DRAINAGE LETTER
FOR
STERLING RANCH ROAD AND
BRIARGATE PARKWAY INTERIM PLAN

Prepared For:

SR Land, LLC
20 Boulder Crescent, Suite 200
Colorado Springs, CO 80903
(719) 491-3024

May 2023
Project No. 25188.03
PCD Filing No: CDR221

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive, Suite 235
Colorado Springs, CO 80919
719-593-2593

J·R ENGINEERING

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 El Paso County for drainage reports and said report is in conformity with the 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.

Mike Bramlett, Colorado P.E. 32314
For and On Behalf of JR Engineering, LLC

COLORADO LICENSED
MIKE BRAMLETT
32314
05/08/23
PROFESSIONAL ENGINEER

DEVELOPER'S STATEMENT:

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

Business Name: SR Land, LLC

By:

Title: MANAGER

Address: 20 Boulder Crescent, Suite 200
Colorado Springs, CO 80903

El Paso County:

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

Joshua Palmer, P.E.
County Engineer/ ECM Administrator

Date

Conditions:

Table of Contents

PURPOSE

This document is the Drainage Letter for Sterling Ranch Road and Briargate Parkway Interim Plan. The purpose of this report is to identify on-site and off-site drainage patterns, storm sewer, culvert and inlet locations, areas tributary to the site, and to safely route developed storm water to adequate outfall facilities during the interim condition of development and the construction of Sterling Ranch Road and Briargate Parkway.

GENERAL SITE DESCRIPTION

GENERAL LOCATION

Sterling Ranch and Briargate Parkway Interim Plan (hereby referred to as the "site") is a proposed development within the Sterling Ranch master planned community with a total area of approximately 376 acres that are presently undeveloped.

The site is located in portions of Section 33 & 34, Township 12 South, Range 65 West of the Sixth Principal Meridian in El Paso County, State of Colorado. The site is bounded by Sand Creek to the west, Sterling Ranch Road cuts through the site, and future development land borders the site to the south, north and east. Refer to the vicinity map in Appendix A for additional information.

DESCRIPTION OF PROPERTY

In the interim condition, the property will be roadway (approximately 17 acres), open space and drainage tracts (approximately 359 acres). The site is comprised of variable sloping grasslands that generally slope(s) downward to the southwest at 1 to 6% towards the Sand Creek tributary basin.

Soils for this project are classified as Blakeland Loamy Sand (8) and Gravelly Sandy Loam (19). These soils are characterized as hydrologic soil types Type A. Group A soils exhibit high infiltration rates when thoroughly wet, and consist mainly of deep, well drained to excessively drained sands or gravelly sands. Spring Coarse Sandy Loam (71) is characterized as Hydrologic Soil Types "B". Group B soils exhibit moderate infiltration rate when thoroughly wet, and consist primarily of deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. Refer to the soil survey map in Appendix A for additional information.

Sand Creek runs west of the site and crosses Briargate Parkway at the north edge and Sterling ranch Road at the southern edge. The site is a tributary to Sand Creek. Currently, JR Engineering is performing studies and plans to address Sand Creek stabilization.

There are no known irrigation facilities located on the project site.

FLOODPLAIN STATEMENT

Based on the FEMA FIRM Maps number 08041C0533G, dated December 7, 2018, the far western portion of the project site that is adjacent to the existing drainage way lies within Zone AE. Zone AE is defined as area subject to inundation by the 1-percent-annual-chance flood event. All of the proposed development lies within Zone X. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. No grading operations are proposed within the Zone AE at this time. FIRM Maps have been presented in Appendix A.

EXISTING DRAINAGE CONDITIONS

MAJOR BASIN DESCRIPTIONS

The site lies within the upper Sand Creek Drainage Basin based on the "Sand Creek Drainage Basin Planning Study" (DBPS) completed by Kiowa Engineering Corporation in January 1993, revised March 1996. The Sand Creek Drainage Basin covers approximately 54 square miles and is divided into 7 major sub-basins. The site is within the respective upper basin Sand Creek sub-basin as shown in Appendix C. The Sand Creek DBPS assumed the Sterling Ranch East of Sand Creek property to have a "single family residential" use for the majority of the site.

The site was also previously studied in the Master Development Drainage Plan (MDDP) for Sterling Ranch prepared by M&S Civil Consultants, INC in October 2018. Excerpts from this report can be found in Appendix C. The Sterling Ranch MDDP assumed a mix of low density to medium density and single family residential lots ranging in size from 0.1 to 1.0 acres for the Sterling Ranch East site. The proposed Sterling Ranch master plan is a mix of; school, multi-family, single-family, and parks and open space. The proposed drainage on the site closely follows the approved "Master Development Drainage Plan for Sterling Ranch", (MDDP). The Briargate Parkway and Sterling Ranch Road roadway is tributary to Pond FSD14A and Pond FSD11B. Interim ponds will be developed before final site design and are shown in this report.

The site generally drains from north to southwest. Currently, the site is used as pasture land for cattle. Sand Creek is located west of the site running north to south. This reach of drainage conveyance is not currently improved. Currently, Kiowa is performing studies and plans to address Sand Creek stabilization adjacent to the site.

EXISTING SUB-BASIN DRAINAGE

The existing/predeveloped condition of the site was broken into six major basins. The basin and sub-basin delineation is shown in the existing drainage map in Appendix E and is described as follows:

Sub-basin EX1 (Q_5= 40.5cfs, Q_{100}=272.1cfs) is 178.68 acres and 2 percent impervious consists of the northern portion of Sterling Ranch Phase 3. Runoff from this basin sheet flows from the north to south to design point EX1 at the northern edge of future Briargate Parkway.

Sub-basin EX2 (Q_5= 4.2cfs, Q_{100}=27.9cfs) is 14.67 acres and 2 percent impervious and consists the northeast portion of Sterling Ranch Phase 3. Runoff from this basin sheet flows south to design point EX2 located just north of future Briargate Parkway.

Sub-basin EX3 (Q_5= 39.0cfs, Q_{100}=262.0cfscfs) is 160.58 acres and 2 percent impervious and is located onsite in the central part of the site. Runoff from this basin drains southwest to design point EX3 along the eastern edge of Sand Creek.

Sub-basin EX4 (Q_5= 9.9cfs, Q_{100}=66.5cfs) is 36.46 and is 2 percent impervious and is located on the eastern portion of the site. Runoff from this basin sheet flows southwest to design point EX4 located just east of future Sterling Ranch Road.

Sub-basin EX5 (Q_5= 1.3cfs, Q_{100}=8.7cfs) is 4.28 and is 2 percent impervious and is located on the northwestern portion of the site. Runoff from this basin sheet flows southeast to design point EX5 located just east of future Sterling Ranch Road.

Sub-basin EX6 (Q_5= 0.2cfs, Q_{100}=1.4cfs) is 0.56 and is 2 percent impervious and is located on the southwestern portion of the site. Runoff from this basin sheet flows east to design point EX6 located just east of future Sterling Ranch Road.

PROPOSED DRAINAGE CONDITIONS

PROPOSED SUB-BASIN DRAINAGE

The proposed site was broken into two major basins: Basin A (Briargate Parkway), Basin B (Sterling Ranch Road). The proposed basin (and sub-basin) delineation is shown on the drainage basin map within Appendix E and is described as follows.

Basin A1 (Q_5= 9.9 cfs, Q_{100}=19.7 cfs) is 4.09 acres and 70 percent impervious and is comprised of Briargate Parkway. Runoff from this basin drains to design point 21, an on grade inlet at the southwest corner of the basin. Collected runoff is piped east through proposed storm sewer until it connects to Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin A2 (Q_5= 10.5 cfs, Q_{100}=21.4 cfs) is 5.05 acres and 67 percent impervious is comprised of Briargate Parkway. Runoff from this basin drains to design point 2, an on grade inlet on the southeast corner of the basin. Collected runoff is piped east through Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin A3 (Q_5= 5.1 cfs, Q_{100}=10.5 cfs) is 1.94 acres and 64 percent impervious is comprised of Briargate Parkway. Runoff from this basin drains to an on grade inlet located at design point 5 in confluence with uncaptured upstream flows from basin A2. Collected runoff is piped south to a proposed manhole at design point 6 until it connects to Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin A4 (Q_5= 4.9 cfs, Q_{100}=8.3 cfs) is 1.52 acres and 70 percent impervious is comprised of Briargate Parkway. Runoff from this basin drains to an on grade inlet located at design point 4 in confluence with uncaptured upstream flows from basin A5, Collected runoff is piped south though Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin A5 (Q_5= 2.6 cfs, Q_{100}=4.9 cfs) is 0.63 acres and 88 percent impervious is comprised of Briargate Parkway. Runoff from this basin drains to an on grade inlet located at design point 1 in confluence with uncaptured upstream flows from basin A1. Collected runoff is piped east to a proposed manhole at design point 1A. Piped runoff flows east through Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin B1 (Q_5= 5.3 cfs, Q_{100}=10.6 cfs) is 1.82 acres and 68 percent impervious is comprised of Sterling Ranch Road. Runoff from this basin drains to an on grade inlet at design point 8 in confluence with uncaptured upstream flows from basin A4. Collected runoff is conveyed south through Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin B2 (Q_5= 5.2 cfs, Q_{100}=10.6 cfs) is 1.90 acres and 64 percent impervious is comprised of Sterling Ranch Road. Runoff from this basin drains to an on grade inlet at design point 7. Collected runoff will be piped west through design point 8 to Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin B3 (Q_5= 3.3 cfs, Q_{100}=6.9 cfs) is 1.27 acres and 64 percent impervious is comprised of Sterling Ranch Road. The runoff from this basin drains to an on grade inlet located at design point 11 in confluence with uncaptured upstream flows from basin B1. Collected runoff will be piped west through Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin B4 (Q_5= 3.3 cfs, Q_{100}=6.9 cfs) 1.33 acres and 61 percent impervious is comprised of Sterling Ranch Road. The runoff from this basin drains to an on grade inlet located at design point 10 in confluence with uncaptured upstream flows from basin B2. Collected runoff will be piped west through design point 11 to Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin B5 (Q_5= 2.4cfs, Q_{100}=4.9 cfs) 0.89 acres and 61 percent impervious is comprised of Sterling Ranch Road. The runoff from this basin drains to an on grade inlet located at design point 15 in confluence with uncaptured upstream flows from basin B3. Collected runoff will be piped west through Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin B6 (Q_5= 2.5 cfs, Q_{100}=5.2 cfs) 0.91 acres and 63 percent impervious is comprised of a Sterling Ranch Road. The runoff from this basin drains to an on grade inlet located at design point 14 in confluence with uncaptured upstream flows from basin B4. Collected runoff will be piped west through Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin B7 (Q_5= 2.4 cfs, Q_{100}=5.4 cfs) is 1.08 acres and 52 percent impervious is comprised of Sterling Ranch Road. The runoff from basin B7 drains to an on grade inlet located at design point 19 in confluence with uncaptured upstream flows from basin B5. Collected runoff will be piped west through Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin B8 (Q_5= 2.9 cfs, Q_{100}=6.2 cfs) is 1.16 acres and 58 percent impervious is comprised of Sterling Ranch Road. Runoff from basin B8 drains to an on grade inlet located at design point 18 in confluence with uncaptured upstream flows from basin B6. Collected runoff will be piped west through design point 19 to Sterling East Filing No. 1 storm sewer system designed by Classic Consulting. Piped runoff is conveyed south to Sterling East Filing No. 1 proposed detention pond FSD Pond 14A and eventually outfalls into Sand Creek.

Basin B9 (Q_5= 4.4 cfs, Q_{100}=9.8 cfs) is 1.98 acres and 51 percent impervious is comprised of Sterling Ranch Road. Runoff from basin B9 drains to a sump inlet located at design point 22 in confluence with uncaptured upstream flows from basin B7. The flow will be piped south through design point 23 to interim Pond FSD 11B.

Basin B10 (Q_5= 5.0 cfs, Q_{100}=11.1 cfs) is 2.19 acres and 53 percent impervious is comprised of Sterling Ranch Road. Runoff from basin B10 drains to a sump inlet located at design point 23 in confluence with uncaptured upstream flows from basin B8. The flow will be piped south to interim Pond FSD 11B.

Basin B11 (Q_5= 3.8 cfs, Q_{100}=11.1 cfs) is 3.53 acres and 26 percent impervious is comprised of proposed storm sewer disturbance south of Sterling Ranch Road, as well as interim Pond FSD 11B. Runoff from basin B11 drains the outlet structure at design point 25 in confluence with upstream flows from design point 24. The flow will be released through the outlet structure and then enter Sand Creek.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

Storm drainage analysis and design criteria for this project were taken from the "*City of Colorado Springs/El Paso County Drainage Criteria Manual*" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "*Urban Storm Drainage Criteria Manual*" Volumes 1 to 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "*Colorado Springs Drainage Criteria Manual*" (CSDCM), dated May 2014, as adopted by El Paso County.

HYDROLOGIC CRITERIA

All hydrologic data was obtained from the "*El Paso Drainage Criteria Manual*" Volumes 1 and 2, and the "*Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual*" Volumes 1, 2, and 3. Onsite drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using the Rational Method, and rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from Table 6-2 of the CSDCM. One hour point rainfall data for the storm events is identified in the chart below. Runoff coefficients were determined based on proposed land use and from data in Table 6-6 from the CSDCM. Time of concentrations were developed using equations from CSDCM. All runoff calculations and applicable charts and graphs are included in the Appendices.

Table 2 - 1-hr Point Rainfall Data

Storm	Rainfall (in.)
5-year	1.50
100-year	2.52

HYDRAULIC CRITERIA

The Rational Method and USDCM's SF-2 and SF-3 forms were used to determine the runoff from the minor and major storms on the site. Sumps and on-grade inlets were sized using UDFCD UD-Inlet v4.06 as shown in Appendix C. Manning's equation was used to size the proposed pipes in this report and StormCAD was used to model the proposed storm sewer system and to analyze the proposed HGL calculations for the Construction Drawings. Per ECM Section 3.3.1.b.2, all storm pipes located within Briargate Parkway will need to have an extended service life of 100 years.

Table 2 - StormCAD Standard Method Conversions

StormCAD Conversion Table			
Bend Loss	Bend Angle	K coefficient Conversion	
	0	0.05	
	22.5	0.1	
	45	0.4	
	60	0.64	
	90	1.32	
Lateral Loss	1 Lateral K coefficient Conversion		
	Bend Angle	Non Surcharged	Surcharged
	45	0.27	0.47
	60	0.52	0.9
	90	1.02	1.77
	2 Laterals K coefficient Conversion		
	45	0.96	
	60	1.16	
	90	1.52	

DRAINAGE FACILITY DESIGN

GENERAL CONCEPT

The proposed stormwater conveyance system was designed to convey the developed Sterling Ranch – East of Sand Creek and Briargate Parkway roadway runoff and treat the proposed condition in the full spectrum water quality and detention Ponds FSD 14A and FSD 11B via storm sewer. The proposed pond FSD 14A is a part of the Sterling Ranch East Filing No.1 (SF 22-35) development and was designed by Classic Consulting to release at less than historic rates to minimize adverse impacts downstream. Treated water will outfall directly into the Sand Creek drainage way, where it will eventually outfall into Fountain Creek. A proposed drainage map is presented in Appendix E showing storm sewer. Proposed storm sewer and pond design by others is included in Appendix D.

FOUR STEP PROCESS TO MINIMIZE ADVERSE IMPACTS OF URBANIZATION

In accordance with the El Paso County Drainage Criteria Manual Volume 2, this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

Step 1 – Reducing Runoff Volumes: The Sterling Ranch East of Sand Creek development project consists of Sterling Ranch Road and Briargate Parkway with open spaces and lawn areas interspersed within the development which helps disconnect impervious areas and reduce runoff volumes.

Step 2 – Stabilize Drainageways: The site lies within the Sand Creek Drainage Basin. Basin and bridge fees will be due at time of platting. These funds will be used for the channel stabilization being designed by Kiowa adjacent to the site and on future projects within the basin to stabilize drainageways. The site does not discharge directly into the open drainageway of Sand Creek, therefore no downstream stabilization will be accomplished with this project.

Step 3 – Treat the WQCV: Water Quality treatment for this site is provided in the proposed full spectrum water quality detention ponds. The runoff from this site will be collected within inlets and conveyed to the proposed pond via storm sewer. Pond design and calculations by others are shown in Appendix D. All flows released from the ponds will be reduced to less than historic rates.

Step 4 –BMPs will be utilized to minimize off-site contaminants and to protect the downstream receiving waters. The permanent erosion control BMPs include asphalt drives, storm inlets and storm pipe, four full spectrum water quality and detention ponds, and permanent vegetation.

WATER QUALITY

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full spectrum water quality and detention are provided for all developed basins. This roadway will drain into two Full Spectrum Drainage Ponds 14A and 11B designed with the Sterling Ranch East Filing No.1 development. Riprap forebays, trickle channels, and swales will be provided in the pond and designed by others. Further details as well as all pond volume, water quality, and outfall calculations are included in the Appendix D of this report. Pond FSD 14A was sized per the MDDP and was designed to include roadway runoff from the proposed Briargate Parkway and Sterling Ranch Road development. The ponds provide water quality and 100yr detention for Sterling Ranch Road and Briargate Parkway while preparing for ultimate outfall design. Interim Pond 11B is sized to provide WQCV on CCES sheets, final design will be with Sterling Ranch East Filing 3 in the future. Flows to interim Pond 11B will enter into a concrete-bottom forebay sized for the interim condition provided by Classic Engineering. Forebay sizing calculations are provided in Appendix C, and pond design sheets are provided in Appendix D.

I see the forebay sizing calcs in App C and Pond calcs in App D, but I don't see any details for the forebay. Please provide.

Table 3: Pond Volumes & Release Rates						
	Required Volume (ac-ft)	Volume Provided (ac-ft)	WQCV (ac-ft)	EURV (ac-ft)	100-year Release (cfs)	Allowable 100-year Release (cfs)
Pond FSD14A	14.133	17.5	2.667	8.767	119.0	182.2
Interim Pond FSD11B	1.004	12.5	0.154	0.259	18.5	35.2

OPERATION & MAINTENANCE

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. The district shall be responsible for the inspection, maintenance, rehabilitation and repair of stormwater and erosion control facilities located on the property unless another party accepts such responsibility in writing and responsibility is properly assigned through legal documentation. Access is provided from onsite facilities and easements for proposed infrastructure located offsite.

DRAINAGE AND BRIDGE FEES

The site lies within the Sand Creek Drainage Basin. Drainage and Bridge fees were paid with the Homestead North at Sterling Ranch Filing No.1 project.

SUMMARY

The proposed Sterling Ranch East of Sand Creek drainage improvements were designed to meet or exceed the El Paso County Drainage Criteria. The proposed development will not adversely affect the offsite drainage ways or surrounding development. This report is in conformance and meets the latest El Paso County Storm Drainage Criteria requirements for this site.

REFERENCES

1. "El Paso County and City of Colorado Springs Drainage Criteria Manual, Vol I & II".

2. Final Bridge and Channel Design Report, prepared by Kiowa Engineering Corporation, May 19, 2020 (not yet approved)

3. "Master Development Drainage Plan for Sterling Ranch", (MMDP) prepared by M&S Civil Consultants, Inc., dated October 24, 2018.

4. Sand Creek Drainage Basin Planning Study, prepared Kiowa Engineering Corporation, January 1993, revised March 1996.

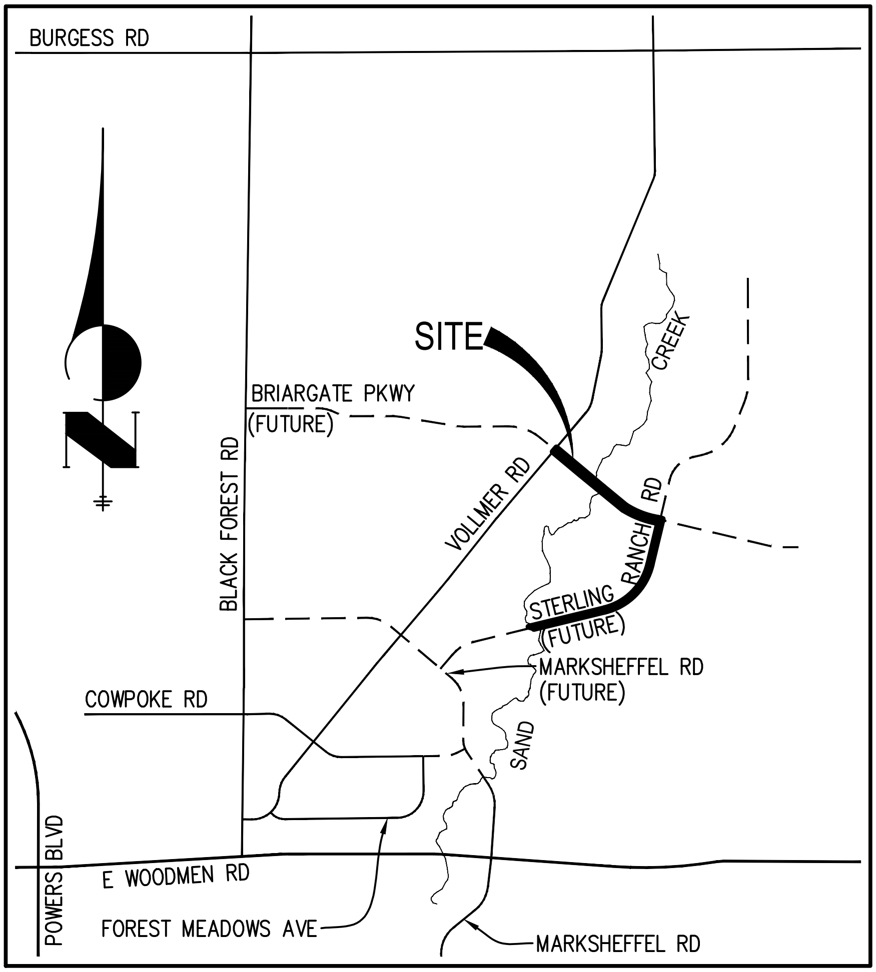
5. Final Drainage Report for Sterling Ranch East Filing No.1, prepared Classic Consulting Engineers & Surveyors, November 2022.

6. Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1, prepared Classic Consulting, April 2023.

7. "Sterling Ranch Road & Briargate Parkway Storm Plans", prepared by Classic Consulting Engineers & Surveyors, dated April 5, 2023.

8. Urban Storm Drainage Criteria Manual (Volumes 1, 2, and 3), Urban Drainage and Flood Control District, June 2001.

Appendix A
Vicinity Map, Soil Descriptions, FEMA Floodplain Map



VICINITY MAP

N.T.S.

VICINITY MAP
STERLING RANCH ROAD
JOB NO. 25188.03
12/17/2021
SHEET 1 OF 1

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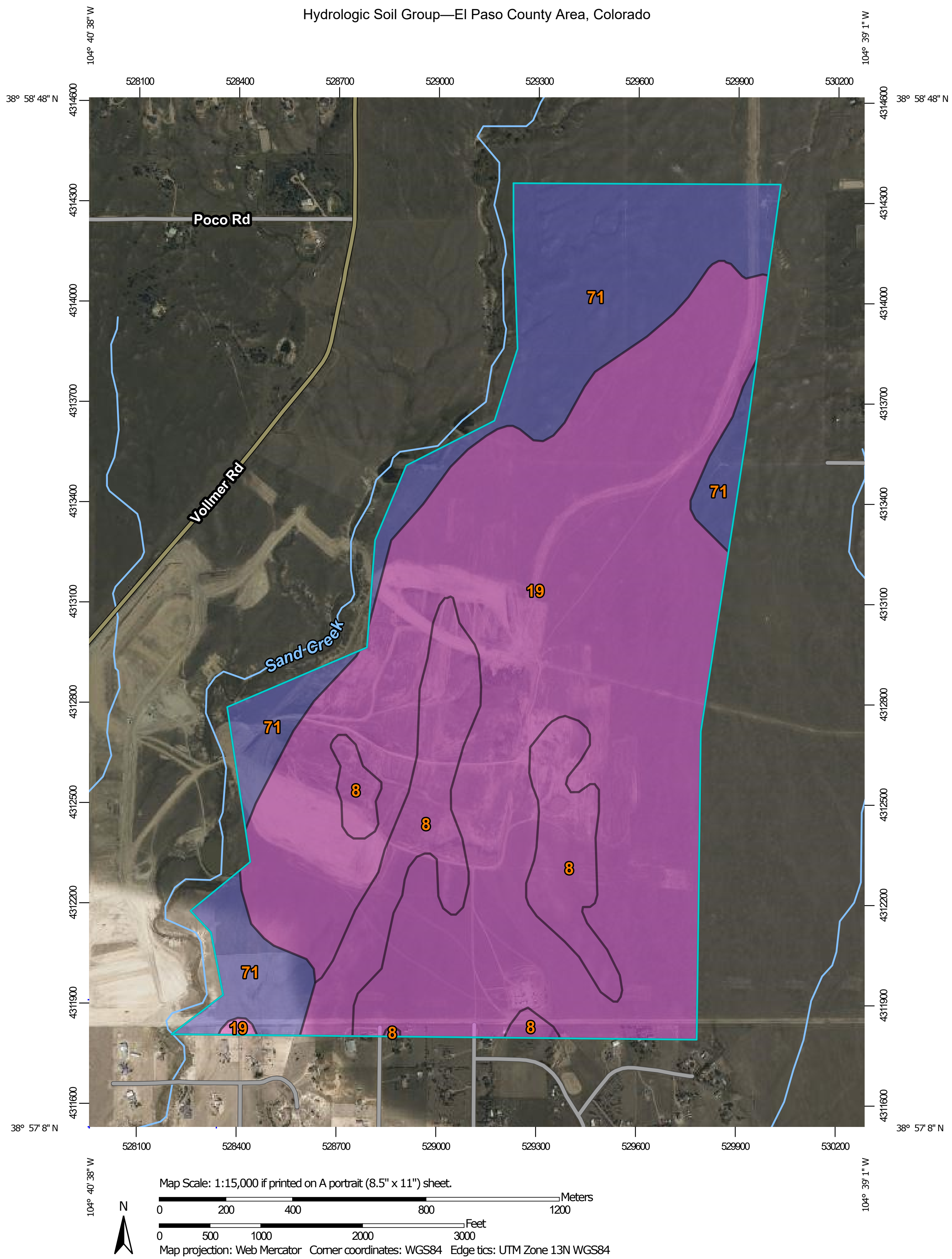


104° 40' 38" W
104° 39' 1" W
38° 58' 48" N
38° 57' 8" N
528100
528400
528700
529000
529300
529600
529900
530200
4314600
4314300
4314000
4313700
4313400
4313100
4312800
4312500
4312200
4311900
4311600
Poco Rd
Vollmer Rd
Sand Creek
71
19
8
Map Scale: 1:15,000 if printed on A portrait (8.5" x 11") sheet.
Meters
0 200 400 800 1200
Feet
0 500 1000 2000 3000
N
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 18, Jun 5, 2020

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

Date(s) aerial images were photographed: Aug 19, 2018—May 26, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	89.8	12.7%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	464.8	65.6%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	153.8	21.7%
Totals for Area of Interest			**708.4**	**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.

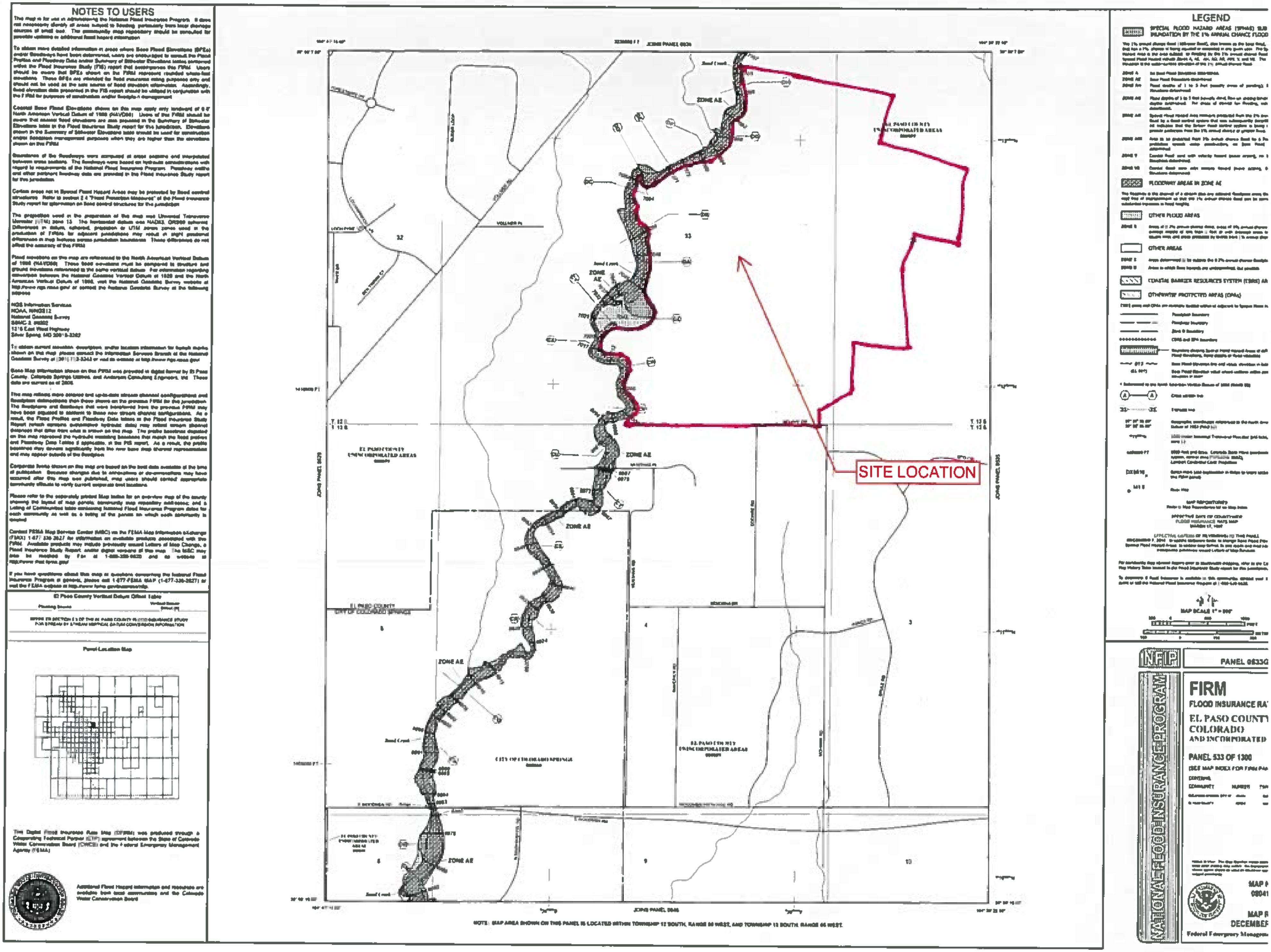
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



NOTES TO USERS
LEGEND
SITE LOCATION
ZONE AE
Panel Location Map
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0533G
FIRM
EL PASO COUNTY
COLORADO
AND INCORPORATED
PANEL 533 OF 1300

Appendix B
Hydrologic Calculations

COMPOSITE % IMPERVIOUS & COMPOSITE EXISTING RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County

Project Name: Sterling Ranch Phase 3
Project No.: 25188.03
Calculated By: CGV
Checked By: RAB
Date: 10/8/20

Basin ID	Total Area (ac)	Streets (100% Impervious)				Residential (65% Impervious)				Light Commercial (80% Impervious)				Historical Analysis (2% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
EX1	178.68	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	178.68	2.0%	0.09	0.36	2.0%
EX2	14.67	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	14.67	2.0%	0.09	0.36	2.0%
EX4	36.46	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	36.46	2.0%	0.09	0.36	2.0%
EX3	160.58	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	160.58	2.0%	0.09	0.36	2.0%
EX5	4.28	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	4.28	2.0%	0.09	0.36	2.0%
EX6	0.56	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	0.56	2.0%	0.09	0.36	2.0%
TOTAL (EX1-EX6)	**395.23**																			**2.0%**
TOTAL	**395.23**																			**2.0%**

EXISTING
STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County

Project Name: Sterling Ranch Phase 3
Project No.: 25188.03
Calculated By: CGV
Checked By: RAB
Date: 10/8/20

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	Cv	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
EX1	178.68	A	2%	0.09	0.36	300	10.5%	14.5	3159	1.6%	10.0	1.3	41.2	55.7	3459.0	29.2	29.2
EX2	14.67	A	2%	0.09	0.36	300	10.0%	14.8	1352	1.0%	10.0	1.0	22.1	36.9	1652.0	19.2	19.2
EX4	36.46	A	2%	0.09	0.36	300	8.3%	15.7	1678	0.8%	10.0	0.9	30.6	46.3	1978.0	21.0	21.0
EX3	160.58	A	2%	0.09	0.36	300	6.9%	16.7	2566	1.3%	10.0	1.2	37.0	53.7	2866.0	25.9	25.9
EX5	4.28	A	2%	0.09	0.36	300	6.9%	16.7	884	3.9%	10.0	2.0	7.5	24.2	1184.0	16.6	16.6
EX6	0.56	A	2%	0.09	0.36	141	14.6%	8.9	151	22.7%	10.0	4.8	0.5	9.5	292.0	11.6	9.5

NOTES:

$$t_c = t_i + t_t \quad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)
t_i = overland (initial) flow time (min)
t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)
C_v = conveyance coefficient (from Table 6-7)
S_w = watercourse slope (ft/ft)

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t} \quad \text{Equation 6-4}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_c = \frac{L}{180} + 10 \quad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)
L = waterway length (ft)

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.

