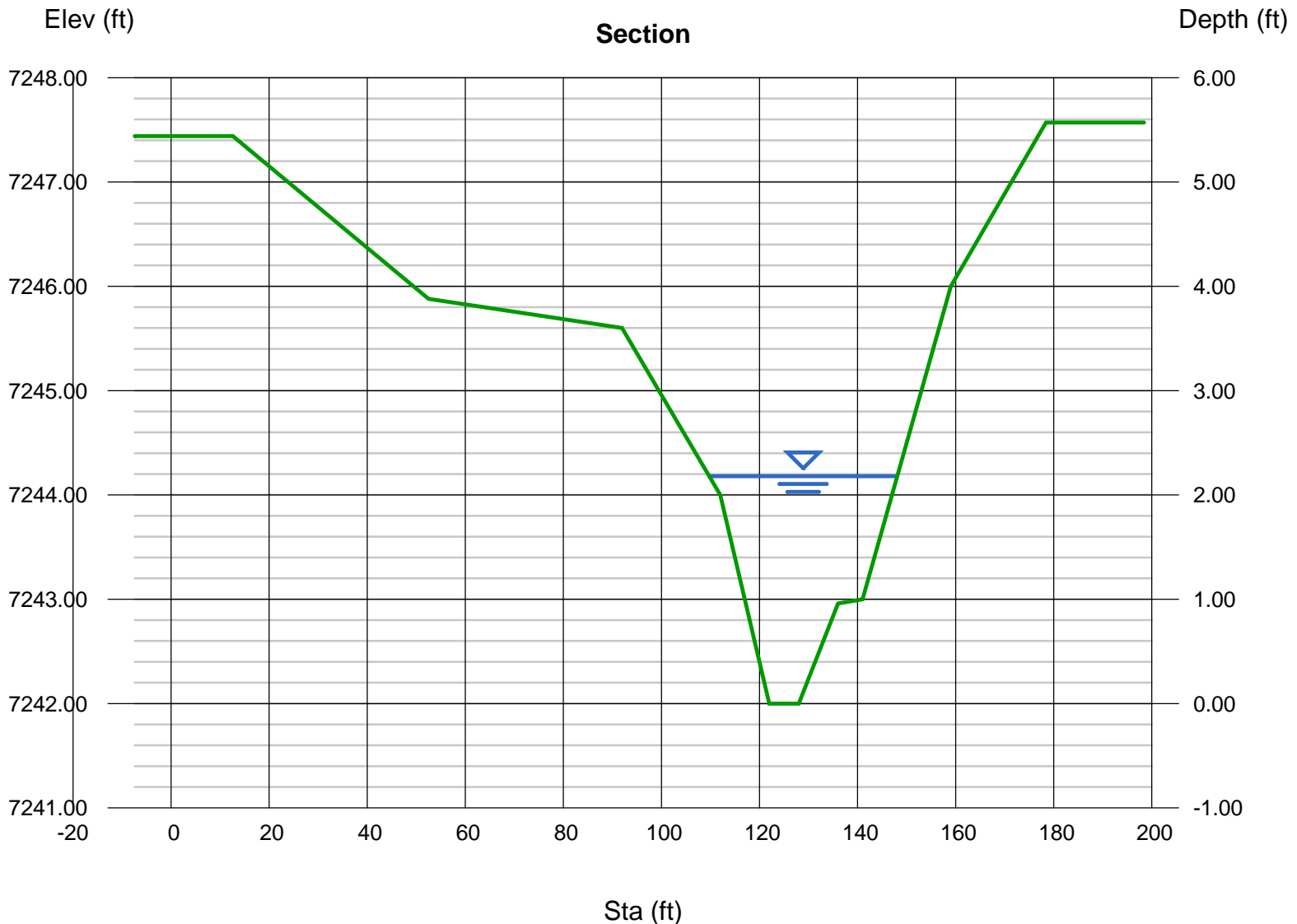
Compute by: Known Q
Known Q (cfs) = 317.00

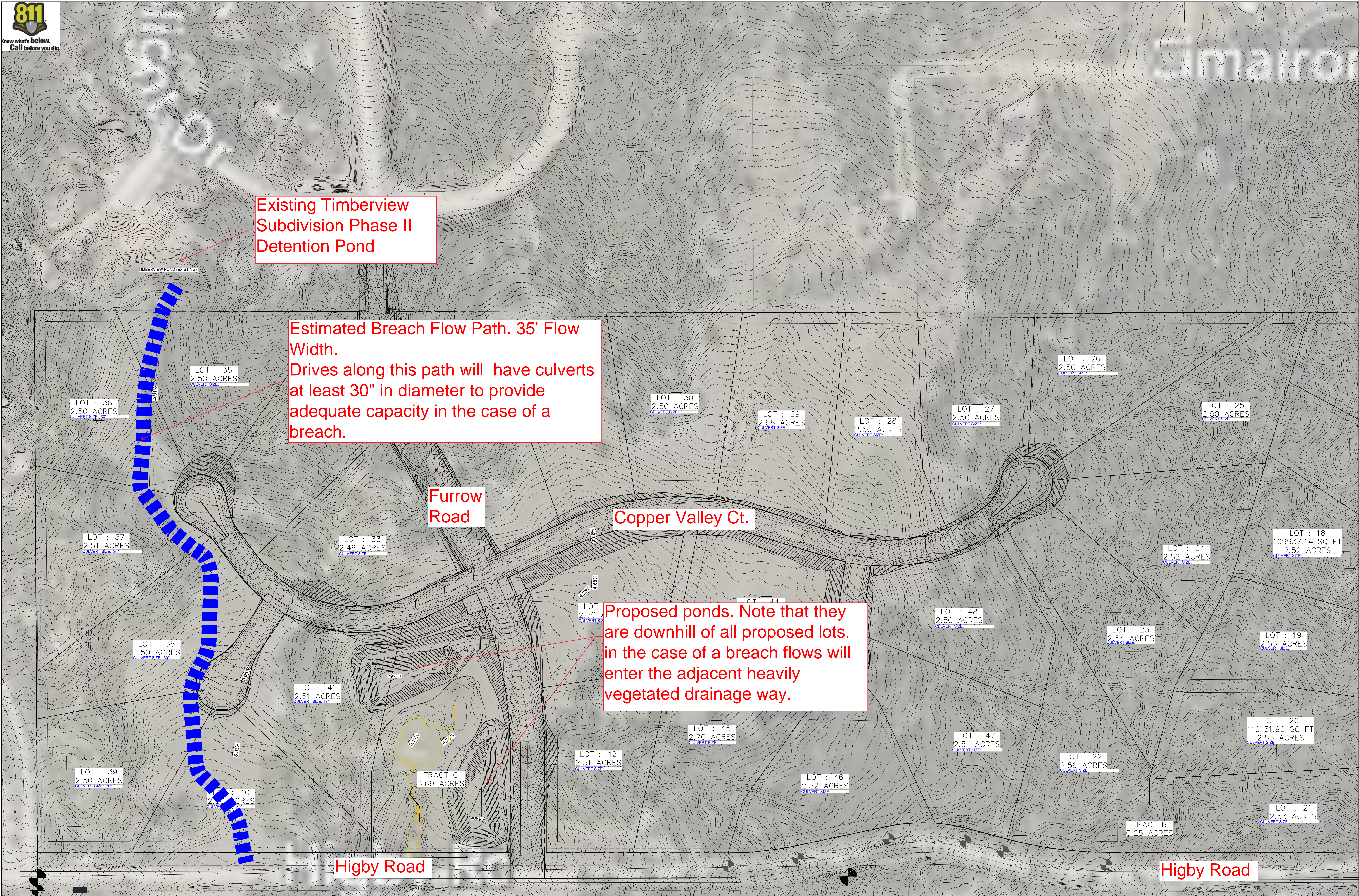
Highlighted

Depth (ft) = 2.18
Q (cfs) = 317.00
Area (sqft) = 48.87
Velocity (ft/s) = 6.49
Wetted Perim (ft) = 38.70
Crit Depth, Yc (ft) = 2.20
Top Width (ft) = 38.34
EGL (ft) = 2.83

