See all of my comments in the Segment 1 FDR about double WQ treatment and revise this Segment 2 FDR accordingly.

I have provided additional Segment 2 specific comments in this FDR as well.

HRGREEN.COM

Eastonville Road – Londonderry Dr. to Rex Rd.
Segment 2 Improvements
Stationing 47+00.00 – 79+31.62

Final Drainage Report

January 2025

HR Green Project No: 201662.08

Prepared For:

D.R. Horton

Contact: Riley Hillen, P.E.

9555 S. Kingston Ct.

Englewood, CO 80112

Prepared By:

HR Green Development, LLC

Contact: Colleen Monahan, P.E., LEED AP

cmonahan@hrgreen.com

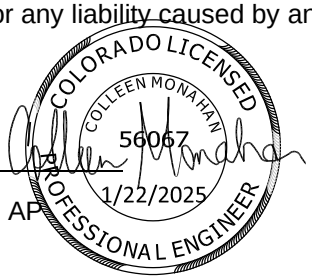
(719) 394-2433

EDARP Filing No:

CDR2321

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.



Colleen Monahan, P.E., LEED AP Date

State of Colorado No. 56067

For and on behalf of HR Green Development, LLC

Owner/Developer's Statement:

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

By: _____ _____

Authorized Signature Date

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

El Paso County Statement

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

_____

Joshua Palmer, P.E. Date

County Engineer/ECM Administrator

Conditions:

Table of Contents

Appendices

I. General Purpose, Location and Description

a. Purpose

The purpose of this Final Drainage Report (FDR) for Eastonville Road Segment 2 Improvements is to describe the onsite and offsite drainage patterns, size drainage infrastructure to safely capture and convey developed runoff to water quality and detention facilities, and to safely route detained stormwater to adequate outfalls. This drainage report will detail the improvements of Eastonville Road from Londonderry Dr. to Rex Road for Segment 2. Stations 47+00.00 to 79+32.00 contain the Segment 2 Improvements for the Eastonville Road from Londonderry Drive to Rex Road for the portion of the project north of Grandview Filing No. 1. The development is considered a single project; however, the plan set has been broken into two segments to align with the Grandview Reserve Filings. A separate FDR describes Segment 1 of the project.

b. Location

Eastonville Road from Londonderry Dr. to Rex Road, referred to as 'the site' herein, is an existing 26' wide treated gravel road in El Paso County, Colorado. Per field inspection the existing pavement is not full depth, and therefore described as 'temporary' for the purpose of this report. The site lies in the existing 60' wide El Paso County Right-of-Way within Sections 21 and 28, Township 12 South, Range 64 West of the 6th Principal Meridian, in El Paso County, State of Colorado.

The site is bound by undeveloped land to the east and west that has historically been used as ranching lands. Falcon Regional Park, which contains ballparks and parking, and Falcon High School also border the site to the west. All lands to the east and west of the site are unplatted. A vicinity map is presented in Appendix A.

c. Description of Property

The site is approximately 0.69 miles (2.17 acres) of existing treated gravel roadway north of Londonderry Dr. and south of Rex Road. Per field inspection the existing pavement is not full depth, and therefore described as 'temporary' for the purpose of this report. The existing treated gravel width for the length of the project is 26' wide. There are 4' wide gravel shoulders and native landscaped swales are located on both sides of the roadway. Offsite stormwater is bypassed under the road through a series of existing culverts. See Appendix A for an existing conditions photo.

The existing roadway has slopes ranging from 0.3% up to about 4%. The general topography of the surrounding area is typical of high desert, short prairie grass with gently rolling hillside with slopes ranging from 2% to 4%. The project site drains generally from the west to the east and is tributary to Black Squirrel Creek.

Per a NRCS soil survey, the site is made up of Type A Columbine gravelly sandy loam, Type A Blakeland loamy sand and Type B Stapleton sandy loam. The NRCS soil survey is presented in Appendix A.

Gieck Ranch Tributary #1 (Channel A) is the only drainageway that traverses the site in the west to east direction through an existing culvert under Eastonville Road. The channel is a mapped wetland and a wetland permit will be required and has been obtained for a part of this Eastonville Road improvement project. NWP # SPA-2024-207 and is included in the project CDR-2321. Channel A is not within a FEMA floodplain.

Gieck Ranch Tributary #2 is located on the north end of the project site and contains a mapped floodplain. A CLOMR permit has been obtained (Case No. #24-08-0102R) and is included in the project CDR-2321. There are no known irrigation facilities in the area.

Existing utilities include an underground gas line that runs under Eastonville road through the Grandview reserve property south of the segment 2 improvements, an existing raw water line that follows the west side of Eastonville north of Falcon Regional Park, and an existing aboveground electrical line along the western side of Eastonville Road. An existing drainage map with these facilities is presented in Appendix F.

d. Floodplain Statement

Based on FEMA Firm map 08041C0552G December 7, 2018, the site is not located in any FEMA designated floodplain. See FEMA Firm Map in Appendix A. There is a Zone A floodplain north of the site and a Zone AE south of the site. There is an approved CLOMR for the Zone A floodplain north of the site that will be needed for a portion of Segment 2 of this project. A CLOMR permit has been obtained (Case No. #24-08-0102R) and is included in the project CDR-2321.

II. Drainage Design Criteria

a. Drainage Criteria

Hydrologic data and calculations were performed using Drainage Criteria Manual Volume 1 of El Paso County (EPCDCM), with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs Drainage Criteria Manual (CCSDCM), May 2014 revised January 2021.

Onsite drainage improvements are designed for the 5-year storm (minor event) and 100-year storm (major event) using rainfall values from the NOAA Atlas 14 Point Precipitation Frequency Data Server. Runoff was calculated per CCSDCM Section 6.3.0 - Rational Method. Private, full spectrum pond design was completed using the latest version of Mile High Flood District's (MHFD) UD-Detention per CCSDCM Section 13.3.2.1 – Private, full spectrum Detention. The detention pond allowable release rate will be limited to less than historic rates.

Rainfall Depths per NOAA Atlas 14		
Return Period (yr)	5	100
1-hr Rainfall Depth (in)	1.21	2.49

Inlet sizing was performed per the methods described in EPCDCM Section III Chapter 7 – Street Drainage and Storm Water Inlets. Storm sewer sizing was performed per the methods described in EPCDCM Section III Chapter 8 – Storm Drains and Appurtenances.

III. Drainage Basins and Subbasins

a. Major Basin Description

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

1. "Gieck Ranch Drainage Basin Planning Study" prepared by Drexel, Barrel & Co, February 2010.
2. "Master Development Drainage Plan Meridian Ranch" prepared by Tech Contractors, July 2021.

3. “Final Drainage Report for The Sanctuary Filing 1 at Meridian Ranch” by Tech Contractors, August 2022.

Gieck Ranch Drainage Basin is a 22.05 square mile watershed located in El Paso County, Colorado. Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains to the Arkansas River. The majority of the basin is undeveloped and is rolling range land typical of Colorado’s semi-arid climates. It should be noted that the Gieck Ranch DBPS has not been approved at the time of this report.

The Meridian Ranch MDDP and The Final Drainage Report for The Sanctuary Filing 1 at Meridian Ranch indicate that the Eastonville Road culvert crossing at the Gieck Ranch Tributary #1, within the project boundary, does not provide enough capacity for the historic flow rates. This culvert will be upgraded as part of this project.

Within the Gieck Ranch Drainage Basin, ranching has historically been the predominant land use, with rolling topography between 2%-4% slopes. Recently urbanization is occurring within the drainage basin, most notably for this project are Meridian Ranch and Latigo Trails Developments. Both are single family residential neighborhoods located upstream to the west and northwest of the Eastonville Segment 2 Improvements project site.

b. Existing Subbasin Description

Eastonville Road Segment 2 (the site) accepts flows from areas to the west and northwest of the site, including portions of Meridian Ranch and Latigo Trails Development. The flows and design points used in the following descriptions are taken from the approved Meridian Ranch MDDP and The Final Drainage Report for The Sanctuary Filing 1 at Meridian Ranch provides the detailed analysis of the pond releases and flows as they outfall from those developments upstream of this Eastonville Road site. For the purpose of this report, full buildout of the Meridian Ranch development was assumed; hence the developed peak flow rates from the “future buildout conditions” for the entirety of Meridian Ranch were used to evaluate the existing conditions below.

Basin FG29 is 62.91 acres of undeveloped area and treated gravel to the crown of Eastonville Road roadway. The area and flows from this basin are per the FDR for the Sanctuary Filing 1 at Meridian Ranch. Stormwater from this basin combines drains southeast to design point G06 which is also per the FDR for the Sanctuary Filing 1 at Meridian Ranch (Q_5 = 22 cfs Q_{100} = 491 cfs). Flows at DP G06 are conveyed across Eastonville to design point G06.1 via an existing 18" CMP culvert and discharges to Gieck Ranch Tributary #1 (Channel A).

Basin FG35 is 19 acres undeveloped area and asphalt roadway to the crown of Rex Road. This basin area and flow are per the FDR for Rex Road through Falcon Regional Park. Stormwater from this basin is conveyed overland to DP G15. Flows at DP G15 (Q_5 = 3.0 cfs Q_{100} = 55 cfs) are conveyed southerly across Rex Road in an existing 24" RCP culvert and drains to DP G16.

Basin FG36 is 19 acres undeveloped area, parking lot, and treated gravel to the crown of Eastonville Road and Rex Road. This basin area and flow are per the FDR for Rex Road through Falcon Regional Park. Stormwater from this basin is conveyed overland to DP G15a. Flows at DP G15a (Q_5 = 1.8 cfs Q_{100} = 19 cfs) are conveyed southerly across Rex Road in an existing 24" RCP culvert and drains to DP G16.

Basin FG37 is 48 acres of undeveloped area and the Falcon Regional Park ball fields and treated gravel to the crown of Eastonville Road. This basin and flows are per the FDR for Rex Road through Falcon Regional Park. Stormwater from this basin drains to design point G16 via an existing roadside swale. Flows to DP G16

(Q_5 = 6.5 cfs Q_{100} = 114 cfs) are conveyed across Eastonville Road in an existing 24" CMP culvert and discharge to Gieck Ranch Tributary #1 (Channel A).

Basin FG 38 is 85 acres of undeveloped area and treated gravel area to the crown of Eastonville Road. This basin area and flows are per the FDR for Falcon Regional Park. Stormwater from this basin combines with flows from Latigo Trails South Pond and is conveyed overland to DP G09 per the Falcon Regional Park FDR. Per the Falcon Regional Park FDR, flows at DP G09 (Q_5 = 52 cfs Q_{100} = 277 cfs) area conveyed east over Eastonville Road and are conveyed “overtopping at various locations”. This basin is located upstream of the Eastonville project and is presented here to show where flows go that are upstream of the project site. The Eastonville project will have no impact into this basin and no further analysis done until further extension of the Eatonville Roadway.

Basin EX1 is 12.19 acres of undeveloped area and a future church property on the east side of the Eastonville Roadway. Stormwater from this basin sheet flows east directly to the Gieck Ranch Tributary #1 at DP13.1 (Q_5 = 3.7 cfs Q_{100} = 25.0 cfs).

Basin EX2 is 0.61 acres of undeveloped area on the future church property on the east side of the Eastonville Roadway. Stormwater from this basin flows south via an existing drainage channel south to DP G16.2 (Q_5 = 0.2 cfs Q_{100} = 1.4 cfs). Ultimately draining east to the Gieck Ranch Tributary #1.

Basin EX3 is 1.90 acres of undeveloped area on the east side of the Eastonville Roadway. Stormwater from this basin flows south via an existing drainage channel south to DP O3 (Q_5 = 0.6 cfs Q_{100} = 3.8 cfs). Ultimately draining east to the Gieck Ranch Tributary #1 combined with flows from DP G16 from the Sanctuary Filing 1.

Basin EX4 is 2.86 acres of undeveloped area on the east side of the Eastonville Roadway. Stormwater from this basin flows south via an existing drainage channel south to DP O3 (Q_5 = 0.8 cfs Q_{100} = 5.7 cfs). Ultimately draining east to the Gieck Ranch Tributary #1 combined with flows from DP G06 from the Sanctuary Filing 1.

c. Proposed Subbasin Description

Description of Proposed Project

The proposed project includes improvements to Eastonville Road from Londonderry Drive to Rex Road. As described above, the current condition of the existing roadway in this area consists of 26’ wide treated gravel roadway with 4’ wide sand shoulders and weedy swales located on both sides of the roadway. Offsite stormwater is bypassed under the road through a series of existing culverts.

The proposed improvements from Rex Road south to the southern property line of the proposed Grandview Reserve Filing 1 include removal of the 26’ wide treated gravel and replacing the road with a Modified Urban Minor Arterial Roadway Cross-Section consisting of 48’ pavement and Type A EPC curb (53’ back of curb to back of curb). This includes Basins EA1-EA11.

Refer to the Eastonville Road Segment 1 improvements FDR for subbasin information and calculations south of subbasins EA10 & EA11.

Eastonville Road Basins

Basin EA1 is 0.22 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.5 cfs) is conveyed in curb and gutter to DP2.1. Flows at DP2.1 are captured in a 5’ Type R sump inlet (Public) and piped to SFB C, a public full spectrum sand filter basin. Basin EA1 will be detained by SFB C. WQ treatment and runoff reduction is provided for disturbed area within this basin

within SFB C. Calculations for runoff reduction have been provided in Appendix B. Refer to the drainage facility design section of this report for additional information on SFB C.

Basin EA2 is 0.25 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 0.9 cfs Q_{100} = 1.7 cfs) is conveyed in curb and gutter to DP3.1. Flows at DP3 are captured in a 5' Type R sump inlet (Public) and piped to Pond C. Basin EA2 will be detained by SFB C. WQ treatment and runoff reduction is provided for disturbed area within this basin within SFB C. Calculations for runoff reduction have been provided in Appendix B. Refer to the drainage facility design section of this report for additional information on SFB C.

Basin EA3 is 0.76 acres of undeveloped area and proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section) from Rex Road and the roundabout at its intersection with Eastonville Road. Stormwater (Q_5 = 2.4 cfs Q_{100} = 4.9 cfs) is conveyed in curb and gutter to DP5. This basin is drawn using information from the FDR for Rex Road through Falcon regional park. Flows at DP5 are captured in a 5' Type R sump inlet (Public) and piped to DP6. Basin EA3 will not be detained per the Meridian Ranch MDDP as this basin has been over-detained within Meridian Ranch. The disturbed area in this basin is part of 16,505 sf of disturbed area at the west leg of the Eastonville/Rex Road roundabout. All of which will be excluded from WQ treatment per ECM APP I.7.C.1.

Basin EA4 is 3.11 acres of undeveloped area and proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section) from Rex Road and the roundabout at its intersection with Eastonville Road Stormwater (Q_5 = 3.8 cfs Q_{100} = 11.7 cfs) is conveyed in curb and gutter to DP6. Flows at DP6 are captured in a 10' Type R sump inlet (Public) and piped to DP6.1. Basin EA4 will not be detained per the Meridian Ranch MDDP as this basin has been over-detained within Meridian Ranch. The disturbed area in this basin is part of 16,505 sf of disturbed area at the west leg of the Eastonville/Rex Road roundabout. All of which will be excluded from WQ treatment per ECM APP I.7.C.1.

Basin EA5 is 0.16 acres of undeveloped area and includes the Pond C Sand Filter. Stormwater (Q_5 = 0.1 cfs Q_{100} = 0.4 cfs) flows directly into the SFB C Sand Filter. Basin EA5 will be detained by SFB C. WQ treatment and runoff reduction is provided for disturbed area within this basin within SFB C. Calculations for runoff reduction have been provided in Appendix B. Refer to the drainage facility design section of this report for additional information on SFB C.

Basin EA6 is 0.25 acres of undeveloped area and the east leg of the Eastonville/Rex Road roundabout. Stormwater (Q_5 = 0.8 cfs Q_{100} = 1.6 cfs) is conveyed east via curb and gutter to design point 10. Temporary Sediment Basin #1 (TSB #1) will be used as an interim BMP for the area. TSB #1 has been sized for the paved area of the roundabout. The disturbed area in this basin is part of 19,279 sf of disturbed area at the east leg of the Eastonville/Rex Road roundabout. All of which will be excluded from WQ treatment per ECM APP I.7.C.1. This area will ultimately be treated by the Grandview Reserve development after the extension of Rex Road.

Basin EA7 is 0.20 acres of undeveloped area and the east leg of the Eastonville/Rex Road roundabout. Stormwater (Q_5 = 0.4 cfs Q_{100} = 1.0 cfs is conveyed east via curb and gutter to design point 10. Temporary Sediment Basin #1 (TSB #1) will be used as an interim BMP for the area. TSB #1 has been sized for the paved area of the roundabout. The disturbed area in this basin is part of 19,279 sf of disturbed area at the east leg of the Eastonville/Rex Road roundabout. All of which will be excluded from WQ treatment per ECM APP I.7.C.1. This area will ultimately be treated by the Grandview Reserve development after the extension of Rex Road.

Basin EA8 is 2.08 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 5.2 cfs Q_{100} = 9.4 cfs) is conveyed in curb and gutter to DP14. Flows at DP14 are captured in a 10' Type R sump inlet (Public) and piped to EDB B. Basin EA8 will be detained by EDB B. WQ treatment and runoff reduction is provided for disturbed area within this basin within EDB B. Calculations for runoff reduction have been provided in Appendix B. Refer to the drainage facility design section of this report for additional information on SFB B.

Basin EA9 is 3.14 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 5.0 cfs Q_{100} = 10.6 cfs) is conveyed in curb and gutter to DP15. Flows at DP15 are captured in a 10' Type R sump inlet (Public) and piped to EDB B. Basin EA9 will be detained by EDB B. WQ treatment and runoff reduction is provided for the disturbed area within this basin within EDB B. Calculations for runoff reduction have been provided in Appendix B. Refer to the drainage facility design section of this report for additional information on SFB B.

Basin EA10 is 0.16 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 0.6 cfs Q_{100} = 1.1cfs) is conveyed in curb and gutter to DP16.1 Flows from DP16.1 drain south and captured in a 10' Type R sump inlet (Public) at DP 16 and piped to Pond B. WQ treatment and runoff reduction is provided for the disturbed area within this basin within EDB B. Calculations for runoff reduction have been provided in Appendix B. Refer to the drainage facility design section of this report for additional information on SFB B.

Basin EA11 is 0.15 acres of proposed roadway (Modified Urban Minor Arterial Roadway Cross-Section). Stormwater (Q_5 = 0.5 cfs Q_{100} = 1.0 cfs) is conveyed in curb and gutter to DP17.1. Flows from DP17.1 drain south and captured in a 10' Type R sump inlet (Public) at DP 17 and piped to Pond B. WQ treatment and runoff reduction is provided for the disturbed area within this basin within EDB B. Calculations for runoff reduction have been provided in Appendix B. Refer to the drainage facility design section of this report for additional information on SFB B.

Basin EA12 is 0.36 acres of landscaping east of the Eastonville Roadway. Stormwater (Q_5 = 0.1 cfs Q_{100} = 1.1 cfs) is conveyed east to DP G06.1. Flows at DP G06.1 combine with flow from DP G06 per the Sanctuary Filing 1 Report. This design point then drains east offsite in the Geick Ranch Tributary #1. There is approximately 12,172 SF of disturbed landscape area within this basin, all of which will be re-stabilized as landscape area with native seeding & mulching. All disturbance within this basin is considered to be separate pervious area (SPA). The required WQCV to be treated from this disturbance is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added or disturbed within this basin. This basin is a part of the Grandview Reserve property and will ultimately be detained and treated by the Grandview Reserve development.

Basin EA13 is 0.45 acres of Eastonville Roadway at the Dawlish Dr roundabout. Stormwater (Q_5 = 1.4 cfs Q_{100} = 2.8 cfs) is conveyed east to DP G06.2. Flows to DP G06.2 ultimately drain southeast to the Geick Ranch Tributary #1. Flows in this basin with ultimately be treated and detained by the Grandview Reserve development. Prior to the Grandview Reserve development, WQ treatment is provided via a 30' wide grass buffer adjacent to the roundabout. There is approximately 15,849 SF of impervious area within this basin treated by the grass buffer. The grass buffer will provide a runoff reduction of 19% and treat 125 cf of the WQCV. The remaining untreated WQCV will be treated at the development of Filing 1 of the Grandview Reserve property east of the roundabout. The remaining basin area consists of existing landscaping, and 3,532 sf of disturbed landscape area. All disturbed landscape area east of the proposed trail is considered as SPA and will be re-stabilized as landscape area with native seeding & mulching. The required WQCV to be

There needs to be more treatment in the interim condition that just 19% reduction via RR. Can you do a TSB like you did with TSB #1 in Segment 1?

treated from the landscape disturbed area is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added. Calculations for runoff reduction have been provided in Appendix B.

Basin EA14 is 1.48 acres of landscaping and concrete/gravel trail on the east side of Eastonville Rd. Stormwater (Q_5 = 1.2 cfs Q_{100} = 3.8 cfs) is conveyed southeast to DP G06.3. This design point ultimately drains southeast offsite in the Geick Ranch Tributary #1. WQ treatment is provided for the proposed concrete/gravel trail via a 10' wide grass buffer adjacent to the trail. There is approximately 14,183 SF of impervious area within this basin treated by the grass buffer. The grass buffer will provide a runoff reduction of 100% and treat all 535 cf of the required WQCV. The remaining basin area consists of existing landscaping, and 34,835 sf of disturbed landscape area. All disturbed landscape area east of the proposed trail is considered as SPA and will be re-stabilized as landscape area with native seeding & mulching. The required WQCV to be treated from the landscape disturbed area is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added. Calculations for runoff reduction have been provided in Appendix B. This basin is a part of the Grandview Reserve property and will ultimately be detained and treated by the Grandview Reserve development.

Basin EA15 is 0.76 acres of landscaping and concrete/gravel trail on the east side of Eastonville Rd. Stormwater (Q_5 = 0.7 cfs Q_{100} = 2.1 cfs) is conveyed southeast to DP G16.1. This design point then drains southeast offsite in the Geick Ranch Tributary #1. WQ treatment is provided for the proposed concrete/gravel trail via a 10' wide grass buffer adjacent to the trail. There is approximately 8,613 SF of impervious area within this basin treated by the grass buffer. The grass buffer will provide a runoff reduction of 100% and treat all 359 cf of the required WQCV. The remaining basin area consists of existing landscaping, and 10,902 sf of disturbed landscape area. All disturbed landscape area east of the proposed trail is considered as SPA and will be re-stabilized as landscape area with native seeding & mulching. The required WQCV to be treated from the landscape disturbed area is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added. Calculations for runoff reduction have been provided in Appendix B. This basin is a part of the Grandview Reserve property and will ultimately be detained and treated by the Grandview Reserve development.

Basin EA16 is 1.18 acres of landscaping on the east side of Eastonville Rd and south of the church property. Stormwater (Q_5 = 0.3 cfs Q_{100} = 2.5 cfs) is conveyed southeast to DP 13.1. Flows from subbasin EA16 will ultimately be treated and detained by the Grandview Reserve development. Flows to DP 13.1 will outfall and drain southeast offsite in the Geick Ranch Tributary #2. There is approximately 13,040 SF of disturbed landscape area within this basin, all of which will be re-stabilized as landscape area with native seeding & mulching. All disturbance within this basin is considered to be separate pervious area (SPA). The required WQCV to be treated from this disturbance is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added or disturbed within this basin. This basin is a part of the Grandview Reserve property and will ultimately be detained and treated by the Grandview Reserve development.

Basin EA17 is 0.30 acres of landscaping on the east side of Eastonville Rd and south of the church property. Stormwater (Q_5 = 0.1 cfs Q_{100} = 0.7 cfs) is conveyed southeast to DP 10.1. This design point drains southeast offsite in the Geick Ranch Tributary #2. There is approximately 11,843 SF of disturbed landscape area within this basin, all of which will be re-stabilized as landscape area with native seeding & mulching. All disturbance within this basin is considered to be separate pervious area (SPA). The required WQCV to be treated from

this disturbance is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added or disturbed within this basin. This basin is a part of the Grandview Reserve property and will ultimately be detained and treated by the Grandview Reserve development.

Basin EA18 is a future development of 11.29 acres. This development will be required to provide its own WQ treatment and detention but will outfall into the public double CDOT type C inlet at DP 12. These flows have been accounted for in the Eastonville storm sewer calculations. Flows to DP 12 will ultimately outfall into the Geick Ranch Tributary #2 (Q_5 = 3.9 cfs Q_{100} = 24.6 cfs). WQ treatment is provided for the proposed concrete/gravel trail via a 10' wide grass buffer adjacent to the trail. There is approximately 6,468 SF of impervious area within this basin treated by the grass buffer. The grass buffer will provide a runoff reduction of 100% and treat all 270 cf of the required WQCV. The remaining basin area consists of existing landscaping, and 20,215 sf of disturbed landscape area. All disturbed landscape area east of the proposed trail is considered as SPA and will be re-stabilized as landscape area with native seeding & mulching. The required WQCV to be treated from the landscape disturbed area is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added. Calculations for runoff reduction have been provided in Appendix B. This basin is a part of future development and will ultimately be detained and treated by the future development.

Offsite Basins

Basin FG29 is 62.91 acres of undeveloped area west of the Eastonville Road roadway. The area and flows from this basin are per the FDR for the Sanctuary Filing 1 at Meridian Ranch. Stormwater from this basin drains southeast to design point G06 which is also per the FDR for the Sanctuary Filing 1 at Meridian Ranch (Q_5 = 22 cfs Q_{100} = 491 cfs). Flows at DP G06 are conveyed across Eastonville to design point G06.1 via a proposed dual 3' X 10' public box culvert and discharges to Gieck Ranch Tributary #1 (Channel A). The disturbed impervious area in this basin is part of 1,308 sf of disturbed area at southwest corner of the proposed roundabout. All of which will be excluded from WQ treatment per ECM APP I.7.C.1. There is also approximately 25,936 SF of disturbed landscape area within this basin, all of which will be re-stabilized as landscape area with native seeding & mulching. All disturbance within this basin is considered to be separate pervious area (SPA). The required WQCV to be treated from this disturbance is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added. This subbasin will continue to follow existing drainage patterns.

Basin FG29a is 21.40 acres of undeveloped area west of the Eastonville Road roadway. The area and flows from this basin are a portion of basin FG29 used to analyze the 18" RCP culvert at DP G06a (Q_5 = 6.4 cfs Q_{100} = 42.9 cfs). There is a localized low point at DP G06a that requires a culvert to drain stormwater to DP G06. In the minor storm, all runoff will be conveyed through the proposed culvert to DP G06. In the major storm, runoff will pond up to an elevation of approximately 6999.32. The majority of runoff will drain around the west edge of the proposed roundabout to DP G06. Riprap has been provided at the 18" RCP culvert outfall/box culvert inlet location for erosion protection. Refer to the description for basin FG29 for WQ and disturbed area descriptions.

Basin FG35 is 19 acres undeveloped area and asphalt roadway to the crown of Rex Road. This basin area and flow are per the FDR for Rex Road through Falcon Regional Park. Stormwater from this basin is conveyed overland to DP G15. Flows at DP G15 (Q_5 = 3.0 cfs Q_{100} = 55 cfs) are conveyed southerly across Rex Road in an existing 24" RCP culvert and drains to DP G16. No development will occur in this basin.

Basin FG36a is 14.14 acres undeveloped area, parking lot northwest of the Eastonville/Rex Road roundabout. This basin area is a portion of existing basin FG36. Flows from this basin drain southeast to DP G15a. Flows at DP G15a1 (Q_5 = 4.6 cfs Q_{100} = 27.7 cfs) are conveyed southeast across Rex Road in a proposed public 30" RCP culvert and drains to DP8. There is approximately 1,351 SF of disturbed landscape area within this basin, all of which will be re-stabilized as landscape area with native seeding & mulching. All disturbance within this basin is considered to be separate pervious area (SPA). The required WQCV to be treated from this disturbance is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added or disturbed within this basin. This subbasin will continue to follow existing drainage patterns.

Basin FG36b is 0.81 acres undeveloped area, parking lot northwest of the Eastonville/Rex Road roundabout. This basin area is a portion of existing basin FG36. Flows from this basin drain southeast to DP7. Flows at DP 7 (Q_5 = 0.4 cfs Q_{100} = 2.0 cfs) are conveyed south across Rex Road in a proposed public 18" RCP culvert and drains to DP8. There is approximately 5,474 SF of disturbed landscape area within this basin, all of which will be re-stabilized as landscape area with native seeding & mulching. All disturbance within this basin is considered to be separate pervious area (SPA). The required WQCV to be treated from this disturbance is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added or disturbed within this basin. This subbasin will continue to follow existing drainage patterns.

Basin FG37a is 22.39 acres of undeveloped area and the Falcon Regional Park ball fields on the west side of Eastonville Road. This basin is a portion of the existing basin FG37. Flows from this basin drain southeast to a proposed public sump triple CDOT type C inlet at DP G16a. Flows to DP G16a are per the FDR for Rex Road through Falcon Regional Park (Q_5 = 12.0 cfs Q_{100} = 59.0 cfs). Flows are then conveyed across Eastonville Road in a proposed public 36” RCP pipe to DP 11.1. Flows ultimately discharge to Gieck Ranch Tributary #2 (Channel B). There is approximately 13,414 SF of disturbed landscape area within this basin, all of which will be re-stabilized as landscape area with native seeding & mulching. All disturbance within this basin is considered to be separate pervious area (SPA). The required WQCV to be treated from this disturbance is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added or disturbed within this basin. This subbasin will continue to follow existing drainage patterns.

Basin FG37b is 24.86 acres of undeveloped area and the Falcon Regional Park ball fields on the west side of Eastonville Road. This basin is a portion of the existing basin FG37. Flows from this basin drain southeast to a proposed public 36” FES inlet at DP G16b (Q_5 = 11.0 cfs Q_{100} = 54.9 cfs). Flows are then conveyed across Eastonville Road in a proposed public 36” RCP pipe to DP 11.1. Flows ultimately discharge to Gieck Ranch Tributary #2 (Channel B). The disturbed impervious area in this basin is part of 6,353 sf of disturbed area on the west side of Eastonville Road. All of which will be excluded from WQ treatment per ECM APP I.7.C.1. There is also approximately 23,591 SF of disturbed landscape area within this basin, all of which will be re-stabilized as landscape area with native seeding & mulching. All disturbance within this basin is considered to be separate pervious area (SPA). The required WQCV to be treated from this disturbance is 0 cf per the runoff reduction calculations provided in Appendix B of this report. The required treatment volume is 0 cf due to no impervious area being added or disturbed within this basin. This subbasin will continue to follow existing drainage patterns.

Basin FG 38 is 85 acres of undeveloped area and treated gravel area to the crown of Eastonville Road. This basin area and flows are per the FDR for Falcon Regional Park. Stormwater from this basin combines with

flows from Latigo Trails South Pond and is conveyed overland to DP G09 per the Falcon Regional Park FDR. Per the Falcon Regional Park FDR, flows at DP G09 (Q_5 = 52 cfs Q_{100} = 277 cfs) area conveyed east over Eastonville Road and are conveyed "overtopping at various locations". This basin is located upstream of the Eastonville project and is presented here to show where flows go that are upstream of the project site. The Eastonville project will have no impact on this basin and no further analysis done until further extension of the Eatonville Roadway.

IV. Drainage Facility Design

a. General Concept

The proposed improvements from Rex Road south to the southern property line of the proposed Grandview Reserve Filing 1 include removal of the 26' wide treated gravel and replacing the road with a Modified Urban Minor Arterial Roadway Cross-Section consisting of 48' pavement and Type A EPC curb (53' back of curb to back of curb). Inlets will be placed at low points and roundabout entrances. Stormwater from this roadway will be piped to either a full spectrum detention pond, sand filter or temporary sediment basin. All ponds and water quality features will discharge at less than historic rates.

b. Water Quality & Detention

Pond C (Sand Filter)

Water quality and stormwater detention for Basins EA1, 2, & 5 is provided in Sand Filter Basin C. SFB C is a public, full spectrum sand filter basin within the Grandview Reserve property to be developed in the future. In Pond C, a total of 0.63 from the proposed project acres at 54% composite imperviousness will be detained. The minimum required acreage of treatment is 0.63 acres. The WQCV is 0.009 ac-ft, the EURV is 0.037 ac-ft, and the 100-year detention volume is 0.062 ac-ft. The WQCV, EURV and 100-year storms are released in 12, 41 and 44 hours, respectively. A 15' access and maintenance road is provided to the bottom of the pond to facilitate maintenance of the pond facilities. A 5' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard south. SFB C outfalls towards the future Channel B improvements at historic runoff rates. Runoff from Pond C will follow historic drainage patterns and not exceed historic flow rates.

SFB C Water Quality Treatment Summary Table

Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Trib to SFB C (ac)
EA1	0.22	0.22	0.22
EA2	0.25	0.25	0.25
EA5	0.16	0.16	0.16
Total	0.63	0.63	0.63

Extended Detention Basin B (Full Spectrum EDB) – Ultimate Condition

The interim condition of EDB B was design and built with the Segment 1 FDR. Water quality and detention for Basins EA6 – EA8 per the segment 1 FDR and EA8-11 per the segment 2 FDR is provided in Extended Detention Basin B ultimate condition; a public county owned, full spectrum extended detention basin within

Filing No. 1 of Grandview Reserve within a proposed drainage easement. A total of 9.48 acres of disturbed area from the proposed project at 66% composite imperviousness will be treated and detained by EDB B for the ultimately developed Eastonville Road Improvements. Ultimate conditions include fully built sections of Eastonville Road from Londonderry Road to Rex Road and is anticipated for Spring 2025. Ultimate condition pond sizing calculations have also been provided in the Appendix of this report. The ultimate conditions WQCV is 0.058 ac-ft, the EURV is 0.780 ac-ft, and the 100-year detention volume is 1.158 ac-ft. The WQCV, EURV and 100-year storms are released in 41, 69 and 67 hours, respectively. A forebay is located at the outfall into the pond and a 40" trickle channel conveys flow towards the outlet structure. A 15' access and maintenance road is provided to the bottom of the pond to facilitate maintenance of the pond facilities. A 15.5' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard towards Gieck Ranch Tributary #1. Refer to the Segment 1 FDR for outfall description.

EDB B Water Quality Treatment Summary Table – Ultimate Condition			
Basin ID	**Total Area (ac)**	**Total Proposed Disturbed Area (ac)**	**Area Trib to SFB A (ac)**
EA6*	1.09	1.09	1.09
EA7*	1.92	1.92	1.92
EA8 *	0.94	0.94	0.94
EA8	2.08	2.08	2.08
EA9	3.14	3.14	3.14
EA10	0.16	0.16	0.16
EA11	0.15	0.15	0.15
Total	9.48	9.48	9.48

* Per Segment 1 FDR.

Runoff Reduction WQ Treatment Summary Table

Basin ID	Total Area (ac)	Disturbed Area (ac)	Disturbed Area Treatment BMP	Disturbed Area Treated via runoff reduction (ac)	WQCV Reduction %	Notes:
EA1	0.22	0.22	SFB C	0.22	17%	Treatment and detention by SFB C (public County sand filter basin) on Grandview Reserve property.
EA2	0.25	0.25	SFB C	0.25	17%	Treatment and detention by SFB C (public County sand filter basin) on Grandview Reserve property.
EA3	0.76	0.19	Exclusion I.7.1.C.1.	-	-	
EA4	3.11	0.19	Exclusion I.7.1.C.1.	-	-	
EA5	0.16	0.16	SFB C	0.16	11%	Treatment and detention by SFB C (public County sand filter basin) on Grandview Reserve property.
EA6	0.25	0.25	Exclusion I.7.1.C.1.	-	-	Future treatment and detention by Grandview Reserve development.
EA7	0.20	0.20	Exclusion I.7.1.C.1.	-	-	Future treatment and detention by Grandview Reserve development.
EA8	2.08	2.08	EDB B	2.08	11%	Treatment and detention by EDB B (public County extended detention basin) on Grandview Reserve property.
EA9	3.14	3.14	EDB B	3.14	11%	Treatment and detention by EDB B (public County extended detention basin) on Grandview Reserve property.
EA10	0.16	0.16	EDB B	0.16	11%	Treatment and detention by EDB B (public County extended detention basin) on Grandview Reserve property.
EA11	0.15	0.15	EDB B	0.15	11%	Treatment and detention by EDB B (public County extended detention basin) on Grandview Reserve property.
EA12	0.36	0.28	SPA	0.28	100%	
EA13	0.45	0.47	RPA (30' GB)	0.47	19%	Future treatment and detention by Grandview Reserve development.
EA14	1.48	1.38	RPA (10' GB)	1.38	100%	Future treatment and detention by Grandview Reserve development.
EA15	0.76	0.60	RPA (10' GB)	0.60	100%	Future treatment and detention by Grandview Reserve development.
EA16	1.18	0.30	SPA	0.30	100%	Future treatment and detention by Grandview Reserve development.
EA17	0.30	0.27	SPA	0.27	100%	
EA18	11.29	0.73	RPA (10' GB)	0.73	100%	Future treatment and detention by future development.
FG29	62.91	0.62	SPA / Exclusion I.7.1.C.1.	0.60	100%	
FG35	18.69	-	-	-	-	
FG36a	14.14	0.03	SPA	0.03	100%	
FG36b	0.81	0.13	SPA	0.13	100%	
FG37a	22.39	0.31	SPA	0.31	100%	
FG37b	24.86	0.69	SPA / Exclusion I.7.1.C.1.	0.54	100%	
FG38	85.00	-	-	-	-	

c. Inspection and Maintenance

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

All public detention ponds are to be owned and maintained by El Paso County, once established, unless an agreement is reached stating otherwise. An agreement for the district to maintain aesthetics of the proposed ponds will be drafted and submitted to the County. Maintenance access for all full spectrum detention facilities will be provided from public Right-of-Way. Maintenance access for the drainageways will be provided through the proposed tracts.

V. Wetlands Mitigation

There is an existing wetland in Gieck Ranch Tributary #1 (Channel A). The wetland is contained entirely within the channel and is classified as jurisdictional. A Nationwide Wetland Permit will be applied for due to the disturbed area at the Dawlish Roundabout. Wetlands maintenance will be the responsibility of the DISTRICT.

VI. Four Step Method to Minimize Adverse Impacts of Urbanization

Step 1 – Reducing Runoff Volumes: Low impact development (LID) practices are utilized to reduce runoff at the source. In general, stormwater discharges are routed across pervious areas prior to capture in storm sewer. This practice promotes infiltration and reduces peak runoff rates. The Impervious Reduction Factor (IRF) method was used and is presented in Appendix D.

Step 2 – Treat and slowly release the WQCV: This step utilizes full spectrum water quality and detention to capture the WQCV and slowly release runoff from the site. Onsite full spectrum detention pond provides water quality treatment for the site. The WQCV is released over a period of at least 12 hours for SFBs and 40 hours for EDBs while the EURV is released over a period of 40-44 hours for SFBs and 68 - 72 hours for EDBs as recommended by the MHFD.

Step 3 – Stabilize stream channels: This step establishes practices to stabilize drainageways and provide scour protection at stormwater outfalls. Erosion protection is provided at all concentrated stormwater discharge points in the form of riprap pads.

Step 4 – Consider the need for source controls: No industrial or commercial uses are proposed within this development and therefore no source controls are proposed.

VII. Drainage and Bridge Fees

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

VIII. Opinion of Probable Cost

An engineer's opinion of probable cost has been provided below for public and private drainage infrastructure improvements. This includes cost estimates for the public full spectrum sand filter basin C. All required stormwater infrastructure will be installed per El Paso County Requirements.

Public Infrastructure Cost Estimate				
Line Item	**Quantity**	**Unit Price**		**Cost**
18" Reinforced Concrete Pipe	490	$82	LF	$40,180
24" Reinforced Concrete Pipe	505	$98	LF	$49,490
30" Reinforced Concrete Pipe	100	$123	LF	$12,300
36" Reinforced Concrete Pipe	789	$151	LF	$119,139
48" Reinforced Concrete Pipe	1060	$245	LF	$259,700
18" CDOT FES	3	$492	EA	$1,476
30" CDOT FES	1	$738	EA	$738
36" CDOT FES	2	$906	EA	$1,812
48" CDOT FES	1	$1,470	EA	$1,470
4' DIA Storm Manhole	3	$15,130	EA	$45,390
5' DIA Storm Manhole	1	$15,130	EA	$15,130
6' DIA Storm Manhole	5	$15,130	EA	$75,650
7' DIA Storm Manhole	1	$15,130	EA	$15,130
8' DIA Storm Manhole	2	$15,130	EA	$30,260
CDOT Type C Inlet	5	$6,037	EA	$30,185
5' CDOT Type R Inlet	3	$7,212	EA	$21,636
10' CDOT Type R Inlet	3	$9,925	EA	$29,775
Rip Rap, d50 size from 6"-24"	666	$104	Tons	$69,264
3' x 10' Concrete Box Culvert	234	$750	LF	$175,500
Box Culvert Wing Walls	2	$45,000	EA	$90,000
10% Contingency				$108,423
TOTAL:				**$1,192,648**

Public SFB C Cost Estimate				
Line Item	**Quantity**	**Unit Price**		**Cost**
Rip Rap, d50 size from 6"-24" (Inflow)	1.5	$97	Tons	$146
Sand Filter Media	44	$100	/CY	$4,400
4" Perforated PVC Underdrain	10	$10	/LF	$100
12" ABC Maintenance Access	19	$40	/CY	$760
Outlet Structure w/ Orifice Plate	1	$5,000	EA	$5,000
Rip Rap, d50 size from 6"-24" (Spillway)	40	$104	Tons	$4,160
4' DIA Storm Manhole	1	$15,130	EA	$15,130
18" RCP Outlet Pipe	180	$60	/LF	$10,800
18" RCP FES	1	$350	EA	$350
10% Contingency				$4,085
TOTAL:				**$44,930**

IX. Hydraulic Grade Line Analysis

Hydraulic grade line analysis and final pipe sizes have been sized and calculations are provided in Appendix C. All proposed storm sewer will be designed in accordance with El Paso County Drainage Criteria Manuals.

X. Summary

Eastonville Road lies within the Gieck Ranch Drainage Basin. Water quality and detention for the site is provided in full spectrum water quality and detention ponds, sand filters and temporary sediment basins. There is one major drainageway that traverses the site: Gieck Ranch Tributary 1. The water quality and detention features ponds will be maintained by the Grandview Reserve Metropolitan District No. 2 (DISTRICT). All drainage facilities were sized per the El Paso County Drainage Criteria Manuals.

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

XI. Drawings

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

XII. References

1. City of Colorado Springs – Drainage Criteria Manual, May 2014, Revised January 2021.
2. Drainage Criteria Manual of El Paso, Colorado, October 2018.
3. Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018.
4. “Gieck Ranch Drainage Basin Planning Study” prepared by Drexel, Barrel & Co, February 2010.
5. “Master Development Drainage Plan Meridian Ranch” prepared by Tech Contractors, July 2021.
6. “The Sanctuary Filing 1 at Meridian Ranch” prepared by Tech Contactors, August 2022.

APPENDIX A – VICINITY MAP, PHOTOS, SOIL MAP, FEMA MAP

MERIDIAN RANCH

FALCON REGIONAL PARK

REX ROAD

GIECK RANCH TRIBUTARY 2

REX RD

DAWLISH DRIVE

EASTONVILLE ROAD

EASTONVILLE ROAD

MODIFIED CROSS-SECTION WITH 48' PAVEMENT AND TYPE A EPC CURB (53' BACK OF CURB TO BACK OF CURB)

PROP. ROW
100.00'
PROP. ROW
EX. ROW
60.00'
EX. ROW

GIECK RANCH TRIBUTARY 1

DAWLISH DRIVE

GRANDVIEW RESERVE METROPOLITAN DISTRICT NO. 2

PROP. ROW
PROP. ROW

EASTONVILLE ROAD

GRANDVIEW RESERVE FILING 1

EX. ROW
60.00'
EX. ROW

BRIXHAM DR

KATE MEADOW LN

GIECK RANCH TRIBUTARY 1

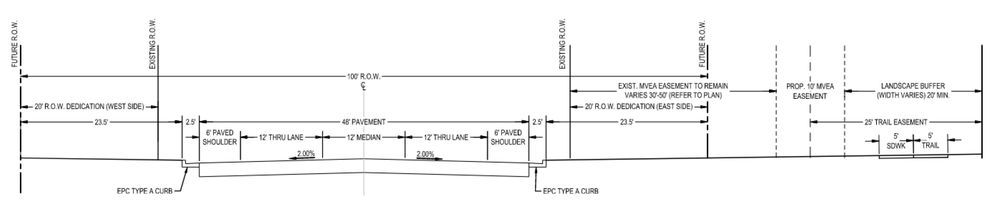
FLOODPLAIN FROM WATER RESOURCES REPORT (TYP.)

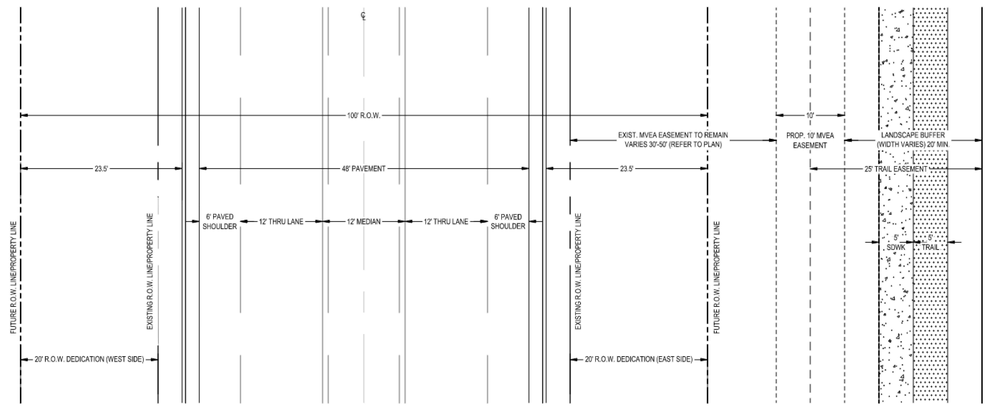
FALCON HIGH SCHOOL

LONDONDERRY DR

LONDONDERRY DRIVE

EASTONVILLE ROAD





EASTONVILLE RD ULTIMATE CROSS SECTION
(MINOR ARTERIAL)
SCALE: N.T.S.
*TRAIL AND SIDEWALK TO MEANDER WITHIN TRAIL EASEMENT

VICINITY MAP

N.T.S.

NORTH
0 150
75

DRAWN BY: CPM JOB DATE: 8/29/2023
APPROVED: JOB NUMBER: 201662.08
CAD DATE: 8/29/2023
CAD FILE: J:\2020\201662.08\CAD\Dwgs\Exhibits\-Overall-Exhibit

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

HR GREEN - COLORADO SPRINGS
7222 COMMERCE CENTER DR. SUITE 220
COLORADO SPRINGS CO 80919
PHONE: 719.622.6222
FAX: 844.273.1057

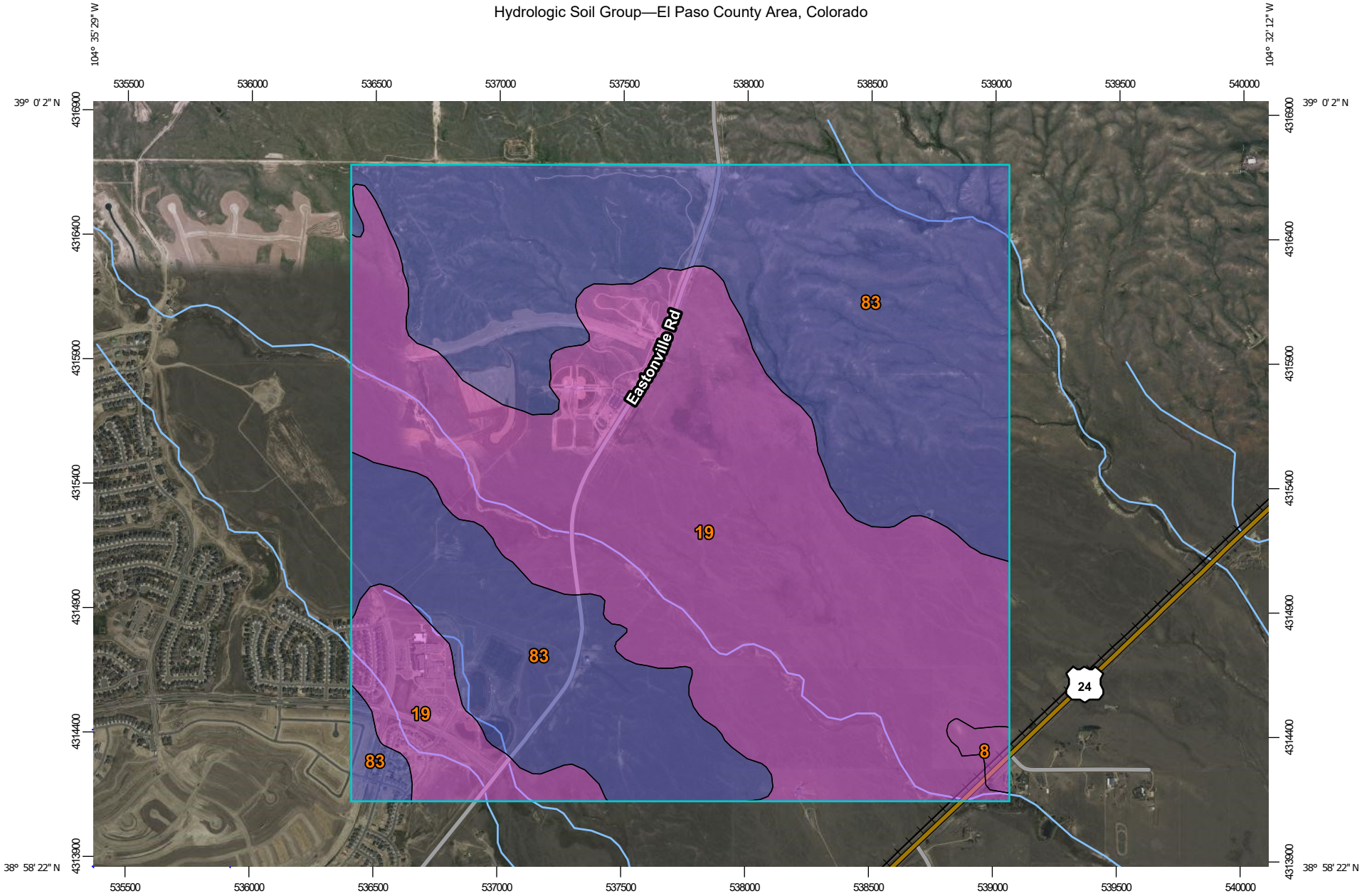
EASTONVILLE ROAD
DR HORTON
EL PASO COUNTY, CO

OVERALL EASTONVILLE PLAN

SHEET 1

1

Photo - at Londonderry and Eastonville looking north


104° 35' 29" W
104° 32' 12" W
39° 0' 2" N
38° 58' 22" N
535500
536000
536500
537000
537500
538000
538500
539000
539500
540000
4316900
4316400
4315900
4315400
4314900
4314400
4313900
Eastonville Rd
83
19
83
19
83
8
24
Map Scale: 1:21,700 if printed on A landscape (11" x 8.5") sheet.
N
0 300 600 1200 1800 Meters
0 1000 2000 4000 6000 Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

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

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

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	10.4	0.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	839.5	49.8%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	835.7	49.6%
Totals for Area of Interest			**1,685.6**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

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

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

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

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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

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

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

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

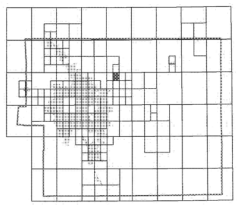
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

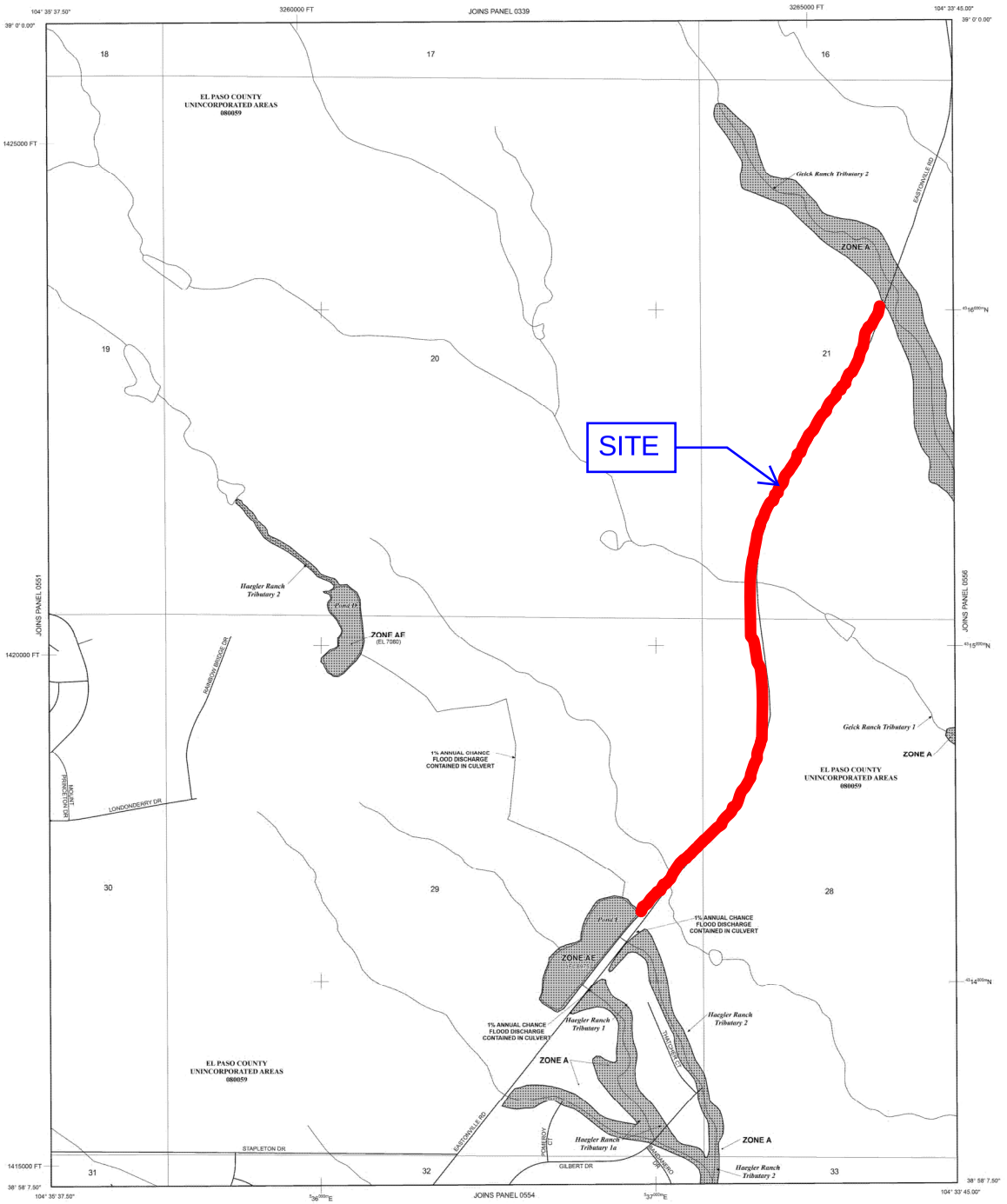
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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

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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST.

LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

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

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

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0552G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 552 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0552	G

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

MAP NUMBER
08041C0552G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NOAA Atlas 14, Volume 8, Version 2
Location name: Elbert, Colorado, USA*
Latitude: 38.9796°, Longitude: -104.5696°
Elevation: 6996 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

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

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

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

Please refer to NOAA Atlas 14 document for more information.