STANDARD FORM SF-3 - EXISTING

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Project Name: Sterling Ranch Phase 3
Project No.: 25188.03
Calculated By: CGV
Checked By: RAB
Date: 10/8/20

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County
Design Storm: 5-Year

STREET	Design Point	DIRECT RUNOFF						
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)
	EX1	EX1	178.68	0.09	29.2	16.08	2.52	40.5
	EX2	EX2	14.67	0.09	19.2	1.32	3.15	4.2
	EX3	EX3	160.58	0.09	25.9	14.45	2.70	39.0
	EX4	EX4	36.46	0.09	21.0	3.28	3.02	9.9
	EX5	EX5	4.28	0.09	16.6	0.39	3.37	1.3
	EX6	EX6	0.56	0.09	9.5	0.05	4.21	0.2

Design Point	TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
EX1															
EX2															
EX3															
EX4															
EX5															
EX6															

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are RCP unless otherwise noted. Pipe size shown in table column.

STANDARD FORM SF-3 - EXISTING
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project Name: Sterling Ranch Phase 3
Project No.: 25188.03
Calculated By: CGV
Checked By: RAB
Date: 10/8/20

Subdivision: Sterling Ranch Subdivision- Existing
Location: El Paso County
Design Storm: 100-Year

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	EX1	EX1	178.68	0.36	29.2	64.32	4.23	272.1															
	EX2	EX2	14.67	0.36	19.2	5.28	5.29	27.9															
	EX3	EX3	160.58	0.36	25.9	57.81	4.53	262.0															
	EX4	EX4	36.46	0.36	21.0	13.13	5.06	66.5															
	EX5	EX5	4.28	0.36	16.6	1.54	5.66	8.7															
	EX6	EX6	0.56	0.36	9.5	0.20	7.07	1.4															

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are RCP unless otherwise noted. Pipe size shown in table column.

COMPOSITE % IMPERVIOUS & COMPOSITE PROPOSED RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Sterling Ranch Rd & Briargate Pkwy
Location: El Paso County

Project Name: Sterling Ranch Phase 3
Project No.: 25188.03
Calculated By: CGV
Checked By: RAB
Date: 5/3/23

Basin ID	Total Area (ac)	Streets/ Walks (100% Impervious)				Lawn/ Historic (2% Impervious)				Basins Total Weighted C		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A1	4.09	0.90	0.96	2.85	69.7%	0.09	0.36	1.24	0.6%	0.65	0.78	70.3%
A2	5.05	0.90	0.96	3.33	65.9%	0.09	0.36	1.72	0.7%	0.62	0.76	66.6%
A3	1.94	0.90	0.96	1.23	63.4%	0.09	0.36	0.71	0.7%	0.60	0.74	64.1%
A4	1.52	0.90	0.96	1.06	69.7%	0.09	0.36	0.46	0.6%	0.65	0.78	70.3%
A5	0.63	0.90	0.96	0.55	87.3%	0.09	0.36	0.08	0.3%	0.80	0.88	87.6%
B1	1.82	0.90	0.96	1.23	67.6%	0.09	0.36	0.59	0.6%	0.64	0.77	68.2%
B2	1.90	0.90	0.96	1.21	63.7%	0.09	0.36	0.69	0.7%	0.61	0.74	64.4%
B3	1.27	0.90	0.96	0.80	63.0%	0.09	0.36	0.47	0.7%	0.60	0.74	63.7%
B4	1.33	0.90	0.96	0.80	60.2%	0.09	0.36	0.53	0.8%	0.58	0.72	60.9%
B5	0.89	0.90	0.96	0.54	60.7%	0.09	0.36	0.35	0.8%	0.58	0.72	61.5%
B6	0.91	0.90	0.96	0.57	62.6%	0.09	0.36	0.34	0.7%	0.60	0.74	63.4%
B7	1.08	0.90	0.96	0.55	50.9%	0.09	0.36	0.53	1.0%	0.50	0.67	51.9%
B8	1.16	0.90	0.96	0.66	56.9%	0.09	0.36	0.50	0.9%	0.55	0.70	57.8%
B9	1.98	0.90	0.96	0.98	49.5%	0.09	0.36	1.00	1.0%	0.49	0.66	50.5%
B10	2.19	0.90	0.96	1.14	52.1%	0.09	0.36	1.05	1.0%	0.51	0.67	53.0%
B11	3.53	0.90	0.96	0.88	24.9%	0.09	0.36	2.65	1.5%	0.29	0.51	26.4%
OS1	176.86	0.90	0.96	0.00	0.0%	0.09	0.35	176.86	2.0%	0.09	0.35	2.0%
OS2	39.27	0.90	0.96	0.00	0.0%	0.09	0.35	39.27	2.0%	0.09	0.35	2.0%
P3-S2	11.9	-	-	-	-	-	-	-	-	-	-	50.0%
Pond FSD 16 (OS)	216.13											2.0%
Pond FSD 14A (A and B)	27.76											63.8%
TOTAL	247.42											9.3%

Values in RED are from the "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1" by Classsic Consulting.

PROPOSED
STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Sterling Ranch Rd & Briargate Pkwy
Location: El Paso County

Project Name: Sterling Ranch Phase 3
Project No.: 25188.03
Calculated By: CGV
Checked By: RAB
Date: 5/3/23

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	Cv	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A1	4.09	A	70.3%	0.65	0.78	37	2.5%	3.6	1030	0.8%	20.0	1.8	9.7	13.3	1067.0	15.9	13.3
A2	5.05	A	66.6%	0.62	0.76	37	2.5%	3.9	1332	0.7%	20.0	1.7	13.2	17.0	1369.0	17.6	17.0
A3	1.94	A	64.1%	0.60	0.74	50	4.0%	4.0	552	1.0%	20.0	2.0	4.6	8.6	602.0	13.3	8.6
A4	1.52	A	70.3%	0.65	0.78	50	2.3%	4.3	590	0.9%	20.0	1.9	5.3	9.6	640.0	13.6	9.6
A5	0.63	A	87.6%	0.80	0.88	30	2.5%	2.2	290	2.2%	20.0	3.0	1.6	3.8	320.0	11.8	5.0
B1	1.82	A	68.2%	0.64	0.77	30	2.7%	3.3	745	2.1%	20.0	2.9	4.3	7.6	775.0	14.3	7.6
B2	1.90	A	64.4%	0.61	0.74	30	2.7%	3.5	757	2.1%	20.0	2.9	4.4	7.9	787.0	14.4	7.9
B3	1.27	A	63.7%	0.60	0.74	30	2.3%	3.8	714	1.5%	20.0	2.4	4.9	8.6	744.0	14.1	8.6
B4	1.33	A	60.9%	0.58	0.72	30	2.3%	3.9	760	1.5%	20.0	2.5	5.1	9.0	790.0	14.4	9.0
B5	0.89	A	61.5%	0.58	0.72	30	2.5%	3.8	559	1.5%	20.0	2.4	3.8	7.6	589.0	13.3	7.6
B6	0.91	A	63.4%	0.60	0.74	30	2.5%	3.7	495	1.5%	20.0	2.4	3.4	7.1	525.0	12.9	7.1
B7	1.08	A	51.9%	0.50	0.67	30	2.5%	4.4	531	1.5%	20.0	2.4	3.6	8.0	561.0	13.1	8.0
B8	1.16	A	57.8%	0.55	0.70	30	2.5%	4.0	526	1.5%	20.0	2.4	3.6	7.6	556.0	13.1	7.6
B9	1.98	A	50.5%	0.49	0.66	30	2.5%	4.5	628	2.3%	20.0	3.0	3.4	7.9	658.0	13.7	7.9
B10	2.19	A	53.0%	0.51	0.67	30	2.5%	4.3	645	2.3%	20.0	3.0	3.5	7.8	675.0	13.8	7.8
B11	3.53	A	26.4%	0.29	0.51	300	2.0%	20.1	330	2.0%	20.0	2.8	1.9	22.0	630.0	13.5	13.5
OS1	176.86	A	2.0%	0.09	0.35	300	2.0%	25.1	3159	1.6%	20.0	2.6	20.6	45.7	3459.0	29.2	29.2
OS2	39.27	A	2.0%	0.09	0.35	300	1.8%	26.0	889	2.3%	20.0	3.0	4.9	30.9	1189.0	16.6	16.6

NOTES:

$$t_c = t_i + t_t \quad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)
t_i = overland (initial) flow time (min)
t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)
C_v = conveyance coefficient (from Table 6-7)
S_w = watercourse slope (ft/ft)

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t} \quad \text{Equation 6-4}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_c = \frac{L}{180} + 10 \quad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)
L = waterway length (ft)

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.

STANDARD FORM SF-3 - PROPOSED
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Rd & Briargate Pkwy
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Phase 3
Project No.: 25188.03
Calculated By: CGV
Checked By: RAB
Date: 5/3/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
													40.1	15.92	0.9					800	1.9	7.0	Future Development to Pond FSD16
	OS1	OS1	176.86	0.09	29.2	15.92	2.52	40.1															
													1.2	0.36	0.9					810	1.9	7.2	On-grade inlet, bypass to DP5
	2	A2	5.05	0.62	17.0	3.15	3.33	10.5								9.3	2.79	0.5	24	72	5.3	0.2	Capture to DP1
													0.0	0	0.9					860	1.9	7.7	Sump Inlet
	21	A1	4.09	0.65	13.3	2.68	3.70	9.9								9.9	2.68	1.0	24	492	6.9	1.2	Capture to DP1a
													0.0	0	0.9					830	1.9	7.4	On-grade inlet, bypass to DP4
	1	A5	0.63	0.80	5.0	0.50	5.17	2.6								2.6	0.50	0.5	24	21	3.7	0.1	Capture to DP1a
total piped flow	1								17.3	3.29	3.31	10.9				10.9	3.29	0.5	24	30	5.5	0.1	Piped to DP1a
																							Proposed Manhole
piped flow	1a								17.4	5.97	3.30	19.7				19.7	5.97	0.5	30	30	6.4	0.1	Piped to DP6
													0.0	0.00	2.0					1166	2.8	6.9	On-grade inlet, bypass to DP8
street flow	4	A4	1.52	0.78	9.6	1.18	4.19	4.9	9.6	1.18	4.19	4.9				4.9	1.18	0.5	18	23	4.5	0.1	Capture to DP6
													0.0	0.00	2.0					1166	2.8	6.9	On-grade inlet, bypass to sump by others
street flow	5	A3	1.94	0.60	8.6	1.17	4.35	5.1	8.6	1.53	4.35	6.7				6.7	1.53	1.0	18				Capture to DP6
total piped flow	6								17.4	8.68	3.30	28.6				28.6	8.68	0.5	36	337	7.0	0.8	Piped to Storm by others
																							Future Development to Interim Pond FSD16
	OS2	OS2	39.27	0.09	16.6	3.53	3.37	11.9	36.2	19.45	2.20	42.7											
																							Pond FSD16 Outfall
	OS2.1															4.3	1.96	1.5	48	2740	5.7	8.0	Piped to Pond within Sand Creek channel
													0.0	0.00	2.0					1000	2.8	5.9	On-grade inlet, bypass to DP10
	7	B2	1.90	0.61	7.9	1.15	4.49	5.2	7.9	1.15	4.49	5.2				5.2	1.15	0.5	18	60	4.5	0.2	Capture to DP8
													0.0	0.00	2.0					1000	2.8	5.9	On-grade inlet, bypass to DP11
street flow	8	B1	1.82	0.64	7.6	1.16	4.54	5.3	7.6	1.16	4.54	5.3				5.3	1.16						Captured piped to storm by others
total piped flow	8								8.1	2.31	4.45	10.3				10.3	2.31	2.2	18	213	9.4	0.4	Capture conveyed via swale to DP13
													0.0	0.00	2.0					720	2.8	4.2	On-grade inlet, bypass to DP14
	10	B4	1.33	0.58	9.0	0.77	4.28	3.3	9.0	0.77	4.28	3.3				3.3	0.77	0.5	18	60	4.1	0.2	Capture to DP11
													0.0	0.00	2.0					720	2.8	4.2	On-grade inlet, bypass to DP15
street flow	11	B3	1.27	0.60	8.6	0.76	4.35	3.3	8.6	0.76	4.35	3.3				3.3	0.76						Captured piped to storm by others
total piped flow	11								9.3	1.53	4.24	6.5				6.5	1.53	4.0	18	205	10.3	0.3	Captured piped to storm by others

STANDARD FORM SF-3 - PROPOSED

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Project Name: Sterling Ranch Phase 3
Project No.: 25188.03
Calculated By: CGV
Checked By: RAB
Date: 5/3/23

Subdivision: Sterling Ranch Rd & Briargate Pkwy
Location: El Paso County
Design Storm: 5-Year

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	14	B6	0.91	0.60	7.1	0.54	4.65	2.5	7.1	0.54	4.65	2.5	0.0	0	2.0	2.5	0.54	0.5	18	805 60	2.8 3.7	4.7 0.3	On-grade inlet, bypass to DP18 Capture to DP15
street flow	15	B5	0.89	0.58	7.6	0.52	4.54	2.4	7.6	0.52	4.54	2.4	0.0	0	2.0	2.4	0.52			805	2.8	4.7	On-grade inlet, bypass to DP19 Captured piped to storm by others
total piped flow	15								7.6	1.06	4.54	4.8				4.8	1.06	7.0	18	180	11.5	0.3	Captured piped to storm by others
	18	B8	1.16	0.55	7.6	0.64	4.54	2.9	7.6	0.64	4.54	2.9	0.0	0	2.0	2.9	0.64	5.0	18	915 60	2.8 8.9	5.4 0.1	On-grade inlet, bypass to DP23 Capture to DP19
street flow	19	B7	1.08	0.50	8.0	0.54	4.47	2.4	8.0	0.54	4.47	2.4	0.0	0	2.0	2.4	0.54			915	2.8	5.4	On-grade inlet, bypass to DP22 Captured piped to storm by others
total piped flow	19								8.0	1.18	4.47	5.3				5.3	1.18	5.0	18	100	10.5	0.2	Captured piped to storm by others
	22	B9	1.98	0.49	7.9	0.97	4.49	4.4	7.9	0.97	4.49	4.4				4.4	0.97	0.5	18	60	4.3	0.2	Sump Inlet Piped to DP23
street flow	23	B10	2.19	0.51	7.8	1.12	4.49	5.0	7.8	1.12	4.49	5.0				5.0	1.12	1.2	24	545	6.1	1.5	Sump Inlet Piped to interim Pond FSD-11B
total piped flow	23								9.3	2.09	4.23	8.8											Piped to interim Pond FSD-11B
	24	P3-S2	-	-	-	-	-	30.0															36" RCP plug for future school site Piped to interim Pond FSD-11B
	24								-	-	-	38.8											Sum of DP23 and DP24 Piped to interim Pond FSD-11B
	25	B11	3.53	0.29	13.5	1.03	3.68	3.8															Storm sewer disturbance and interim Pond FSD-11B Releases through Pond FSD-11B outlet

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are public and RCP unless otherwise noted. Pipe size shown in table column.
Values in RED are from the "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1" by Classic Consulting.

STANDARD FORM SF-3 - PROPOSED
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project Name: Sterling Ranch Phase 3
Subdivision: Sterling Ranch Rd & Briargate Pkwy
Project No.: 25188.03
Location: El Paso County
Calculated By: CGV
Design Storm: 100-Year
Checked By: RAB
Date: 5/3/23

Description	Design Point	DIRECT RUNOFF: Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	TOTAL RUNOFF: tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	STREET/SWALE: $Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	PIPE: Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	TRAVEL TIME: Length (ft)	Velocity (fps)	t_t (min)	REMARKS
													261.9	61.90	0.9					800	1.9	7.0	Future Development to Pond FSD16
	OS1	OS1	176.86	0.35	29.2	61.90	4.23	261.9															
													7.7	1.38	0.9					810	1.9	7.2	On-grade inlet, bypass to DP5
	2	A2	5.05	0.76	17.0	3.82	5.59	21.4								13.7	2.44	0.5	24	72	5.7	0.2	Capture to DP1
													0.0	0.00	0.9					860	1.9	7.7	Sump Inlet
	21	A1	4.09	0.78	13.3	3.18	6.21	19.7								19.7	3.18	1.0	24	492	8.1	1.0	Capture to DP1a
													0.4	0.05	0.9					830	1.9	7.4	On-grade inlet, bypass to DP4
	1	A5	0.63	0.88	5.0	0.56	8.68	4.9								4.5	0.51	0.5	24	21	4.3	0.1	Capture to DP1a
total piped flow	1								17.2	2.96	5.56	16.4				16.4	2.96	0.5	24	30	5.8	0.1	Piped to DP1a
																							Proposed Manhole
piped flow	1a								17.3	6.14	5.55	34.0				34.0	6.14	0.5	30	30	6.9	0.1	Piped to DP6
													0.5	0.07	2.0					1166	2.8	6.9	On-grade inlet, bypass to DP8
street flow	4	A4	1.52	0.78	9.6	1.18	7.04	8.3	9.6	1.18	7.04	8.3				8.2	1.11	0.5	18	23	4.6	0.1	Capture to DP6
													5.5	1.17	2.0					1166	2.8	6.9	On-grade inlet, bypass to sump by others
street flow	5	A3	1.94	0.74	8.6	1.44	7.31	10.5	24.3	2.82	4.70	13.2				12.7	1.65	1.0	18				Capture to DP6
total piped flow	6								24.3	8.89	4.70	41.8				41.8	8.89	0.5	36	337	7.5	0.7	Piped to storm by others
																							Future Development to Interim Pond FSD16
	OS2	OS2	39.27	0.35	16.6	13.74	5.65	77.7	36.2	84.53	3.69	311.7											
																							Pond FSD16 Outfall
	OS2.1															120.4	32.65	1.5	48	2740	15.1	3.0	Piped to Pond within Sand Creek channel
													1.2	0.16	2.0					1000	2.8	5.9	On-grade inlet, bypass to DP10
	7	B2	1.90	0.74	7.9	1.41	7.53	10.6								9.4	1.25	0.5	18	60	5.3	0.2	Capture to DP8
													1.5	0.20	2.0					1000	2.8	5.9	On-grade inlet, bypass to DP11
street flow	8	B1	1.82	0.77	7.6	1.39	7.63	10.6	7.6	1.39	7.63	10.6				9.7	1.19						Capture piped to storm by others
total piped flow	8								8.1	2.44	7.48	18.3				18.3	2.44	8.0	18	213	17.7	0.2	Capture conveyed via swale to DP13
													2.0	0.33	2.0					720	2.8	4.2	On-grade inlet, bypass to DP14
	10	B4	1.33	0.72	9.0	0.96	7.19	6.9	13.8	1.12	6.13	6.9				6.2	0.79	0.5	18	60	4.7	0.2	Capture to DP11
													2.1	0.34	2.0					720	2.8	4.2	On-grade inlet, bypass to DP15
street flow	11	B3	1.27	0.74	8.6	0.94	7.31	6.9	13.5	1.14	6.18	7.0				6.3	0.80						Captured piped to storm by others
total piped flow	11								14.0	1.59	6.09	9.7				9.7	1.59	4.0	18	205	11.5	0.3	Captured piped to storm by others

STANDARD FORM SF-3 - PROPOSED

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Project Name: Sterling Ranch Phase 3
Project No.: 25188.03
Calculated By: CGV
Checked By: RAB
Date: 5/3/23

Subdivision: Sterling Ranch Rd & Briargate Pkwy
Location: El Paso County
Design Storm: 100-Year

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
													1.4	0.23	2.0					805	2.8	4.7	On-grade inlet, bypass to DP18
	14	B6	0.91	0.74	7.1	0.67	7.81	5.2	13.3	1.00	6.22	6.2				5.7	0.77	0.5	18	60	4.6	0.2	Capture to DP15
													1.4	0.22	2.0					805	2.8	4.7	On-grade inlet, bypass to DP19
street flow	15	B5	0.89	0.72	7.6	0.64	7.63	4.9	12.9	0.98	6.30	6.2				5.7	0.76						Captured piped to storm by others
total piped flow	15								7.6	1.53	7.63	11.7				11.7	1.53	7.0	18	180	15.0	0.2	Captured piped to storm by others
													1.7	0.26	2.0					915	2.8	5.4	On-grade inlet, bypass to DP23
	18	B8	1.16	0.70	7.6	0.81	7.63	6.2	11.8	1.04	6.52	6.7				5.9	0.77	5.0	18	60	10.8	0.1	Capture to DP19
													1.2	0.19	2.0					915	2.8	5.4	On-grade inlet, bypass to DP22
street flow	19	B7	1.08	0.67	8.0	0.72	7.50	5.4	12.3	0.94	6.40	6.0				5.5	0.75						Captured piped to storm by others
total piped flow	19								8.0	1.53	7.50	11.5				11.5	1.53	5.0	18	100	13.2	0.1	Captured piped to storm by others
																							Sump Inlet
	22	B9	1.98	0.66	7.9	1.30	7.53	9.8	7.9	1.30	7.53	9.8				9.8	1.30	0.5	18	60	5.5	0.2	Piped to DP23
																							Sump Inlet
street flow	23	B10	2.19	0.67	7.8	1.47	7.54	11.1	7.8	1.47	7.54	11.1				11.1	1.47	1.2	24	545	7.6	1.2	Piped to interim Pond FSD-11B
total piped flow	23								9.0	2.77	7.19	19.9											Piped to interim Pond FSD-11B
																							36" RCP plug for future school site
	24	P3-S2	-	-	-	-	-	59.0															Piped to interim Pond FSD-11B
																							Sum of DP23 and DP24
	24								-	-	-	78.9											Piped to interim Pond FSD-11B
																							Storm sewer disturbance and interim Pond FSD-11B
	25	B11	3.53	0.51	13.5	1.80	6.18	11.1															Releases through Pond FSD-11B outlet

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
All pipes are public and RCP unless otherwise noted. Pipe size shown in table column.
Values in RED are from the "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Preliminary Plan No. 1" by Classsic Consulting.

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision:	Sterling Ranch Rd & Briargate Pkwy	Project Name:	Sterling Ranch Phase 3
Location:	El Paso County	Project No.:	25188.03
		Calculated By:	CGV
		Checked By:	RAB
		Date:	5/3/23

	STORM DRAIN SYSTEM			Notes
		Sand Creek Outfall		
Q_{100} (cfs):		120.4		
Conduit		Pipe		
D_c, Pipe Diameter (in):		48		
W, Box Width (ft):				
H, Box Height (ft):				
Y_t, Tailwater Depth (ft):		1.60		If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H		0.40		
$Q/D^{2.5}$ or $Q/(WH^{3/2})$		3.76		
Supercritical?		No		
Y_n, Normal Depth (ft) [Supercritical]:				
D_a, H_a (in) [Supercritical]:		N/A		$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:		N/A		
Riprap d_{50} (in) [Subcritical]:		12.47		
Required Riprap Size:		H		Fig. 9-38 or Fig. 9-36
d_{50} (in):		15		
Expansion Factor, $1/(2\tan\theta)$:		3.90		Read from Fig. 9-35 or 9-36
θ:		0.13		
Erosive Soils?				
Area of Flow, A_t (ft^2):		17.20		$A_t=Q/V$
Length of Protection, L_p (ft):		26.3		$L=(1/(2\tan\theta))(At/Yt - D)$
Min Length (ft)		12.0		Min L=3D or 3H
Max Length (ft)		40.0		Max L=10D or 10H
Min Bottom Width, T (ft):		10.7		$T=2*(L_p*\tan\theta)+W$
Design Length (ft)		27.0		
Design Width (ft)		10.7		
Riprap Depth (in)		30		Depth=2(d_{50})
Type II Bedding Depth (in)*		8		*Not used if Soil Riprap
Cutoff Wall				
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans
* For use when the flow in the culvert is supercritical (and less than full).

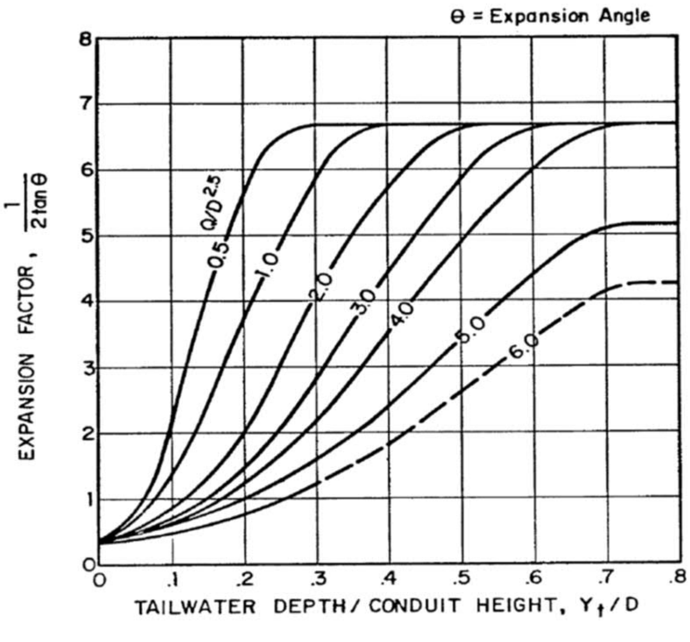


Figure 9-35. Expansion factor for circular conduits

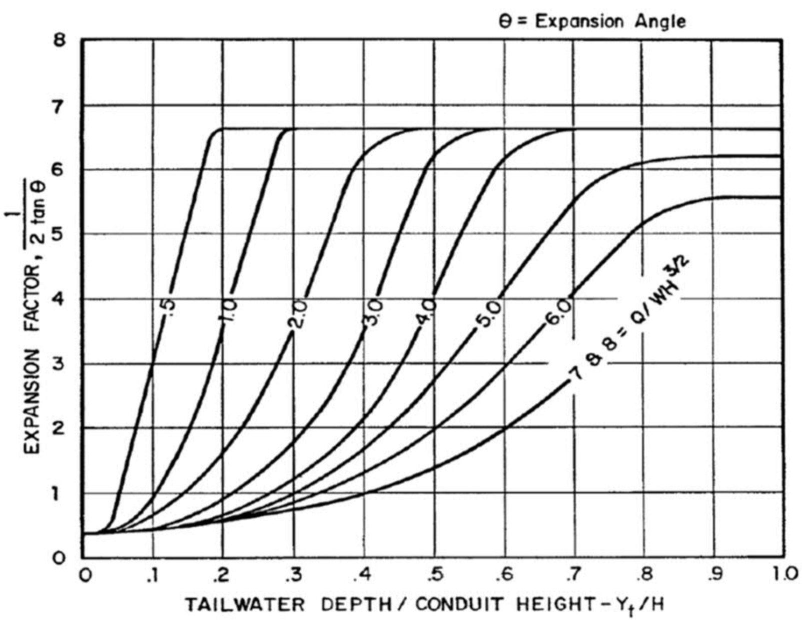


Figure 9-36. Expansion factor for rectangular conduits

Appendix C
Hydraulic Calculations

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP1	DP2	DP4	DP5
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.6	10.5	4.9	5.1
Major Q_{Known} (cfs)	4.9	21.4	8.3	10.5

Unresolved:
Flows do not match with DP flows shown in hydrology spreadsheet (6.7 & 13.2 cfs)

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	DP1	DP2
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	1.2
Major Bypass Flow Received, Q_b (cfs)	0.0	0.1	0.4	7.7

Watershed Characteristics

Subcatchment Area (acres)				
Percent Impervious				
NRCS Soil Type				

Watershed Profile

Overland Slope (ft/ft)				
Overland Length (ft)				
Channel Slope (ft/ft)				
Channel Length (ft)				

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				
C_1				
C_2				
C_3				
User-defined C				
User-defined 5-yr C_5				
User-defined T_c				

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				
C_1				
C_2				
C_3				
User-defined C				
User-defined 5-yr C_5				
User-defined T_c				

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	2.6	10.5	4.9	6.3
Major Total Design Peak Flow, Q (cfs)	4.9	21.5	8.7	18.2
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	1.2	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.4	7.7	0.5	5.5

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP7	DP8	DP10	DP11	DP14
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	5.2	5.3	3.3	3.3	2.5
Major Q_{Known} (cfs)	10.6	10.6	6.9	6.9	5.2

Unresolved: Doesn't match hydrology spre (6.2 cfs)

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	DP4	DP7	DP8	DP10
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.5	1.2	1.5	2.0

Watershed Characteristics

Subcatchment Area (acres)					
Percent Impervious					
NRCS Soil Type					

Watershed Profile

Overland Slope (ft/ft)					
Overland Length (ft)					
Channel Slope (ft/ft)					
Channel Length (ft)					

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)					
One-Hour Precipitation, P_1 (inches)					
C_1					
C_2					
C_3					
User-defined C					
User-defined 5-yr C_5					
User-defined T_c					

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)					
One-Hour Precipitation, P_1 (inches)					
C_1					
C_2					
C_3					
User-defined C					
User-defined 5-yr C_5					
User-defined T_c					

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	5.2	5.3	3.3	3.3	2.5
Major Total Design Peak Flow, Q (cfs)	10.6	11.1	8.1	8.4	7.2
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	1.2	1.5	2.0	2.1	1.4

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP15	DP18	DP19	DP23	DP22
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.4	2.9	2.4	5.0	4.4
Major Q_{Known} (cfs)	4.9	6.2	5.4	11.1	9.8

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	DP11	DP14	DP15	DP18	DP19
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	2.1	1.4	1.4	1.7	1.2

Doesn't match flow in hydrology spreadsheet (6.0 cfs)

Watershed Characteristics

Subcatchment Area (acres)					
Percent Impervious					
NRCS Soil Type					

Watershed Profile

Overland Slope (ft/ft)					
Overland Length (ft)					
Channel Slope (ft/ft)					
Channel Length (ft)					

Doesn't match flow in hydrology spreadsheet (6.2 cfs)

Doesn't match flow in hydrology spreadsheet (6.7 cfs)

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)					
One-Hour Precipitation, P_1 (inches)					
C_1					
C_2					
C_3					
User-defined C					
User-defined 5-yr C_5					
User-defined T_c					

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)					
One-Hour Precipitation, P_1 (inches)					
C_1					
C_2					
C_3					
User-defined C					
User-defined 5-yr C_5					
User-defined T_c					

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	2.4	2.9	2.4	5.0	4.4
Major Total Design Peak Flow, Q (cfs)	7.0	7.6	6.8	12.8	11.0
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	1.4	1.7	1.2	N/A	N/A

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP21
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	9.9
Major Q_{Known} (cfs)	19.7

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0

Watershed Characteristics

Subcatchment Area (acres)	
Percent Impervious	
NRCS Soil Type	

Watershed Profile

Overland Slope (ft/ft)	
Overland Length (ft)	
Channel Slope (ft/ft)	
Channel Length (ft)	

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	
C_1	
C_2	
C_3	
User-defined C	
User-defined 5-yr C_5	
User-defined T_c	

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	
C_1	
C_2	
C_3	
User-defined C	
User-defined 5-yr C_5	
User-defined T_c	

CALCULATED OUTPUT

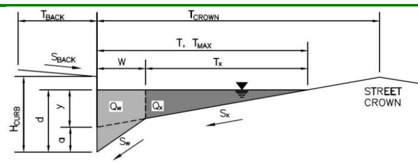
Minor Total Design Peak Flow, Q (cfs)	9.9
Major Total Design Peak Flow, Q (cfs)	19.7
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	39.0	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 =	0.009	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	27.0	27.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

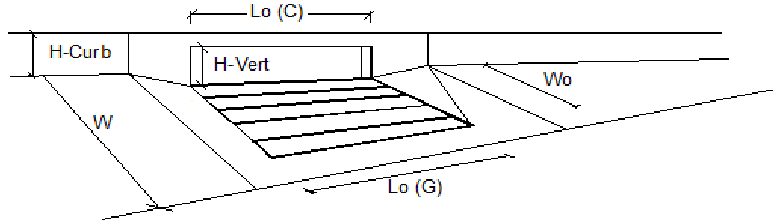
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	16.1	27.1	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



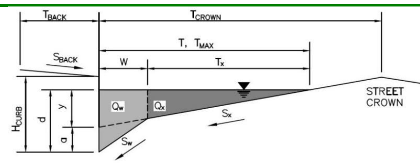
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		Q =	2.6	4.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	0.0	0.4	cfs
Capture Percentage = Q_a/Q_o =		C% =	100	92	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP2



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	39.0	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 =	0.009	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	27.0	27.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

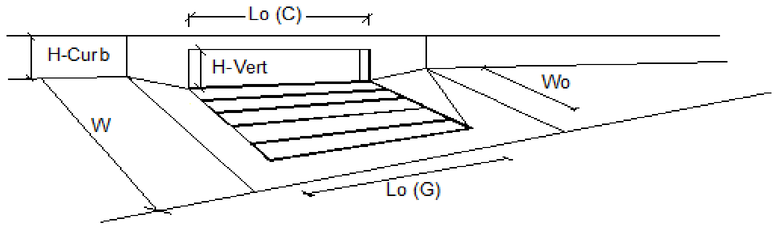
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	16.1	27.1	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



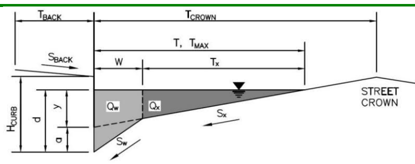
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		Q =	9.3	13.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	1.2	7.7	cfs
Capture Percentage = Q_a/Q_o =		C% =	88	64	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP4



<u>Gutter Geometry:</u>

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	39.0	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 =	0.009	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	27.0	27.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