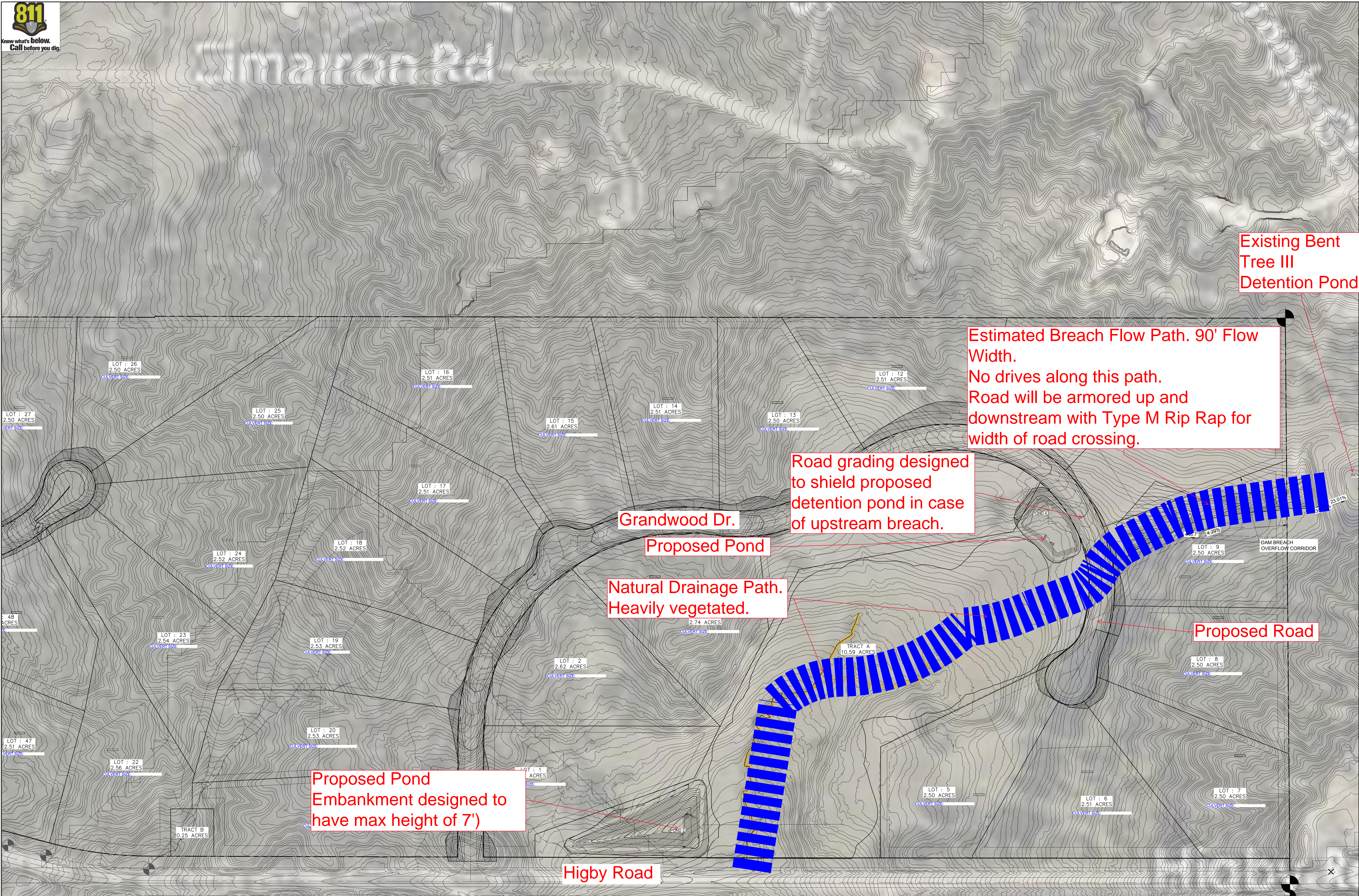
(Sta, El, n)-(Sta, El, n)...

(12.60, 7247.44)-(52.51, 7245.88, 0.040)-(91.95, 7245.60, 0.040)-(112.00, 7244.00, 0.050)-(122.00, 7242.00, 0.050)-(128.00, 7242.00, 0.050)-(136.00, 7242.96, 0.050)-(141.00, 7243.00, 0.050)-(159.00, 7246.00, 0.040)-(178.40, 7247.57, 0.040)





REFERENCE DRAWINGS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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[illegible]

FIRMETTE



FLOOD HAZARD INFORMATION

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

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, A99	
	With BFE or Depth Zone AE, AO, AH, VE, AR	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		8 Coastal Transect
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to 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.

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

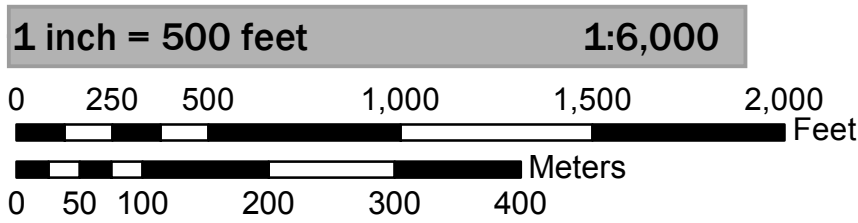
This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **3/8/2019 10:41:59 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at <https://www.fema.gov/media-library/assets/documents/118418>

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

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD83
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map please see the Flood Insurance Study(FIS) Report for your community at <https://msc.fema.gov>



NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

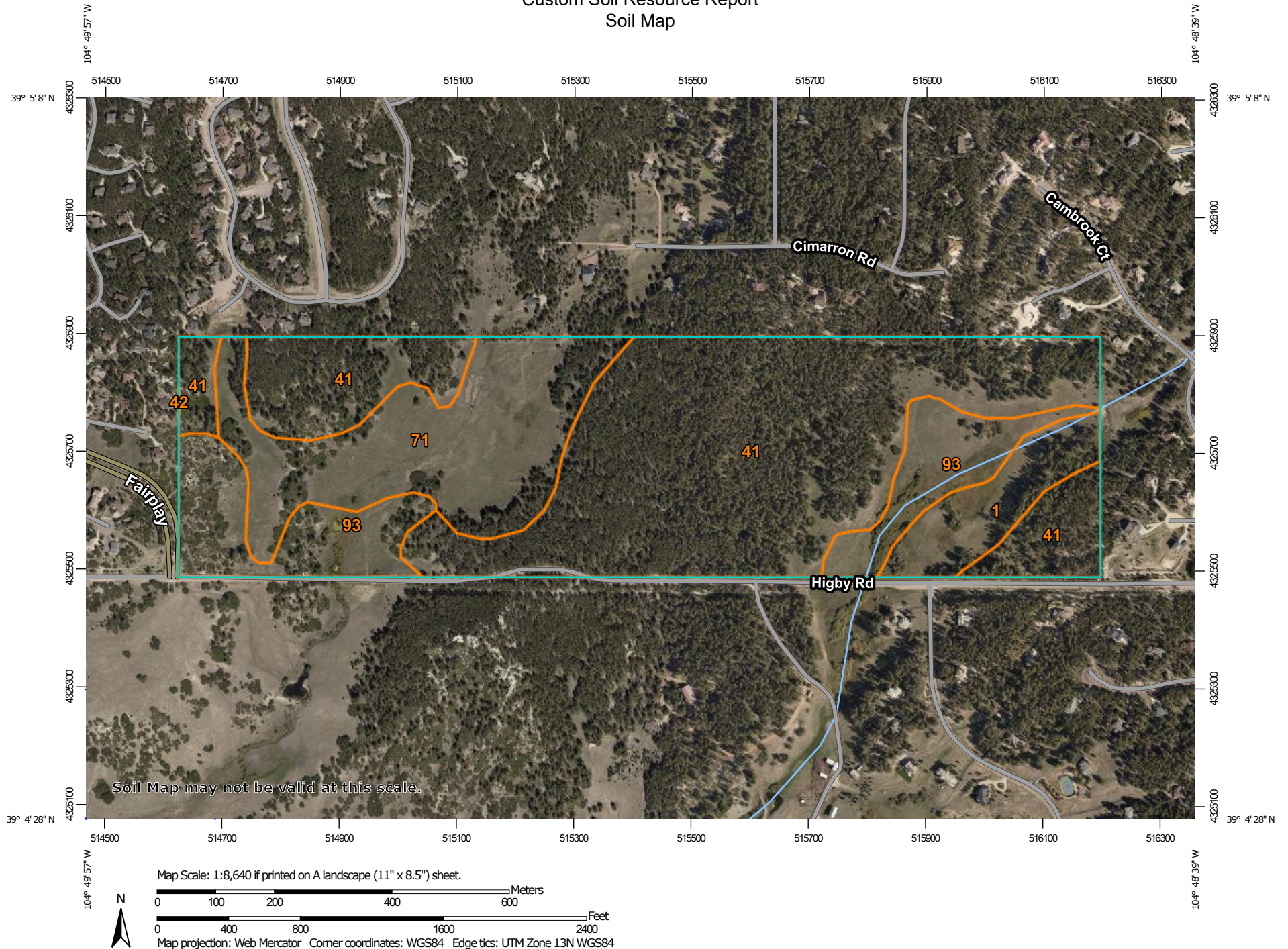
PANEL 279 OF 1275

Panel Contains:

COMMUNITY	NUMBER	PANEL
EL PASO COUNTY	080059	0279
COLORADO		
TOWN OF MONUMENT	080064	0279
COLORADO		


USDA NRCS WEB SOIL SURVEY REPORT

Custom Soil Resource Report Soil Map




MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout


 Borrow Pit


 Clay Spot


 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop


 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole

 Slide or Slip


 Sodic Spot


 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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: Aug 19, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	10.1	6.4%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	91.6	57.5%
42	Kettle-Rock outcrop complex	0.0	0.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	33.4	20.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	24.2	15.2%
Totals for Area of Interest		159.3	100.0%

Map Unit Descriptions

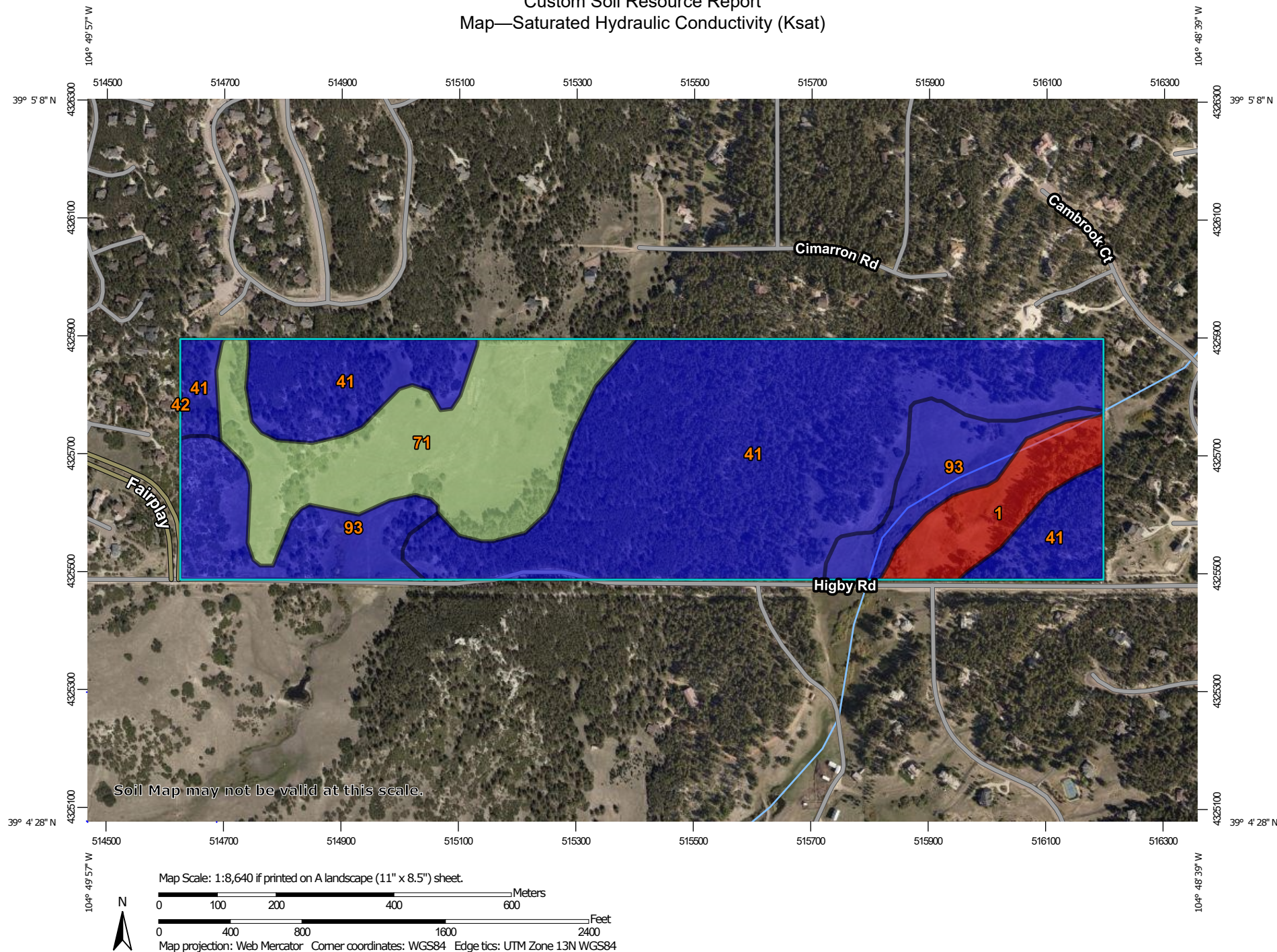
The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

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

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

Custom Soil Resource Report


Map—Saturated Hydraulic Conductivity (Ksat)




Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)





 Area of Interest (AOI)

Background





 Aerial Photography

Soils





Soil Rating Polygons

-  ≤ 9.0000
-  > 9.0000 and ≤ 28.0000
-  > 28.0000 and ≤ 92.0000
-  Not rated or not available


Soil Rating Lines

-  ≤ 9.0000
-  > 9.0000 and ≤ 28.0000
-  > 28.0000 and ≤ 92.0000
-  Not rated or not available






Soil Rating Points

-  ≤ 9.0000
-  > 9.0000 and ≤ 28.0000
-  > 28.0000 and ≤ 92.0000
-  Not rated or not available

Water Features

 Streams and Canals

Transportation

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

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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: Aug 19, 2018—Sep 23, 2018

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.

Table—Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	9.0000	10.1	6.4%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	92.0000	91.6	57.5%
42	Kettle-Rock outcrop complex	92.0000	0.0	0.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	28.0000	33.4	20.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	92.0000	24.2	15.2%
Totals for Area of Interest			159.3	100.0%

Rating Options—Saturated Hydraulic Conductivity (Ksat)

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

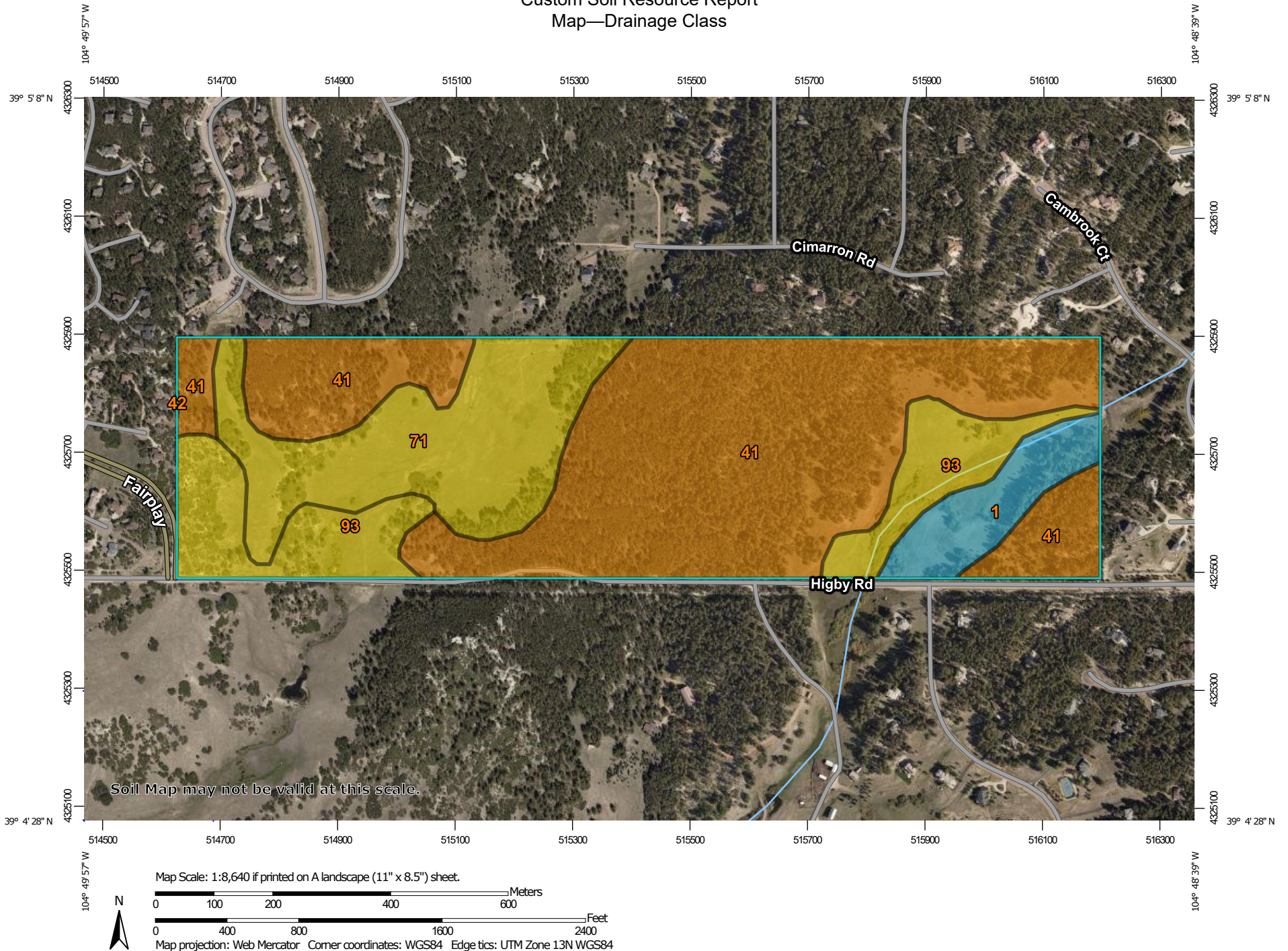
Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Drainage Class