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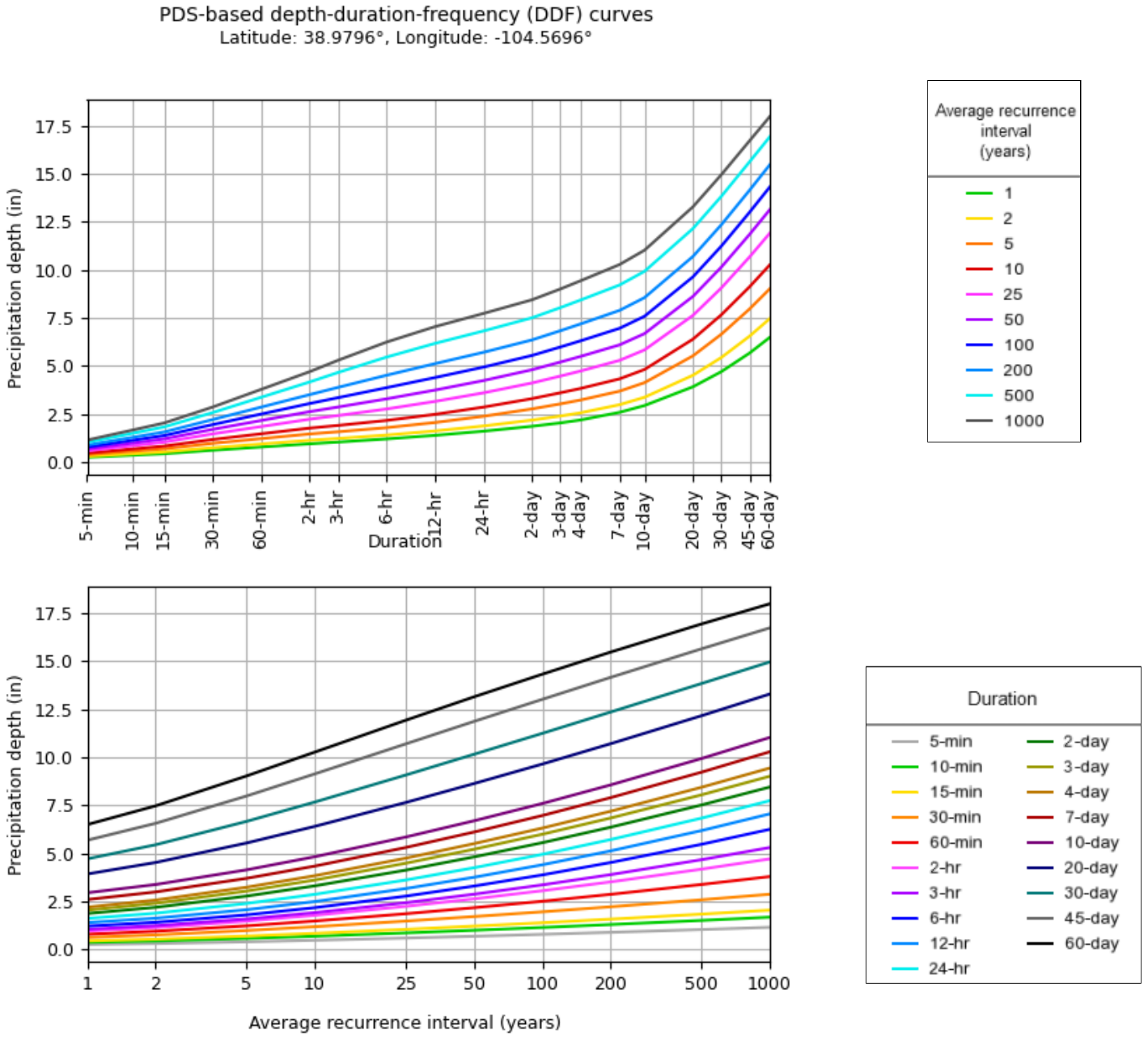
PF graphical



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Wed Nov 22 20:22:49 2023

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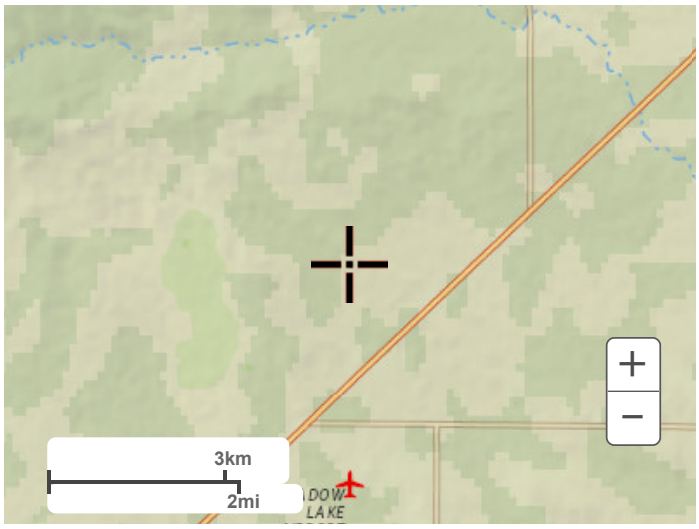
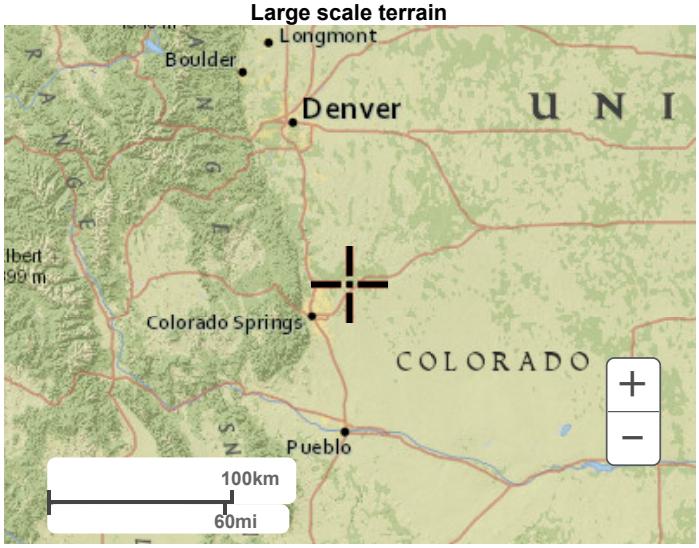
Maps & aerials

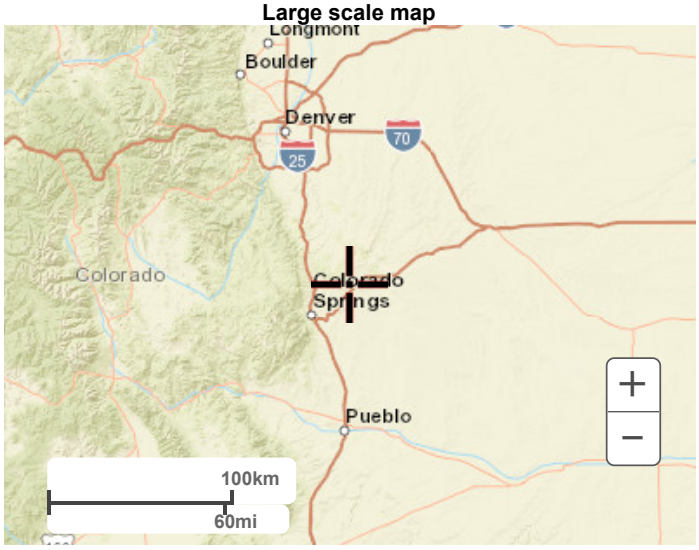
Small scale terrain



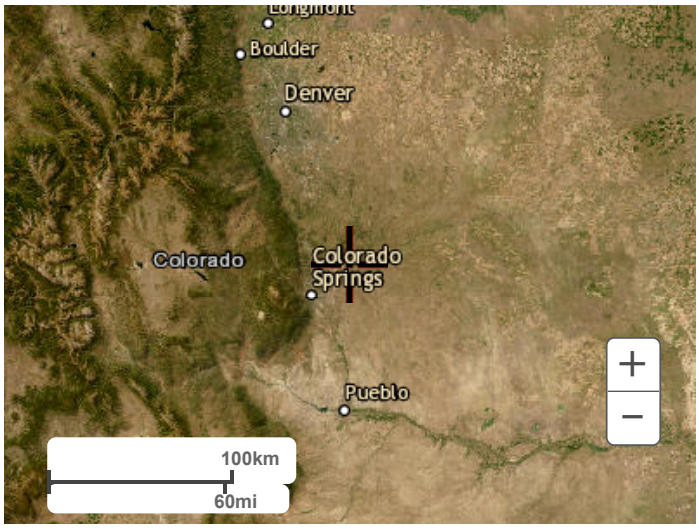
Large scale terrain



Large scale map



Large scale aerial



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

Disclaimer

APPENDIX B – HYDROLOGIC CALCULATIONS

HRGreen	**EASTONVILLE ROAD - SEGMENT 2**	**Calc'd by:**	**SPC**
	EXISTING CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**10/14/2024**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
EX1	12.19	2	3.7	25.0
EX2	0.61	2	0.2	1.4
EX3	1.90	2	0.6	3.8
EX4	2.86	2	0.8	5.7
*FG29	62.91	-	2.9	60.0
**FG35	18.69	-	2.4	25.0
**FG36	18.88	-	1.8	19.0
**FG37	48.26	-	2.7	45.0
***FG38	85.00	-	-	-

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
13.1	EX1	3.7	25.0
*G06	FG29, DP G12	22.0	491.0
G06.1	EX4, DO G06	22.8	496.7
***G09	FG38	52.0	277.0
*G12	-	21.0	450.0
**G15	FG35	3.0	55.0
**G15a	FG36	1.8	19.0
**G16	FG37, DP G15/G15a	6.5	114.0
G16.1	EX3	7.1	117.8
G16.2	EX2	0.2	1.4

* Basin/design point name, area, and flows taken from the "FDR for The Sanctuary Filing 1 at Meridian Ranch".
** Basin/design point name, area, and flows taken from the "FDR for Rex Road through Falcon Regional Park".
*** Basin/design point name, area, and flows taken from the "FDR for Falcon Regional Park".

HRGreen	**EASTONVILLE ROAD - SEGMENT** **EXISTING CONDITIONS** **EL PASO COUNTY, CO**

Calc'd by:	SPC
Checked by:	CM
Date:	10/14/2024

SOIL TYPE:	**HSG A&B**

COMPOSITE 'C' FACTORS

	LAND USE TYPE															TOTAL	COMPOSITE IMPERVIOUSNESS & C FACTOR		
	Paved			Historic Flow Analysis--Greenbelts, Agriculture			Land Use Undefined			Land Use Undefined			Land Use Undefined						
	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}				
	100	0.90	0.96	2	0.09	0.36	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00				
BASIN	ACRES			ACRES			ACRES			ACRES			ACRES			ACRES	%I	C_5	C_{100}
EX1				12.19												12.19	2	0.09	0.36
EX2				0.61												0.61	2	0.09	0.36
EX3				1.90												1.90	2	0.09	0.36
EX4				2.86												2.86	2	0.09	0.36
*FG29																62.91	-	-	-
**FG35																18.69	-	-	-
**FG36																18.88	-	-	-
**FG37																48.26	-	-	-
***FG38																85.00	-	-	-
																0.00			
																0.00			

* Basin name, area, and flows taken from the "FDR for The Sanctuary Filing 1 at Meridian Ranch".
** Basin name, area, and flows taken from the "FDR for Rex Road through Falcon Regional Park".
*** Basin name, area, and flows taken from the "FDR for Falcon Regional Park".

HRGreen	**EASTONVILLE ROAD - SEGMENT 2**	**Calc'd by:**	**SPC**
	EXISTING CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**10/14/2024**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL	*tc=(L/180)+10*	Design tc
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)	*tc max*	*tc design (min)*
EX1	0.09	12.19	300	2.8	22.8	10	835	3.0	1.7	8.0	30.8	16.3	16.3
EX2	0.09	0.61	180	1.3	22.8	10	411	1.6	1.3	5.4	28.2	13.3	13.3
EX3	0.09	1.90	116	1.5	17.4	10	1137	1.0	1.0	19.0	36.4	17.0	17.0
EX4	0.09	2.86	60	1.4	12.8	10	1302	1.1	1.0	20.7	33.5	17.6	17.6
*FG29													
**FG35													
**FG36													
**FG37													
***FG38													

* Basin name, area, and flows taken from the "FDR for The Sanctuary Filing 1 at Meridian Ranch".
** Basin name, area, and flows taken from the "FDR for Rex Road through Falcon Regional Park".
*** Basin name, area, and flows taken from the "FDR for Falcon Regional Park".

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

*For buried riprap, select C_v value based on type of vegetative cover.

HRGreen

EASTONVILLE ROAD - SEGMENT 2
EXISTING CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by:	SPC
Checked by:	CM
Date:	10/14/2024

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (mi	
	13.1	EX1	12.19	0.09	16.3	1.10	3.40	3.7				3.7											
	G16.2	EX2	0.61	0.09	13.3	0.05	3.70	0.2				0.2											
	G16.1	EX3	1.90	0.09	17.0	0.17	3.34	0.6				7.1											
	G06.1	EX4	2.86	0.09	17.6	0.26	3.28	0.8				22.8											
	G06	*FG29	62.91					2.9				22.0											
	G15	**FG35	18.69					2.4				3.0											
	G15a	**FG36	18.88					1.8				1.8											
	G16	**FG37	48.26					2.7				6.5											
	G09	***FG38	85.00					-				52.0											
	G12											21.0											

HRGreen

EASTONVILLE ROAD - SEGMENT 2

EXISTING CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	SPC
Checked by:	CM
Date:	10/14/2024

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min	
	13.1	EX1	12.19	0.36	16.3	4.39	5.70	25.0				25.0											
	G16.2	EX2	0.61	0.36	13.3	0.22	6.22	1.4				1.4											
	G16.1	EX3	1.90	0.36	17.0	0.68	5.60	3.8				**117.8**											
	G06.1	EX4	2.86	0.36	17.6	1.03	5.51	5.7				**496.7**											
	G06	*FG29	62.91					60.0				**491.0**											
	G15	**FG35	18.69					25.0				**55.0**											
	G15a	**FG36	18.88					19.0				**19.0**											
	G16	**FG37	48.26					45.0				**114.0**											
	G09	***FG38	85.00					-				**277.0**											
	G12											**450.0**											

EASTONVILLE ROAD SEG 2	**Calc'd by:**	**SPC**
PROPOSED CONDITIONS	**Checked by:**	**CM**
EL PASO COUNTY, CO	**Date:**	**10/28/2024**

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q_5 (cfs)	Q_{100} (cfs)
EA1	0.22	73	0.8	1.5
EA2	0.25	72	0.9	1.7
EA3	0.76	65	2.4	4.9
EA4	3.11	24	3.8	11.7
EA5	0.16	0	0.1	0.4
EA6	0.25	76	0.8	1.6
EA7	0.20	50	0.4	1.0
EA8	2.08	99	5.2	9.4
EA9	3.14	60	5.0	10.6
EA10	0.16	75	0.6	1.1
EA11	0.15	67	0.5	1.0
EA12	0.36	0	0.1	1.1
EA13	0.45	73	1.4	2.8
EA14	1.48	21	1.2	3.8
EA15	0.76	24	0.7	2.1
EA16	1.18	0	0.3	2.5
EA17	0.30	0	0.1	0.7
EA18	11.29	3	3.9	24.6
*FG29	62.91	-	2.9	60.0
FG29a	21.40	2	6.4	42.9
**FG35	18.69	-	2.4	25.0
FG36a	14.14	4	4.6	27.7
FG36b	0.81	8	0.4	2.0
FG37a	22.39	0	5.4	39.5
FG37b	24.86	6	11.0	54.9
***FG38	85.00	-	-	-

Flows do not match with other spreadsheets or report. Please verify flow and revise tables, text, map accordingly so all items match

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)
*G06	FG29, DP G06a, G15	22.0	491.0
*G12	-	21.0	450.0
**G15	FG35	3.0	55.0
***G09	FG38	52.0	277.0
2.1	EA1	0.8	1.5
3.1	EA2, DP2.1	1.6	3.2
4.1	EA5, DP3.1	1.7	3.4
5	EA3	2.4	4.9
6	EA4, DP5	5.9	16.0
G15a1	FG36a	4.6	27.7
7	FG36b	0.4	2.0
8	DPG15a1,7	4.9	29.2
6.1	DP6,8	9.0	40.2
G15a	DP6.1	9.0	40.2
**G16a	FG37a, DPG15,G15a	12.0	59.0
10	EA5, EA6, SFB C OUTFLOW	1.3	3.3
10.1	EA7	0.1	0.7
11.1	DPG16a,G16b	23.0	113.9
12	EA18	3.9	24.6
13	DP11.1, 12	27.0	138.5
13.1	DP13	27.3	141.0
14	EA8	5.2	9.4
15	EA9	5.0	10.6
15.1	DP14,15	10.2	19.9
16.1	EA10	0.6	1.1
17.1	EA11	0.5	1.0
G16.1	EA15	0.7	2.1
G16.2	-	0.0	0.0
G06a	FG29a	6.4	42.9
G06.1	EA12, DPG06	22.1	492.1
G06.2	EA13	1.4	2.8
G06.3	EA14	1.2	3.8
G16b	FG37b	11.0	54.9

* Basin/design point name, area, and flows taken from the "FDR for The Sanctuary Filing 1 at Meridian Ranch".
** Basin/design point name, area, and flows taken from the "FDR for Rex Road through Falcon Regional Park".
*** Basin/design point name, area, and flows taken from the "FDR for Falcon Regional Park".

EASTONVILLE ROAD SEG 2
PROPOSED CONDITIONS
EL PASO COUNTY, CO

Calc'd by: SPC

Checked by: CM

Date: 10/28/2024

SOIL TYPE: HSG A&B

COMPOSITE 'C' FACTORS

BASIN	LAND USE TYPE															TOTAL	COMPOSITE IMPERVIOUSNESS & C FACTOR		
	Paved			Historic Flow Analysis-- Greenbelts, Agriculture			Lawns			Gravel			Drive and Walks						
	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}				
	100	0.90	0.96	2	0.09	0.36	0	0.08	0.35	80	0.59	0.70	100	0.90	0.96				
	ACRES			ACRES			ACRES			ACRES			ACRES			ACRES	%I	C_5	C_{100}
EA1	0.16						0.06									0.22	73	0.68	0.79
EA2	0.18						0.07									0.25	72	0.67	0.79
EA3	0.49						0.27									0.76	65	0.61	0.74
EA4	0.69			2.27			0.15									3.11	24	0.27	0.49
EA5	0.00						0.16									0.16	0	0.08	0.35
EA6	0.19						0.06									0.25	76	0.71	0.82
EA7	0.10						0.10									0.20	50	0.49	0.65
EA8	2.06						0.02									2.08	99	0.89	0.95
EA9	1.88						1.26									3.14	60	0.57	0.72
EA10	0.12						0.04									0.16	75	0.70	0.81
EA11	0.10						0.05									0.15	67	0.63	0.76
EA12							0.36									0.36	0	0.08	0.35
EA13	0.33						0.12									0.45	73	0.68	0.80
EA14							1.16			0.07			0.25			1.48	21	0.24	0.47
EA15							0.57			0.04			0.15			0.76	24	0.27	0.49
EA16							1.18									1.18	0	0.08	0.35
EA17							0.30									0.30	0	0.08	0.35
*FG29																62.91	-	-	-
FG29a				21.40												21.40	2	0.09	0.36
**FG35																18.69	-	-	-
FG36a				13.81						0.33						14.14	4	0.10	0.37
FG36b				0.74						0.07						0.81	8	0.13	0.39
FG37a							22.39									22.39	0	0.08	0.35
FG37b	1.53						23.33									24.86	6	0.13	0.39
***FG38																85.00	-	-	-
EA18				11.16						0.03			0.10			11.29	3	0.10	0.37

COMPOSITE 'C' FACTORS

	LAND USE TYPE															TOTAL	COMPOSITE IMPERVIOUSNESS & C FACTOR		
	Paved			Historic Flow Analysis-- Greenbelts, Agriculture			Lawns			Gravel			Drive and Walks						
	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}				
	100	0.90	0.96	2	0.09	0.36	0	0.08	0.35	80	0.59	0.70	100	0.90	0.96				
BASIN	ACRES			ACRES			ACRES			ACRES			ACRES			ACRES	%I	C_5	C_{100}
SFB C	0.34			0.00			0.29									0.63	54		
EDB B	6.14			0.00			3.23			0.09			0.01			9.48	66		

* Basin name, area, and flows taken from the "FDR for The Sanctuary Filing 1 at Meridian Ranch".

** Basin name, area, and flows taken from the "FDR for Rex Road through Falcon Regional Park".

*** Basin name, area, and flows taken from the "FDR for Falcon Regional Park".

HRGreen	**EASTONVILLE ROAD SEG 2**	**Calc'd by:**	**SPC**
	PROPOSED CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**10/28/2024**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)
EA1	0.68	0.22	34	2.0	3.6	20	137	1.4	2.4	1.0	5.0
EA2	0.67	0.25	34	2.0	3.6	20	60	1.4	2.4	0.4	5.0
EA3	0.61	0.76	34	2.0	4.2	20	126	1.4	2.4	0.9	5.0
EA4	0.27	3.11	34	2.0	7.1	20	126	3.8	3.9	0.5	7.6
EA5	0.08	0.16	20	2.0	6.6	20	20	33.0	11.5	0.0	6.7
EA6	0.71	0.25	26	2.0	2.9	20	630	1.7	2.6	4.0	7.0
EA7	0.49	0.20	24	2.0	4.4	20	630	1.7	2.6	4.0	8.4
EA8	0.89	2.08	26	2.0	1.5	20	2500	0.7	1.7	24.9	26.4
EA9	0.57	3.14	26	2.0	3.9	20	2500	0.7	1.7	24.9	28.8
EA10	0.70	0.16	26	2.0	3.0	20	157	0.6	1.5	1.7	5.0
EA11	0.63	0.15	26	2.0	3.5	20	157	0.6	1.5	1.7	5.2
EA12	0.08	0.36	30	25.0	3.5	10	0	0.0	0.0	0.0	5.0
EA13	0.68	0.45	76	2.0	5.3	10	115	2.0	1.4	1.4	6.7
EA14	0.24	1.48	50	10.0	5.2	10	1300	1.1	1.0	20.7	25.8
EA15	0.27	0.76	50	10.0	5.0	10	1137	1.0	1.0	19.0	24.0
EA16	0.08	1.18	300	3.0	22.5	10	500	3.0	1.7	4.8	27.3
EA17	0.08	0.30	89	5.0	10.3	10	0	0.0	0.0	0.0	10.3
*FG29											
FG29a	0.09	21.40	100	2.0	14.7	10	1190	2.5	1.6	12.5	27.2
**FG35											
FG36a	0.10	14.14	100	2.5	13.5	10	1512	3.0	1.7	14.5	28.0
FG36b	0.13	0.81	100	1.5	15.5	10	250	1.5	1.2	3.4	18.9
FG37a	0.08	22.39	100	2.5	13.8	10	1920	2.5	1.6	20.2	34.0
FG37b	0.13	24.86	100	3.5	11.7	10	1036	3.5	1.9	9.2	20.9
***FG38											
EA18	0.10	11.29	200	11.6	11.5	10	675	3.4	1.8	6.1	17.6

* Basin name, area, and flows taken from the "FDR for The Sanctuary Filing 1 at Meridian Ranch".
** Basin name, area, and flows taken from the "FDR for Rex Road through Falcon Regional Park".
*** Basin name, area, and flows taken from the "FDR for Falcon Regional Park".

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v

HRGreen	**EASTONVILLE ROAD SEG 2**	**Calc'd by:**	**SPC**
	PROPOSED CONDITIONS	**Checked by:**	**CM**
	EL PASO COUNTY, CO	**Date:**	**10/28/2024**

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)

Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

EASTONVILLE ROAD SEG 2

PROPOSED CONDITIONS

DESIGN STORM: 5-YEAR

Calc'd by:	SPC
Checked by:	CM
Date:	10/28/2024

HRGreen

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
	G06	*FG29	62.91					2.9				**22.0**											
	G12	-						-				**21.0**											
	G15	**FG35	18.69					2.4				**3.0**											
	G09	***FG38	85.00					-				**52.0**											
	2.1	EA1	0.22	0.68	5.0	0.15	5.17	0.8	5.0	0.15	5.17	**0.8**				0.8	0.15	1.0	1.5	56	5.9	0.16	BASIN EA1 CAPTURED IN 5' TYPE R INLET @ DP2.1, PIPE TO DP3.1
	3.1	EA2	0.25	0.67	5.0	0.17	5.17	0.9	5.2	0.32	5.12	**1.6**				1.6	0.32	5.1	1.5	34	13.4	0.04	BASIN EA2 CAPTURED IN 5' TYPE R INLET@ DP3.1, PIPE TO DP4.1 (SFB C)
	4.1	EA5	0.16	0.08	6.7	0.01	4.74	0.1	6.7	0.33	5.12	**1.7**											SFB C BASIN
	5	EA3	0.76	0.61	5.0	0.46	5.15	2.4	5.0	0.46	5.15	**2.4**				2.4	0.46	2.0	1.5	48	8.4	0.09	BASIN EA3 CAPTURED IN TYPE R INLET @ DP5, PIPE TO DP6
	6	EA4	3.11	0.27	7.6	0.84	4.54	3.8	7.6	1.30	4.54	**5.9**				5.9	1.30	2.0	2.0	43	10.2	0.07	BASIN EA4 CAPTURED IN TYPE R INLET @ DP6, PIPE TO DP6.1
	G15a1	FG36a	14.14	0.10	19.0	1.44	3.17	4.6	19.0	1.44	3.17	**4.6**				4.6	1.44	0.6	2.0	43	5.6	0.13	BASIN FG36a CAPUTURED BY 24" FES, PIPE TO DP8
	7	FG36b	0.81	0.13	11.9	0.11	3.86	0.4	11.9	0.11	3.86	**0.4**				0.4	0.11	3.3	1.5	37	10.8	0.06	BASIN FG36b CAPTURED IN 18" FES, PIPE TO DP8
	8								19.1	1.54	3.16	**4.9**				4.9	1.54	0.9	2.0	56	6.8	0.14	DPG15a1 AND 7 COMBINED, PIPE TO DP6.1
	6.1								19.2	2.84	3.15	**9.0**				9.0	2.84	2.5	2.0	60	11.4	0.09	DP8 & DP 6 COMBINED, PIPE TO DP G15a
	G15a								19.2	2.84	3.15	**9.0**	9.0	2.84	2.1					615	2.9	3.56	DP6.1 DISCHARGE TO ROADSIDE SWALE TO DPG15a
	G16a	FG37a	22.39	0.08	21.2	1.79	3.00	5.4				**12.0**											DP G16a PER THE FDR FOR REX ROAD THROUGH FALCON REGIONAL PARK
	10	EA6	0.25	0.71	7.0	0.18	4.67	0.8	8.4	0.28	4.39	**1.3**											BASIN EA6 & EA7 @ DP10 (TEMPORARY SEDIMENT BASIN #1) INCLUDES SFB C OUTFLOW
		EA7	0.20	0.49	8.4	0.10	4.39	0.4															
	12	EA18	11.29	0.10	14.9	1.12	3.53	3.9	14.9	1.12	3.53	**3.9**				3.9	1.12	1.0	1.5	28	5.9	0.08	BASIN EA18 CAPTURED @ DP12 IN TYPE C INLET, PIPE TO DP13
	13											**27.0**											COMBINED DP11.1 & DP12, PIPE TO CHANNEL B (DP13.1)
	14	EA8	2.08	0.89	24.0	1.86	2.81	5.2	24.0	1.86	2.81	**5.2**				5.2	1.86	7.0	1.5	8	15.7	0.01	BASIN EA8 CAPTURED IN 10' TYPE R SUMP @ DP14, PIPE TO DP15.1
	15	EA9	3.14	0.57	24.0	1.79	2.81	5.0	24.0	1.79	2.81	**5.0**				5.0	1.79	1.8	1.5	54	7.9	0.11	BASIN EA8 CAPTURED IN 10' TYPE R SUMP @ DP15, PIPE TO DP15.1
	15.1								24.1	3.65	2.81	**10.2**											COMBINED DP14 & DP15, PIPE TO DP18 OF THE EASTONVILLE ROAD SEGMENT 1 FDR
	16.1	EA10	0.16	0.70	5.0	0.11	5.17	0.6	5.0	0.11	5.17	**0.6**											BASIN EA10 CONVEYED VIA CURB & GUTTER TO 10' TYPE R INLET. INLET DESIGN IS PROVIDED IN THE EASTONVILLE ROAD SEGMENT 1 FDR
	17.1	EA11	0.15	0.63	5.2	0.09	5.11	0.5	5.2	0.09	5.11	**0.5**											BASIN EA11 CONVEYED VIA CURB & GUTTER TO 10' TYPE R INLET. INLET DESIGN IS PROVIDED IN THE EASTONVILLE ROAD SEGMENT 1 FDR
	G16.1	EA15	0.76	0.27	16.6	0.21	3.37	0.7	16.6	0.21	3.37	**0.7**											OFFSITE FLOW AT DP G16.1
	G16.2	NA						0.0				**0.0**											OFFSITE FLOW AT DP G16.2
	G06a	FG29a	21.40	0.09	17.2	1.93	3.32	6.4	17.2	1.93	3.32	**6.4**											BASIN FG29a FLOW CAPTURED BY 24" FES AT DP G06a

HRGreen

EASTONVILLE ROAD SEG 2

PROPOSED CONDITIONS

DESIGN STORM: 5-YEAR

Calc'd by:	SPC
Checked by:	CM
Date:	10/28/2024

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
	G06.1	EA12	0.36	0.08	5.0	0.03	5.17	0.1	5.0	0.03	5.17	**22.1**											OFFSITE FLOW AT DPG06.1
	G06.2	EA13	0.45	0.68	6.7	0.30	4.73	1.4	6.7	0.30	4.73	**1.4**											OFFSITE FLOW AT DPG06.2
	G06.3	EA14	1.48	0.24	17.5	0.36	3.29	1.2	17.5	0.36	3.29	**1.2**											OFFSITE FLOW AT DP G06.3
	G16b	FG37b	24.86	0.13	16.3	3.24	3.40	11.0	16.3	3.24	3.40	**11.0**				11.0	3.24	1.0	4.0	610	11.4	0.89	BASIN FG37b FLOW CAPTURED BY 36" FES AT DP G16b
	10.1	EA17	0.30	0.08	10.3	0.02	4.08	0.1	10.3	0.02	4.08	**0.1**											OFFSITE FLOW AT DP10.1
	11.1											**23.0**											DP G16a & G16b COMBINED AT DP11.1
	13.1	EA16	1.18	0.08	14.4	0.09	3.58	0.3	14.4	0.09	3.58	**27.3**											TOTAL FLOW OFFSITE AT DP 13.1

HRGreen

EASTONVILLE ROAD SEG 2

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	SPC
Checked by:	CM
Date:	10/28/2024

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
	G06	*FG29						60.0				**491.0**											
	G12	-						-				**450.0**											
	G15	**FG35						25.0				**55.0**											
	G09	***FG38						-				**277.0**											
	2.1	EA1	0.22	0.79	5.0	0.17	8.68	1.5	5.0	0.17	8.68	**1.5**				1.5	0.17	1.0	1.5	56	5.9	0.16	BASIN EA1 CAPTURED IN 5' TYPE R INLET @ DP2.1, PIPE TO DP3.1
	3.1	EA2	0.25	0.79	5.0	0.20	8.68	1.7	5.2	0.37	8.60	**3.2**				3.2	0.37	5.1	1.5	34	13.4	0.04	BASIN EA2 CAPTURED IN 5' TYPE R INLET@ DP3.1, PIPE TO DP4.1 (SFB C)
	4.1	EA5	0.16	0.35	6.7	0.06	7.95	0.4	6.7	0.43	7.95	**3.4**											SFB C BASIN
	5	EA3	0.76	0.74	5.0	0.57	8.66	4.9	5.0	0.57	8.66	**4.9**				4.9	0.57	2.0	1.5	48	8.4	0.09	BASIN EA3 CAPTURED IN TYPE R INLET @ DP5, PIPE TO DP6
	6	EA4	3.11	0.49	7.6	1.53	7.63	11.7	7.6	2.10	7.63	**16.0**				16.0	2.10	2.0	2.0	43	10.2	0.07	BASIN EA4 CAPTURED IN TYPE R INLET @ DP6, PIPE TO DP6.1
	G15a1	FG36a	14.14	0.37	19.0	5.20	5.32	27.7	19.0	5.20	5.32	**27.7**				27.7	5.20	0.6	2.0	43	5.6	0.13	BASIN FG36a CAPUTURED BY 24" FES, PIPE TO DP8
	7	FG36b	0.81	0.39	11.9	0.31	6.48	2.0	11.9	0.31	6.48	**2.0**				2.0	0.31	3.3	1.5	37	10.8	0.06	BASIN FG36b CAPTURED IN 18" FES, PIPE TO DP8
	8								19.1	5.51	5.30	**29.2**				29.2	5.51	0.9	2.0	56	6.8	0.14	DPG15a1 AND 7 COMBINED, PIPE TO DP6.1
	6.1								19.2	7.61	5.29	**40.2**				40.2	7.61	2.5	2.0	60	11.4	0.09	DP8 & DP 6 COMBINED, PIPE TO DP G15a
	G15a								19.2	7.61	5.29	**40.2**	40.2	7.61	2.1					615	2.9	3.56	DP6.1 DISCHARGE TO ROADSIDE SWALE TO DPG15a
	G16a	FG37a	22.39	0.35	21.2	7.84	5.04	39.5				**59.0**											DP G16a PER THE FDR FOR REX ROAD THROUGH FALCON REGIONAL PARK
	10	EA6	0.25	0.82	7.0	0.21	7.85	1.6	8.4	0.34	7.37	**3.3**											BASIN EA6 & EA7 @ DP10 (TEMPORARY SEDIMENT BASIN #1) INCLUDES SFB C OUTFLOW
		EA7	0.20	0.65	8.4	0.13	7.37	1.0															
	12	EA18	11.29	0.37	14.9	4.14	5.93	24.6	14.9	4.14	5.93	**24.6**				24.6	4.14	1.0	1.5	28	5.9	0.08	BASIN EA18 CAPTURED @ DP12 IN TYPE C INLET, PIPE TO DP13
	13											**138.5**											COMBINED DP11.1 & DP12, PIPE TO CHANNEL B (DP13.1)
	14	EA8	2.08	0.95	24.0	1.98	4.72	9.4	24.0	1.98	4.72	**9.4**				9.4	1.98	7.0	1.5	8	15.7	0.01	BASIN EA8 CAPTURED IN 10' TYPE R SUMP @ DP14, PIPE TO DP15.1
	15	EA9	3.14	0.72	24.0	2.25	4.72	10.6	24.0	2.25	4.72	**10.6**				10.6	2.25	1.8	1.5	54	7.9	0.11	BASIN EA8 CAPTURED IN 10' TYPE R SUMP @ DP15, PIPE TO DP15.1
	15.1								24.1	4.23	4.71	**19.9**											COMBINED DP14 & DP15, PIPE TO DP18 OF THE EASTONVILLE ROAD SEGMENT 1 FDR
	16.1	EA10	0.16	0.81	5.0	0.13	8.68	1.1	5.0	0.13	8.68	**1.1**											BASIN EA10 CONVEYED VIA CURB & GUTTER TO 10' TYPE R INLET. INLET DESIGN IS PROVIDED IN THE EASTONVILLE ROAD SEGMENT 1 FDR
	17.1	EA11	0.15	0.76	5.2	0.11	8.58	1.0	5.2	0.11	8.58	**1.0**											BASIN EA11 CONVEYED VIA CURB & GUTTER TO 10' TYPE R INLET. INLET DESIGN IS PROVIDED IN THE EASTONVILLE ROAD SEGMENT 1 FDR
	G16.1	EA15	0.76	0.49	16.6	0.37	5.66	2.1	16.6	0.37	5.66	**2.1**											OFFSITE FLOW AT DP G16.1
	G16.2	NA										**0.0**											OFFSITE FLOW AT DP G16.2
	G06a	FG29a	21.40	0.36	17.2	7.70	5.57	42.9	17.2	7.70	5.57	**42.9**											BASIN FG29a FLOW CAPTURED BY 24" FES AT DP G06a
	G06.1	EA12	0.36	0.35	5.0	0.13	8.68	1.1	5.0	0.13	8.68	**492.1**											OFFSITE FLOW AT DPG06.1

HRGreen

EASTONVILLE ROAD SEG 2

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	SPC
Checked by:	CM
Date:	10/28/2024

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
	G06.2								6.7	0.36	7.95	**2.8**											OFFSITE FLOW AT DPG06.2
		EA13	0.45	0.80	6.7	0.36	7.95	2.8															
	G06.3								17.5	0.69	5.52	**3.8**											OFFSITE FLOW AT DP G06.3
		EA14	1.48	0.47	17.5	0.69	5.52	3.8															
	G16b								16.3	9.63	5.70	**54.9**				54.9	9.63	1.0	4.0	610	11.4	0.89	BASIN FG37b FLOW CAPTURED BY 36" FES AT DP G16b
		FG37b	24.86	0.39	16.3	9.63	5.70	54.9															
	10.1								10.3	0.11	6.85	**0.7**											OFFSITE FLOW AT DP10.1
		EA17	0.30	0.35	10.3	0.11	6.85	0.7															
	11.1											**113.9**				113.9	0.00	1.5	4.0	890	14.0	1.06	DP G16a & G16b COMBINED AT DP11.1
	13.1								14.4	0.41	6.01	**141.0**											TOTAL FLOW OFFSITE AT DP 13.1
		EA16	1.18	0.35	14.4	0.41	6.01	2.5															

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: SPC
Company: HR GREEN
Date: October 15, 2024
Project: Eastonville Segment 2 - RR
Location: COLORADO SPRINGS, CO

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA	SPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA	SPA	SPA	SPA	SPA	UIA:RPA	SPA
Area ID	SFB C	SFB C SPA	EDB B - RR (PART 1)	EDB B - RR (PART 2)	EDB B - RR (PART 3)	EDB B - RR (PART 4)	EDB B SPA	FG36b	EA17	FG37a	EA18 UIA	EA18 SPA
Downstream Design Point ID	4.1	4.1	19	19	19	19	19	7	10.1	G16a	12	12
Downstream BMP Type	SF	SF	EDB	EDB	EDB	EDB	EDB	None	None	None	None	None
DCIA (ft^2)	--	--	--	--	--	--	--	--	--	--	--	--
UIA (ft^2)	14,819	--	68,074	68,074	68,074	68,074	--	--	--	--	6,468	--
RPA (ft^2)	574	--	1,392	1,392	1,392	1,392	--	--	--	--	4,931	--
SPA (ft^2)	--	12,050	--	--	--	--	128,550	5,474	11,843	13,414	--	20,215
HSG A (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
HSG B (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
HSG C/D (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Average Slope of RPA (ft/ft)	0.005	--	0.005	0.005	0.005	0.005	--	--	--	--	0.100	--
UIA:RPA Interface Width (ft)	20.00	--	70.00	70.00	70.00	70.00	--	--	--	--	485.00	--

CALCULATED RUNOFF RESULTS

Area ID	SFB C	SFB C SPA	B - RR (PAR	B - RR (PAR	B - RR (PAR	B - RR (PAR	EDB B SPA	FG36b	EA17	FG37a	EA18 UIA	EA18 SPA
UIA:RPA Area (ft^2)	15,393	--	69,466	69,466	69,466	69,466	--	--	--	--	11,399	--
L / W Ratio	16.00	--	14.18	14.18	14.18	14.18	--	--	--	--	0.06	--
UIA / Area	0.9627	--	0.9800	0.9800	0.9800	0.9800	--	--	--	--	0.5674	--
Runoff (in)	0.42	0.00	0.44	0.44	0.44	0.44	0.00	0.00	0.00	0.00	0.00	0.00
Runoff (ft^3)	533	0	2521	2521	2521	2521	0	0	0	0	0	0
Runoff Reduction (ft^3)	85	603	316	316	316	316	6428	274	592	671	270	1011

CALCULATED WQCV RESULTS

Area ID	SFB C	SFB C SPA	B - RR (PAR	B - RR (PAR	B - RR (PAR	B - RR (PAR	EDB B SPA	FG36b	EA17	FG37a	EA18 UIA	EA18 SPA
WQCV (ft^3)	494	0	2836	2836	2836	2836	0	0	0	0	270	0
WQCV Reduction (ft^3)	85	0	316	316	316	316	0	0	0	0	270	0
WQCV Reduction (%)	17%	0%	11%	11%	11%	11%	0%	0%	0%	0%	100%	0%
Untreated WQCV (ft^3)	409	0	2521	2521	2521	2521	0	0	0	0	0	0

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	4.1	4.1	19	19	19	19	19	7	10.1	G16a	12	12
DCIA (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
UIA (ft^2)	14,819	14,819	272,296	272,296	272,296	272,296	272,296	0	0	0	6,468	6,468
RPA (ft^2)	574	574	5,568	5,568	5,568	5,568	5,568	0	0	0	4,931	4,931
SPA (ft^2)	12,050	12,050	128,550	128,550	128,550	128,550	128,550	5,474	11,843	13,414	20,215	20,215
Total Area (ft^2)	27,443	27,443	406,414	406,414	406,414	406,414	406,414	5,474	11,843	13,414	31,614	31,614
Total Impervious Area (ft^2)	14,819	14,819	272,296	272,296	272,296	272,296	272,296	0	0	0	6,468	6,468
WQCV (ft^3)	494	494	11,346	11,346	11,346	11,346	11,346	0	0	0	270	270
WQCV Reduction (ft^3)	85	85	1,262	1,262	1,262	1,262	1,262	0	0	0	270	270
WQCV Reduction (%)	17%	17%	11%	11%	11%	11%	11%	0%	0%	0%	100%	100%
Untreated WQCV (ft^3)	409	409	10,083	10,083	10,083	10,083	10,083	0	0	0	0	0

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	2,180,915
Total Impervious Area (ft^2)	1,404,054
WQCV (ft^3)	12,109
WQCV Reduction (ft^3)	1,616
WQCV Reduction (%)	13%
Untreated WQCV (ft^3)	10,493

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: SPC
Company: HR GREEN
Date: October 15, 2024
Project: Eastonville Segment 2 - RR
Location: COLORADO SPRINGS, CO

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	SPA	SPA	UIA:RPA	SPA	SPA	SPA	SPA	UIA:RPA	SPA	UIA:RPA	SPA	
Area ID	EA16	FG37b	EA15 UIA	EA15 SPA	FG36a	FG29	EA12	EA13 UIA	EA13 SPA	EA14 UIA	EA14 SPA	
Downstream Design Point ID	13.1	G16b	G16.1	G16.1	G15a1	G06	G06.1	G06.2	G06.2	G06.3	G06.3	
Downstream BMP Type	None	None	None	None	None	None	None	None	None	None	None	
DCIA (ft^2)	--	--	--	--	--	--	--	--	--	--	--	
UIA (ft^2)	--	--	8,613	--	--	--	--	15,849	--	14,183	--	
RPA (ft^2)	--	--	6,625	--	--	--	--	1,265	--	10,910	--	
SPA (ft^2)	13,040	23,591	--	10,902	1,351	25,936	12,172	--	3,532	--	34,835	
HSG A (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
HSG B (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
HSG C/D (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Average Slope of RPA (ft/ft)	--	--	0.100	--	--	--	--	0.330	--	0.100	--	
UIA:RPA Interface Width (ft)	--	--	662.50	--	--	--	--	40.00	--	1091.00	--	

CALCULATED RUNOFF RESULTS

Area ID	EA16	FG37b	EA15 UIA	EA15 SPA	FG36a	FG29	EA12	EA13 UIA	EA13 SPA	EA14 UIA	EA14 SPA	
UIA:RPA Area (ft^2)	--	--	15,238	--	--	--	--	17,114	--	25,093	--	
L / W Ratio	--	--	0.06	--	--	--	--	10.70	--	0.06	--	
UIA / Area	--	--	0.5652	--	--	--	--	0.9261	--	0.5652	--	
Runoff (in)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	
Runoff (ft^3)	0	0	0	0	0	0	0	535	0	0	0	
Runoff Reduction (ft^3)	652	1180	359	545	68	1297	609	125	177	591	1742	

CALCULATED WQCV RESULTS

Area ID	EA16	FG37b	EA15 UIA	EA15 SPA	FG36a	FG29	EA12	EA13 UIA	EA13 SPA	EA14 UIA	EA14 SPA	
WQCV (ft^3)	0	0	359	0	0	0	0	660	0	591	0	
WQCV Reduction (ft^3)	0	0	359	0	0	0	0	125	0	591	0	
WQCV Reduction (%)	0%	0%	100%	0%	0%	0%	0%	19%	0%	100%	0%	
Untreated WQCV (ft^3)	0	0	0	0	0	0	0	535	0	0	0	

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

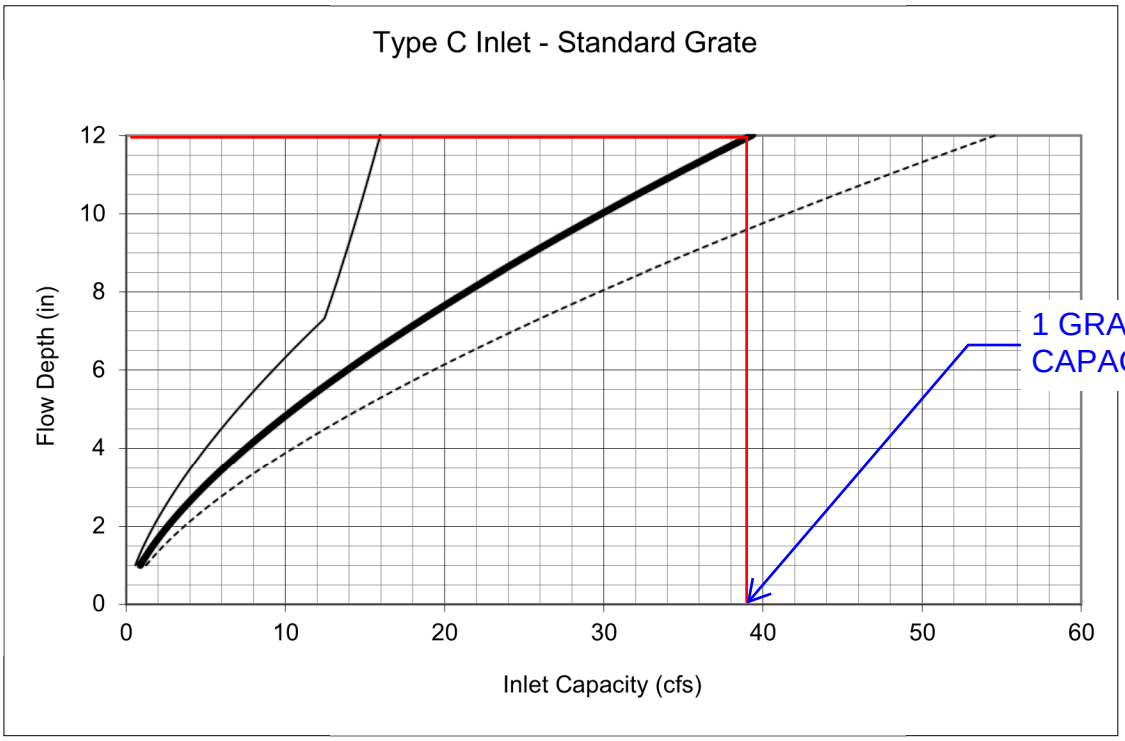
Downstream Design Point ID	13.1	G16b	G16.1	G15a1	G06	G06.1	G06.2	G06.3				
DCIA (ft^2)	0	0	0	0	0	0	0	0				
UIA (ft^2)	0	0	8,613	0	0	0	15,849	14,183				
RPA (ft^2)	0	0	6,625	0	0	0	1,265	10,910				
SPA (ft^2)	13,040	23,591	10,902	1,351	25,936	12,172	3,532	34,835				
Total Area (ft^2)	13,040	23,591	26,140	1,351	25,936	12,172	20,646	59,928				
Total Impervious Area (ft^2)	0	0	8,613	0	0	0	15,849	14,183				
WQCV (ft^3)	0	0	359	0	0	0	660	591				
WQCV Reduction (ft^3)	0	0	359	0	0	0	125	591				
WQCV Reduction (%)	0%	0%	100%	0%	0%	0%	19%	100%				
Untreated WQCV (ft^3)	0	0	0	0	0	0	535	0				

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	182,804
Total Impervious Area (ft^2)	38,645
WQCV (ft^3)	1,610
WQCV Reduction (ft^3)	1,075
WQCV Reduction (%)	67%
Untreated WQCV (ft^3)	535

APPENDIX C – HYDRAULIC CALCULATIONS

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



DP12 Q100 =24.6 CFS -> 2 GRATE TYPE C INLET

One Grate Two Grates Three Grates

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

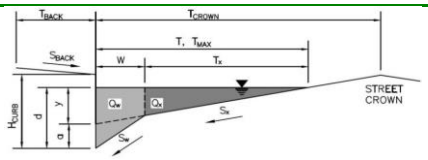
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP2.1**



Gutter Geometry:

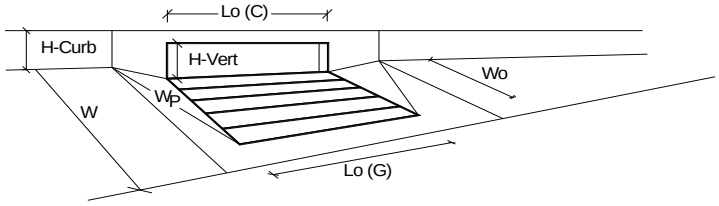
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	☐ Override Depths
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.3	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.44	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.75	0.93	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.1**	**8.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.8	1.5	cfs

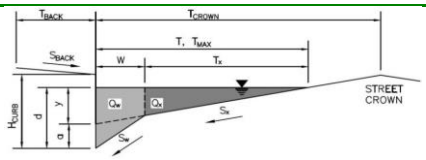
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP3.1**



Gutter Geometry:

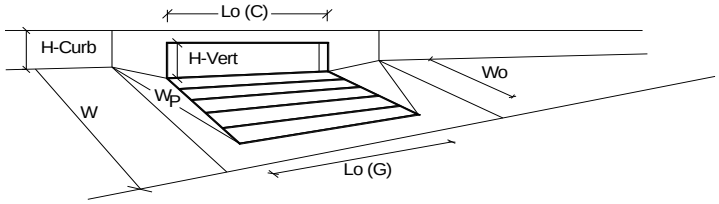
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	☐ Override Depths
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.3	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.44	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.75	0.93	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.1**	**8.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.9	1.7	cfs

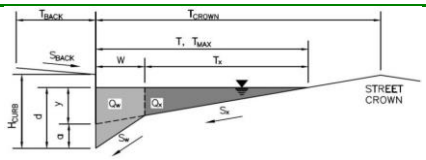
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP5**



Gutter Geometry:

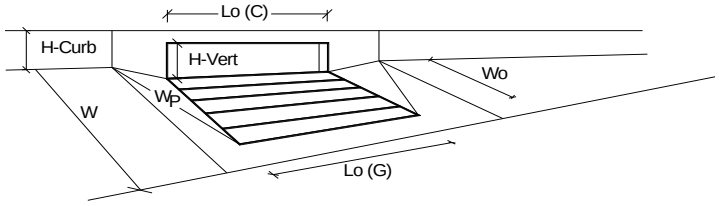
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

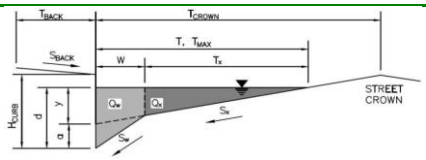
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	☐ Override Depths
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.3	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.44	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.75	0.93	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.1**	**8.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.4	4.9	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP6**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

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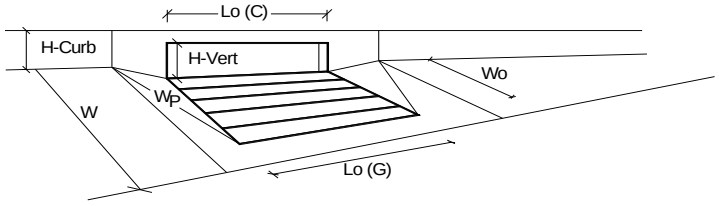


CDOT Type R Curb Opening

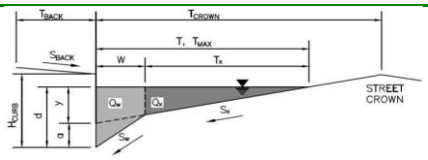
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	☐ Override Depths
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.3	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.44	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.56	0.69	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**10.0**	**16.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.8	11.7	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP14**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

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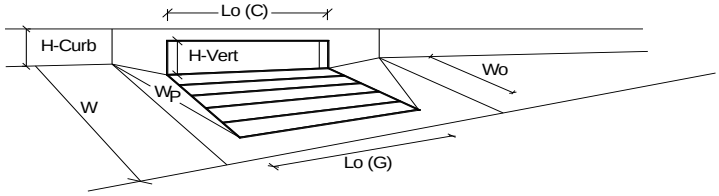


CDOT Type R Curb Opening

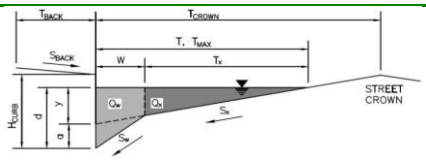
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	☐ Override Depths
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.8	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.55	0.73	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.9**	**18.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.2	9.4	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP15**



Gutter Geometry:

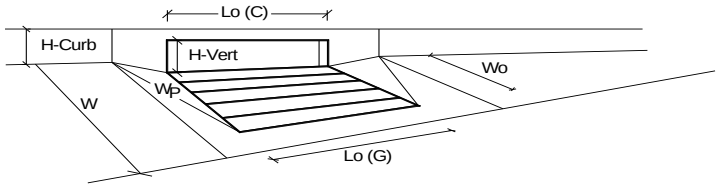
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	☐ Override Depths
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	7.8	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.55	0.73	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.9**	**18.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.0	10.6	cfs

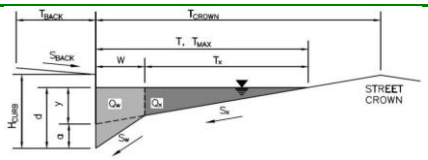
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP16 - Ultimate Flow**



Gutter Geometry:

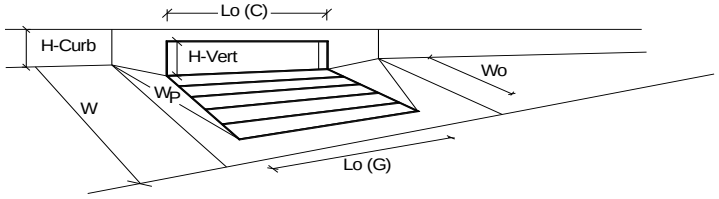
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	5.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	5.9	☐ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.56	0.56	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.93	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**10.0**	**10.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.7	6.3	cfs

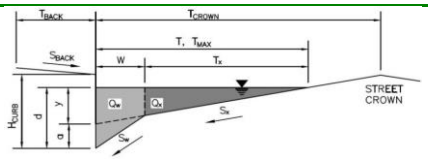
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **DP17 - Ultimate Flow**



Gutter Geometry:

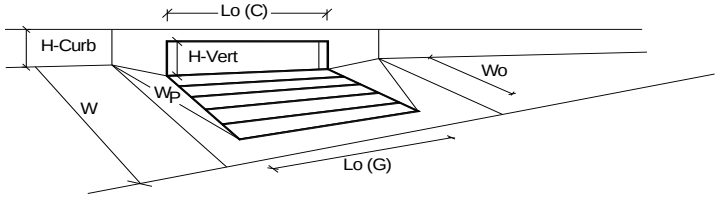
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	5.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.9	5.9	☐ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.56	0.56	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.93	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**10.0**	**10.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.7	6.4	cfs

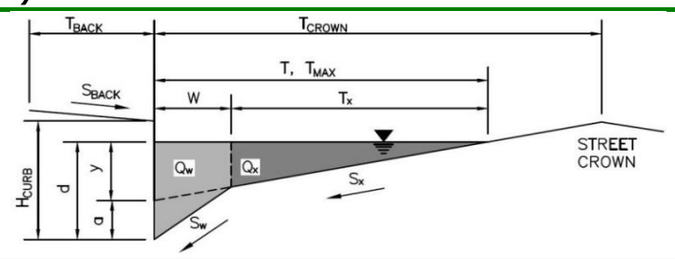
MHFD-Inlet, Version 5.01 (April 2021)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **Street Capacity (DP14)**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.005	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**12.3**	**30.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

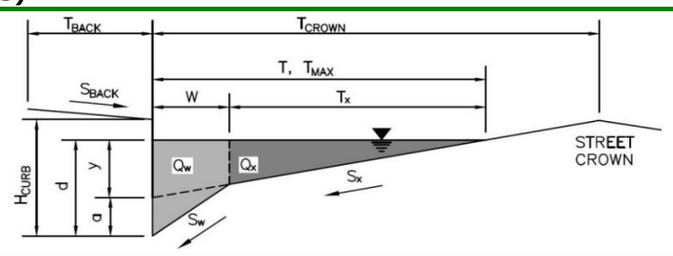
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Eastonville Road**

Inlet ID: **Street Capacity (DP15)**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.005	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.9	8.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**12.3**	**30.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

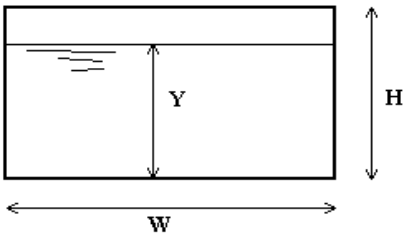
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

BOX CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eastonville Road Segment 2

Box ID: Geick Ranch Tributary 1 Box Culvert (DP G06)



Design Information (Input)			
Box conduit invert slope	So =	0.0150	ft/ft
Box Manning's n-value	n =	0.0120	
Box Width	W =	10.00	ft
Box Height	H =	3.00	ft
Design discharge	Q =	491.00	cfs

Full-flow capacity (Calculated)			
Full-flow area	Af =	30.00	sq ft
Full-flow wetted perimeter	Pf =	26.00	ft
Full-flow capacity	Qf =	501.88	cfs

Calculations of Normal Flow Condition			
Normal flow depth (<H)	Yn =	2.36	ft
Flow area	An =	23.58	sq ft
Wetted perimeter	Pn =	14.72	ft
Flow velocity	Vn =	20.82	fps
Discharge	Qn =	491.02	cfs
Percent of Full Flow	Flow =	97.8%	of full flow
Normal Depth Froude Number	Fr_n =	2.39	supercritical