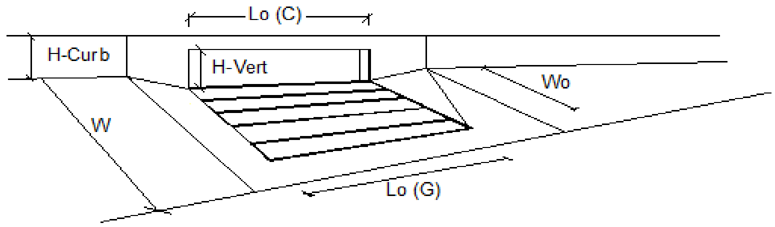
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	16.1	27.1	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

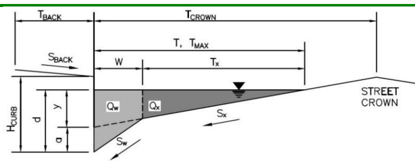
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	4.9	8.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	0.5	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	94	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP5



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	39.0	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 =	0.009	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	27.0	27.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

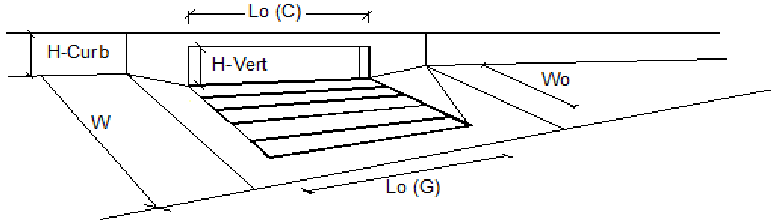
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	16.1	27.1	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

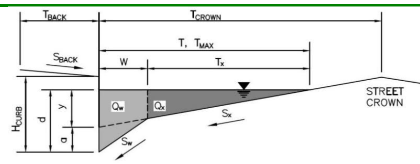
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	6.3	12.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	5.5	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	70	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP7



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0		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} =	0.013		
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 =	0.022		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013		
		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

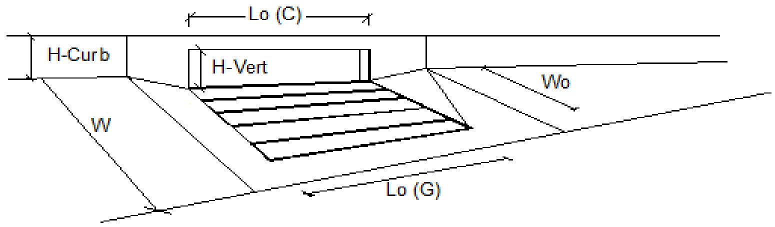
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	24.0	24.0	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

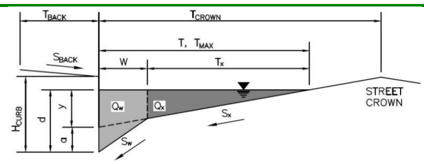
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	5.2	9.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	1.2	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	89	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP8



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0	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} =	0.013	
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 =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

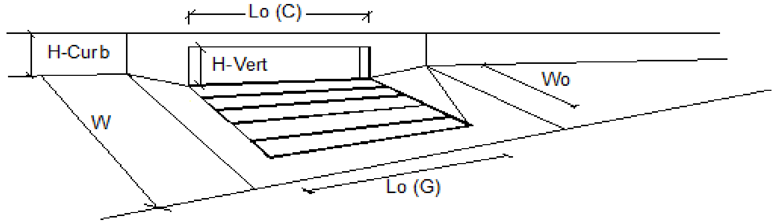
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	20.8	20.8	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

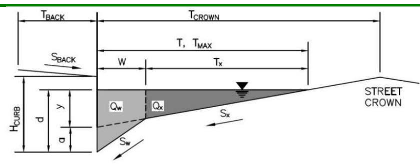
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	5.3	9.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	1.5	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	87	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP10



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0	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} =	0.013	
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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

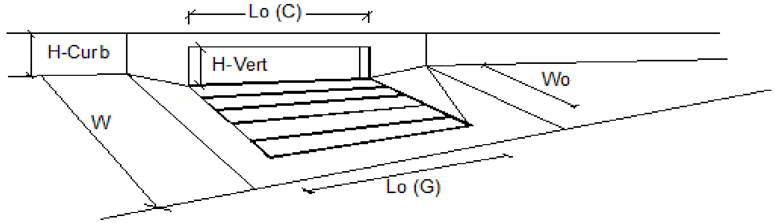
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	24.0	24.0	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

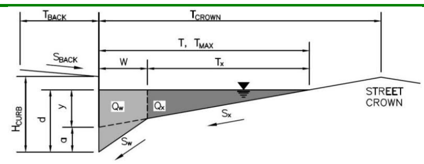
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	3.3	6.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	2.0	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	76	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP11



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0	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} =	0.013	
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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

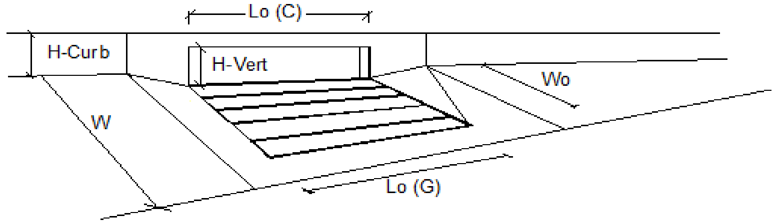
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	24.0	24.0	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



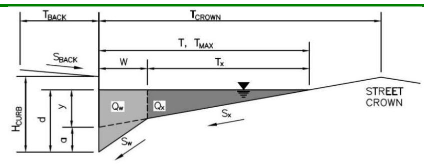
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		Q =	3.3	6.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	0.0	2.1	cfs
Capture Percentage = Q_a/Q_o =		C% =	100	75	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP14



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0	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} =	0.013	
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 =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

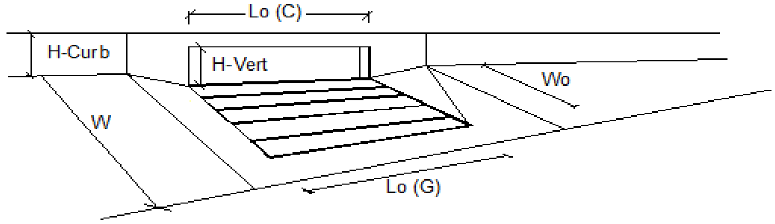
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	20.8	20.8	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



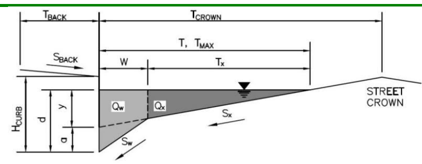
Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	2.5	5.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	1.4	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	80	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP15



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0	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} =	0.013	
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 =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

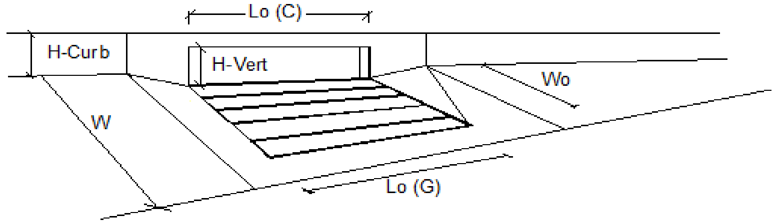
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	20.8	20.8	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

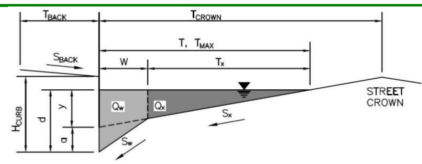
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	2.4	5.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	1.4	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	81	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP18



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0		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} =	0.013		
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 =	0.015		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013		
		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

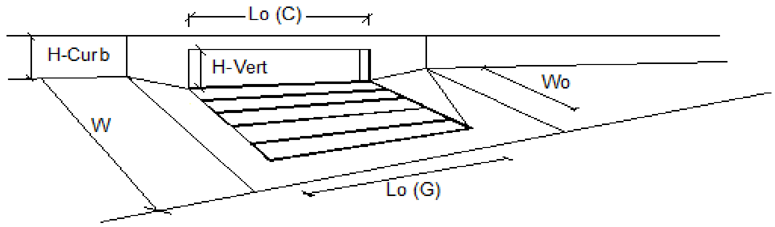
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	20.8	20.8	cfs

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

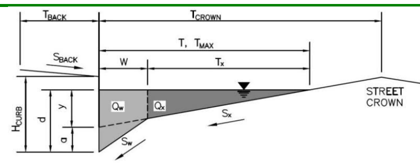
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	2.9	5.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	1.7	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	78	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP19



Gutter Geometry:

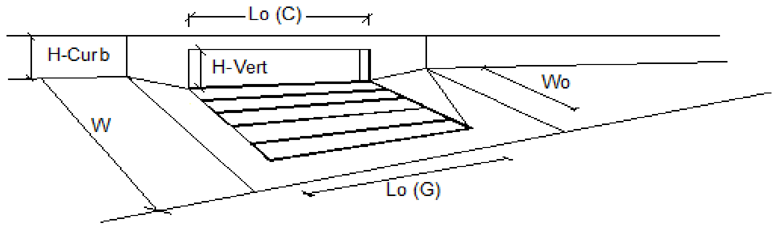
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		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 =	0.015		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013		
		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	
MINOR STORM Allowable Capacity is based on Depth Criterion		Minor Storm	Major Storm	
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	20.8	20.8	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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



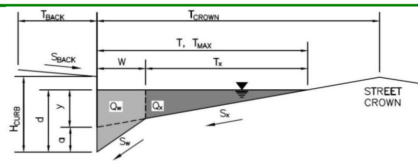
Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	2.4	5.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	1.2	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	82	%

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP23



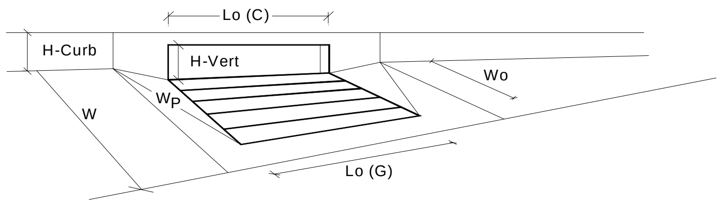
Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0		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} =	0.013		
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 =	0.025		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} =	0.013		
		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} =	6.0	6.0	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)



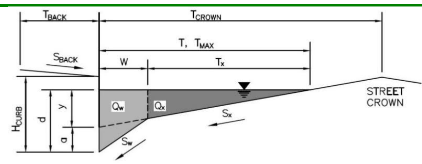
		MINOR	MAJOR	
Design Information (Input) — CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override Depths
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	$RF_{Combination}$ =	0.57	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.79	
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 =	13.5	13.5	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.0	12.8	cfs

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP22



Gutter Geometry:

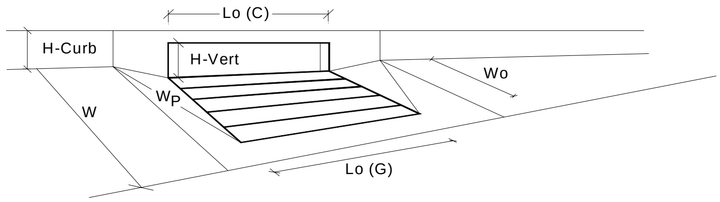
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	39.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.025	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} =	0.013	

		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} =	6.0	6.0	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)



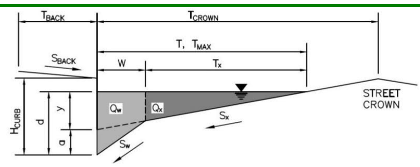
		MINOR	MAJOR	
Design Information (Input) — CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.1	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
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	0.34	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.58	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.79	
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 =	13.5	14.1	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.4	11.0	cfs

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

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

Project: Sterling Ranch Road & Briargate Parkway - East of Sand Creek

Inlet ID: DP21



Gutter Geometry:

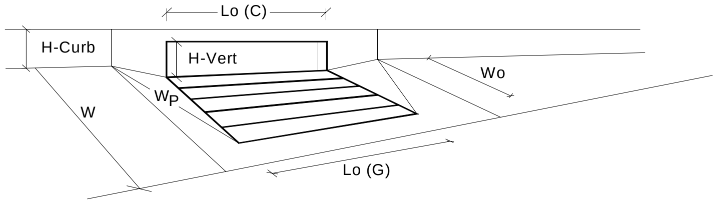
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	39.0		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} =	0.013		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	27.0	27.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

		Minor Storm	Major Storm	
	Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

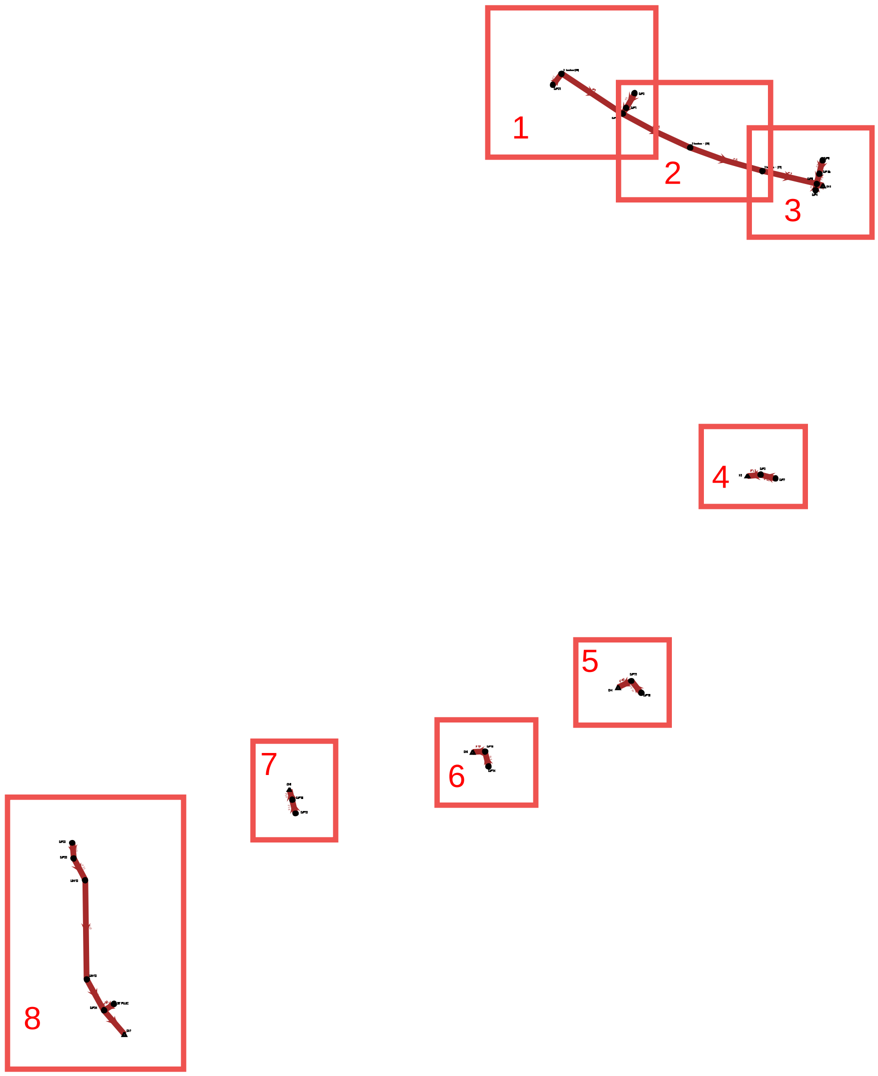


			MINOR	MAJOR	
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	7.0	inches
Grate Information			MINOR	MAJOR	Override Depths
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	

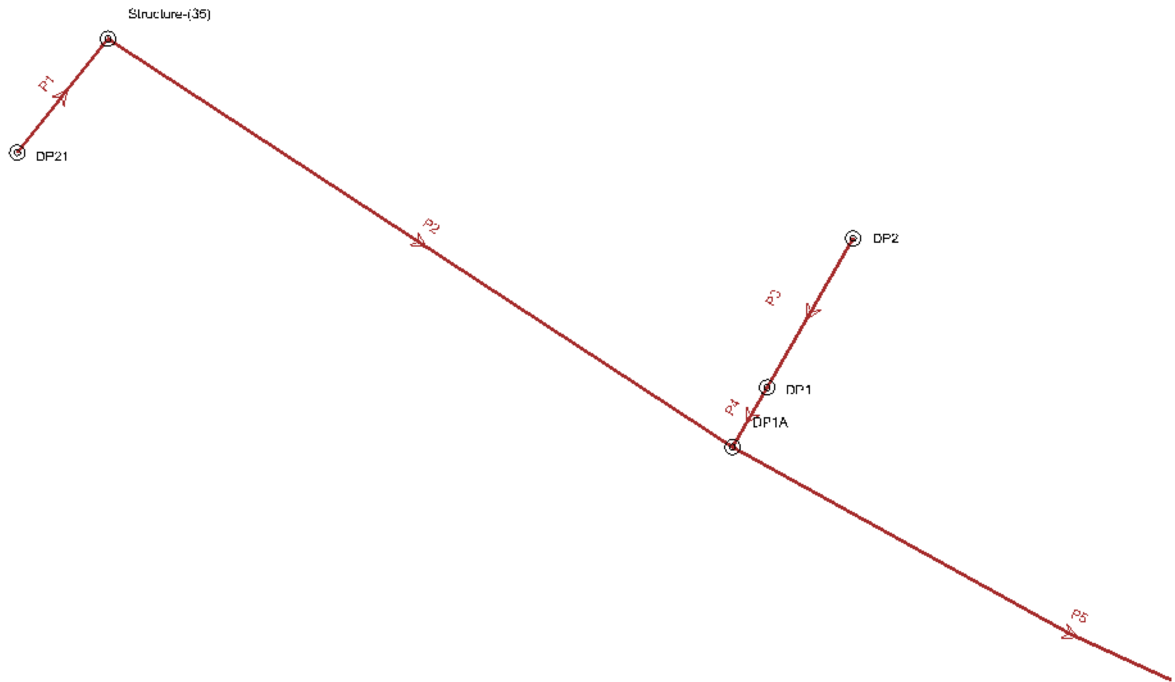
		MINOR	MAJOR	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.84	
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 =	13.5	20.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{\text{PEAK REQUIRED}}$ =	9.9	19.7	cfs

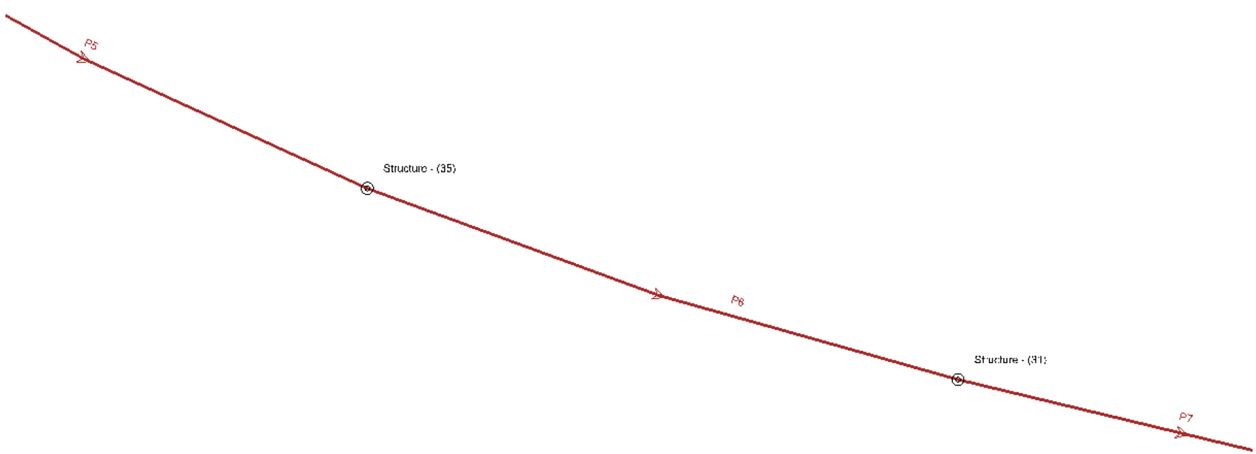
Overall StormCAD Map



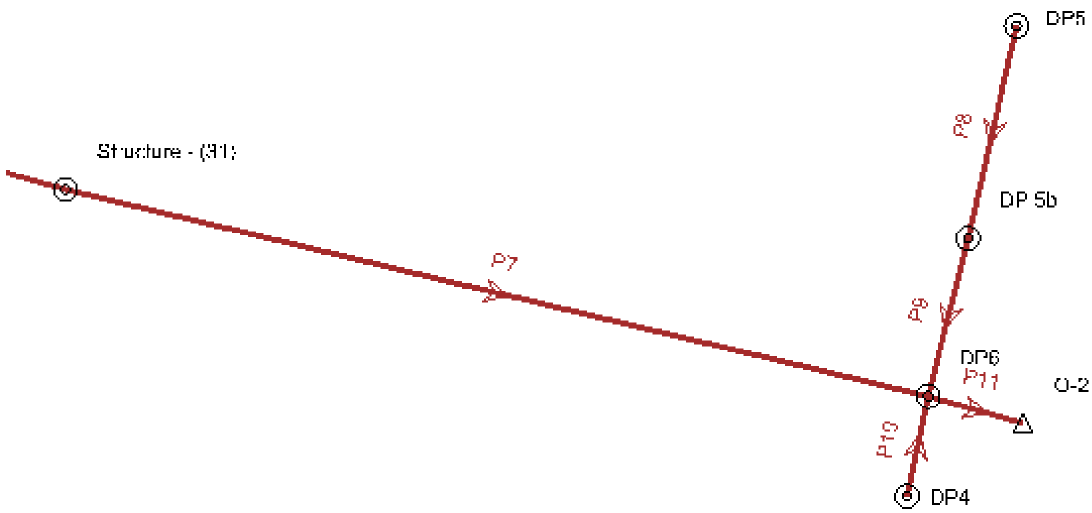
Map 1


Structure-(35)
P1
DP21
P2
DP2
P3
DP1
P4
DP1A
P5

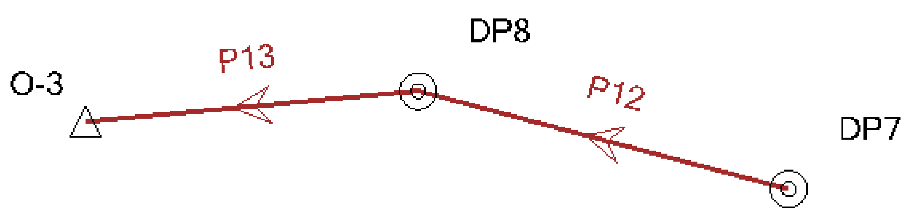
Map 2


P5
Structure - (35)
P6
Structure - (31)
P7

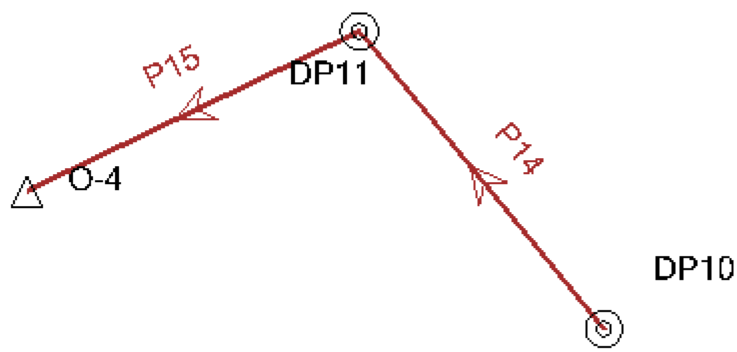
Map 3


DP5
P8
Structure - (31)
DP 5b
P7
P9
DP6
P11
O-2
P10
DP4

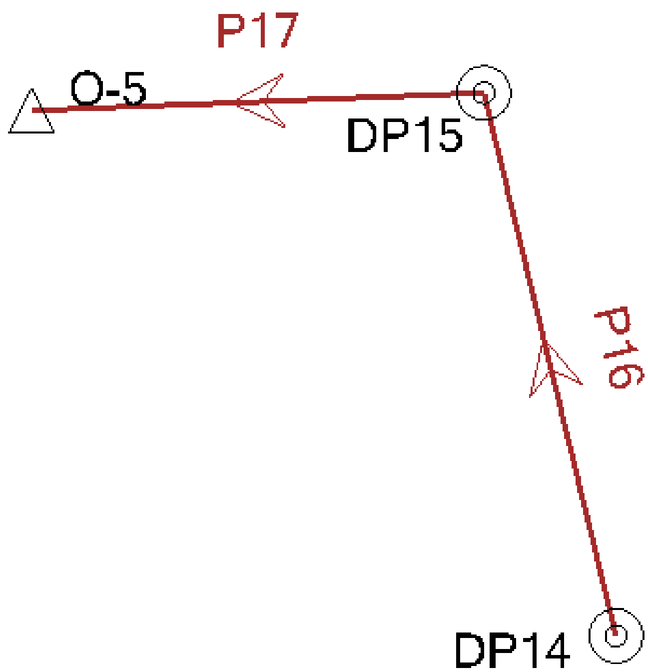
Map 4


DP8
P13
O-3
P12
DP7

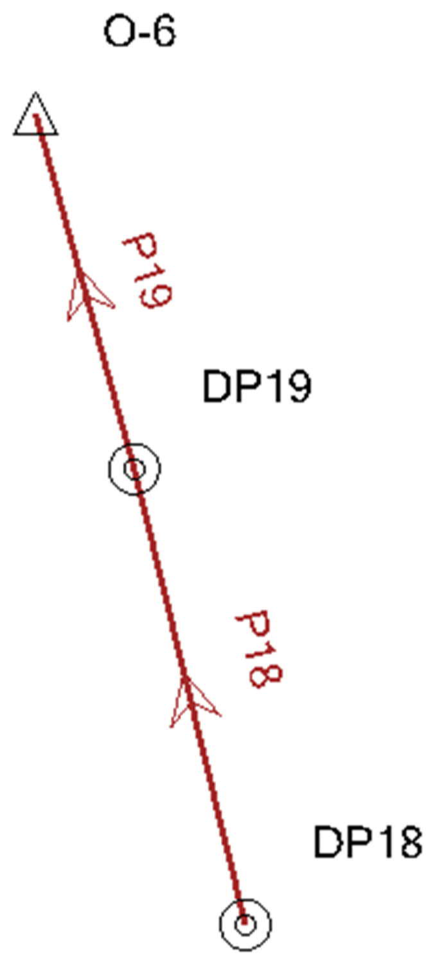
Map 5



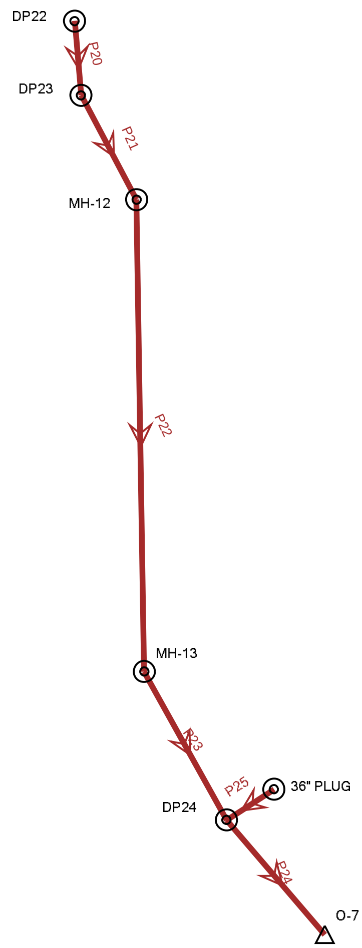
Map 6



Map 7



Map 8



Scenario: 5-year
Current Time Step: 0.000 h
Conduit FlexTable: Combined Pipe/Node Report

Upstream Structure	Label	Flow (cfs)	Capacity (Full Flow) (cfs)	Diameter (in)	Manning's n	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	HGL (In) (ft)	HGL (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Velocity (ft/s)	Upstream Structure Headloss Coefficient
DP21	P1	9.90	22.60	24.0	0.013	28.1	0.010	7,109.08	7,108.80	7,113.91	7,114.15	7,110.21	7,110.33	7,110.66	7,110.56	6.96	0.050
Structure-(35)	P2	9.90	23.74	24.0	0.013	496.6	0.011	7,108.60	7,103.13	7,114.15	7,111.92	7,109.73	7,104.97	7,110.18	7,105.13	7.21	1.320
DP2	P3	9.30	15.99	24.0	0.013	68.0	0.005	7,103.81	7,103.47	7,110.47	7,111.94	7,105.07	7,105.02	7,105.38	7,105.21	5.28	0.050
DP1	P4	10.90	16.21	24.0	0.013	27.3	0.005	7,103.27	7,103.13	7,111.94	7,111.92	7,105.01	7,104.97	7,105.23	7,105.17	5.53	0.050
DP1A	P5	19.70	28.90	30.0	0.013	306.2	0.005	7,102.63	7,101.11	7,111.92	7,109.26	7,104.14	7,102.62	7,104.77	7,103.25	6.33	1.320
Structure - (35)	P6	19.70	28.99	30.0	0.013	306.2	0.005	7,100.91	7,099.38	7,109.26	7,106.25	7,102.42	7,100.89	7,103.05	7,101.52	6.35	0.050
Structure - (31)	P7	19.70	78.40	30.0	0.013	226.9	0.037	7,099.18	7,090.89	7,106.25	7,103.13	7,100.69	7,091.74	7,101.32	7,094.49	13.30	0.050
DP5	P8	6.70	12.93	18.0	0.013	56.1	0.015	7,092.83	7,091.98	7,103.12	7,104.26	7,093.83	7,092.75	7,094.28	7,093.58	7.38	0.050
DP 5b	P9	6.70	10.47	18.0	0.013	41.3	0.010	7,091.78	7,091.37	7,104.26	7,103.13	7,092.78	7,092.25	7,093.23	7,092.85	6.29	0.050
DP4	P10	4.90	29.73	18.0	0.013	26.1	0.080	7,093.48	7,091.39	7,103.04	7,103.13	7,094.33	7,091.84	7,094.68	7,093.73	12.43	0.050
DP6	P11	28.60	108.28	36.0	0.013	24.7	0.026	7,089.37	7,088.72	7,103.13	7,098.25	7,091.10	7,089.99	7,091.81	7,091.57	12.93	1.320
DP7	P12	5.20	7.41	18.0	0.013	62.3	0.005	7,072.21	7,071.90	7,076.74	7,076.88	7,073.14	7,072.78	7,073.46	7,073.14	4.54	0.050
DP8	P13	10.30	29.66	18.0	0.013	25.8	0.080	7,068.35	7,066.29	7,076.88	7,075.00	7,069.58	7,067.00	7,070.27	7,069.46	15.27	0.100
DP10	P14	3.30	7.39	18.0	0.013	62.5	0.005	7,056.45	7,056.14	7,061.15	7,061.26	7,057.34	7,057.30	7,057.48	7,057.38	4.07	0.050
DP11	P15	6.50	23.54	18.0	0.013	21.3	0.050	7,055.84	7,054.77	7,061.26	7,060.00	7,056.83	7,055.38	7,057.26	7,056.81	11.38	1.100
DP14	P16	2.50	7.41	18.0	0.013	62.3	0.005	7,045.95	7,045.64	7,050.74	7,050.62	7,046.58	7,046.56	7,046.78	7,046.63	3.78	0.050
DP15	P17	4.80	27.80	18.0	0.013	15.1	0.070	7,045.34	7,044.28	7,050.62	7,050.50	7,046.18	7,044.77	7,046.53	7,046.16	11.79	1.100
DP18	P18	2.90	23.48	18.0	0.013	56.2	0.050	7,030.13	7,027.32	7,038.47	7,038.40	7,030.78	7,027.68	7,031.02	7,028.94	9.03	0.050
DP19	P19	5.30	10.49	18.0	0.013	23.1	0.010	7,027.02	7,026.79	7,038.40	7,038.00	7,027.91	7,027.56	7,028.28	7,028.08	5.95	0.050
DP22	P20	4.40	7.41	18.0	0.013	56.3	0.005	7,013.45	7,013.17	7,017.91	7,017.91	7,014.28	7,014.10	7,014.58	7,014.33	4.37	0.050
DP23	P21	8.80	24.94	24.0	0.013	79.0	0.012	7,012.67	7,011.71	7,017.91	7,016.44	7,013.73	7,012.53	7,014.15	7,013.35	7.25	0.870
MH-12	P22	8.80	26.59	24.0	0.013	334.4	0.014	7,011.51	7,006.89	7,016.44	7,012.50	7,012.57	7,007.68	7,012.99	7,008.58	7.60	0.100
MH-13	P23	8.80	16.06	24.0	0.013	130.9	0.005	7,006.69	7,006.03	7,012.50	7,011.76	7,007.75	7,007.50	7,008.17	7,007.70	5.23	0.100
DP24	P24	38.80	73.68	42.0	0.013	98.8	0.005	7,004.53	7,004.00	7,011.76	7,004.00	7,006.47	7,005.80	7,007.25	7,006.74	7.76	1.320
36" PLUG	P25	30.00	27.24	36.0	0.013	-	0.002	7,005.11	7,005.03	7,013.72	7,011.76	7,007.60	7,007.50	7,007.96	7,007.86	4.24	0.050