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained,

Custom Soil Resource Report Map—Drainage Class



Custom Soil Resource Report



















MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons


	Excessively drained		Excessively drained
	Somewhat excessively drained		Somewhat excessively drained
	Well drained		Well drained
	Moderately well drained		Moderately well drained
	Somewhat poorly drained		Somewhat poorly drained
	Poorly drained		Poorly drained
	Very poorly drained		Very poorly drained
	Subaqueous		Subaqueous
	Not rated or not available		Not rated or not available

Soil Rating Lines





	Excessively drained
	Somewhat excessively drained
	Well drained
	Moderately well drained
	Somewhat poorly drained
	Poorly drained
	Very poorly drained
	Subaqueous
	Not rated or not available

Soil Rating Points

Water Features

 Streams and Canals

Transportation

	Rails
	Interstate Highways
	US Routes
	Major Roads
	Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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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)

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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: Aug 19, 2018—Sep 23, 2018

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.

Table—Drainage Class

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	Poorly drained	10.1	6.4%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	Somewhat excessively drained	91.6	57.5%
42	Kettle-Rock outcrop complex	Somewhat excessively drained	0.0	0.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	Well drained	33.4	20.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	Well drained	24.2	15.2%
Totals for Area of Interest			159.3	100.0%

Rating Options—Drainage Class

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group

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.

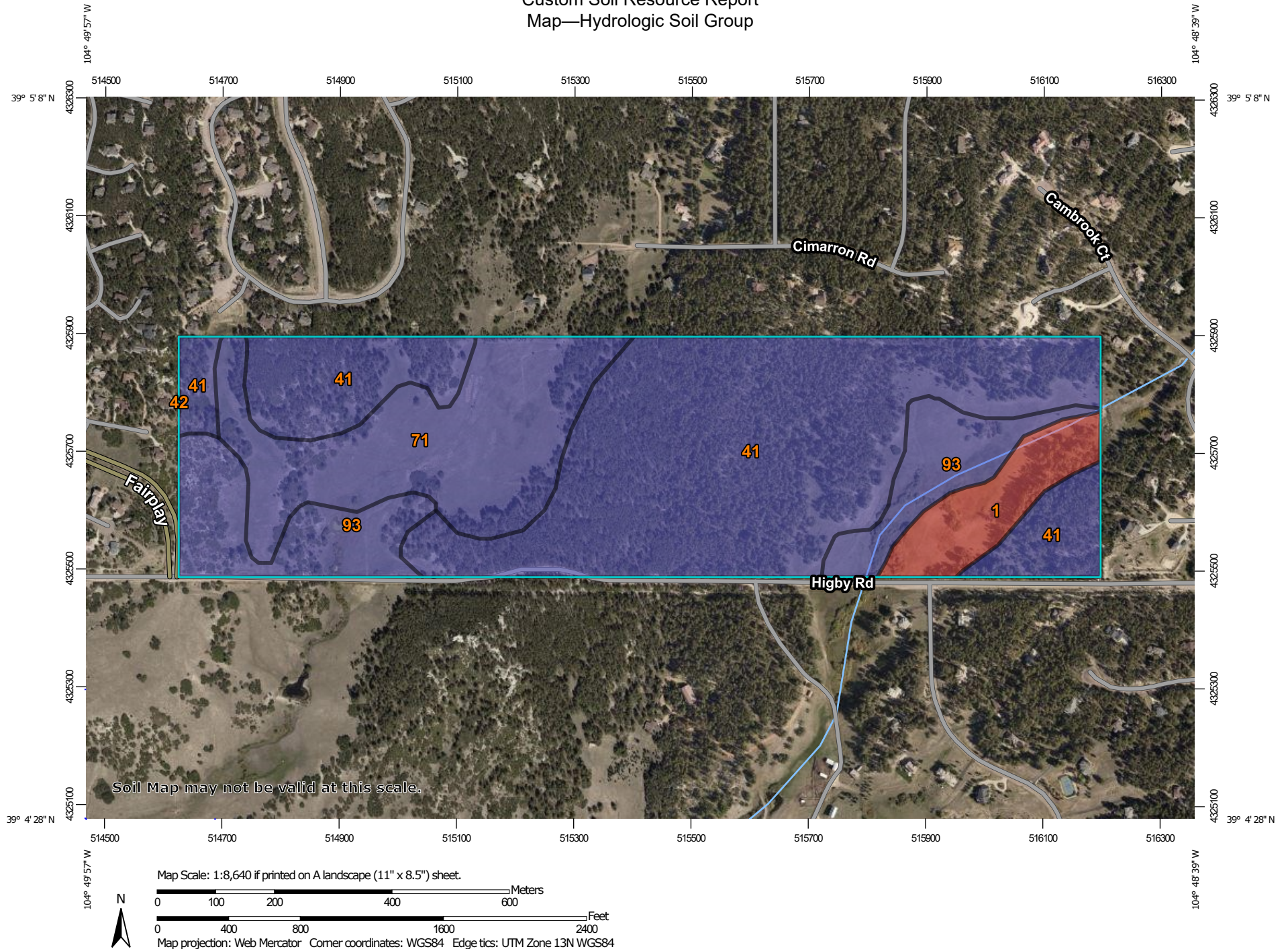
The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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


Custom Soil Resource Report Map—Hydrologic Soil Group



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines


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

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available


Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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: Aug 19, 2018—Sep 23, 2018

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	D	10.1	6.4%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	91.6	57.5%
42	Kettle-Rock outcrop complex	B	0.0	0.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	33.4	20.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	B	24.2	15.2%
Totals for Area of Interest			159.3	100.0%

Rating Options—Hydrologic Soil Group*Aggregation Method: Dominant Condition**Component Percent Cutoff: None Specified**Tie-break Rule: Higher*