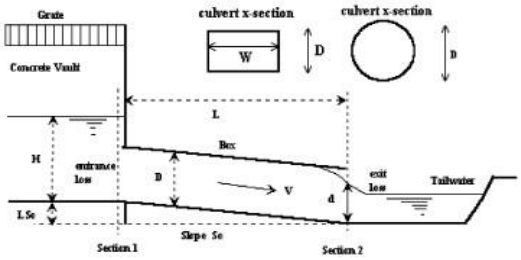
Calculation of Critical Flow Condition			
Critical flow depth	Yc =	3.00	ft
Critical flow area	Ac =	30.00	sq ft
Critical flow velocity	Vc =	16.37	fps
Critical Depth Froude Number	Fr_c =	1.67	

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: EASTONVILLE ROAD

ID: Geick Ranch Tributary 1 Box Culvert (DP G06)



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =		inches
	Inlet Edge Type (Choose from pull-down list)			
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	H (Rise) =	3.00	ft
	Barrel Width (Span) in Feet	W (Span) =	10.00	ft
	Inlet Edge Type (Choose from pull-down list)		1:1 Bevel w/ 45 deg. Flared Wingwall	
	Number of Barrels	# Barrels =	2	
	Inlet Elevation at Culvert Invert	Elev IN =	100	ft
	Outlet Elevation **OR** Slope	So =	0.015	ft/ft
	Culvert Length	L =	116.5	ft
	Manning's Roughness	n =	0.012	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.50
Friction Loss Coefficient	K_f =	0.40
Sum of All Loss Coefficients	K_s =	1.90
Minimum Energy Condition Coefficient	KE_{low} =	0.0044
Orifice Inlet Condition Coefficient	C_d =	0.65

Calculations of Culvert Capacity (output):

Backwater calculations required to obtain Outlet Control Flowrate when HWo < 0.75 * Culvert Ris

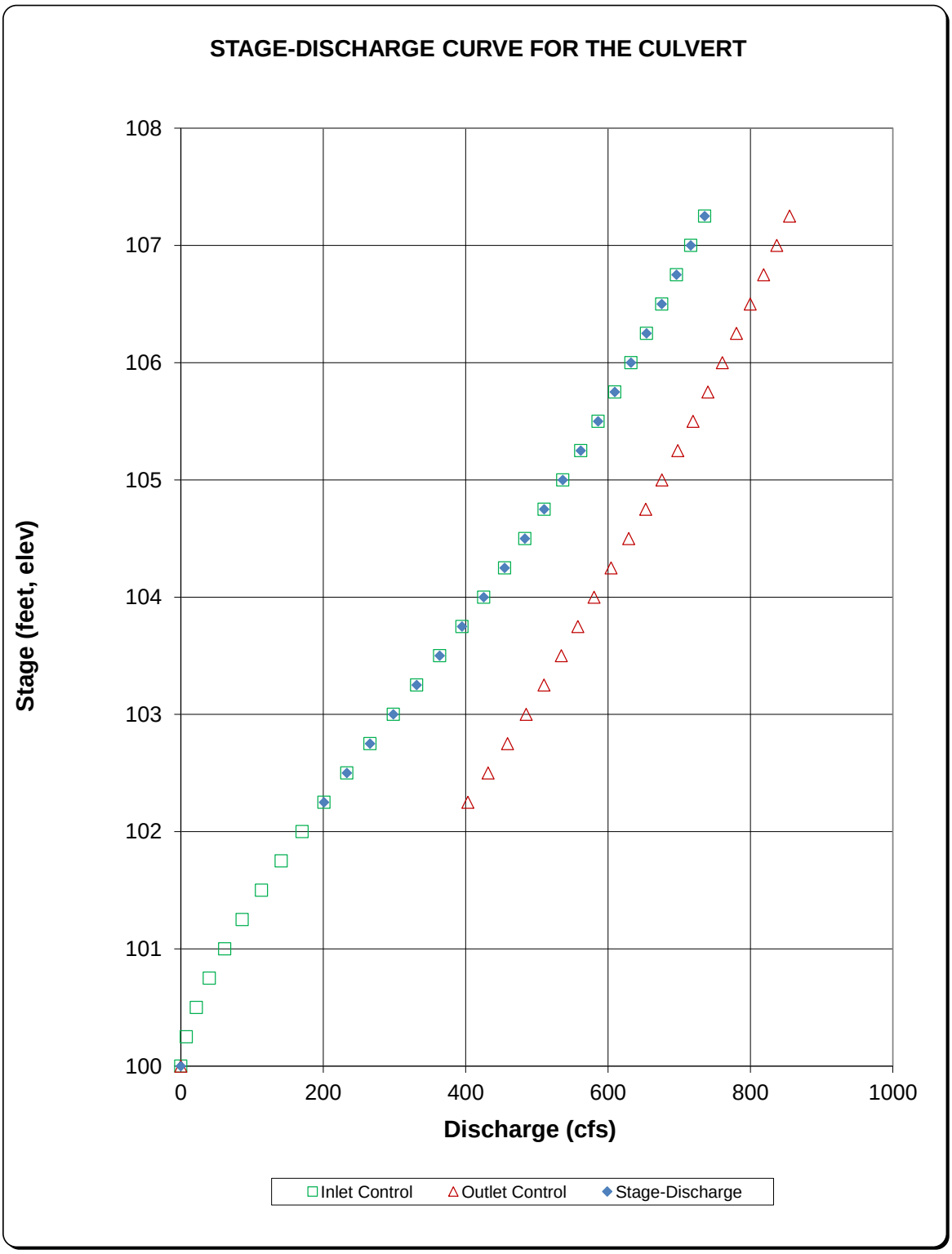
Headwater Surface Elevation (ft)	Tailwater Surface Elevation (ft)	Inlet Control Equation Used	Inlet Control Flowrate (cfs)	Outlet Control Flowrate (cfs)	Controlling Culvert Flowrate (cfs)	Flow Control Used
100.00		No Flow (WS < inlet)	0.00	0.00	**0.00**	N/A
100.25		Min. Energy. Eqn.	7.74	#N/A	#N/A	#N/A
100.50		Min. Energy. Eqn.	21.82	#N/A	#N/A	#N/A
100.75		Min. Energy. Eqn.	40.04	#N/A	#N/A	#N/A
101.00		Min. Energy. Eqn.	61.66	#N/A	#N/A	#N/A
101.25		Min. Energy. Eqn.	86.22	#N/A	#N/A	#N/A
101.50		Min. Energy. Eqn.	113.26	#N/A	#N/A	#N/A
101.75		Regression Eqn.	141.06	#N/A	#N/A	#N/A
102.00		Regression Eqn.	170.46	#N/A	#N/A	#N/A
102.25		Regression Eqn.	201.26	403.16	**201.26**	INLET
102.50		Regression Eqn.	233.22	431.72	**233.22**	INLET
102.75		Regression Eqn.	265.78	458.99	**265.78**	INLET
103.00		Regression Eqn.	298.68	485.11	**298.68**	INLET
103.25		Regression Eqn.	331.42	510.21	**331.42**	INLET
103.50		Regression Eqn.	363.62	534.39	**363.62**	INLET
103.75		Regression Eqn.	395.04	557.76	**395.04**	INLET
104.00		Regression Eqn.	425.50	580.38	**425.50**	INLET
104.25		Regression Eqn.	454.90	604.46	**454.90**	INLET
104.50		Regression Eqn.	483.22	629.17	**483.22**	INLET
104.75		Regression Eqn.	510.44	652.94	**510.44**	INLET
105.00		Regression Eqn.	536.62	675.87	**536.62**	INLET
105.25		Regression Eqn.	561.84	698.05	**561.84**	INLET
105.50		Regression Eqn.	586.16	719.54	**586.16**	INLET
105.75		Regression Eqn.	609.62	740.41	**609.62**	INLET
106.00		Regression Eqn.	632.28	760.72	**632.28**	INLET
106.25		Regression Eqn.	654.22	780.49	**654.22**	INLET
106.50		Regression Eqn.	675.50	799.77	**675.50**	INLET
106.75		Regression Eqn.	696.22	818.60	**696.22**	INLET
107.00		Regression Eqn.	716.24	837.01	**716.24**	INLET
107.25		Regression Eqn.	735.82	855.02	**735.82**	INLET
				Processing Time:	**00.12 Seconds**	

CULVERT SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

MHFD-Culvert, Version 4.00 (May 2020)

Project: EASTONVILLE ROAD

ID: Geick Ranch Tributary 1 Box Culvert (DP G06)

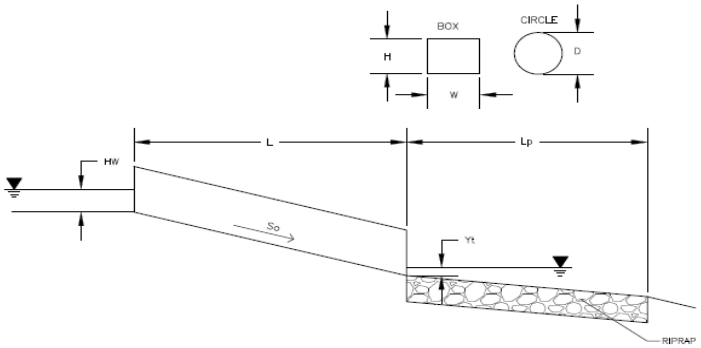


DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: **Eastonville Road Segment 2**

ID: **Geick Ranch Tributary 1 Box Culvert (DP G06)**



Soil Type:

Choose One:
- ○ Sandy
- ◉ Non-Sandy

Supercritical Flow! Using Adjusted Rise to calculate protection type.

Design Information:

Design Discharge	Q =	491	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =		inches
Inlet Edge Type (Choose from pull-down list)			
OR:			
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	H (Rise) =	3	ft
Barrel Width (Span) in Feet	W (Span) =	10	ft
Inlet Edge Type (Choose from pull-down list)		1:1 Bevel w/ 45 deg. Flared Wingwall	
Number of Barrels	# Barrels =	2	
Inlet Elevation	Elev IN =	100	ft
Outlet Elevation **OR** Slope	So =	0.015	ft/ft
Culvert Length	L =	116.5	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	7	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	30.00	ft^2
Culvert Normal Depth	Y_n =	1.48	ft
Culvert Critical Depth	Y_c =	2.65	ft
Froude Number	Fr =	2.41	**Supercritical!**
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.40	
Sum of All Loss Coefficients	k_s =	1.90	ft
Headwater:			
Inlet Control Headwater	HW_I =	4.57	ft
Outlet Control Headwater	HW_O =	3.06	ft
Design Headwater Elevation	**HW =**	**104.57**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/H=**	**1.52**	**HW/H > 1.5!**
Outlet Protection:			
Flow/(Span * Rise^1.5)	Q/WH^1.5 =	4.72	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.20	ft
Tailwater/Rise	Yt/H =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	1.85	
Flow Area at Max Channel Velocity	A_t =	70.14	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	20.00	ft
Length of Riprap Protection	**L_p =**	**30**	**ft**
Width of Riprap Protection at Downstream End	**T =**	**37**	**ft**
Adjusted Rise for Supercritical Flow	Ha =	2.24	ft
Minimum Theoretical Riprap Size	d_{50} min=	5	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	**Type =**	**VL**	

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 16 2024

DP G06a Culvert - Minor

Invert Elev Dn (ft)	=	6996.64
Pipe Length (ft)	=	204.64
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6997.66
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

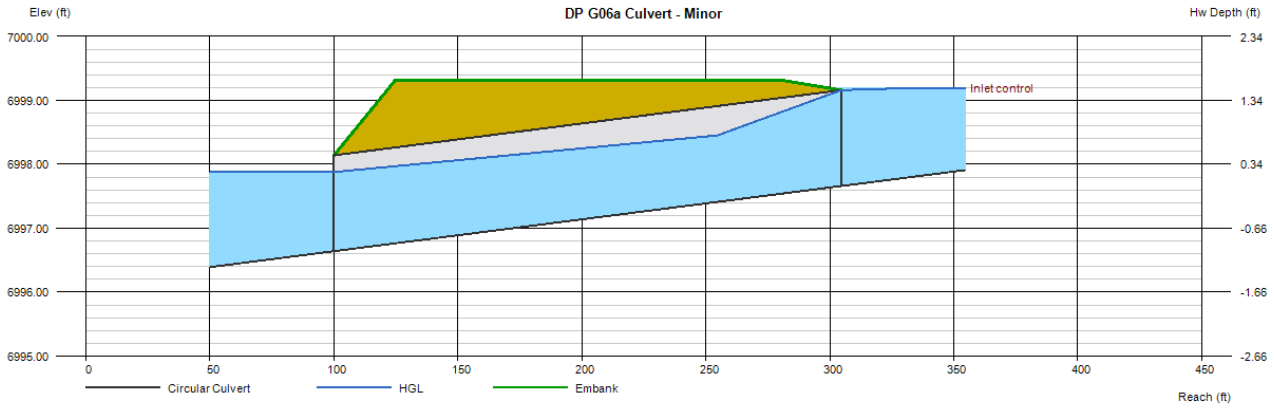
Top Elevation (ft)	=	6999.32
Top Width (ft)	=	155.00
Crest Width (ft)	=	110.00

Calculations

Qmin (cfs)	=	6.40
Qmax (cfs)	=	6.40
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	6.40
Qpipe (cfs)	=	6.40
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.10
Veloc Up (ft/s)	=	5.25
HGL Dn (ft)	=	6997.88
HGL Up (ft)	=	6998.64
Hw Elev (ft)	=	6999.19
Hw/D (ft)	=	1.02
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 16 2024

DP G06a Culvert - Major

Invert Elev Dn (ft)	=	6996.64
Pipe Length (ft)	=	204.64
Slope (%)	=	0.50
Invert Elev Up (ft)	=	6997.66
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

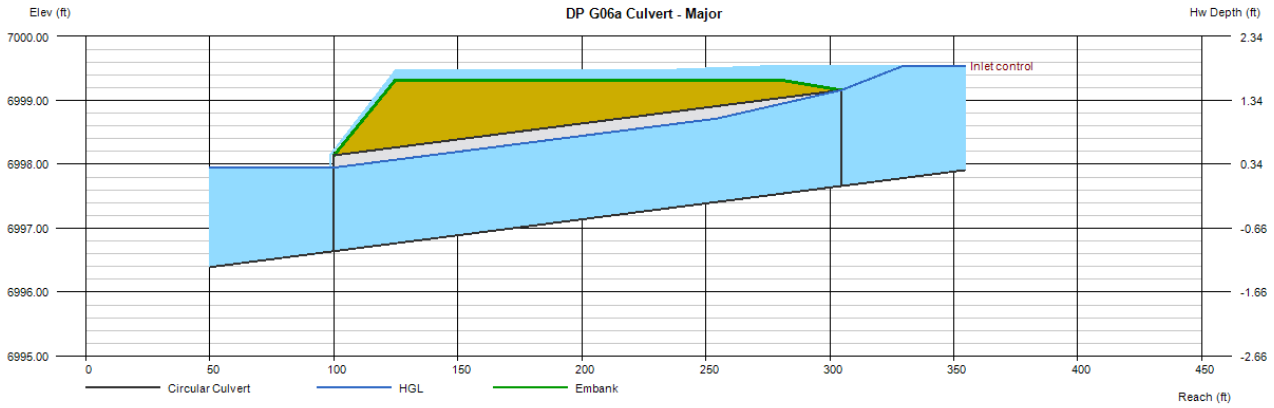
Top Elevation (ft)	=	6999.32
Top Width (ft)	=	155.00
Crest Width (ft)	=	110.00

Calculations

Qmin (cfs)	=	42.90
Qmax (cfs)	=	42.90
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	42.90
Qpipe (cfs)	=	8.30
Qovertop (cfs)	=	34.60
Veloc Dn (ft/s)	=	5.08
Veloc Up (ft/s)	=	5.09
HGL Dn (ft)	=	6997.95
HGL Up (ft)	=	6998.97
Hw Elev (ft)	=	6999.54
Hw/D (ft)	=	1.25
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 16 2024

DPG06A Swale

Trapezoidal

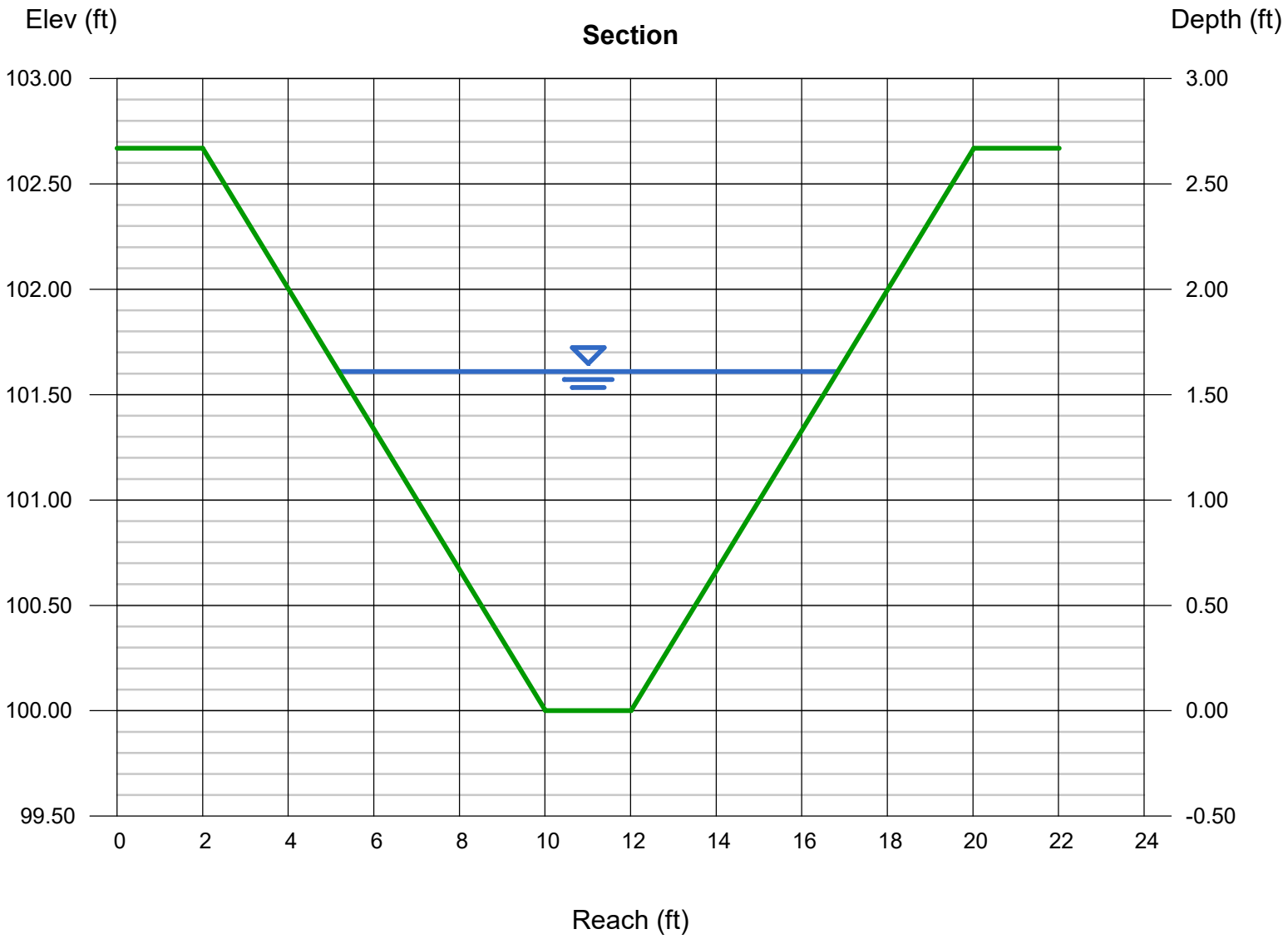
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.67
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 42.90

Highlighted

Depth (ft)	= 1.61
Q (cfs)	= 42.90
Area (sqft)	= 11.00
Velocity (ft/s)	= 3.90
Wetted Perim (ft)	= 12.18
Crit Depth, Yc (ft)	= 1.37
Top Width (ft)	= 11.66
EGL (ft)	= 1.85



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 16 2024

DPG16a Swale

Trapezoidal

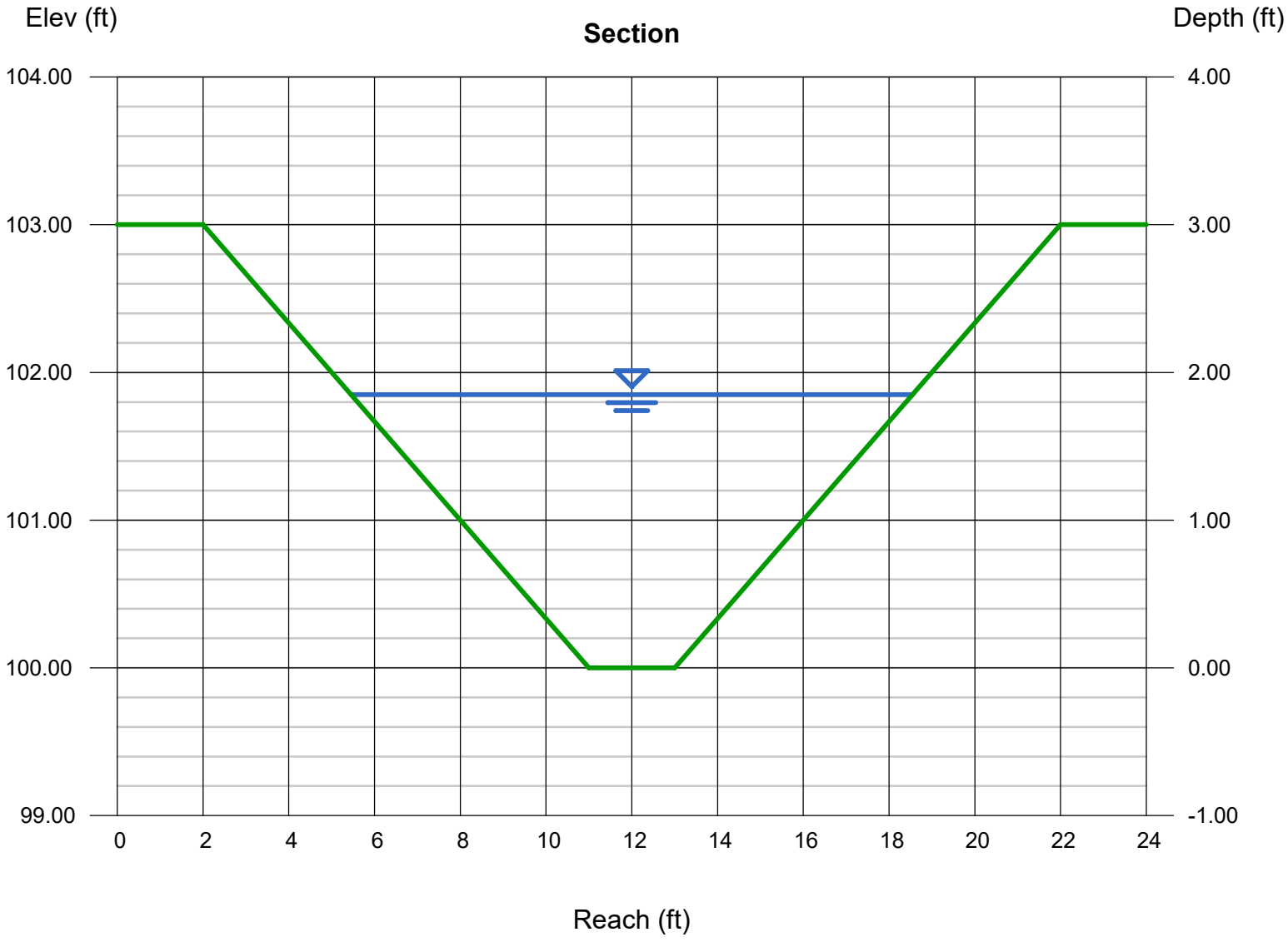
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 59.00

Highlighted

Depth (ft)	= 1.85
Q (cfs)	= 59.00
Area (sqft)	= 13.97
Velocity (ft/s)	= 4.22
Wetted Perim (ft)	= 13.70
Crit Depth, Yc (ft)	= 1.60
Top Width (ft)	= 13.10
EGL (ft)	= 2.13



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 16 2024

DPG16b Swale

Trapezoidal

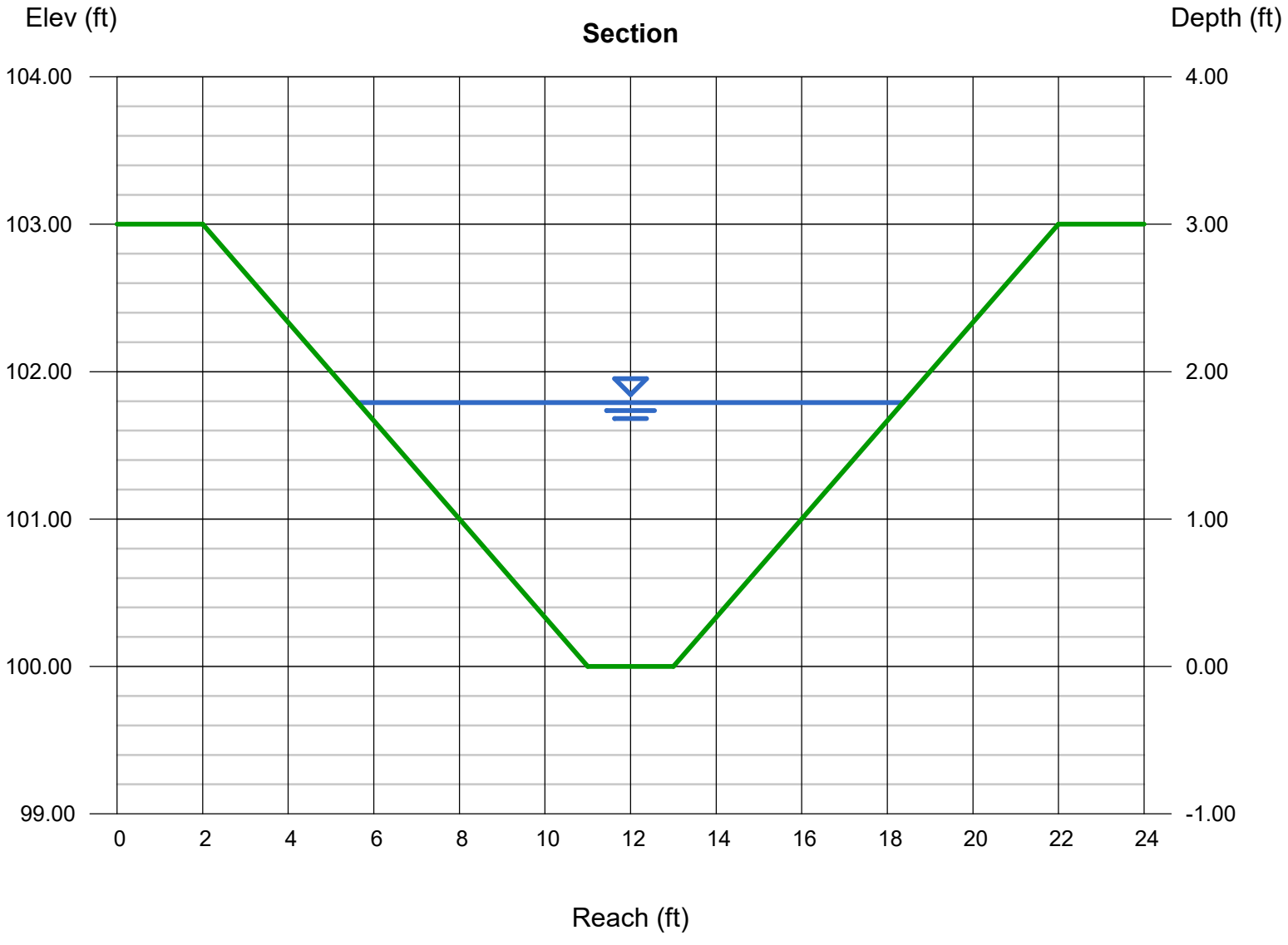
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 54.90

Highlighted

Depth (ft)	= 1.79
Q (cfs)	= 54.90
Area (sqft)	= 13.19
Velocity (ft/s)	= 4.16
Wetted Perim (ft)	= 13.32
Crit Depth, Yc (ft)	= 1.54
Top Width (ft)	= 12.74
EGL (ft)	= 2.06



FROUDE NUMBER CALCULATIONS			CALCULATED BY:	SPC	DATE:	10/28/2024
PROJECT: EASTONVILLE RD SEGMENT 2			CHECKED BY:	CM		
Froude Number Calculations: 100-YR						
DP	Velocity	Gravitational Constant	Hydraulic depth	Xsectional Area	top Width	Froude #
-	ft/s	ft/s^2	ft	ft^2	ft	N/A
G06a	3.90	32.17	0.94	11.00	11.66	0.71
G16a	4.22	32.17	1.07	13.97	13.1	0.72
G16b	4.16	32.17	1.06	13.49	12.74	0.71
7	1.68	33.17	0.28	1.19	4.28	0.55

SHEAR STRESS & CHANNEL LININGS		CALCULATED BY:	SPC	DATE:	10/28/2024
PROJECT: EASTONVILLE RD SEGMENT 2		CHECKED BY:	CM		

Shear Stress Calculations: 100-YR				
DP	unit weight of water	Depth of flow	Slope	Shear Stress
-	lb/ft^3	ft	ft/ft	lb/ft^2
G06a	62.43	1.61	0.005	0.50
G16a	62.43	1.85	0.005	0.58
G16b	62.43	1.79	0.005	0.56
7	63.43	0.38	0.005	0.12

Channel Lining Determination					
	Calculated Values		P300 Max Values		
DP	Shear Stress	Velocity	Shear Stress	Velocity	Lining Required
G06a	0.50	3.90	3	9	NO LINING RQD
G16a	0.58	4.22	3	9	NO LINING RQD
G16b	0.56	4.16	3	9	NO LINING RQD
7	0.12	1.68	3	9	NO LINING RQD

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 16 2024

DP7 SWALE

Trapezoidal

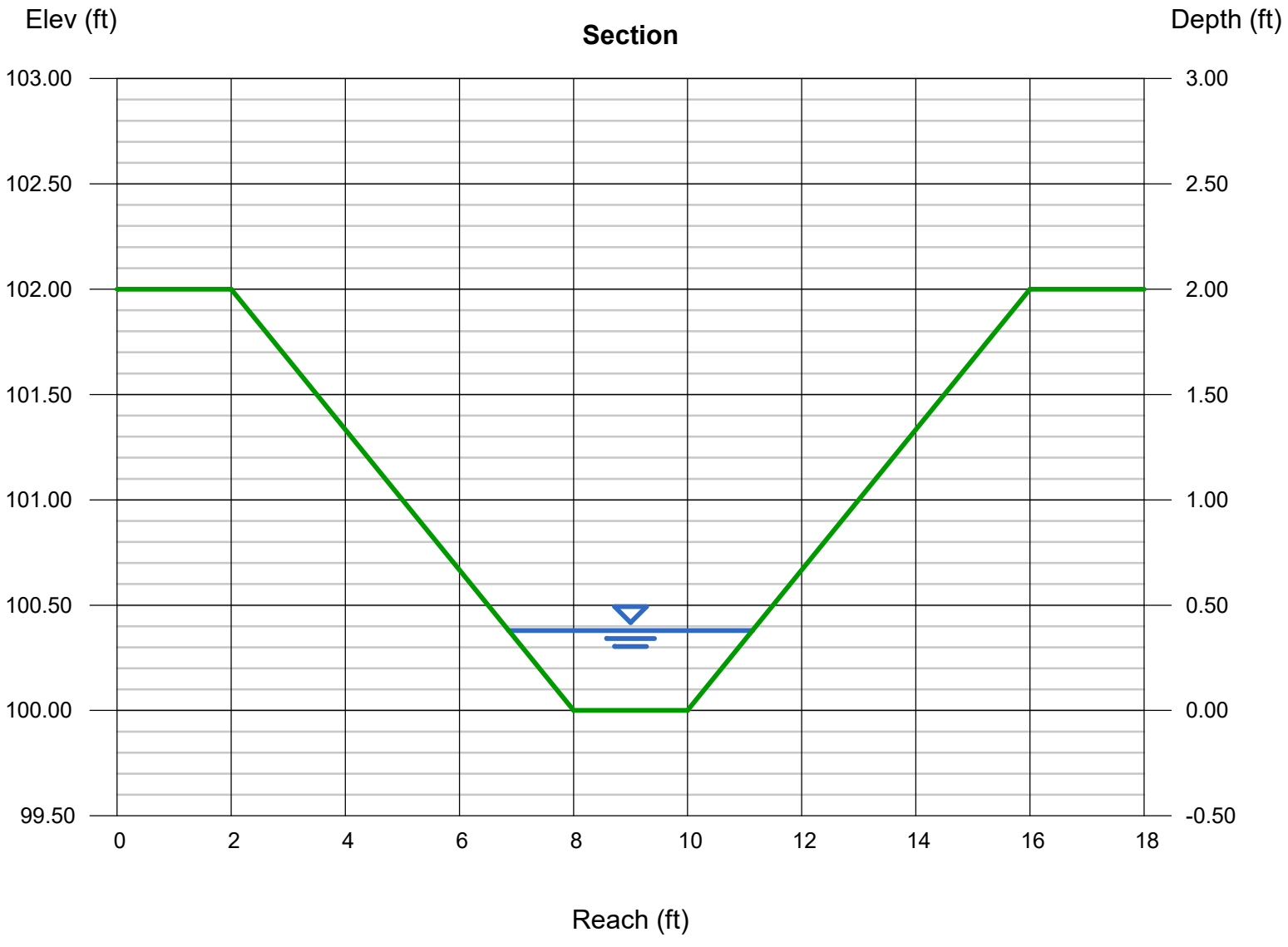
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.00

Highlighted

Depth (ft)	= 0.38
Q (cfs)	= 2.000
Area (sqft)	= 1.19
Velocity (ft/s)	= 1.68
Wetted Perim (ft)	= 4.40
Crit Depth, Yc (ft)	= 0.28
Top Width (ft)	= 4.28
EGL (ft)	= 0.42



HRGreen	EASTONVILLE RD SEG 2	Calc'd by:	SPC
	201662.08	Checked by:	CM
	DP G06 (18" RCP OUTLET)	Date:	10/16/2024

Input Parameters		
Flow (Q)	8.3	cfs
Tailwater depth (Y_t)	0.60	ft
Conduit Diameter (D_c)	18	in
Expansion Factor (per Fig. 9-35)	4.33	
Soil Type	Non-Cohesive Soils	

Calculated Parameters		
Froude Parameter ($Q/D^{2.5}$)	3.01	
D_{50} =	3.74	in
UDFCD Riprap Type =	Type VL	
Design D_{50} =	6	in
Minimum Mantle Thickness =	12	in
Minimum Length of Apron (L_p) =	6	ft
Minimum Width of Apron (T) =	2	ft

Calculated D_{50} for riprap was calculated using Equation 9-16 in the USDCM Vol 2.

$$d_{50} = \frac{0.023Q}{Y_t^{1.2} D_c^{0.3}}$$

Calculated minimum length of apron was calculated using Equations 9-11 and 9-12 in the USDCM Vol. 2

$$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$$ Equation 9-11

Where:

L_p = length of protection (ft)

W = width of the conduit (ft, use diameter for circular conduits)

Y_t = tailwater depth (ft)

θ = the expansion angle of the culvert flow

$$A_t = \frac{Q}{V}$$ Equation 9-12

Where:

Q = design discharge (cfs)

V = the allowable non-eroding velocity in the downstream channel (ft/sec)

A_t = required area of flow at allowable velocity (ft^2)

Calculated minimum width of apron was calculated using Equations 9-14 in the USDCM Vol. 2

$$T = 2(L_p \tan\theta) + W$$ Equation 9-14

Note:

[1] Calculations follow criteria in the USDCM Vol.2 Chapter 9

[2] Calculations assume a circular culvert

[3] This spreadsheet assumes y_t/D_t=0.4 in cases where y_t is unknown or a hydraulic jump is suspected downstream of the outlet.

[4] Per the USDCM Vol.2 in no case should L_p be less than 3D, nor does L_p need to be greater than 10D whenever the Froude parameter is less than 6.0. whenever the Froude parameter is greater than 6, increase the maximum L_p required by 1/4 D_c for each whole number by which the Froude parameter is greater than 6. The minimum width of Apron (T) should not be less than the outlet pipe diameter.

HRGreen	EASTONVILLE RD SEG 2	Calc'd by:	SPC
	201662.08	Checked by:	CM
	DP13.1 (48" RCP OUTLET)	Date:	10/16/2024

Input Parameters		
Flow (Q)	141	cfs
Tailwater depth (Y_t)	1.60	ft
Conduit Diameter (D_c)	48	in
Expansion Factor (per Fig. 9-35)	3.5	
Soil Type	Non-Cohesive Soils	

Calculated Parameters		
Froude Parameter ($Q/D^{2.5}$)	4.41	
D_{50} =	14.61	in
UDFCD Riprap Type =	Type H	
Design D_{50} =	18	in
Minimum Mantle Thickness =	36	in
Minimum Length of Apron (L_p) =	48	ft
Minimum Width of Apron (T) =	80	ft

Width seems rather large. Verify calculation

Calculated D_{50} for riprap was calculated using Equation 9-16 in the USDCM Vol 2.

$$d_{50} = \frac{0.023Q}{Y_t^{1.2} D_c^{0.3}}$$

Calculated minimum length of apron was calculated using Equations 9-11 and 9-12 in the USDCM Vol. 2

$$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$$ Equation 9-11

$$A_t = \frac{Q}{V}$$ Equation 9-12

Where:

L_p = length of protection (ft)

W = width of the conduit (ft, use diameter for circular conduits)

Y_t = tailwater depth (ft)

θ = the expansion angle of the culvert flow

Where:

Q = design discharge (cfs)

V = the allowable non-eroding velocity in the downstream channel (ft/sec)

A_t = required area of flow at allowable velocity (ft^2)

Calculated minimum width of apron was calculated using Equations 9-14 in the USDCM Vol. 2

$$T = 2(L_p \tan\theta) + W$$ Equation 9-14

Note:

[1] Calculations follow criteria in the USDCM Vol.2 Chapter 9

[2] Calculations assume a circular culvert

[3] This spreadsheet assumes y_t/D_t=0.4 in cases where y_t is unknown or a hydraulic jump is suspected downstream of the outlet.

[4] Per the USDCM Vol.2 in no case should L_p be less than 3D, nor does L_p need to be greater than 10D whenever the Froude parameter is less than 6.0. whenever the Froude parameter is greater than 6, increase the maximum L_p required by 1/4 D_c for each whole number by which the Froude parameter is greater than 6. The minimum width of Apron (T) should not be less than the outlet pipe diameter.

HRGreen	EASTONVILLE RD SEG 2	Calc'd by:	SPC
	201662.08	Checked by:	CM
	DP G15a (36" RCP OUTLET)	Date:	10/16/2024

Input Parameters		
Flow (Q)	40.2	cfs
Tailwater depth (Y_t)	1.20	ft
Conduit Diameter (D_c)	36	in
Expansion Factor (per Fig. 9-35)	5	
Soil Type	Non-Cohesive Soils	

Calculated Parameters		
Froude Parameter ($Q/D^{2.5}$)	2.58	
D_{50} =	6.41	in
UDFCD Riprap Type =	Type L	
Design D_{50} =	9	in
Minimum Mantle Thickness =	18	in
Minimum Length of Apron (L_p) =	19	ft
Minimum Width of Apron (T) =	26	ft

Width seems rather large. Verify calculation

Calculated D_{50} for riprap was calculated using Equation 9-16 in the USDCM Vol 2.

$$d_{50} = \frac{0.023Q}{Y_t^{1.2} D_c^{0.3}}$$

Calculated minimum length of apron was calculated using Equations 9-11 and 9-12 in the USDCM Vol. 2

$$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$$ Equation 9-11

Where:

L_p = length of protection (ft)

W = width of the conduit (ft, use diameter for circular conduits)

Y_t = tailwater depth (ft)

θ = the expansion angle of the culvert flow

$$A_t = \frac{Q}{V}$$ Equation 9-12

Where:

Q = design discharge (cfs)

V = the allowable non-eroding velocity in the downstream channel (ft/sec)

A_t = required area of flow at allowable velocity (ft^2)

Calculated minimum width of apron was calculated using Equations 9-14 in the USDCM Vol. 2

$$T = 2(L_p \tan\theta) + W$$ Equation 9-14

Note:

[1] Calculations follow criteria in the USDCM Vol.2 Chapter 9

[2] Calculations assume a circular culvert

[3] This spreadsheet assumes y_t/D_t=0.4 in cases where y_t is unknown or a hydraulic jump is suspected downstream of the outlet.

[4] Per the USDCM Vol.2 in no case should L_p be less than 3D, nor does L_p need to be greater than 10D whenever the Froude parameter is less than 6.0. whenever the Froude parameter is greater than 6, increase the maximum L_p required by 1/4 D_c for each whole number by which the Froude parameter is greater than 6. The minimum width of Apron (T) should not be less than the outlet pipe diameter.

HRGreen	EASTONVILLE RD SEG 2	Calc'd by:	SPC
	201662.08	Checked by:	CM
	DP10 (SFB C Outlet)	Date:	10/16/2024

Input Parameters		
Flow (Q)	0.8	cfs
Tailwater depth (Y_t)	0.60	ft
Conduit Diameter (D_c)	18	in
Expansion Factor (per Fig. 9-35)	6.5	
Soil Type	Non-Cohesive Soils	

Calculated Parameters		
Froude Parameter ($Q/D^{2.5}$)	0.29	
D_{50} =	0.36	in
UDFCD Riprap Type =	Type VL	
Design D_{50} =	6	in
Minimum Mantle Thickness =	12	in
Minimum Length of Apron (L_p) =	5	ft
Minimum Width of Apron (T) =	6	ft

Calculated D_{50} for riprap was calculated using Equation 9-16 in the USDCM Vol 2.

$$d_{50} = \frac{0.023Q}{Y_t^{1.2} D_c^{0.3}}$$

Calculated minimum length of apron was calculated using Equations 9-11 and 9-12 in the USDCM Vol. 2

$$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$$ Equation 9-11

$$A_t = \frac{Q}{V}$$ Equation 9-12

Where:

L_p = length of protection (ft)

W = width of the conduit (ft, use diameter for circular conduits)

Y_t = tailwater depth (ft)

θ = the expansion angle of the culvert flow

Where:

Q = design discharge (cfs)

V = the allowable non-eroding velocity in the downstream channel (ft/sec)

A_t = required area of flow at allowable velocity (ft^2)

Calculated minimum width of apron was calculated using Equations 9-14 in the USDCM Vol. 2

$$T = 2(L_p \tan\theta) + W$$ Equation 9-14

Note:

[1] Calculations follow criteria in the USDCM Vol.2 Chapter 9

[2] Calculations assume a circular culvert

[3] This spreadsheet assumes y_t/D_t=0.4 in cases where y_t is unknown or a hydraulic jump is suspected downstream of the outlet.

[4] Per the USDCM Vol.2 in no case should L_p be less than 3D, nor does L_p need to be greater than 10D whenever the Froude parameter is less than 6.0. whenever the Froude parameter is greater than 6, increase the maximum L_p required by 1/4 D_c for each whole number by which the Froude parameter is greater than 6. The minimum width of Apron (T) should not be less than the outlet pipe diameter.

HRGreen	EASTONVILLE RD SEG 2	Calc'd by:	SPC
	201662.08	Checked by:	CM
	DP3.1 (SFB C Inlet)	Date:	10/16/2024

Input Parameters		
Flow (Q)	3.2	cfs
Tailwater depth (Y_t)	0.60	ft
Conduit Diameter (D_c)	18	in
Expansion Factor (per Fig. 9-35)	6.25	
Soil Type	Non-Cohesive Soils	

Calculated Parameters		
Froude Parameter ($Q/D^{2.5}$)	1.16	
D_{50} =	1.44	in
UDFCD Riprap Type =	Type VL	
Design D_{50} =	6	in
Minimum Mantle Thickness =	12	in
Minimum Length of Apron (L_p) =	5	ft
Minimum Width of Apron (T) =	2	ft

Calculated D_{50} for riprap was calculated using Equation 9-16 in the USDCM Vol 2.

$$d_{50} = \frac{0.023Q}{Y_t^{1.2} D_c^{0.3}}$$

Calculated minimum length of apron was calculated using Equations 9-11 and 9-12 in the USDCM Vol. 2

$$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$$ Equation 9-11

$$A_t = \frac{Q}{V}$$ Equation 9-12

Where:

L_p = length of protection (ft)

W = width of the conduit (ft, use diameter for circular conduits)

Y_t = tailwater depth (ft)

θ = the expansion angle of the culvert flow

Where:

Q = design discharge (cfs)

V = the allowable non-eroding velocity in the downstream channel (ft/sec)

A_t = required area of flow at allowable velocity (ft^2)

Calculated minimum width of apron was calculated using Equations 9-14 in the USDCM Vol. 2

$$T = 2(L_p \tan\theta) + W$$ Equation 9-14

Note:

[1] Calculations follow criteria in the USDCM Vol.2 Chapter 9

[2] Calculations assume a circular culvert

[3] This spreadsheet assumes y_t/D_t=0.4 in cases where y_t is unknown or a hydraulic jump is suspected downstream of the outlet.

[4] Per the USDCM Vol.2 in no case should L_p be less than 3D, nor does L_p need to be greater than 10D whenever the Froude parameter is less than 6.0. whenever the Froude parameter is greater than 6, increase the maximum L_p required by 1/4 D_c for each whole number by which the Froude parameter is greater than 6. The minimum width of Apron (T) should not be less than the outlet pipe diameter.

SFB-C

Riprap Sizing - Spillway				
q (cfs/ft)	S (ft/ft)	C_f	n	D_{50} min. (in)
0.40	0.33	3	0.025	4.25

Type VL Riprap (D_{50} = 6") will be utilized for the spillway protection

$$D_{50} = 5.23\ S^{0.43}\ (1.35 C_f\ q)^{0.56}$$ Equation 13-9

Where:

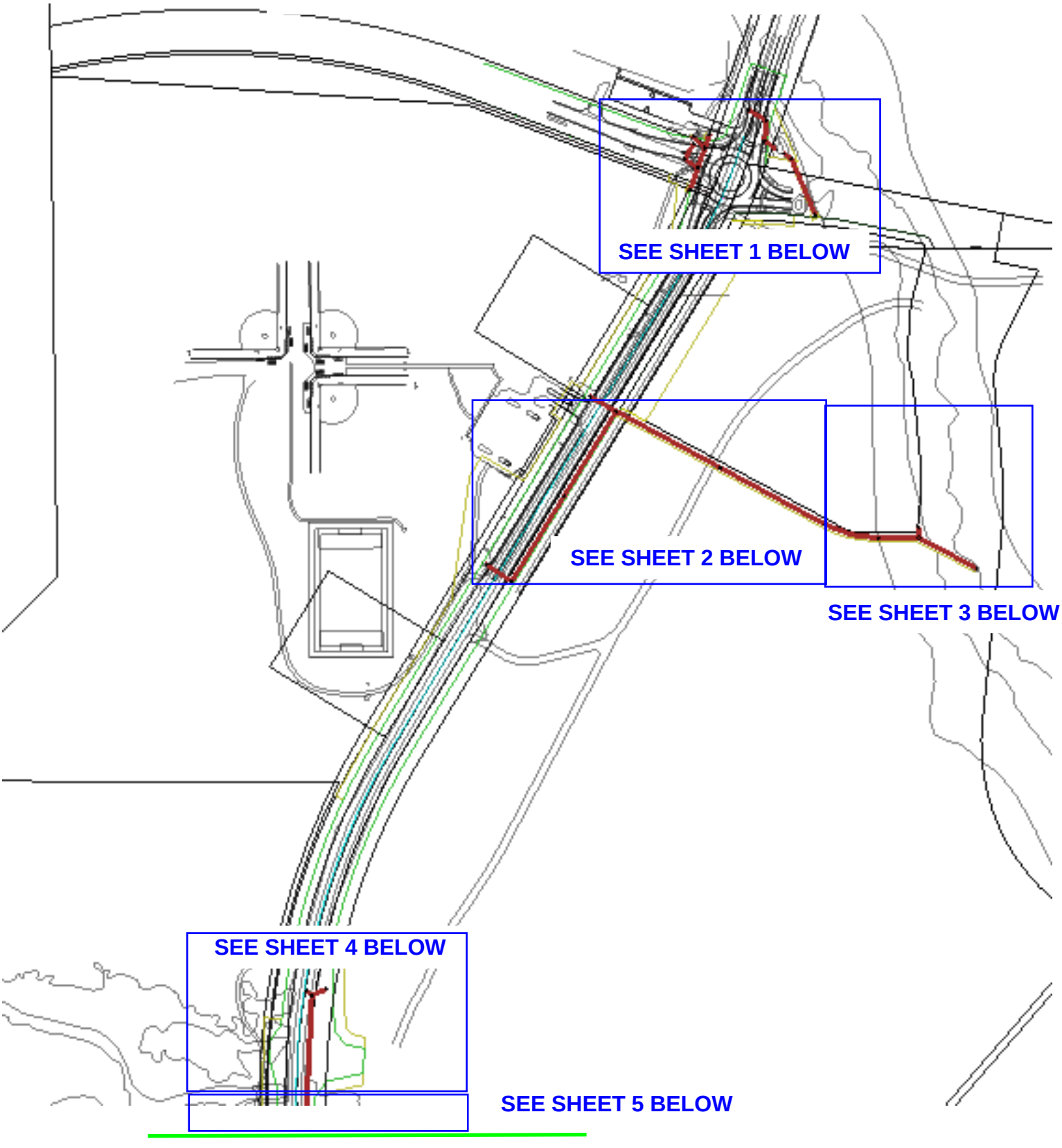
D_{50} = median rock size (in)
S = longitudinal slope (ft/ft)
C_f = concentration factor (1.0 to 3.0)
q = unit discharge (cfs/ft)

When:

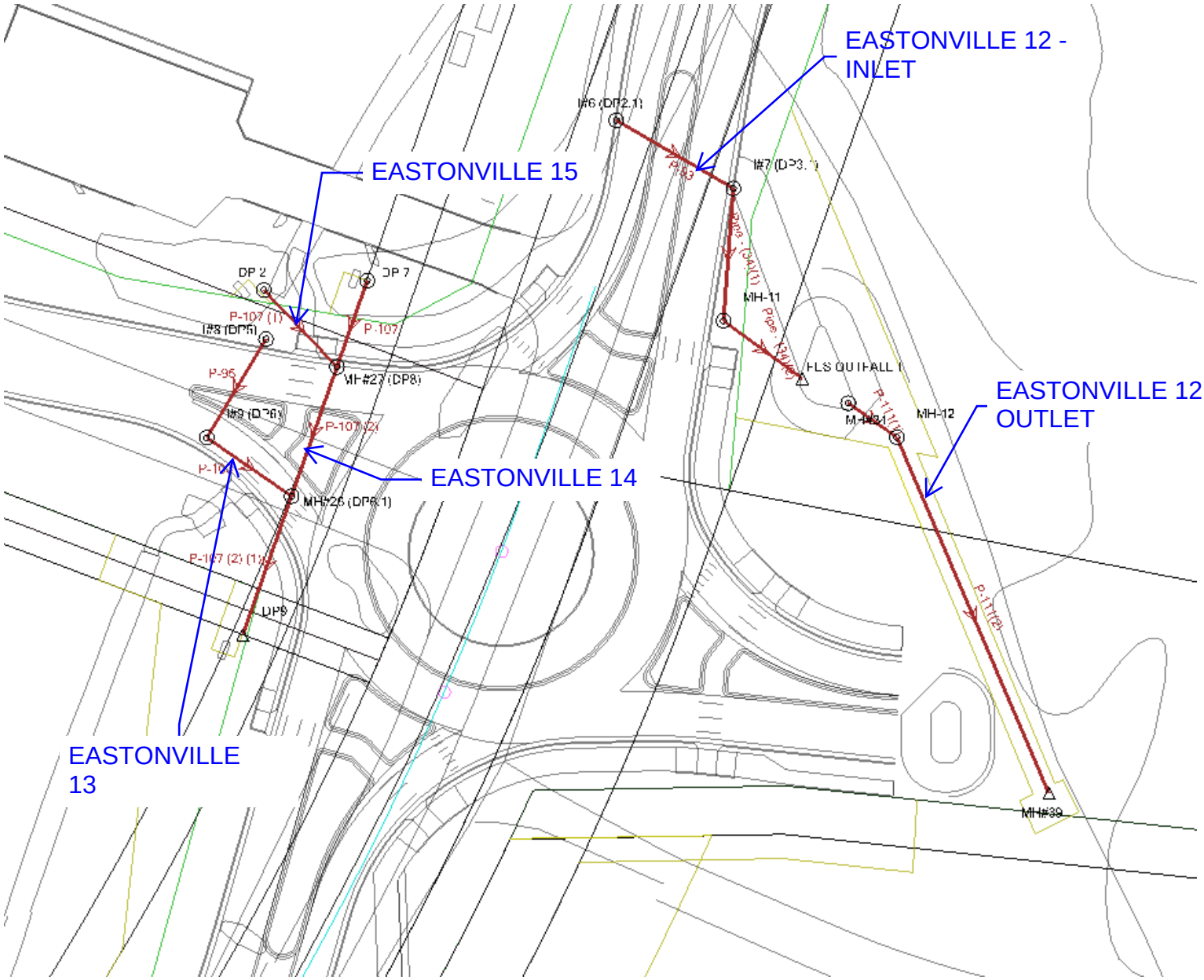
η (porosity) = 0.0 (i.e., for buried soil riprap)

Unresolved:
Provide calculations for Pond B spillway riprap sizing.