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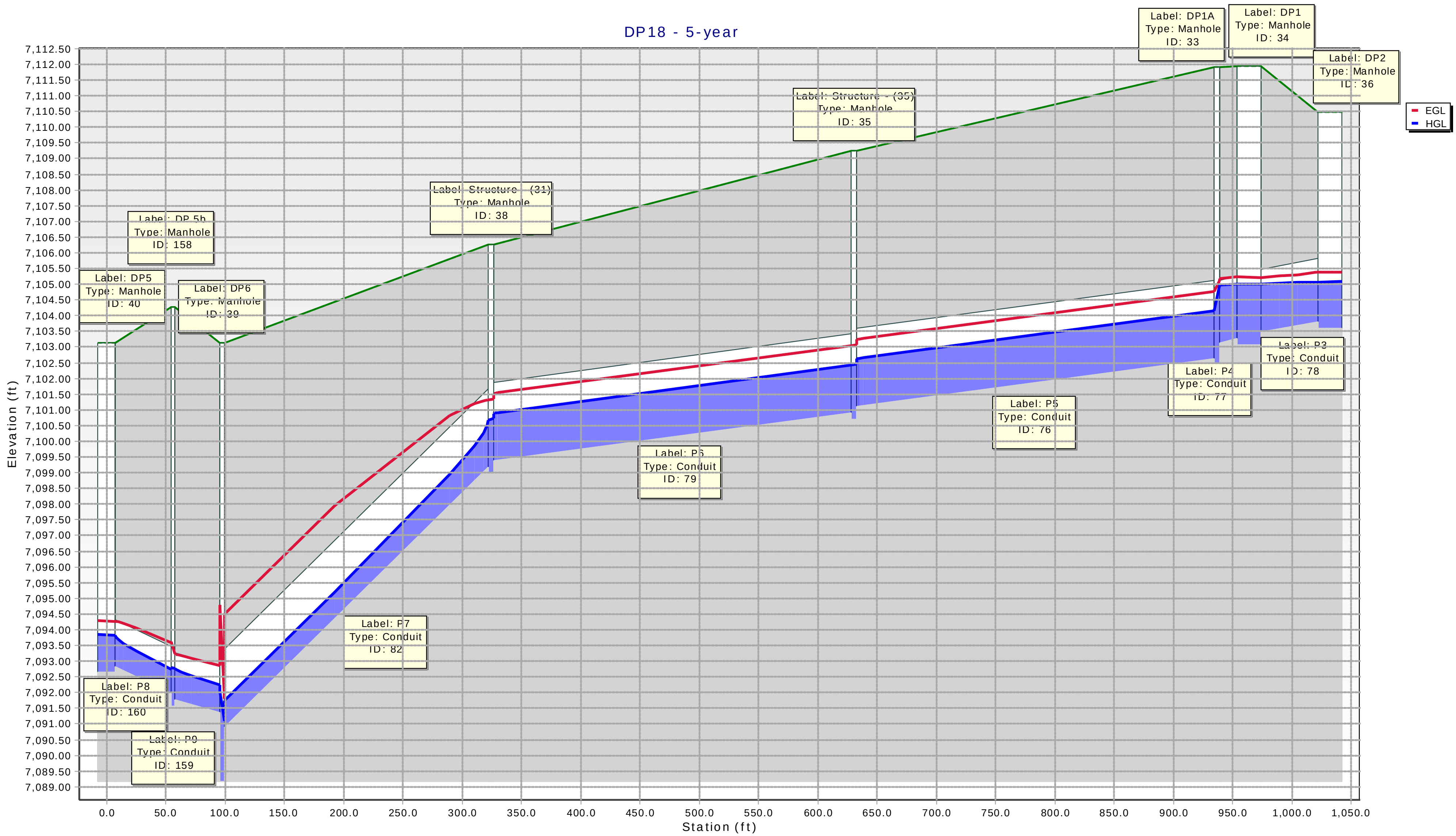
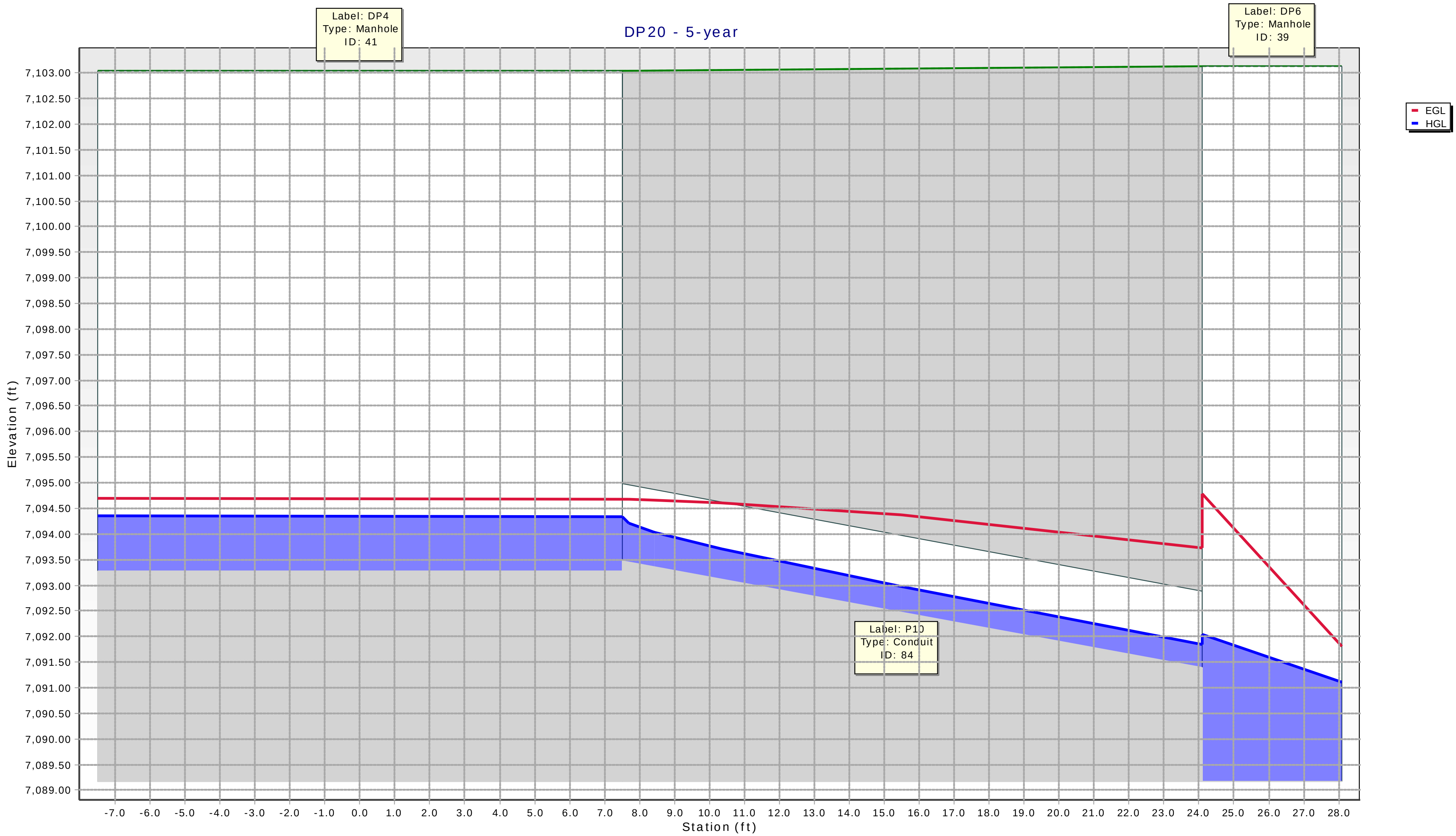

DP18 - 5-year
Elevation (ft)
Station (ft)
EGL
HGL
Label: DP1A
Type: Manhole
ID: 33
Label: DP1
Type: Manhole
ID: 34
Label: DP2
Type: Manhole
ID: 36
Label: Structure - (35)
Type: Manhole
ID: 35
Label: Structure - (31)
Type: Manhole
ID: 38
Label: DP 5b
Type: Manhole
ID: 158
Label: DP5
Type: Manhole
ID: 40
Label: DP6
Type: Manhole
ID: 39
Label: P3
Type: Conduit
ID: 78
Label: P4
Type: Conduit
ID: 77
Label: P5
Type: Conduit
ID: 76
Label: P6
Type: Conduit
ID: 79
Label: P7
Type: Conduit
ID: 82
Label: P8
Type: Conduit
ID: 160
Label: P9
Type: Conduit
ID: 159



DP20 - 5-year
Label: DP4
Type: Manhole
ID: 41
Label: DP6
Type: Manhole
ID: 39
Label: P10
Type: Conduit
ID: 84
EGL
HGL
Elevation (ft)
Station (ft)
7,103.00
7,102.50
7,102.00
7,101.50
7,101.00
7,100.50
7,100.00
7,099.50
7,099.00
7,098.50
7,098.00
7,097.50
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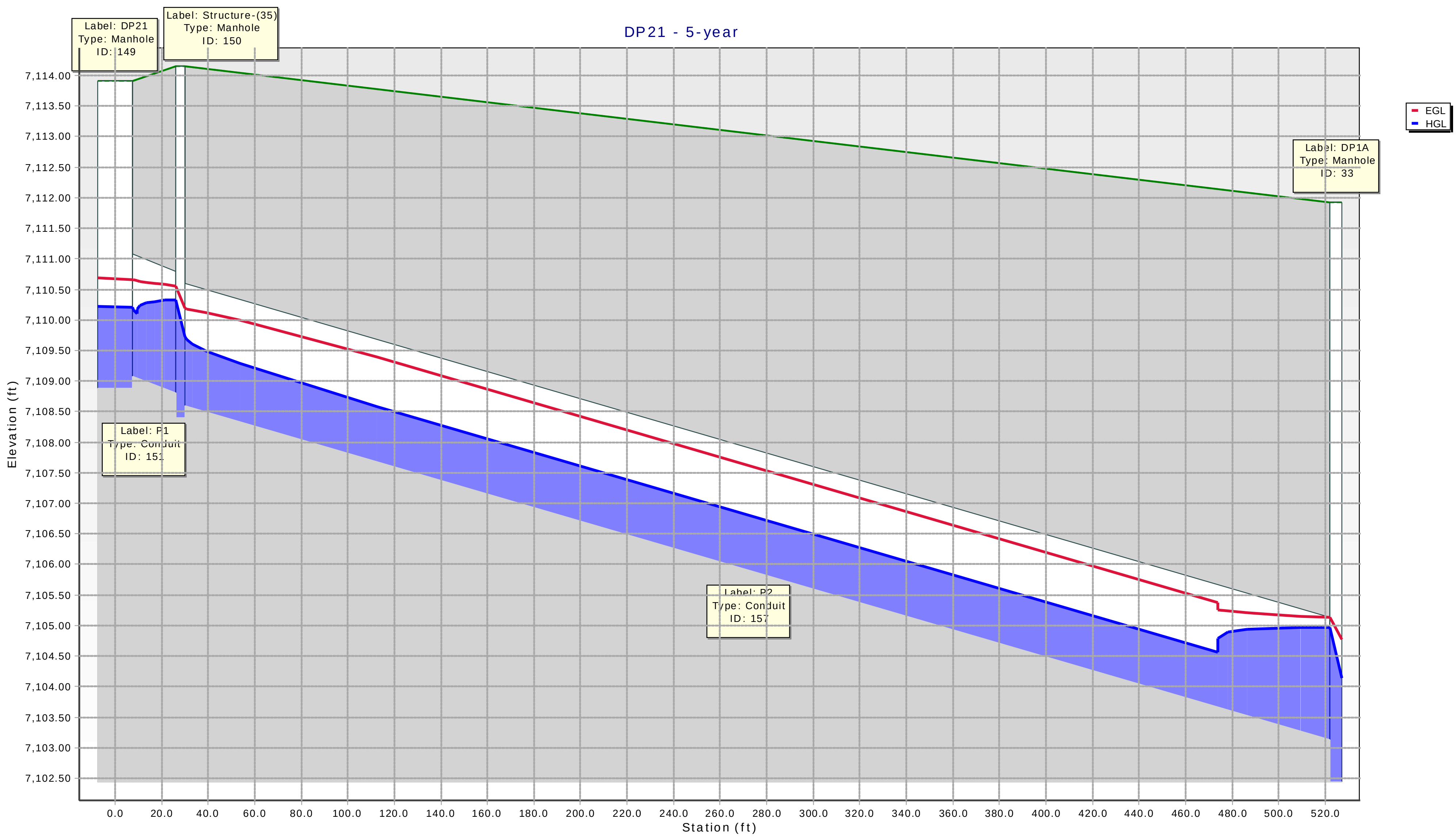
-7.0 -6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0



DP21 - 5-year
Label: DP21
Type: Manhole
ID: 149
Label: Structure-(35)
Type: Manhole
ID: 150
Label: DP1A
Type: Manhole
ID: 33
Label: P1
Type: Conduit
ID: 151
Label: P2
Type: Conduit
ID: 157
EGL
HGL
Elevation (ft)
Station (ft)
7,114.00
7,113.50
7,113.00
7,112.50
7,112.00
7,111.50
7,111.00
7,110.50
7,110.00
7,109.50
7,109.00
7,108.50
7,108.00
7,107.50
7,107.00
7,106.50
7,106.00
7,105.50
7,105.00
7,104.50
7,104.00
7,103.50
7,103.00
7,102.50
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
220.0
240.0
260.0
280.0
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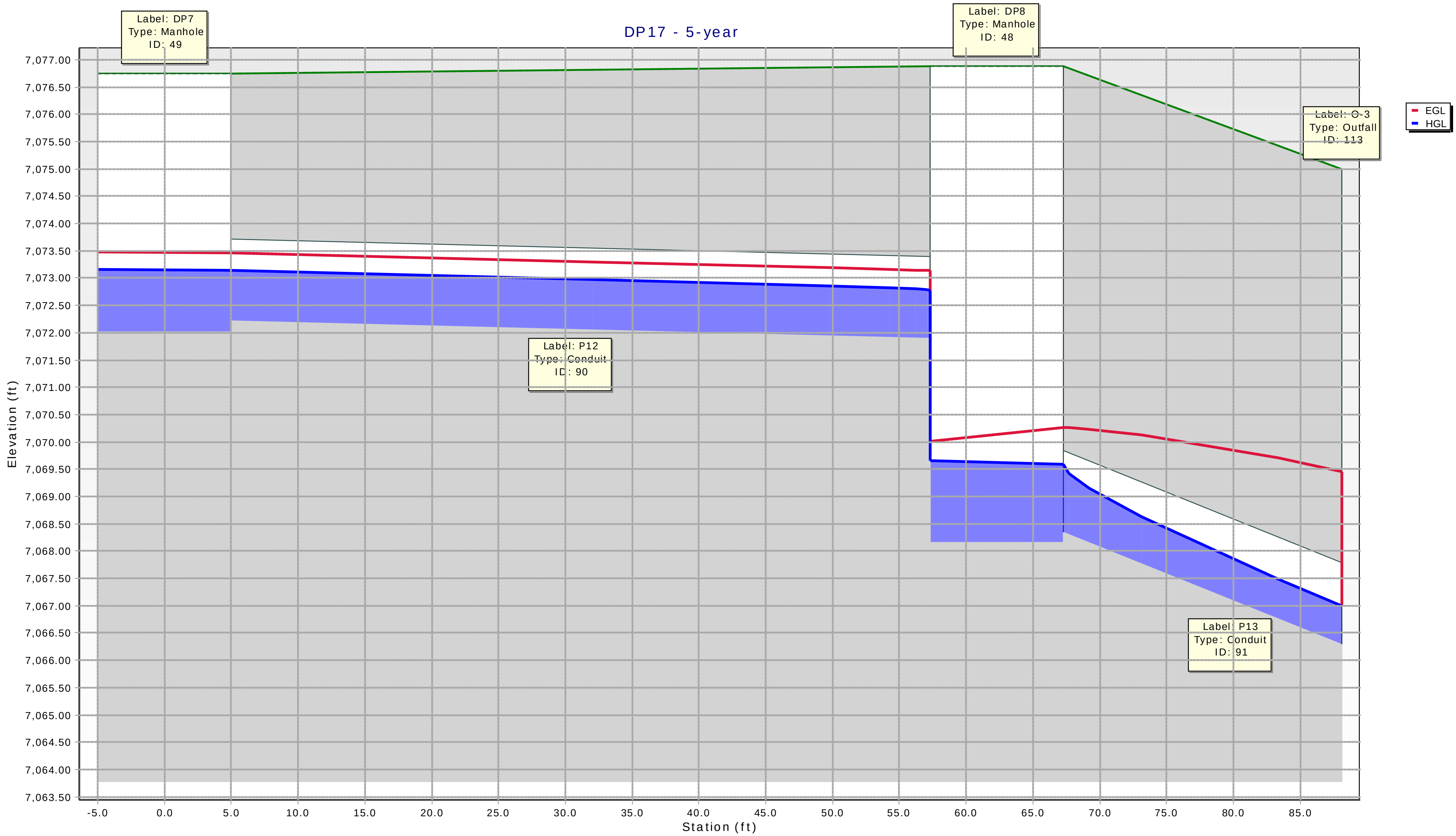
480.0
500.0
520.0


DP17 - 5-year
Label: DP7
Type: Manhole
ID: 49
Label: DP8
Type: Manhole
ID: 48
Label: O-3
Type: Outfall
ID: 113
Label: P12
Type: Conduit
ID: 90
Label: P13
Type: Conduit
ID: 91
EGL
HGL
Elevation (ft)
Station (ft)
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7,076.50
7,076.00
7,075.50
7,075.00
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7,074.00
7,073.50
7,073.00
7,072.50
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7,069.50
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7,068.00
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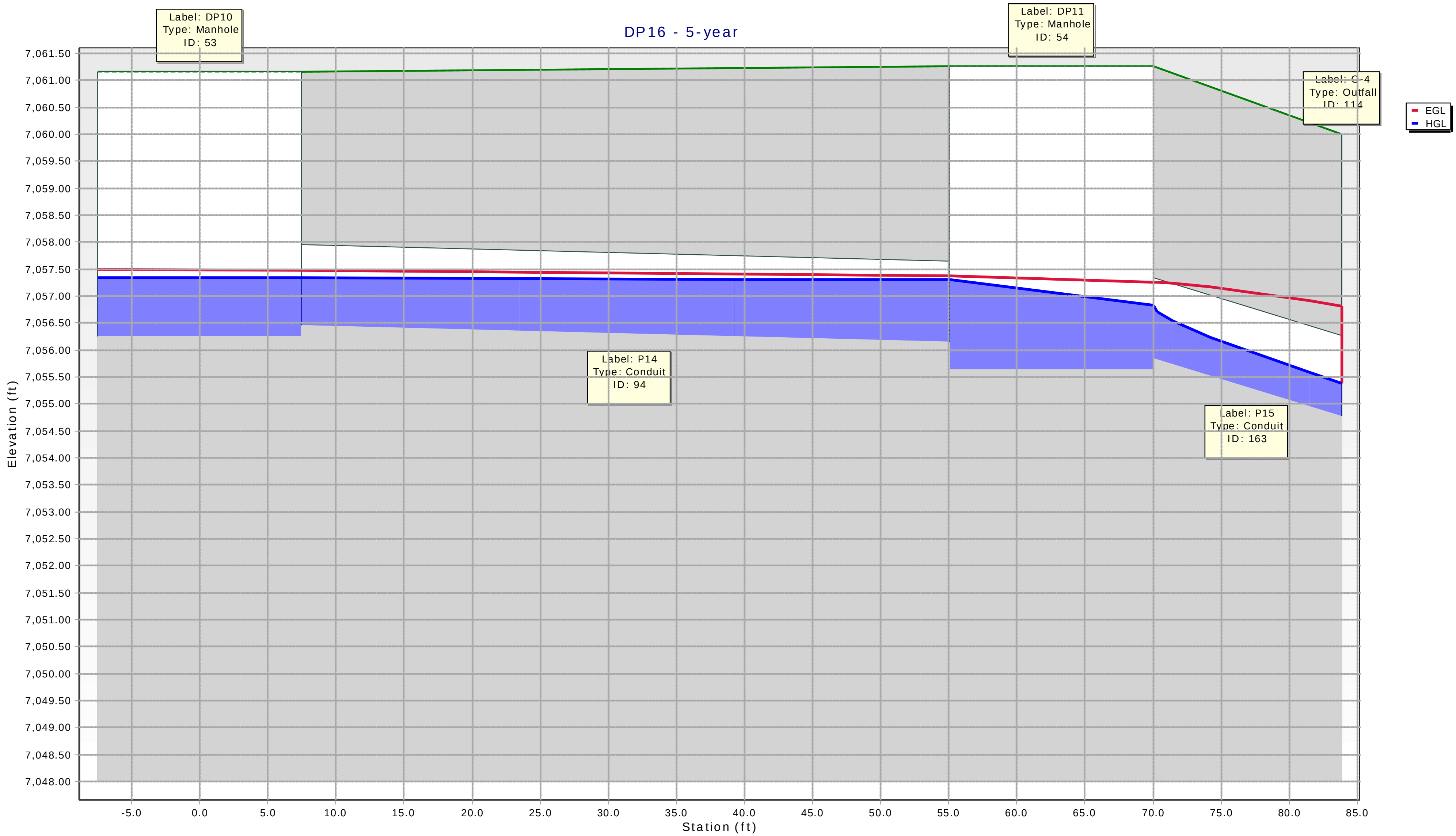
7,067.00
7,066.50
7,066.00
7,065.50
7,065.00
7,064.50
7,064.00
7,063.50
-5.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0



DP16 - 5-year
Label: DP10
Type: Manhole
ID: 53
Label: DP11
Type: Manhole
ID: 54
Label: C-4
Type: Outfall
ID: 114
Label: P14
Type: Conduit
ID: 94
Label: P15
Type: Conduit
ID: 163
EGL
HGL
Elevation (ft)
Station (ft)
7,061.50
7,061.00
7,060.50
7,060.00
7,059.50
7,059.00
7,058.50
7,058.00
7,057.50
7,057.00
7,056.50
7,056.00
7,055.50
7,055.00
7,054.50
7,054.00
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7,053.00
7,052.50
7,052.00
7,051.50
7,051.00
7,050.50
7,050.00
7,049.50
7,049.00
7,048.50
7,048.00
-5.0
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
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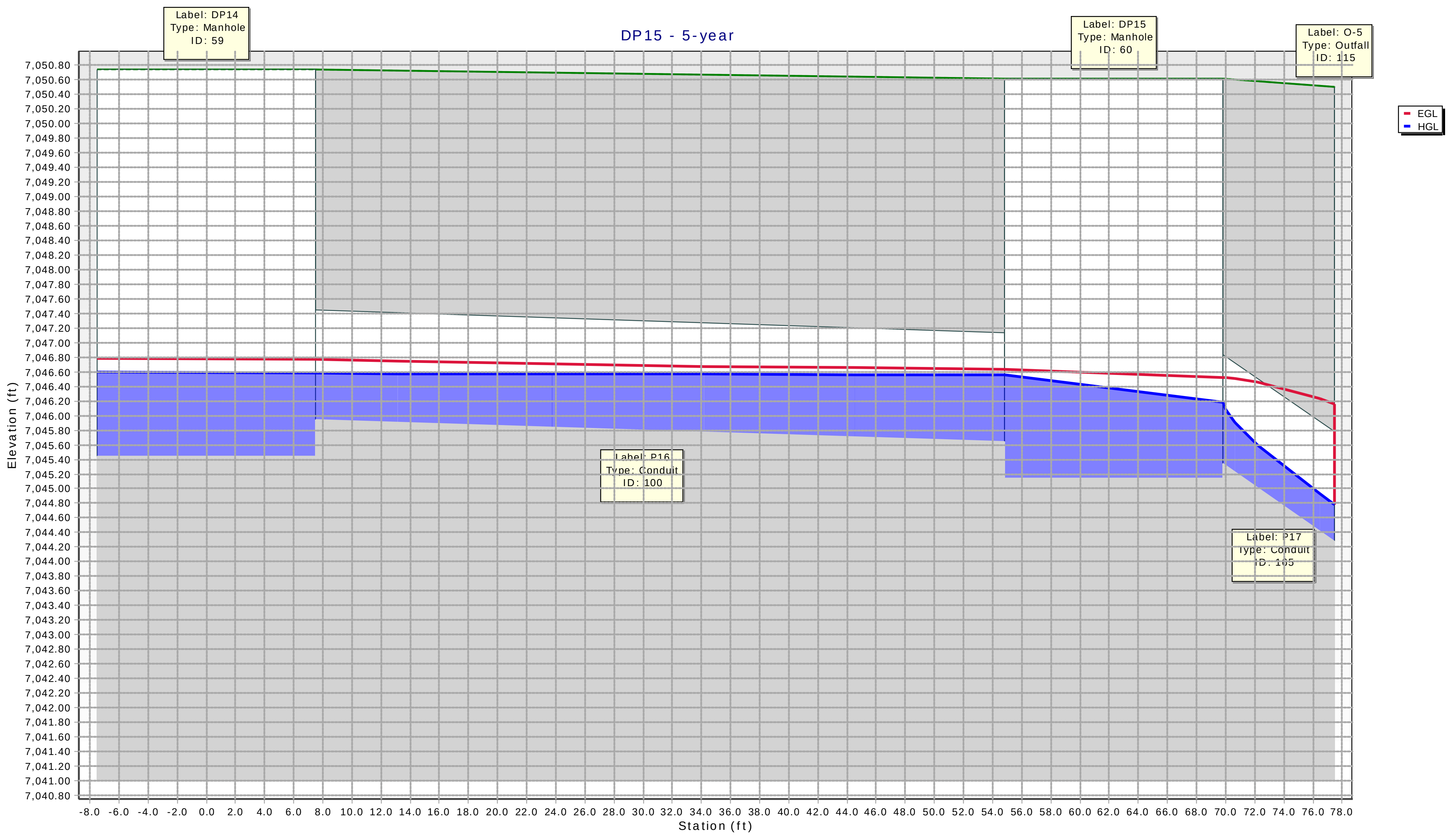
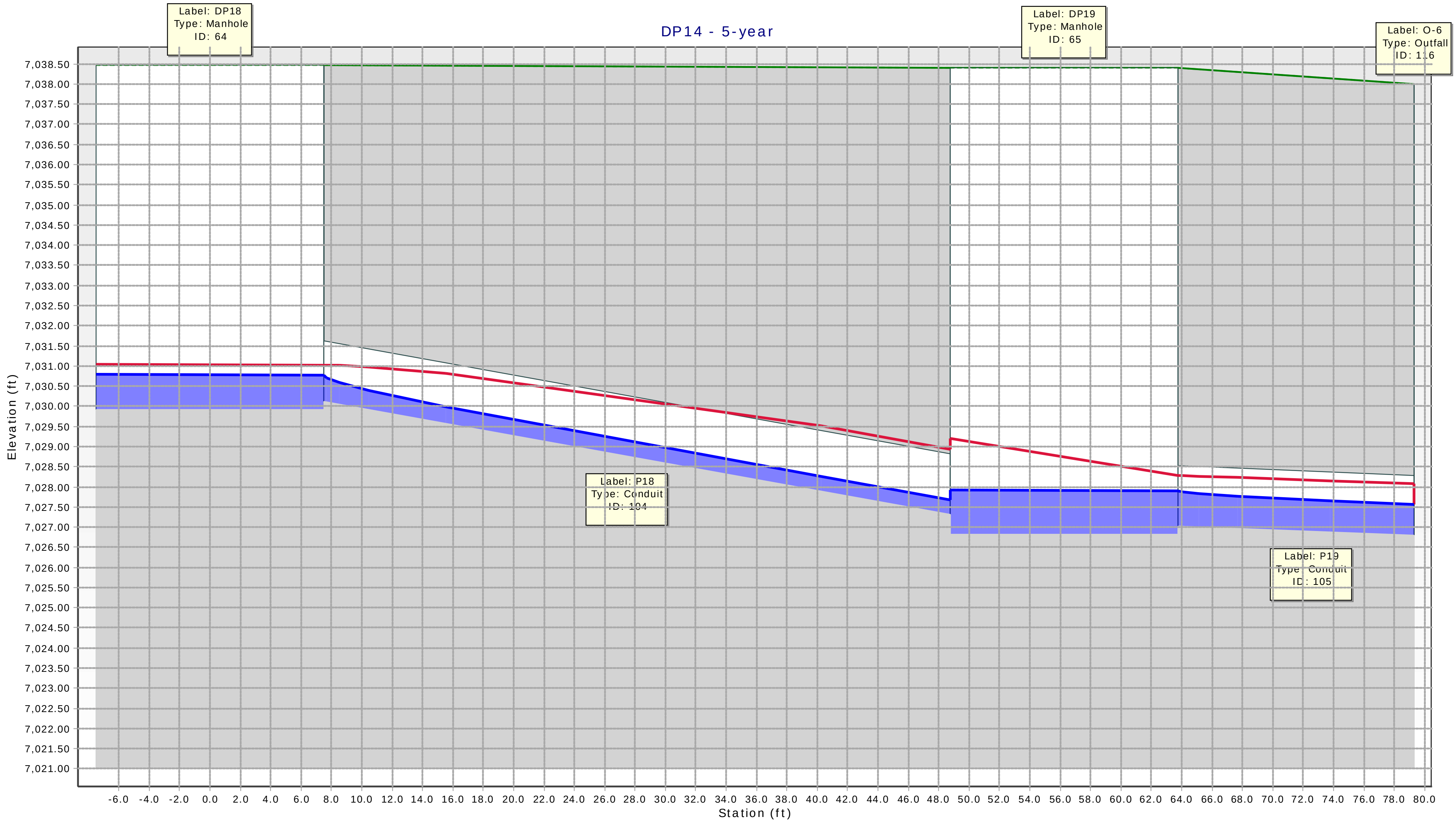
75.0
80.0
85.0



DP15 - 5-year
Label: DP14
Type: Manhole
ID: 59
Label: DP15
Type: Manhole
ID: 60
Label: O-5
Type: Outfall
ID: 115
Label: P16
Type: Conduit
ID: 100
Label: P17
Type: Conduit
ID: 105
EGL
HGL
Elevation (ft)
Station (ft)