APPENDIX D

MAPS

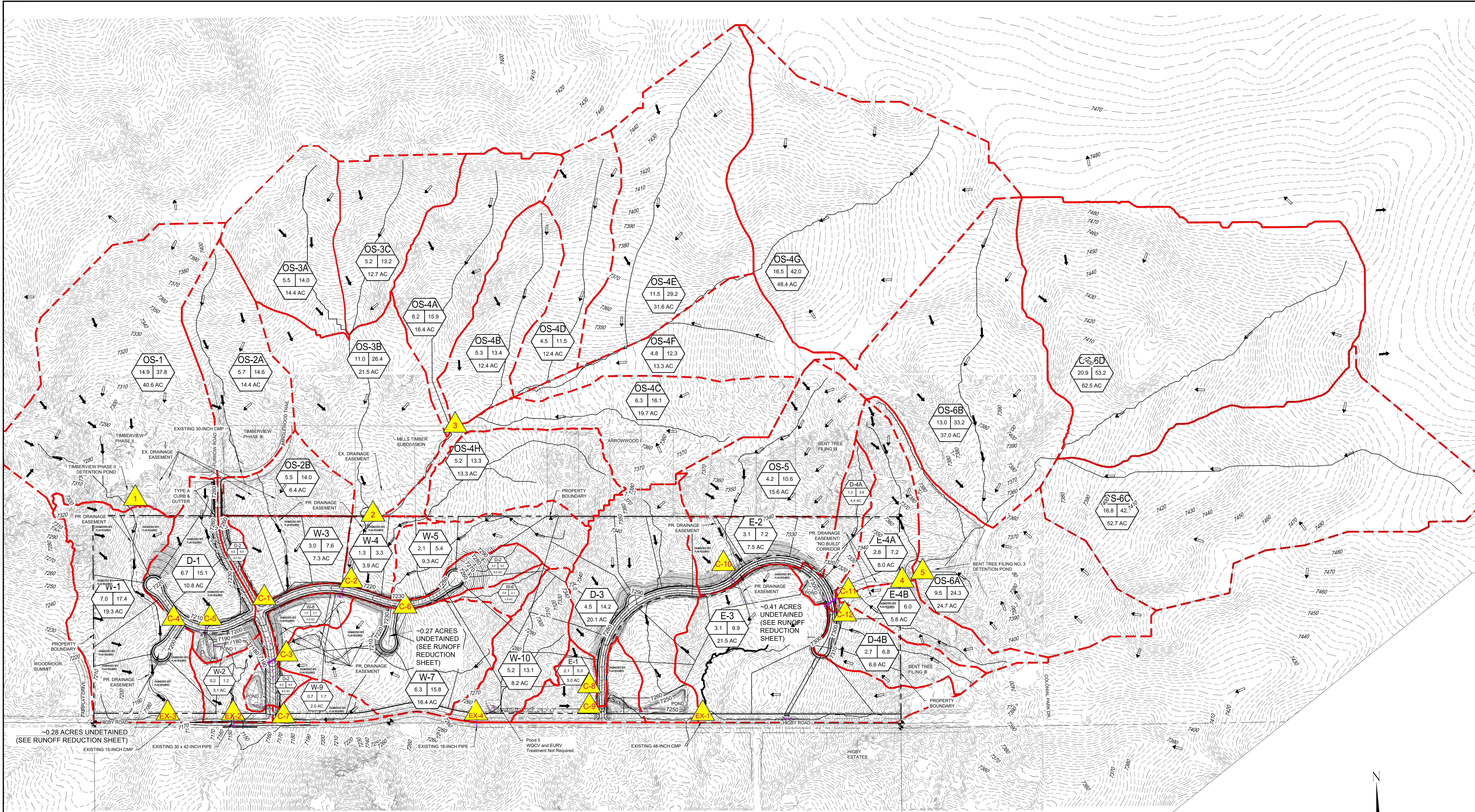


GRAPHIC SCALE

250 0 125 250 500

(IN FEET)

1 inch = 250 ft.

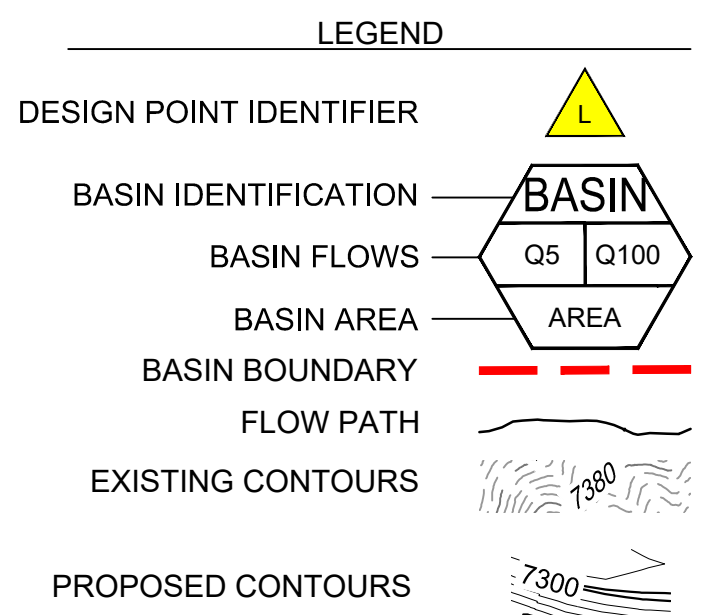
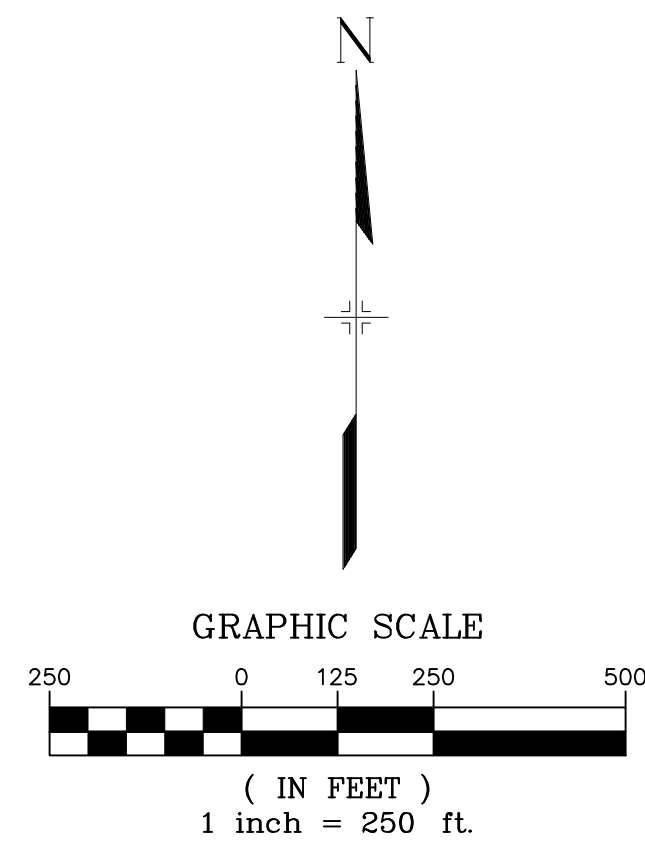


Sub Basins - West			
Sub-Basin	Area (Acres)	Q5 (cfs)	Q100 (cfs)
OS-1	40.6	14.9	37.8
OS-2A	14.4	5.7	14.6
OS-2B	6.4	5.5	14.0
Basin OS-3A	14.4	5.5	14.0
Basin OS-3B	21.5	11.0	26.4
Basin OS-3C	12.7	5.2	13.2
Basin OS-4A	16.4	6.2	15.9
Basin OS-4B	12.4	5.3	13.4
Basin OS-4C	19.7	6.3	16.1
Basin OS-4D	12.4	4.5	11.5
Basin OS-4E	31.6	11.5	29.2
Basin OS-4F	13.3	4.8	12.3
Basin OS-4G	48.4	16.5	42.0
Basin OS-4H	13.3	5.2	13.3
W-1	19.3	7.0	17.4
W-2	3.1	0.2	1.2
W-3	7.3	3.0	7.6
W-4	3.9	1.3	3.3
W-5	9.3	2.1	5.4
W-6	1.8	0.8	2.1
W-7	16.4	6.3	15.8
W-8	2.5	1.0	2.7
W-9	2.0	0.7	1.7
D-1	10.8	6.7	15.1
D-2	8.2	4.5	9.5

Sub Basins - East			
Sub-Basin	Area (Acres)	Q5 (cfs)	Q100 (cfs)
Basin OS-5	15.6	4.2	10.6
Basin OS-6A	24.7	9.5	24.3
Basin OS-6B	37.0	13.0	33.2
Basin OS-6C	52.7	16.8	42.7
Basin OS-6D	62.5	20.9	53.2
E-1	5.0	2.1	5.3
E-2	7.5	3.1	7.2
E-3	21.5	3.1	9.9
Basin E-4A	8.0	2.8	7.2
Basin E-4B	5.8	2.3	6.0
Basin D-3	20.1	4.5	14.2
Basin D-4A	4.4	1.3	3.4
Basin D-4B	6.6	2.7	6.8

Sub Basins - Central			
Sub-Basin	Area (Acres)	Q5 (cfs)	Q100 (cfs)
W-10	8.2	3.6	12.7