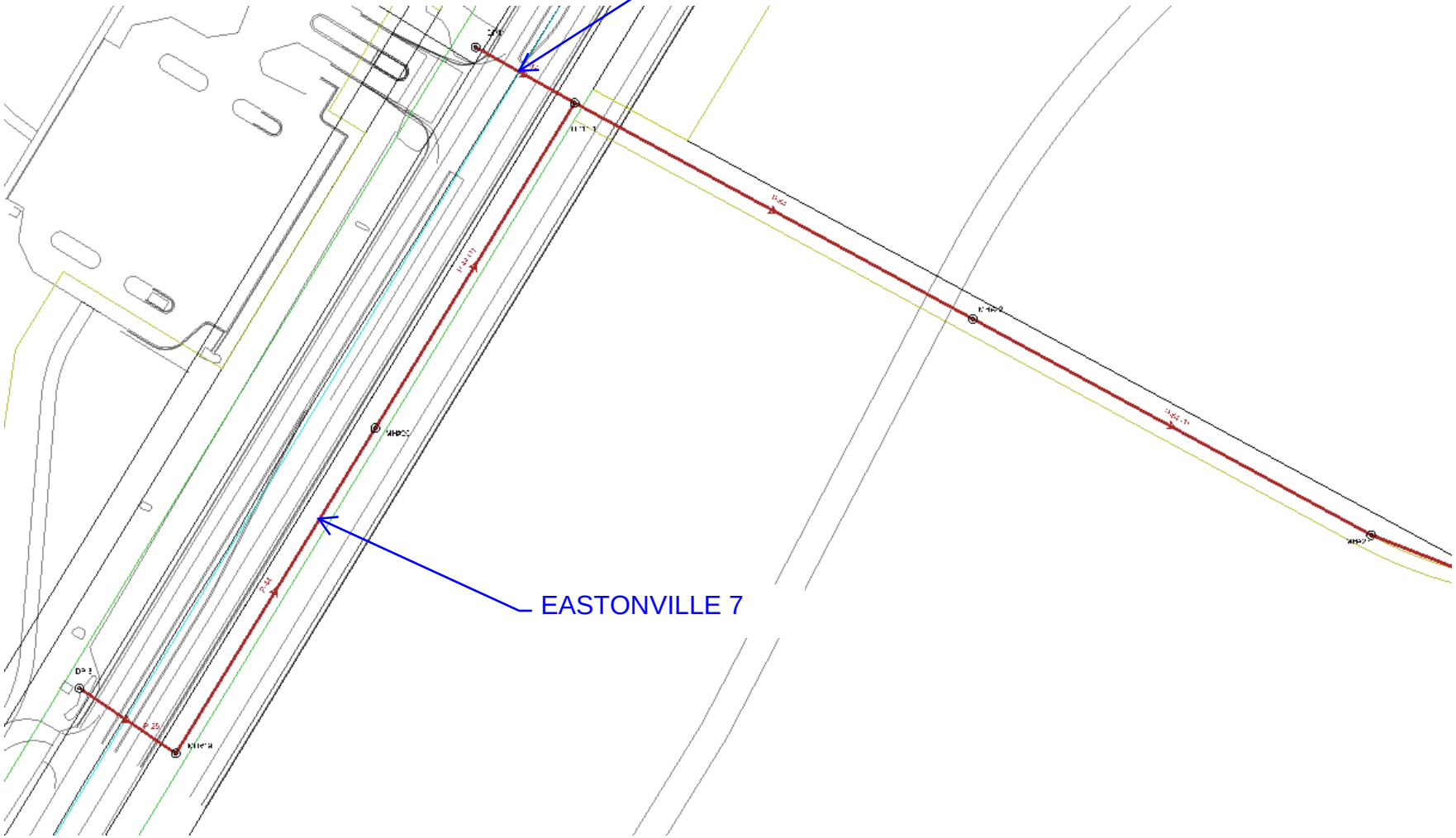
STORMCAD NETWORK LAYOUT: SEGMENT 2



MATCHLINE REFER TO SEGMENT 2 FDR


EASTONVILLE 12 - INLET
EASTONVILLE 15
EASTONVILLE 12 - OUTLET
EASTONVILLE 14
EASTONVILLE 13
DP 2
DP 7
MH-11
MH-12
MH#39

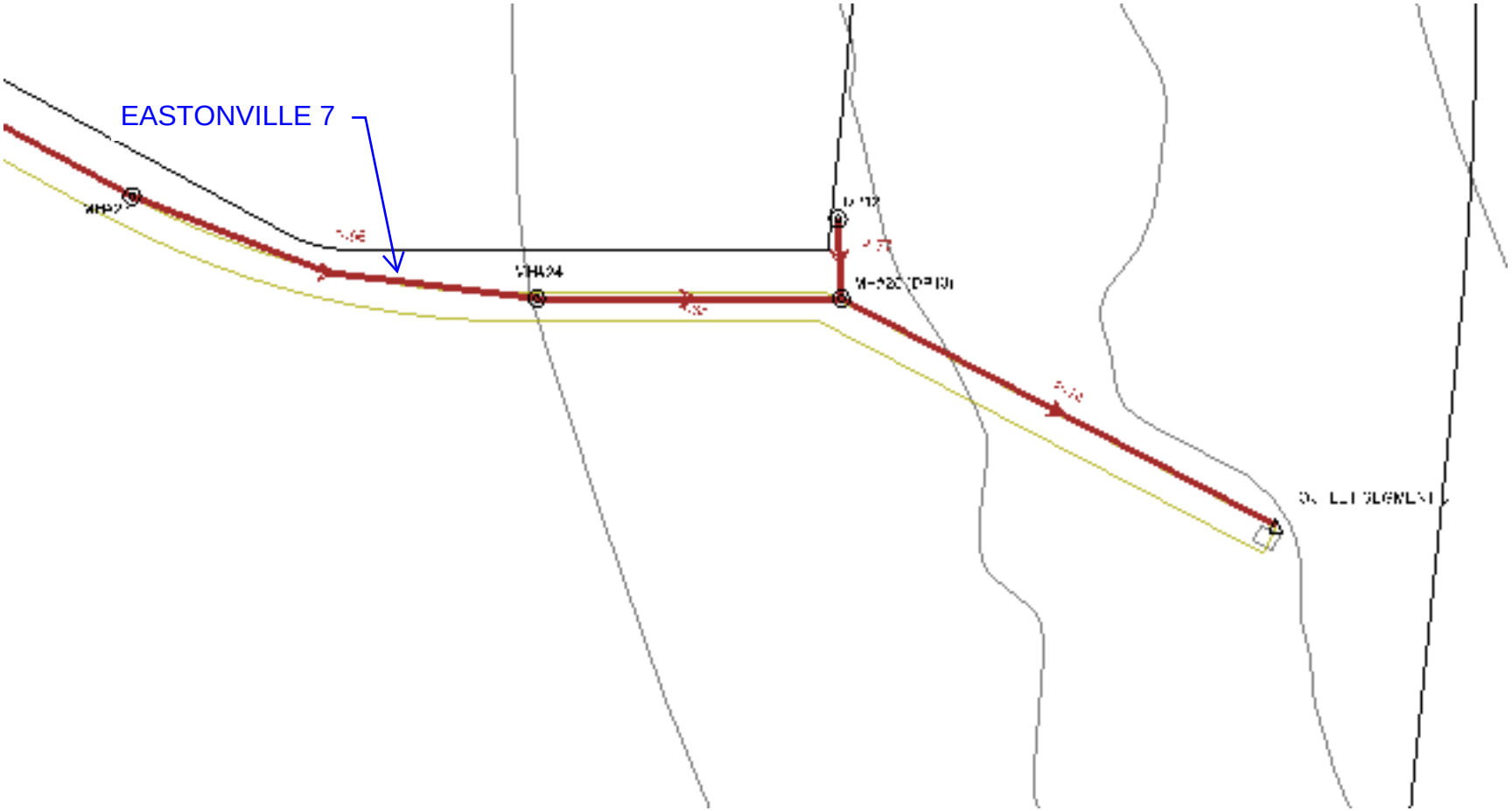
SHEET 1



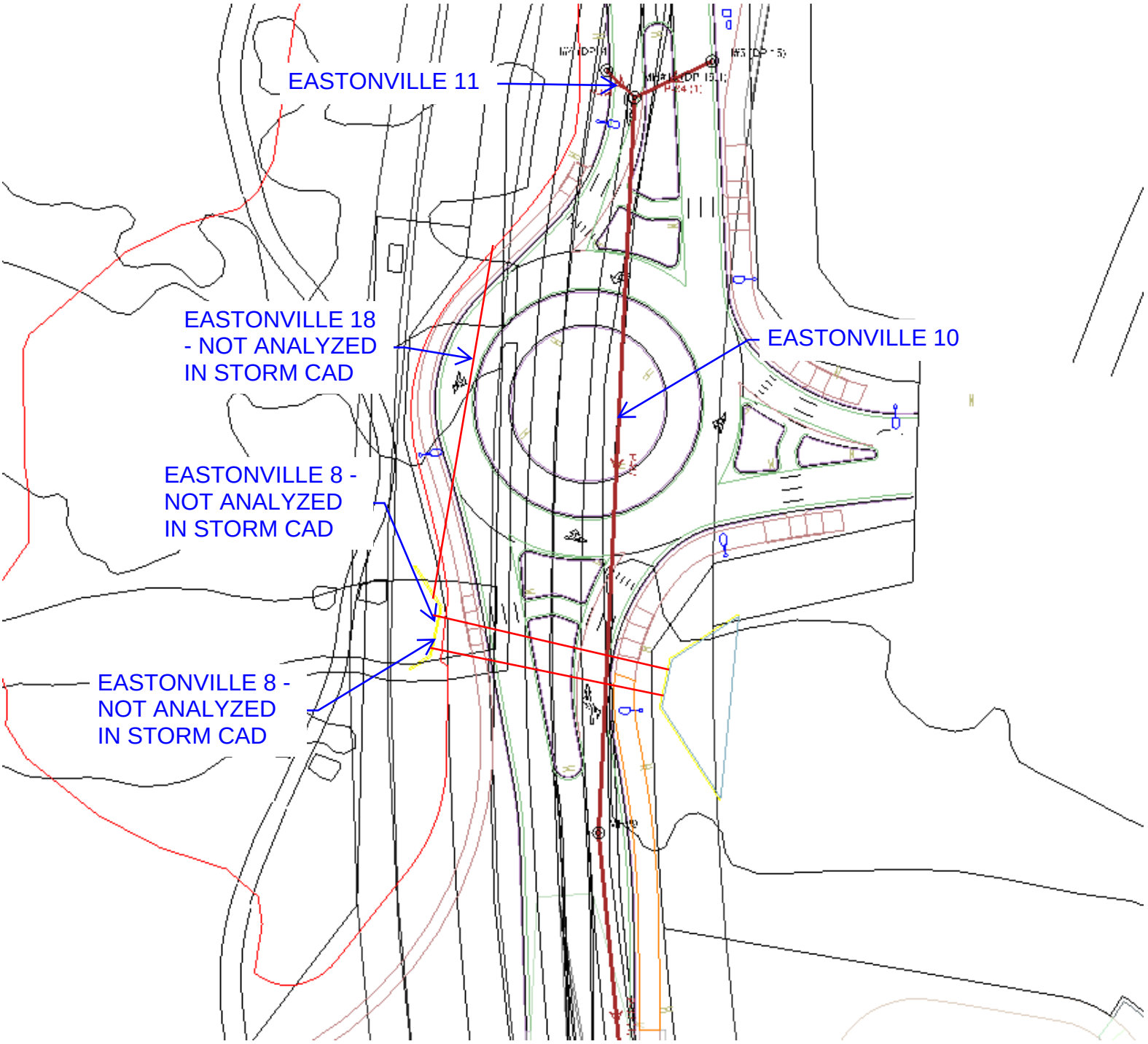
MATCHLINE SEE SHEET 3

SHEET 2

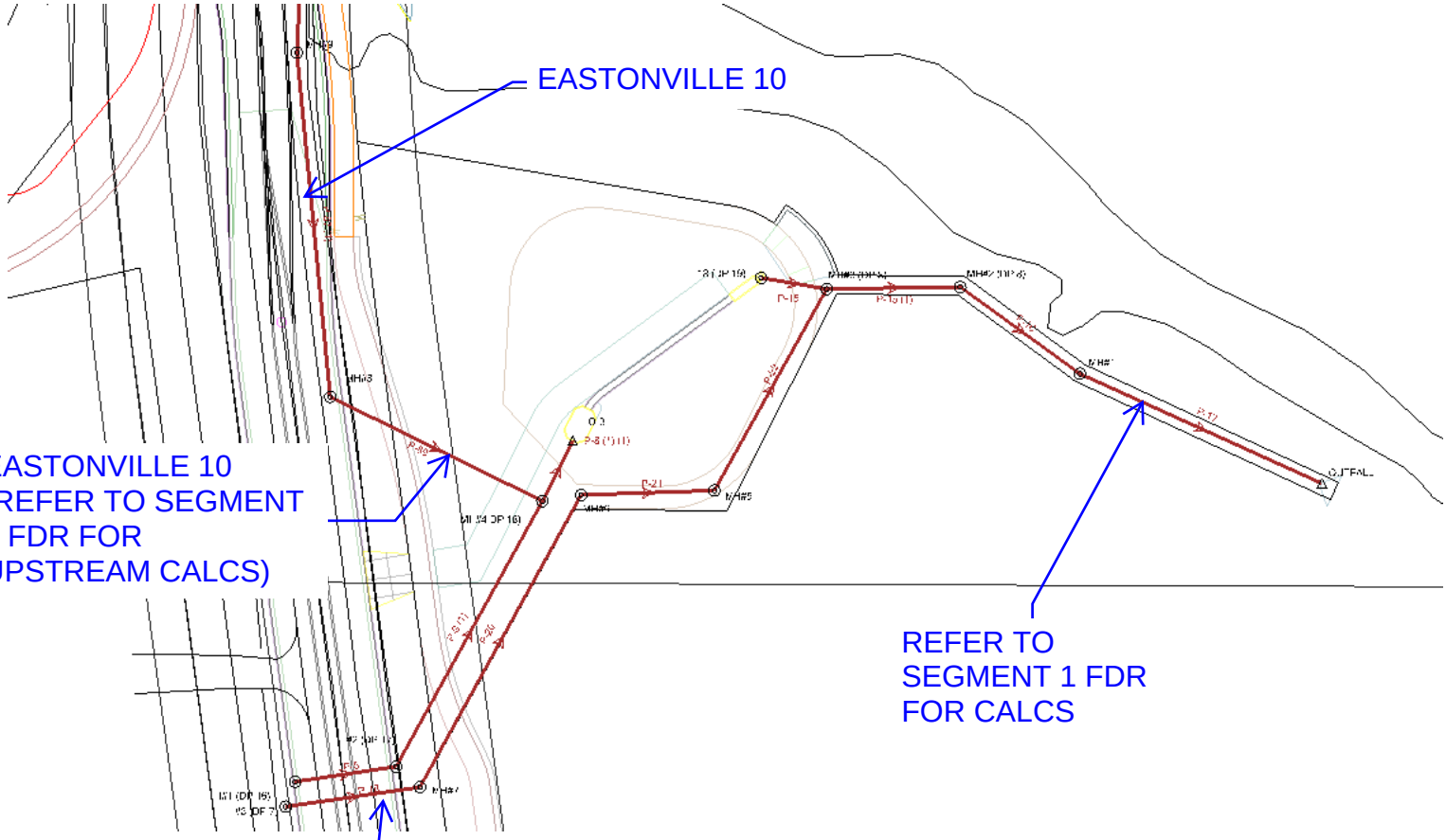
MATCHLINE SEE SHEET 2



SHEET 3


EASTONVILLE 11
EASTONVILLE 18
- NOT ANALYZED
IN STORM CAD
EASTONVILLE 10
EASTONVILLE 8 -
NOT ANALYZED
IN STORM CAD
EASTONVILLE 8 -
NOT ANALYZED
IN STORM CAD

SHEET 4


EASTONVILLE 10
EASTONVILLE 10
(REFER TO SEGMENT
1 FDR FOR
UPSTREAM CALCS)
REFER TO
SEGMENT 1 FDR
FOR CALCS
REFER TO
SEGMENT 1 FDR
FOR CALCS

SHEET 5

100 YEAR TAILWATER CONDITION: PIPE SUMMARY TABLE

	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
131: P-107 (2)	MH#26 (DP6.1)	7,020.74	DP G15a	7,020.44	60.7	0.005	36.0	0.013	40.20	7.46	46.89	85.7	7,022.88	7,022.50
132: P-103	I#9 (DP6)	7,022.17	MH#26 (DP6.1)	7,021.74	42.7	0.010	24.0	0.013	16.00	5.09	22.71	70.4	7,024.62	7,024.41
133: P-107 (2)	MH#27 (DP8)	7,021.52	MH#26 (DP6.1)	7,021.24	56.6	0.005	30.0	0.013	29.20	5.95	28.85	101.2	7,024.70	7,024.41
134: P-107	DP 7	7,023.01	MH#27 (DP8)	7,022.72	37.8	0.008	18.0	0.013	2.00	1.13	9.21	21.7	7,025.20	7,025.19
135: P-107 (1)	MH#27 (DP8)	7,021.72	DP G15a1	7,022.00	43.9	-0.006	30.0	0.013	27.70	5.64	32.77	84.5	7,025.39	7,025.19
136: P-95	I#8 (DP5)	7,023.14	I#9 (DP6)	7,022.67	47.5	0.010	18.0	0.013	4.90	2.77	10.45	46.9	7,024.98	7,024.88
137: P-93	I#6 (DP2.1)	7,022.31	I#7 (DP3.1)	7,022.03	55.9	0.005	18.0	0.013	1.50	3.29	7.43	20.2	7,022.77	7,022.59
140: P-44 (1)	MH#20	7,003.74	DP11.1	6,999.51	266.5	0.016	36.0	0.013	54.90	12.67	84.03	65.3	7,006.15	7,004.01
141: P-64	DP11.1	6,998.52	MH#22	6,995.26	316.5	0.010	48.0	0.013	113.90	12.84	145.88	78.1	7,001.75	6,997.92
142: P-44	MH#19	7,006.50	MH#20	7,003.84	266.5	0.010	36.0	0.013	54.90	10.53	66.63	82.4	7,008.91	7,005.91
143: P-26	DP G16b	7,007.68	MH#19	7,006.80	81.5	0.011	36.0	0.013	54.90	7.77	69.32	79.2	7,011.13	7,010.58
144: P-64 (1)	MH#22	6,995.15	MH#23	6,988.82	316.6	0.020	48.0	0.013	113.90	16.63	203.15	56.1	6,998.38	6,995.48
145: P-87	MH#10 (DP 1...	6,993.41	MH#9	6,989.86	350.8	0.010	24.0	0.013	19.90	8.17	22.76	87.5	6,995.01	6,991.31
146: P-87 (1)	MH#9	6,989.76	MH#8	6,986.86	193.5	0.015	24.0	0.013	17.20	9.29	27.70	62.1	6,991.26	6,989.91
147: P-84	I#4 (DP14)	6,994.25	MH#10 (DP 1...	6,993.91	15.1	0.023	18.0	0.013	9.40	9.31	15.77	59.6	6,995.44	6,995.45
148: P-84 (1)	I#5 (DP 15)	6,994.74	MH#10 (DP 1...	6,993.91	39.7	0.021	18.0	0.013	10.60	9.29	15.18	69.8	6,995.99	6,995.45
149: P-66	MH#23	6,988.82	MH#24	6,988.00	149.0	0.006	48.0	0.013	113.90	9.06	106.64	106.8	6,995.41	6,994.48
150: P-68	MH#24	6,988.00	MH#25 (DP13)	6,987.50	107.8	0.005	48.0	0.013	113.90	9.06	97.84	116.4	6,994.41	6,993.73
151: P-77	DP12	6,990.32	MH#25 (DP13)	6,989.50	28.1	0.029	36.0	0.013	24.60	3.48	113.85	21.6	6,993.77	6,993.73
152: P-74	MH#25 (DP13)	6,987.50	OUTLET SEG...	6,986.67	173.3	0.005	48.0	0.013	138.50	11.02	99.34	139.4	6,992.04	6,990.17
225: P-42	DP G16a	7,001.22	DP11.1	6,999.51	85.7	0.020	36.0	0.013	59.00	8.35	94.22	62.6	7,004.68	7,004.01
227: Pipe - (34	I#7 (DP3.1)	7,021.83	MH-11	7,021.41	41.5	0.010	18.0	0.013	3.20	5.24	10.56	30.3	7,022.58	7,022.65
228: Pipe - (34	MH-11	7,021.21	FES OUTFALL 1	7,021.00	42.5	0.005	18.0	0.013	3.20	4.03	7.38	43.3	7,022.65	7,022.61
230: P-111(1)	MH#34	7,018.67	MH-12	7,018.57	20.4	0.005	18.0	0.013	1.00	2.91	7.35	13.6	7,019.04	7,018.94
231: P-111(2)	MH-12	7,018.37	MH#39	7,016.77	158.3	0.010	18.0	0.013	1.00	3.76	10.56	9.5	7,018.74	7,017.08

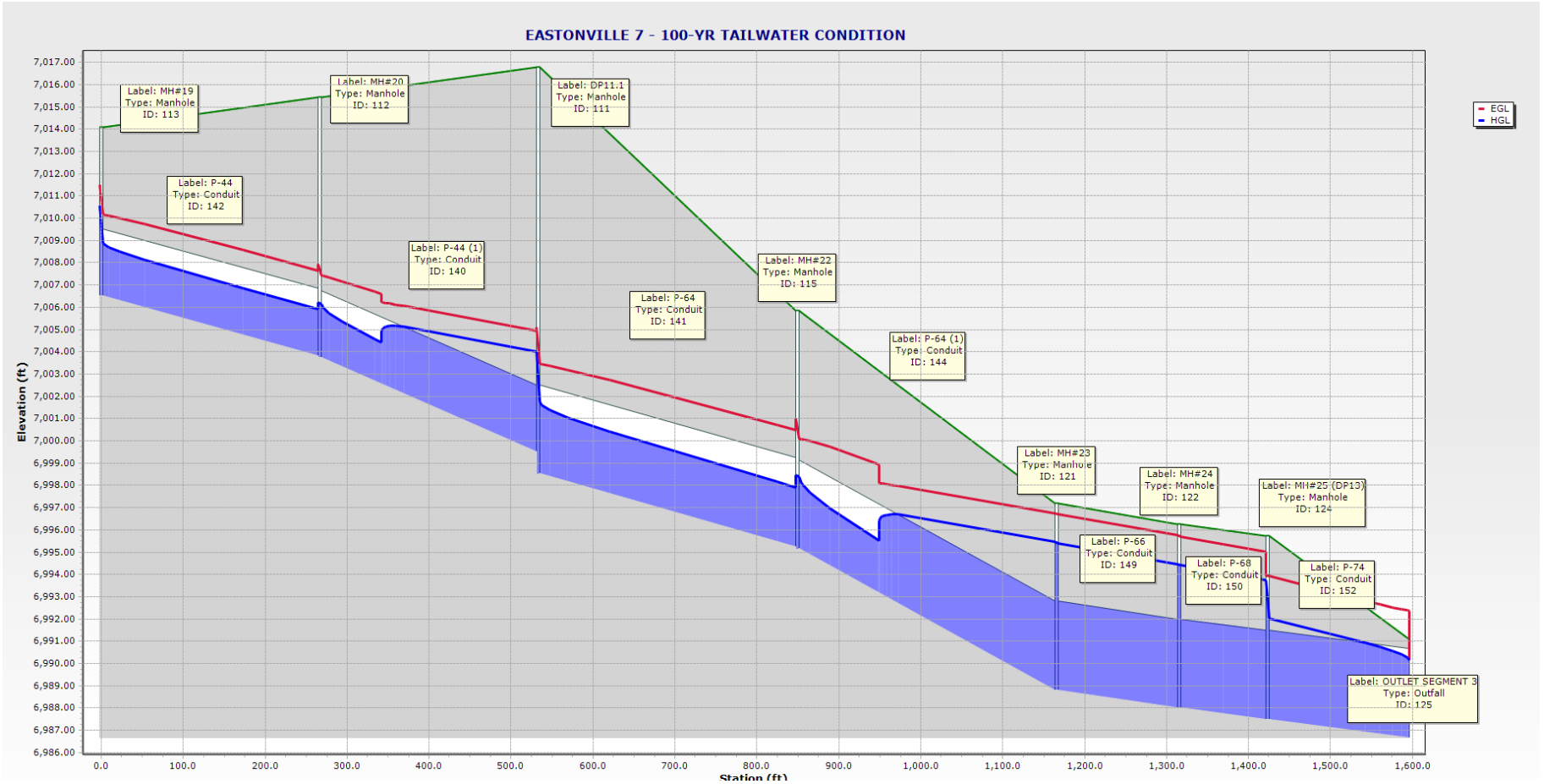
NOTE: EASTONVILLE 12 - INLET & EASTONVILLE 10 SEGMENTS HAVE BEEN ANALYZED IN THE FREE OUTFALL CONDITION BELOW TO MEET CAPACITY & VELOCITY REQUIREMENTS. SEGMENT 1 PIPES & STRUCTURES NOT INCLUDED IN TABLE, REFER TO SEGMENT 1 FDR.

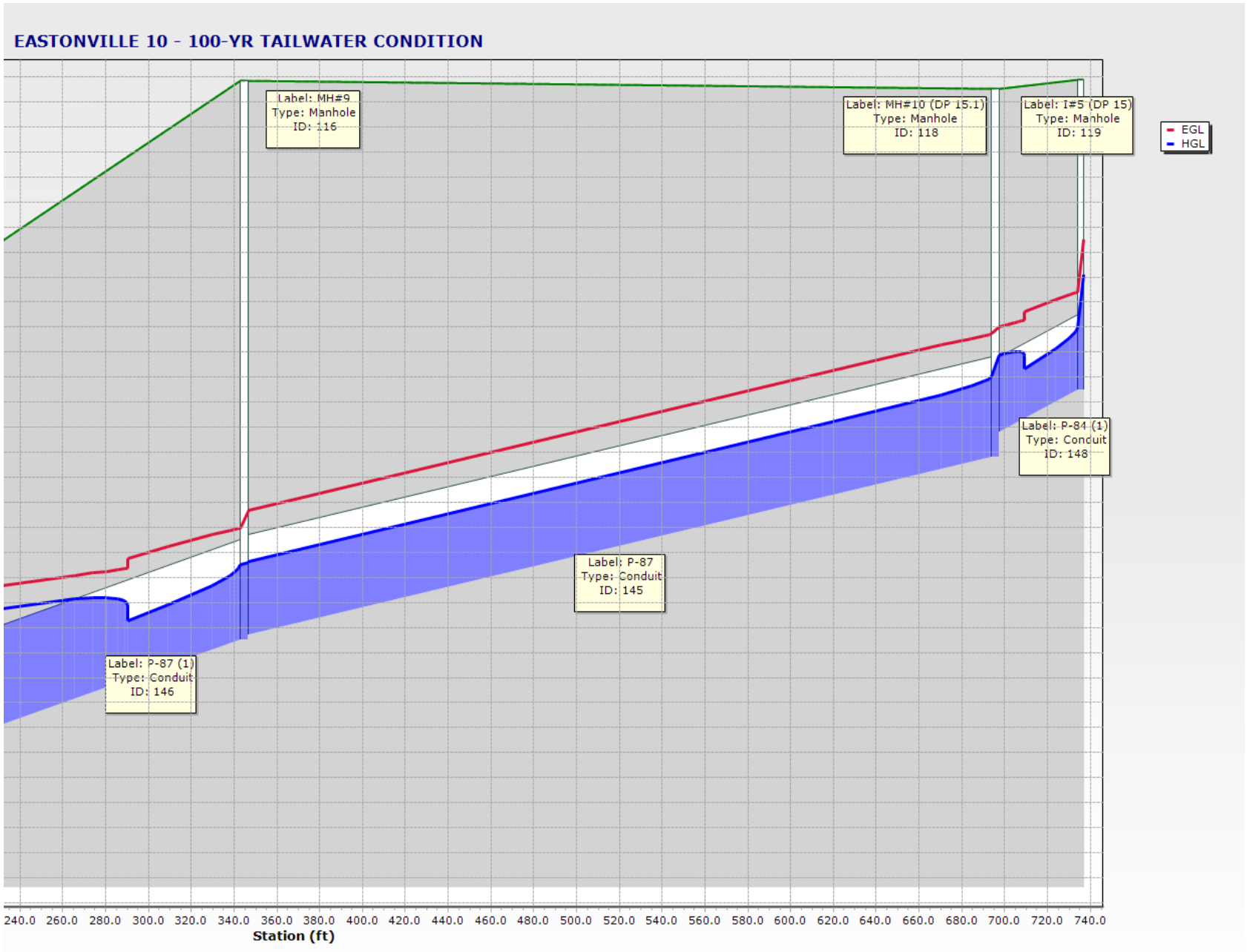
100 YEAR TAILWATER CONDITION: STRUCTURE SUMMARY TABLE

	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)
98: MH#26 (D	7,026.97	7,026.97	7,021.74	40.20	7,022.88	Standard	7,024.41
99: MH#27 (D	7,027.08	7,027.08	7,022.72	29.20	7,024.70	Standard	7,025.19
100: I#9 (DP6)	7,026.99	7,026.99	7,022.67	16.00	7,024.62	Standard	7,024.88
101: I#8 (DP5)	7,027.04	7,027.04	(N/A)	4.90	7,024.98	Standard	7,025.16
102: I#7 (DP3.	7,026.45	7,026.45	7,022.03	3.20	7,022.58	Standard	7,022.59
103: I#6 (DP2.	7,026.38	7,026.38	(N/A)	1.50	7,022.77	Standard	7,023.02
106: MH#34	7,025.00	7,025.00	(N/A)	1.00	7,019.04	Standard	7,019.11
111: DP11.1	7,016.78	7,016.78	6,999.51	113.90	7,001.75	Standard	7,004.01
112: MH#20	7,015.43	7,015.43	7,003.84	54.90	7,006.15	Standard	7,006.21
113: MH#19	7,014.08	7,014.08	7,006.80	54.90	7,008.91	Standard	7,010.58
115: MH#22	7,005.85	7,005.85	6,995.26	113.90	6,998.38	Standard	6,998.46
116: MH#9	7,000.92	7,000.92	6,989.86	17.20	6,991.26	Standard	6,991.29
117: I#4 (DP1	7,000.75	7,000.75	(N/A)	9.40	6,995.44	Standard	6,996.35
118: MH#10 (	7,000.75	7,000.75	6,993.91	19.90	6,995.01	Standard	6,995.45
119: I#5 (DP 1	7,000.94	7,000.94	(N/A)	10.60	6,995.99	Standard	6,997.05
121: MH#23	6,997.20	6,997.20	6,988.82	113.90	6,995.41	Standard	6,995.48
122: MH#24	6,996.25	6,996.25	6,988.00	113.90	6,994.41	Standard	6,994.48
123: DP12	6,996.40	6,996.40	(N/A)	24.60	6,993.77	Standard	6,994.05
124: MH#25 (	6,995.75	6,995.75	6,987.50	138.50	6,992.04	Standard	6,993.73
192: DP 7	7,027.00	7,027.00	(N/A)	2.00	7,025.20	Standard	7,025.23
193: DP G15a1	7,027.00	7,027.00	(N/A)	27.70	7,025.39	Standard	7,026.13
194: DP G16b	7,013.60	7,013.60	(N/A)	54.90	7,011.13	Standard	7,012.54
224: DP G16a	7,010.95	7,010.95	(N/A)	59.00	7,004.68	Absolute	7,004.68
226: MH-11	7,026.84	7,026.84	7,021.41	3.20	7,022.65	Absolute	7,022.65
229: MH-12	7,024.52	7,024.52	7,018.57	1.00	7,018.74	Absolute	7,018.74

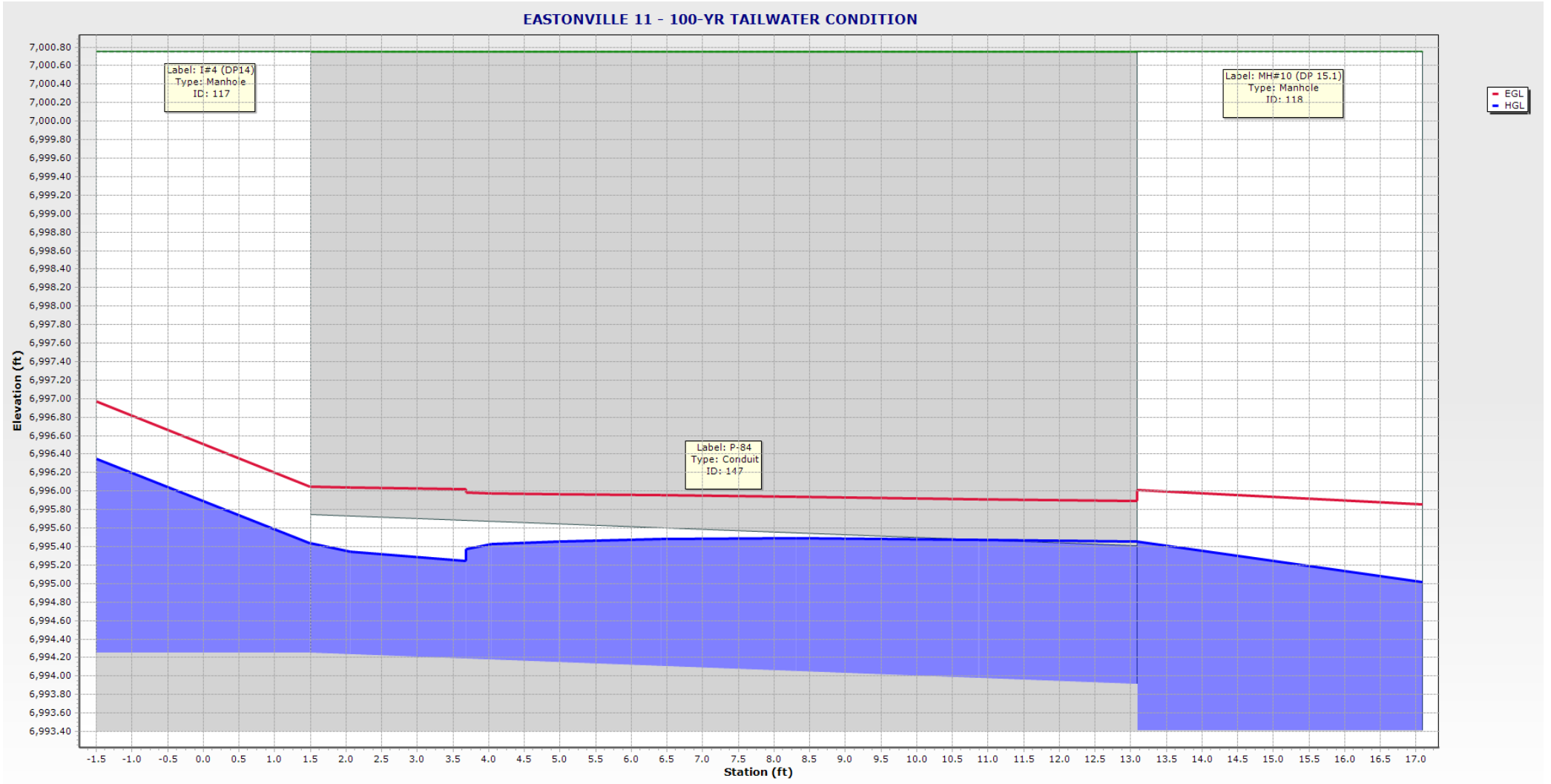
	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
107: DP G15a	7,023.44	7,020.44	Free Outfall		7,022.50	40.20
108: FES OUTF	7,025.00	7,021.00	User Defined Tailwater	7,022.61	7,022.61	3.20
110: MH#39	7,018.27	7,016.77	Free Outfall		7,017.08	1.00
125: OUTLET S	6,991.09	6,986.67	Free Outfall		6,990.17	138.50

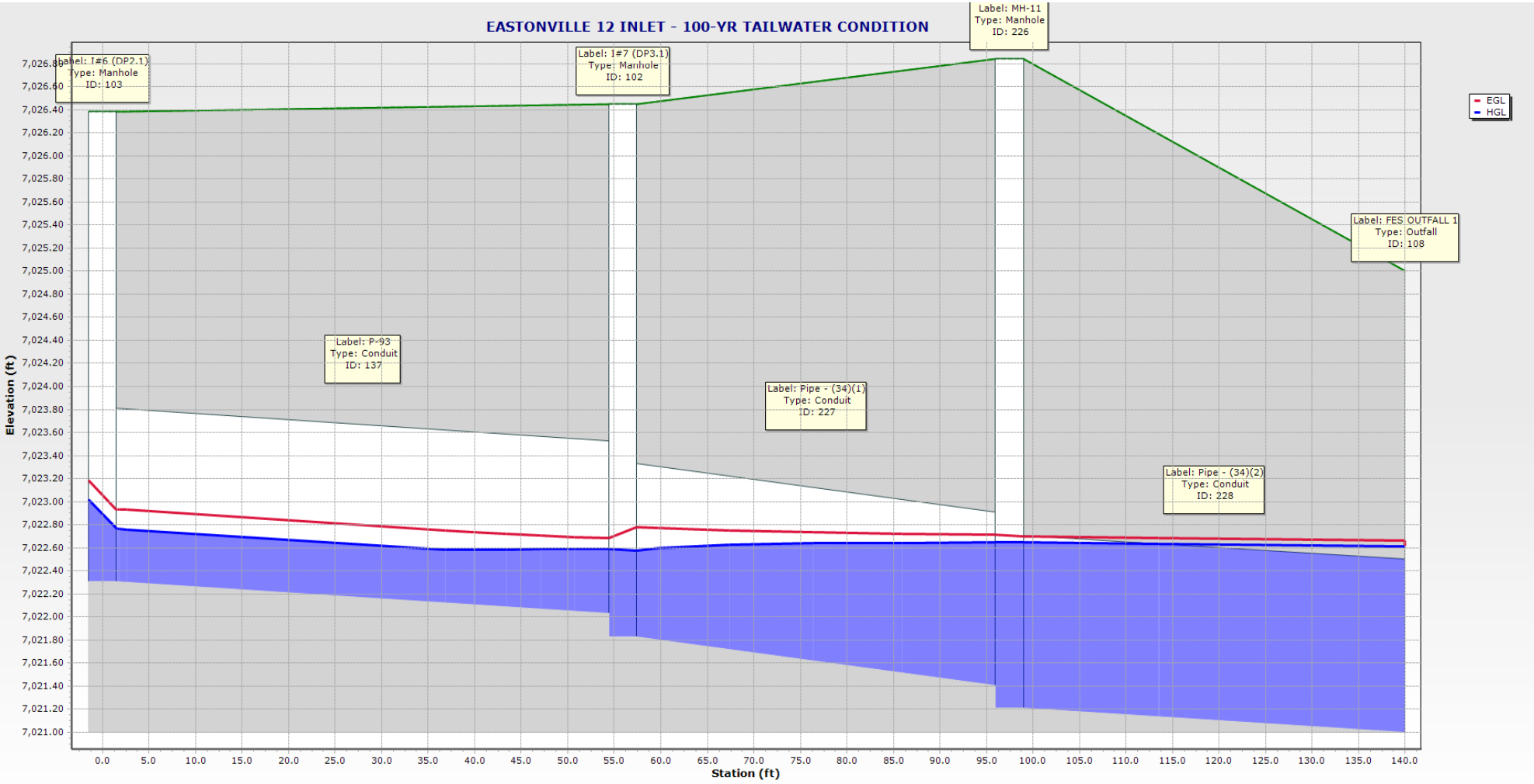
NOTE: EASTONVILLE 12 - INLET & EASTONVILLE 10 SEGMENTS HAVE BEEN ANALYZED IN THE FREE OUTFALL CONDITION BELOW TO MEET CAPACITY & VELOCITY REQUIREMENTS. SEGMENT 1 PIPES & STRUCTURES NOT INCLUDED IN TABLE, REFER TO SEGMENT 1 FDR.


EASTONVILLE 7 - 100-YR TAILWATER CONDITION
Elevation (ft)
Station (ft)
EGL
HGL
Label: MH#19
Type: Manhole
ID: 113
Label: MH#20
Type: Manhole
ID: 112
Label: DP11.1
Type: Manhole
ID: 111
Label: P-44
Type: Conduit
ID: 142
Label: P-44 (1)
Type: Conduit
ID: 140
Label: P-64
Type: Conduit
ID: 141
Label: MH#22
Type: Manhole
ID: 115
Label: P-64 (1)
Type: Conduit
ID: 144
Label: MH#23
Type: Manhole
ID: 121
Label: MH#24
Type: Manhole
ID: 122
Label: MH#25 (DP13)
Type: Manhole
ID: 124
Label: P-66
Type: Conduit
ID: 149
Label: P-68
Type: Conduit
ID: 150
Label: P-74
Type: Conduit
ID: 152
Label: OUTLET SEGMENT 3
Type: Outfall
ID: 125

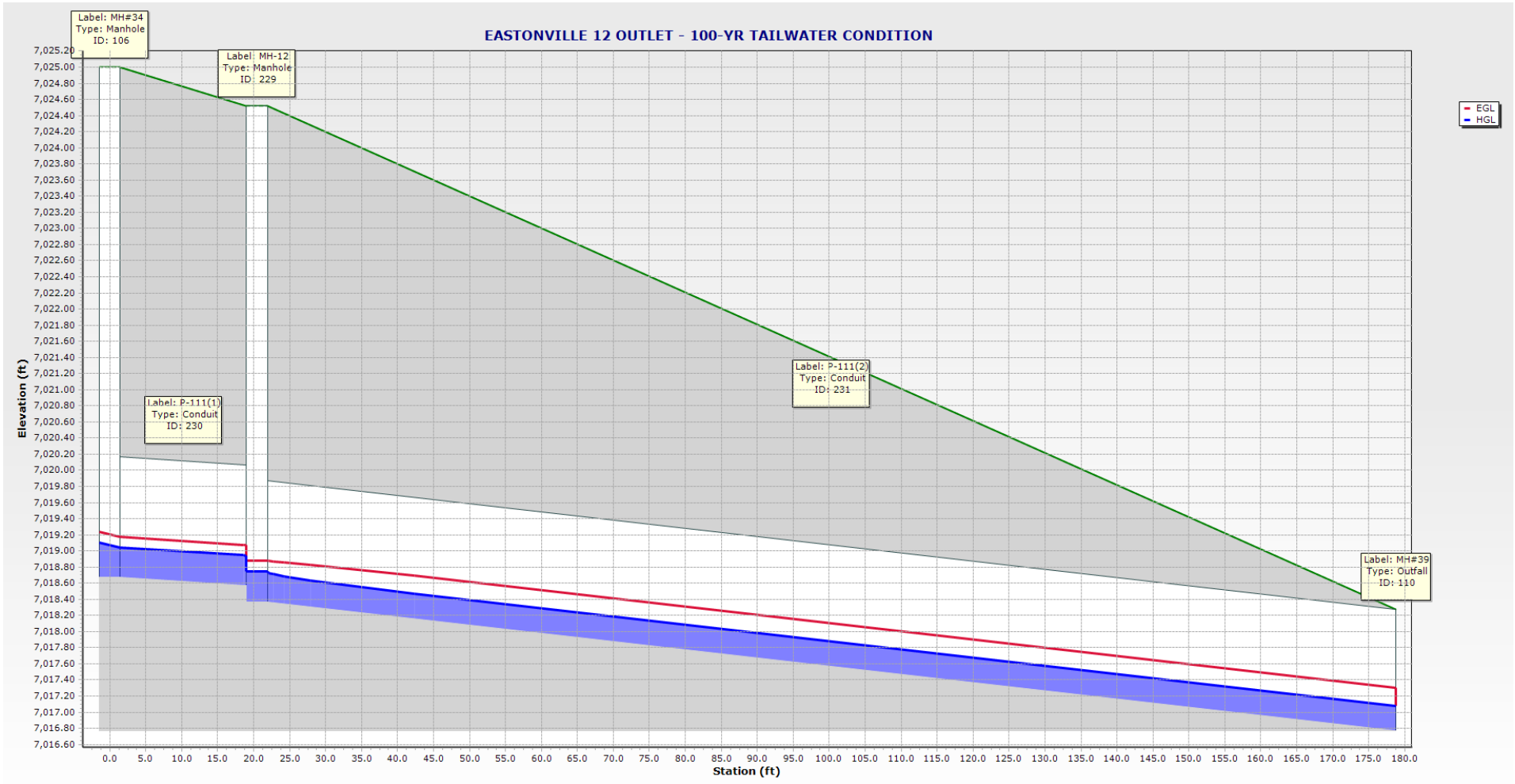


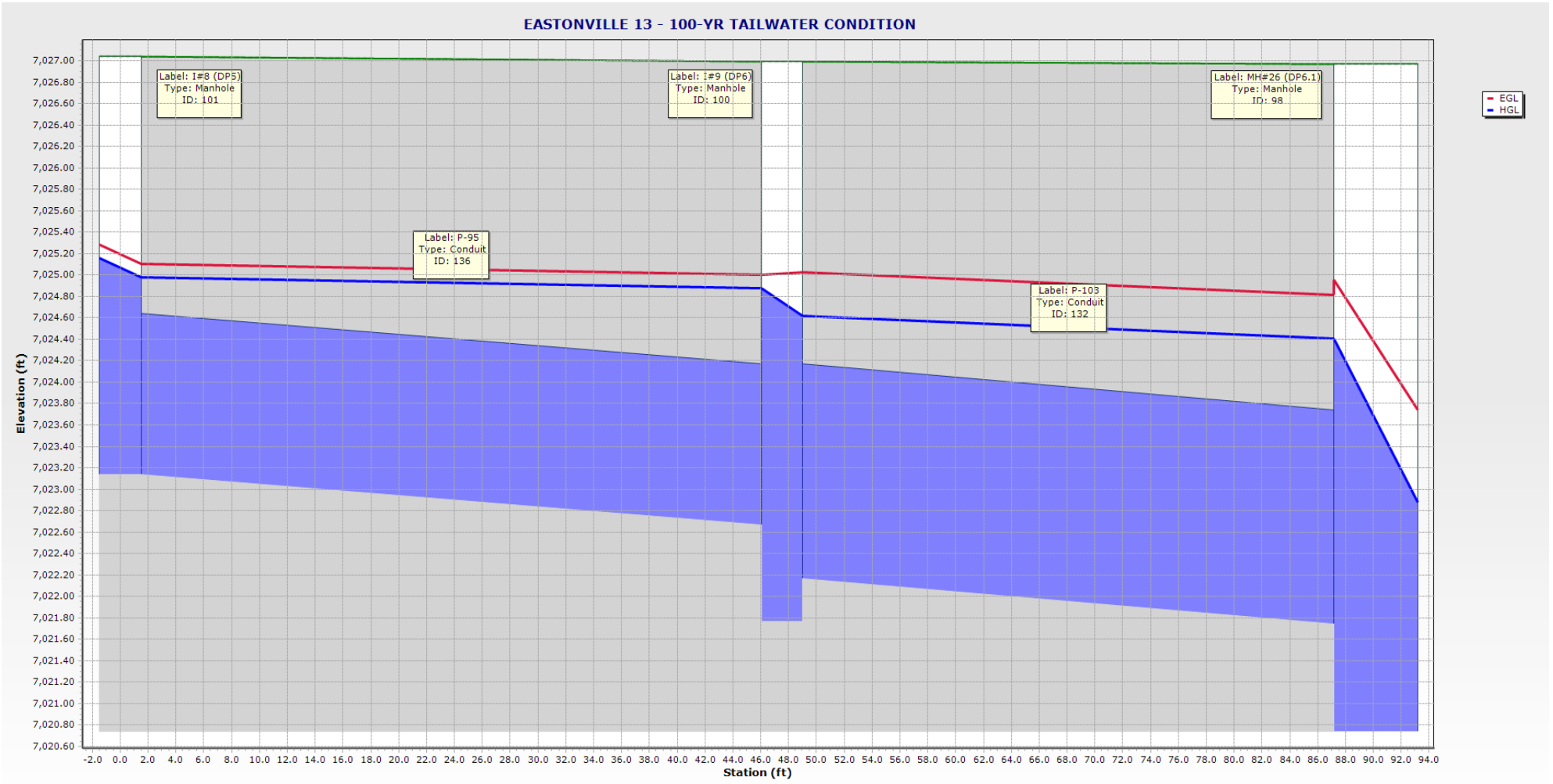
NOTE: THIS SEGMENT HAS BEEN ANALYZED IN THE FREE OUTFALL CONDITION BLEOW TO MEET CAPACITY & VELOCITY REQUIREMENTS

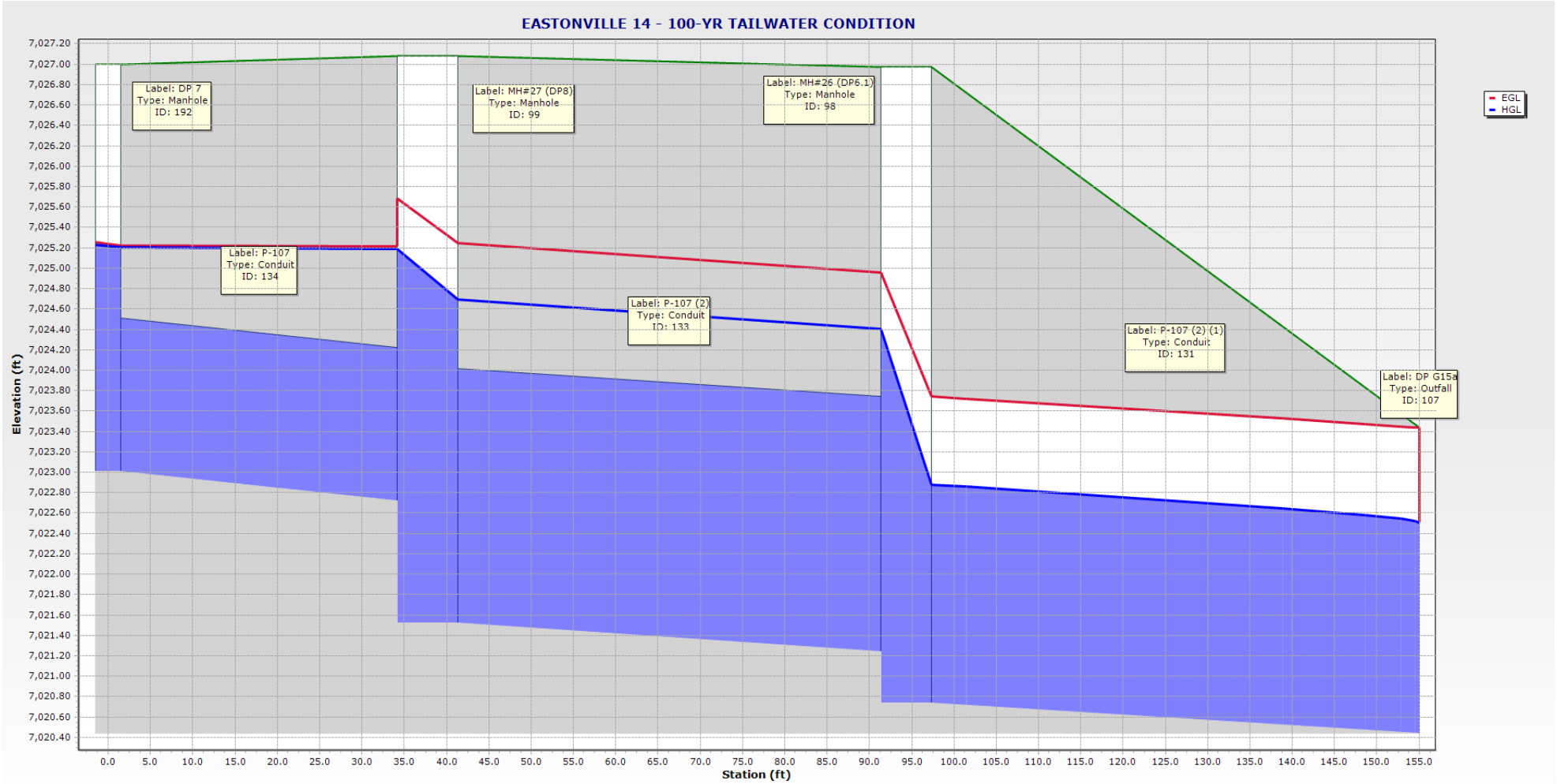

EASTONVILLE 11 - 100-YR TAILWATER CONDITION
Label: I#4 (DP14)
Type: Manhole
ID: 117
Label: MH#10 (DP 15.1)
Type: Manhole
ID: 118
Label: P-84
Type: Conduit
ID: 147
EGL
HGL
Elevation (ft)
Station (ft)

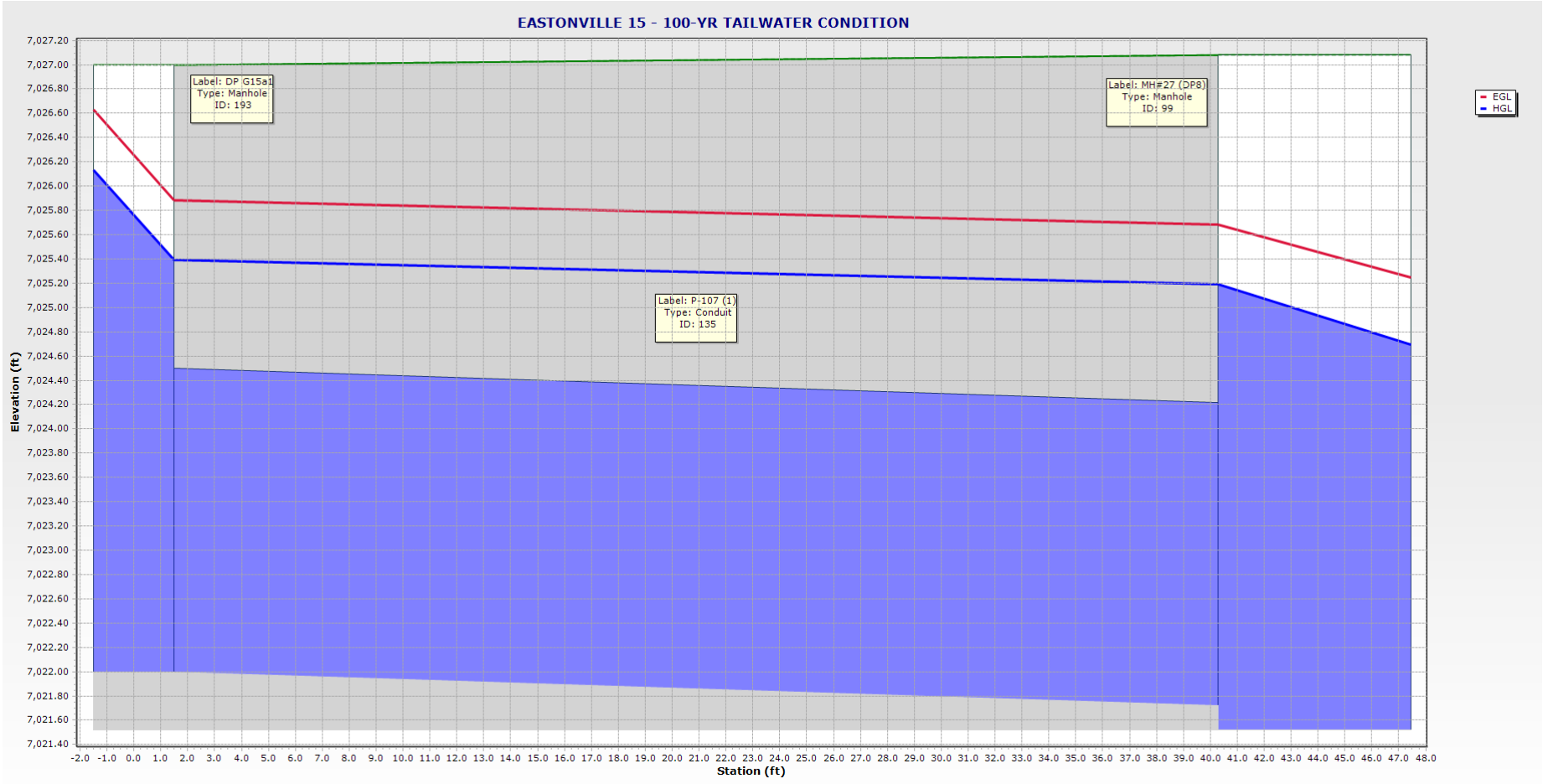


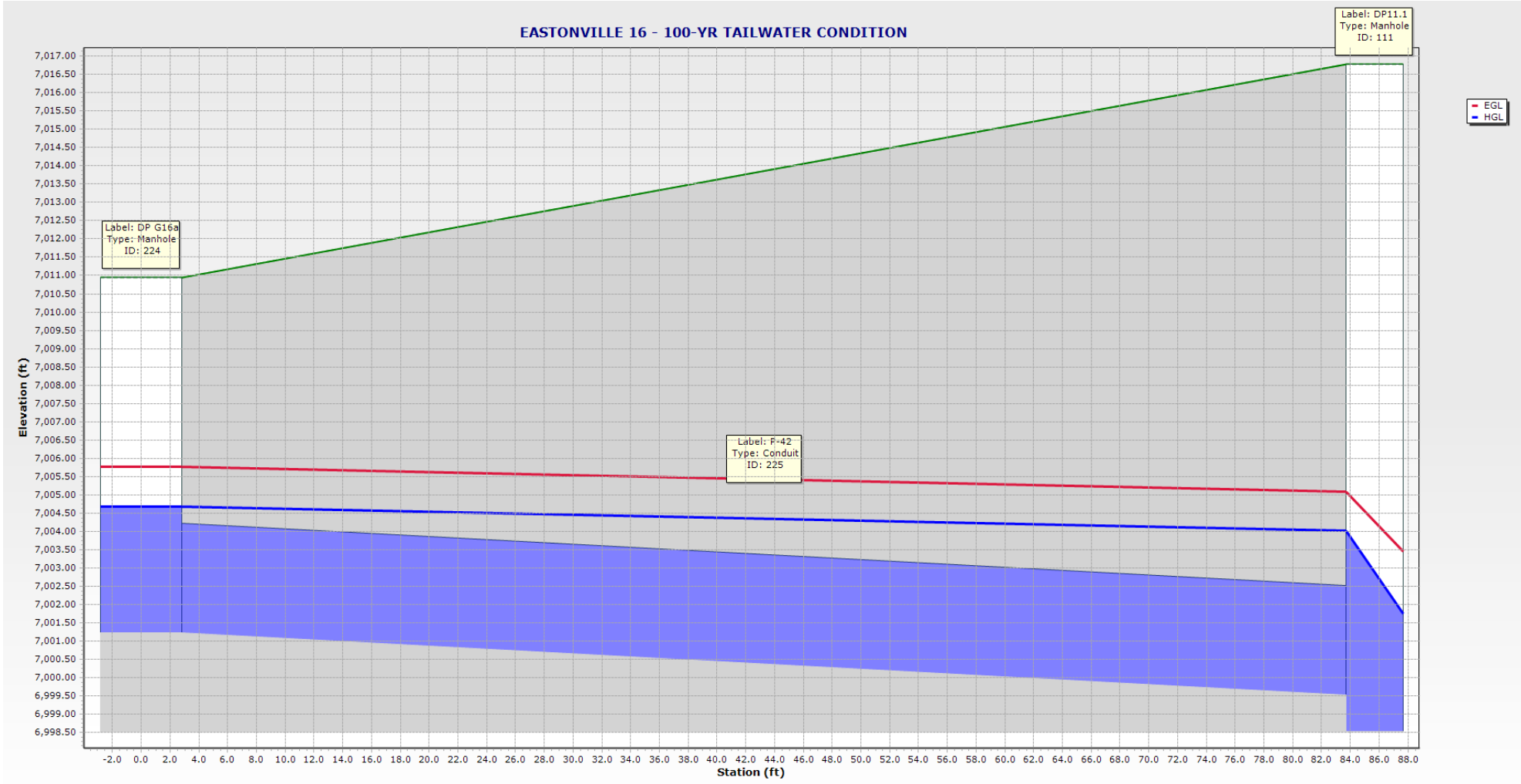
NOTE: THIS SEGMENT HAS BEEN ANALYZED IN THE FREE OUTFALL CONDITION BLEOW TO MEET CAPACITY & VELOCITY REQUIREMENTS


EASTONVILLE 12 OUTLET - 100-YR TAILWATER CONDITION
Label: MH#34
Type: Manhole
ID: 106
Label: MH-12
Type: Manhole
ID: 229
Label: P-111(1)
Type: Conduit
ID: 230
Label: P-111(2)
Type: Conduit
ID: 231
Label: MH#39
Type: Outfall
ID: 110
EGL
HGL
Elevation (ft)
Station (ft)