DP14 - 5-year
Label: DP18
Type: Manhole
ID: 64
Label: DP19
Type: Manhole
ID: 65
Label: O-6
Type: Outfall
ID: 116
Label: P18
Type: Conduit
ID: 104
Label: P19
Type: Conduit
ID: 105
Elevation (ft)
7,038.50
7,038.00
7,037.50
7,037.00
7,036.50
7,036.00
7,035.50
7,035.00
7,034.50
7,034.00
7,033.50
7,033.00
7,032.50
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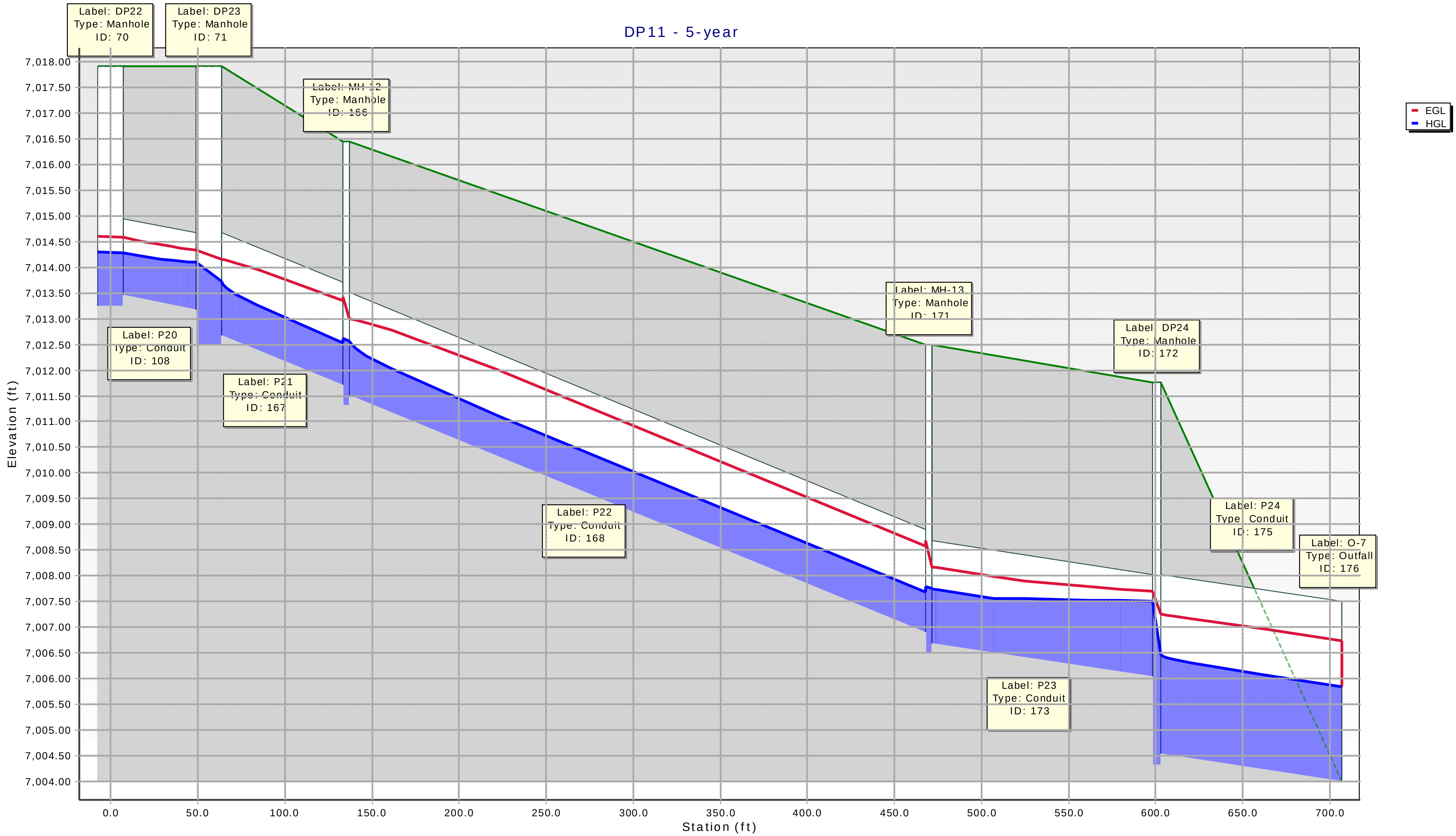
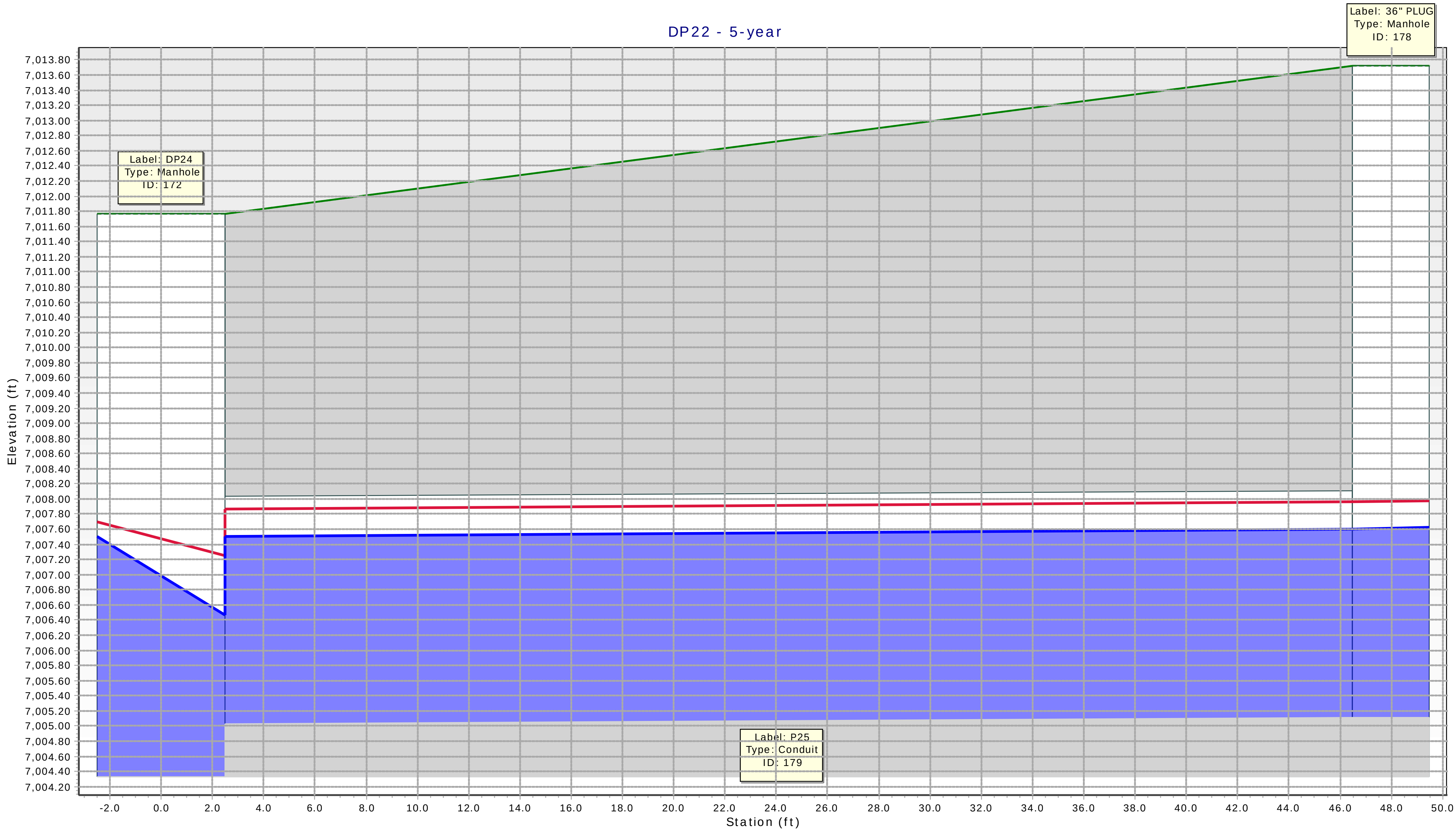
7,024.50
7,024.00
7,023.50
7,023.00
7,022.50
7,022.00
7,021.50
7,021.00
Station (ft)
-6.0 -4.0 -2.0 0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0 34.0 36.0 38.0 40.0 42.0 44.0 46.0 48.0 50.0 52.0 54.0 56.0 58.0 60.0 62.0 64.0 66.0 68.0 70.0 72.0 74.0 76.0 78.0 80.0


DP11 - 5-year
Label: DP22
Type: Manhole
ID: 70
Label: DP23
Type: Manhole
ID: 71
Label: MH-12
Type: Manhole
ID: 166
Label: MH-13
Type: Manhole
ID: 171
Label: DP24
Type: Manhole
ID: 172
Label: P20
Type: Conduit
ID: 108
Label: P21
Type: Conduit
ID: 167
Label: P22
Type: Conduit
ID: 168
Label: P23
Type: Conduit
ID: 173
Label: P24
Type: Conduit
ID: 175
Label: O-7
Type: Outfall
ID: 176
EGL
HGL
Elevation (ft)
Station (ft)
7,018.00
7,017.50
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
7,010.00
7,009.50
7,009.00
7,008.50
7,008.00
7,007.50
7,007.00
7,006.50
7,006.00
7,005.50
7,005.00
7,004.50
7,004.00
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
500.0
550.0
600.0
650.0
700.0



DP22 - 5-year
Label: DP24
Type: Manhole
ID: 172
Label: 36" PLUG
Type: Manhole
ID: 178
Label: P25
Type: Conduit
ID: 179
Elevation (ft)
Station (ft)

Scenario: 100-year
Current Time Step: 0.000 h
Conduit FlexTable: Combined Pipe/Node Report

Upstream Structure	Label	Flow (cfs)	Capacity (Full Flow) (cfs)	Diameter (in)	Manning's n	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	HGL (In) (ft)	HGL (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Velocity (ft/s)	Upstream Structure Headloss Coefficient
DP21	P1	19.70	22.60	24.0	0.013	28.1	0.010	7,109.08	7,108.80	7,113.91	7,114.15	7,111.54	7,111.32	7,112.15	7,111.93	6.27	0.050
Structure-(35)	P2	19.70	23.74	24.0	0.013	496.6	0.011	7,108.60	7,103.13	7,114.15	7,111.92	7,110.47	7,106.75	7,111.12	7,107.36	8.45	1.320
DP2	P3	13.70	15.99	24.0	0.013	68.0	0.005	7,103.81	7,103.47	7,110.47	7,111.94	7,107.17	7,106.92	7,107.46	7,107.21	4.36	0.050
DP1	P4	16.40	16.21	24.0	0.013	27.3	0.005	7,103.27	7,103.13	7,111.94	7,111.92	7,106.90	7,106.75	7,107.32	7,107.18	5.22	0.050
DP1A	P5	34.00	28.90	30.0	0.013	306.2	0.005	7,102.63	7,101.11	7,111.92	7,109.26	7,105.77	7,103.67	7,106.51	7,104.41	6.93	1.320
Structure - (35)	P6	34.00	28.99	30.0	0.013	306.2	0.005	7,100.91	7,099.38	7,109.26	7,106.25	7,103.63	7,101.36	7,104.37	7,102.39	6.93	0.050
Structure - (31)	P7	34.00	78.40	30.0	0.013	226.9	0.037	7,099.18	7,090.89	7,106.25	7,103.13	7,101.16	7,094.82	7,102.19	7,095.56	15.40	0.050
DP5	P8	12.70	12.93	18.0	0.013	56.1	0.015	7,092.83	7,091.98	7,103.12	7,104.26	7,096.28	7,095.46	7,097.08	7,096.26	7.19	0.050
DP 5b	P9	12.70	10.47	18.0	0.013	41.3	0.010	7,091.78	7,091.37	7,104.26	7,103.13	7,095.42	7,094.82	7,096.22	7,095.62	7.19	0.050
DP4	P10	8.20	29.73	18.0	0.013	26.1	0.080	7,093.48	7,091.39	7,103.04	7,103.13	7,094.98	7,094.82	7,095.31	7,095.15	14.37	0.050
DP6	P11	41.90	108.28	36.0	0.013	24.7	0.026	7,089.37	7,088.72	7,103.13	7,098.25	7,094.10	7,094.00	7,094.64	7,094.55	5.93	1.320
DP7	P12	9.40	7.41	18.0	0.013	62.3	0.005	7,072.21	7,071.90	7,076.74	7,076.88	7,073.71	7,073.08	7,074.15	7,073.70	5.32	0.050
DP8	P13	14.00	29.66	18.0	0.013	25.8	0.080	7,068.35	7,066.29	7,076.88	7,075.00	7,069.73	7,067.15	7,070.78	7,069.95	16.55	0.100
DP10	P14	6.20	7.39	18.0	0.013	62.5	0.005	7,056.45	7,056.14	7,061.15	7,061.26	7,058.01	7,057.80	7,058.20	7,057.99	3.51	0.050
DP11	P15	10.10	23.54	18.0	0.013	21.3	0.050	7,055.84	7,054.77	7,061.26	7,060.00	7,057.06	7,055.57	7,057.73	7,057.28	12.81	1.100
DP14	P16	5.70	7.41	18.0	0.013	62.3	0.005	7,045.95	7,045.64	7,050.74	7,050.62	7,047.71	7,047.52	7,047.87	7,047.69	3.23	0.050
DP15	P17	11.70	27.80	18.0	0.013	15.1	0.070	7,045.34	7,044.28	7,050.62	7,050.50	7,046.64	7,046.00	7,047.44	7,046.68	15.05	1.100
DP18	P18	5.90	23.48	18.0	0.013	56.2	0.050	7,030.13	7,027.32	7,038.47	7,038.40	7,031.99	7,031.81	7,032.16	7,031.98	3.34	0.050
DP19	P19	11.50	10.49	18.0	0.013	23.1	0.010	7,027.02	7,026.79	7,038.40	7,038.00	7,031.78	7,031.50	7,032.43	7,032.16	6.51	0.050
DP22	P20	9.80	7.41	18.0	0.013	56.3	0.005	7,013.45	7,013.17	7,017.91	7,017.91	7,015.50	7,015.01	7,015.98	7,015.49	5.55	0.050
DP23	P21	19.90	24.94	24.0	0.013	79.0	0.012	7,012.67	7,011.71	7,017.91	7,016.44	7,014.27	7,013.07	7,015.12	7,014.26	8.82	0.870
MH-12	P22	19.90	26.59	24.0	0.013	334.4	0.014	7,011.51	7,006.89	7,016.44	7,012.50	7,013.11	7,010.27	7,013.96	7,010.89	9.29	0.100
MH-13	P23	19.90	16.06	24.0	0.013	130.9	0.005	7,006.69	7,006.03	7,012.50	7,011.76	7,010.20	7,009.19	7,010.83	7,009.81	6.33	0.100
DP24	P24	78.90	73.68	42.0	0.013	98.8	0.005	7,004.53	7,004.00	7,011.76	7,004.00	7,007.57	7,006.78	7,008.80	7,008.22	8.57	1.320
36" PLUG	P25	59.00	27.24	36.0	0.013	-	0.002	7,005.11	7,005.03	7,013.72	7,011.76	7,009.57	7,009.19	7,010.65	7,010.27	8.35	0.050

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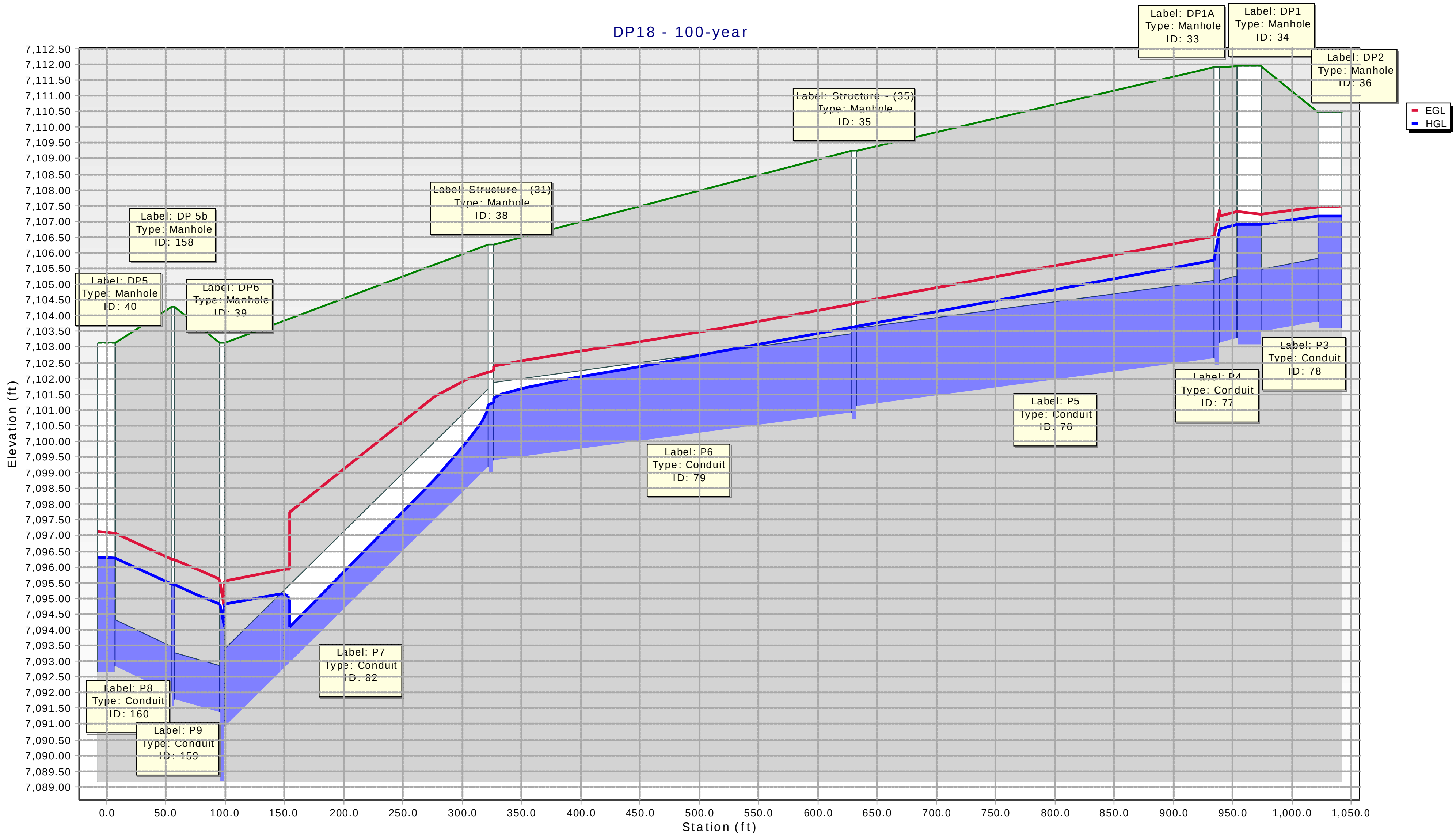
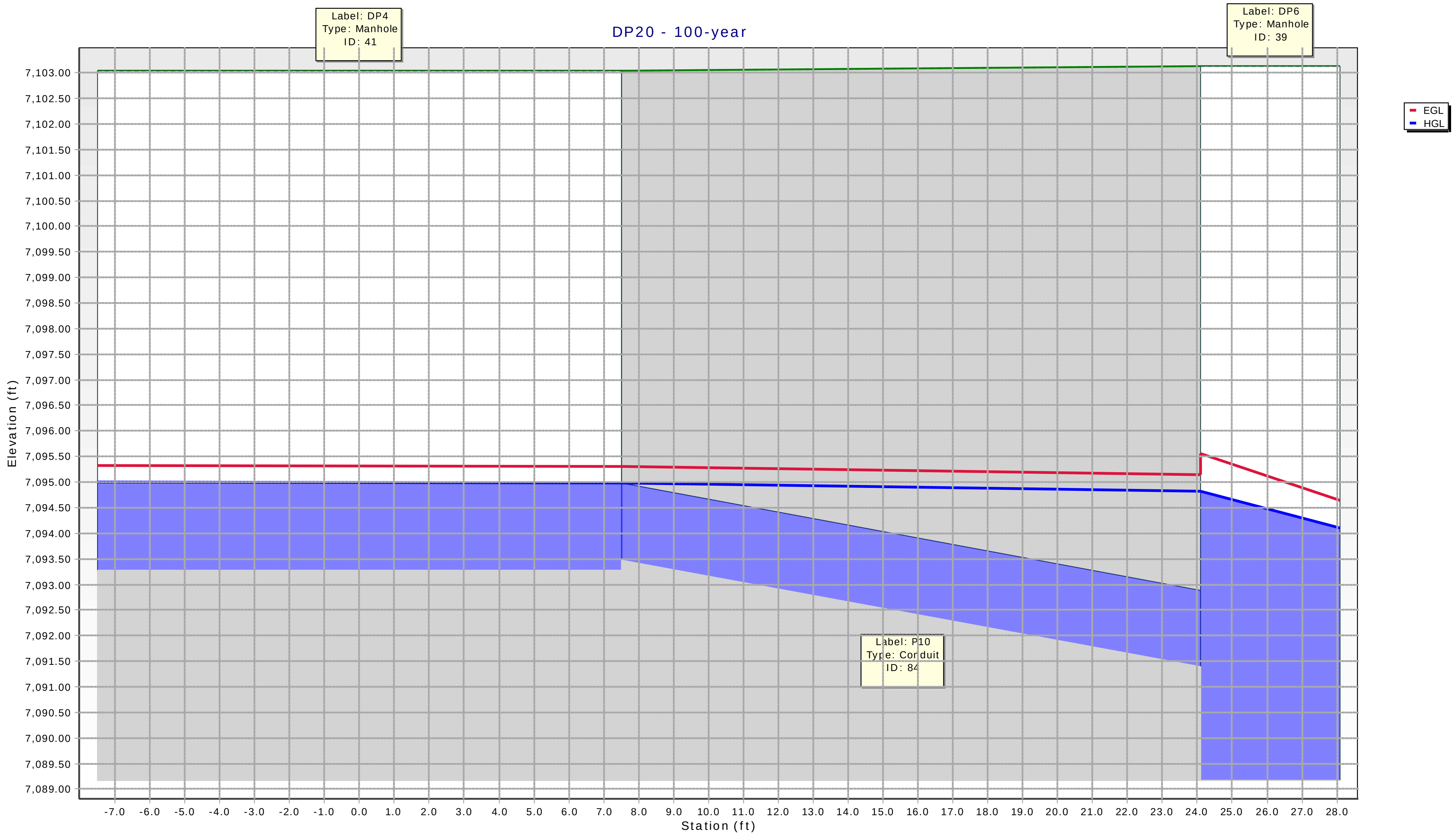

DP18 - 100-year
Elevation (ft)
Station (ft)
EGL
HGL
Label: DP1A
Type: Manhole
ID: 33
Label: DP1
Type: Manhole
ID: 34
Label: DP2
Type: Manhole
ID: 36
Label: Structure - (35)
Type: Manhole
ID: 35
Label: Structure - (31)
Type: Manhole
ID: 38
Label: DP 5b
Type: Manhole
ID: 158
Label: DP5
Type: Manhole
ID: 40
Label: DP6
Type: Manhole
ID: 39
Label: P3
Type: Conduit
ID: 78
Label: P4
Type: Conduit
ID: 77
Label: P5
Type: Conduit
ID: 76
Label: P6
Type: Conduit
ID: 79
Label: P7
Type: Conduit
ID: 82
Label: P8
Type: Conduit
ID: 160
Label: P9
Type: Conduit
ID: 159


DP20 - 100-year
Label: DP4
Type: Manhole
ID: 41
Label: DP6
Type: Manhole
ID: 39
Label: P10
Type: Conduit
ID: 84
EGL
HGL
Elevation (ft)
Station (ft)
7,103.00
7,102.50
7,102.00
7,101.50
7,101.00
7,100.50
7,100.00
7,099.50
7,099.00
7,098.50
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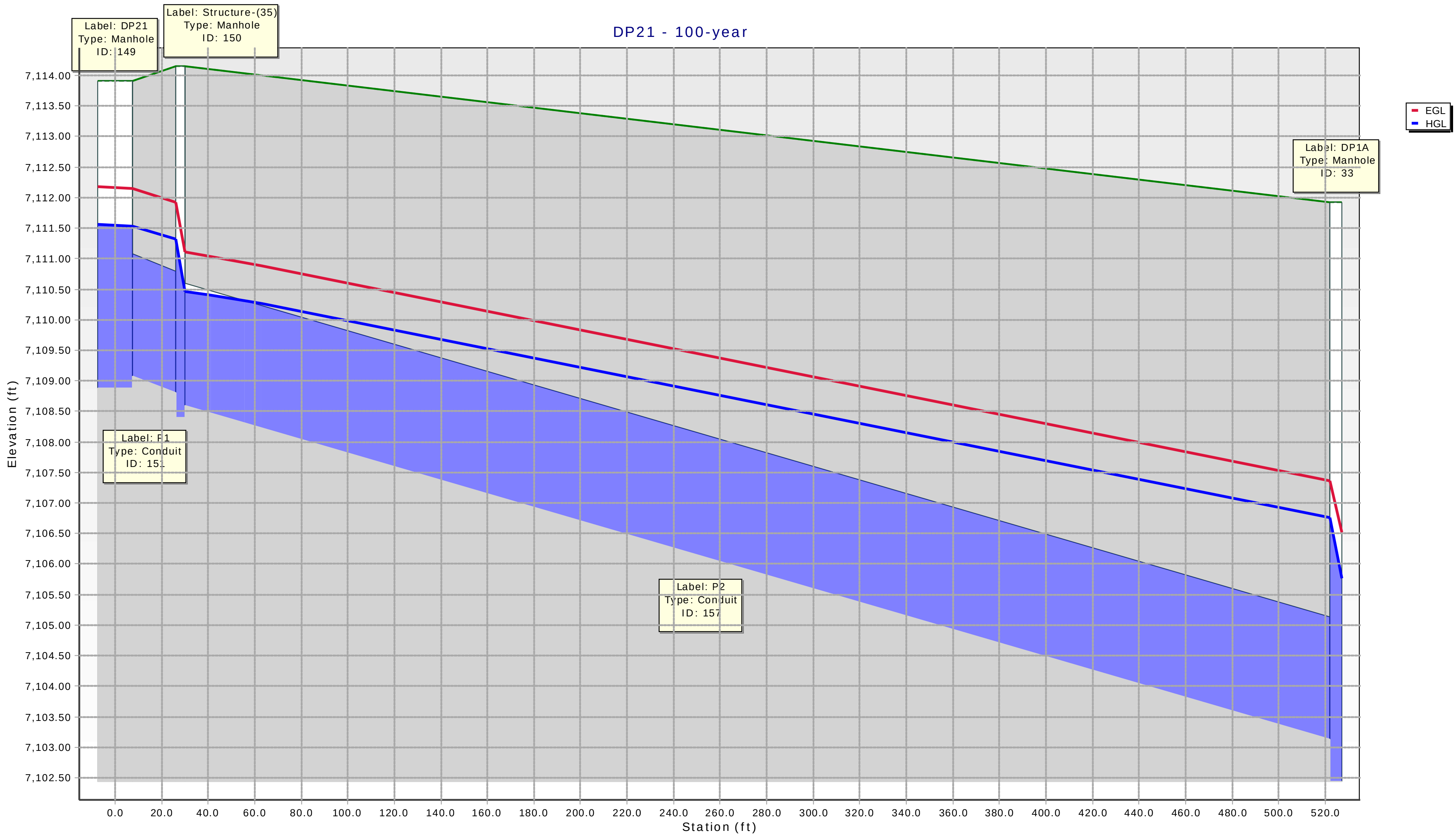
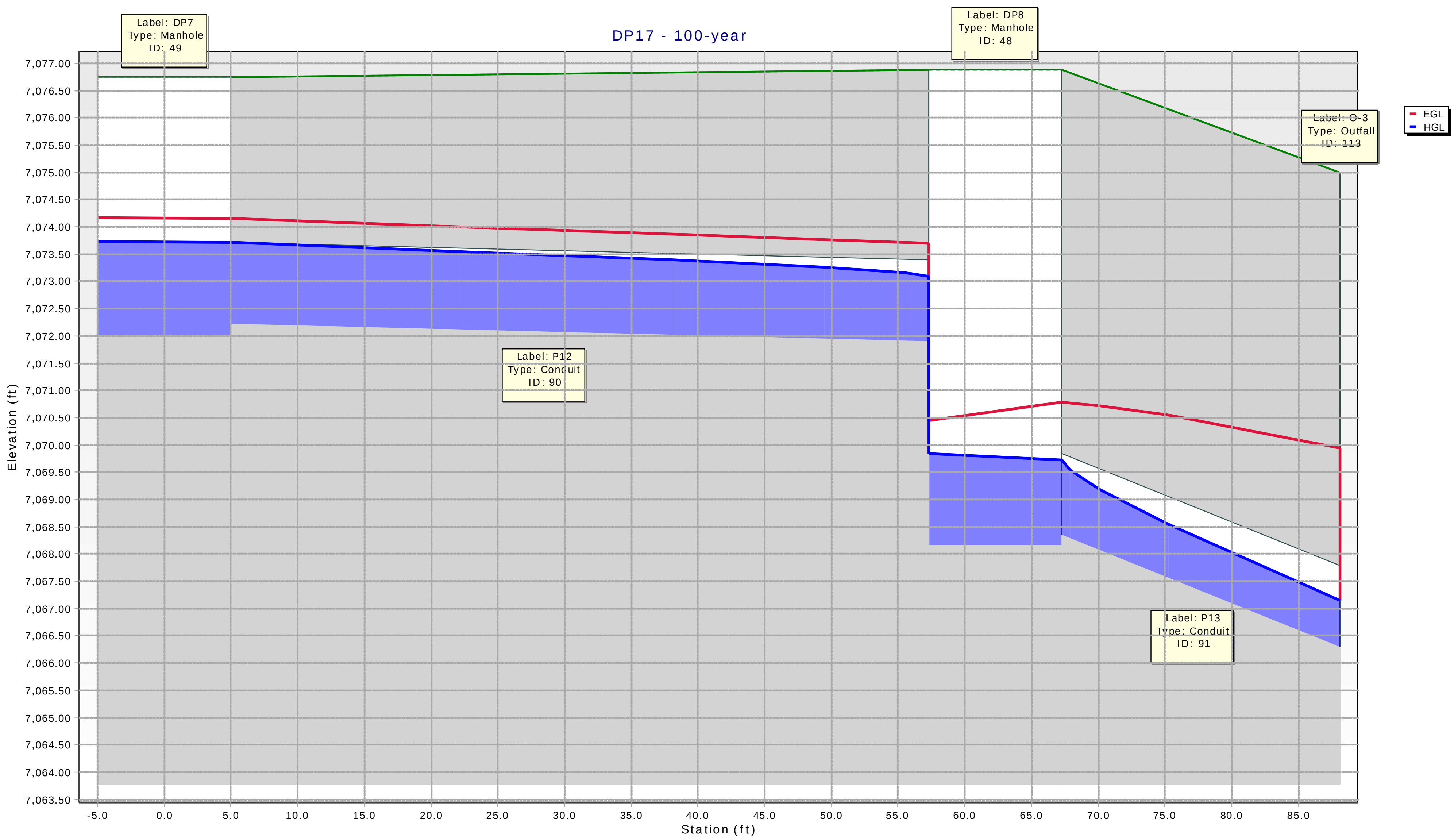
7,092.50
7,092.00
7,091.50
7,091.00
7,090.50
7,090.00
7,089.50
7,089.00
-7.0 -6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0



DP21 - 100-year
Label: DP21
Type: Manhole
ID: 149
Label: Structure-(35)
Type: Manhole
ID: 150
Label: DP1A
Type: Manhole
ID: 33
Label: P1
Type: Conduit
ID: 151
Label: P2
Type: Conduit
ID: 157
EGL
HGL
Elevation (ft)
7,114.00
7,113.50
7,113.00
7,112.50
7,112.00
7,111.50
7,111.00
7,110.50
7,110.00
7,109.50
7,109.00
7,108.50
7,108.00
7,107.50
7,107.00
7,106.50
7,106.00
7,105.50
7,105.00
7,104.50
7,104.00
7,103.50
7,103.00
7,102.50
Station (ft)
0.0 20.0 40.0 60.0 80.0 100.0 120.0 140.0 160.0 180.0 200.0 220.0 240.0 260.0 280.0 300.0 320.0 340.0 360.0 380.0 400.0 420.0 440.0 460.0 480.0 500.0 520.0


DP17 - 100-year
Label: DP7
Type: Manhole
ID: 49
Label: DP8
Type: Manhole
ID: 48
Label: O-3
Type: Outfall
ID: 113
Label: P12
Type: Conduit
ID: 90
Label: P13
Type: Conduit
ID: 91
EGL
HGL
Elevation (ft)
7,077.00
7,076.50
7,076.00
7,075.50
7,075.00
7,074.50
7,074.00
7,073.50
7,073.00
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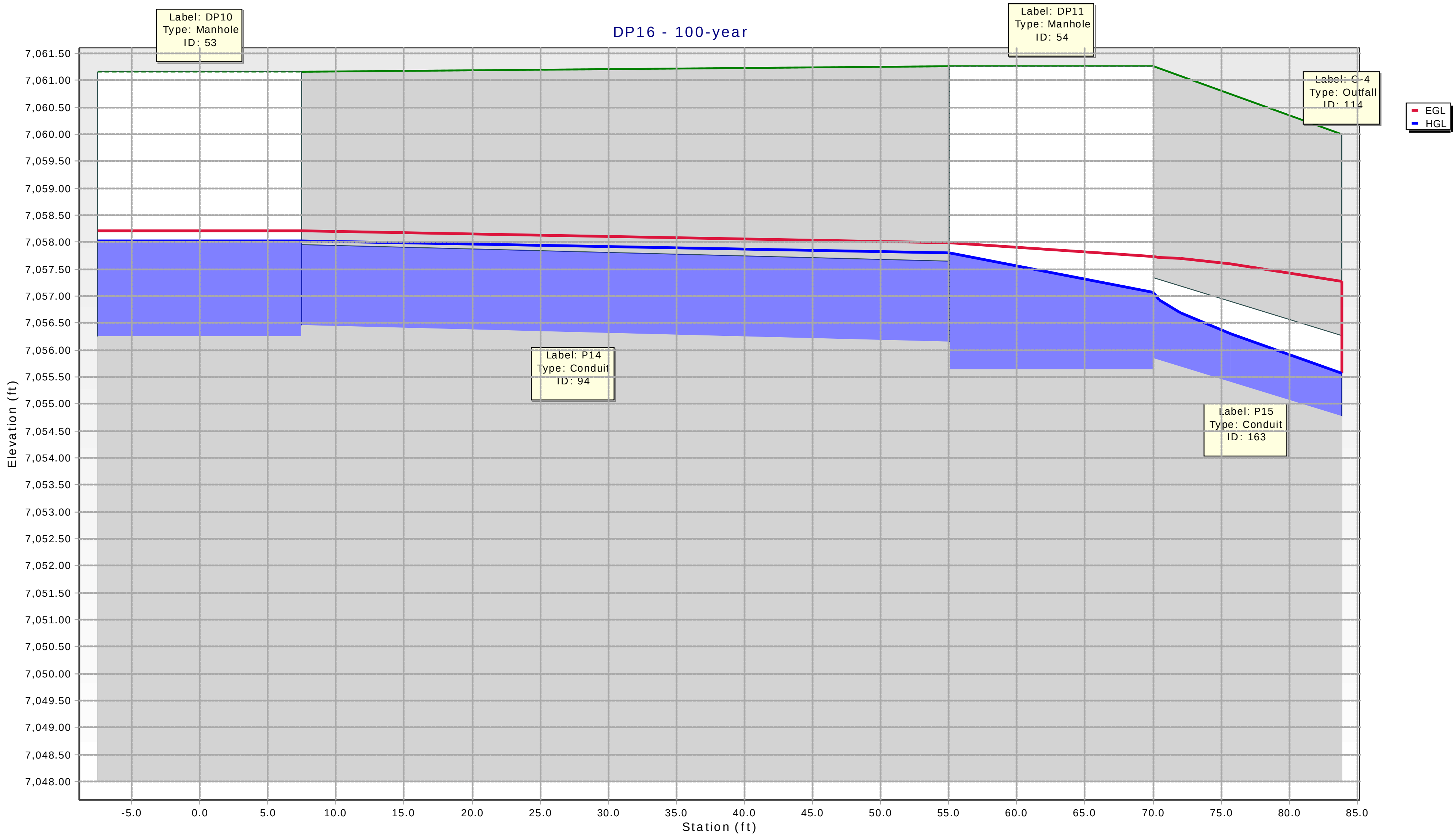
7,069.00
7,068.50
7,068.00
7,067.50
7,067.00
7,066.50
7,066.00
7,065.50
7,065.00
7,064.50
7,064.00
7,063.50
Station (ft)
-5.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0