Design Point	Name in HMS	Sub-Basins	Downstream Design Point	Total Area (Ac)	Q5	Q100
1	Reservoir OS-1	OS-1	EX-3	40.6	13.3	29.1
2	Route Basin OS-3A	OS-3A, OS-3B, OS-3C	C-2	48.8	14.4	36
3	Upper Junction	OS-4B, OS-4C, OS-4D, OS-4E, OS-4F, OS-4G	C-2	137.6	44.9	114.3
4	Reservoir OS-5	OS-6A, OS-6B, OS-6C, OS-6D	5	177.0	44.9	128.8
5	OS-5 inflow	Design Point 4 (Offsite reservoir)	C-10	177.0	53.1	135.7
C-1	Junction C-1	OS-2A, OS-2B, W-3	C-3	33.2	9.5	23.9
C-2	Junction C-2	W-4, Design Point 2, OS-4A, Design Point 3, OS-4H, W-5	C-3	225.9	53.6	135.1
C-3	Junction C-3	W-8, Design Point C-1, Design Point C-2, W-6, W-7	EX-2	280.7	57.0	142.9
C-4		D-1	EX-2	12.8	6.7	15.1
C-5		D-1	EX-2	12.8	6.7	15.1
C-6		D-2	EX-2	6.4	4.5	9.5
C-7		W-9	EX-2	1.9	0.7	1.7
C-8		E-1	EX-3	13.2	2.1	5.3
C-9		Basin D-3	EX-3	19.2	4.5	14.2
C-10		OS-5, E-2	EX-3	22.5	7.3	17.8
C-11	C-10	E-4A, E-4B, Design Point 4	EX-3	191.0	45.7	130.9
C-12	Pond 4	D-4A, D-4B	EX-1	6.6	4.0	10.2
EX-1	Sink-1	E-1A, Pond 3, C-10	Existing 48" CMP	270.9	49.5	140.6
EX-2	Sink-2	W-2, Pond 1, Design Point C-3, Pond 2, W-9	Existing 30" x 42" CMP Proposed 19" x 30" HERCP (Horizontal Elliptical)	305.0	54.6	143.2
EX-3	Sink-3	Design Point 1, W-1	15" CMP	59.9	11.2	35.7
EX-4	Sink-4	UD-Detention: W-4	Existing 18" CMP	8.2	2.6	10.1



EL PASO COUNTY, CO

PRELIMINARY DRAINAGE REPORT

GRANDWOOD RANCH

POST DEVELOPMENT CONDITIONS

PRELIMINARY
THIS DRAWING HAS NOT
BEEN APPROVED BY
GOVERNING AGENCIES AND
IS SUBJECT TO CHANGE

DESIGNED BY: JSTN
DRAWN BY: JN
CHECKED BY: JTS
SCALE: 1" = 250'
DATE ISSUED: JUNE 2020
SHEET: 2 OF 4
PROJECT NO: 201105.004

FOR AND ON BEHALF OF
MATRIX DESIGN GROUP, INC.
PROJECT NO: 201105.004

PREPARED BY:
Matrix
Excellence by Design

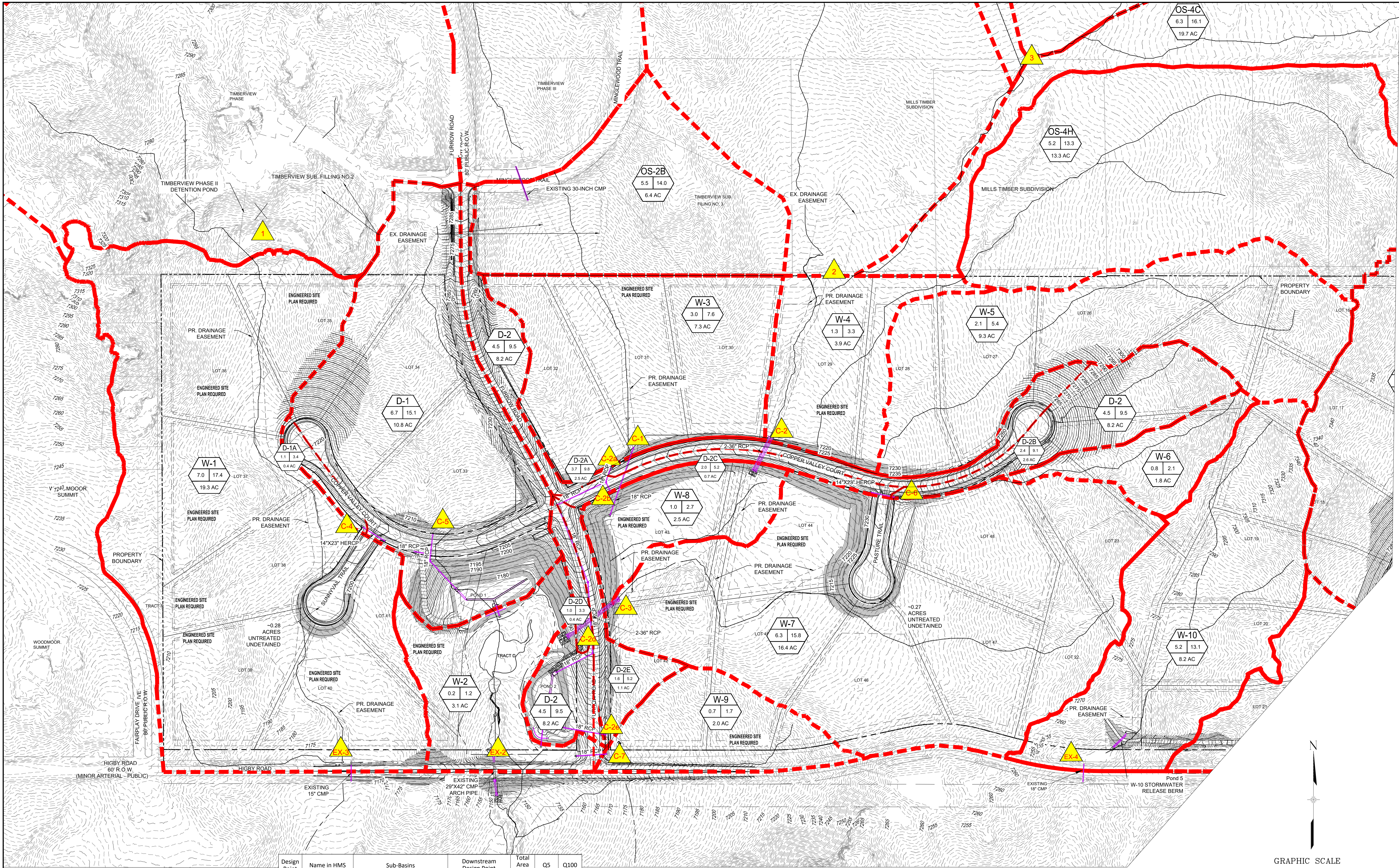
SEAL

SHEET KEY

REVISIONS

COMPUTER FILE MANAGEMENT

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THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE



Sub Basins - West				
Sub-Basin	Area (Acres)	Q5 (cfs)	Q100 (cfs)	
OS-1	40.6	14.9	37.8	
OS-2A	14.4	5.7	14.6	
OS-2B	6.4	5.5	14.0	
Basin OS-3A	14.4	5.5	14.0	
Basin OS-3B	21.5	11.0	26.4	
Basin OS-3C	12.7	5.2	13.2	
Basin OS-4A	16.4	6.2	15.9	
Basin OS-4B	12.4	5.3	13.4	
Basin OS-4C	19.7	6.3	16.1	
Basin OS-4D	12.4	4.5	11.5	
Basin OS-4E	31.6	11.5	29.2	
Basin OS-4F	13.3	4.8	12.3	
Basin OS-4G	48.4	16.5	42.0	
Basin OS-4H	13.3	5.2	13.1	
W-1	19.3	7.0	17.4	
W-2	3.1	0.2	1.2	
W-3	7.3	3.0	7.6	
W-4	3.9	1.3	3.3	
W-5	9.3	2.1	5.4	
W-6	1.8	0.8	2.1	
W-7	16.4	6.3	15.8	
W-8	2.5	1.0	2.7	
W-9	2.0	0.7	1.7	
D-1	10.8	6.7	15.1	
D-2	8.2	4.5	9.5	

Sub Basins - East				
Sub-Basin	Area (Acres)	Q5 (cfs)	Q100 (cfs)	
Basin OS-5	15.6	4.2	10.6	
Basin OS-6A	24.7	9.5	24.3	
Basin OS-6B	37.0	13.0	33.2	
Basin OS-6C	52.7	16.8	42.7	
Basin OS-6D	62.5	20.9	53.2	
E-1	5.0	2.1	5.3	
E-2	7.5	3.1	7.2	
E-3	21.5	3.1	9.9	
Basin E-4A	8.0	2.8	7.2	
Basin E-4B	5.8	2.3	6.0	
Basin D-3	20.1	4.5	14.2	
Basin D-4A	4.4	1.3	3.4	
Basin D-4B	6.6	2.7	6.8	

Sub Basins - Central				
Sub-Basin	Area (Acres)	Q5 (cfs)	Q100 (cfs)	
W-10	8.2	3.6	12.7	