EASTONVILLE 13 - 100-YR TAILWATER CONDITION
Label: I#8 (DP5)
Type: Manhole
ID: 101
Label: I#9 (DP6)
Type: Manhole
ID: 100
Label: MH#26 (DP6.1)
Type: Manhole
ID: 98
Label: P-95
Type: Conduit
ID: 136
Label: P-103
Type: Conduit
ID: 132
EGL
HGL
Elevation (ft)
7,027.00
7,026.80
7,026.60
7,026.40
7,026.20
7,026.00
7,025.80
7,025.60
7,025.40
7,025.20
7,025.00
7,024.80
7,024.60
7,024.40
7,024.20
7,024.00
7,023.80
7,023.60
7,023.40
7,023.20
7,023.00
7,022.80
7,022.60
7,022.40
7,022.20
7,022.00
7,021.80
7,021.60
7,021.40
7,021.20
7,021.00
7,020.80
7,020.60
-2.0 0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0 34.0 36.0 38.0 40.0 42.0 44.0 46.0 48.0 50.0 52.0 54.0 56.0 58.0 60.0 62.0 64.0 66.0 68.0 70.0 72.0 74.0 76.0 78.0 80.0 82.0 84.0 86.0 88.0 90.0 92.0 94.0
Station (ft)


EASTONVILLE 14 - 100-YR TAILWATER CONDITION
Elevation (ft)
Station (ft)
EGL
HGL
Label: DP 7
Type: Manhole
ID: 192
Label: MH#27 (DP8)
Type: Manhole
ID: 99
Label: MH#26 (DP6.1)
Type: Manhole
ID: 98
Label: P-107
Type: Conduit
ID: 134
Label: P-107 (2)
Type: Conduit
ID: 133
Label: P-107 (2) (1)
Type: Conduit
ID: 131
Label: DP G15a
Type: Outfall
ID: 107


EASTONVILLE 15 - 100-YR TAILWATER CONDITION
Label: DP G15a1
Type: Manhole
ID: 193
Label: MH#27 (DP8)
Type: Manhole
ID: 99
Label: P-107 (1)
Type: Conduit
ID: 135
EGL
HGL
Elevation (ft)
Station (ft)


EASTONVILLE 16 - 100-YR TAILWATER CONDITION
Label: DP11.1
Type: Manhole
ID: 111
Label: DP G16a
Type: Manhole
ID: 224
Label: R-42
Type: Conduit
ID: 225
EGL
HGL
Elevation (ft)
Station (ft)
7,017.00
7,016.50
7,016.00
7,015.50
7,015.00
7,014.50
7,014.00
7,013.50
7,013.00
7,012.50
7,012.00
7,011.50
7,011.00
7,010.50
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7,002.00
7,001.50
7,001.00
7,000.50
7,000.00
6,999.50
6,999.00
6,998.50
-2.0 0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0 34.0 36.0 38.0 40.0 42.0 44.0 46.0 48.0 50.0 52.0 54.0 56.0 58.0 60.0 62.0 64.0 66.0 68.0 70.0 72.0 74.0 76.0 78.0 80.0 82.0 84.0 86.0 88.0

5 YEAR TAILWATER CONDITION: PIPE SUMMARY TABLE

	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
131: P-107 (2)	MH#26 (DP6.1)	7,020.74	DP G15a	7,020.44	60.7	0.005	36.0	0.013	9.00	5.12	46.89	19.2	7,021.69	7,021.33
132: P-103	I#9 (DP6)	7,022.17	MH#26 (DP6.1)	7,021.74	42.7	0.010	24.0	0.013	5.90	6.07	22.71	26.0	7,023.03	7,022.44
133: P-107 (2)	MH#27 (DP8)	7,021.52	MH#26 (DP6.1)	7,021.24	56.6	0.005	30.0	0.013	4.90	4.38	28.85	17.0	7,022.25	7,022.29
134: P-107	DP 7	7,023.01	MH#27 (DP8)	7,022.72	37.8	0.008	18.0	0.013	0.40	2.60	9.21	4.3	7,023.24	7,022.93
135: P-107 (1)	MH#27 (DP8)	7,021.72	DP G15a1	7,022.00	43.9	-0.006	30.0	0.013	4.60	4.71	32.77	14.0	7,022.71	7,022.49
136: P-95	I#8 (DP5)	7,023.14	I#9 (DP6)	7,022.67	47.5	0.010	18.0	0.013	2.40	4.80	10.45	23.0	7,023.73	7,023.16
137: P-93	I#6 (DP2.1)	7,022.31	I#7 (DP3.1)	7,022.03	55.9	0.005	18.0	0.013	0.80	2.75	7.43	10.8	7,022.64	7,022.36
140: P-44 (1)	MH#20	7,003.74	DP11.1	6,999.51	266.5	0.016	36.0	0.013	11.00	8.22	84.03	13.1	7,004.79	7,000.63
141: P-64	DP11.1	6,998.52	MH#22	6,995.26	316.5	0.010	48.0	0.013	23.00	8.47	145.88	15.8	6,999.94	6,996.33
142: P-44	MH#19	7,006.50	MH#20	7,003.84	266.5	0.010	36.0	0.013	11.00	6.97	66.63	16.5	7,007.55	7,004.66
143: P-26	DP G16b	7,007.68	MH#19	7,006.80	81.5	0.011	36.0	0.013	11.00	7.17	69.32	15.9	7,008.73	7,008.06
144: P-64 (1)	MH#22	6,995.15	MH#23	6,988.82	316.6	0.020	48.0	0.013	23.00	10.72	203.15	11.3	6,996.57	6,990.26
145: P-87	MH#10 (DP 1...	6,993.41	MH#9	6,989.86	350.8	0.010	24.0	0.013	10.20	7.04	22.76	44.8	6,994.55	6,990.80
146: P-87 (1)	MH#9	6,989.76	MH#8	6,986.86	193.5	0.015	24.0	0.013	10.20	8.15	27.70	36.8	6,990.90	6,988.20
147: P-84	I#4 (DP14)	6,994.25	MH#10 (DP 1...	6,993.91	15.1	0.023	18.0	0.013	5.20	8.00	15.77	33.0	6,995.13	6,994.80
148: P-84 (1)	I#5 (DP 15)	6,994.74	MH#10 (DP 1...	6,993.91	39.7	0.021	18.0	0.013	5.00	7.70	15.18	32.9	6,995.60	6,994.80
149: P-66	MH#23	6,988.82	MH#24	6,988.00	149.0	0.006	48.0	0.013	23.00	6.77	106.64	21.6	6,990.24	6,989.44
150: P-68	MH#24	6,988.00	MH#25 (DP13)	6,987.50	107.8	0.005	48.0	0.013	23.00	6.36	97.84	23.5	6,989.42	6,989.55
151: P-77	DP12	6,990.32	MH#25 (DP13)	6,989.50	28.1	0.029	36.0	0.013	3.90	7.49	113.85	3.4	6,990.94	6,989.90
152: P-74	MH#25 (DP13)	6,987.50	OUTLET SEG...	6,986.67	173.3	0.005	48.0	0.013	27.00	6.73	99.34	27.2	6,989.04	6,988.30
225: P-42	DP G16a	7,001.22	DP11.1	6,999.51	85.7	0.020	36.0	0.013	12.00	9.14	94.22	12.7	7,002.32	7,000.63
227: Pipe - (34	I#7 (DP3.1)	7,021.83	MH-11	7,021.41	41.5	0.010	18.0	0.013	1.60	4.31	10.56	15.1	7,022.31	7,022.16
228: Pipe - (34	MH-11	7,021.21	FES OUTFALL 1	7,021.00	42.5	0.005	18.0	0.013	1.60	3.34	7.38	21.7	7,022.16	7,022.16
230: P-111(1)	MH#34	7,018.67	MH-12	7,018.57	20.4	0.005	18.0	0.013	0.10	1.46	7.35	1.4	7,018.79	7,018.69
231: P-111(2)	MH-12	7,018.37	MH#39	7,016.77	158.3	0.010	18.0	0.013	0.10	1.89	10.56	0.9	7,018.49	7,016.87

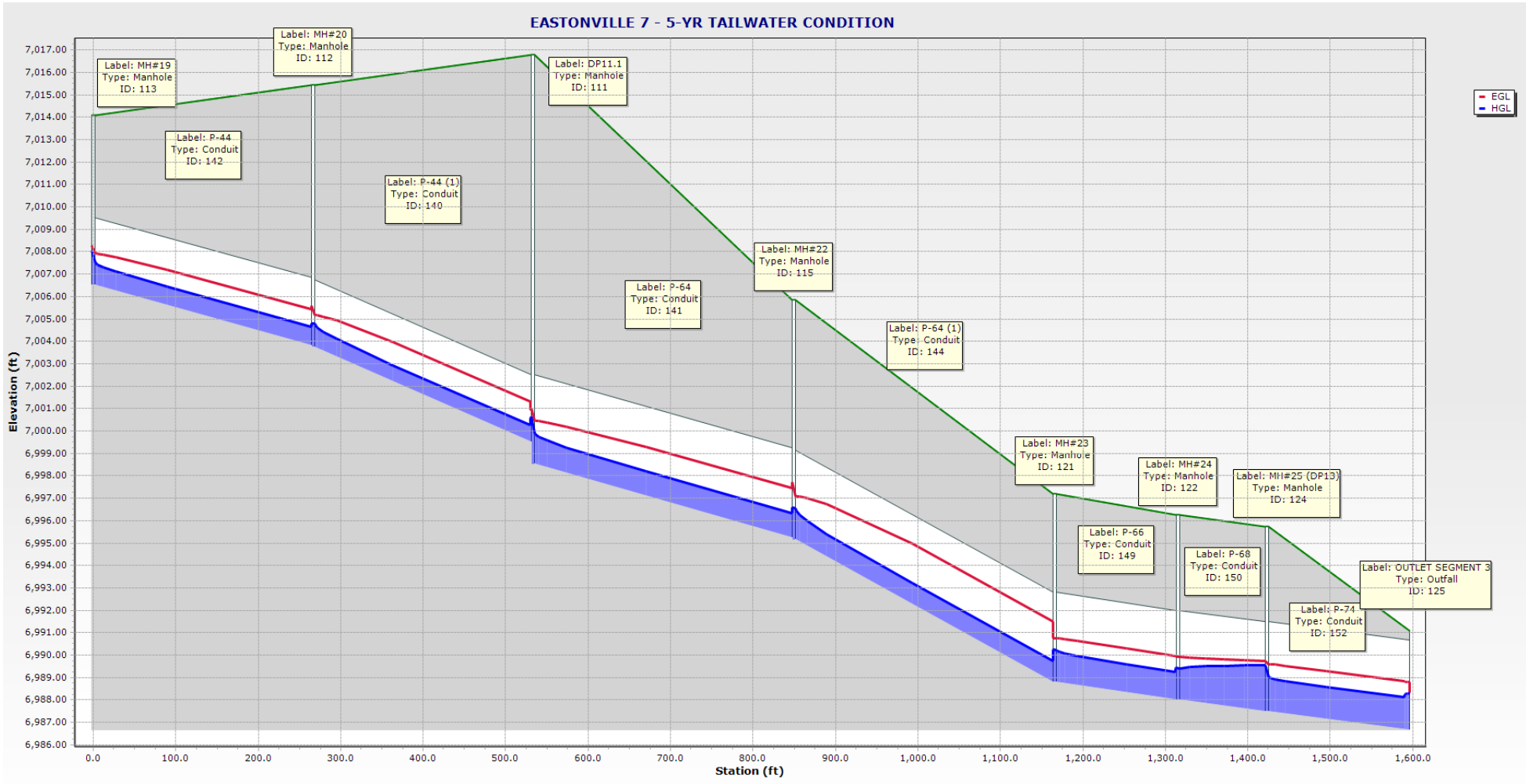
NOTE: EASTONVILLE 12 - INLET, EASTONVILLE 10, & EASTONVILLE 11 SEGMENTS HAVE BEEN ANALYZED IN THE FREE OUTFALL CONDITION BELOW TO MEET CAPACITY & VELOCITY REQUIREMENTS. SEGMENT 1 PIPES & STRUCTURES INCLUDED IN TABLE, REFER TO FDR FOR COMPLETE ANALYSIS.

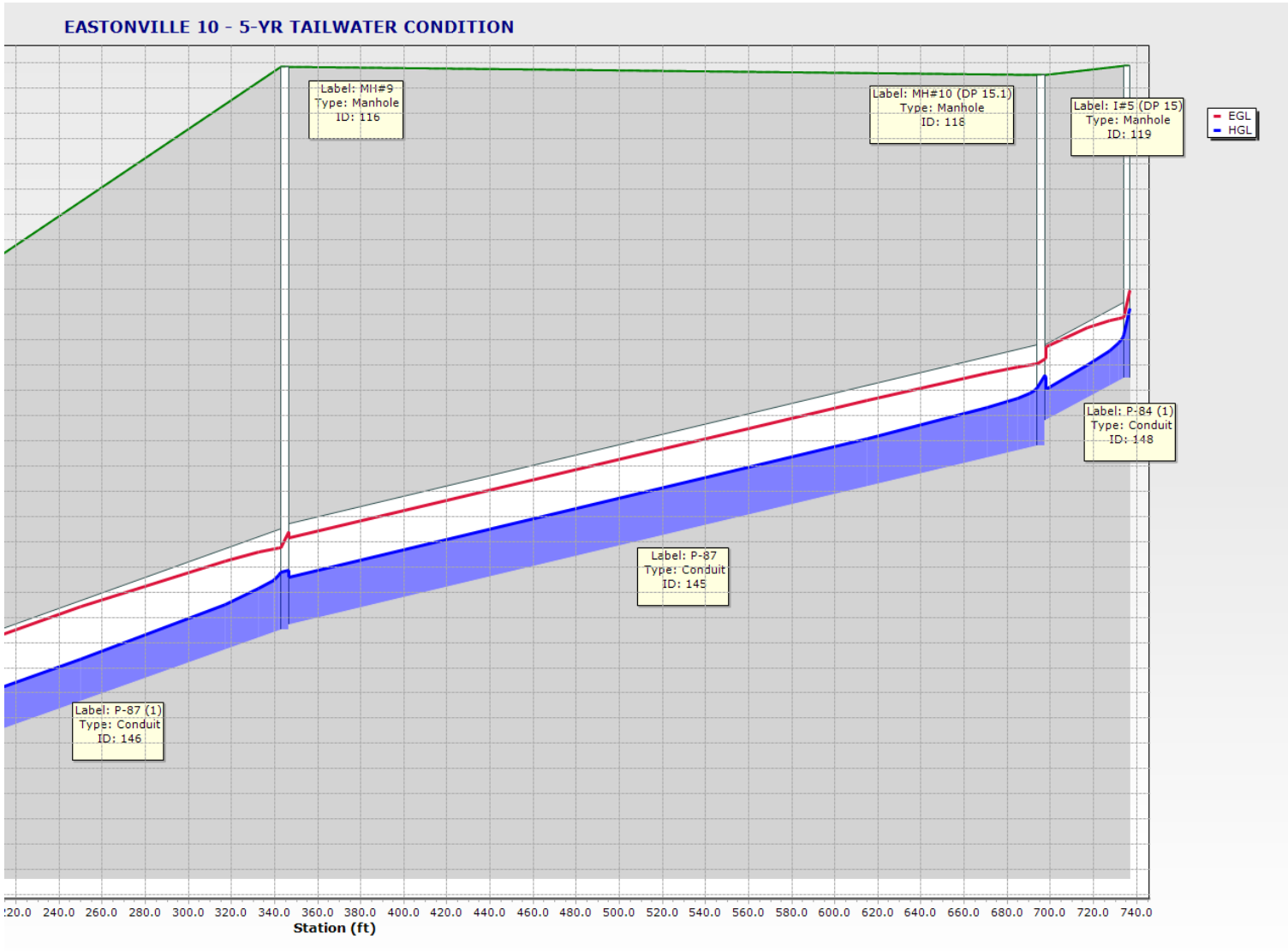
5 YEAR TAILWATER CONDITION: STRUCTURE SUMMARY TABLE

	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)
98: MH#26 (D	7,026.97	7,026.97	7,021.74	9.00	7,021.69	Standard	7,022.29
99: MH#27 (D	7,027.08	7,027.08	7,022.72	4.90	7,022.25	Standard	7,022.49
100: I#9 (DP6)	7,026.99	7,026.99	7,022.67	5.90	7,023.03	Standard	7,023.24
101: I#8 (DP5)	7,027.04	7,027.04	(N/A)	2.40	7,023.73	Standard	7,024.05
102: I#7 (DP3.	7,026.45	7,026.45	7,022.03	1.60	7,022.31	Standard	7,022.31
103: I#6 (DP2.	7,026.38	7,026.38	(N/A)	0.80	7,022.64	Standard	7,022.82
106: MH#34	7,025.00	7,025.00	(N/A)	0.10	7,018.79	Standard	7,018.81
111: DP11.1	7,016.78	7,016.78	6,999.51	23.00	6,999.94	Standard	7,000.63
112: MH#20	7,015.43	7,015.43	7,003.84	11.00	7,004.79	Standard	7,004.81
113: MH#19	7,014.08	7,014.08	7,006.80	11.00	7,007.55	Standard	7,008.06
115: MH#22	7,005.85	7,005.85	6,995.26	23.00	6,996.57	Standard	6,996.60
116: MH#9	7,000.92	7,000.92	6,989.86	10.20	6,990.90	Standard	6,990.93
117: I#4 (DP1	7,000.75	7,000.75	(N/A)	5.20	6,995.13	Standard	6,995.67
118: MH#10 (	7,000.75	7,000.75	6,993.91	10.20	6,994.55	Standard	6,994.80
119: I#5 (DP 1	7,000.94	7,000.94	(N/A)	5.00	6,995.60	Standard	6,996.13
121: MH#23	6,997.20	6,997.20	6,988.82	23.00	6,990.24	Standard	6,990.26
122: MH#24	6,996.25	6,996.25	6,988.00	23.00	6,989.42	Standard	6,989.44
123: DP12	6,996.40	6,996.40	(N/A)	3.90	6,990.94	Standard	6,991.26
124: MH#25 (	6,995.75	6,995.75	6,987.50	27.00	6,989.04	Standard	6,989.55
192: DP 7	7,027.00	7,027.00	(N/A)	0.40	7,023.24	Standard	7,023.36
193: DP G15a1	7,027.00	7,027.00	(N/A)	4.60	7,022.71	Standard	7,023.09
194: DP G16b	7,013.60	7,013.60	(N/A)	11.00	7,008.73	Standard	7,009.31
224: DP G16a	7,010.95	7,010.95	(N/A)	12.00	7,002.32	Absolute	7,002.32
226: MH-11	7,026.84	7,026.84	7,021.41	1.60	7,022.16	Absolute	7,022.16
229: MH-12	7,024.52	7,024.52	7,018.57	0.10	7,018.49	Absolute	7,018.49

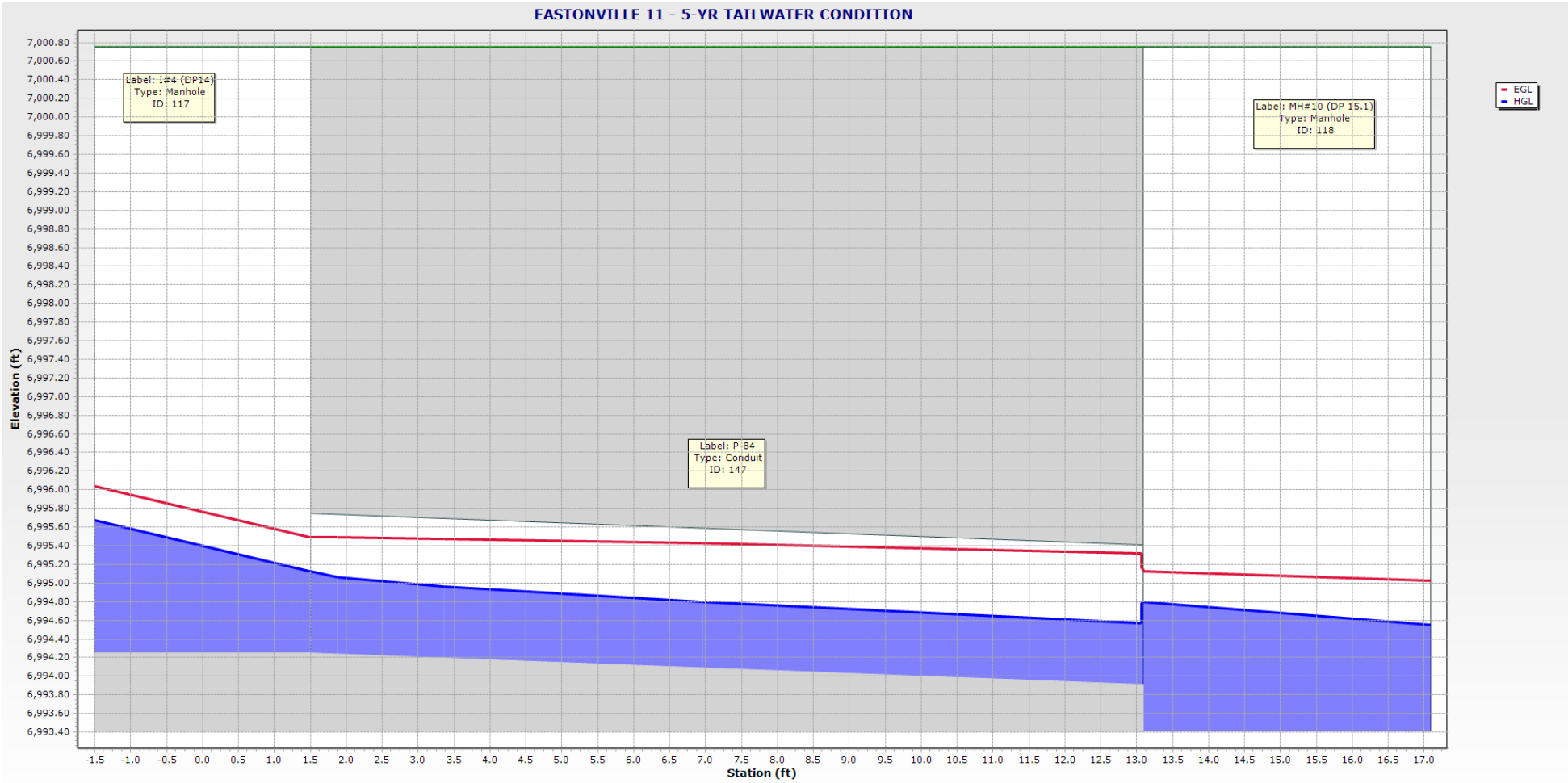
	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
107: DP G15a	7,023.44	7,020.44	Free Outfall		7,021.33	9.00
108: FES OUTF	7,025.00	7,021.00	User Defined Tailwater	7,022.16	7,022.16	1.60
110: MH#39	7,018.27	7,016.77	Free Outfall		7,016.87	0.10
125: OUTLET S	6,991.09	6,986.67	User Defined Tailwater	6,988.30	6,988.30	27.00

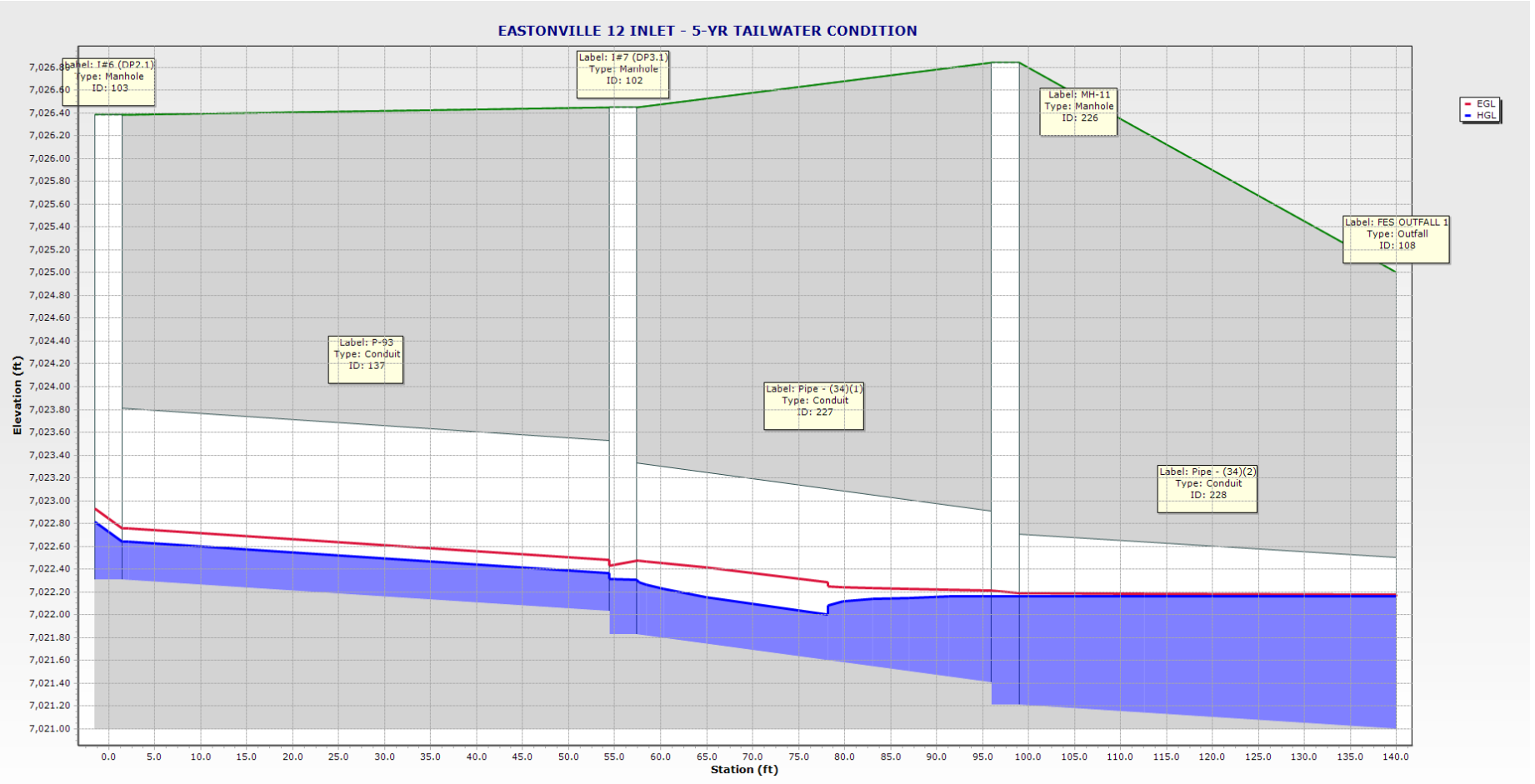
NOTE: EASTONVILLE 12 - INLET & EASTONVILLE 10 SEGMENTS HAVE BEEN ANALYZED IN THE FREE OUTFALL CONDITION BELOW TO MEET CAPACITY & VELOCITY REQUIREMENTS. SEGMENT 1 PIPES & STRUCTURES NOT INCLUDED IN TABLE, REFER TO SEGMENT 1 FDR.


EASTONVILLE 7 - 5-YR TAILWATER CONDITION
Label: MH#19
Type: Manhole
ID: 113
Label: MH#20
Type: Manhole
ID: 112
Label: DP11.1
Type: Manhole
ID: 111
Label: MH#22
Type: Manhole
ID: 115
Label: MH#23
Type: Manhole
ID: 121
Label: MH#24
Type: Manhole
ID: 122
Label: MH#25 (DP13)
Type: Manhole
ID: 124
Label: OUTLET SEGMENT 3
Type: Outfall
ID: 125
Label: P-44
Type: Conduit
ID: 142
Label: P-44 (1)
Type: Conduit
ID: 140
Label: P-64
Type: Conduit
ID: 141
Label: P-64 (1)
Type: Conduit
ID: 144
Label: P-66
Type: Conduit
ID: 149
Label: P-68
Type: Conduit
ID: 150
Label: P-74
Type: Conduit
ID: 152
EGL
HGL
Elevation (ft)
7,017.00
7,016.00
7,015.00
7,014.00
7,013.00
7,012.00
7,011.00
7,010.00
7,009.00
7,008.00
7,007.00
7,006.00
7,005.00
7,004.00
7,003.00
7,002.00
7,001.00
7,000.00
6,999.00
6,998.00
6,997.00
6,996.00
6,995.00
6,994.00
6,993.00
6,992.00
6,991.00
6,990.00
6,989.00
6,988.00
6,987.00
6,986.00
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
900.0
1,000.0
1,100.0
1,200.0
1,300.0
1,400.0
1,500.0
1,600.0
Station (ft)

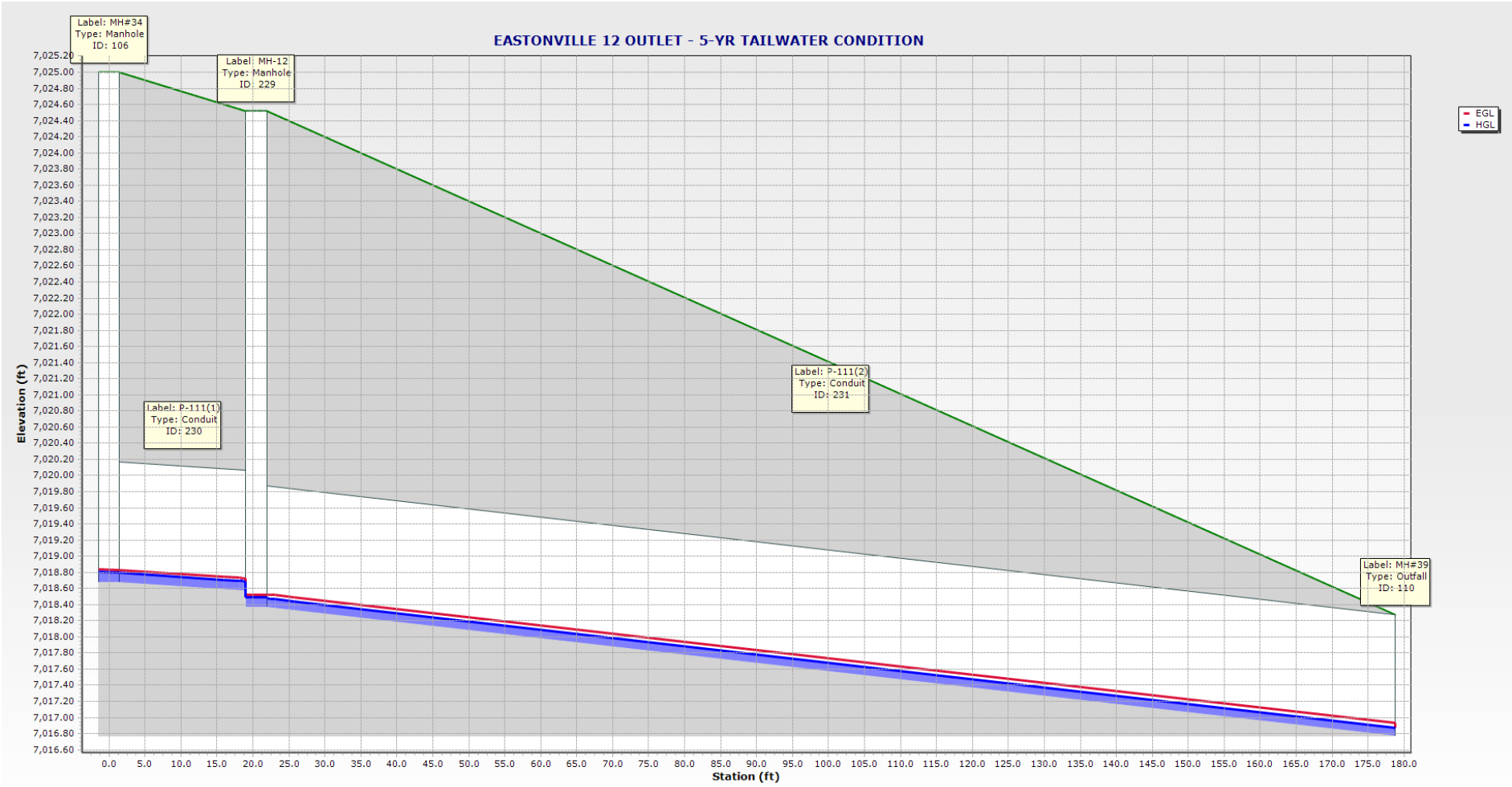


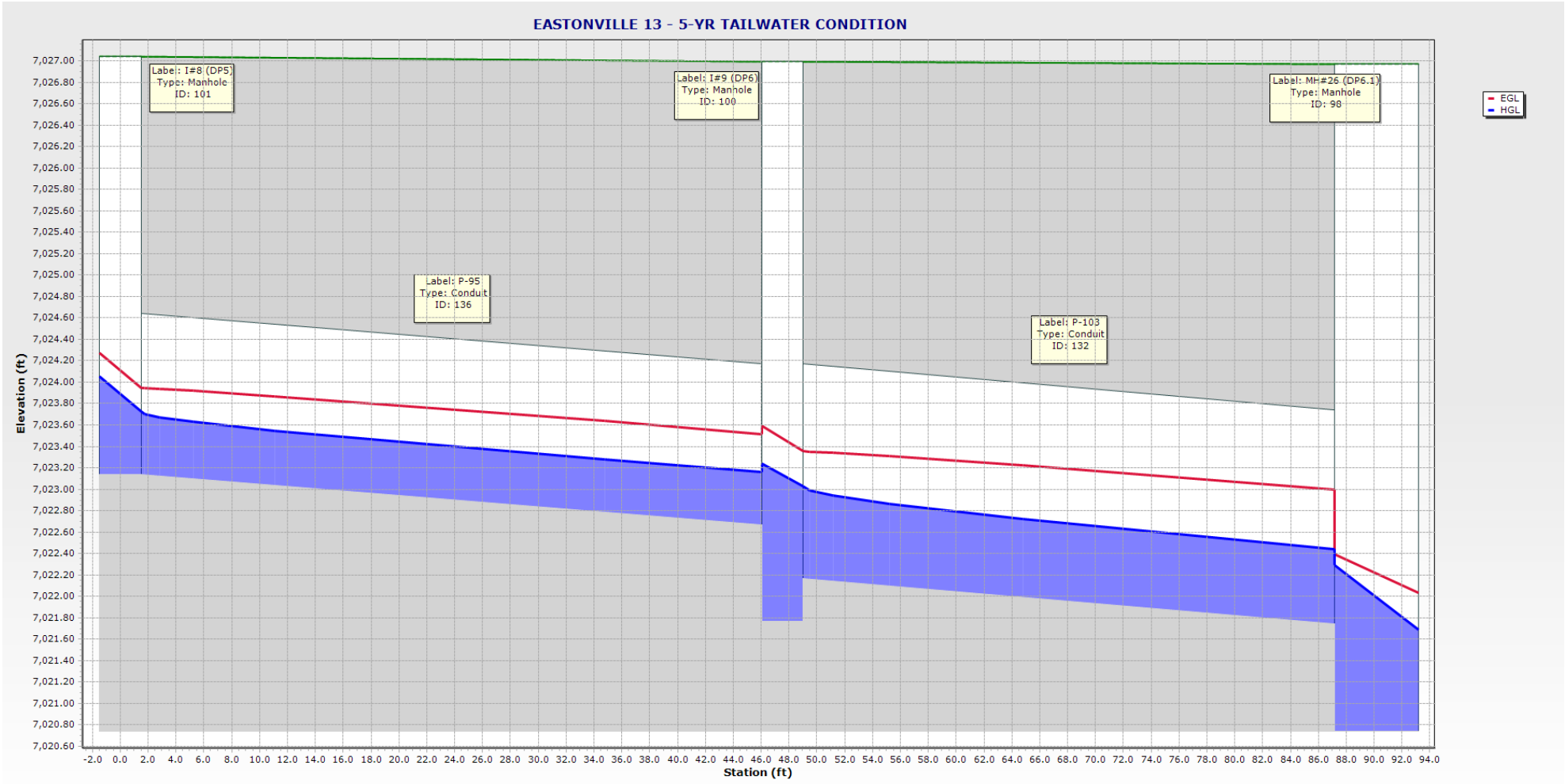
NOTE: THIS SEGMENT HAS BEEN ANALYZED IN THE FREE OUTFALL CONDITION BLEOW TO MEET CAPACITY & VELOCITY REQUIREMENTS

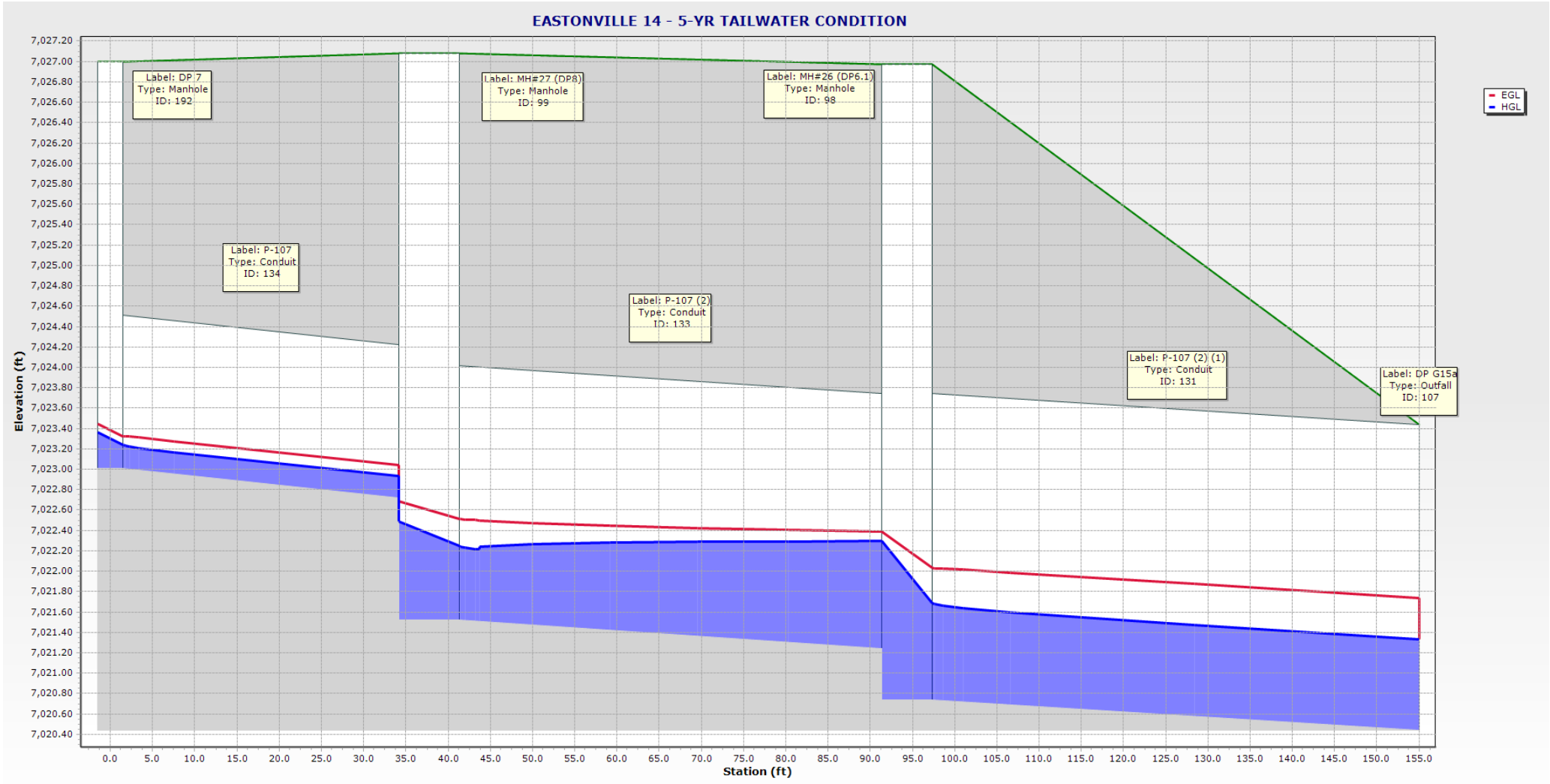

EASTONVILLE 11 - 5-YR TAILWATER CONDITION
Label: I#4 (DP14)
Type: Manhole
ID: 117
Label: MH#10 (DP 15.1)
Type: Manhole
ID: 118
Label: P-84
Type: Conduit
ID: 147
EGL
HGL
Elevation (ft)
Station (ft)



NOTE: THIS SEGMENT HAS BEEN ANALYZED IN THE FREE OUTFALL CONDITION BLEOW TO MEET CAPACITY & VELOCITY REQUIREMENTS


EASTONVILLE 12 OUTLET - 5-YR TAILWATER CONDITION
Label: MH#34
Type: Manhole
ID: 106
Label: MH-12
Type: Manhole
ID: 229
Label: P-111(1)
Type: Conduit
ID: 230
Label: P-111(2)
Type: Conduit
ID: 231
Label: MH#39
Type: Outfall
ID: 110
EGL
HGL
Elevation (ft)
Station (ft)


EASTONVILLE 13 - 5-YR TAILWATER CONDITION
Label: I#8 (DP5)
Type: Manhole
ID: 101
Label: I#9 (DP6)
Type: Manhole
ID: 100
Label: MH#26 (DP6.1)
Type: Manhole
ID: 98
Label: P-95
Type: Conduit
ID: 136
Label: P-103
Type: Conduit
ID: 132
EGL
HGL
Elevation (ft)
Station (ft)


EASTONVILLE 14 - 5-YR TAILWATER CONDITION
Label: DP 7
Type: Manhole
ID: 192
Label: MH#27 (DP8)
Type: Manhole
ID: 99
Label: MH#26 (DP6.1)
Type: Manhole
ID: 98
Label: P-107
Type: Conduit
ID: 134
Label: P-107 (2)
Type: Conduit
ID: 133
Label: P-107 (2) (1)
Type: Conduit
ID: 131
Label: DP G15a
Type: Outfall
ID: 107
EGL
HGL
Elevation (ft)
Station (ft)
7,027.20
7,027.00
7,026.80
7,026.60
7,026.40
7,026.20
7,026.00
7,025.80
7,025.60
7,025.40
7,025.20
7,025.00
7,024.80
7,024.60
7,024.40
7,024.20
7,024.00
7,023.80
7,023.60
7,023.40
7,023.20
7,023.00
7,022.80
7,022.60
7,022.40
7,022.20
7,022.00
7,021.80
7,021.60
7,021.40
7,021.20
7,021.00
7,020.80
7,020.60
7,020.40
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
105.0
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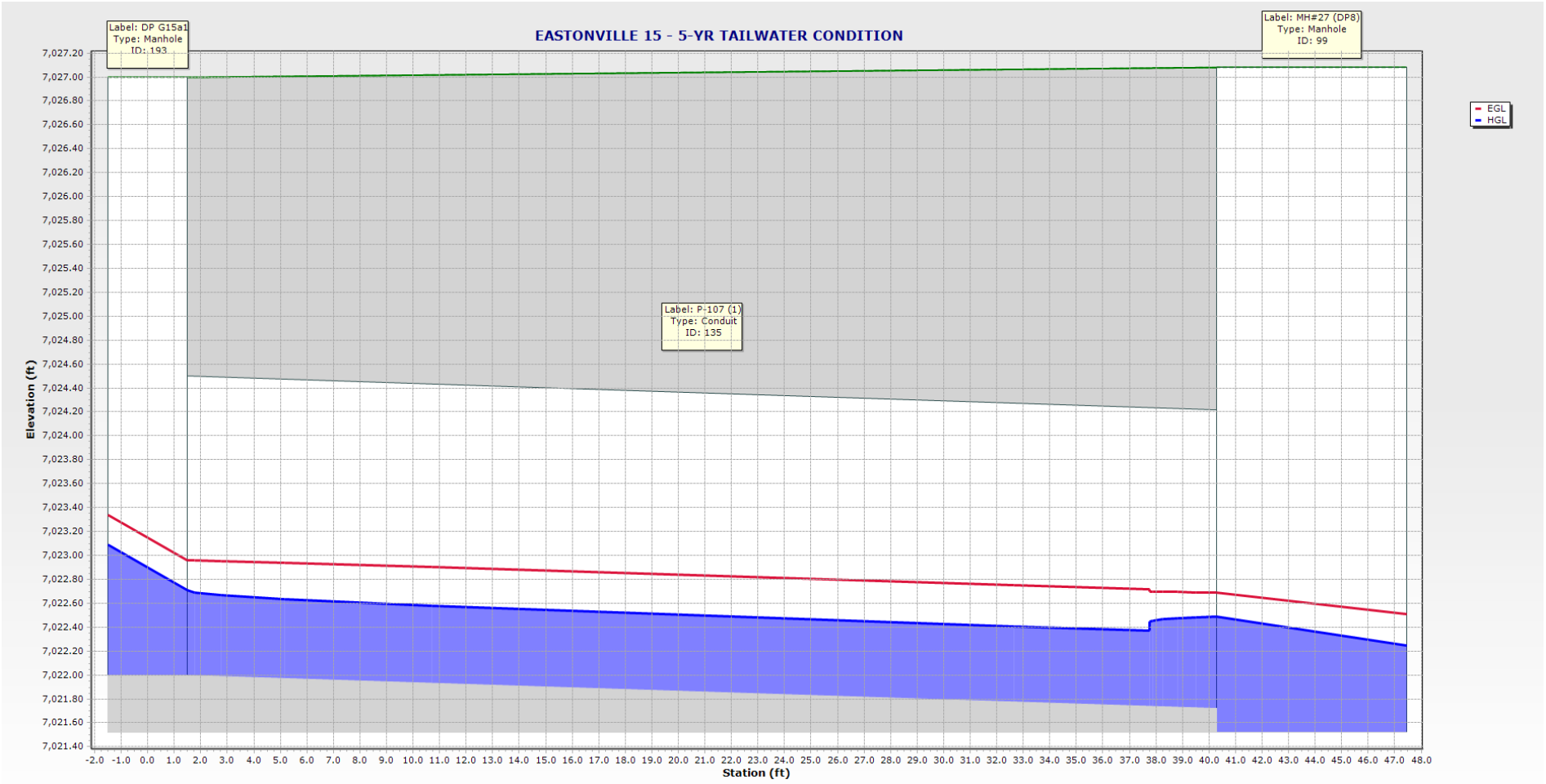
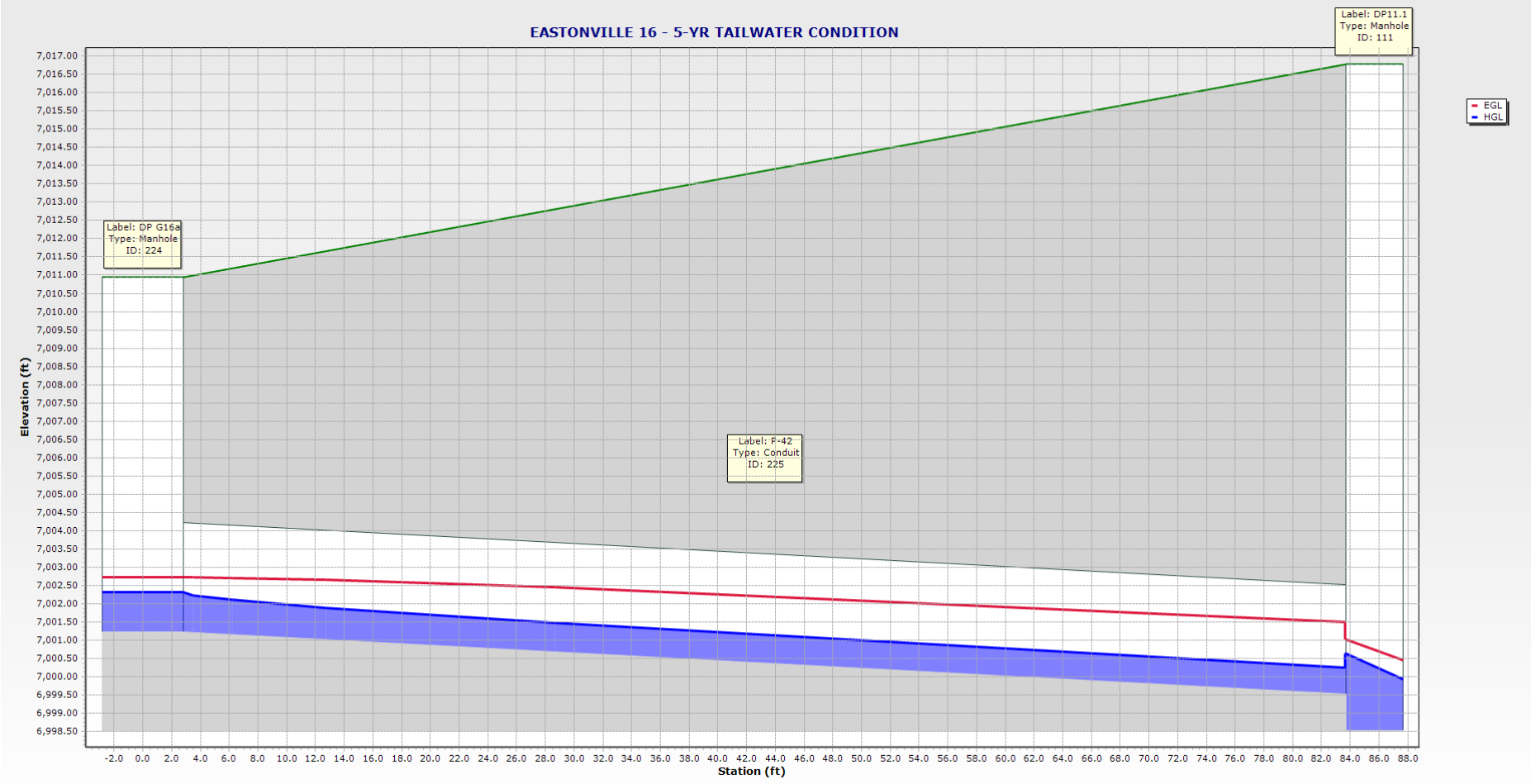
115.0
120.0
125.0
130.0
135.0
140.0
145.0
150.0
155.0


EASTONVILLE 15 - 5-YR TAILWATER CONDITION
Label: DP G15a1
Type: Manhole
ID: 193
Label: MH#27 (DP8)
Type: Manhole
ID: 99
Label: P-107 (1)
Type: Conduit
ID: 135
EGL
HGL
Elevation (ft)
Station (ft)
7,027.20
7,027.00
7,026.80
7,026.60
7,026.40
7,026.20
7,026.00
7,025.80
7,025.60
7,025.40
7,025.20
7,025.00
7,024.80
7,024.60
7,024.40
7,024.20
7,024.00
7,023.80
7,023.60
7,023.40
7,023.20
7,023.00
7,022.80
7,022.60
7,022.40
7,022.20
7,022.00
7,021.80
7,021.60
7,021.40
-2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0 38.0 39.0 40.0 41.0 42.0 43.0 44.0 45.0 46.0 47.0 48.0


EASTONVILLE 16 - 5-YR TAILWATER CONDITION
Label: DP11.1
Type: Manhole
ID: 111
Label: DP G16a
Type: Manhole
ID: 224
Label: P-42
Type: Conduit
ID: 225
EGL
HGL
Elevation (ft)
Station (ft)
7,017.00
7,016.50
7,016.00
7,015.50
7,015.00
7,014.50
7,014.00
7,013.50
7,013.00
7,012.50
7,012.00
7,011.50
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7,010.50
7,010.00
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7,007.50
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7,006.50
7,006.00
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7,005.00
7,004.50
7,004.00
7,003.50
7,003.00
7,002.50
7,002.00
7,001.50
7,001.00
7,000.50
7,000.00
6,999.50
6,999.00
6,998.50
-2.0 0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0 34.0 36.0 38.0 40.0 42.0 44.0 46.0 48.0 50.0 52.0 54.0 56.0 58.0 60.0 62.0 64.0 66.0 68.0 70.0 72.0 74.0 76.0 78.0 80.0 82.0 84.0 86.0 88.0

100 YEAR FREE OUTFALL CONDITION: PIPE SUMMARY TABLE

	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
131: P-107 (2)	MH#26 (DP6.1)	7,020.74	DP G15a	7,020.44	60.7	0.005	36.0	0.013	40.20	7.46	46.89	85.7	7,022.88	7,022.50
132: P-103	I#9 (DP6)	7,022.17	MH#26 (DP6.1)	7,021.74	42.7	0.010	24.0	0.013	16.00	5.09	22.71	70.4	7,024.62	7,024.41
133: P-107 (2)	MH#27 (DP8)	7,021.52	MH#26 (DP6.1)	7,021.24	56.6	0.005	30.0	0.013	29.20	5.95	28.85	101.2	7,024.70	7,024.41
134: P-107	DP 7	7,023.01	MH#27 (DP8)	7,022.72	37.8	0.008	18.0	0.013	2.00	1.13	9.21	21.7	7,025.20	7,025.19
135: P-107 (1)	MH#27 (DP8)	7,021.72	DP G15a1	7,022.00	43.9	-0.006	30.0	0.013	27.70	5.64	32.77	84.5	7,025.39	7,025.19
136: P-95	I#8 (DP5)	7,023.14	I#9 (DP6)	7,022.67	47.5	0.010	18.0	0.013	4.90	2.77	10.45	46.9	7,024.98	7,024.88
137: P-93	I#6 (DP2.1)	7,022.31	I#7 (DP3.1)	7,022.03	55.9	0.005	18.0	0.013	1.50	3.29	7.43	20.2	7,022.77	7,022.52
140: P-44 (1)	MH#20	7,003.74	DP11.1	6,999.51	266.5	0.016	36.0	0.013	54.90	12.67	84.03	65.3	7,006.15	7,004.01
141: P-64	DP11.1	6,998.52	MH#22	6,995.26	316.5	0.010	48.0	0.013	113.90	12.84	145.88	78.1	7,001.75	6,997.92
142: P-44	MH#19	7,006.50	MH#20	7,003.84	266.5	0.010	36.0	0.013	54.90	10.53	66.63	82.4	7,008.91	7,005.91
143: P-26	DP G16b	7,007.68	MH#19	7,006.80	81.5	0.011	36.0	0.013	54.90	7.77	69.32	79.2	7,011.13	7,010.58
144: P-64 (1)	MH#22	6,995.15	MH#23	6,988.82	316.6	0.020	48.0	0.013	113.90	16.63	203.15	56.1	6,998.38	6,995.48
145: P-87	MH#10 (DP 1...	6,993.41	MH#9	6,989.86	350.8	0.010	24.0	0.013	19.90	8.17	22.76	87.5	6,995.01	6,991.31
146: P-87 (1)	MH#9	6,989.76	MH#8	6,986.86	193.5	0.015	24.0	0.013	17.20	9.29	27.70	62.1	6,991.26	6,989.07
147: P-84	I#4 (DP14)	6,994.25	MH#10 (DP 1...	6,993.91	15.1	0.023	18.0	0.013	9.40	9.31	15.77	59.6	6,995.44	6,995.45
148: P-84 (1)	I#5 (DP 15)	6,994.74	MH#10 (DP 1...	6,993.91	39.7	0.021	18.0	0.013	10.60	9.29	15.18	69.8	6,995.99	6,995.45
149: P-66	MH#23	6,988.82	MH#24	6,988.00	149.0	0.006	48.0	0.013	113.90	9.06	106.64	106.8	6,995.41	6,994.48
150: P-68	MH#24	6,988.00	MH#25 (DP13)	6,987.50	107.8	0.005	48.0	0.013	113.90	9.06	97.84	116.4	6,994.41	6,993.73
151: P-77	DP12	6,990.32	MH#25 (DP13)	6,989.50	28.1	0.029	36.0	0.013	24.60	3.48	113.85	21.6	6,993.77	6,993.73
152: P-74	MH#25 (DP13)	6,987.50	OUTLET SEG...	6,986.67	173.3	0.005	48.0	0.013	138.50	11.02	99.34	139.4	6,992.04	6,990.17
225: P-42	DP G16a	7,001.22	DP11.1	6,999.51	85.7	0.020	36.0	0.013	59.00	8.35	94.22	62.6	7,004.68	7,004.01
227: Pipe - (34	I#7 (DP3.1)	7,021.83	MH-11	7,021.41	41.5	0.010	18.0	0.013	3.20	5.24	10.56	30.3	7,022.51	7,021.98
228: Pipe - (34	MH-11	7,021.21	FES OUTFALL 1	7,021.00	42.5	0.005	18.0	0.013	3.20	4.03	7.38	43.3	7,021.90	7,021.68
230: P-111(1)	MH#34	7,018.67	MH-12	7,018.57	20.4	0.005	18.0	0.013	1.00	2.91	7.35	13.6	7,019.04	7,018.94
231: P-111(2)	MH-12	7,018.37	MH#39	7,016.77	158.3	0.010	18.0	0.013	1.00	3.76	10.56	9.5	7,018.74	7,017.08