DP16 - 100-year
Label: DP10
Type: Manhole
ID: 53
Label: DP11
Type: Manhole
ID: 54
Label: O-4
Type: Outfall
ID: 114
Label: P14
Type: Conduit
ID: 94
Label: P15
Type: Conduit
ID: 163
EGL
HGL
Elevation (ft)
Station (ft)
7,061.50
7,061.00
7,060.50
7,060.00
7,059.50
7,059.00
7,058.50
7,058.00
7,057.50
7,057.00
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7,053.00
7,052.50
7,052.00
7,051.50
7,051.00
7,050.50
7,050.00
7,049.50
7,049.00
7,048.50
7,048.00
-5.0
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
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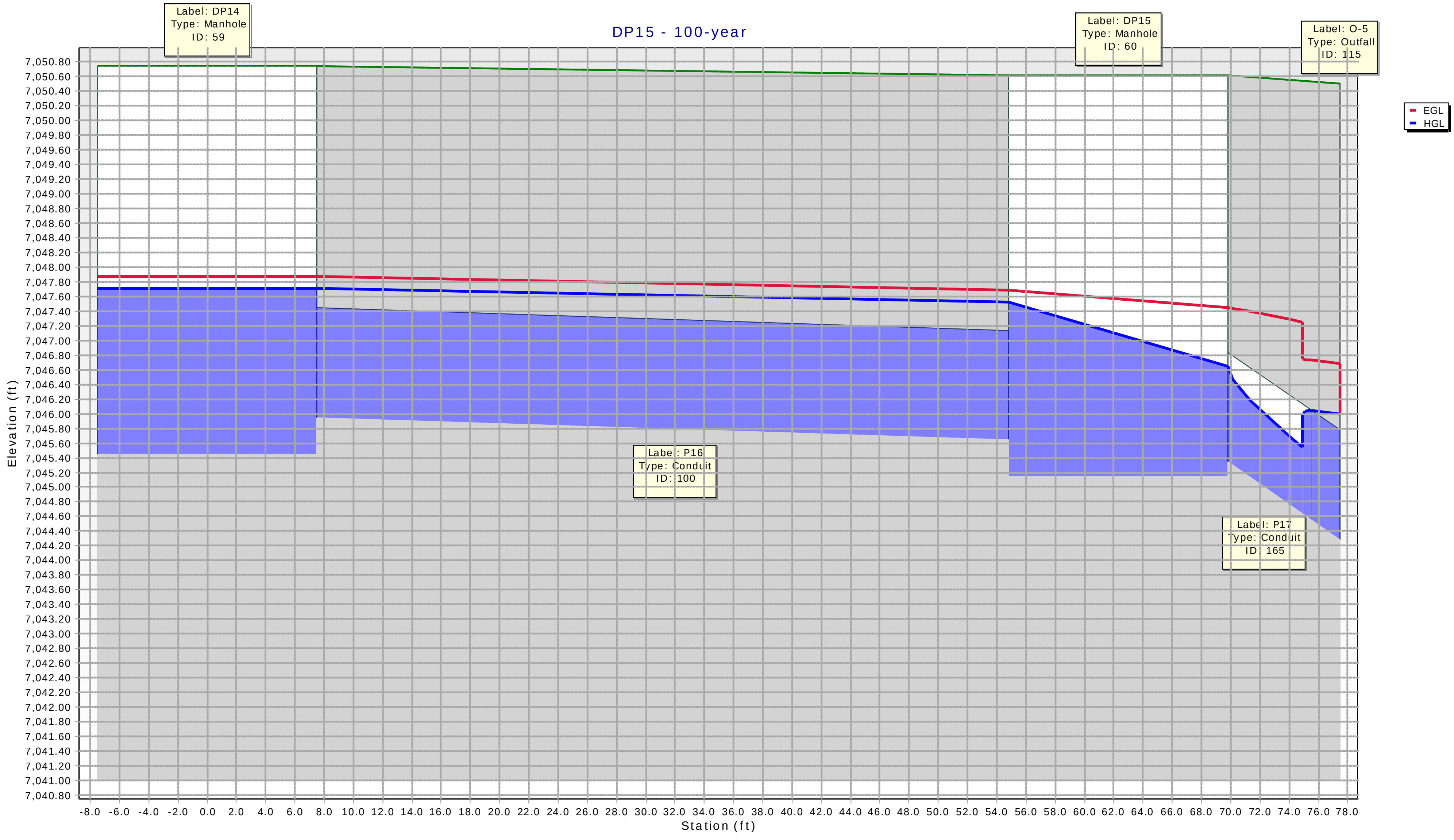
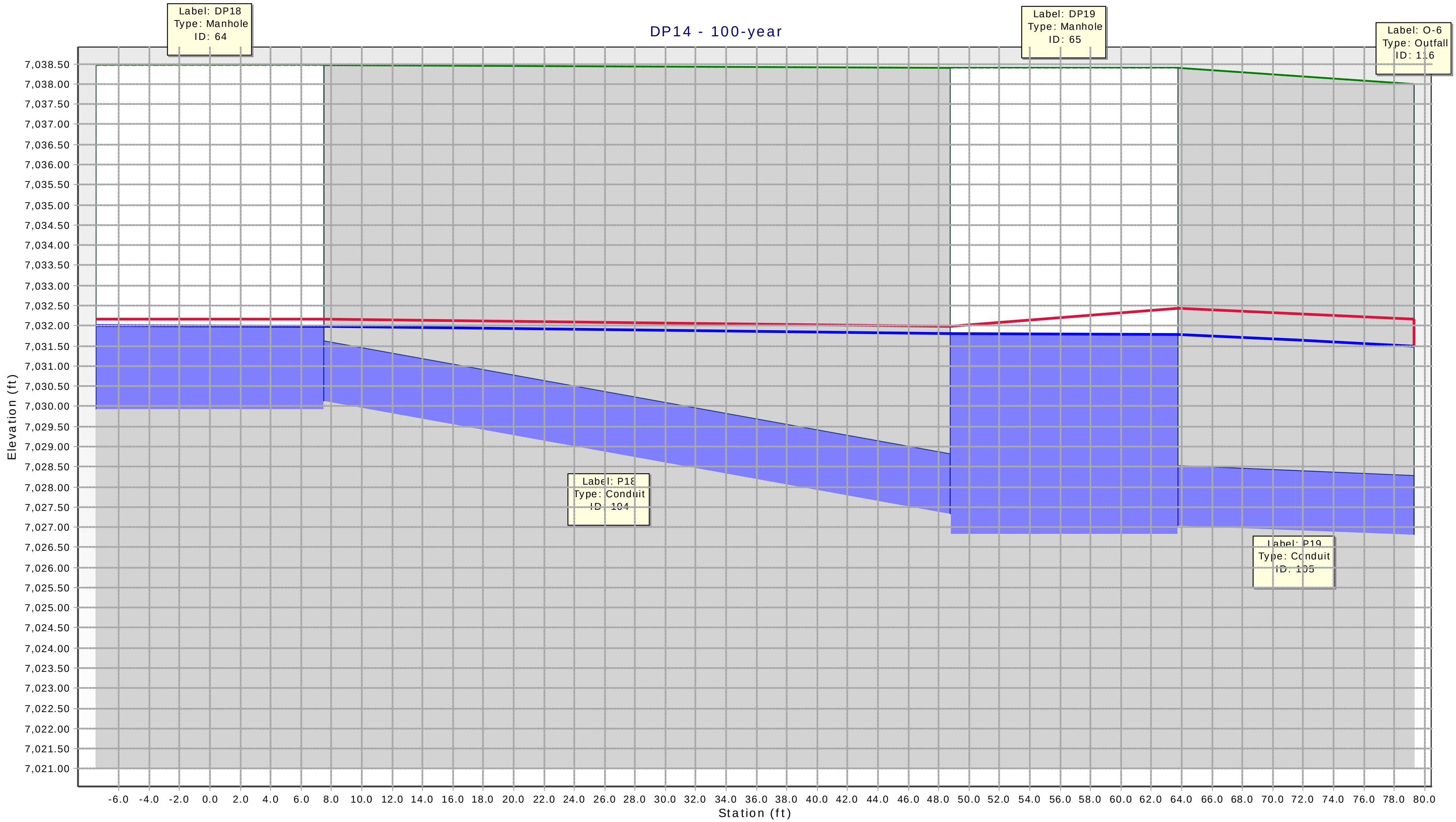
75.0
80.0
85.0


DP15 - 100-year
Label: DP14
Type: Manhole
ID: 59
Label: DP15
Type: Manhole
ID: 60
Label: O-5
Type: Outfall
ID: 115
Label: P16
Type: Conduit
ID: 100
Label: P17
Type: Conduit
ID: 165
EGL
HGL
Elevation (ft)
Station (ft)
7,050.80
7,040.80
-8.0
78.0


DP14 - 100-year
Label: DP18
Type: Manhole
ID: 64
Label: DP19
Type: Manhole
ID: 65
Label: O-6
Type: Outfall
ID: 116
Label: P18
Type: Conduit
ID: 104
Label: P19
Type: Conduit
ID: 105
Elevation (ft)
Station (ft)
7,038.50
7,038.00
7,037.50
7,037.00
7,036.50
7,036.00
7,035.50
7,035.00
7,034.50
7,034.00
7,033.50
7,033.00
7,032.50
7,032.00
7,031.50
7,031.00
7,030.50
7,030.00
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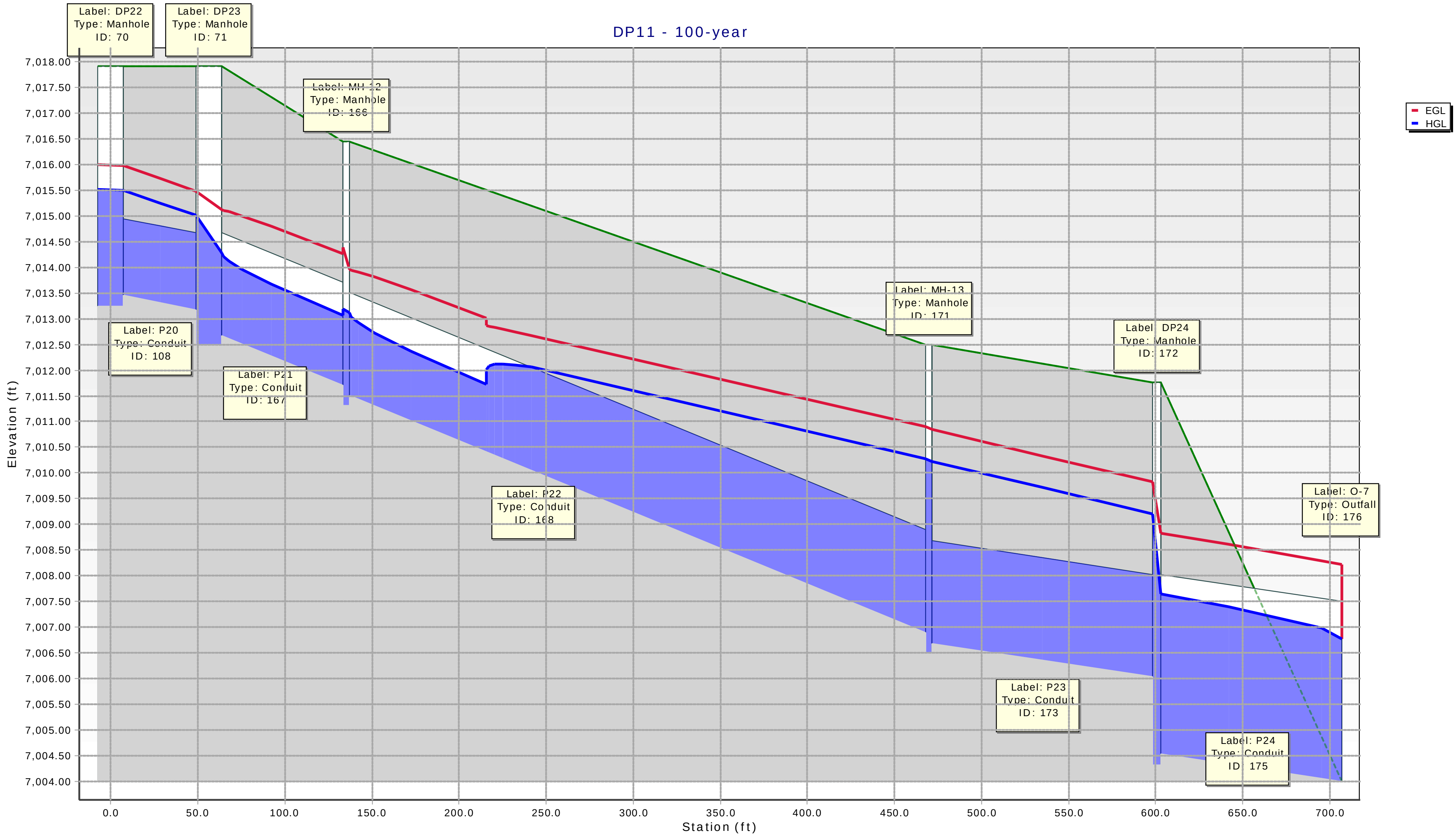
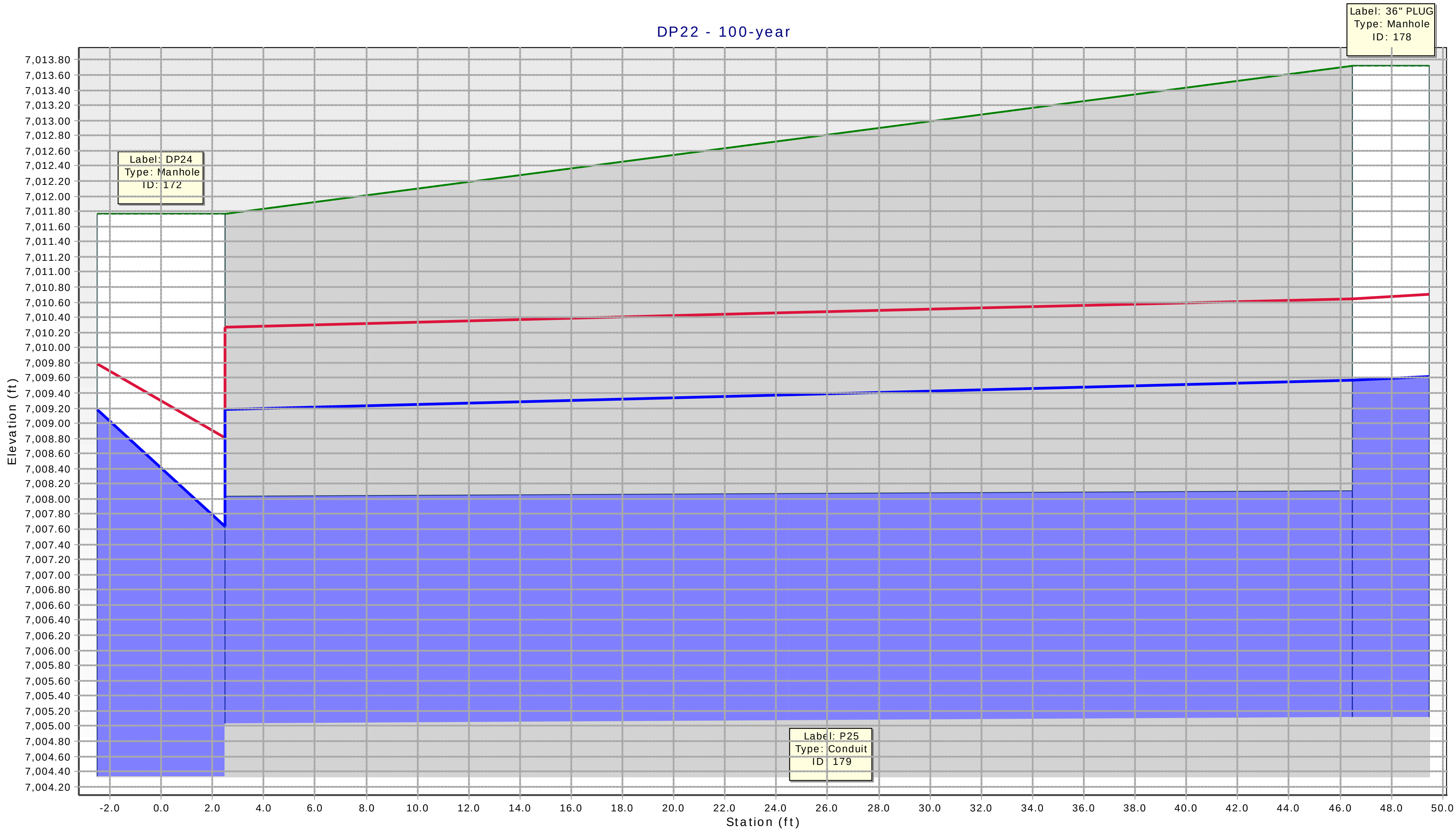
7,025.00
7,024.50
7,024.00
7,023.50
7,023.00
7,022.50
7,022.00
7,021.50
7,021.00
-6.0 -4.0 -2.0 0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0 34.0 36.0 38.0 40.0 42.0 44.0 46.0 48.0 50.0 52.0 54.0 56.0 58.0 60.0 62.0 64.0 66.0 68.0 70.0 72.0 74.0 76.0 78.0 80.0

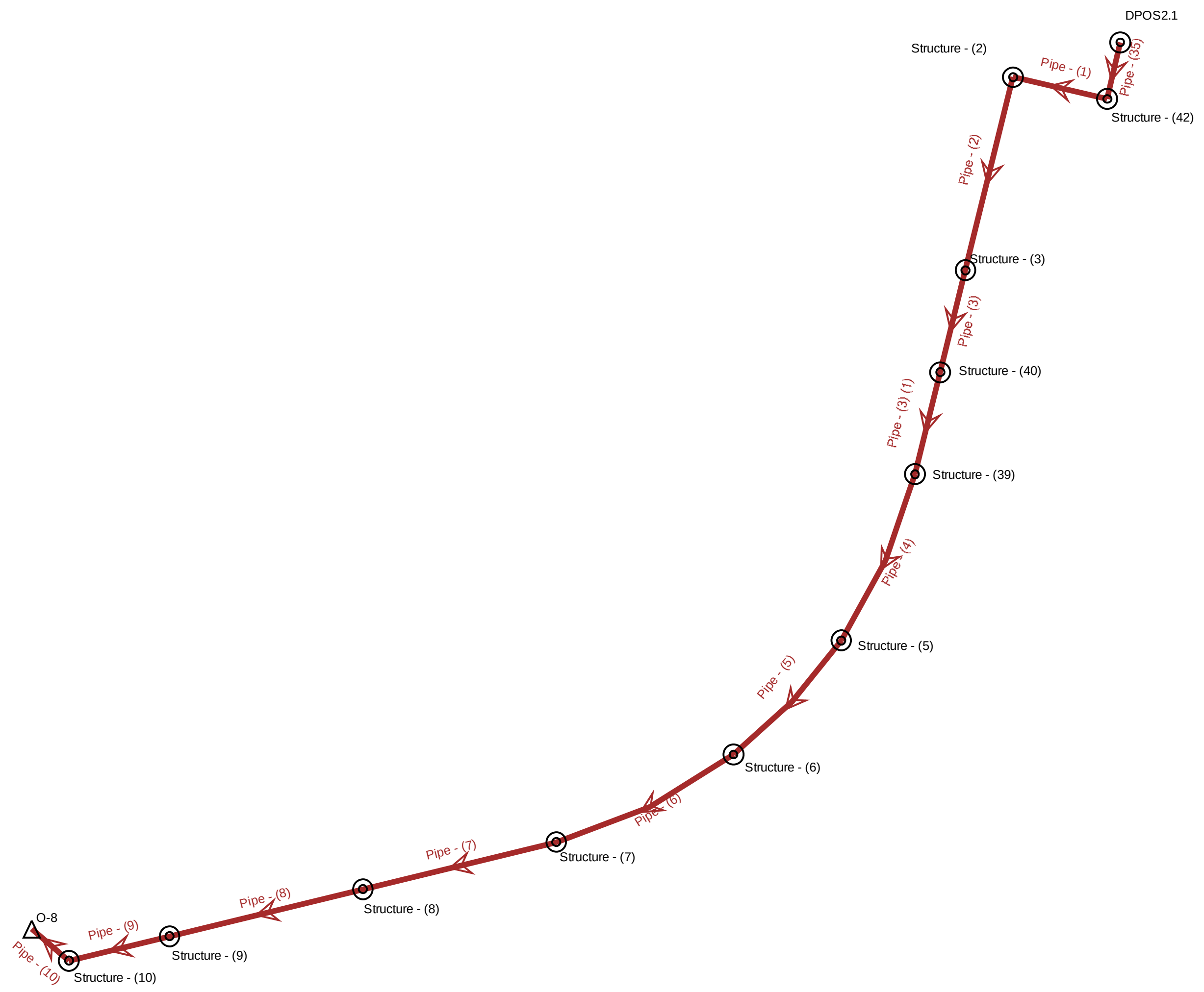
DP11 - 100-year





DP22 - 100-year
Label: 36" PLUG
Type: Manhole
ID: 178
Label: DP24
Type: Manhole
ID: 172
Label: P25
Type: Conduit
ID: 179
Elevation (ft)
Station (ft)
7,004.20
7,004.40
7,004.60
7,004.80
7,005.00
7,005.20
7,005.40
7,005.60
7,005.80
7,006.00
7,006.20
7,006.40
7,006.60
7,006.80
7,007.00
7,007.20
7,007.40
7,007.60
7,007.80
7,008.00
7,008.20
7,008.40
7,008.60
7,008.80
7,009.00
7,009.20
7,009.40
7,009.60
7,009.80
7,010.00
7,010.20
7,010.40
7,010.60
7,010.80
7,011.00
7,011.20
7,011.40
7,011.60
7,011.80
7,012.00
7,012.20
7,012.40
7,012.60
7,012.80
7,013.00
7,013.20
7,013.40
7,013.60
7,013.80
-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

Map 9: DP12 Alignment



DP12 Alignment

Scenario: 5-year
Current Time Step: 0.000 h
Conduit FlexTable: Combined Pipe/Node Report

Upstream Structure	Label	Flow (cfs)	Capacity (Full Flow) (cfs)	Diameter (in)	Manning's n	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	HGL (In) (ft)	HGL (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Velocity (ft/s)	Upstream Structure Headloss Coefficient
Structure - (42)	Pipe - (1)	4.30	101.56	48.0	0.013	291.3	0.005	7,087.93	7,086.48	7,108.02	7,102.69	7,088.53	7,087.15	7,088.74	7,087.30	4.01	1.320
Structure - (2)	Pipe - (2)	4.30	192.11	48.0	0.013	599.8	0.018	7,086.27	7,075.54	7,102.69	7,089.15	7,086.87	7,075.96	7,087.08	7,076.57	6.26	1.320
Structure - (3)	Pipe - (3)	4.30	203.11	48.0	0.013	316.6	0.020	7,075.34	7,069.01	7,089.15	7,082.43	7,075.94	7,069.42	7,076.15	7,070.08	6.51	0.050
Structure - (40)	Pipe - (3) (1)	4.30	175.91	48.0	0.013	317.1	0.015	7,068.81	7,064.05	7,082.43	7,076.20	7,069.41	7,064.49	7,069.62	7,065.02	5.89	0.050
Structure - (39)	Pipe - (4)	4.30	178.81	48.0	0.013	551.6	0.015	7,063.85	7,055.30	7,076.20	7,067.81	7,064.45	7,055.73	7,064.66	7,056.28	5.95	0.050
Structure - (5)	Pipe - (5)	4.30	172.95	48.0	0.013	475.0	0.014	7,055.10	7,048.22	7,067.81	7,060.59	7,055.70	7,048.65	7,055.91	7,049.18	5.82	0.050
Structure - (6)	Pipe - (6)	4.30	166.88	48.0	0.013	600.1	0.013	7,047.21	7,039.11	7,060.59	7,051.46	7,047.81	7,039.56	7,048.02	7,040.06	5.67	0.050
Structure - (7)	Pipe - (7)	4.30	200.56	48.0	0.013	600.1	0.019	7,038.91	7,027.21	7,051.46	7,042.26	7,039.51	7,027.62	7,039.72	7,028.27	6.45	0.050
Structure - (8)	Pipe - (8)	4.30	190.45	48.0	0.013	600.1	0.018	7,027.01	7,016.46	7,042.26	7,032.56	7,027.61	7,016.88	7,027.82	7,017.48	6.22	0.050
Structure - (9)	Pipe - (9)	4.30	187.26	48.0	0.013	312.2	0.017	7,016.26	7,010.95	7,032.56	7,022.33	7,016.86	7,011.37	7,017.07	7,011.96	6.15	0.050
Structure - (10)	Pipe - (10)	4.30	101.56	48.0	0.013	147.4	0.005	7,010.75	7,010.01	7,022.33	7,014.43	7,011.35	7,010.58	7,011.56	7,010.82	4.01	0.520
DPOS2.1	Pipe - (35)	4.30	101.56	48.0	0.013	175.2	-0.005	7,088.14	7,089.01	7,108.02	7,101.51	7,089.61	7,088.81	7,089.82	7,088.96	4.01	0.000

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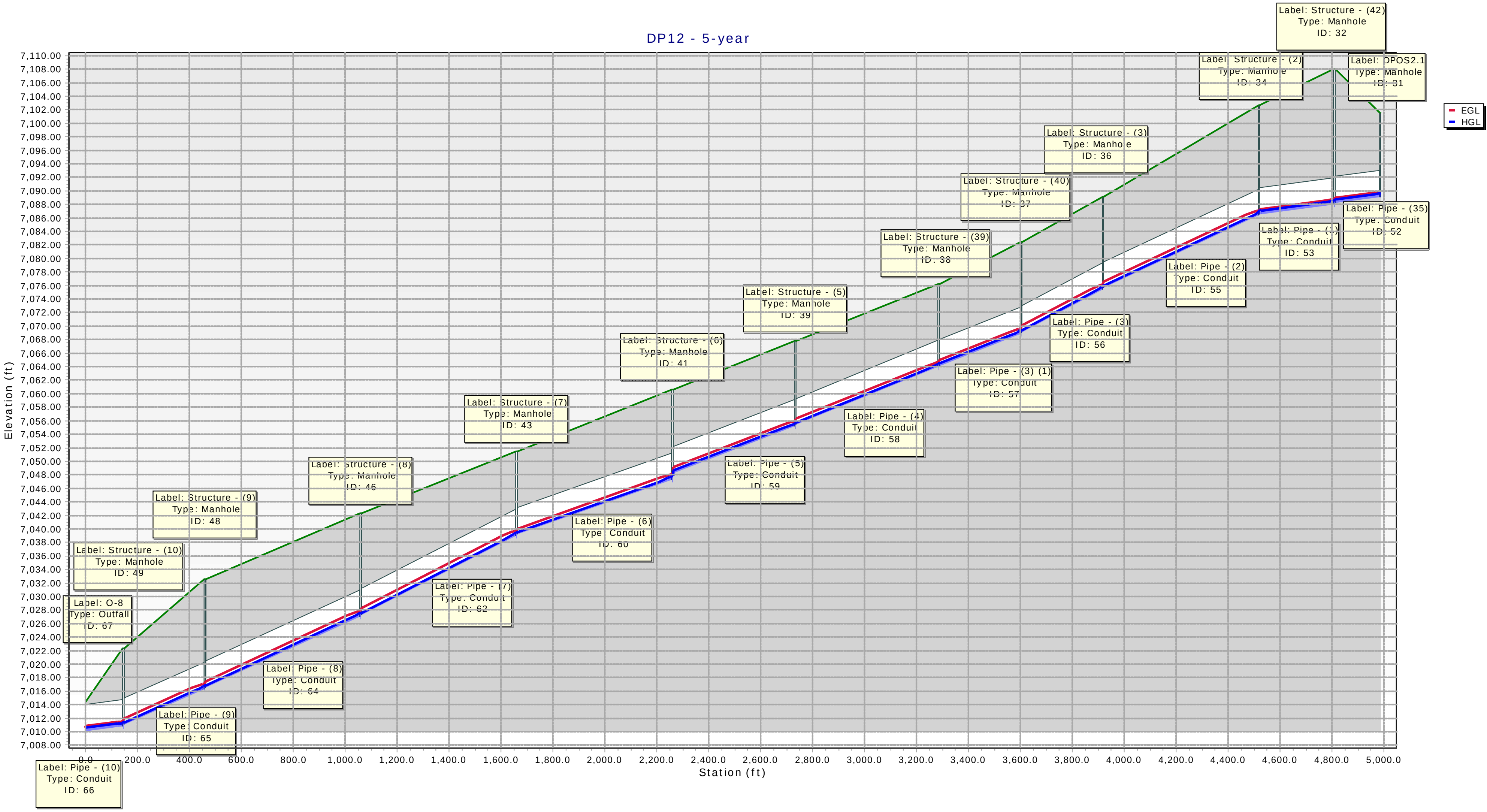
DP12 - 5-year
Elevation (ft)
Station (ft)
EGL
HGL
Label: Structure - (42)
Type: Manhole
ID: 32
Label: Structure - (2)
Type: Manhole
ID: 34
Label: DPOS2.1
Type: Manhole
ID: 31
Label: Structure - (3)
Type: Manhole
ID: 36
Label: Structure - (40)
Type: Manhole
ID: 37
Label: Pipe - (35)
Type: Conduit
ID: 52
Label: Structure - (39)
Type: Manhole
ID: 38
Type: Conduit
ID: 53
Label: Pipe - (2)
Type: Conduit
ID: 55
Label: Structure - (5)
Type: Manhole
ID: 39
Label: Pipe - (3)
Type: Conduit
ID: 56
Label: Structure - (6)
Type: Manhole
ID: 41
Label: Pipe - (3) (1)
Type: Conduit
ID: 57
Label: Structure - (7)
Type: Manhole
ID: 43
Label: Pipe - (4)
Type: Conduit
ID: 58
Label: Structure - (8)
Type: Manhole
ID: 46
Label: Pipe - (5)
Type: Conduit
ID: 59
Label: Structure - (9)
Type: Manhole
ID: 48
Label: Pipe - (6)
Type: Conduit
ID: 60
Label: Structure - (10)
Type: Manhole
ID: 49
Label: Pipe - (7)
Type: Conduit
ID: 62
Label: O-8
Type: Outfall
ID: 67
Label: Pipe - (8)
Type: Conduit
ID: 64
Label: Pipe - (9)
Type: Conduit
ID: 65
Label: Pipe - (10)
Type: Conduit
ID: 66
7,110.00
7,108.00
7,106.00
7,104.00
7,102.00
7,100.00
7,098.00
7,096.00
7,094.00
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7,090.00
7,088.00
7,086.00
7,084.00
7,082.00
7,080.00
7,078.00
7,076.00
7,074.00
7,072.00
7,070.00
7,068.00
7,066.00
7,064.00
7,062.00
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7,058.00
7,056.00
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7,040.00
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7,022.00
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7,014.00
7,012.00
7,010.00
7,008.00
0.0
200.0
400.0
600.0
800.0
1,000.0
1,200.0
1,400.0
1,600.0
1,800.0
2,000.0
2,200.0
2,400.0
2,600.0
2,800.0
3,000.0
3,200.0
3,400.0
3,600.0
3,800.0
4,000.0
4,200.0
4,400.0
4,600.0
4,800.0
5,000.0

DP12 Alignment

Scenario: 100-year
Current Time Step: 0.000 h
Conduit FlexTable: Combined Pipe/Node Report

Upstream Structure	Label	Flow (cfs)	Capacity (Full Flow) (cfs)	Diameter (in)	Manning's n	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	HGL (In) (ft)	HGL (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Velocity (ft/s)	Upstream Structure Headloss Coefficient
Structure - (42)	Pipe - (1)	120.40	101.56	48.0	0.013	291.3	0.005	7,087.93	7,086.48	7,108.02	7,102.69	7,094.04	7,091.99	7,095.46	7,093.42	9.58	1.320
Structure - (2)	Pipe - (2)	120.40	192.11	48.0	0.013	599.8	0.018	7,086.27	7,075.54	7,102.69	7,089.15	7,089.58	7,077.84	7,091.41	7,081.89	16.14	1.320
Structure - (3)	Pipe - (3)	120.40	203.11	48.0	0.013	316.6	0.020	7,075.34	7,069.01	7,089.15	7,082.43	7,078.65	7,071.25	7,080.48	7,075.57	16.85	0.050
Structure - (40)	Pipe - (3) (1)	120.40	175.91	48.0	0.013	317.1	0.015	7,068.81	7,064.05	7,082.43	7,076.20	7,072.11	7,066.50	7,073.94	7,069.98	15.07	0.050
Structure - (39)	Pipe - (4)	120.40	178.81	48.0	0.013	551.6	0.015	7,063.85	7,055.30	7,076.20	7,067.81	7,067.16	7,057.71	7,068.99	7,061.33	15.27	0.050
Structure - (5)	Pipe - (5)	120.40	172.95	48.0	0.013	475.0	0.014	7,055.10	7,048.22	7,067.81	7,060.59	7,058.41	7,050.67	7,060.24	7,054.11	14.87	0.050
Structure - (6)	Pipe - (6)	120.40	166.88	48.0	0.013	600.1	0.013	7,047.21	7,039.11	7,060.59	7,051.46	7,050.52	7,041.63	7,052.35	7,044.88	14.46	0.050
Structure - (7)	Pipe - (7)	120.40	200.56	48.0	0.013	600.1	0.019	7,038.91	7,027.21	7,051.46	7,042.26	7,042.22	7,029.45	7,044.05	7,033.77	16.68	0.050
Structure - (8)	Pipe - (8)	120.40	190.45	48.0	0.013	600.1	0.018	7,027.01	7,016.46	7,042.26	7,032.56	7,030.32	7,018.77	7,032.15	7,022.77	16.03	0.050
Structure - (9)	Pipe - (9)	120.40	187.26	48.0	0.013	312.2	0.017	7,016.26	7,010.95	7,032.56	7,022.33	7,019.56	7,015.36	7,021.39	7,016.78	15.82	0.050
Structure - (10)	Pipe - (10)	120.40	101.56	48.0	0.013	147.4	0.005	7,010.75	7,010.01	7,022.33	7,014.43	7,014.59	7,013.32	7,016.06	7,015.15	9.58	0.520
DPOS2.1	Pipe - (35)	120.40	101.56	48.0	0.013	175.2	-0.005	7,088.14	7,089.01	7,108.02	7,101.51	7,097.15	7,095.92	7,098.58	7,097.35	9.58	0.000