Design Point	Name in HMS	Sub-Basins	Downstream Design Point	Total Area (AC)	Q5	Q100
1	Reservoir OS-1	OS-1	EX-3	40.6	13.3	29.1
2	Route Basin OS-3A	OS-3A, OS-3B, OS-3C	C-2	48.8	14.4	36
3	Upper Junction	OS-4B, OS-4C, OS-4D, OS-4E, OS-4F, OS-4G	C-2	137.6	44.9	114.3
4	Reservoir OS-5	OS-5A, OS-5B, OS-5C, OS-5D	5	177.0	44.9	128.8
5	OS-5 inflow	Design Point 4 (Offsite reservoir)	C-10	177.0	53.1	135.7
C-1	Junction C-1	OS-2A, OS-2B, W-3	C-3	33.2	9.5	23.9
C-2	Junction C-2	W-4, Design Point 2, OS-4A, Design Point 3, OS-4H, W-5	C-3	225.9	53.6	135.1
C-3	Junction C-3	W-8, Design Point C-1, Design Point C-2, W-6, W-7	EX-2	280.7	57.0	142.9
C-4		D-1	EX-2	12.8	6.7	15.1
C-5		D-1	EX-2	12.8	6.7	15.1
C-6		D-2	EX-2	6.4	4.5	9.5
C-7		W-9	EX-2	1.9	0.7	1.7
C-8		E-1	EX-3	13.2	2.1	5.3
C-9		Basin D-3	EX-3	19.2	4.5	14.2
C-10		OS-5, E-2	EX-3	22.5	7.3	17.8
C-11	C-10	E-4A, E-4B, Design Point 4	EX-3	191.0	45.7	130.9
C-12	Pond 4	D-4A, D-4B	EX-1	6.6	4.0	10.2
EX-1	Sink-1	E-1A, Pond 3, C-10	Existing 48" CMP	270.9	49.4	140.4
EX-2	Sink-2	W-2, Pond 1, Design Point C-3, Pond 2, W-9	29" x 42" CMP Proposed 36" RCP	305.0	54.5	142.8
EX-3	Sink-3	Design Point 1, W-1	15" CMP	59.9	11.2	35.7
EX-4	Sink-4	UD-Detention: W-4	Existing 18" CMP	8.2	2.6	10.1

Cross Road Culvert Sizing

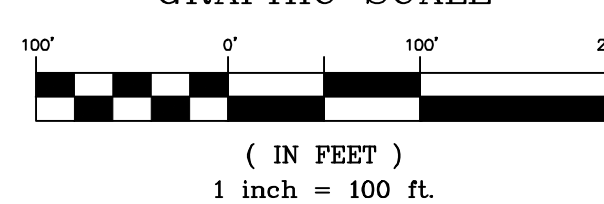
Mannings n 0.013 (reinforced concrete)
18 inches

Allowable Velocities in Culverts

Min v max V 3 fps 18 fps

Design Point	Discharge (cfs)	Max Slope (%)	Culvert Diameter (ft)	Velocity (ft/s)	Stormwater Treatment
C-1	23.9	6	1.5	16.5	Bypass of Historic Flow
C-1	11.5	7.5	2	14.8	Treated Developed Flow (Basin D-2)
C-2	135.1	3.5	3	18	Bypass of Historic Flow (2 culverts, 69 cfs each)
C-3	142.9	135.1	3	18	Bypass of Historic Flow (2 culverts, 72.8 cfs each)
C-4	15.1	2	1.5	14.71	Treated Developed Flow
C-5	15.1	2	3	14.71	Treated Developed Flow
C-6	9.5	4.5	1.5	11.9	Treated Developed Flow
C-7	1.7	6.5	1.5	8.3	Bypass of Historic Flow
C-8	5.3	7	1.5	11.9	Bypass of Historic Flow
C-9	14.2	6.5	2	15	Treated Developed Flow
C-10	17.8	3.3	1.5	12.2	Bypass of Historic Flow
C-11	130.9	2.5	2.5	15	Bypass of Historic Flow
C-12	10.2	10	1.5	14.75	Treated Developed Flow

GRAPHIC SCALE



LEGEND

DESIGN POINT IDENTIFIER

Basin Identification

Basin Flows

Basin Area

Basin Boundary

Flow Path

Existing Contours

Proposed Contours

EL PASO COUNTY, CO

FINAL DRAINAGE REPORT

GRANDWOOD RANCH

POST DEVELOPMENT CONDITIONS

PRELIMINARY

THIS DRAWING HAS NOT BEEN APPROVED BY GOVERNING AGENCIES AND IS SUBJECT TO CHANGE

DESIGNED BY: JTS

DRAWN BY: JTS

CHECKED BY: JTS

SCALE: 1" = 250'

DATE ISSUED: JUNE 2020

SHEET: 3 OF 4

PROJECT NO: 20.1105.004

FOR AND ON BEHALF OF: MATRIX DESIGN GROUP, INC.

PROJECT NO: 20.1105.004

DR03

SEAL

PREPARED BY: Matrix

Excellence by Design

SHEET KEY

NO. DATE DESCRIPTION

REVISIONS

REFERENCE DRAWINGS

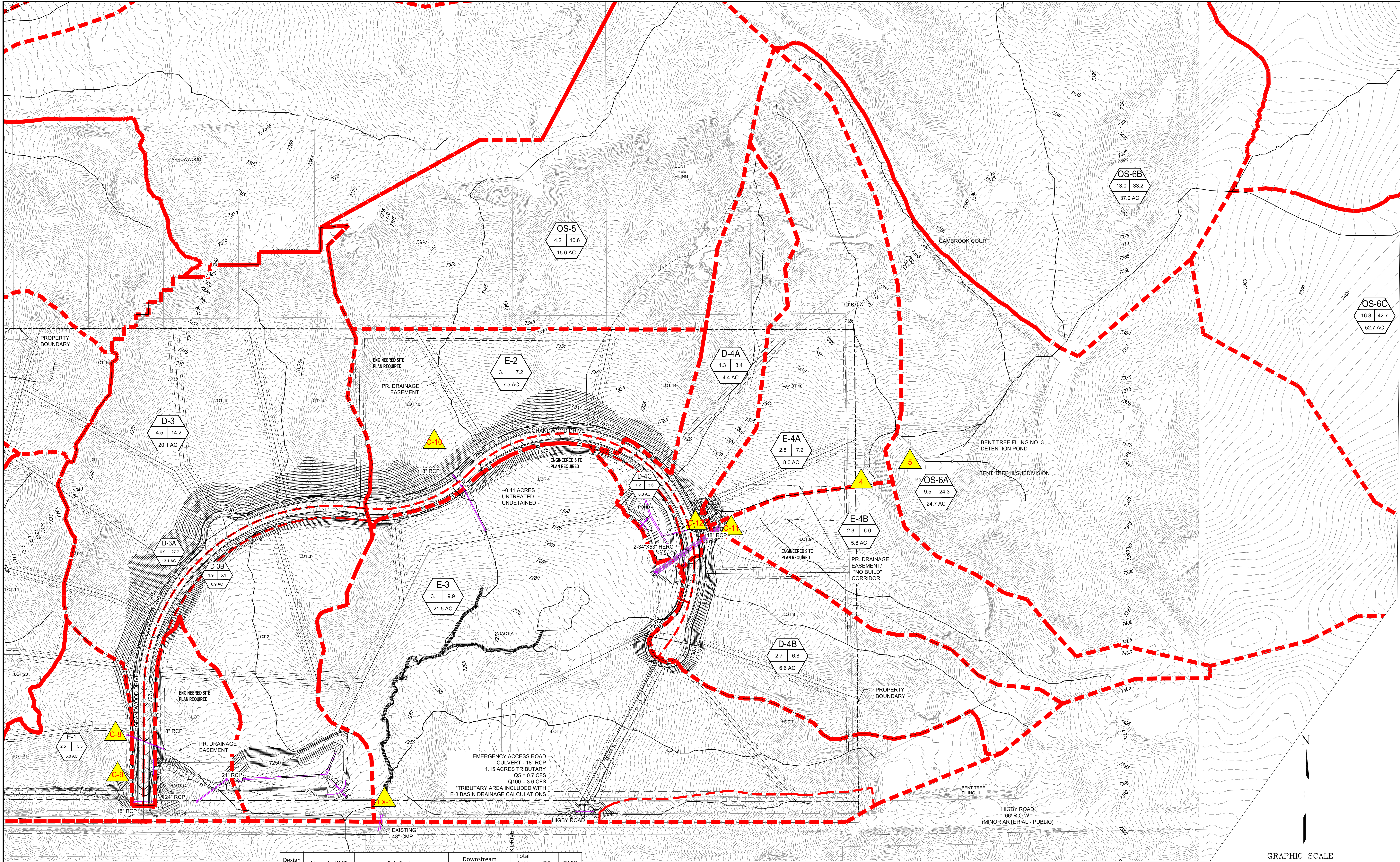
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FILE NAME: 20.1105.004 Grandwood Ranch\200 Drainage\Reports\DRD03\DR03.DWG