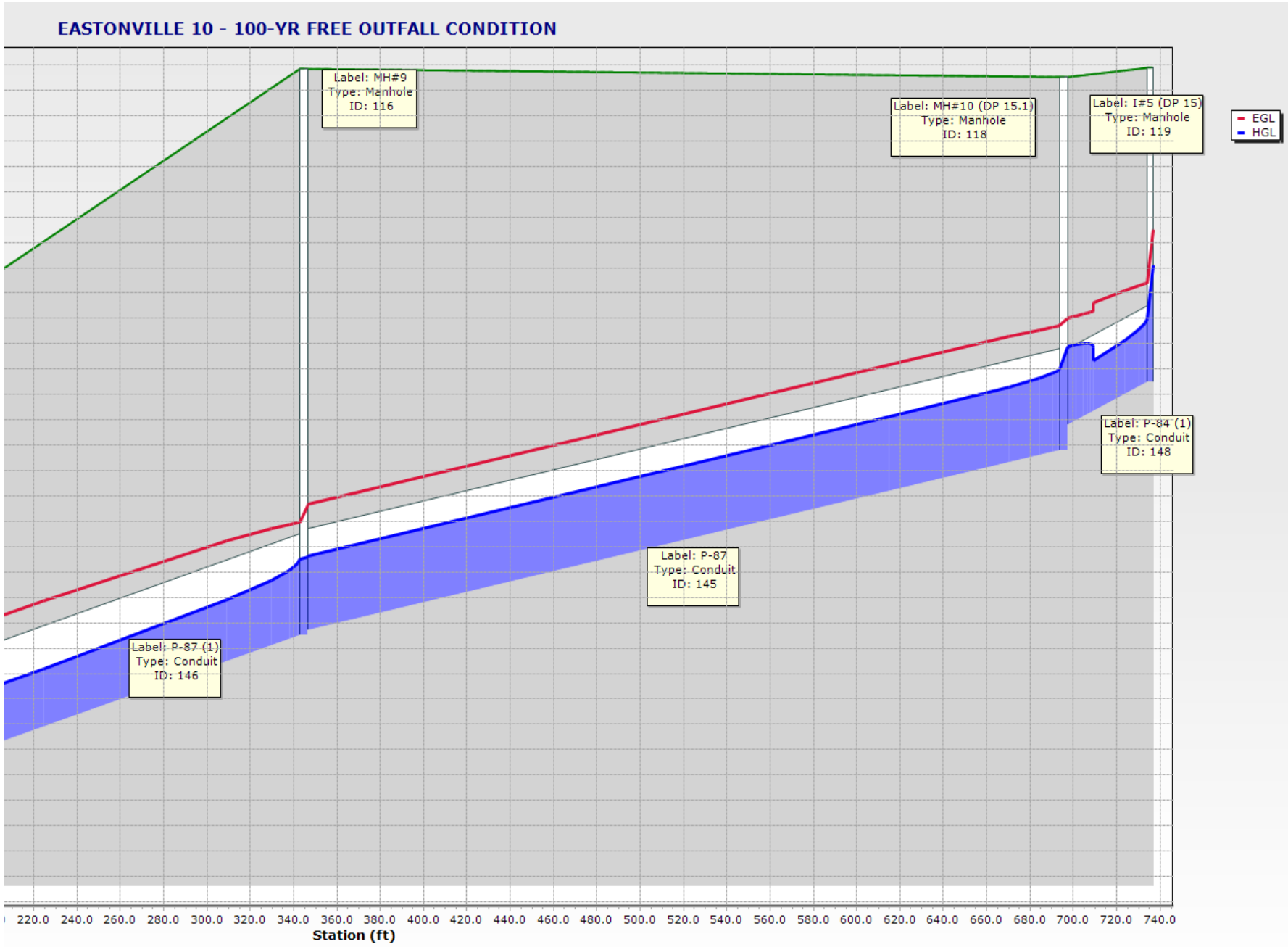
NOTE: SEE PROFILES BELOW FOR PIPES STUDIED WITH THIS ANALYSIS

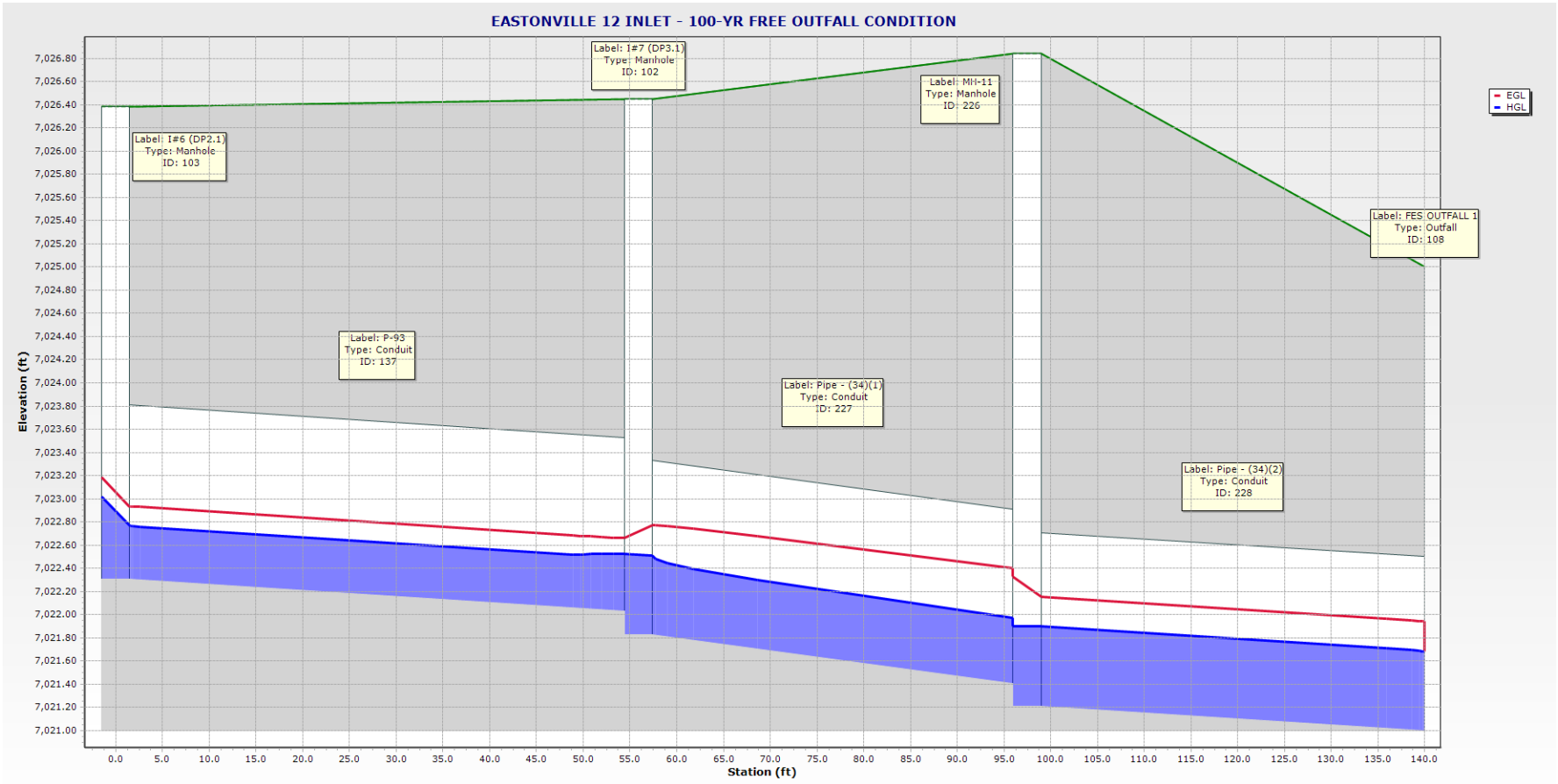
100 YEAR FREE OUTFALL CONDITION: STRUCTURE SUMMARY TABLE

	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)
98: MH#26 (D	7,026.97	7,026.97	7,021.74	40.20	7,022.88	Standard	7,024.41
99: MH#27 (D	7,027.08	7,027.08	7,022.72	29.20	7,024.70	Standard	7,025.19
100: I#9 (DP6)	7,026.99	7,026.99	7,022.67	16.00	7,024.62	Standard	7,024.88
101: I#8 (DP5)	7,027.04	7,027.04	(N/A)	4.90	7,024.98	Standard	7,025.16
102: I#7 (DP3.	7,026.45	7,026.45	7,022.03	3.20	7,022.51	Standard	7,022.52
103: I#6 (DP2.	7,026.38	7,026.38	(N/A)	1.50	7,022.77	Standard	7,023.02
106: MH#34	7,025.00	7,025.00	(N/A)	1.00	7,019.04	Standard	7,019.11
111: DP11.1	7,016.78	7,016.78	6,999.51	113.90	7,001.75	Standard	7,004.01
112: MH#20	7,015.43	7,015.43	7,003.84	54.90	7,006.15	Standard	7,006.21
113: MH#19	7,014.08	7,014.08	7,006.80	54.90	7,008.91	Standard	7,010.58
115: MH#22	7,005.85	7,005.85	6,995.26	113.90	6,998.38	Standard	6,998.46
116: MH#9	7,000.92	7,000.92	6,989.86	17.20	6,991.26	Standard	6,991.29
117: I#4 (DP1	7,000.75	7,000.75	(N/A)	9.40	6,995.44	Standard	6,996.35
118: MH#10 (	7,000.75	7,000.75	6,993.91	19.90	6,995.01	Standard	6,995.45
119: I#5 (DP 1	7,000.94	7,000.94	(N/A)	10.60	6,995.99	Standard	6,997.05
121: MH#23	6,997.20	6,997.20	6,988.82	113.90	6,995.41	Standard	6,995.48
122: MH#24	6,996.25	6,996.25	6,988.00	113.90	6,994.41	Standard	6,994.48
123: DP12	6,996.40	6,996.40	(N/A)	24.60	6,993.77	Standard	6,994.05
124: MH#25 (	6,995.75	6,995.75	6,987.50	138.50	6,992.04	Standard	6,993.73
192: DP 7	7,027.00	7,027.00	(N/A)	2.00	7,025.20	Standard	7,025.23
193: DP G15a1	7,027.00	7,027.00	(N/A)	27.70	7,025.39	Standard	7,026.13
194: DP G16b	7,013.60	7,013.60	(N/A)	54.90	7,011.13	Standard	7,012.54
224: DP G16a	7,010.95	7,010.95	(N/A)	59.00	7,004.68	Absolute	7,004.68
226: MH-11	7,026.84	7,026.84	7,021.41	3.20	7,021.90	Absolute	7,021.90
229: MH-12	7,024.52	7,024.52	7,018.57	1.00	7,018.74	Absolute	7,018.74

	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
107: DP G15a	7,023.44	7,020.44	Free Outfall		7,022.50	40.20
108: FES OUTF	7,025.00	7,021.00	Free Outfall		7,021.68	3.20
110: MH#39	7,018.27	7,016.77	Free Outfall		7,017.08	1.00
125: OUTLET S	6,991.09	6,986.67	Free Outfall		6,990.17	138.50

NOTE: SEE PROFILES BELOW FOR PIPES STUDIED WITH THIS ANALYSIS


EASTONVILLE 10 - 100-YR FREE OUTFALL CONDITION
Label: MH#9
Type: Manhole
ID: 116
Label: MH#10 (DP 15.1)
Type: Manhole
ID: 118
Label: I#5 (DP 15)
Type: Manhole
ID: 119
EGL
HGL
Label: P-84 (1)
Type: Conduit
ID: 148
Label: P-87
Type: Conduit
ID: 145
Label: P-87 (1)
Type: Conduit
ID: 146
220.0 240.0 260.0 280.0 300.0 320.0 340.0 360.0 380.0 400.0 420.0 440.0 460.0 480.0 500.0 520.0 540.0 560.0 580.0 600.0 620.0 640.0 660.0 680.0 700.0 720.0 740.0
Station (ft)


EASTONVILLE 12 INLET - 100-YR FREE OUTFALL CONDITION
Label: I#7 (DP3.1)
Type: Manhole
ID: 102
Label: MH-11
Type: Manhole
ID: 226
Label: I#6 (DP2.1)
Type: Manhole
ID: 103
Label: FES OUTFALL 1
Type: Outfall
ID: 108
Label: P-93
Type: Conduit
ID: 137
Label: Pipe - (34)(1)
Type: Conduit
ID: 227
Label: Pipe - (34)(2)
Type: Conduit
ID: 228
EGL
HGL
Elevation (ft)
7,026.80
7,026.60
7,026.40
7,026.20
7,026.00
7,025.80
7,025.60
7,025.40
7,025.20
7,025.00
7,024.80
7,024.60
7,024.40
7,024.20
7,024.00
7,023.80
7,023.60
7,023.40
7,023.20
7,023.00
7,022.80
7,022.60
7,022.40
7,022.20
7,022.00
7,021.80
7,021.60
7,021.40
7,021.20
7,021.00
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
105.0
110.0
115.0
120.0
125.0
130.0
135.0
140.0
Station (ft)

5 YEAR FREE OUTFALL CONDITION: PIPE SUMMARY TABLE

	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
131: P-107 (2)	MH#26 (DP6.1)	7,020.74	DP G15a	7,020.44	60.7	0.005	36.0	0.013	9.00	5.12	46.89	19.2	7,021.69	7,021.33
132: P-103	I#9 (DP6)	7,022.17	MH#26 (DP6.1)	7,021.74	42.7	0.010	24.0	0.013	5.90	6.07	22.71	26.0	7,023.03	7,022.44
133: P-107 (2)	MH#27 (DP8)	7,021.52	MH#26 (DP6.1)	7,021.24	56.6	0.005	30.0	0.013	4.90	4.38	28.85	17.0	7,022.25	7,022.29
134: P-107	DP 7	7,023.01	MH#27 (DP8)	7,022.72	37.8	0.008	18.0	0.013	0.40	2.60	9.21	4.3	7,023.24	7,022.93
135: P-107 (1)	MH#27 (DP8)	7,021.72	DP G15a1	7,022.00	43.9	-0.006	30.0	0.013	4.60	4.71	32.77	14.0	7,022.71	7,022.49
136: P-95	I#8 (DP5)	7,023.14	I#9 (DP6)	7,022.67	47.5	0.010	18.0	0.013	2.40	4.80	10.45	23.0	7,023.73	7,023.16
137: P-93	I#6 (DP2.1)	7,022.31	I#7 (DP3.1)	7,022.03	55.9	0.005	18.0	0.013	0.80	2.75	7.43	10.8	7,022.64	7,022.36
140: P-44 (1)	MH#20	7,003.74	DP11.1	6,999.51	266.5	0.016	36.0	0.013	11.00	8.22	84.03	13.1	7,004.79	7,000.63
141: P-64	DP11.1	6,998.52	MH#22	6,995.26	316.5	0.010	48.0	0.013	23.00	8.47	145.88	15.8	6,999.94	6,996.33
142: P-44	MH#19	7,006.50	MH#20	7,003.84	266.5	0.010	36.0	0.013	11.00	6.97	66.63	16.5	7,007.55	7,004.66
143: P-26	DP G16b	7,007.68	MH#19	7,006.80	81.5	0.011	36.0	0.013	11.00	7.17	69.32	15.9	7,008.73	7,008.06
144: P-64 (1)	MH#22	6,995.15	MH#23	6,988.82	316.6	0.020	48.0	0.013	23.00	10.72	203.15	11.3	6,996.57	6,990.26
145: P-87	MH#10 (DP 1...	6,993.41	MH#9	6,989.86	350.8	0.010	24.0	0.013	10.20	7.04	22.76	44.8	6,994.55	6,990.80
146: P-87 (1)	MH#9	6,989.76	MH#8	6,986.86	193.5	0.015	24.0	0.013	10.20	8.15	27.70	36.8	6,990.90	6,988.20
147: P-84	I#4 (DP14)	6,994.25	MH#10 (DP 1...	6,993.91	15.1	0.023	18.0	0.013	5.20	8.00	15.77	33.0	6,995.13	6,994.80
148: P-84 (1)	I#5 (DP 15)	6,994.74	MH#10 (DP 1...	6,993.91	39.7	0.021	18.0	0.013	5.00	7.70	15.18	32.9	6,995.60	6,994.80
149: P-66	MH#23	6,988.82	MH#24	6,988.00	149.0	0.006	48.0	0.013	23.00	6.77	106.64	21.6	6,990.24	6,989.44
150: P-68	MH#24	6,988.00	MH#25 (DP13)	6,987.50	107.8	0.005	48.0	0.013	23.00	6.36	97.84	23.5	6,989.42	6,989.55
151: P-77	DP12	6,990.32	MH#25 (DP13)	6,989.50	28.1	0.029	36.0	0.013	3.90	7.49	113.85	3.4	6,990.94	6,989.90
152: P-74	MH#25 (DP13)	6,987.50	OUTLET SEG...	6,986.67	173.3	0.005	48.0	0.013	27.00	6.73	99.34	27.2	6,989.04	6,988.30
225: P-42	DP G16a	7,001.22	DP11.1	6,999.51	85.7	0.020	36.0	0.013	12.00	9.14	94.22	12.7	7,002.32	7,000.63
227: Pipe - (34	I#7 (DP3.1)	7,021.83	MH-11	7,021.41	41.5	0.010	18.0	0.013	1.60	4.31	10.56	15.1	7,022.31	7,021.80
228: Pipe - (34	MH-11	7,021.21	FES OUTFALL 1	7,021.00	42.5	0.005	18.0	0.013	1.60	3.34	7.38	21.7	7,021.69	7,021.47
230: P-111(1)	MH#34	7,018.67	MH-12	7,018.57	20.4	0.005	18.0	0.013	0.10	1.46	7.35	1.4	7,018.79	7,018.69
231: P-111(2)	MH-12	7,018.37	MH#39	7,016.77	158.3	0.010	18.0	0.013	0.10	1.89	10.56	0.9	7,018.49	7,016.87

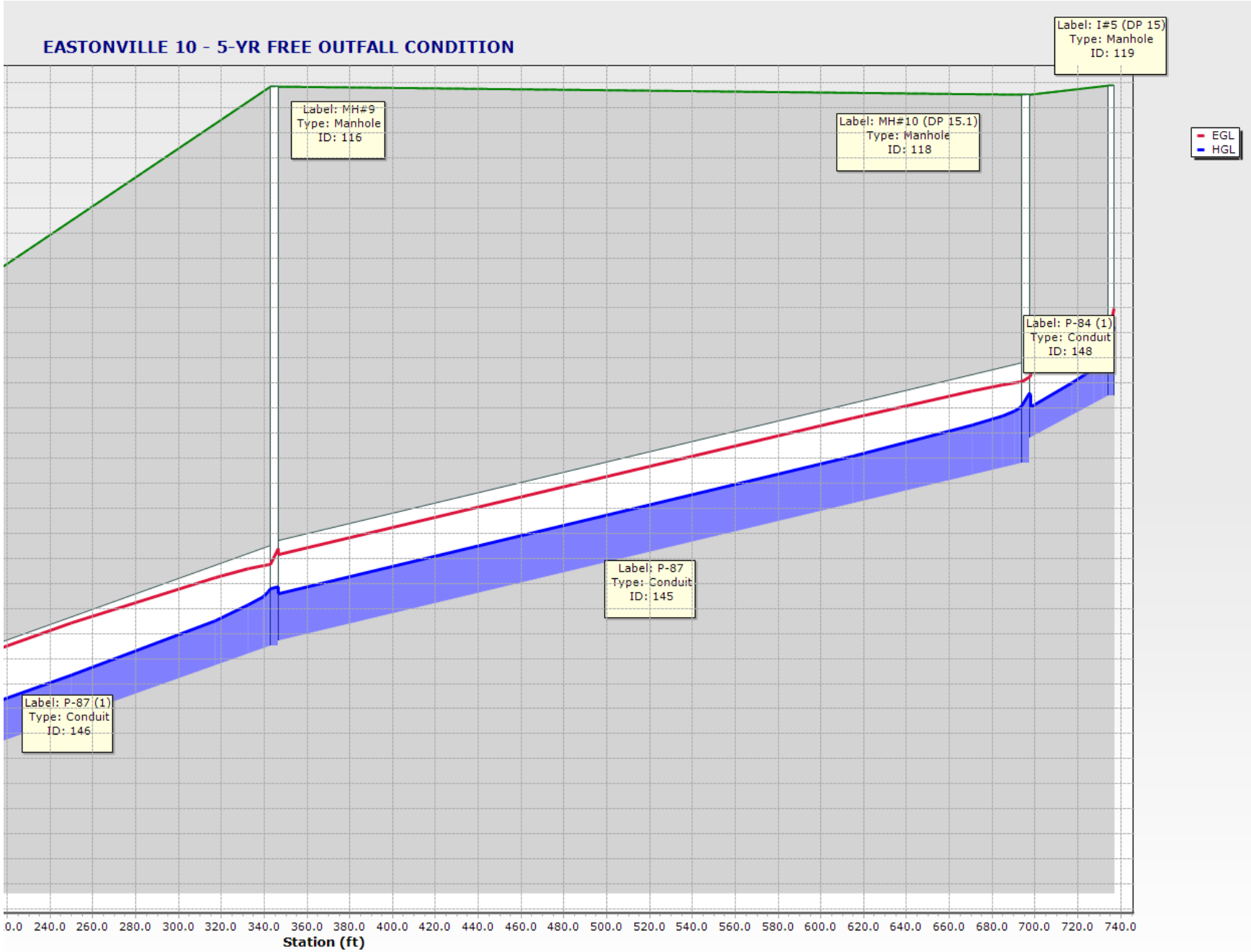
NOTE: SEE PROFILES BELOW FOR PIPES STUDIED WITH THIS ANALYSIS

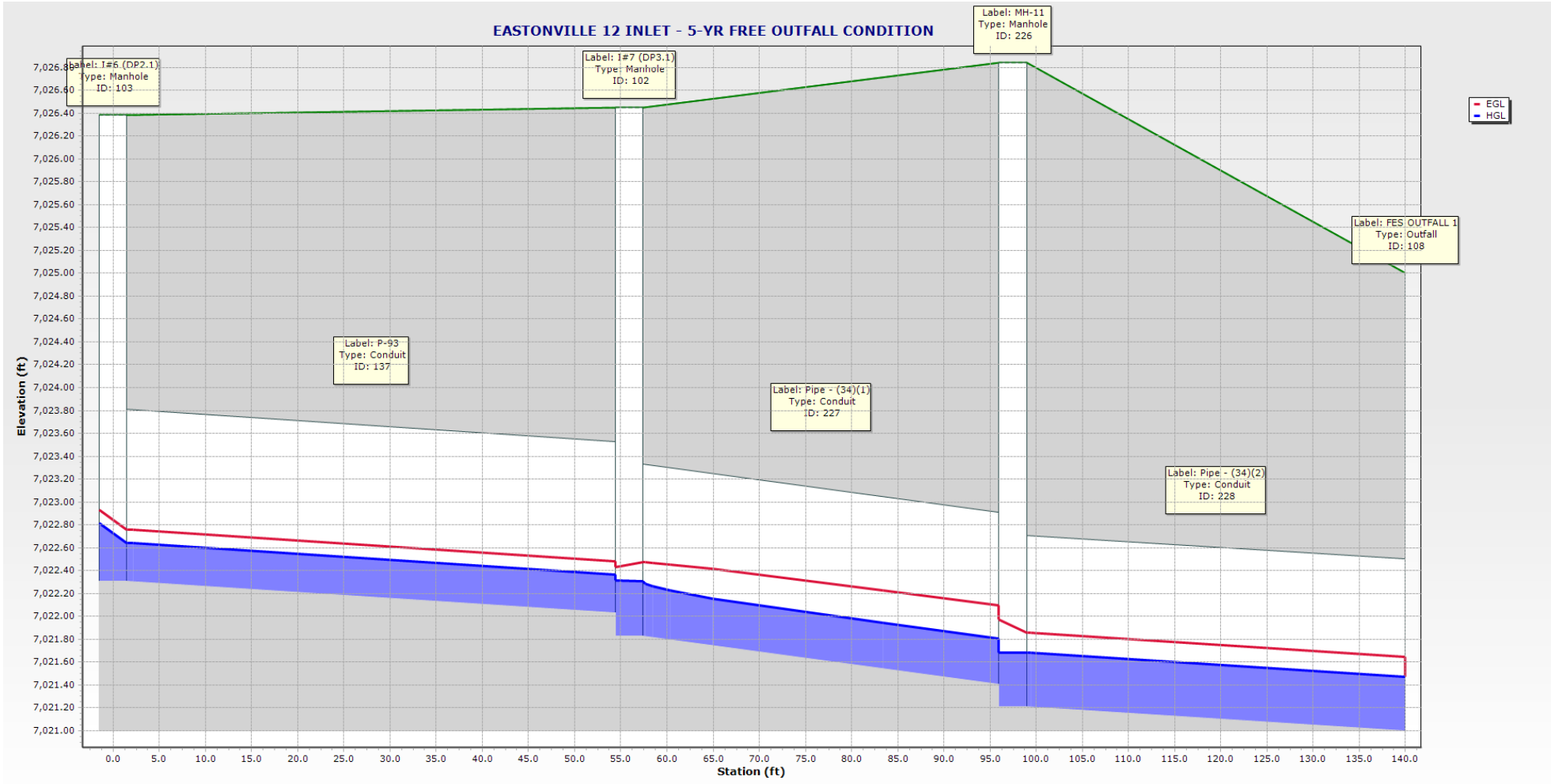
5 YEAR FREE OUTFALL CONDITION: STRUCTURE SUMMARY TABLE

	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)
98: MH#26 (D	7,026.97	7,026.97	7,021.74	9.00	7,021.69	Standard	7,022.29
99: MH#27 (D	7,027.08	7,027.08	7,022.72	4.90	7,022.25	Standard	7,022.49
100: I#9 (DP6)	7,026.99	7,026.99	7,022.67	5.90	7,023.03	Standard	7,023.24
101: I#8 (DP5)	7,027.04	7,027.04	(N/A)	2.40	7,023.73	Standard	7,024.05
102: I#7 (DP3.	7,026.45	7,026.45	7,022.03	1.60	7,022.31	Standard	7,022.31
103: I#6 (DP2.	7,026.38	7,026.38	(N/A)	0.80	7,022.64	Standard	7,022.82
106: MH#34	7,025.00	7,025.00	(N/A)	0.10	7,018.79	Standard	7,018.81
111: DP11.1	7,016.78	7,016.78	6,999.51	23.00	6,999.94	Standard	7,000.63
112: MH#20	7,015.43	7,015.43	7,003.84	11.00	7,004.79	Standard	7,004.81
113: MH#19	7,014.08	7,014.08	7,006.80	11.00	7,007.55	Standard	7,008.06
115: MH#22	7,005.85	7,005.85	6,995.26	23.00	6,996.57	Standard	6,996.60
116: MH#9	7,000.92	7,000.92	6,989.86	10.20	6,990.90	Standard	6,990.93
117: I#4 (DP1	7,000.75	7,000.75	(N/A)	5.20	6,995.13	Standard	6,995.67
118: MH#10 (	7,000.75	7,000.75	6,993.91	10.20	6,994.55	Standard	6,994.80
119: I#5 (DP 1	7,000.94	7,000.94	(N/A)	5.00	6,995.60	Standard	6,996.13
121: MH#23	6,997.20	6,997.20	6,988.82	23.00	6,990.24	Standard	6,990.26
122: MH#24	6,996.25	6,996.25	6,988.00	23.00	6,989.42	Standard	6,989.44
123: DP12	6,996.40	6,996.40	(N/A)	3.90	6,990.94	Standard	6,991.26
124: MH#25 (	6,995.75	6,995.75	6,987.50	27.00	6,989.04	Standard	6,989.55
192: DP 7	7,027.00	7,027.00	(N/A)	0.40	7,023.24	Standard	7,023.36
193: DP G15a1	7,027.00	7,027.00	(N/A)	4.60	7,022.71	Standard	7,023.09
194: DP G16b	7,013.60	7,013.60	(N/A)	11.00	7,008.73	Standard	7,009.31
224: DP G16a	7,010.95	7,010.95	(N/A)	12.00	7,002.32	Absolute	7,002.32
226: MH-11	7,026.84	7,026.84	7,021.41	1.60	7,021.69	Absolute	7,021.69
229: MH-12	7,024.52	7,024.52	7,018.57	0.10	7,018.49	Absolute	7,018.49

	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
107: DP G15a	7,023.44	7,020.44	Free Outfall		7,021.33	9.00
108: FES OUTF	7,025.00	7,021.00	Free Outfall		7,021.47	1.60
110: MH#39	7,018.27	7,016.77	Free Outfall		7,016.87	0.10
125: OUTLET S	6,991.09	6,986.67	User Defined Tailwater	6,988.30	6,988.30	27.00

NOTE: SEE PROFILES BELOW FOR PIPES STUDIED WITH THIS ANALYSIS


EASTONVILLE 10 - 5-YR FREE OUTFALL CONDITION
Label: I#5 (DP 15)
Type: Manhole
ID: 119
Label: MH#9
Type: Manhole
ID: 116
Label: MH#10 (DP 15.1)
Type: Manhole
ID: 118
EGL
HGL
Label: P-84 (1)
Type: Conduit
ID: 148
Label: P-87
Type: Conduit
ID: 145
Label: P-87 (1)
Type: Conduit
ID: 146
0.0 240.0 260.0 280.0 300.0 320.0 340.0 360.0 380.0 400.0 420.0 440.0 460.0 480.0 500.0 520.0 540.0 560.0 580.0 600.0 620.0 640.0 660.0 680.0 700.0 720.0 740.0
Station (ft)


EASTONVILLE 12 INLET - 5-YR FREE OUTFALL CONDITION
Label: I#6 (DP2.1)
Type: Manhole
ID: 103
Label: I#7 (DP3.1)
Type: Manhole
ID: 102
Label: MH-11
Type: Manhole
ID: 226
Label: FES OUTFALL 1
Type: Outfall
ID: 108
Label: P-93
Type: Conduit
ID: 137
Label: Pipe - (34)(1)
Type: Conduit
ID: 227
Label: Pipe - (34)(2)
Type: Conduit
ID: 228
EGL
HGL
Elevation (ft)
Station (ft)

APPENDIX D – WATER QUALITY & DETENTION

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 2**

Designer: SPC
Company: HR Green
Date: October 16, 2024
Project: Eastonville Road - Segment 2 Improvements SFB C
Location: El Paso County, CO

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a
(100% if all paved and roofed areas upstream of sand filter) — I_a = 54.0 %

B) Tributary Area's Imperviousness Ratio (i = I_a/100) — i = 0.540

C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time
WQCV= 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i) — WQCV = 0.17 watershed inches

D) Contributing Watershed Area (including sand filter area) — Area = 27,443 sq ft

E) Water Quality Capture Volume (WQCV) Design Volume
V_{WQCV} = WQCV / 12 * Area — V_{WQCV} = cu ft

F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = in

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume — $V_{WQCV\ OTHER}$ = cu ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired) — $V_{WQCV\ USER}$ = 409 cu ft

2. Basin Geometry

A) WQCV Depth — D_{WQCV} = 0.7 ft

B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls. — Z = 3.00 ft / ft
DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

C) Minimum Filter Area (Flat Surface Area) — A_{Min} = 185 sq ft

D) Actual Filter Area — ✓ A_{Actual} = 461 sq ft

E) Volume Provided — V_T = 6263 cu ft

3. Filter Material

Choose One
(●) 18" CDOT Class B or C Filter Material
( ) Other (Explain):

4. Underdrain System

A) Are underdrains provided?

Choose One
(●) YES
( ) NO

B) Underdrain system orifice diameter for 12 hour drain time

Refer to MHFD Detention Calcs

i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice

ii) Volume to Drain in 12 Hours

iii) Orifice Diameter, 3/8" Minimum

Design Procedure Form: Sand Filter (SF)

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5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	Engery dissapation at inlet points provided via riprap, and means of conveying flows in excess of the WQCV through the outlet is via the modified type 'C' inlet outlet structure grate, and a restricted outlet pipe.

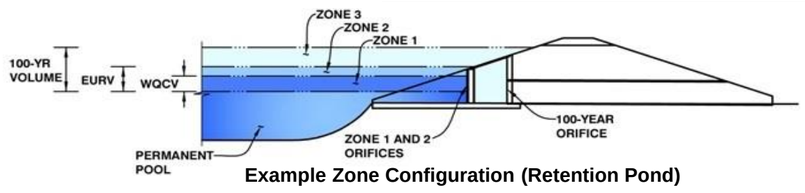
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: **Eastonville Road**

Basin ID: **SFB C**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**SF**	
Watershed Area =	0.63	acres
Watershed Length =	171	ft
Watershed Length to Centroid =	85	ft
Watershed Slope =	0.018	ft/ft
Watershed Imperviousness =	54.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	12.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.009	acre-feet	0.009	acre-feet
Excess Urban Runoff Volume (EURV) =	0.037	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.93 in.) =	0.023	acre-feet	0.93	inches
5-yr Runoff Volume (P1 = 1.21 in.) =	0.032	acre-feet	1.21	inches
10-yr Runoff Volume (P1 = 1.46 in.) =	0.043	acre-feet	1.46	inches
25-yr Runoff Volume (P1 = 1.84 in.) =	0.063	acre-feet	1.84	inches
50-yr Runoff Volume (P1 = 2.16 in.) =	0.079	acre-feet	2.16	inches
100-yr Runoff Volume (P1 = 2.49 in.) =	0.097	acre-feet	2.49	inches
500-yr Runoff Volume (P1 = 3.37 in.) =	0.142	acre-feet	3.37	inches
Approximate 2-yr Detention Volume =	0.022	acre-feet		
Approximate 5-yr Detention Volume =	0.031	acre-feet		
Approximate 10-yr Detention Volume =	0.041	acre-feet		
Approximate 25-yr Detention Volume =	0.050	acre-feet		
Approximate 50-yr Detention Volume =	0.054	acre-feet		
Approximate 100-yr Detention Volume =	0.062	acre-feet		

Define Zones and Basin Geometry

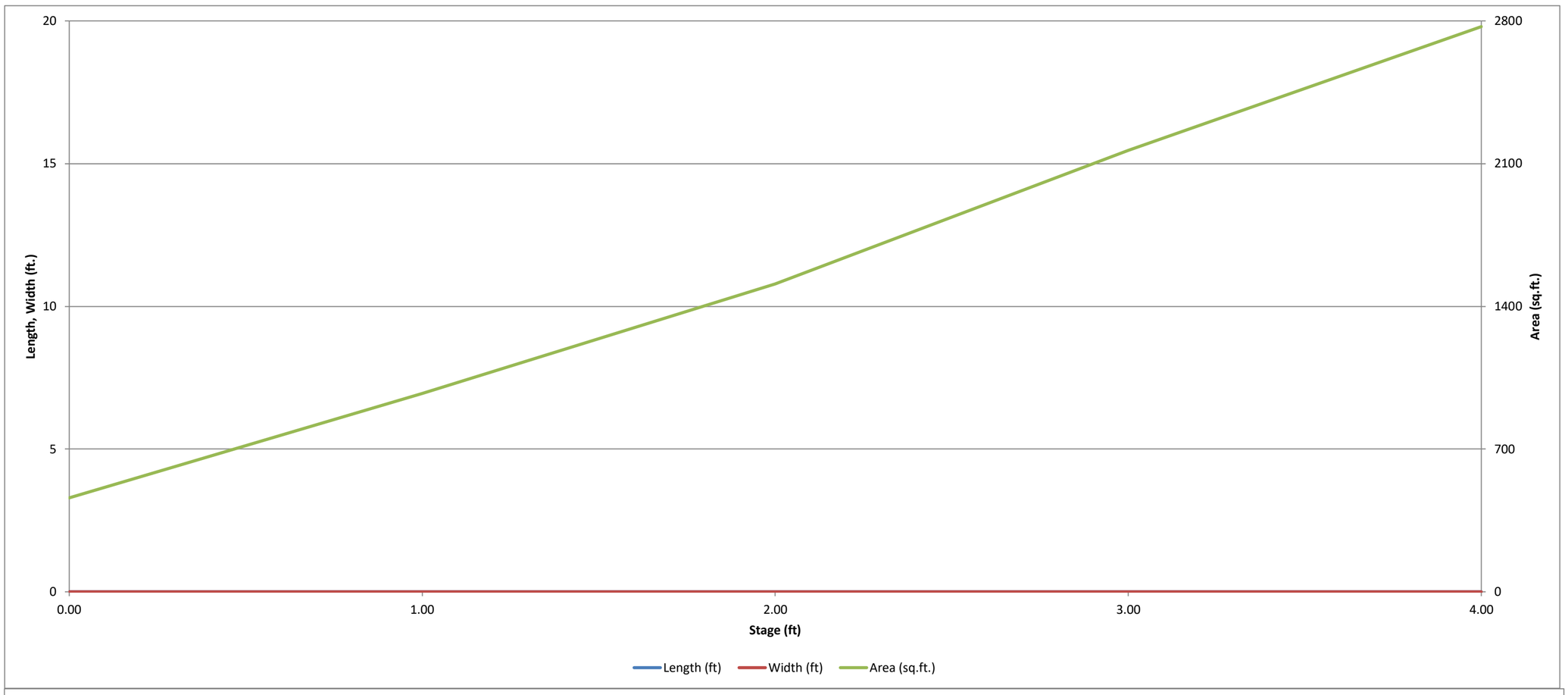
Zone 1 Volume (WQCV) =	0.009	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.027	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.025	acre-feet
Total Detention Basin Volume =	0.062	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	N/A	ft
Slope of Trickle Channel (S_{TC}) =	N/A	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

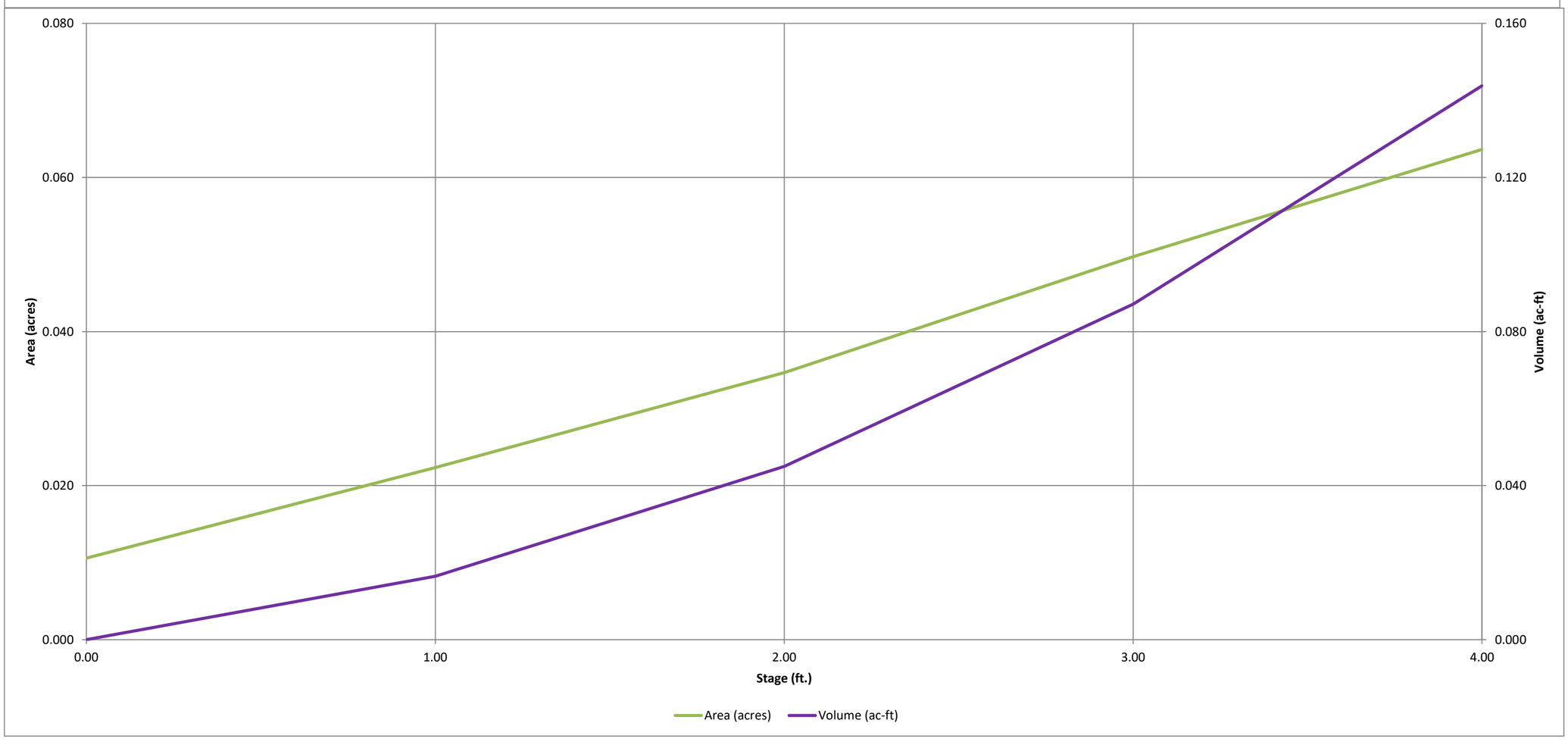
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	461	0.011		
7022	--	1.00	--	--	--	973	0.022	717	0.016
7023	--	2.00	--	--	--	1,509	0.035	1,958	0.045
7024	--	3.00	--	--	--	2,165	0.050	3,795	0.087
7025	--	4.00	--	--	--	2,772	0.064	6,263	0.144

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



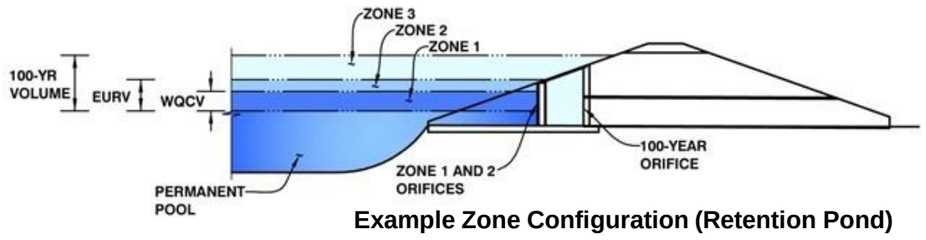


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: **Eastonville Road**

Basin ID: **SFB C**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.66	0.009	Filtration Media
Zone 2 (EURV)	1.75	0.027	Filtration Media
Zone 3 (100-year)	2.44	0.025	Weir&Pipe (Restrict)
Total (all zones)		0.062	

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

			Calculated Parameters for Underdrain		
✓ Underdrain Orifice Invert Depth =	1.98	ft (distance below the filtration media surface)	Underdrain Orifice Area =	0.0	ft^2
✓ Underdrain Orifice Diameter =	0.48	inches	Underdrain Orifice Centroid =	0.02	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		
Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

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		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
✓ Overflow Weir Front Edge Height, Ho =	1.85	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.85	N/A	feet
✓ Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	58.36	N/A	
✓ Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.26	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	3.13	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
✓ Depth to Invert of Outlet Pipe =	2.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.11	N/A	ft^2
✓ Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.10	N/A	feet
✓ Restrictor Plate Height Above Pipe Invert =	2.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.68	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

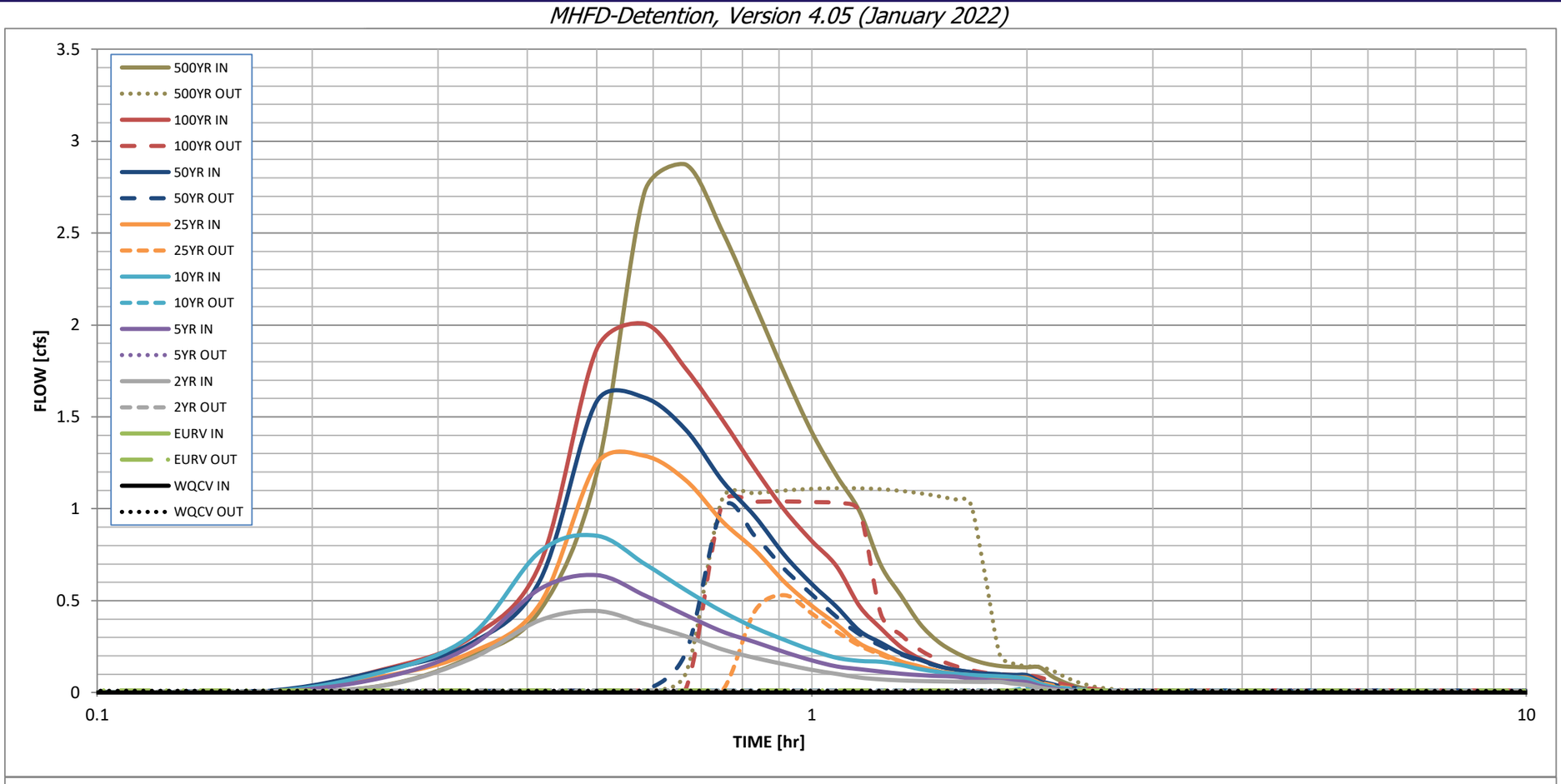
			Calculated Parameters for Spillway		
✓ Spillway Invert Stage=	2.77	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.23	feet
✓ Spillway Crest Length =	5.00	feet	Stage at Top of Freeboard =	4.00	feet
✓ Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.06	acres
✓ Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.14	acre-ft

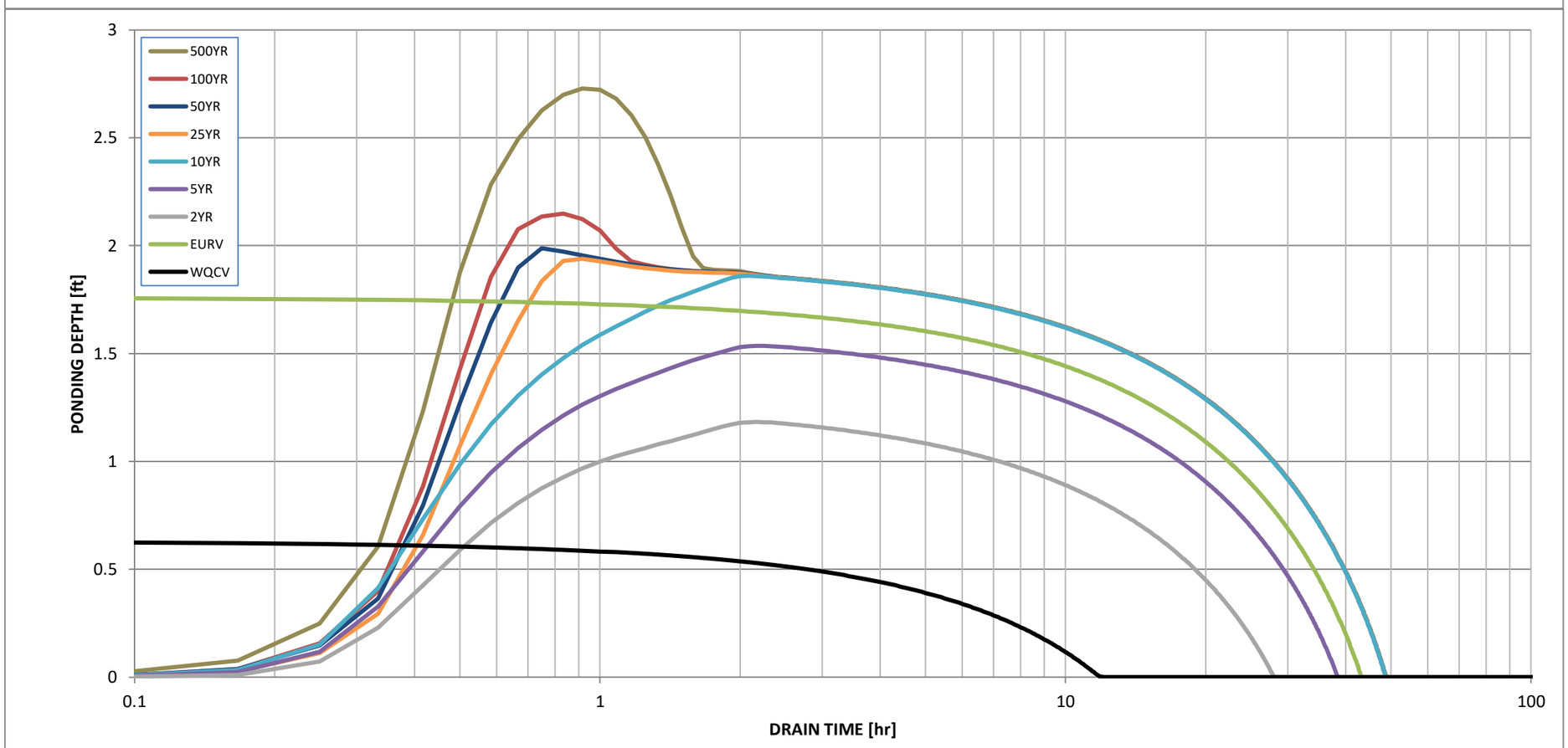
Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

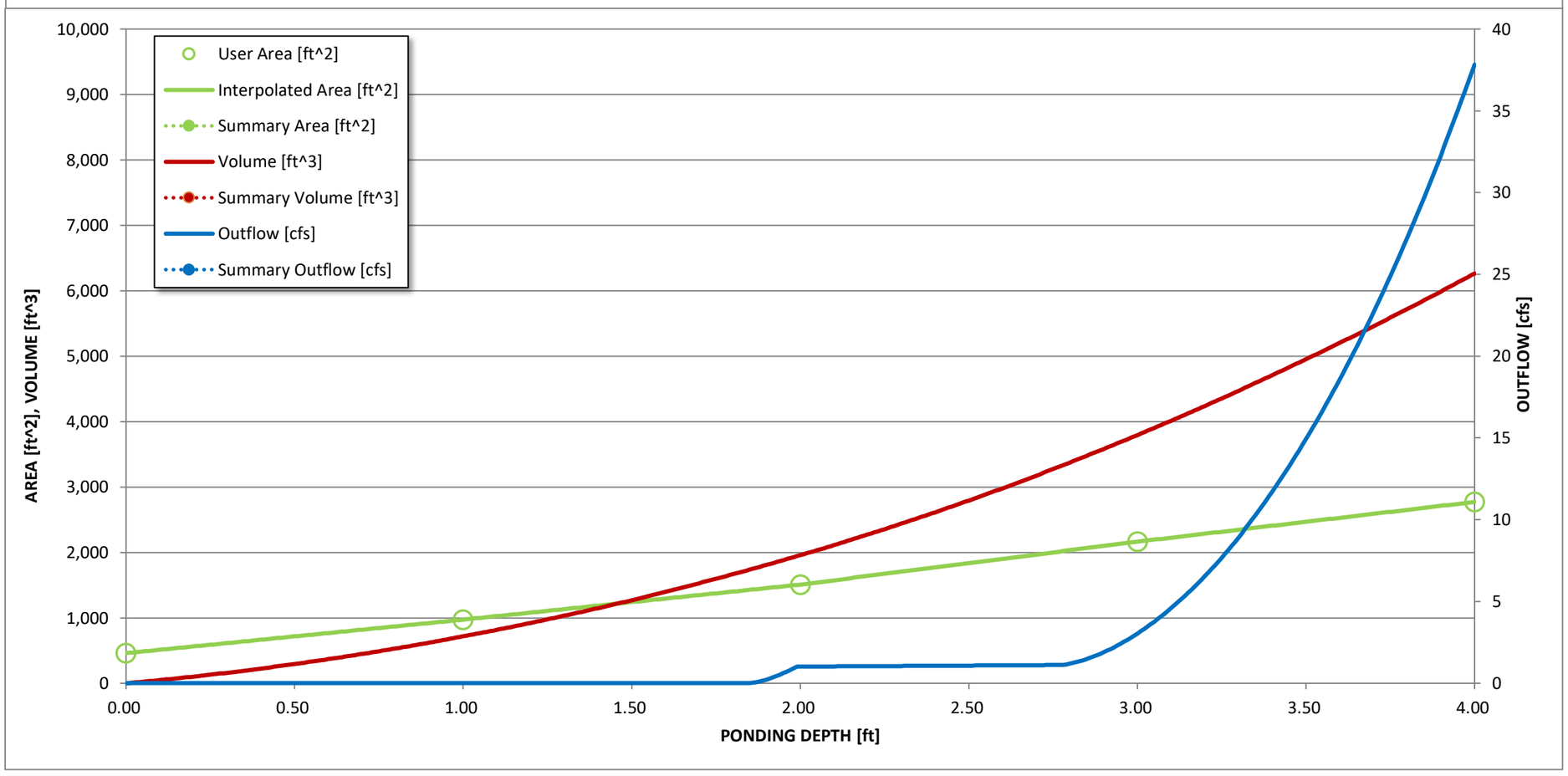
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.93	1.21	1.46	1.84	2.16	2.49	3.37
CUHP Runoff Volume (acre-ft) =	0.009	0.037	0.023	0.032	0.043	0.063	0.079	0.097	0.142
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.023	0.032	0.043	0.063	0.079	0.097	0.142
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.2	0.5	0.8	1.0	1.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.12	0.32	0.87	1.20	1.59	2.49
Peak Inflow Q (cfs) =	N/A	N/A	0.4	0.6	0.9	1.3	1.6	2.0	2.9
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.0	0.5	1.0	1.0	1.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.2	1.0	1.3	1.0	0.7
Structure Controlling Flow =	Filtration Media	Filtration Media	Filtration Media	Filtration Media	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.1	0.2	0.2	0.2
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) =	12	42	27	37	47	46	46	45	43
Time to Drain 99% of Inflow Volume (hours) =	**12**	43	28	38	48	48	48	47	47
Maximum Ponding Depth (ft) =	0.64	1.77	1.18	1.54	1.86	1.94	1.99	2.15	2.73
Area at Maximum Ponding Depth (acres) =	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.05
Maximum Volume Stored (acre-ft) =	0.009	0.037	0.021	0.030	0.040	0.043	0.044	0.050	0.074

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
	0:15:00	0.00	0.00	0.04	0.08	0.11	0.09	0.12	0.12	0.19
	0:20:00	0.00	0.00	0.18	0.25	0.31	0.22	0.27	0.30	0.45
	0:25:00	0.00	0.00	0.39	0.56	0.77	0.48	0.61	0.70	1.19
	0:30:00	0.00	0.00	0.44	0.64	0.85	1.25	1.58	1.87	2.72
	0:35:00	0.00	0.00	0.37	0.53	0.70	1.29	1.60	2.01	2.87
	0:40:00	0.00	0.00	0.31	0.42	0.56	1.15	1.43	1.76	2.51
	0:45:00	0.00	0.00	0.23	0.33	0.44	0.93	1.15	1.48	2.11
	0:50:00	0.00	0.00	0.19	0.27	0.35	0.77	0.96	1.22	1.73
	0:55:00	0.00	0.00	0.15	0.22	0.29	0.60	0.75	0.99	1.42
	1:00:00	0.00	0.00	0.12	0.18	0.23	0.47	0.59	0.83	1.18
	1:05:00	0.00	0.00	0.10	0.14	0.19	0.37	0.47	0.69	0.99
	1:10:00	0.00	0.00	0.08	0.13	0.17	0.27	0.34	0.47	0.69
	1:15:00	0.00	0.00	0.07	0.11	0.17	0.22	0.27	0.35	0.53
	1:20:00	0.00	0.00	0.07	0.10	0.15	0.17	0.21	0.25	0.38
	1:25:00	0.00	0.00	0.06	0.10	0.13	0.14	0.18	0.19	0.28
	1:30:00	0.00	0.00	0.06	0.09	0.11	0.12	0.15	0.15	0.22
	1:35:00	0.00	0.00	0.06	0.09	0.10	0.10	0.12	0.12	0.18
	1:40:00	0.00	0.00	0.06	0.08	0.10	0.09	0.11	0.11	0.16
	1:45:00	0.00	0.00	0.06	0.07	0.09	0.09	0.10	0.10	0.14
	1:50:00	0.00	0.00	0.06	0.06	0.09	0.08	0.10	0.09	0.14
	1:55:00	0.00	0.00	0.05	0.06	0.08	0.08	0.10	0.09	0.14
	2:00:00	0.00	0.00	0.04	0.06	0.08	0.08	0.10	0.09	0.14
	2:05:00	0.00	0.00	0.03	0.04	0.05	0.05	0.06	0.06	0.09
	2:10:00	0.00	0.00	0.02	0.02	0.03	0.03	0.04	0.04	0.06
	2:15:00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.02	0.04
	2:20:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02
	2:25:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	2:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: SPC
Company: HR Green
Date: October 28, 2024
Project: Eastonville Road - Segment 1 Improvements EDB B ULTIMATE CONDITIONS
Location: EL PASO COUNTY, CO

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 66.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.660

C) Contributing Watershed Area — Area = 9.480 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = 0.42 in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- ○ Water Quality Capture Volume (WQCV)
- ◉ Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
V_{DESIGN} = ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$)
$V_{DESIGN\ OTHER}$ = 0.199 ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
$V_{DESIGN\ USER}$ = ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
- i) Percentage of Watershed consisting of Type A Soils — HSG_A = 100 %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = 0 %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = 0 %

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: $EURV_{C/D} = 1.20 * i^{1.08}$
$EURV_{DESIGN}$ = 0.780 ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)
$EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)
L : W = 2.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)
Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)
V_{FMIN} = 0.006 ac-ft

B) Actual Forebay Volume
V_F = 0.006 ac-ft

C) Forebay Depth (D_F = 18 inch maximum)
D_F = 15.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 26.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
Q_F = 0.52 cfs

E) Forebay Discharge Design

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 = 4.3 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: SPC
Company: HR Green
Date: October 28, 2024
Project: Eastonville Road - Segment 1 Improvements EDB B ULTIMATE CONDITIONS
Location: EL PASO COUNTY, CO

6. Trickle Channel

A) Type of Trickle Channel — Choose One: (●) Concrete ( ) Soft Bottom

F) Slope of Trickle Channel — S = 0.0050 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 10 sq ft

C) Outlet Type — Choose One: (●) Orifice Plate ( ) Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = 1.00 inches

E) Total Outlet Area — A_{ot} = 5.50 square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches) — D_{IS} = 4 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV) — V_{IS} = 26 cu ft

C) Initial Surcharge Provided Above Micropool — V_s = 3.3 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$ — A_t = 193 square inches

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 are to the total screen are for the material specified.) — *S.S. Well Screen with 60% Open Area*

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other') — User Ratio =

D) Total Water Quality Screen Area (based on screen type) — A_{total} = 321 sq. in.