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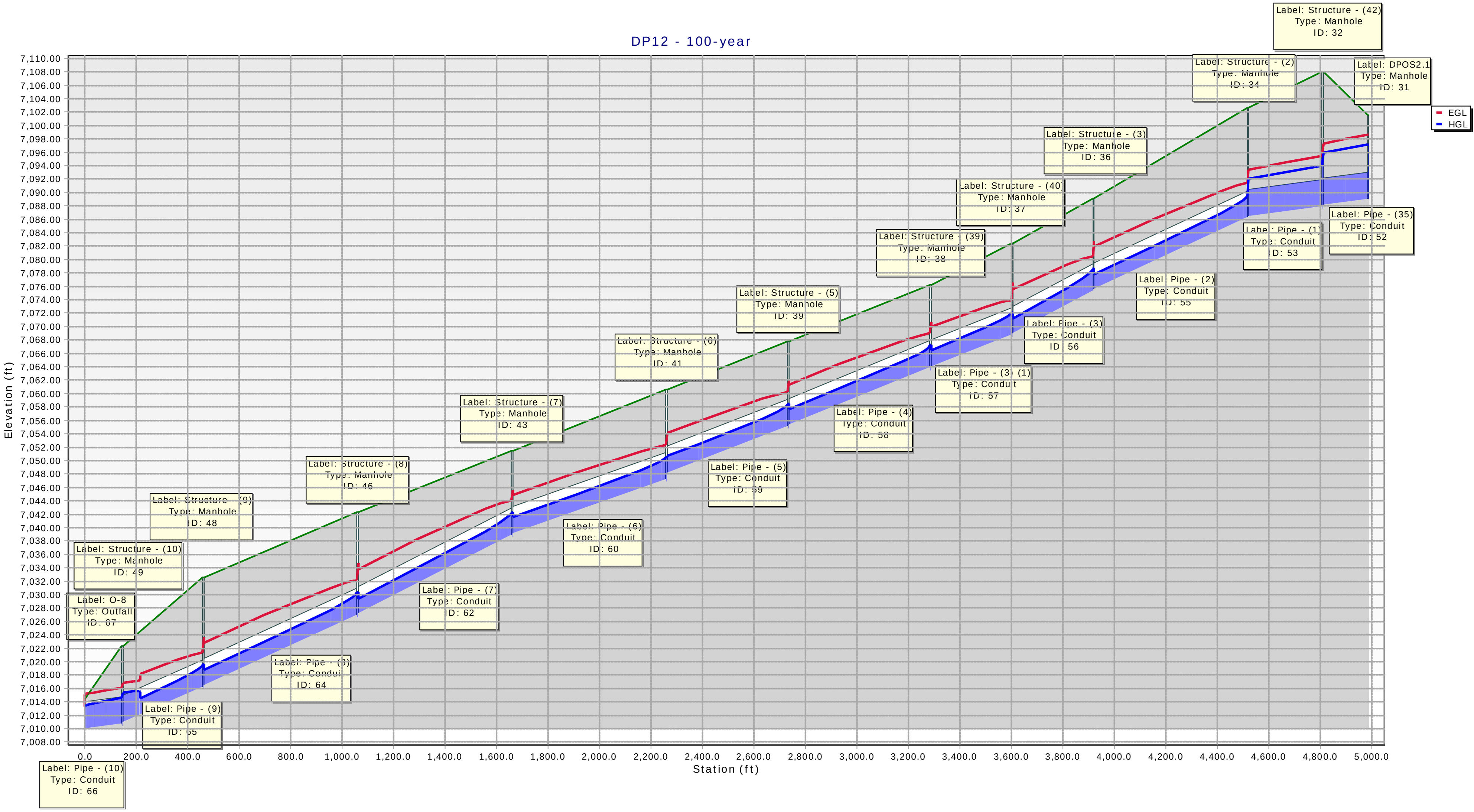

DP12 - 100-year
Elevation (ft)
Station (ft)
EGL
HGL
Label: Structure - (42) Type: Manhole ID: 32
Label: Structure - (2) Type: Manhole ID: 34
Label: DPOS2.1 Type: Manhole ID: 31
Label: Structure - (3) Type: Manhole ID: 36
Label: Structure - (40) Type: Manhole ID: 37
Label: Structure - (39) Type: Manhole ID: 38
Label: Structure - (5) Type: Manhole ID: 39
Label: Structure - (6) Type: Manhole ID: 41
Label: Structure - (7) Type: Manhole ID: 43
Label: Structure - (8) Type: Manhole ID: 46
Label: Structure - (9) Type: Manhole ID: 48
Label: Structure - (10) Type: Manhole ID: 49
Label: O-8 Type: Outfall ID: 67
Label: Pipe - (35) Type: Conduit ID: 52
Label: Pipe - (1) Type: Conduit ID: 53
Label: Pipe - (2) Type: Conduit ID: 55
Label: Pipe - (3) Type: Conduit ID: 56
Label: Pipe - (3) (1) Type: Conduit ID: 57
Label: Pipe - (4) Type: Conduit ID: 58
Label: Pipe - (5) Type: Conduit ID: 59
Label: Pipe - (6) Type: Conduit ID: 60
Label: Pipe - (7) Type: Conduit ID: 62
Label: Pipe - (8) Type: Conduit ID: 64
Label: Pipe - (9) Type: Conduit ID: 65
Label: Pipe - (10) Type: Conduit ID: 66

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: Gabe Gonzales
Company: JR Engineering
Date: May 4, 2023
Project: Sterling Ranch Road and Briargate Parkway
Location: Interim Pond FSD 11B

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 10.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.100
C) Contributing Watershed Area	Area = 27.200 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.43 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 ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$	$V_{DESIGN\ OTHER}$= ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= 0.154 ac-ft
I) NRCS Hydrologic Soil Groups of Tributary Watershed i) Percentage of Watershed consisting of Type A Soils ii) Percentage of Watershed consisting of Type B Soils iii) Percentage of Watershed consisting of Type C/D Soils	 HSG_A = % HSG_B = % $HSG_{C/D}$ = %
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: $EURV_{C/D} = 1.20 * i^{1.08}$	$EURV_{DESIGN}$ = 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} = 2% of the WQCV)	V_{FMIN} = 0.003 ac-ft
B) Actual Forebay Volume	V_F = 0.003 ac-ft
C) Forebay Depth (D_F = 18 inch maximum)	D_F = 18.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 37.20 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 0.74 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 DESIGN WEIR TO PASS Qf AT Df
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = in
G) Rectangular Notch Width	Calculated W_N = in

Weir Report

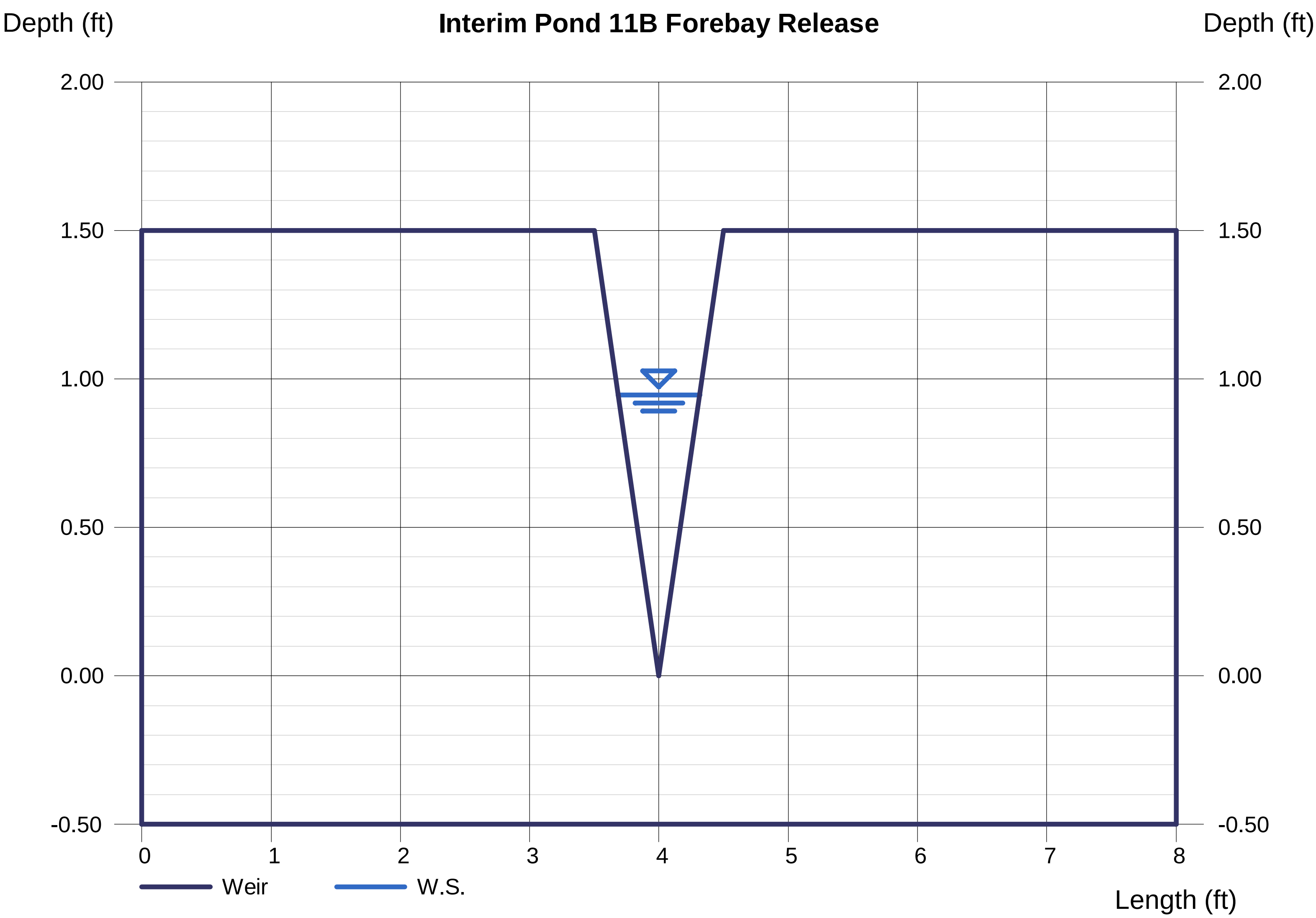
Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 4 2023

Interim Pond 11B Forebay Release

V-Notch Weir
Crest = Sharp
Angle (Deg) = 37
Total Depth (ft) = 1.50

Calculations
Weir Coeff. Cw = 0.85
Compute by: Known Q
Known Q (cfs) = 0.74

Highlighted
Depth (ft) = 0.95
Q (cfs) = 0.740
Area (sqft) = 0.30
Velocity (ft/s) = 2.48
Top Width (ft) = 0.63



Appendix D
Reference Materials

Add back in calculations for Pond 16 from FDR for Sterling Ranch East Filing 2 & Foursquare at Sterling Ranch East Filing 1 (SF-22-037 & SF-22-036) at the end of Appendix D

MASTER DEVELOPMENT DRAINAGE PLAN FOR STERLING RANCH

OCTOBER 2018

Prepared for:

Morley-Bentley Investments, LLC
20 Boulder Crescent, 2nd Floor
Colorado Springs, CO 80903
(719) 471-1742

Prepared by:

CIVIL CONSULTANTS, INC.

20 Boulder Crescent, Suite 110
Colorado Springs, CO 80903
(719) 955-5485

Project #09-002
SKP-18-003
SF-17-024

at DP87 culminating in peak runoff rates within Sand Creek of Q5 = 374.6 cfs, Q100 = 1905.9 cfs.

Basin SC3-16A (Q5 = 120.4 cfs, Q100 = 351.8 cfs) consists of a 168.1 acre area located within Sterling Ranch, that is located north of Briargate Parkway and east of Sand Creek Channel. This portion of Sterling Ranch is planned to house residential development that ranges from low density rural lots 1 acres in size to medium density urban residential with lots ranging in size from 0.1 to 0.2 acres. Runoff from the basin shall be collected and conveyed within street and storm sewer systems to a full spectrum detention pond (FSD16A), at the northwest corner of Briargate Parkway and Sterling Ranch Road. The treated detained flows from the pond will discharge to DP22 at peak flow rates of 8.8 cfs and 128.3 cfs in the 5 and 100 year events respectively.

Basin SC3-16B (Q5 = 53.7 cfs, Q100 = 143.8 cfs) consists of a 50.7 acre area located within Sterling Ranch, that is located north of Briargate Parkway and east of Sand Creek Channel. This portion of Sterling Ranch is planned for a low to medium density residential lots ranging in size from 0.1 to 0.2 acres lots and portions of roadways. Runoff from the basin shall be collected and conveyed within street and storm sewer systems to a full spectrum detention pond (FSD16B), at the northeast corner of Briargate Parkway and Sterling Ranch Road. The treated detained flows from the pond will discharge to DP22 at peak flow rates of 0.4 cfs and 28.1 cfs in the 5 and 100 year events respectively. The combined peak flow rates from SC3-16B and FSD14A (DP22, Q5=8.8 cfs and Q100=174.9 cfs) will be conveyed south via storm sewer system to DP21.

Basin SC3-14B (Q5 = 34.3 cfs, Q100 = 94.1 cfs) consists of a 34.7 acre area located within of Sterling. Ranch, that is located between south of Briargate Parkway and east of Sterling Ranch Road, east of Sand Creek. This portion of Sterling Ranch is planned for a low to medium density residential lots ranging in size from 0.1 to 0.33 acres lots and portions of roadways. Runoff from the basin shall be collected and conveyed within street and storm sewer systems to a full spectrum detention pond (FSD14B), at the south end of the basin. The treated detained flows from the pond will discharge to DP21 at peak flow rates of 0.3 cfs and 19.3 cfs in the 5 and 100 year events respectively. The combined peak flow rates from DP22 and FSD14B (DP21, Q5=8.8 cfs and Q100=174.9 cfs) will be conveyed to Pond W3 above the intersection of Sand Creek channel and Sterling Ranch Road.

Basin SC3-14A (Q5 = 175.4 cfs, Q100 = 466.3 cfs) consists of a 164.9 acre area located within of Sterling. Ranch, that is located between south of Briargate Parkway and east of Sterling Ranch Road, east of Sand Creek. This portion of Sterling Ranch is planned for a k-8 school site, several single family residential lots ranging in size from 0.2 to 0.33 acres lots as well as portions of park and open space. Runoff from the basin shall be collected and conveyed within street and storm sewer systems and directed to a full spectrum detention pond (FSD14A), at the southwest corner of the basin. The treated detained flows from the pond will discharge to Pond W3 at peak flow rates of 7.5 cfs and 142.2 cfs in the 5 and 100 year events respectively.

Basin SC3-13 (Q5 = 57.8 cfs, Q100 = 136.9 cfs) consists of a 41.0 acre area located within of Sterling. Ranch, that is located just the east of the Barbarick Subdivision and north of Sterling Ranch Road. This portion of Sterling Ranch is planned for residential lots ranging in size from 0.1 to 0.2 acres in size. Runoff from the basin shall be collected by storm sewer systems and conveyed to a full spectrum detention pond (FSD13) located in the south end of the basin, adjacent to sand creek. The treated detained flows from the pond will discharge into Sand Creek at peak flow rates of 4.2 cfs and 47.2 cfs in the 5 and 100 year events respectively.

Runoff from DP87, DP21 and from FSD Ponds 13, and 14A will combine within the Sand Creek Channel at proposed Regional Pond Detention Facility W3. The purpose of the regional pond is to reduce the post development flow rates within the Sand Creek Channel at the Southern Sterling Ranch boundary to at or below the existing flow rates calculated by this report. The pond is also necessary due to the drainage basin diversion, as discussed in other parts of this report. The total combined discharge reaching the regional facility (Pond W-3) has been calculated at 374.5 cfs and 2204.1 cfs in the 5 and 100 year events respectively.

As conceptually designed the proposed facility will utilize a check/diversion wall located upstream of the existing stock pond and proposed detention facility that will function to divert base flows within the channel to aid in retaining a fixed water surface within the existing stock pond and in larger storm events diverted flows safely around the amenity to the west side to detention Pond W3. A small controlled outlet structure along with an improved downstream embankment will be added to the existing stock pond to stabilize it and retain a fixed maximum water surface elevation. In the larger detention pond eight (8) small 24” storm sewer pipe located within a separate embankment will allow for free flow discharge of 2 year runoff and begin to detain flows of 5 years and larger events. Flows exiting the small storm pipes or overtopping the separated embankment will enter a concrete forebay that conveys drainage to two (2) cell 8’h x10’w concrete box culvert (CBC) under Proposed Sterling Ranch Road to DP68. As the anticipated flow rate leaving the pond is planned to be less than 1,500 cfs, and the proposed culvert crossing is conceptually planned to have an open area of less than 200 ft sq of open area and thus will need to meet the headwater requirements of Table 6-5 of the DCM, which in this concept design is a ratio of about ~1.3. The total combined discharge calculated to leave the regional facility (Pond W-3) has been calculated at 200.3 cfs and 1,350.6 cfs in the 5 and 100 year events respectively, with a maximum 100 year water surface of 7017.3, a

HW/D ratio of ~1.3. The peak detained volume has been estimated at 78.2 ac-ft. A low point in Sterling Ranch Road will be designed adjacent to the facility to provide a safe overflow route. An exhibit showing the concept design and its various elements is included in the appendix of this report.

As previously discussed a Condition Letter of Map Revision and Letter of Map Revision (CLOMR/LOMR) will need to be processed through the Federal Emergency Management Agency (FEMA) to revise the hydrology to the Sand Creek Channel and allow for the remapping of the revised floodplains. It should be noted that the DBPS flow rates for Reach SC-8 (Reach 163) adjacent to this location were estimate to be 2,630 cfs and that the effective FEMA 100 year flow rate is 2,600cfs. A comparison table of the various flow rates is provided later in this text and on the accompanying drainage maps.

The final design of the culvert crossing and final determination of approved rates as well as the final pond design will be discussed within the future Sterling Ranch Channel Design Report and Sand Creek CLOMR/LOMR documents. No deviations for this pond and accompanying outlet structure are anticipated at this time.

It is important to note that the planned discharge outlet pipe for the FSD pond located to the west of the pond W3 will need to be extended to the downstream outlet side of the culvert to ensure that the 100 year water surface elevation with W3 does not affect the functionality of the adjacent FSD and its storm sewer systems.

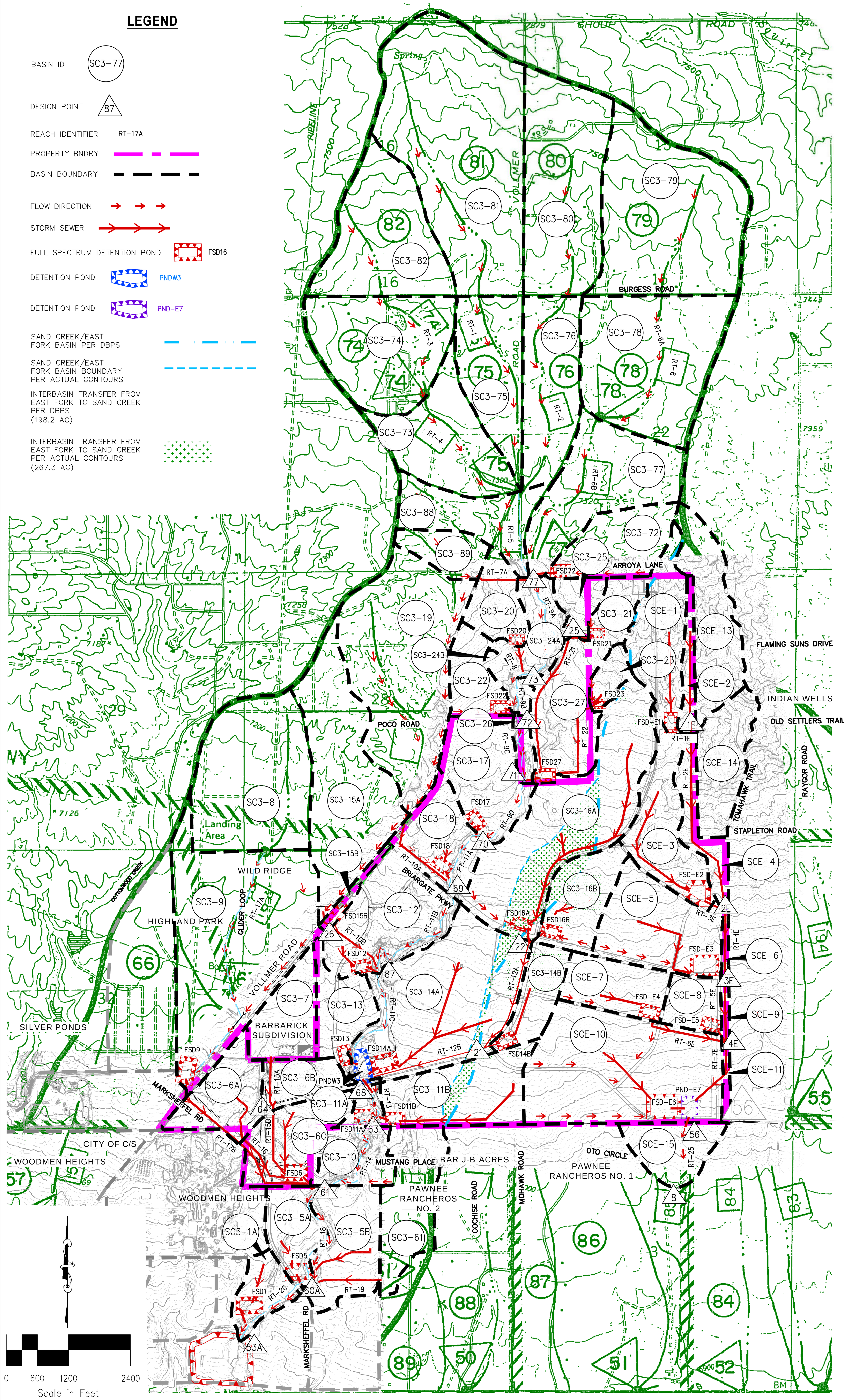
In regards to timing, the need to construction this facility can be tied to the Sand Creek Channel improvements which is discussed within this report and also within the Subdivision Improvements Agreement. In no case should runoff from the East Fork of Sand Creek be diverted to the Main Branch of the Sand Creek Channel prior to the construction and of this facility.

Basin SC3-11A (Q5 = 7.8 cfs, Q100 = 24.3 cfs) consists of a 10.7 acre area located within of Sterling. Ranch, that is south of Sterling Ranch Road, west of Sand Creek. This portion of Sterling Ranch consists of single family residential for lots ranging in size from 0.2 to 0.3 acres in size and open space associated with the Sand Creek Channel. Runoff from the developed portion of the basin shall be collected and conveyed within street and storm sewer systems to a full spectrum detention pond FSD11A. The treated detained flows from the pond will discharge into Sand Creek at peak flow rates of 0.9 cfs and 12.3 cfs in the 5 and 100 year events respectively just upstream of DP-63. It should be noted that this detention facility may not be necessary if grading can be oriented to force surface runoff to the west.

Basin SC3-11B (Q5 = 81.3 cfs, Q100 = 213.7 cfs) consists of a 76.6 acre area located within of Sterling. Ranch, that is south of Sterling Ranch Road, east of Sand Creek. This portion of Sterling Ranch consists of single family residential planned for lots ranging in size from 0.2 to 0.3 acres in size and a portion of a park site and collector roadways. Runoff from the developed portion of the basin shall be collected and conveyed within street and storm sewer systems westward to a full spectrum detention pond FSD11B. The treated detained flows from the pond will discharge into Sand Creek at peak flow rates of 4.5 cfs and 69.5 cfs in the 5 and 100 year events respectively. The runoff from DP68 and from FSD ponds 11A and 11B combine at DP63 at peak flow rates of Q5 = 201.0 cfs, Q100 = 1385.1, which is less than the anticipated existing modeled flow rates of Q5 = 430.7 cfs, Q100 = 1911.5 at DP63. Runoff from DP63 continues south within the Sand Creek Channel toward DP61.

Basin SC3-7 (Q5 = 69.9 cfs, Q100 = 157.2 cfs) consists of a 45.7 acre industrial zoned area, referred to as the Barbarick Subdivision, located outside of Sterling Ranch. Per the Final Drainage Report for Barbarick Subdivision, Portions of Lots 1, 2 and Lots 3and 4 the filing consists of four lots which upon which development will be constructed which will include adding a proposed Extended Detention Basin within Lot 4. This detention basin will provide water quality treatment for portions of Lots 1 & 2, and Lots 3 & 4. The EBD will structure will outfall at the south end of Lot 4 at the Barbarick Subdivision/Sterling Ranch property line. Per the report the proposed total outflow from the EDB pond will be Q5 = 0.3 cfs, Q100 = 45.9** cfs(**which includes pass through flows of 29.4 cfs). A second Sand Filter Basin water quality detention catchment will be provided at the southeast/downstream end of Lot 2. The SFB will outfall at the southeast corner of the Lot 2 at the Barbarick Subdivision/Sterling Ranch property line. Per the report the proposed total outflow the SFB pond will be Q5 = 0.1 cfs, Q100 = 3.6 cfs. At the initial writing of this report, neither EDB nor SFB structure has been fully constructed, and thus the assumption was made to utilize the full un-detained untreated runoff from the offsite development for onsite drainage planning purposes. Thus the downstream facilities planned within Sterling Ranch will account for the total un-detained runoff from the parcel of Q5 = 69.9 cfs, Q100 = 157.2 cfs and will plan to treat the total runoff onsite facilities. This provides a conservative approach for master planning. Runoff discharged from the property will be collected by proposed storm sewer within Sterling Ranch and routed to DP64. These facilities and their effects on drainage will be re-reviewed with subsequent drainage report and shall be implemented into final design and construction.

Basin SC3-6B (Q5=43.4 cfs, Q100=102.7 cfs) consists of a 30.9 acre area located within of Sterling Ranch, that is north of Sterling



BASIN SUMMARY

BASIN	CN	AREA (ACRES)	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)
SC3-1A	73	27.8	0.044	16.3	23.3	33.0	45.8	57.1	68.9
SC3-5A	84	39.1	0.061	40.6	53.7	71.0	92.4	110.6	129.1
SC3-5B	81	63.0	0.098	53.8	73.0	98.5	130.8	158.6	187.0
SC3-6A	88	49.3	0.077	61.4	79.3	102.2	130.1	153.6	177.1
SC3-6B	85	30.9	0.048	32.9	43.4	57.0	73.9	88.2	102.7
SC3-6C	82	58.0	0.091	53.9	72.5	97.1	128.0	154.5	181.5
SC3-7	88	45.7	0.071	54.0	69.9	90.3	115.2	136.2	157.2
SC3-8	62	143.4	0.224	25.4	42.1	66.7	100.7	132.3	166.2
SC3-9	66	217.4	0.340	45.8	71.5	108.6	158.9	204.9	254.0
SC3-10	63	36.0	0.056	7.6	12.3	19.4	29.1	38.0	47.7
SC3-11A	70	10.7	0.017	5.3	7.8	11.3	15.9	20.0	24.3
SC3-11B	80	76.6	0.120	59.4	81.3	110.8	148.1	180.5	213.7
SC3-12	81	88.2	0.138	77.8	105.6	142.5	189.1	229.1	270.0
SC3-13	85	41.0	0.064	43.9	57.8	76.0	98.5	117.6	136.9
SC3-14A	79	164.9	0.258	127.6	175.4	239.8	321.9	393.2	466.3
SC3-14B	77	34.7	0.054	24.6	34.3	47.4	64.2	79.0	94.1
SC3-15A	62	139.7	0.218	21.3	35.5	56.3	85.3	112.1	141.0
SC3-15B	87	7.9	0.012	10.8	14.0	18.2	23.3	27.6	31.9
SC3-16A	74	168.1	0.263	84.4	120.4	170.0	234.8	292.2	351.8
SC3-16B	78	50.7	0.079	39.0	53.7	73.6	99.0	121.1	143.8
SC3-17	73	70.6	0.110	41.8	59.6	85.2	119.0	149.1	180.6
SC3-18	81	53.8	0.084	49.3	67.1	91.0	121.2	147.3	174.0
SC3-19	62	184.0	0.287	28.8	47.7	75.7	114.4	150.2	188.8
SC3-20	65	34.2	0.053	9.9	15.5	23.8	35.1	45.5	56.6
SC3-21	66	23.3	0.036	7.0	10.8	16.3	23.7	30.4	37.5
SC3-22	65	33.9	0.053	9.4	14.8	22.5	32.9	42.5	52.6
SC3-23	67	14.5	0.023	5.5	8.3	12.4	18.0	23.0	28.4
SC3-24A	65	35.7	0.056	13.0	20.4	31.1	45.7	59.0	73.2
SC3-24B	65	12.2	0.019	3.4	5.3	8.1	11.8	15.2	18.9
SC3-25	66	19.0	0.030	5.8	8.9	13.4	19.5	25.1	31.0
SC3-26	63	10.0	0.016	2.5	4.0	6.2	9.2	12.1	15.1
SC3-27	71	70.0	0.109	35.1	51.2	73.8	103.7	130.3	158.3
SC3-61	63	65.5	0.102	13.7	22.0	34.4	51.6	67.6	84.8
SC3-72	64	56.2	0.088	12.8	20.2	31.4	46.7	60.9	76.0
SC3-73	63	90.0	0.141	16.4	26.4	41.3	62.1	81.3	102.0
SC3-74	63	119.7	0.187	22.3	36.5	57.3	85.9	112.3	140.7
SC3-75	63	79.3	0.124	13.1	21.5	33.7	50.5	66.1	82.8
SC3-76	63	86.4	0.135	14.2	23.1	36.4	54.6	71.4	89.6
SC3-77	62	106.9	0.167	16.6	27.6	43.8	66.2	87.0	109.4
SC3-78	63	155.6	0.243	28.1	45.3	70.6	106.2	139.1	174.5
SC3-79	63	189.0	0.295	34.9	57.0	89.5	134.3	175.6	220.1
SC3-80	63	147.7	0.231	27.3	44.3	69.6	104.5	136.8	171.4
SC3-81	62	262.9	0.411	42.6	70.2	111.0	167.4	219.6	275.7
SC3-82	62	117.8	0.184	20.0	33.2	52.8	80.0	105.1	132.3
SC3-88	62	60.2	0.094	10.5	17.4	27.6	41.8	54.9	69.0
SC3-89	62	27.5	0.043	6.1	10	15.7	23.6	30.8	38.6
SCE-1	65	64.4	0.101	23.3	35.9	53.8	79.1	102.4	127.4
SCE-2	64	15.0	0.023	4.4	7.0	10.8	15.9	20.7	25.7
SCE-3	70	67.5	0.105	30.6	45.2	65.9	93.3	118.0	143.9
SCE-4	70	29.5	0.046	13.3	19.6	28.6	40.6	51.6	62.6
SCE-5	87	85.5	0.134	100.4	130.6	169.6	217.4	257.8	298.4
SCE-6	64	3.8	0.006	1.6	2.5	3.7	5.4	7.0	8.6
SCE-7	89	44.9	0.070	58.9	75.5	96.6	122.2	143.7	165.2
SCE-8	92	25.5	0.040	38.6	48.4	60.7	75.4	87.7	99.9
SCE-9	64	4.0	0.006	1.5	2.4	3.6	5.3	6.8	8.5
SCE-10	83	174.3	0.272	141.6	189.4	252.5	331.4	398.9	467.5
SCE-11	64	5.8	0.009	2.3	3.6	5.5	8.0	10.3	12.8
SCE-13	63	78.6	0.123	19.6	31.3	48.7	73.1	95.7	120.0
SCE-14	63	52.5	0.082	13.2	21.2	33.3	49.9	65.2	81.7
SCE-15	51	39.7	0.062	2.2	5.1	10.1	17.7	25.1	33.4