CTB FILE: 20.1105.004.ctb

PLOT DATE: December 18, 2020 10:32:08 AM

THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE



Sub Basins - West			
Sub-Basin	Area (Acres)	Q5 (cfs)	Q100 (cfs)
OS-1	40.6	14.9	37.8
OS-2A	14.4	5.7	14.6
OS-2B	6.4	5.5	14.0
Basin OS-3A	14.4	5.5	14.0
Basin OS-3B	21.5	11.0	26.4
Basin OS-3C	12.7	5.2	13.2
Basin OS-4A	16.4	6.2	15.9
Basin OS-4B	12.4	5.3	13.4
Basin OS-4C	19.7	6.3	16.1
Basin OS-4D	12.4	4.5	11.5
Basin OS-4E	31.6	11.5	29.2
Basin OS-4F	13.3	4.8	12.3
Basin OS-4G	48.4	16.5	42.0
Basin OS-4H	13.3	5.2	13.1
W-1	19.3	7.0	17.4
W-2	3.1	0.2	1.2
W-3	7.3	3.0	7.6
W-4	3.9	1.3	3.3
W-5	9.3	2.1	5.4
W-6	1.8	0.5	2.1
W-7	16.4	6.3	15.8
W-8	2.5	1.0	2.7
W-9	2.0	0.7	1.7
D-1	10.8	6.7	15.1
D-2	8.2	4.5	9.5

Sub Basins - East			
Sub-Basin	Area (Acres)	Q5 (cfs)	Q100 (cfs)
Basin OS-5	15.6	4.2	10.6
Basin OS-6A	24.7	9.5	24.3
Basin OS-6B	37.0	13.0	33.2
Basin OS-6C	52.7	16.8	42.7
Basin OS-6D	62.5	20.9	53.2
E-1	5.0	2.1	5.3
E-2	7.5	3.1	7.2
E-3	21.5	9.9	24.7
Basin E-4A	8.0	2.8	7.2
Basin E-4B	5.8	2.3	6.0
Basin D-3	20.1	4.5	14.2
Basin D-4A	4.4	1.3	3.4
Basin D-4B	6.6	2.7	6.8

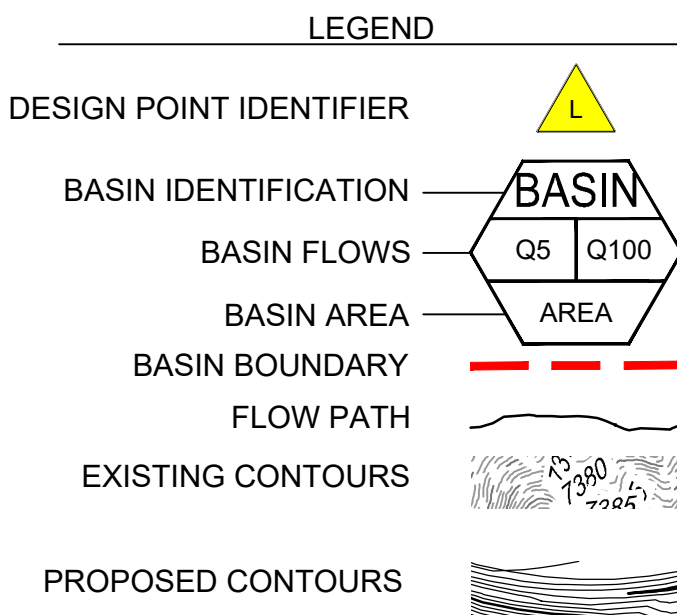
Sub Basins - Central			
Sub-Basin	Area (Acres)	Q5 (cfs)	Q100 (cfs)
W-10	8.2	3.6	12.7

Design Point	Name in HMS	Sub-Basins	Downstream Design Point	Total Area (AC)	Q5	Q100
1	Reservoir OS-1	OS-1	EX-3	40.6	13.3	29.1
2	Route Basin OS-3A	OS-3A, OS-3B, OS-3C	C-2	48.8	14.4	36
3	Upper Junction	OS-4B, OS-4C, OS-4D, OS-4E, OS-4F, OS-4G	C-2	137.6	44.9	114.3
4	Reservoir OS-5	OS-6A, OS-6B, OS-6C, OS-6D	5	177.0	44.9	128.8
5	OS-5 inflow	Design Point 4 (Offsite reservoir)	C-10	177.0	53.1	135.7
C-1	Junction C-1	OS-2A, OS-2B, W-3	C-3	33.2	9.5	23.9
C-2	Junction C-2	W-4, Design Point 2, OS-4A, Design Point 3, OS-4H, W-5	C-3	225.9	53.6	135.1
C-3	Junction C-3	W-8, Design Point C-1, Design Point C-2, W-6, W-7	EX-2	280.7	57.0	142.9
C-4		D-1	EX-2	12.8	6.7	15.1
C-5		D-1	EX-2	12.8	6.7	15.1
C-6		D-2	EX-2	6.4	4.5	9.5
C-7		W-9	EX-2	1.9	0.7	1.7
C-8		E-1	EX-3	13.2	2.1	5.3
C-9		Basin D-3	EX-3	19.2	4.5	14.2
C-10		OS-5, E-2	EX-3	22.5	7.3	17.8
C-11		E-4A, E-4B, Design Point 4	EX-3	191.0	45.7	130.9
C-12	Pond 4	D-4A, D-4B	EX-1	6.6	4.0	10.2
EX-1	Sink-1	E-1A, Pond 3, C-10	Existing 48" CMP	270.9	49.4	140.4
EX-2	Sink-2	W-2, Pond 1, Design Point C-3, Pond 2, W-9	30" x 42" CMP Proposed 19" x 30" HERCP (Horizontal Elliptical)	305.0	54.5	142.8
EX-3	Sink-3	Design Point 1, W-1	15" CMP	59.9	11.2	35.7
EX-4	Sink-4	UD-Detention: W-4	Existing 18" CMP	8.2	2.6	10.1

Cross Road Culvert Sizing
Mannings n 0.013 (reinforced concrete)
Min D 18 inches

		Allowable Velocities in Culverts	
		Min	max V
		3 fps	18 fps
*Dam breach flow used			
Design Point	Peak Discharge (cfs)	Max Slope (%)	Culvert Diameter (ft)
C-1	23.9	6	1.5
C-1	11.5	7.5	2
C-2	135.1	3.5	3
C-3	142.9	135.1	3
C-4	15.1	2	1.5
C-5	15.1	2	3
C-6	9.5	4.5	1.5
C-7	1.7	6.5	1.5
C-8	5.3	7	1.5
C-9	14.2	6.5	2
C-10	17.8	3.3	1.5
C-11	130.9	2.5	2.5
C-12	10.2	10	1.5

Velocity (ft/s)	Stormwater Treatment
16.5	Bypass of Historic Flow
14.8	Treated Developed Flow (Basin D-2)
18	Bypass of Historic Flow (2 culverts, 69 cfs each)
18	Bypass of Historic Flow (2 culverts, 72.8 cfs each)
14.71	Treated Developed Flow
14.71	Treated Developed Flow
11.9	Treated Developed Flow
8.3	Bypass of Historic Flow
11.9	Bypass of Historic Flow
15	Treated Developed Flow
12.2	Bypass of Historic Flow
15	Bypass of Historic Flow (2 culverts, 65.6 cfs each)
14.75	Treated Developed Flow



EL PASO COUNTY, CO

FINAL DRAINAGE REPORT

GRANDWOOD RANCH

POST DEVELOPMENT CONDITIONS

PRELIMINARY
THIS DRAWING HAS NOT
BEEN APPROVED BY
GOVERNING AGENCIES AND
IS SUBJECT TO CHANGE

FOR AND ON BEHALF OF
MATRIX DESIGN GROUP, INC.
DRAWN BY: JTS
CHECKED BY: JTS
PROJECT NO. 20-105-004

DESIGNED BY: JTS
SCALE: 1" = 100'
DATE ISSUED: JUNE 2020
SHEET: 4 OF 4

SEAL

PREPARED BY:
Matrix
Excellence by Design

COMPUTER FILE MANAGEMENT
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DESCRIPTION
REVISIONS
BY
DATE
NO.