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E) — H= 5.05 feet

F) Height of Water Quality Screen (H_{TR}) — H_{TR}= 88.6 inches

G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended) — $W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: SPC
Company: HR Green
Date: October 28, 2024
Project: Eastonville Road - Segment 1 Improvements EDB B ULTIMATE CONDITIONS
Location: EL PASO COUNTY, CO

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ○ Irrigated
- ◉ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

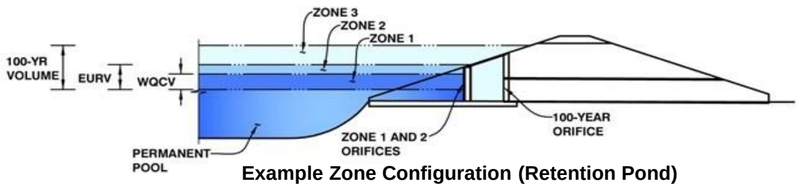
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: **Eastonville Road**

Basin ID: **POND B: Ultimate Conditions (INCLUDES SEGMENT 2 FLOW) [BASINS EA6 - EA11]**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	9.48	acres
Watershed Length =	1,750	ft
Watershed Length to Centroid =	500	ft
Watershed Slope =	0.009	ft/ft
Watershed Imperviousness =	66.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.058	acre-feet	0.058	acre-feet
Excess Urban Runoff Volume (EURV) =	0.780	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.574	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.752	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.895	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.080	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.262	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.482	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	2.400	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	0.508	acre-feet		
Approximate 5-yr Detention Volume =	0.663	acre-feet		
Approximate 10-yr Detention Volume =	0.799	acre-feet		
Approximate 25-yr Detention Volume =	0.961	acre-feet		
Approximate 50-yr Detention Volume =	1.058	acre-feet		
Approximate 100-yr Detention Volume =	1.158	acre-feet		

Define Zones and Basin Geometry

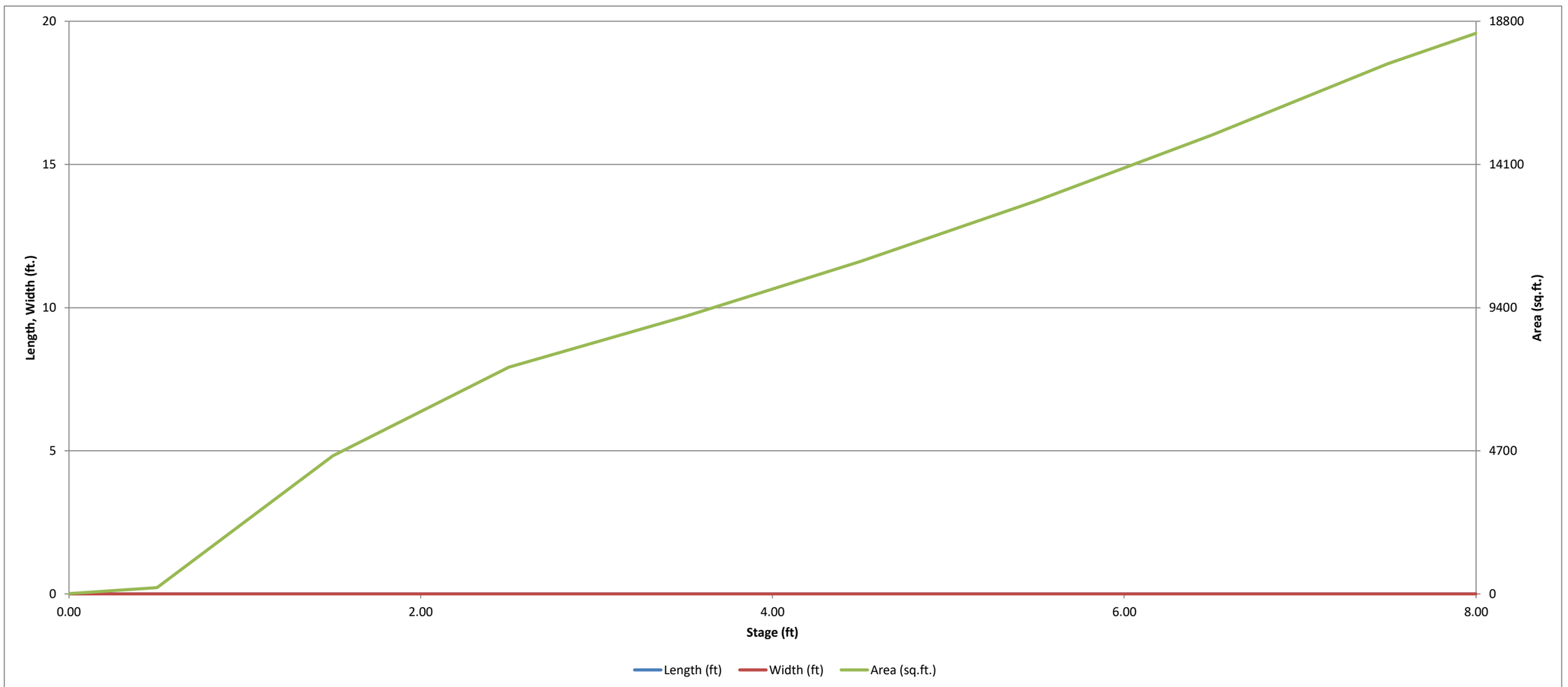
Zone 1 Volume (WQCV) =	0.058	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.722	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.378	acre-feet
Total Detention Basin Volume =	1.158	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

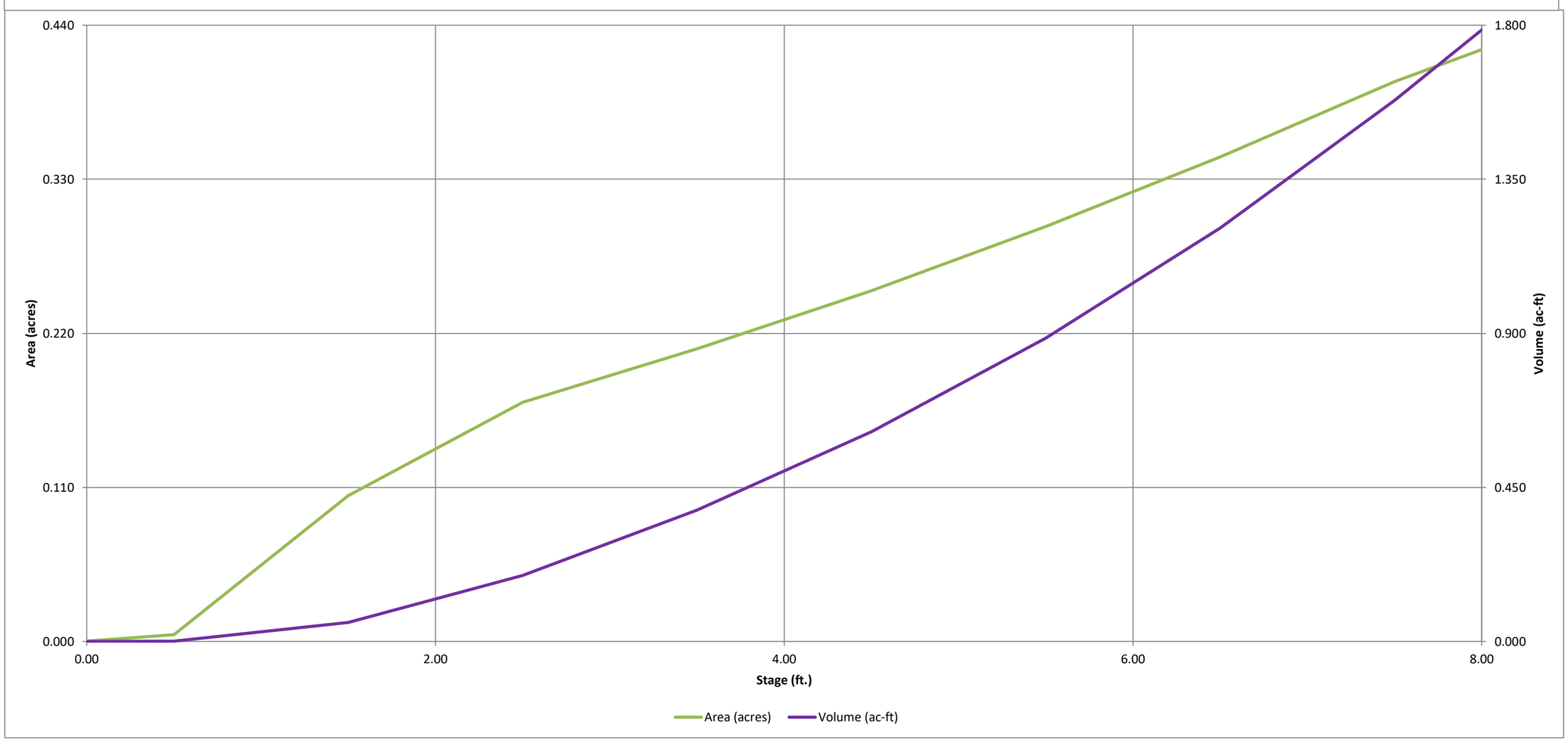
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
6983.5 **Top of Micropool**	--	0.00	--	--	--	10	0.000		
6984	--	0.50	--	--	--	211	0.005	55	0.001
6985	--	1.50	--	--	--	4,539	0.104	2,430	0.056
6986	--	2.50	--	--	--	7,443	0.171	8,421	0.193
6987	--	3.50	--	--	--	9,104	0.209	16,695	0.383
6988	--	4.50	--	--	--	10,914	0.251	26,704	0.613
6989	--	5.50	--	--	--	12,910	0.296	38,616	0.886
6990	--	6.50	--	--	--	15,069	0.346	52,605	1.208
6991	--	7.50	--	--	--	17,408	0.400	68,844	1.580
6991.5	--	8.00	--	--	--	18,407	0.423	77,797	1.786

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



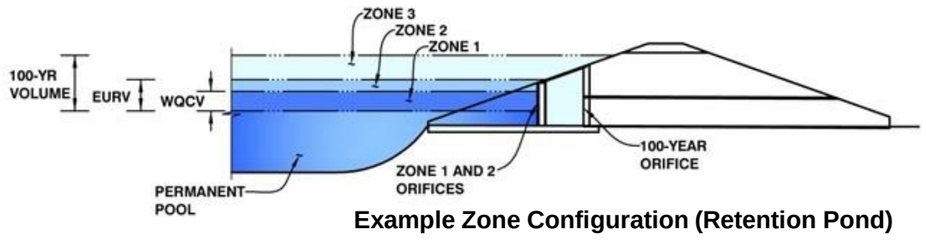


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: **Eastonville Road**

Basin ID: **POND B: Ultimate Conditions (INCLUDES SEGMENT 2 FLOW) [BASINS EA6 - EA11]**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.52	0.058	Orifice Plate
Zone 2 (EURV)	5.13	0.722	Circular Orifice
Zone 3 (100-year)	6.36	0.378	Weir&Pipe (Restrict)
Total (all zones)		1.158	

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	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		
Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.736E-03	ft^2
Depth at top of Zone using Orifice Plate =	1.52	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.25	sq. inches (diameter = 9/16 inch)	Elliptical Slot Area =	N/A	ft^2

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	0.50	1.00					
✓ Orifice Area (sq. inches)	0.25	0.25	0.25					

	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		Calculated Parameters for Vertical Orifice	Zone 2 Circular	Not Selected	
X Invert of Vertical Orifice =	1.60	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.05	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	5.13	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.13	N/A	feet
✓ Vertical Orifice Diameter =	3.00	N/A	inches				

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		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.20	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.20	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	21.42	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	6.26	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	3.13	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.29	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.20	N/A	feet
✓ Restrictor Plate Height Above Pipe Invert =	4.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.98	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.50	feet
Spillway Crest Length =	15.50	feet	Stage at Top of Freeboard =	8.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.42	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.79	acre-ft

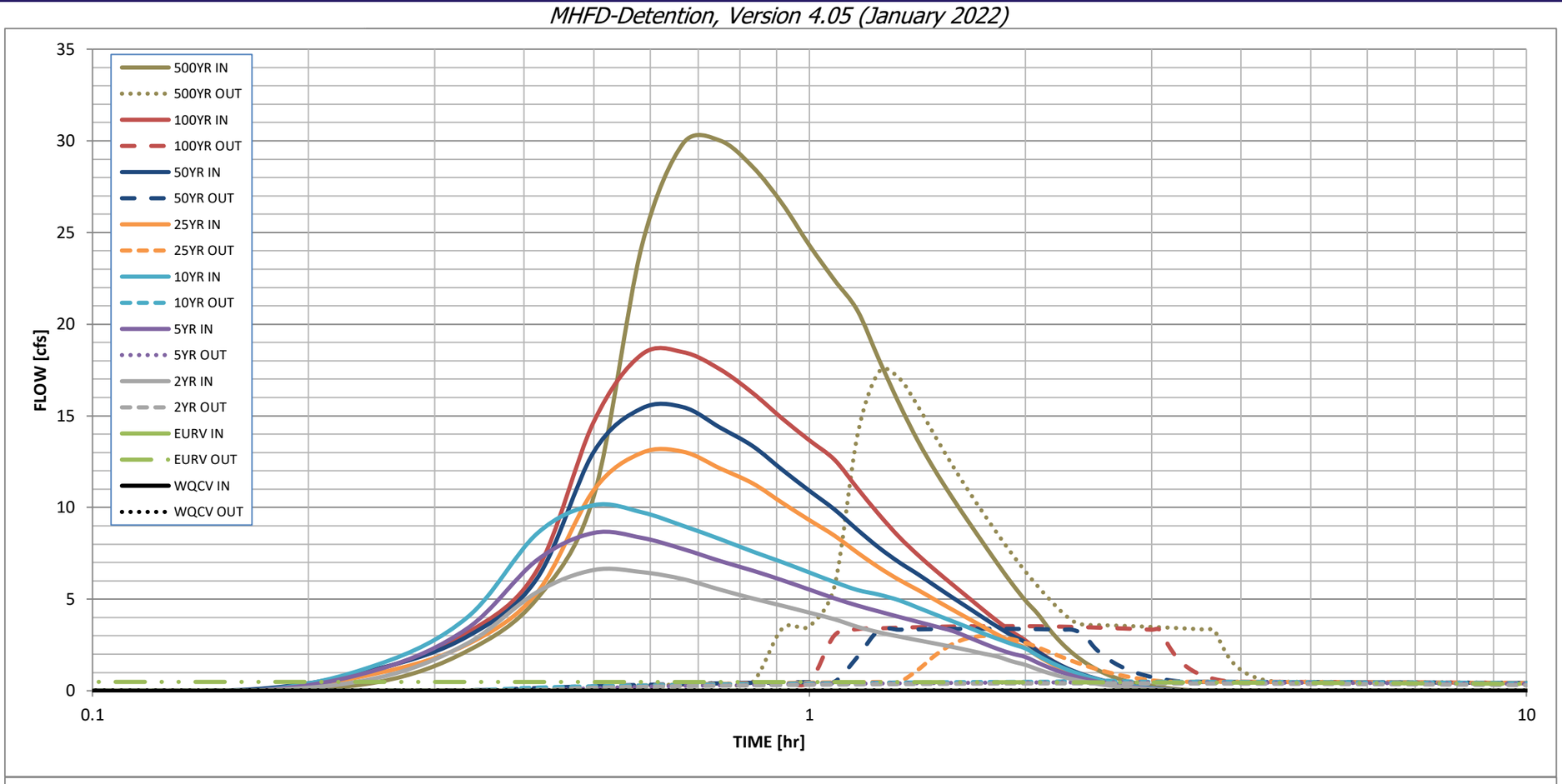
Routed Hydrograph Results

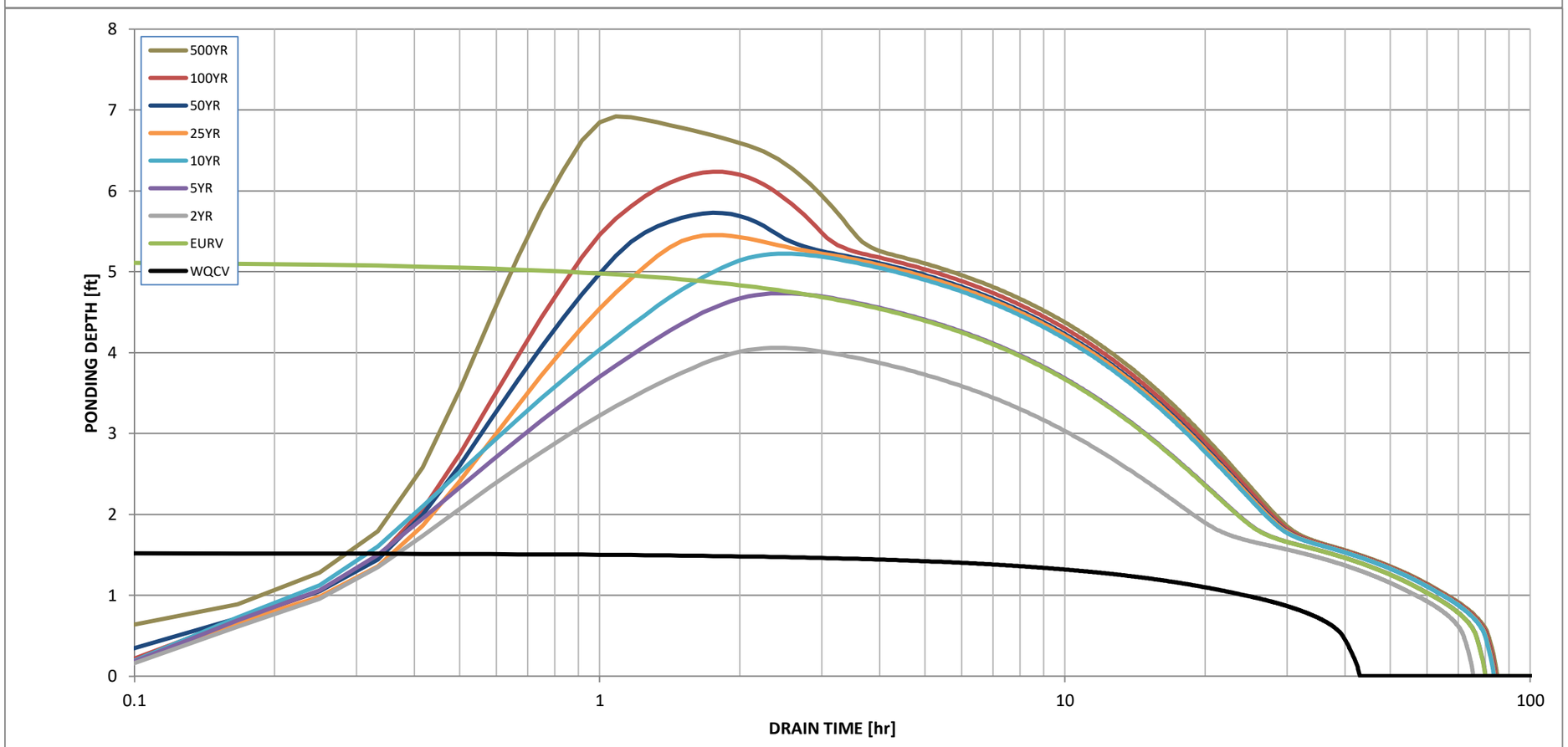
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

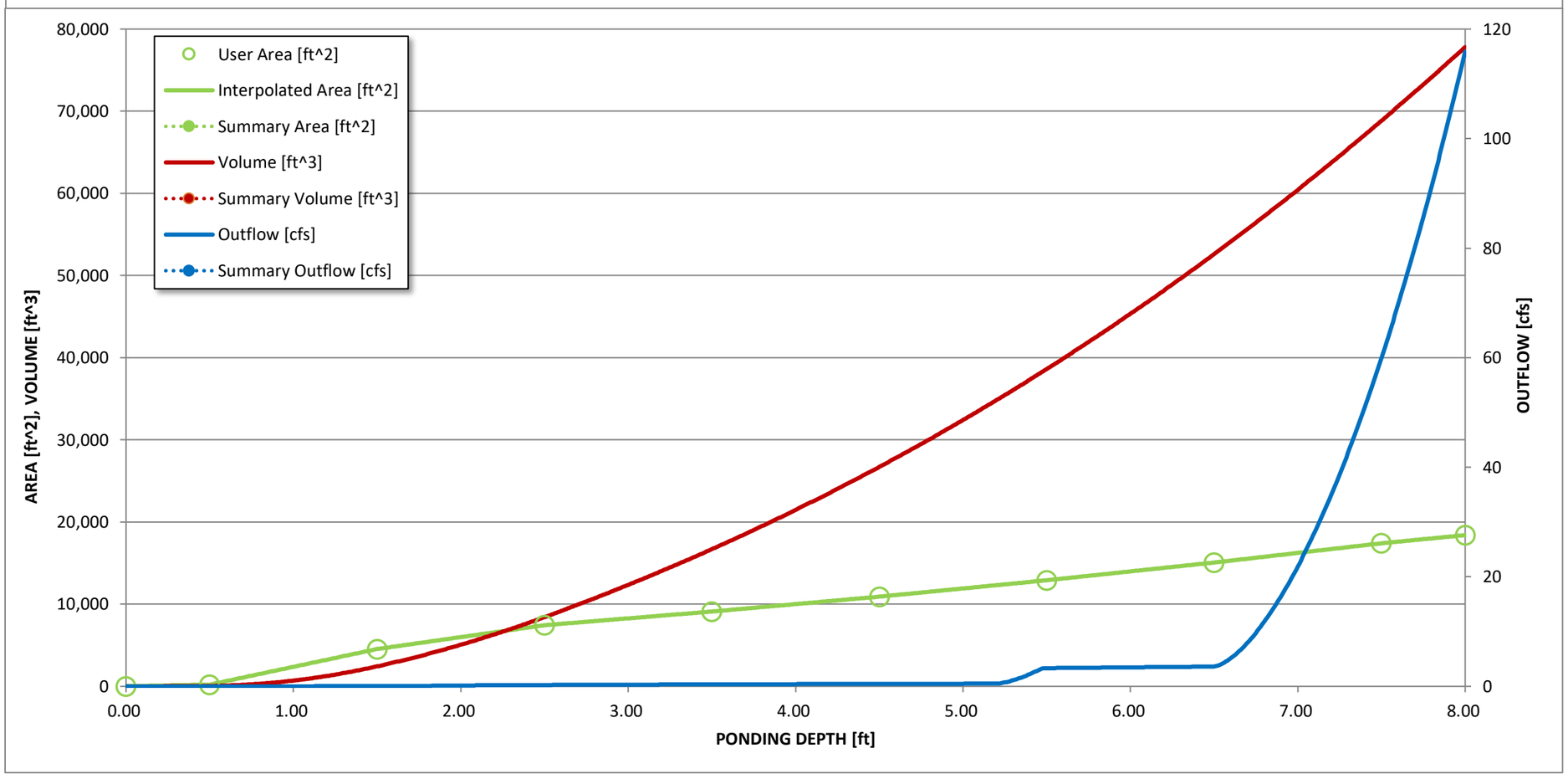
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.058	0.780	0.574	0.752	0.895	1.080	1.262	1.482	2.400
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.574	0.752	0.895	1.080	1.262	1.482	2.400
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.1	1.0	2.1	3.5	9.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.11	0.22	0.37	0.99
Peak Inflow Q (cfs) =	N/A	N/A	6.6	8.6	10.1	13.0	15.5	18.5	30.0
Peak Outflow Q (cfs) =	0.0	0.5	0.4	0.5	0.6	3.0	3.4	3.5	17.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	5.6	4.9	2.9	1.6	1.0	1.9
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 Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.4	0.5	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) =	39	56	56	57	57	54	51	48	35
Time to Drain 99% of Inflow Volume (hours) =	**41**	69	66	69	71	70	68	67	61
Maximum Ponding Depth (ft) =	1.53	5.14	4.06	4.73	5.22	5.45	5.73	6.24	6.92
Area at Maximum Ponding Depth (acres) =	0.11	0.28	0.23	0.26	0.28	0.29	0.31	0.33	0.37
Maximum Volume Stored (acre-ft) =	0.059	0.783	0.504	0.672	0.805	0.872	0.953	1.116	1.354

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.01	0.48
	0:15:00	0.00	0.00	0.71	1.16	1.44	0.97	1.21	1.18	2.18
	0:20:00	0.00	0.00	2.59	3.41	4.01	2.54	2.97	3.17	5.02
	0:25:00	0.00	0.00	5.38	7.13	8.57	5.34	6.11	6.57	10.59
	0:30:00	0.00	0.00	6.59	8.61	10.13	10.94	13.02	14.66	24.23
	0:35:00	0.00	0.00	6.48	8.35	9.74	12.98	15.41	18.34	29.86
	0:40:00	0.00	0.00	6.09	7.73	9.00	13.04	15.47	18.47	30.02
	0:45:00	0.00	0.00	5.52	7.08	8.28	12.14	14.36	17.54	28.58
	0:50:00	0.00	0.00	5.04	6.56	7.60	11.32	13.35	16.24	26.56
	0:55:00	0.00	0.00	4.64	6.03	7.02	10.25	12.05	14.85	24.30
	1:00:00	0.00	0.00	4.26	5.52	6.45	9.31	10.91	13.66	22.41
	1:05:00	0.00	0.00	3.90	5.05	5.93	8.47	9.90	12.61	20.74
	1:10:00	0.00	0.00	3.49	4.65	5.50	7.54	8.78	11.04	18.07
	1:15:00	0.00	0.00	3.19	4.33	5.25	6.73	7.81	9.62	15.67
	1:20:00	0.00	0.00	2.96	4.03	4.94	6.06	7.01	8.40	13.63
	1:25:00	0.00	0.00	2.76	3.76	4.54	5.50	6.36	7.41	11.96
	1:30:00	0.00	0.00	2.57	3.51	4.15	4.94	5.70	6.56	10.51
	1:35:00	0.00	0.00	2.39	3.27	3.80	4.42	5.09	5.79	9.22
	1:40:00	0.00	0.00	2.21	2.92	3.45	3.94	4.52	5.08	8.02
	1:45:00	0.00	0.00	2.03	2.58	3.12	3.48	3.97	4.40	6.88
	1:50:00	0.00	0.00	1.86	2.28	2.82	3.05	3.47	3.77	5.85
	1:55:00	0.00	0.00	1.61	2.03	2.55	2.66	3.02	3.22	4.93
	2:00:00	0.00	0.00	1.42	1.85	2.31	2.35	2.65	2.75	4.18
	2:05:00	0.00	0.00	1.17	1.53	1.92	1.89	2.13	2.18	3.30
	2:10:00	0.00	0.00	0.95	1.24	1.57	1.51	1.70	1.72	2.58
	2:15:00	0.00	0.00	0.77	1.01	1.28	1.21	1.36	1.35	2.02
	2:20:00	0.00	0.00	0.62	0.82	1.03	0.97	1.08	1.06	1.58
	2:25:00	0.00	0.00	0.50	0.66	0.83	0.77	0.87	0.83	1.23
	2:30:00	0.00	0.00	0.40	0.53	0.66	0.61	0.69	0.65	0.95
	2:35:00	0.00	0.00	0.32	0.42	0.52	0.48	0.54	0.50	0.73
	2:40:00	0.00	0.00	0.25	0.32	0.40	0.37	0.42	0.39	0.56
	2:45:00	0.00	0.00	0.20	0.25	0.31	0.29	0.32	0.30	0.44
	2:50:00	0.00	0.00	0.16	0.20	0.25	0.23	0.26	0.24	0.35
	2:55:00	0.00	0.00	0.12	0.15	0.19	0.18	0.20	0.19	0.27
	3:00:00	0.00	0.00	0.09	0.11	0.14	0.13	0.15	0.14	0.20
	3:05:00	0.00	0.00	0.06	0.08	0.10	0.10	0.11	0.10	0.14
	3:10:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.07	0.10
	3:15:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.06
	3:20:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:25:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft ^{2}]	Area [acres]	Volume [ft ^{3}]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

APPENDIX E – REFERENCE MATERIAL

Final Drainage Report

for

The Sanctuary Filing 1

at

Meridian Ranch

EL PASO COUNTY, COLORADO

August 2022

Prepared For:

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

Prepared By:
Tech Contractors
11910 Tourmaline Dr., Ste 130
Falcon, CO 80831
719.495.7444

PCD Project No. SF22-020

Future Drainage - SCS Calculation Method

Following is a tabulation of the surface drainage characteristics for the future conditions using the SCS calculation method. Please refer to Figure 6 - Meridian Ranch SCS Calculations – Future Basins Map

Table 5: Future Drainage Basins-SCS

FUTURE SCS (Full Spectrum)						
	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
OS06	0.1313	80	52	12	3.8	0.5
G1a	0.1313	80	52	12	3.8	0.5
G1a-G2	0.1313	79	52	11	3.7	0.5
OS05	0.0578	39	26	5.6	1.8	0.2
OS05-G1	0.0578	39	25	5.5	1.7	0.2
FG01	0.0538	31	22	7.0	3.4	0.9
FG01-G1	0.0538	31	22	7.0	3.4	0.9
G1	0.1116	61	41	11	4.9	1.1
G1-G2	0.1116	61	41	11	4.8	1.1
FG02	0.0391	32	22	6.4	2.7	0.5
G2	0.2820	167	112	27	10	1.9
G2-G3	0.2820	163	108	27	10	1.9
FG03	0.0203	24	17	5.9	3.0	0.8
FG04	0.0172	22	16	5.8	3.1	0.9
G3	0.3195	185	123	31	12	2.4
FG06	0.0675	56	40	12	5.8	1.3
FG05	0.0580	45	33	12	6.7	2.4
OS07ab	0.0170	12	7.9	1.8	0.5	0.07
OS07ab-POND F	0.0170	12	7.6	1.7	0.5	0.07
POND F IN	0.4620	293	200	54	23	5.1
POND F	0.4620	178	121	16	8.0	2.1
POND F-G7	0.4620	177	120	16	8.0	2.1
OS07c	0.0296	19	12	2.7	0.9	0.12
OS07c-G4	0.0296	19	12	2.6	0.9	0.12
FG21a	0.0095	5.9	4.0	1.0	0.4	0.06
G4	0.0391	25	16	3.6	1.2	0.2
G4-G7	0.0391	24	16	3.5	1.2	0.2
FG21b	0.0150	21	16	6.5	3.9	1.7
G7	0.5161	194	131	18	8.9	2.3
G7-G8	0.5161	194	131	18	8.9	2.3
FG22	0.1354	121	88	32	17	5.4
OS08a	0.0251	16	11	2.3	0.7	0.10
OS08-G8	0.0251	16	10	2.3	0.7	0.10
FG23a	0.0216	21	15	5.2	2.7	0.8
OS07d	0.0034	2.5	1.6	0.4	0.11	0.01
OS07d-G8	0.0034	2.4	1.6	0.3	0.11	0.01
G8	0.7016	279	178	46	24	7.7
G8-G10	0.7016	278	177	45	24	7.6
FG24b	0.0589	76	57	24	15	6.5
FG24a	0.0348	24	16	4.5	2.0	0.4
OS08b	0.0165	9.5	6.3	1.4	0.5	0.07
OS08b-G9a	0.0165	9.4	6.0	1.4	0.5	0.07
OS09a	0.0093	5.3	3.5	0.8	0.3	0.04
OS09a-G9a	0.0093	5.2	3.4	0.7	0.3	0.04
G9a	0.1195	97	71	28	16	6.7

FUTURE SCS (Full Spectrum)						
	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
G9a-G9b	0.1195	96	70	27	16	6.6
FG24c	0.0291	40	30	13	8.4	4.0
FG24d	0.0262	39	30	14	8.7	4.4
G9b	0.1748	170	127	53	32	14
REX RD WQCV	0.1748	158	125	51	31	14
G9b-G10	0.1748	158	123	50	31	13
FG23b	0.0236	17	11	2.7	0.9	0.13
G10	0.9000	390	263	90	46	15
G10-G11	0.9000	389	254	85	44	15
FG23c	0.0109	11	7.6	2.2	1.0	0.2
G11	0.9109	393	258	86	44	15
FG25	0.1084	111	84	36	22	9.9
FG28	0.0184	15	10	3.0	1.2	0.2
POND G IN-WEST	1.0377	503	350	122	63	22
FG27	0.0679	98	79	42	30	18
FG26	0.0570	65	50	24	16	8.2
G13	0.0570	65	50	24	16	8.2
G13-POND G	0.0570	64	50	24	16	8.1
POND G IN-EAST	0.1249	160	127	64	44	25
POND G	1.1626	450	293	52	21	5.3
G12	1.1626	450	293	52	21	5.3
G12-G06	1.1626	449	293	52	21	5.3
FG29	0.0983	60	39	8.9	2.9	0.4
FG32	0.0402	51	40	20	14	7.5
FG32-G06	0.0402	50	40	19	13	7.4
G06	1.3011	491	317	57	22	7.5

Rational Calculations

The Rational Hydrologic Calculation Method was used to estimate the total runoff from the 5-year and the 100-year design storm and thus establish the storm drainage system design. Using the rational calculation methodology outlined in the Hydrology Section (Ch 6) of the COSDCM coupled with the El Paso County EPCDCM an effective storm drainage design for the Sanctuary Filing 1 has been designed. The storm drainage facilities have been designed such that the minor storm will be captured by the inlets and conveyed by the storm drain pipes such that the street flow does not overtop the curbs. The storm drainage facility has been designed such that the major storm will be captured by the inlets and conveyed by the storm drain pipes such that the street flow does not exceed the right-of-way widths for residential streets and the hydraulic grade line will be less than one foot below the surface.

The site is located within the Gieck Ranch Drainage Basin. The storm drain runoff will be collected by a series of inlets and storm drain pipe then conveyed through the project and discharge directly into the existing Pond G that is properly sized to safely convey the storm water flows away from the project without damaging adjacent property.

Rational Narrative

The following is a detailed narrative of the storm drainage system located in the Sanctuary Filing 1. These storm drainage systems meet the requirements of as found in the El Paso

the peak flow rates for the key design points impacted by the development of the Sanctuary Filing 1.

Table 7: Key Design Point Comparison – Interim SCS Model

MERIDIAN RANCH DISCHARGE KEY DESIGN POINTS (INTERIM)						
		PEAK DISCHARGE Q_{100} (CFS)	PEAK DISCHARGE Q_{50} (CFS)	PEAK DISCHARGE Q_{10} (CFS)	PEAK DISCHARGE Q_5 (CFS)	PEAK DISCHARGE Q_2 (CFS)
G12 - DISCHARGE POINT AT REGIONAL PARK (G05 - HISTORIC)	Historic	536	350	84	30	5.2
	Interim	466	307	50	19	5.0
	% of Historic	87%	88%	59%	62%	96%
G06 - EASTONVILLE ROAD[1]	Historic	551	369	88	32	5.5
	Interim	491	323	52	20	5.3
	% of Historic	89%	87%	59%	62%	96%

[1] Flow rate at Eastonville Rd. listed for reference only

The outlet (DP G12) for Pond G located west of the Falcon Regional Park, upstream of Eastonville Rd (DP G06). At full buildout the discharge from Pond G will be 450 CFS during the 100-yr storm event into an existing natural drainage course that traverses the regional park. The 100-year historical peak flow rate at the western boundary of the regional park is 536 CFS. The calculated 100-year future developed flow rate will be 84% of the historic flow rate. The developed peak flow rate for the full spectrum of design storms are calculated to be below that of the corresponding historic peak flow rates. See Table 8 for a complete comparative list of the future developed peak flow rates for the key design points impacted by the development of Rolling Hills Ranch.

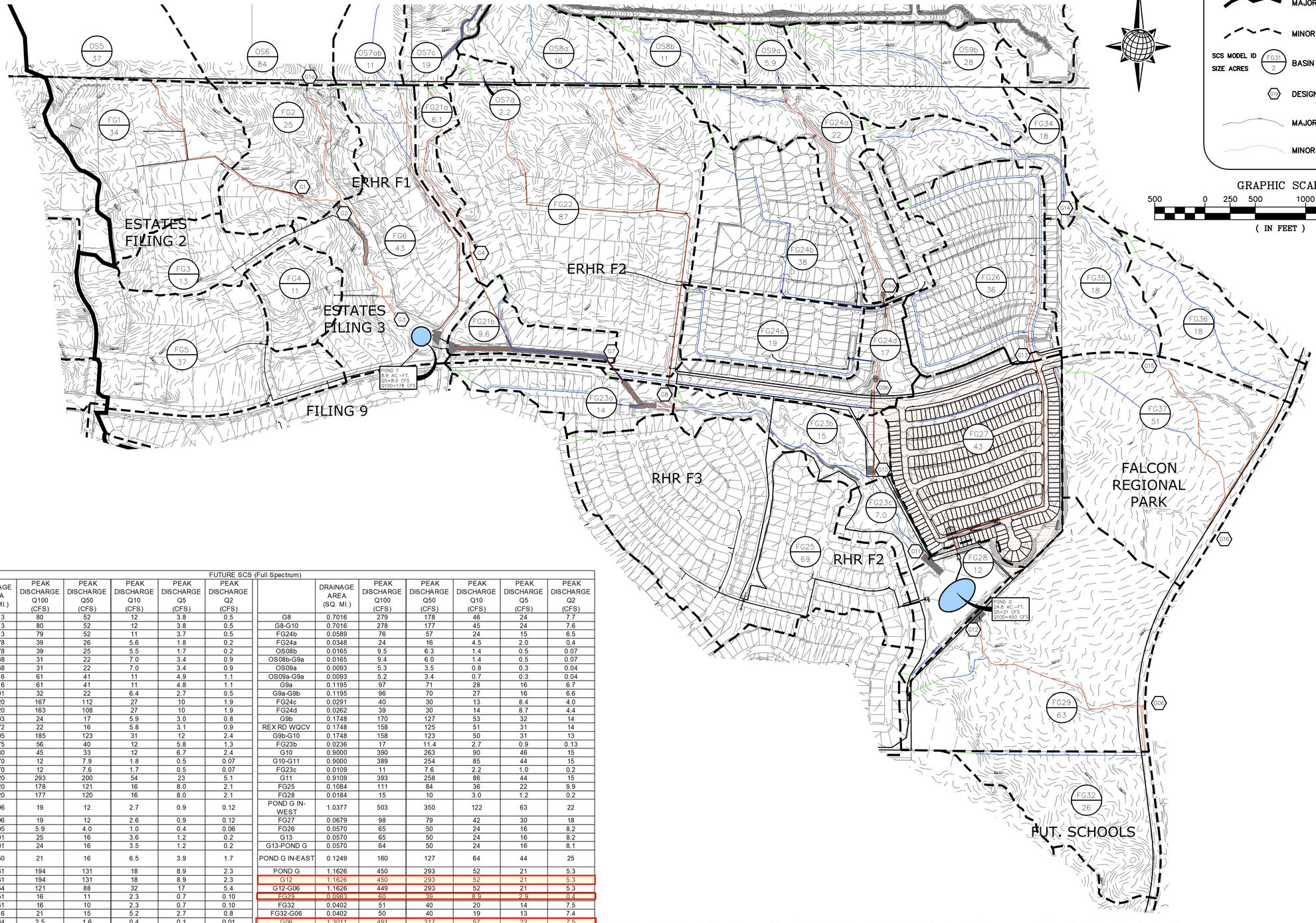
Table 8: Key Design Point Comparison – Future SCS Model

MERIDIAN RANCH DISCHARGE KEY DESIGN POINTS (FUTURE)						
		PEAK DISCHARGE Q_{100} (CFS)	PEAK DISCHARGE Q_{50} (CFS)	PEAK DISCHARGE Q_{10} (CFS)	PEAK DISCHARGE Q_5 (CFS)	PEAK DISCHARGE Q_2 (CFS)
G12 - POND G OUTLET REGIONAL PARK (G05 - HISTORIC)	Historic	536	350	84	30	5.2
	Future	450	293	52	21	5.3
	% of Historic	84%	84%	62%	68%	102%
G06 - EASTONVILLE ROAD[1]	Historic	551	369	88	32	5.5
	Future	491	317	57	22	7.5
	% of Historic	89%	86%	65%	71%	136%

[1] Flow rate at Eastonville Rd. listed for reference only

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

THE SANCTUARY FILING 1



LEGEND

- MAJOR BASIN BOUNDARY
- MINOR BASIN BOUNDARY
- SCS MODEL ID / SIZE ACRES — FG31 / 2 — BASIN IDENTIFICATION
- DESIGN POINT
- MAJOR CONTOUR INTERVAL
- MINOR CONTOUR INTERVAL

GRAPHIC SCALE

500 0 250 500 1000 2000

(IN FEET)

FUTURE SCS (Full Spectrum)

	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
OS06	0.1313	80	52	12	3.8	0.5
G1a	0.1313	80	52	12	3.8	0.5
G1a-G2	0.1313	79	52	11	3.7	0.5
OS05	0.0578	39	26	5.6	1.8	0.2
OS05-G1	0.0578	39	25	5.5	1.7	0.2
FG01	0.0538	31	22	7.0	3.4	0.9
FG01-G1	0.0538	31	22	7.0	3.4	0.9
G1	0.1116	61	41	11	4.9	1.1
G1-G2	0.1116	61	41	11	4.8	1.1
FG02	0.0391	32	22	6.4	2.7	0.5
G2	0.2820	167	112	27	10	1.9
G2-G3	0.2820	163	108	27	10	1.9
FG03	0.0203	24	17	5.9	3.0	0.8
FG04	0.0172	22	16	5.8	3.1	0.9
G3	0.3195	185	123	31	12	2.4
FG06	0.0675	56	40	12	5.8	1.3
FG05	0.0580	45	33	12	6.7	2.4
OS07ab	0.0170	12	7.9	1.8	0.5	0.07
OS07ab-POND F	0.0170	12	7.6	1.7	0.5	0.07
POND F IN	0.4620	293	200	54	23	5.1
POND F	0.4620	178	121	16	8.0	2.1
POND F-G7	0.4620	177	120	16	8.0	2.1
OS07c	0.0296	19	12	2.7	0.9	0.12
OS07c-G4	0.0296	19	12	2.6	0.9	0.12
FG21a	0.0095	5.9	4.0	1.0	0.4	0.06
G4	0.0391	25	16	3.6	1.2	0.2
G4-G7	0.0391	24	16	3.5	1.2	0.2
FG21b	0.0150	21	16	6.5	3.9	1.7
G7	0.5161	194	131	18	8.9	2.3
G7-G8	0.5161	194	131	18	8.9	2.3
FG22	0.1354	121	88	32	17	5.4
OS08a	0.0251	16	11	2.3	0.7	0.10
OS08-G8	0.0251	16	10	2.3	0.7	0.10
FG23a	0.0216	21	15	5.2	2.7	0.8
OS07d	0.0034	2.5	1.6	0.4	0.1	0.01
OS07d-G8	0.0034	2.4	1.6	0.3	0.1	0.01

	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
G8	0.7016	279	178	46	24	7.7
G8-G10	0.7016	278	177	45	24	7.6
FG24b	0.0589	76	57	24	15	6.5
FG24a	0.0348	24	16	4.5	2.0	0.4
OS08b	0.0165	9.5	6.3	1.4	0.5	0.07
OS08b-G9a	0.0165	9.4	6.0	1.4	0.5	0.07
OS09a	0.0093	5.3	3.5	0.8	0.3	0.04
OS09a-G9a	0.0093	5.2	3.4	0.7	0.3	0.04
G9a	0.1195	97	71	28	16	6.7
G9a-G9b	0.1195	96	70	27	16	6.6
FG24c	0.0291	40	30	13	8.4	4.0
FG24d	0.0262	39	30	14	8.7	4.4
G9b	0.1748	170	127	53	32	14
REX RD WQCV	0.1748	158	125	51	31	14
G9b-G10	0.1748	158	123	50	31	13
FG23b	0.0236	17	11.4	2.7	0.9	0.13
G10	0.9000	390	263	90	46	15
G10-G11	0.9000	389	254	85	44	15
FG23c	0.0109	11	7.6	2.2	1.0	0.2
G11	0.9109	393	258	86	44	15
FG25	0.1084	111	84	36	22	9.9
FG28	0.0184	15	10	3.0	1.2	0.2
POND G IN-WEST	1.0377	503	350	122	63	22
FG27	0.0679	98	79	42	30	18
FG26	0.0570	65	50	24	16	8.2
G13	0.0570	65	50	24	16	8.2
G13-POND G	0.0570	64	50	24	16	8.1
POND G IN-EAST	0.1249	160	127	64	44	25
POND G	1.1626	450	293	52	21	5.3
G12	1.1626	450	293	52	21	5.3
G12-G06	1.1626	449	293	52	21	5.3
FG29	0.0983	60	39	8.9	2.9	0.4
FG32	0.0402	51	40	20	14	7.5
FG32-G06	0.0402	50	40	19	13	7.4
G06	1.3011	491	317	57	22	7.5

FUTURE CONDITIONS - SCS MAP

FIGURE 6

No.	Revisions	Date	Init.	Appr.	Date
-					
-					
-					

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MERIDIAN RANCH

FUTURE CONDITIONS - SCS MAP
THE SANCTUARY FILING 1
FDR - FDR

Drawn by TAK
Checked by .
Date JUNE 2022

Scale AS SHOWN

- of -

Preliminary & Final Drainage Report

for

Rex Road

through

Falcon Regional Park

MERIDIAN RANCH

A GOLF & RECREATIONAL COMMUNITY

EL PASO COUNTY, COLORADO

June 2023

Prepared For:

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

Prepared By:
Tech Contractors
11910 Tourmaline Dr., Ste 130
Falcon, CO 80831
719.495.7444

PCD Project No. CDR236

Proposed Drainage - SCS Calculation Method

Following is a tabulation of the surface drainage characteristics for the proposed conditions using the SCS calculation method. Please refer to Figure 5 – Rex Road SCS Calculations – Proposed Basins Map

Table 3: Future Drainage Basins-SCS

PROPOSED SCS (Full Spectrum)						
HYDROLOGIC ELEMENT	Drainage Area (SQ. MI.)	Peak Discharge Q100 (CFS)	Peak Discharge Q50 (CFS)	Peak Discharge Q10 (CFS)	Peak Discharge Q5 (CFS)	Peak Discharge Q2 (CFS)
OS09b	0.0435	22	14	3.2	1.1	0.2
OS09b-G14	0.0435	22	14	3.2	1.1	0.2
FG34	0.0275	20	13	3.3	1.3	0.2
G14	0.0710	38	25	5.5	2.0	0.3
G14-G15	0.0710	37	24	5.5	2.0	0.3
FG35	0.0292	25	18	5.5	2.4	0.5
G15	0.1002	55	36	8.0	3.0	0.6
G15-G16	0.1002	54	35	8.0	3.0	0.6
FG37	0.0754	46	31	7.3	2.7	0.4
FG36	0.0295	19	13	3.9	1.8	0.4
G15a	0.0295	19	13	3.9	1.8	0.4
G15a-G16	0.0295	19	13	3.8	1.7	0.4
G16	0.2051	114	74	16	6.5	1.2

Rational Calculations

The Rational Hydrologic Calculation Method was used to estimate the total runoff from the 5-year and the 100-year design storm and thus establish the storm drainage system design for facilities with less than 100 acres if tributary area. Using the rational calculation methodology outlined in the Hydrology Section (Ch 6) of the COSDCM coupled with the El Paso County EPCDCM an effective drainage design for the Rex Road construction has been designed. The storm drainage facilities have been designed such that the minor storm will be conveyed such that the street flow does not overtop the curbs. The culvert undercrossing has been designed such that the major storm will be safely conveyed downstream under Rex Road.

The site is located within the Gieck Ranch Drainage Basin. The storm drain runoff will be collected by natural swales and conveyed southeasterly toward Eastonville Road and away from the project without damaging adjacent property.

Rational Narrative

The following is a detailed narrative of the proposed storm drainage runoff tributary to Rex Road (see Figure 6 for more information). These storm drainage analysis meets the requirements as found in the El Paso County Engineering Criteria Manual I.7.1.C.5. (ECM) for storm water quality and discharge into Waters of the State. Discharge points are located on the south side of Rex Road (DP15 & DP15a).

- Basin OS9b (28 acres, Q_5= 5.0 CFS, Q_{100} = 34 CFS) contains off-site area north of Meridian Ranch within the future Latigo Trails subdivision entering Meridian Ranch via existing natural swale at Design Point 1. The surface runoff is collected into natural drainage swales and ultimately directed southerly through Meridian Ranch Basin FG34 to DP G14.

- Basin FG34 (18 acres, Q_5= 4.7 CFS, Q_{100} = 25 CFS) contains open space area within the future Rolling Hills Ranch North subdivision entering the Falcon Regional Park via a natural swale at Design Point G14. The surface runoff is collected into natural drainage swales and ultimately directed southerly to the Falcon Regional Park. The flow (Q_5= 7.5 CFS, Q_{100} = 46 CFS) is conveyed downstream via a natural swale to a proposed culvert at Rex Road (DP G15.1).

- Basin FG35a (14 acres, Q_5= 4.5 CFS, Q_{100} = 23 CFS) contains area within the Falcon Regional Park north of Rex Road. The surface runoff will sheet flow toward natural swales and is directed toward a proposed 36" RCP culvert under Rex Road located at DP G15.1. The total flow at the culvert (Q_5= 8.0 CFS, Q_{100} = 47 CFS) is conveyed downstream via a 36" RCP where the culvert flow is combined with runoff from Basin FG35b at Inlet I01.

- Basin FG35b (4.9 acres, Q_5= 6.3 CFS, Q_{100} = 17 CFS) contains area north of Rex Rd and portions of Rex Road east of Meridian Ranch and west of the above mentioned 36" RCP culvert crossing. The surface runoff will sheet flow off the surrounding areas onto Rex Road and the flow will be directed to a proposed flow-by inlet (Inlet I01) and combined with the flow in the 36" RCP culvert. Most of the flow is captured (Q_5= 5.2 CFS, Q_{100} = 12 CFS) with the remaining flow (Q_5= 1.2 CFS, Q_{100} = 5.3 CFS) continuing downstream to Design Point G15a. The combined flow in the 30" RCP (Q_5= 4.9 CFS, Q_{100} = 23 CFS) from Basin FG36a will continue downstream along a natural channel through Basin FG37.

- Basin FG36a (18 acres, Q_5= 5.3 CFS, Q_{100} = 26 CFS) contains Regional Park area north of Rex Road within the Falcon Regional Park west of Eastonville Road. The surface runoff flows to a natural swale toward a proposed 30" RCP culvert near the intersection of Rex Rd with Eastonville Rd. The culvert flow is conveyed downstream to DP15a.

- Basin FG36c (2.8 acres, Q_5= 3.3 CFS, Q_{100} = 8.0 CFS) contains area north of Rex Road within the Falcon Regional Park west of Eastonville Road. The surface runoff sheet flows onto Rex Rd. The surface runoff is combined with the by-pass flow from Inlet I01 and is carried eastward toward the intersection of Rex Rd with Eastonville Rd. Near the intersection the flow (Q_5= 4.2 CFS, Q_{100} = 12 CFS) is directed southerly via a down drain to DP15a where it is combined with the culvert flow from FG36a. The total flow (Q_5= 8.0 CFS, Q_{100} = 32 CFS) is directed to DP16a.

- Basin FG37 (48 acres, Q_5= 10 CFS, Q_{100} = 62 CFS) contains area within the Falcon Regional Park south of Rex Rd. The surface flow from the area combines with the

runoff from the Rex Rd culvert crossings and is directed to the Eastonville Rd culvert crossing located at DP G16 (Q_5= 15 CFS, Q_{100} = 78 CFS).

DETENTION POND

There are no existing or proposed detention ponds associated with this project. Water quality is achieved through the benefit of runoff reduction through portions of the adjacent swales and the construction of a bioretention pond near the southeast corner of the intersection of Rex Rd with Eastonville Rd.

DRAINAGE FEES

The proposed project falls in the Gieck Ranch Drainage Basin and there are no drainage or bridge fees associated with the Gieck Ranch Drainage Basin and this is not a final plat.

The following is the imperviousness calculation:

	Acres	Assumed Imperviousness	Impervious Acres
Open Space	0.0	3%	0.0
Right-of-way	4.2	90%	4.6
Residential Lots	0.0	65%	0.0
Total	4.2		3.8=90% imperv.

GIECK RANCH FEES:

Drainage Fees: There are no drainage fees for this basin.

Bridge Fees: There are no bridge fees for this basin.

CONCLUSION

The rational and SCS based hydrologic calculation methods were used to estimate the historic and developed runoff values to determine the impact of this extension of Rex Road on surrounding property. The resulting calculations were used to estimate the hydraulic impact on the existing natural drainage swales and proposed facilities.. Based on the aforementioned design parameters the extension of Rex Road will not adversely affect downstream properties as the resultant developed flow rates for the various design storms fall below the historic flow rates of the same storms.

Below is a comparison of various flow rates at key design points:

MERIDIAN RANCH DISCHARGE KEY DESIGN POINTS						
Proposed Conditions SCS Calculations		Peak Discharge Q100 (CFS)	Peak Discharge Q50 (CFS)	Peak Discharge Q10 (CFS)	Peak Discharge Q5 (CFS)	Peak Discharge Q2 (CFS)
G14 - DISCHARGE POINT TO REGIONAL PARK (G07 - HISTORIC)	Historic	38	25	5.8	2.2	0.4
	Proposed	38	25	5.5	2.0	0.3
	% of Historic	100%	100%	95%	89%	85%
G16 - EASTONVILLE RD[1] DOWNSTREAM OF REX RD	Historic	116	77	18	6.8	1.2
	Proposed	114	74	16	6.5	1.2
	% of Historic	98%	97%	89%	95%	99%

[1] Flow rate at Eastonville Rd. listed for reference only

EROSION CONTROL DESIGN

General Concept

Historically, erosion on this property has been held to a minimum by a variety of natural features and agricultural practices including:

- Substantial prairie grass growth
- Construction of drainage arresting berms
- Construction of multiple stock ponds along drainage courses

During construction, best management practices (BMP) for erosion control will be employed based on El Paso County Criteria. BMP's will be utilized as deemed necessary by the contractor and/or engineer and are not limited to the measures shown on the construction drawing set. The contractor shall minimize the amount of area disturbed during all construction activities.

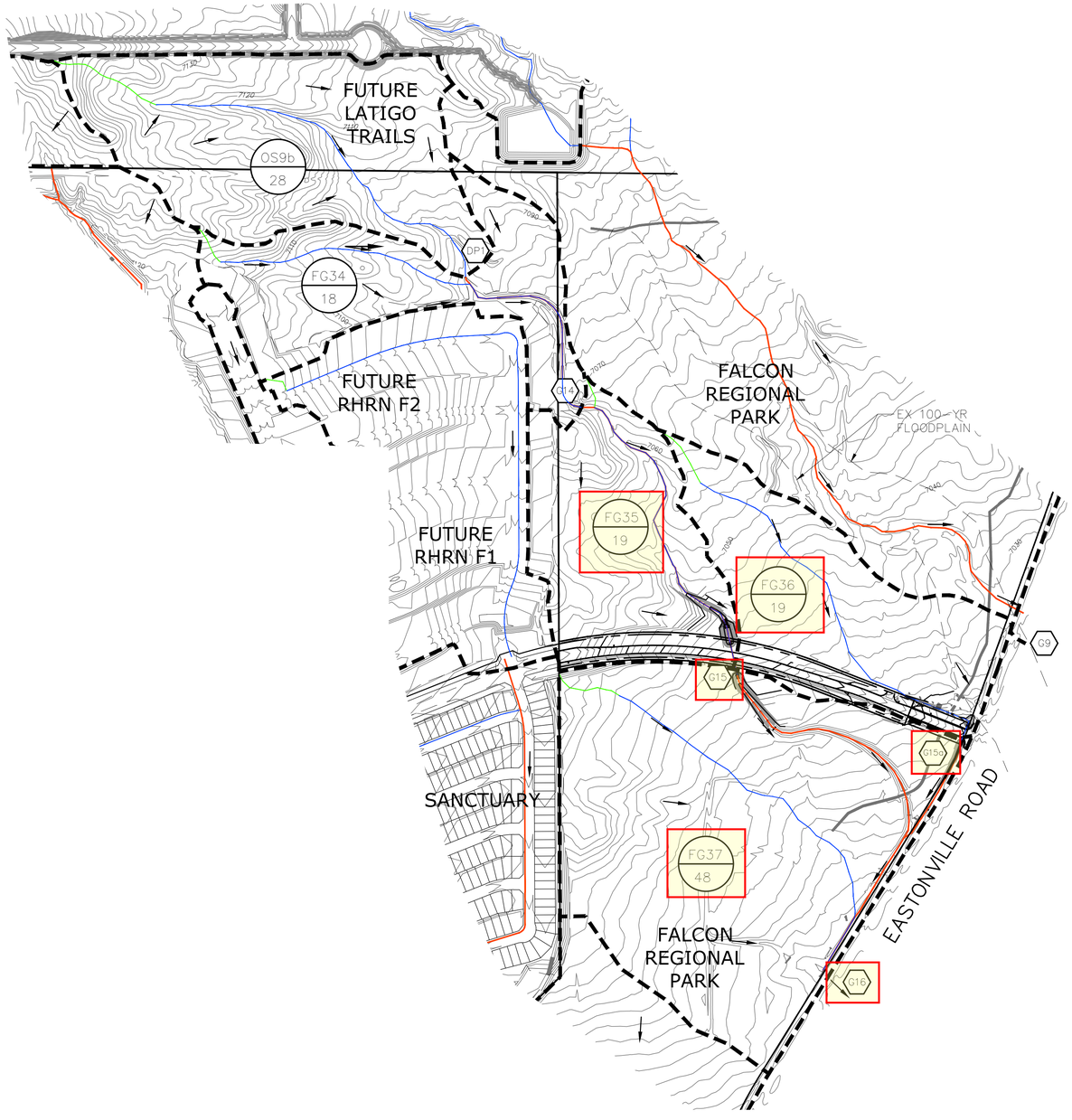
In general the following shall be applied in developing the sequence of major activities:

- Install down-slope and side-slope perimeter BMP's before the land disturbing activity occurs.
- Do not disturb an area until it is necessary for the construction activity to proceed
- Cover or stabilize as soon as possible.
- Time the construction activities to reduce the impacts from seasonal climatic changes or weather events.
- The construction of filtration BMP's should wait until the end of the construction project when upstream drainage areas have been stabilized.
- Do not remove the temporary perimeter controls until after all upstream areas are stabilized.

Four Step Process

The following four step process is recommended for selecting structural BMP's in developing urban areas:

REX ROAD - PDR/FDR



LEGEND

- MAJOR BASIN BOUNDARY
- MINOR BASIN BOUNDARY
- SCS MODEL ID / SIZE ACRES — FG31 / 2 — BASIN IDENTIFICATION
- DESIGN POINT
- MAJOR CONTOUR INTERVAL
- MINOR CONTOUR INTERVAL
- 100 YEAR FLOOD PLAIN
- INITIAL TIME
- OVERLAND TIME
- ROUTING

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)

1 inch = 300 ft.

PROPOSED SCS (Full Spectrum)

HYDROLOGIC ELEMENT	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGE Q100 (CFS)	PEAK DISCHARGE Q50 (CFS)	PEAK DISCHARGE Q10 (CFS)	PEAK DISCHARGE Q5 (CFS)	PEAK DISCHARGE Q2 (CFS)
OS09b	0.0435	22	14	3.2	1.1	0.2
OS09b-G14	0.0435	22	14	3.2	1.1	0.2
FG34	0.0275	20	13	3.3	1.3	0.2
G14	0.0710	38	25	5.5	2.0	0.3
G14-G15	0.0710	37	24	5.5	2.0	0.3
FG35	0.0292	25	18	5.5	2.4	0.5
G15	0.1002	55	36	8.0	3.0	0.6
G15-G16	0.1002	54	35	8.0	3.0	0.6
FG37	0.0754	46	31	7.3	2.7	0.4
FG36	0.0295	19	13	3.9	1.8	0.4
G15a	0.0295	19	13	3.9	1.8	0.4
G15a-G16	0.0295	19	13	3.8	1.7	0.4
G16	0.2051	114	74	16	6.5	1.2

PROPOSED CONDITIONS - SCS MAP

FIGURE 5

No.	Revisions	Date	Init.	Appr.	Date
-	-				
-	-				
-	-				

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MERIDIAN RANCH

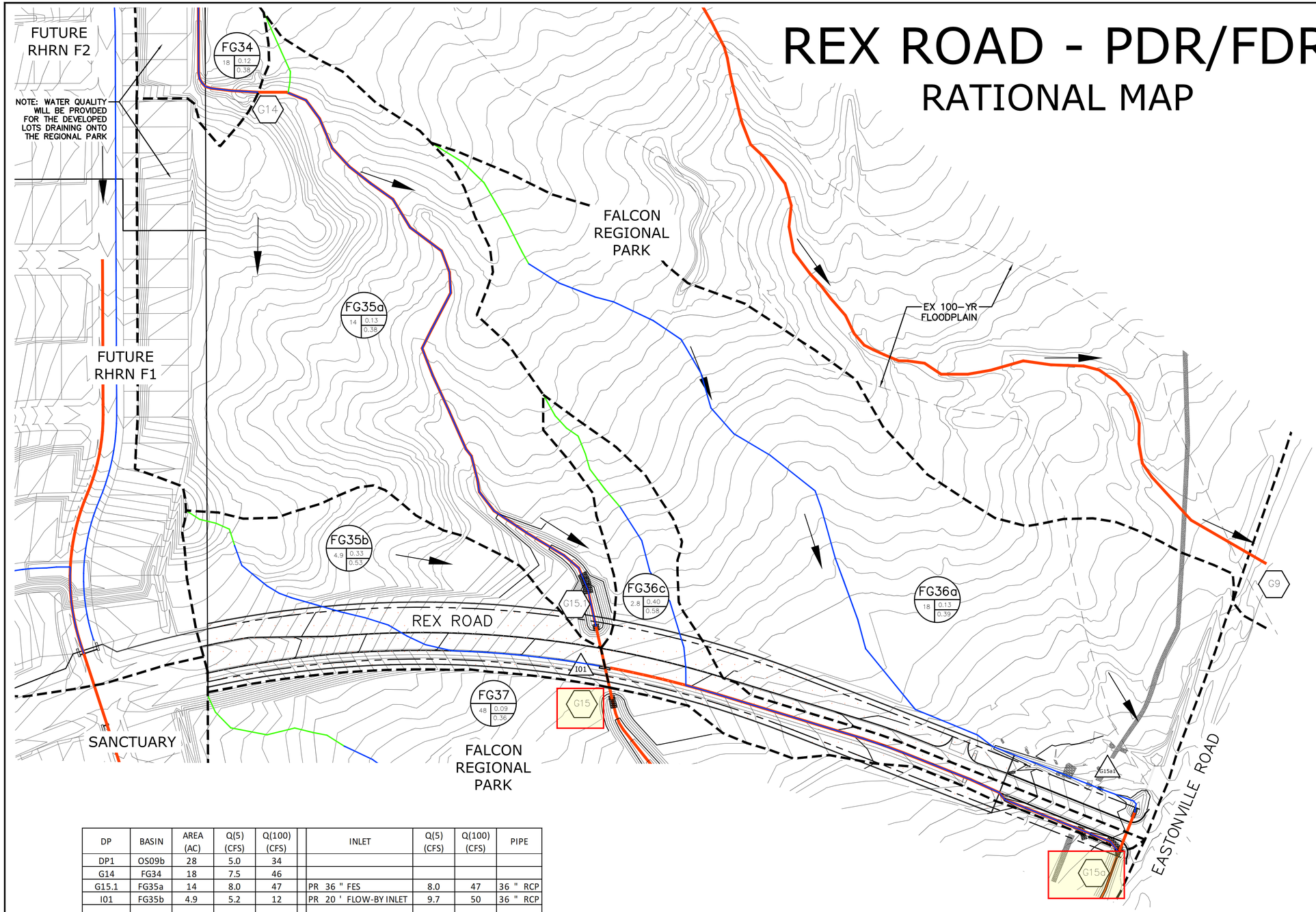
PROPOSED CONDITIONS - SCS MAP
REX ROAD
PDR - FDR

Drawn by TAK | Checked by . | Date XXX 2023

Scale AS SHOWN | - of -

REX ROAD - PDR/FDR

RATIONAL MAP



INDEX MAP

N.T.S.

- G01 / 2.7 | 0.40 | 0.55 — BASIN DESIGNATION; SUB-WATERSHED DESIGNATION; MINOR/MAJOR STORM COEFFICIENT; BASIN AREA IN ACRES
- 61 — DESIGN POINT DESIGNATION
- MAJOR BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- 6130 — EXISTING CONTOUR
- 6130 — PROPOSED COUNTOUR
- PROPOSED STORM SEWER
- INITIAL OVERLAND TIME (Ti)
- TRAVEL TIME (Tt)
- OVERLAND TIME (To)

DP	BASIN	AREA (AC)	Q(5) (CFS)	Q(100) (CFS)	INLET	Q(5) (CFS)	Q(100) (CFS)	PIPE
DP1	OS09b	28	5.0	34				
G14	FG34	18	7.5	46				
G15.1	FG35a	14	8.0	47	PR 36 " FES	8.0	47	36 " RCP
I01	FG35b	4.9	5.2	12	PR 20 ' FLOW-BY INLET	9.7	50	36 " RCP
G15a1	FG36a	18	5.3	26	PR 24 " FES	5.3	26	24 " RCP
G15a	FG36c	3	4.2	12	PR GRASS SWALE	4.2	12	
G15a			8.3	34	PR GRASS SWALE	8.3	34	
G15			9.7	50	PR GRASS SWALE	9.7	50	
G16a			12	60	PR GRASS SWALE	12	60	
G16	FG37	48	15	79	EX REX ROAD CULVERT	15	79	

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 INCH = 100 ft.

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

FIGURE 6

No.	Revisions	Date	Init.	Appr.	Date
-					
-					
-					

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MERIDIAN RANCH

PROPOSED CONDITIONS
RATIONAL MAP
REX ROAD - PDR - FDR

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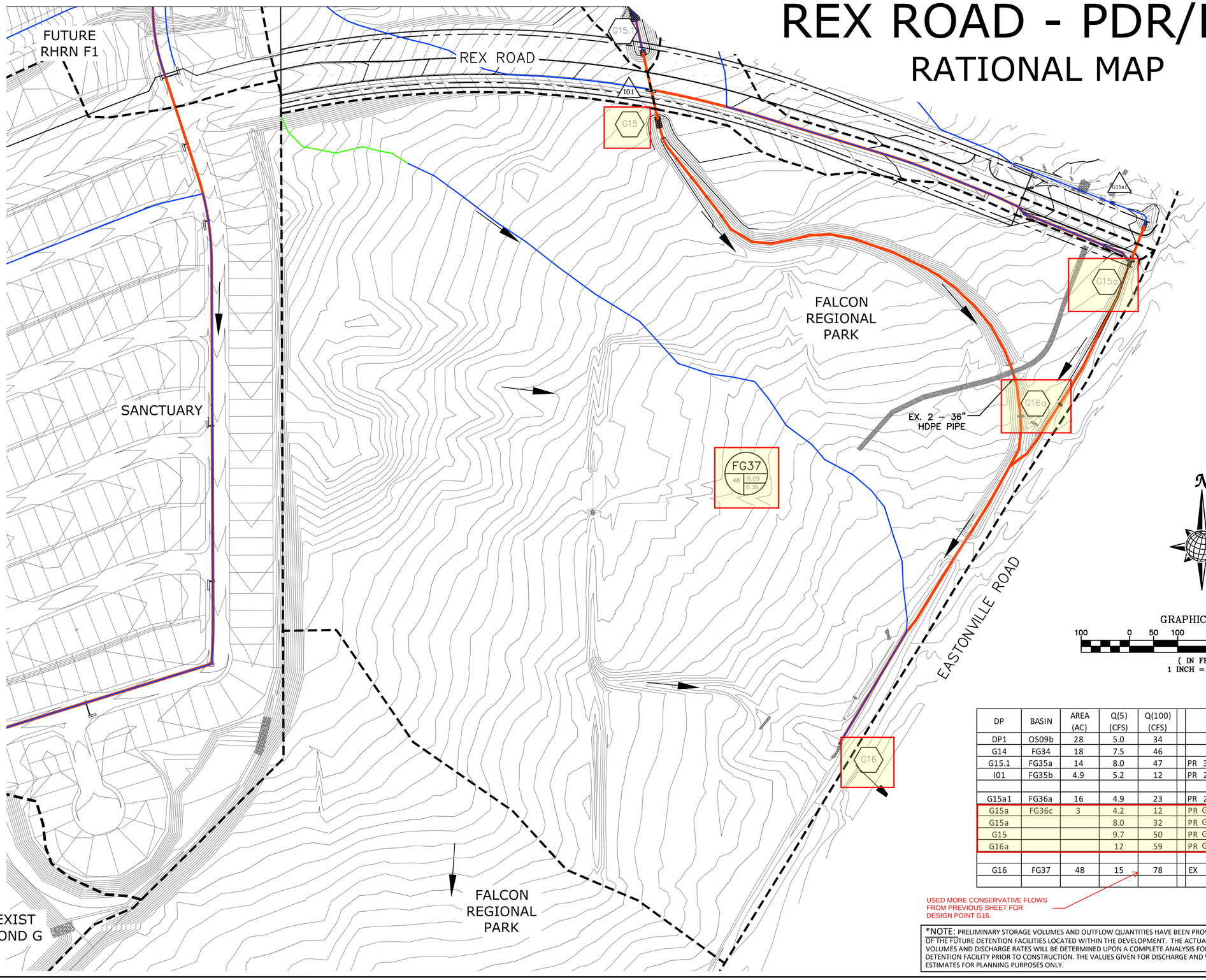
2 of 3

REX ROAD - PDR/FDR

RATIONAL MAP



INDEX MAP
N.T.S.

- G01 (2.7 | 0.40 | 0.55) — BASIN DESIGNATION; SUB-WATERSHED DESIGNATION; MINOR/MAJOR STORM COEFFICIENT; BASIN AREA IN ACRES
- 61 — DESIGN POINT DESIGNATION
- MAJOR BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- 6130 — EXISTING CONTOUR
- 6130 — PROPOSED COUNTOUR
- PROPOSED STORM SEWER
- INITIAL OVERLAND TIME (Ti)
- TRAVEL TIME (Tt)
- OVERLAND TIME (To)

N

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 INCH = 100 ft.

DP	BASIN	AREA (AC)	Q(5) (CFS)	Q(100) (CFS)		INLET	Q(5) (CFS)	Q(100) (CFS)	PIPE
DP1	OS09b	28	5.0	34					
G14	FG34	18	7.5	46					
G15.1	FG35a	14	8.0	47		PR 36 " FES	8.0	47	36 " RCP
I01	FG35b	4.9	5.2	12		PR 20 ' FLOW-BY INLET	9.7	50	36 " RCP
G15a1	FG36a	16	4.9	23		PR 24 " FES	4.9	23	24 " RCP
G15a	FG36c	3	4.2	12		PR GRASS SWALE	4.2	12	
G15a			8.0	32		PR GRASS SWALE	8.0	32	
G15			9.7	50		PR GRASS SWALE	9.7	50	
G16a			12	59		PR GRASS SWALE	12	59	
G16	FG37	48	15	78		EX REX ROAD CULVERT	15	78	

USED MORE CONSERVATIVE FLOWS FROM PREVIOUS SHEET FOR DESIGN POINT G16.

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

FIGURE 6

No.	Revisions	Date	Init.	Appr.	Date
-					
-					
-					

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MERIDIAN RANCH

PROPOSED CONDITIONS
RATIONAL MAP
REX ROAD - PDR - FDR

Drawn by TAK
Checked by .
Date APR 2023

Scale AS SHOWN

3 of 3

FINAL DRAINAGE REPORT

for

FALCON REGIONAL PARK

Prepared for:

El Paso County Community Services Department
2002 Creek Crossing
Colorado Springs, CO 80905

October 21, 2015

Prepared by:

19 E. Willamette Ave.
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(719)-477-9429
(719)-471-0766 fax
www.jpsengr.com

JPS Project No. 071506

Drexel, Barrell & Co., "Gieck Ranch Drainage Basin Planning Study," February 1, 2008.

El Paso County Engineering Criteria Manual, January, 2006, as amended.

Tech Contractors, "Revision to Master Development Drainage Plan, Meridian Ranch," July, 2015.

II. EXISTING / PROPOSED DRAINAGE CONDITIONS

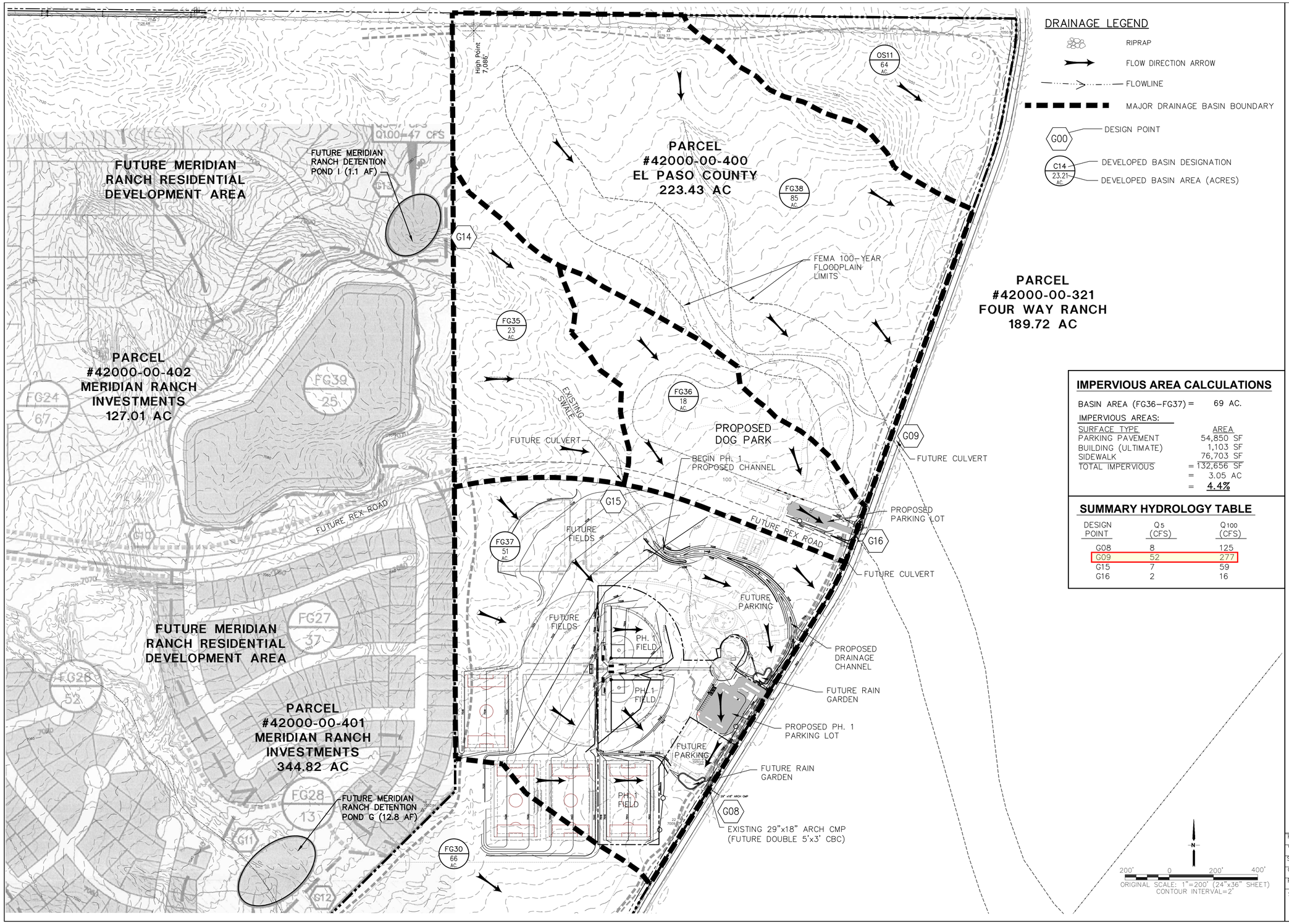
According to the Natural Resources Conservation Service (NRCS) Web Soil Survey for the park site, on-site soils are comprised of Columbine gravelly sandy loam and Stapleton sandy loam. These soils are classified as hydrologic soils group A and B. The existing site topography slopes downward to the southeast with average grades of approximately 2-3 percent.

Drainage planning for the Falcon Regional Park site has been addressed in the "Master Development Drainage Plan (MDDP), Meridian Ranch" by Tech Contractors, dated July, 2015. The enclosed Developed Drainage Plan (Sheet D1, Appendix B) shows the drainage basins impacting the park site consistent with the basin designations identified in the MDDP. As shown on Sheet D1, the park property lies within Basins OS11, FG30, FG35, FG36, FG37, and FG38.

The proposed dog park lies within Basin FG36. Surface drainage in Basin FG36 sheet flows southeasterly to Design Point #G16, with historic peak flows calculated as Q_5 = 2.3 cfs and Q_{100} = 17.9 cfs (Rational Method). Based on the relatively small impervious area associated with the proposed parking area on the south side of the dog park, the developed peak flow at DP #G16 is calculated as Q_5 = 3.3 cfs and Q_{100} = 19.4 cfs (Rational Method), showing a minimal increase.

On the north side of the new parking lot for the dog park, an existing drainage swale within Basin FG38 flows southeasterly along a delineated FEMA floodplain, draining to DP #G09. According to the MDDP, peak flows at DP #G09 are calculated as Q_5 = 52 cfs and Q_{100} = 277 cfs. According to County maintenance staff, flows from this design point currently combine and flow along the west side of Eastonville Road overtopping at various locations near the curve to the south. We recommend that plans for the upcoming PPRTA Eastonville Road improvement project provide for a culvert at this drainage crossing.

The primary active use area of the park lies within Basin FG37. Off-site drainage from the Meridian Ranch area northwest of the site enters the west boundary of the park property at Design Point #G14 and flows southeasterly through an existing drainage swale, ultimately reaching an existing 29"x18" Arch CMP culvert crossing Eastonville Road on the south side of the proposed parking lot.



IMPERVIOUS AREA CALCULATIONS

BASIN AREA (FG36–FG37) = 69 AC.

IMPERVIOUS AREAS:

SURFACE TYPE	AREA
PARKING PAVEMENT	54,850 SF
BUILDING (ULTIMATE)	1,103 SF
SIDEWALK	76,703 SF
TOTAL IMPERVIOUS	= 132,656 SF
	= 3.05 AC
	= 4.4%

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q_5 (CFS)	Q_{100} (CFS)
G08	8	125
G09	52	277
G15	7	59
G16	2	16

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Colorado Springs, CO
80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	BY	DATE

FALCON REGIONAL PARK

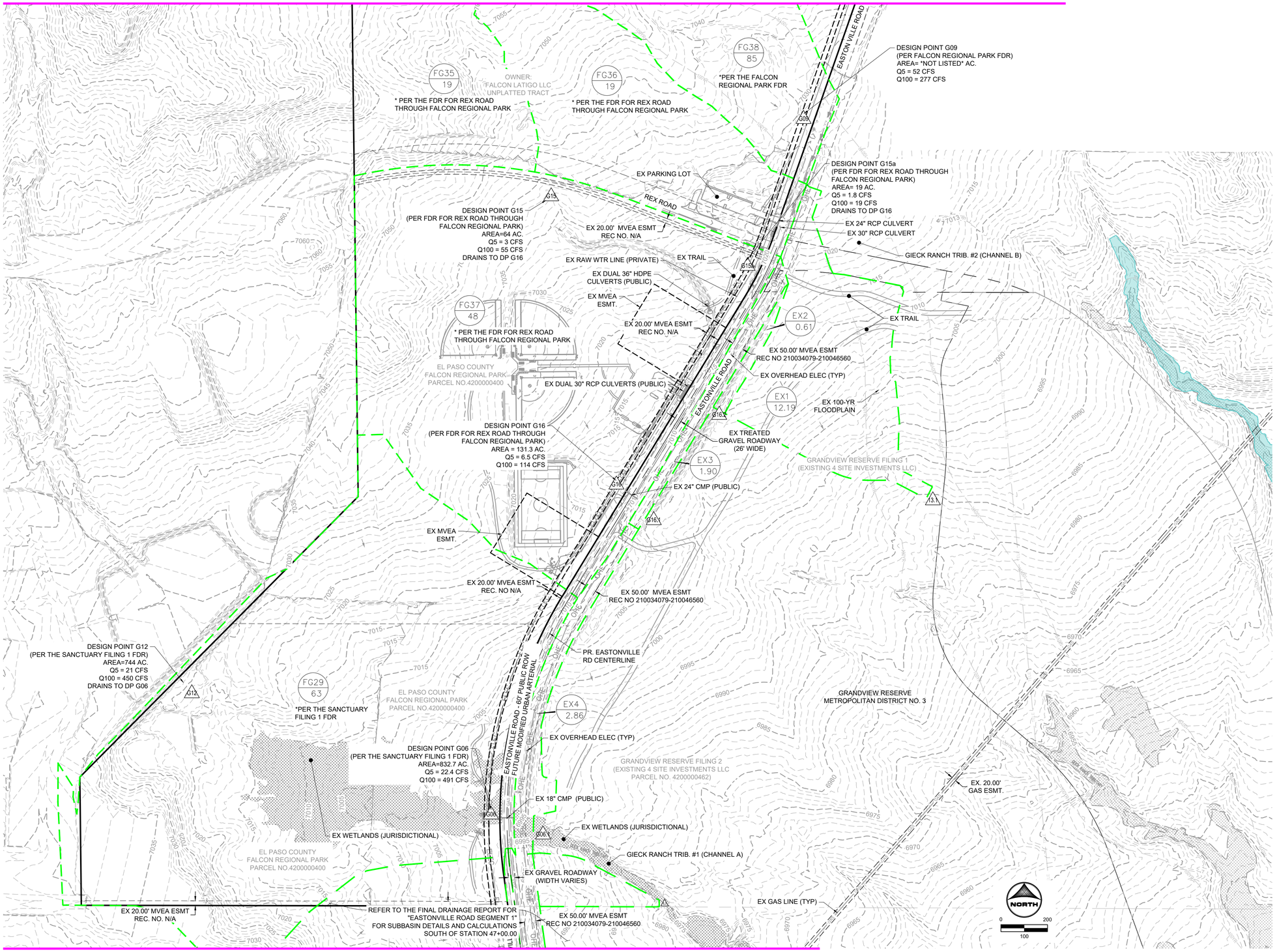
DEVELOPED DRAINAGE PLAN

HORZ. SCALE:	1"=200'	DRAWN:	BJJ
VERT. SCALE:	N/A	DESIGNED:	JPS
SURVEYED:	TECH	CHECKED:	JPS
CREATED:	8/17/15	LAST MODIFIED:	10/21/15
PROJECT NO.	071506	MODIFIED BY:	BJJ

SHEET: D1

APPENDIX F – DRAINAGE MAPS

SEE SHEET 2



REFER TO EASTONVILLE ROAD SEGMENT 1 FDR

LEGEND:

- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EX STORM SEWER
- EX DRAINAGE SWALE
- EX PROPERTY LINE
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL (NAME / AREA)

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
EX1	12.19	2	3.7	25.0
EX2	0.61	2	0.2	1.4
EX3	1.90	2	0.6	3.8
EX4	2.86	2	0.8	5.7
*FG29	62.91	-	2.9	60.0
**FG35	18.69	-	2.4	25.0
**FG36	18.88	-	1.8	19.0
**FG37	48.26	-	2.7	45.0
***FG38	85.00	-	-	-

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)
13.1	EX1	3.7	25.0
*G06	FG29, DP G12	22.0	491.0
G06.1	EX4, DO G06	22.8	496.7
***G09	FG38	52.0	277.0
*G12	-	21.0	450.0
**G15	FG35	3.0	55.0
**G15a	FG36	1.8	19.0
**G16	FG37, DP G15/G15a	6.5	114.0
G16.1	EX3	7.1	117.8
G16.2	EX2	0.2	1.4

* BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR THE SANCTUARY FILING 1 AT MERIDIAN RANCH".

** BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR REX ROAD THROUGH FALCON REGIONAL PARK".

*** BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR FALCON REGIONAL PARK".

DRAWN BY: SPC JOB DATE: 10/14/2024
APPROVED: CM JOB NUMBER: 201662.08
CAD DATE: 10/14/2024
CAD FILE: J:\2020\201662\CAD\Dwgs\C\Eastonville_Road_662.08\Drainage\201662.08_FDR_map_ex_Sht2

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

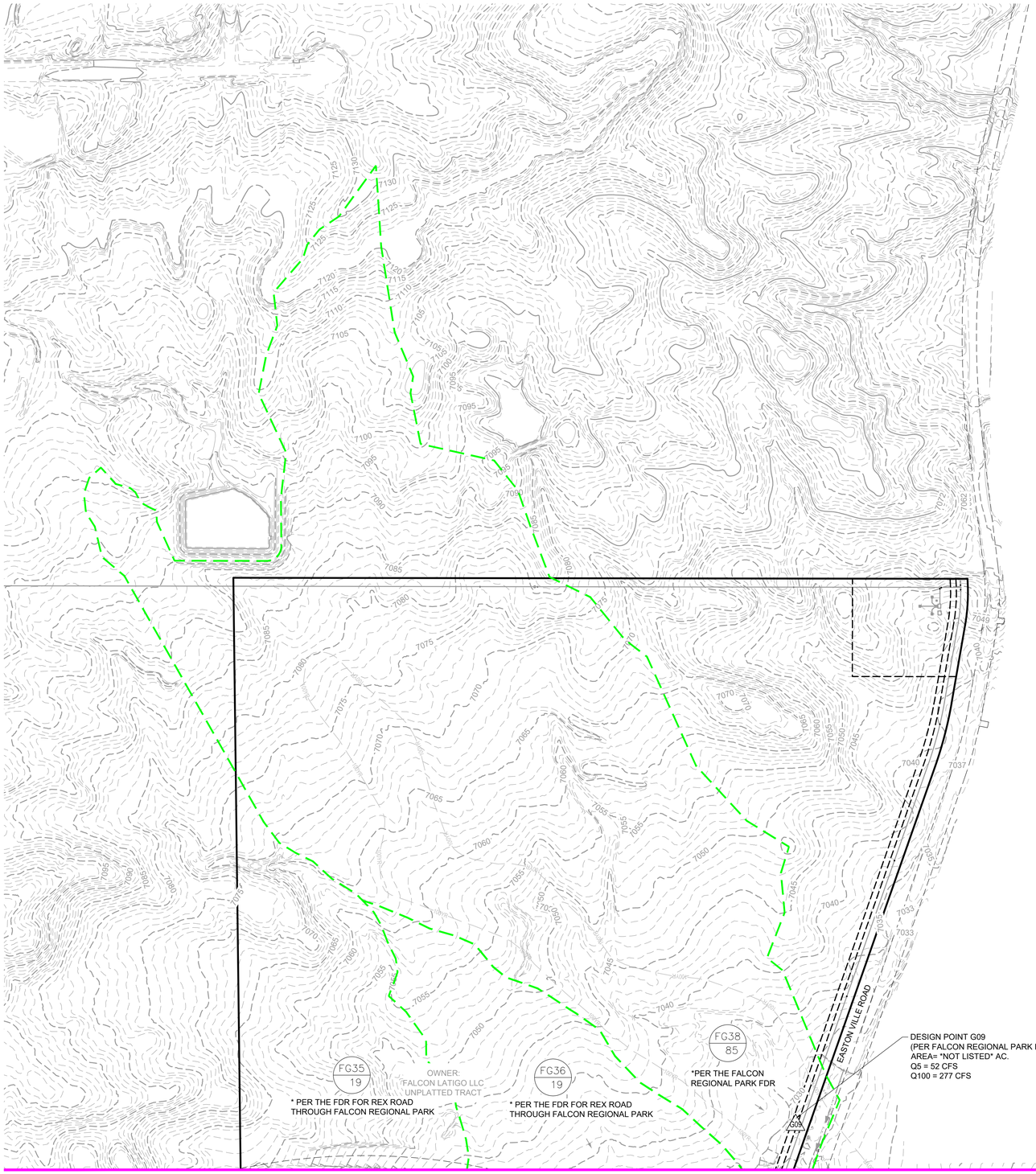
HRGreen
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PKWY SUITE 230
COLORADO SPRINGS CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

D·R·HORTON America's Builder

EXISTING CONDITIONS - DRAINAGE MAP

SHEET DRN 1



LEGEND:

- EXISTING MAJOR CONTOUR — — — 5250 — — —
- EXISTING MINOR CONTOUR
- EX STORM SEWER
- EX DRAINAGE SWALE
- EX PROPERTY LINE
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL (NAME / AREA)

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
EX1	12.19	2	3.7	25.0
EX2	0.61	2	0.2	1.4
EX3	1.90	2	0.6	3.8
EX4	2.86	2	0.8	5.7
*FG29	62.91	-	2.9	60.0
**FG35	18.69	-	2.4	25.0
*FG36	18.88	-	1.8	19.0
**FG37	48.26	-	2.7	45.0
***FG38	85.00	-	-	-

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)
13.1	EX1	3.7	25.0
*G06	FG29, DP G12	22.0	491.0
G06.1	EX4, DO G06	22.8	496.7
***G09	FG38	52.0	277.0
*G12	-	21.0	450.0
**G15	FG35	3.0	55.0
**G15a	FG36	1.8	19.0
**G16	FG37, DP G15/G15a	6.5	114.0
G16.1	EX3	7.1	117.8
G16.2	EX2	0.2	1.4

* BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR THE SANCTUARY FILING 1 AT MERIDIAN RANCH".

** BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR REX ROAD THROUGH FALCON REGIONAL PARK".

*** BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR FALCON REGIONAL PARK".

DRAWN BY:	SPC	JOB DATE:	10/14/2024
APPROVED:	CM	JOB NUMBER:	201662.08
CAD DATE:	10/14/2024		
CAD FILE:	J:\2020\201662\CAD\Dwgs\C\Eastonville_Road_662.08\Drainage\201662.08_FDR_map_ex_Seq2		

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NO.	DATE	BY	REVISION DESCRIPTION

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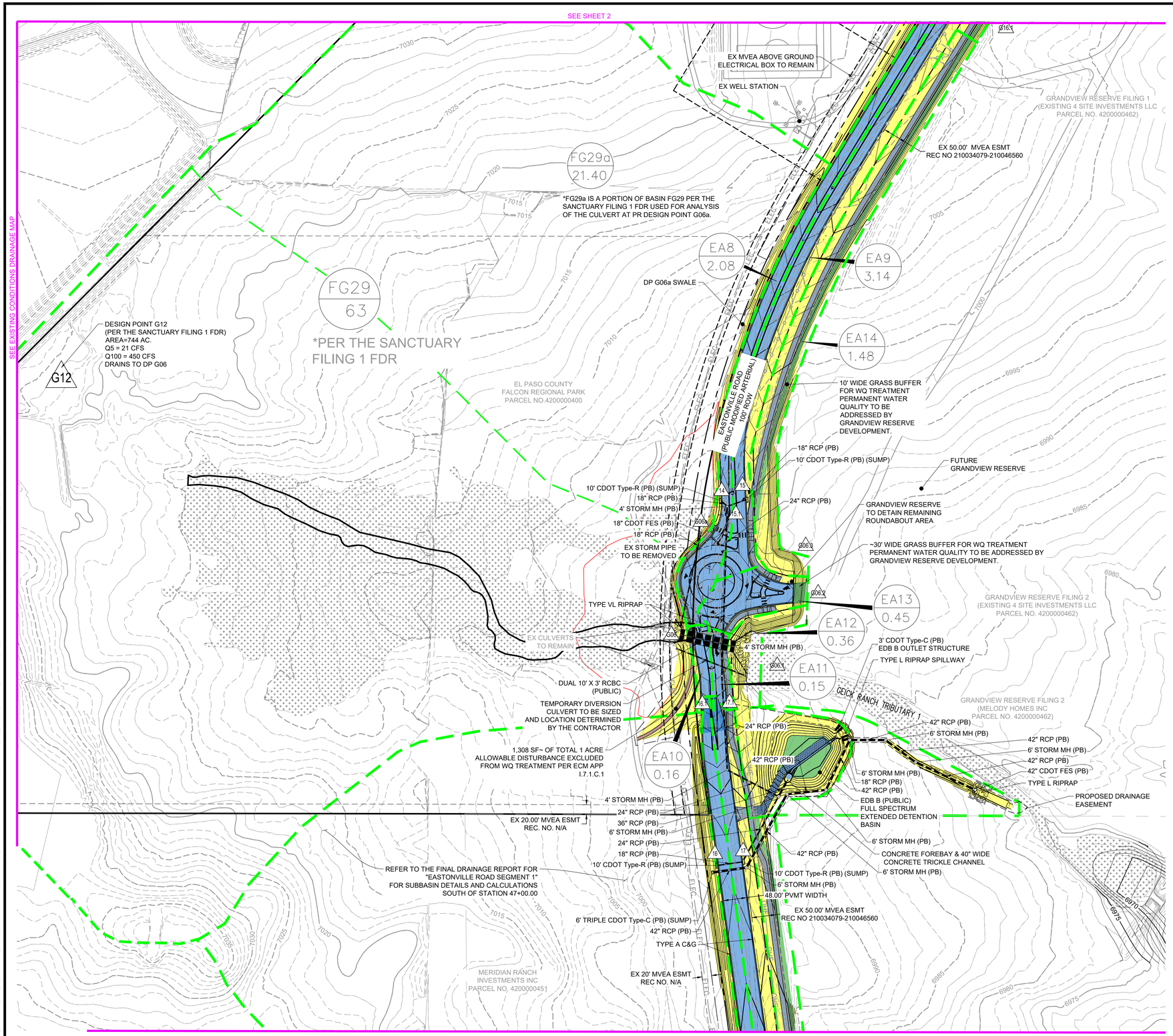
COLORADO SPRINGS CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

EXISTING CONDITIONS - DRAINAGE MAP

SHEET DRN 2



LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- PROPOSED DRAINAGE SWALE
- PROPERTY LINE
- PROPOSED FLOW DIRECTION
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN DESIGN POINT
- PROPOSED BASIN LABEL — NAME / AREA
- PRELIMINARY 100-YR FLOODPLAIN
- WETLANDS

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
EA1	0.22	73	0.8	1.5
EA2	0.25	72	0.9	1.7
EA3	0.76	65	2.4	4.9
EA4	3.11	24	3.8	11.7
EA5	0.16	0	0.1	0.4
EA6	0.25	76	0.8	1.6
EA7	0.20	50	0.4	1.0
EA8	2.08	99	5.2	9.4
EA9	3.14	60	5.0	10.6
EA10	0.16	75	0.6	1.1
EA11	0.15	67	0.5	1.0
EA12	0.36	0	0.1	1.1
EA13	0.45	73	1.4	2.8
EA14	1.48	21	1.2	3.8
EA15	0.76	24	0.7	2.1
EA16	1.18	0	0.3	2.5
EA17	0.30	0	0.1	0.7
EA18	11.29	3	3.9	24.6
*FG29	62.91	-	2.9	60.0
FG29a	21.40	2	6.4	42.9
**FG35	18.69	-	2.4	25.0
FG36a	14.14	4	4.6	27.7
FG36b	0.81	8	0.4	2.0
FG37a	22.39	0	5.4	39.5
FG37b	24.86	6	11.0	54.9
***FG38	85.00	-	-	-

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)
*G06	FG29, DP G06a, G15	22.0	491.0
*G12	-	21.0	450.0
**G15	FG35	3.0	55.0
***G09	FG38	52.0	277.0
2.1	EA1	0.8	1.5
3.1	EA2, DP2.1	1.6	3.2
4.1	EA5, DP3.1	1.7	3.4
5	EA3	2.4	4.9
6	EA4, DP5	5.9	16.0
G15a1	FG36a	4.6	27.7
7	FG36b	0.4	2.0
8	DPG15a1,7	4.9	29.2
6.1	DP6,8	9.0	40.2
G15a	DP6.1	9.0	40.2
**G16a	FG37a, DPG15,G15a	12.0	59.0
10	EA5, EA6, SFB C OUTFLOW	1.3	3.3
10.1	EA7	0.1	0.7
11.1	DPG16a,G16b	23.0	113.9
12	EA18	3.9	24.6
13	DP11.1, 12	27.0	138.5
13.1	DP13	27.3	141.0
14	EA8	5.2	9.4
15	EA9	5.0	10.6
15.1	DP14,15	10.2	19.9
16.1	EA10	0.6	1.1
17.1	EA11	0.5	1.0
G16.1	EA15	0.7	2.1
G16.2	-	0.0	0.0
G06a	FG29a	6.4	42.9
G06.1	EA12, DPG06	22.1	492.1
G06.2	EA13	1.4	2.8
G06.3	EA14	1.2	3.8
G16b	FG37b	11.0	54.9

Highlighted flows did not match with flows in report or other hydrology spreadsheets. Verify flows and revise accordingly so all items reference same flow.

BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR THE SANCTUARY FILING 1 AT MERIDIAN RANCH".

** BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR REX ROAD THROUGH FALCON REGIONAL PARK".

*** BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR FALCON REGIONAL PARK".

Provide a Legend for the shading colors on this map, like was done with the Segment 1 FDR Drainage Maps

DRAWN BY:	SPC	JOB DATE:	10/16/2024
APPROVED:	CM	JOB NUMBER:	201662.08
CAD DATE:	10/21/2024		
CAD FILE:	J:\2020\201662\CAD\Dwgs\C\Eastonville_Road_662.08\Drainage\201662.08_FDR_map_Seg2		

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1975 RESEARCH PKWY SUITE 230
COLORADO SPRINGS CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

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PROPOSED CONDITIONS - DRAINAGE MAP

SHEET DRN 1

SEE EXISTING CONDITIONS DRAINAGE MAP

SEE EXISTING CONDITIONS DRAINAGE MAP

SEE SHEET 1

* PER THE FDR FOR REX ROAD THROUGH FALCON REGIONAL PARK

*PER THE FALCON REGIONAL PARK FDR

REX ROAD

EASTONVILLE ROAD

FG35 19

FG38 85

FG36a 14.14

FG36b 0.81

EA1 0.22

EA2 0.25

EA17 0.30

EA3 0.76

EA4 3.11

EA18 11.29

EA9 3.14

EA8 2.08

EA16 1.18

EA15 0.76

EA7 0.20

EA6 0.25

EA5 0.16

FG37a 22.39

FG37b 24.86

DESIGN POINT G09
(PER FALCON REGIONAL PARK FDR)
AREA= *NOT LISTED* AC.
Q5 = 52 CFS
Q100 = 277 CFS

DESIGN POINT G15
(PER FDR FOR REX ROAD THROUGH FALCON REGIONAL PARK)
AREA=64 AC.
Q5 = 3 CFS
Q100 = 55 CFS
DRAINS TO DP G16a

DESIGN POINT G16a
(PER FDR FOR REX ROAD THROUGH FALCON REGIONAL PARK).
Q5 = 12 CFS
Q100 = 59 CFS

DP7 SWALE
EX STORM PIPE TO BE REMOVED
18" CDOT FES (PB)
18" RCP (PB)
6' STORM MH (PB)
30" RCP (PB)
24" CDOT FES (PB)
5' CDOT Type-R (PB) (SUMP)
EX 20.00' MVEA ESMT REC NO. N/A
16,505 SF~ OF TOTAL 1 ACRE ALLOWABLE DISTURBANCE EXCLUDED FROM WQ TREATMENT PER ECM APP I.7.1.C.1
10' CDOT Type-R (PB) (SUMP)
36" RCP (PB)
TYPE L RIPRAP
36" CDOT FES (PB)
POND C (WQ SAND FILTER)
DP16a SWALE
EX CULVERTS TO REMAIN
10' WIDE GRASS BUFFER FOR WQ TREATMENT PERMANENT WATER QUALITY TO BE ADDRESSED BY FUTURE DEVELOPMENT.
EX 20.00' MVEA ESMT REC NO. N/A
EPC TYPE A C&G
TRIPLE CDOT TYPE-C (PB) (SUMP)
EX CULVERTS (TO BE FLOW FILLED)
2,786 SF~ OF TOTAL 1 ACRE ALLOWABLE DISTURBANCE EXCLUDED FROM WQ TREATMENT PER ECM APP I.7.1.C.1
EX PARKING AREA TO REMAIN
8' STORM MH (PB)
DP16b SWALE
3,567 SF~ OF TOTAL 1 ACRE ALLOWABLE DISTURBANCE EXCLUDED FROM WQ TREATMENT PER ECM APP I.7.1.C.1
EX POND TO REMAIN
EX 20.00' MVEA ESMT REC. NO N/A
EX STORM PIPE TO BE REMOVED
8' STORM MH (PB)
5' CDOT Type-R (PB) (SUMP)
18" RCP (PB)
4' STORM MH (PB)
18" CDOT FES (PB)
3' CDOT Type-C (PB) (SFB C OUTLET STRUC.)
18" RCP (PB) Unresolved: Show riprap spillway
PR. TYPE VL RIPRAP SPILLWAY
PR. TEMPORARY SEDIMENT BASIN #1
TYPE L RIPRAP W/ 12" PVC RISER PIPE
FUTURE REX ROAD
TYPE VL RIPRAP LEVEL SPREADER
TYPE L RIPRAP SPILLWAY
Unresolved: Show riprap spillway
19,279 SF~ OF TOTAL 1 ACRE ALLOWABLE DISTURBANCE EXCLUDED FROM WQ TREATMENT PER ECM APP I.7.1.C.1
EX 100-YR FLOODPLAIN
EX 50.00' MVEA ESMT REC NO 210034079-210046560
TEMPORARY CONSTRUCTION ESMT.
GRANDVIEW RESERVE FILING 1 (EXISTING 4 SITE INVESTMENTS LLC)
6' STORM MH (PB)
48" RCP (PB)
36" RCP (PB)
5' STORM MH (PB)
36" CDOT FES (PB)
FUTURE GRANDVIEW RESERVE
6' DOUBLE CDOT TYPE-C (PB) (SUMP)
R300'
TYPE H RIPRAP
7' STORM MH (PB)
48" CDOT FES (PB)

CHANNEL B - GIECK RANCH TRIB. 2 (NOT A PART OF THIS PROJECT, SHOWN FOR REFERENCE)

PR 10' X 4' RCBC (FUTURE) (NOT A PART OF THIS PROJECT, SHOWN FOR REFERENCE)

EL PASO COUNTY FALCON REGIONAL PARK PARCEL NO.4200000400

EL PASO COUNTY FALCON REGIONAL PARK PARCEL NO.4200000400

LEGEND:

PROPOSED MAJOR CONTOUR	5250
PROPOSED MINOR CONTOUR	
EXISTING MAJOR CONTOUR	5250
EXISTING MINOR CONTOUR	
PROPOSED STORM SEWER	
PROPOSED DRAINAGE SWALE	
PROPERTY LINE	
PROPOSED FLOW DIRECTION	
EXISTING FLOW DIRECTION	
PROPOSED DRAINAGE BASIN	
DESIGN POINT	
PROPOSED BASIN LABEL	NAME / AREA
PRELIMINARY 100-YR FLOODPLAIN	
WETLANDS	

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
EA1	0.22	73	0.8	1.5
EA2	0.25	72	0.9	1.7
EA3	0.76	65	2.4	4.9
EA4	3.11	24	3.8	11.7
EA5	0.16	0	0.1	0.4
EA6	0.25	76	0.8	1.6
EA7	0.20	50	0.4	1.0
EA8	2.08	99	5.2	9.4
EA9	3.14	60	5.0	10.6
EA10	0.16	75	0.6	1.1
EA11	0.15	67	0.5	1.0
EA12	0.36	0	0.1	1.1
EA13	0.45	73	1.4	2.8
EA14	1.48	21	1.2	3.8
EA15	0.76	24	0.7	2.1
EA16	1.18	0	0.3	2.5
EA17	0.30	0	0.1	0.7
EA18	11.29	3	3.9	24.6
*FG29	62.91	-	2.9	60.0
FG29a	21.40	2	6.4	42.9
**FG35	18.69	-	2.4	25.0
FG36a	14.14	4	4.6	27.7
FG36b	0.81	8	0.4	2.0
FG37a	22.39	0	5.4	39.5
FG37b	24.86	6	11.0	54.9
***FG38	85.00	-	-	-

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)
*G06	FG29, DP G06a, G15	22.0	491.0
*G12	-	21.0	450.0
**G15	FG35	3.0	55.0
***G09	FG38	52.0	277.0
2.1	EA1	0.8	1.5
3.1	EA2, DP2.1	1.6	3.2
4.1	EA5, DP3.1	1.7	3.4
5	EA3	2.4	4.9
6	EA4, DP5	5.9	16.0
G15a1	FG36a	4.6	27.7
7	FG36b	0.4	2.0
8	DPG15a1,7	4.9	29.2
6.1	DP6,8	9.0	40.2
G15a	DP6.1	9.0	40.2
**G16a	FG37a, DPG15,G15a	12.0	59.0
10	EA5, EA6, SFB C OUTFLOW	1.3	3.3
10.1	EA7	0.1	0.7
11.1	DPG16a,G16b	23.0	113.9
12	EA18	3.9	24.6
13	DP11.1, 12	27.0	138.5
13.1	DP13	27.3	141.0
14	EA8	5.2	9.4
15	EA9	5.0	10.6
15.1	DP14,15	10.2	19.9
16.1	EA10	0.6	1.1
17.1	EA11	0.5	1.0
G16.1	EA15	0.7	2.1
G16.2	-	0.0	0.0
G06a	FG29a	6.4	42.9
G06.1	EA12, DPG06	22.1	492.1
G06.2	EA13	1.4	2.8
G06.3	EA14	1.2	3.8
G16b	FG37b	11.0	54.9

* BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR THE SANCTUARY FILING 1 AT MERIDIAN RANCH".

** BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR REX ROAD THROUGH FALCON REGIONAL PARK".

*** BASIN/DESIGN POINT NAME, AREA, AND FLOWS TAKEN FROM THE "FDR FOR FALCON REGIONAL PARK".

NORTH
0 100
50

DRAWN BY: SPC JOB DATE: 10/28/2024
APPROVED: CM JOB NUMBER: 201662.08
CAD DATE: 10/28/2024
CAD FILE: J:\2020\201662\CAD\Dwgs\C\Eastonville_Road_662.08\Drainage\201662.08_FDR_map_Seg2

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NO.	DATE	BY	REVISION DESCRIPTION

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EASTONVILLE ROAD
D.R. HORTON
EL PASO COUNTY, CO

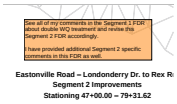
D·R·HORTON America's Builder

PROPOSED CONDITIONS - DRAINAGE MAP

SHEET DRN 2

V4_Drainage Report Final - Segment 2.pdf Markup Summary

1 (1)



Subject: SW - Textbox
Page Index: 1
Date: 2/10/2025 2:33:34 PM
Author: Glenn Reese - EPC Stormwater
Color:
Layer:
Space:
Page Label: 1

See all of my comments in the Segment 1 FDR about double WQ treatment and revise this Segment 2 FDR accordingly.

I have provided additional Segment 2 specific comments in this FDR as well.

9 (2)

Subject: SW - Highlight
Page Index: 9
Date: 2/10/2025 4:44:16 PM
Author: Glenn Reese - EPC Stormwater
Color:
Layer:
Space:
Page Label: 9

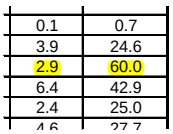
The remaining untreated WQCV will be treated at the development of Filing 1 of the Grandview Reserve

---

Subject: SW - Textbox with Arrow
Page Index: 9
Date: 2/10/2025 4:45:13 PM
Author: Glenn Reese - EPC Stormwater
Color:
Layer:
Space:
Page Label: 9

There needs to be more treatment in the interim condition that just 19% reduction via RR. Can you do a TSB like you did with TSB #1 in Segment 1?

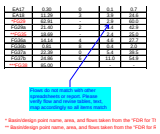
37 (2)



0.1	0.7
3.9	24.6
2.9	60.0
6.4	42.9
2.4	25.0
4.6	27.7

Subject: Highlight
Page Index: 37
Date: 2/10/2025 3:59:43 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: 27

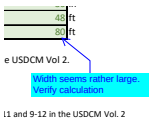
2.9 60.0



Subject: Callout
Page Index: 37
Date: 2/10/2025 4:00:57 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: 27

Flows do not match with other spreadsheets or report. Please verify flow and revise tables, text, map accordingly so all items match

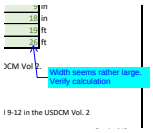
81 (1)



Subject: Callout
Page Index: 81
Date: 2/10/2025 4:17:38 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: 71

Width seems rather large. Verify calculation

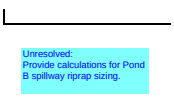
82 (1)



Subject: Callout
Page Index: 82
Date: 2/10/2025 4:18:12 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: 72

Width seems rather large. Verify calculation

85 (1)



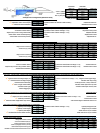
Subject: Text Box
Page Index: 85
Date: 2/10/2025 4:24:37 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: 75

Unresolved:
Provide calculations for Pond B spillway riprap sizing.

123 (1)

Subject: Checkmark
Page Index: 123
Date: 2/10/2025 2:36:34 PM
Author: Glenn Reese - EPC Stormwater
Color:
Layer:
Space:
Page Label: 113

127 (1)

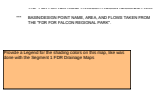


Subject: Checkmark
Page Index: 127
Date: 2/10/2025 4:30:50 PM
Author: Glenn Reese - EPC Stormwater
Color:
Layer:
Space:
Page Label: 117

137 (1)

Subject: Group
Page Index: 137
Date: 2/10/2025 4:30:59 PM
Author: Glenn Reese - EPC Stormwater
Color:
Layer:
Space:
Page Label: 127

161 (6)



Subject: SW - Textbox
Page Index: 161
Date: 2/10/2025 2:32:13 PM
Author: Glenn Reese - EPC Stormwater
Color:
Layer:
Space:
Page Label: [1] FDR Map 1

Provide a Legend for the shading colors on this map, like was done with the Segment 1 FDR Drainage Maps

---

2.9

Subject: Highlight
Page Index: 161
Date: 2/10/2025 4:30:30 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: [1] FDR Map 1

2.9

60.0

Subject: Highlight
Page Index: 161
Date: 2/10/2025 4:30:39 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: [1] FDR Map 1

60.0

2.4

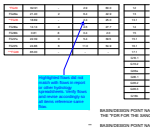
Subject: Highlight
Page Index: 161
Date: 2/10/2025 4:30:42 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: [1] FDR Map 1

.4

25.0

Subject: Highlight
Page Index: 161
Date: 2/10/2025 4:30:44 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: [1] FDR Map 1

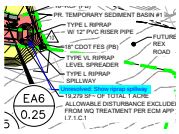
25.0



Subject: Callout
Page Index: 161
Date: 2/10/2025 4:31:39 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: [1] FDR Map 1

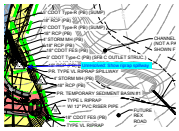
Highlighted flows did not match with flows in report or other hydrology spreadsheets. Verify flows and revise accordingly so all items reference same flow.

162 (2)



Subject: Callout
Page Index: 162
Date: 2/10/2025 4:37:57 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: [1] FDR Map 2

Unresolved: Show riprap spillway



Subject: Callout
Page Index: 162
Date: 2/10/2025 4:38:43 PM
Author: CDurham
Color:
Layer:
Space:
Page Label: [1] FDR Map 2

Unresolved: Show riprap spillway