DESIGN POINT SUMMARY

DESIGN POINT	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)	LOCATION
DP-74	0.371	39.3	65.3	104.8	158.9	209.1	262.8	
DP-75	1.413	141.2	235.1	376.6	566.6	750.9	950.5	
DP-77	2.343	209.9	351.9	580.6	886.6	1168.4	1467.7	ARROYA LANE X-ING
DP-78	0.538	59.7	98.4	154.0	232.6	306.2	385.3	
DP-73	2.471	207.5	354.3	588.5	897.1	1187.2	1506.7	
DP-72	2.543	206.2	352.5	586.7	897.2	1195.3	1518.6	POCO ROAD X-ING
DP-71	2.757	205.9	349.3	610.5	932.4	1226.9	1612.2	STERLING RANCH NORTHERN BNDRY
DP-70	2.867	205.3	349.8	614.0	940.1	1260.6	1636.7	
DP-69	3.238	212.7	366.6	653.7	1010.6	1364.1	1775.7	BRIARGATE PARKWAY X-ING
DP-87	3.594	216.9	374.6	681.9	1072.1	1471.5	1905.9	
DP-68	4.312	214.6	374.5	714.9	1187.6	1674.9	2204.1	UPSTREAM OF POND W3
DP-64	0.119	85.9	112.1	145.9	187.5	222.6	258.0	
DP-63	4.449	154.4	201.0	375.7	815.9	1112.1	1385.1	STERLING RANCH SOUTHERN BNDRY
DP-61	5.356	156.6	223.9	428.0	928.2	1287.3	1620.1	COLORADO SPRINGS/EL PASO BNDRY
DP-60A	5.617	161.6	224.8	439.1	950.4	1320.5	1661.8	MARKSHEFFEL X-ING
DP-53A	5.661	161.6	225.7	441.8	951.1	1326.0	1668.9	SAND CREEK AND POND 3
DP-1E	0.247	23.9	38.3	70.1	132.8	173.0	220.9	
DP-2E	0.486	48.9	76.8	123.0	228.7	319.7	419.4	
DP-3E	0.626	48.5	75.7	122.2	271.1	387.1	500.1	
DP-4E	0.745	48.1	76.2	122.4	286.9	407.3	534.8	
DP-56	1.017	23.1	35.3	71.5	108.3	152.1	196.4	NEAR SE PROP CORNER
DP-8	1.079	24.1	37.2	73.5	111.3	155.4	200.7	BELOW SE PROP CORNER
DP-21	0.396	0.6	8.8	17.8	57.1	116.8	174.9	
DP-22	0.342	0.6	8.8	17.6	56.8	105.1	156.4	
DP-25	0.066	5.9	9.1	16.3	35.1	46.4	58.2	
DP-26	0.012	0.1	1.1	3.2	7.3	9.5	12.0	

DESIGN POINT SUMMARY (VOLUME)

DESIGN POINT	AREA (SQ MI)	V_2 (AC-FT)	V_5 (AC-FT)	V_{10} (AC-FT)	V_{25} (AC-FT)	V_{50} (AC-FT)	V_{100} (AC-FT)	LOCATION
DP-74	0.371	5.9	9.0	13.6	19.8	25.5	31.6	
DP-75	1.413	22.7	34.5	51.7	75.4	97.1	120.5	
DP-77	2.343	37.7	57.4	85.9	125.1	161.1	199.9	ARROYA LANE X-ING
DP-78	0.538	8.9	13.5	20.1	29.3	37.7	46.7	
DP-73	2.471	40.0	60.8	91.0	132.5	170.7	211.7	
DP-72	2.543	41.3	62.9	94.0	136.8	176.2	218.5	POCO ROAD X-ING
DP-71	2.757	46.3	70.0	104.3	151.3	194.5	240.8	STERLING RANCH NORTHERN BNDRY
DP-70	2.867	49.5	74.5	110.6	160.1	205.4	254.0	
DP-69	3.238	57.5	86.1	127.4	183.8	235.3	290.6	BRIARGATE PARKWAY X-ING
DP-87	3.594	66.5	98.9	145.6	209.1	267.1	329.1	
DP-68	4.312	81.8	123.7	183.9	264.9	338.0	415.8	UPSTREAM OF POND W3
DP-64	0.119	7.0	9.1	11.8	15.2	18.1	21.1	
DP-63	4.449	85.6	129.5	192.3	276.7	352.8	433.5	STERLING RANCH SOUTHERN BNDRY
DP-61	5.356	103.7	157.8	235.1	338.4	431.3	529.8	COLORADO SPRINGS/EL PASO BNDRY
DP-60A	5.617	111.0	168.6	250.4	359.5	457.7	561.5	MARKSHEFFEL X-ING
DP-53A	5.661	112.0	170.0	252.6	362.6	461.7	566.5	SAND CREEK AND POND 3
DP-1E	0.247	3.1	5.2	8.4	12.7	16.6	20.9	
DP-2E	0.480	6.1	10.4	16.9	25.7	33.7	42.2	
DP-3E	0.620	7.0	13.7	23.4	36.1	47.4	59.3	
DP-4E	0.736	7.6	15.6	27.2	43.0	57.2	72.0	
DP-56	1.017	7.7	16.1	28.6	51.3	71.7	92.9	NEAR SE PROP CORNER
DP-8	1.079	8.0	16.7	26.6	53.0	74.0	95.9	BELOW SE PROP CORNER
DP-21	0.396	6.3	11.3	18.3	27.5	35.6	44.0	
DP-22	0.736	6.3	10.7	16.7	24.6	31.5	38.7	
DP-25	1.017	1.3	1.9	2.8	4.1	5.2	6.4	
DP-26	1.079	0.7	0.9	1.2	1.5	1.8	2.1	

WATER QUALITY & DETENTION POND SUMMARY

FSD1						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	16.3	23.3	33.0	45.8	57.1	68.9
ALLOWABLE RELEASE (CFS)	0.1	1.7	3.3	10.9	17.5	25.5
MODELED RELEASE (CFS)	0.1	1.6	3.2	10.9	17.4	25.4
STORED VOLUME (AC-FT)	2.4	2.6	3.0	3.6	1.9	2.2

FSD5						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	40.6	53.7	71.0	92.4	110.6	129.1
ALLOWABLE RELEASE (CFS)	0.1	1.4	2.6	11.3	19.8	30.2
MODELED RELEASE (CFS)	0.1	1.4	2.6	11.2	19.7	30.1
STORED VOLUME (AC-FT)	3.0	3.2	3.8	4.1	4.7	5.2

FSD6						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	196.5	258.5	339.1	438.7	523.3	608.6
ALLOWABLE RELEASE (CFS)	0.5	7.6	14.6	58.4	99.6	149.7
MODELED RELEASE (CFS)	0.5	7.5	14.5	58.2	99.6	149.6
STORED VOLUME (AC-FT)	15.5	16.4	18.7	20.8	23.3	26.0

FSD9						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	64.6	105.6	169.5	252.3	327.1	410.1
ALLOWABLE RELEASE (CFS)	1.7	24.9	49.8	141.1	207.2	290.0
MODELED RELEASE (CFS)	1.7	24.9	49.8	141.1	207.0	289.9
STORED VOLUME (AC-FT)	8.7	8.7	9.6	10.8	12.3	13.8

FSD11A						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	5.3	7.8	11.3	15.9	20.0	24.3
ALLOWABLE RELEASE (CFS)	0.1	1.6	3.2	7.5	9.7	12.4
MODELED RELEASE (CFS)	0.2	0.9	3.0	7.5	9.7	12.3
STORED VOLUME (AC-FT)	0.3	0.3	0.4	0.4	0.5	0.6

FSD11B						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	59.4	81.3	110.8	148.1	180.5	213.7
ALLOWABLE RELEASE (CFS)	0.3	4.5	8.7	29.6	47.7	69.6
MODELED RELEASE (CFS)	0.3	4.5	8.6	29.5	47.7	69.5
STORED VOLUME (AC-FT)	4.8	4.9	5.5	6.4	7.3	8.2

FSD12						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	77.8	105.6	142.5	189.1	229.1	270.0
ALLOWABLE RELEASE (CFS)	0.9	13.2	26.7	62.0	80.2	103.2
MODELED RELEASE (CFS)	0.9	9.0	26.7	61.9	80.1	103.1
STORED VOLUME (AC-FT)	5.2	5.5	5.8	6.7	7.8	8.9

FSD13						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	43.9	57.8	76.0	98.5	117.6	136.9
ALLOWABLE RELEASE (CFS)	0.4	6.1	12.3	28.6	37.0	47.6
MODELED RELEASE (CFS)	0.4	4.2	12.3	28.6	36.9	47.2
STORED VOLUME (AC-FT)	3.1	3.1	3.3	3.8	4.4	5.0

FSD14A						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	127.6	175.4	239.8	321.9	393.2	466.3
ALLOWABLE RELEASE (CFS)	0.5	7.5	14.4	56.2	95.2	142.4
MODELED RELEASE (CFS)	0.5	7.5	14.4	56.2	95.1	142.2
STORED VOLUME (AC-FT)	9.9	10.6	11.9	13.5	15.3	17.3

FSD14B						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	24.6	34.3	47.4	64.2	79.0	94.1
ALLOWABLE RELEASE (CFS)	0.0	0.3	0.5	5.7	11.8	19.3
MODELED RELEASE (CFS)	0.0	0.3	0.5	4.5	11.8	19.3
STORED VOLUME (AC-FT)	1.9	2.5	3.3	3.5	3.5	3.8

FSD15B						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	10.8	14.0	18.2	23.3	27.6	31.9
ALLOWABLE RELEASE (CFS)	0.1	1.6	3.2	7.3	9.5	12.0
MODELED RELEASE (CFS)	0.1	1.1	3.2	7.3	9.5	12.0
STORED VOLUME (AC-FT)	0.6	0.6	0.7	0.8	0.9	1.0

FSD16A						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	84.4	120.4	170.0	234.8	292.2	351.8
ALLOWABLE RELEASE (CFS)	0.6	8.8	17.3	56.2	88.4	128.3
MODELED RELEASE (CFS)	0.6	8.8	17.3	56.2	88.3	128.3
STORED VOLUME (AC-FT)	7.6	7.7	8.9	10.4	12.1	13.8

SAND CREEK FLOW COMPARISON CHART

DESIGN POINT	AREA (SQ MI)	Q_{100} (CFS)	DESCRIPTION
DP-77	2.343	1468	PROPOSED CONDITION
	2.91	2262	SAND CREEK DBPS
		2600	FEMA
DP-71	2.757	1612	PROPOSED CONDITION
		2260	SAND CREEK DBPS
DP-63	4.449	1385	PROPOSED CONDITION
	4.33	2630	SAND CREEK DBPS
		2600	FEMA
DP-60A	5.661	1662	PROPOSED CONDITION
	5.38	3295	SAND CREEK DBPS

EFSC DBPS DESIGN POINT SUMMARY (PEAK FLOW)

DBPS DESIGN POINT	AREA (SQ MI)	Q_{10} (CFS) (EXIST)	Q_{100} (CFS) (EXIST)	AREA (SQ MI)	Q_{10} (CFS) (PROP)	Q_{100} (CFS) (PROP)
DP-50	0.32	47.0	195.7	0.32	146.7	370.3
DP-51 (BASIN 86)	0.33	17.7	74.1	0.33	110.0	233.5
DP-52	1.67	80.5	456.5	1.67	1207.9	2123.0
DP-56	0.79	63.6	265.0	0.79	513.0	908.2

Values reported from SCDBPS, (DP 50, 51, 52 Not analyzed as a part of this study)
DBPS Reach 85(Basin91)=Q10=28.8cfs Q100=115.2cfs / Q10=345.7cfs Q100=588.9cfs
(EXISTING) (PROPOSED)

WATER QUALITY & DETENTION POND SUMMARY

FSD16B						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	39.0	53.7	73.6	99.0	121.1	143.8
ALLOWABLE RELEASE (CFS)	0.0	0.4	0.7	8.3	17.2	28.2
MODELED RELEASE (CFS)	0.0	0.4	0.7	7.9	17.2	28.1
STORED VOLUME (AC-FT)	3.0	3.9	5.1	5.1	5.3	5.8

FSD17						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	41.8	59.6	85.2	119.0	149.1	180.6
ALLOWABLE RELEASE (CFS)	0.7	11.1	22.5	52.0	67.2	86.3
MODELED RELEASE (CFS)	0.7	8.4	22.4	52.0	67.2	86.1
STORED VOLUME (AC-FT)	2.6	2.6	2.8	3.4	4.0	4.7

FSD18						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	49.3	67.1	91.0	121.2	147.3	174.0
ALLOWABLE RELEASE (CFS)	0.6	9.2	18.4	42.2	54.6	69.9
MODELED RELEASE (CFS)	0.6	6.3	18.4	42.2	54.6	69.6
STORED VOLUME (AC-FT)	3.2	3.2	3.4	4.0	4.7	5.3

FSD20						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	9.9	15.5	23.8	35.1	45.5	56.6
ALLOWABLE RELEASE (CFS)	0.4	5.5	11.1	25.7	33.2	42.5
MODELED RELEASE (CFS)	0.4	2.8	10.9	25.7	33.0	42.4
STORED VOLUME (AC-FT)	0.7	0.8	0.8	0.9	1.0	1.2

FSD21						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	7.0	10.8	16.3	23.7	30.4	37.5
ALLOWABLE RELEASE (CFS)	0.3	4.0	8.0	18.3	23.7	30.3
MODELED RELEASE (CFS)	0.3	3.3	8.0	18.3	23.7	30.1
STORED VOLUME (AC-FT)	0.5	0.5	0.5	0.6	0.7	0.8

FSD22						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	9.4	14.8	22.5	32.9	42.5	52.6
ALLOWABLE RELEASE (CFS)	0.4	5.8	11.5	26.5	34.3	43.9
MODELED RELEASE (CFS)	0.4	5.8	11.4	26.5	34.3	43.8
STORED VOLUME (AC-FT)	0.6	0.6	0.7	0.8	0.9	1.0

FSD23						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	5.5	8.3	12.4	18.0	23.0	28.4
ALLOWABLE RELEASE (CFS)	0.2	2.4	4.9	11.2	14.5	18.6
MODELED RELEASE (CFS)	0.2	2.0	4.9	11.2	14.5	18.6
STORED VOLUME (AC-FT)	0.3	0.3	0.4	0.4	0.5	0.6

FSD27						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	38.8	57.6	84.1	119.7	159.2	206.3
ALLOWABLE RELEASE (CFS)	1.4	21.1	42.4	97.8	126.4	161.9
MODELED RELEASE (CFS)	1.4	18.4	42.3	97.7	126.2	161.9
STORED VOLUME (AC-FT)	2.7	2.8	2.9	3.2	3.7	4.2

FSD72						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	12.8	20.2	31.4	46.7	60.9	76.0
ALLOWABLE RELEASE (CFS)	0.6	9.6	19.3	44.4	57.4	73.4
MODELED RELEASE (CFS)	0.6	9.3	19.2	44.4	57.4	73.4
STORED VOLUME (AC-FT)	1.0	1.0	1.1	1.1	1.2	1.3

PNDW3						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	214.6	374.5	714.9	1187.6	1674.9	2204.1
MODELED RELEASE (CFS)	154.3	200.3	366.8	799.9	1085.6	1350.6
STORED VOLUME (AC-FT)	2.8	9.5	26.3	41.2	57.2	78.2

FSD-E1						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	23.3	35.9	53.8	79.1	102.4	127.4
ALLOWABLE RELEASE (CFS)	0.7	11.0	22.1	50.9	65.7	84.1
MODELED RELEASE (CFS)	0.7	5.4	19.9	48.9	62.8	84.0
STORED VOLUME (AC-FT)	1.3	1.3	1.5	1.8	2.1	2.5

FSD-E2						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	30.6	45.2	65.9	93.3	118.0	143.9
ALLOWABLE RELEASE (CFS)	0.6	9.5	19.2	45.5	59.8	77.6
MODELED RELEASE (CFS)	0.6	3.2	18.5	41.3	58.5	74.7
STORED VOLUME (AC-FT)	2.1	2.3	2.4	2.8	3.3	3.8

FSD-E3						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	100.4	130.6	169.6	217.4	257.8	298.4
ALLOWABLE RELEASE (CFS)	0.9	13.2	26.5	61.6	79.8	102.6
MODELED RELEASE (CFS)	1.0	6.8	25.7	56.0	79.8	101.3
STORED VOLUME (AC-FT)	7.0	7.2	7.7	8.9	10.1	11.4

FSD-E4						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	58.9	75.5	96.6	122.2	143.7	165.2
ALLOWABLE RELEASE (CFS)	0.3	4.4	8.8	23.0	32.2	43.7
MODELED RELEASE (CFS)	0.9	2.8	8.7	21.9	32.2	43.6
STORED VOLUME (AC-FT)	4.2	4.3	4.7	5.4	6.2	6.9

FSD-E5						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	38.6	48.4	60.7	75.4	87.7	99.9
ALLOWABLE RELEASE (CFS)	0.0	0.2	0.4	4.2	8.7	14.3
MODELED RELEASE (CFS)	0.0	0.2	0.5	2.2	5.1	10.0
STORED VOLUME (AC-FT)	3.0	3.7	4.4	4.8	5.0	5.3

FSD-E6						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	141.6	189.4	252.5	331.4	398.9	467.5
ALLOWABLE RELEASE (CFS)	0.2	1.9	3.2	37.4	77.3	125.6
MODELED RELEASE (CFS)	0.2	0.9	3.2	18.3	64.1	123.3
STORED VOLUME (AC-FT)	13.0	17.0	21.9	22.2	22.6	23.7

PND-E7						
STORM EVENT (YR)	2	5	10	25	50	100
PEAK INFLOW (CFS)	46.5	75.4	121.2	285.2	402.4	548.0
MODELED RELEASE (CFS)	23.1	35.3	71.5	108.3	152.1	196.4
STORED VOLUME (AC-FT)	1.0	1.8	4.6	10.5	17.9	28.0

M&S CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

2018 STERLING RANCH MDDP

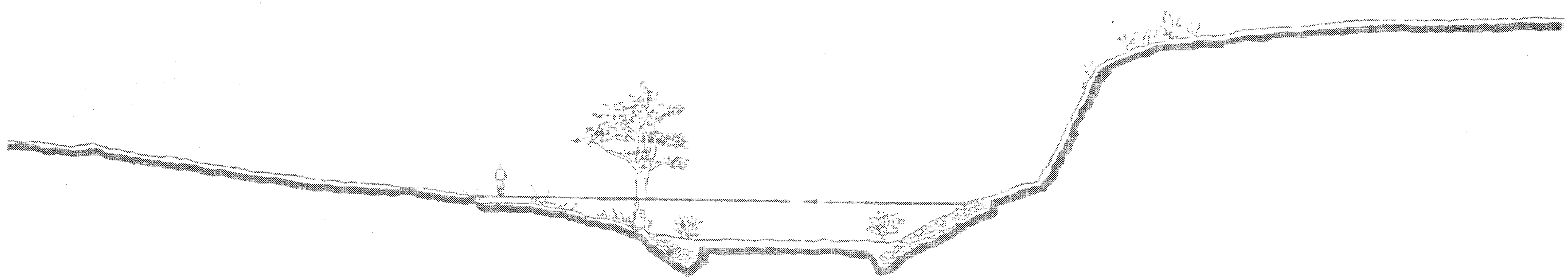
DEVELOPED HYDROLOGIC CONDITIONS MAP

PROJECT NO. 09-002 FILE: \dwg\Eng Exhibits\2018-MDDP-PROPCOND.dwg
DESIGNED BY: JD
DRAWN BY: JD
CHECKED BY: VAS
SCALE HORIZ: 1"=2400' VERT: 1"=2400'
DATE: 10-21-2018
DM2

SAND CREEK DRAINAGE BASIN PLANNING STUDY

PRELIMINARY DESIGN REPORT

CITY OF COLORADO SPRINGS, EL PASO COUNTY, COLORADO

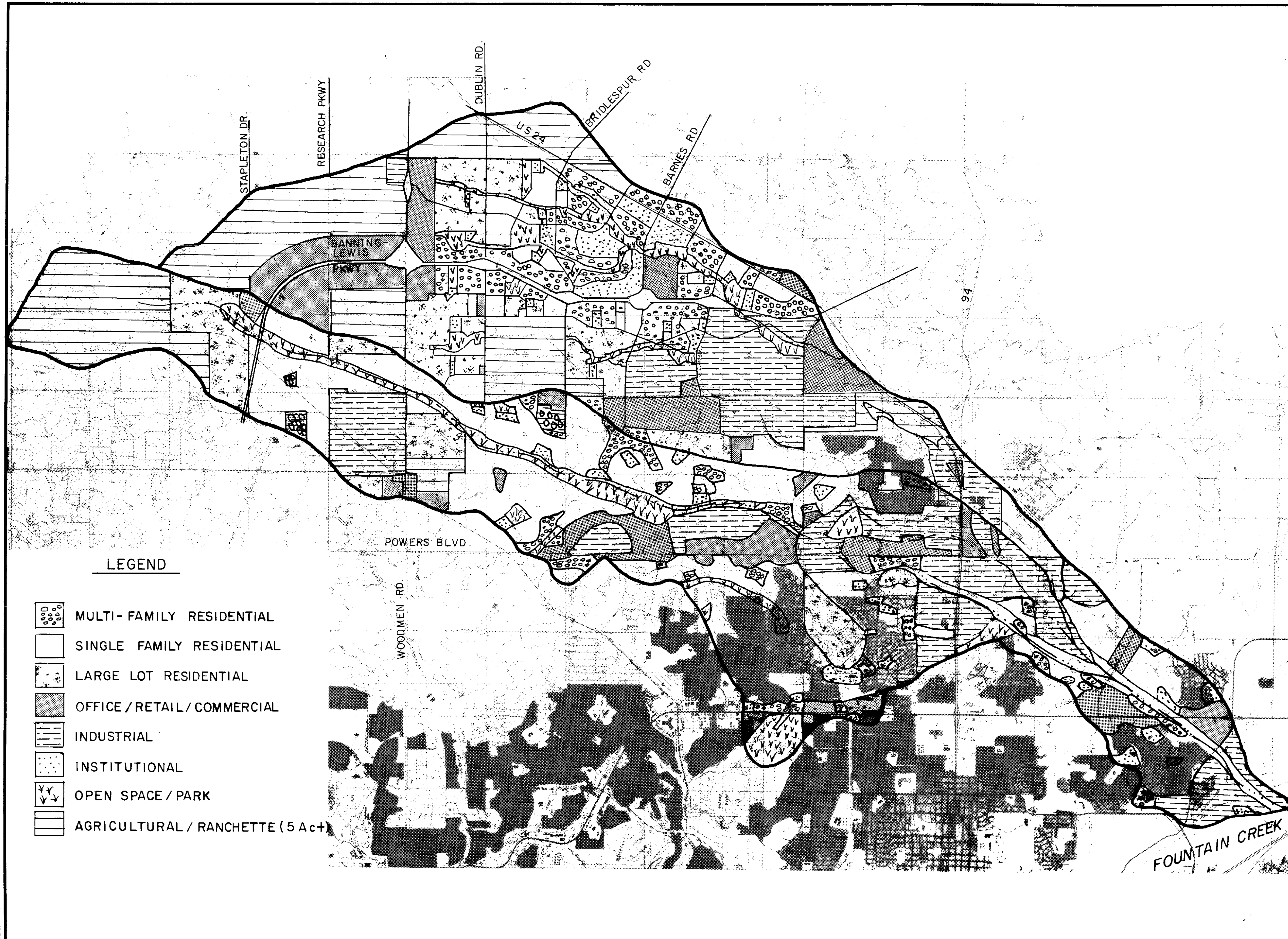


PREPARED FOR:

City of Colorado Springs
Department of Comprehensive Planning, Development and Finance
Engineering Division
30 S. Nevada
Colorado Springs, Colorado 80903

PREPARED BY:

Kiowa Engineering Corporation
1011 North Weber
Colorado Springs, CO 80903



Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE BASIN PLANNING STUDY

PROPOSED LAND USE

Project No. 90-04-09
Date: 9/90
Design:
Drawn: EAK
Check:
Revisions:

7

FIG. II-3

Table III-1. Percent Impervious Values.

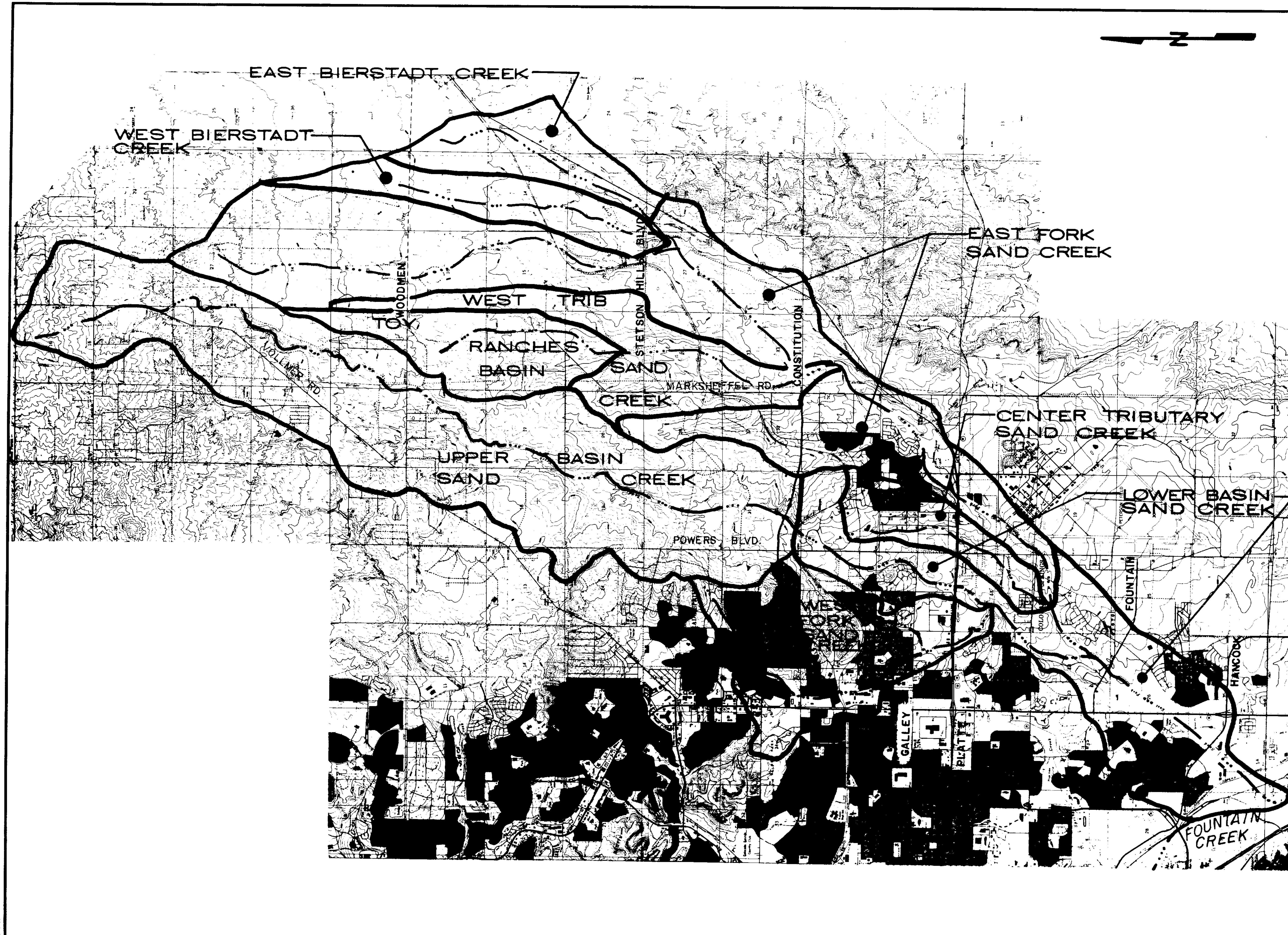
Land Use Classification	Percent Impervious	Land Use Density
Multi-Family Residential	65-80	10-24 DU/AC
Single-Family Residential	45-65	6-10 DU/AC
Low Density Residential	30-45	1-6 DU/AC
Large Lot Residential/ Agricultural	5-20	1 DU/AC
Office/Commercial	80-90	
Industrial	85-95	
Institutional	50-75	
Dedicated Open Space/Park	5-10	
Rangeland - Poor to Good Condition	5- 20	

NOTE: The above data was used in the preparation of the hydrologic analysis for the Sand Creek Drainage Basin Planning Study. These data are not intended to reflect future land use planning within the City or the County.

Table III-2: Summary of Peak Discharges
24-hour Duration Storm, AMC-II
Baseline Hydrologic Conditions

Design Point	Location	Area s.m.	100-year (cfs) Existing	Future	10-year (cfs) Existing	Future
	SAND CREEK (1)					
1	@ Fountain Creek	54.1	16900	25800	7470	11800
12	Hancock Blvd.	53.1	16100	25000	7250	11600
19	Fountain Blvd.	50.7	13600	22100	6230	10800
27	West Fork Sand Creek	23.0	11300	18900	5920	8790
99	C.R.I. & P. RR	16.0	5820	14530	2360	7400
20	North Carefree	13.5	4030	10260	1520	4810
37	Stetson Hills Blvd.	10.0	3230	6690	840	3060
60	Woodmen Road	5.4	2630	3300	760	950
75	Black Forest Road	1.4	1000	1030	320	350
	WEST FORK SAND CREEK					
27	@ Sand Creek	5.0	6840	6840	3200	3200
52	U. S. 24	4.8	6860	6860	3230	3230
59	Constitution Ave.	2.1	3450	3450	1680	1680
69	South Carefree	1.0	1630	1630	810	810
	CENTER TRIBUTARY SAND CREEK					
42	Airport Road	1.6	1530	2010	650	1200
43	Powers Blvd.	1.3	1300	1710	590	980
44	U. S. 24	1.1	1200	1680	580	960
45	Galley Road	0.8	1180	1340	530	650
	EAST FORK SAND CREEK					
1	@ Center Tributary	24.3	3970	15600	700	6530
9	@ East Fork Sub. Tributary	19.8	3730	13990	650	6050
29	@ W. Bierstadt Creek	10.6	2080	7460	400	3330
40	@ Tamlin Road	4.6	950	3570	210	1820
52	@ Woodmen Road	1.7	460	2120	80	1210
	EAST FORK SUB-TRIBUTARY SAND CREEK					
11	@ Constitution Avenue	5.9	1330	4100	240	1630
15	@ Chicago & Rock Island RR	5.2	1250	3540	230	1370
26	@ Confluence w/Toy Ranch	1.0	220	820	50	370
47	@ Proposed Dublin Blvd.	0.4	100	300	20	140
	WEST BIERSTADT CREEK					
31	@ Confluence w/ East Fork	1.8	480	1590	80	600
39	@ Tamlin Road	0.8	270	680	50	290
54	@ Woodmen Road	0.5	230	420	55	150
	EAST BIERSTADT CREEK					
32	@ Conf. w/W Bierstadt	2.4	520	1520	90	580
38	@ Chicago & Rock Island RR	0.4	120	350	15	130

(1) Future baseline condition discharges for Sand Creek compiled with the assumption that the discharges from the East Fork Sand Creek basin are maintained at existing rates as shown on this Table.



Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado
80905-1308

SAND CREEK DRAINAGE
BASIN PLANNING STUDY

REGIONAL SUB-BASINS

Project No	90-04-09
Date:	11/90
Design:	
Drawn:	EAK
Check.	
Revisions:	

11

FIG. III-1

INNOVATIVE DESIGN. CLASSIC RESULTS.

STERLING RANCH MDDP AMENDMENT NO. 2 & PRELIMINARY DRAINAGE REPORT FOR STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Prepared for:
CLASSIC SRJ LAND, LLC
2138 FLYING HORSE CLUB DRIVE
COLORADO SPRINGS CO 80921
(719) 592-9333

Prepared by:
CLASSIC CONSULTING
619 N. CASCADE AVE SUITE 200
COLORADO SPRINGS CO 80903
(719) 785-0790

Job No. 1183.22

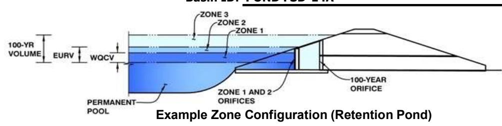
PCD Project No.
SKP-22-004 / SP-22-004

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Basin ID: POND FSD-14A



Example Zone Configuration (Retention Pond)

Depth Increment = 1.00 ft

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	157.00	acres		
Watershed Length =	2,625	ft		
Watershed Length to Centroid =	900	ft		
Watershed Slope =	0.056	ft/ft		
Watershed Imperviousness =	49.00%	percent		
Percentage Hydrologic Soil Group A =	90.0%	percent		
Percentage Hydrologic Soil Group B =	10.0%	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) =	2.663	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	8.759	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	6.661	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	8.831	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	10.583	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	13.891	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	16.645	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	20.295	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.48 in.) =	32.488	acre-feet	3.48	inches
Approximate 2-yr Detention Volume =	5.719	acre-feet		
Approximate 5-yr Detention Volume =	7.566	acre-feet		
Approximate 10-yr Detention Volume =	9.333	acre-feet		
Approximate 25-yr Detention Volume =	11.288	acre-feet		
Approximate 50-yr Detention Volume =	12.523	acre-feet		
Approximate 100-yr Detention Volume =	14.133	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.663	acre-feet
Zone 2 Volume (EURV - Zone 1) =	6.096	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	5.374	acre-feet
Total Detention Basin Volume =	14.133	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

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)
Top of Micropool	--	0.00	--	--	--	798	0.018		
7013.5	--	0.50	--	--	--	798	0.018	399	0.009
7014	--	1.00	--	--	--	1,548	0.036	985	0.023
7015	--	2.00	--	--	--	11,091	0.255	7,305	0.168
7016	--	3.00	--	--	--	49,238	1.130	37,469	0.860
7018	--	5.00	--	--	--	124,427	2.856	211,134	4.847
7020	--	7.00	--	--	--	136,372	3.131	471,933	10.834
7022	--	9.00	--	--	--	148,834	3.417	757,139	17.382
7024	--	11.00	--	--	--	161,766	3.714	1,067,739	24.512
7025	--	12.00	--	--	--	168,538	3.869	1,232,891	28.303
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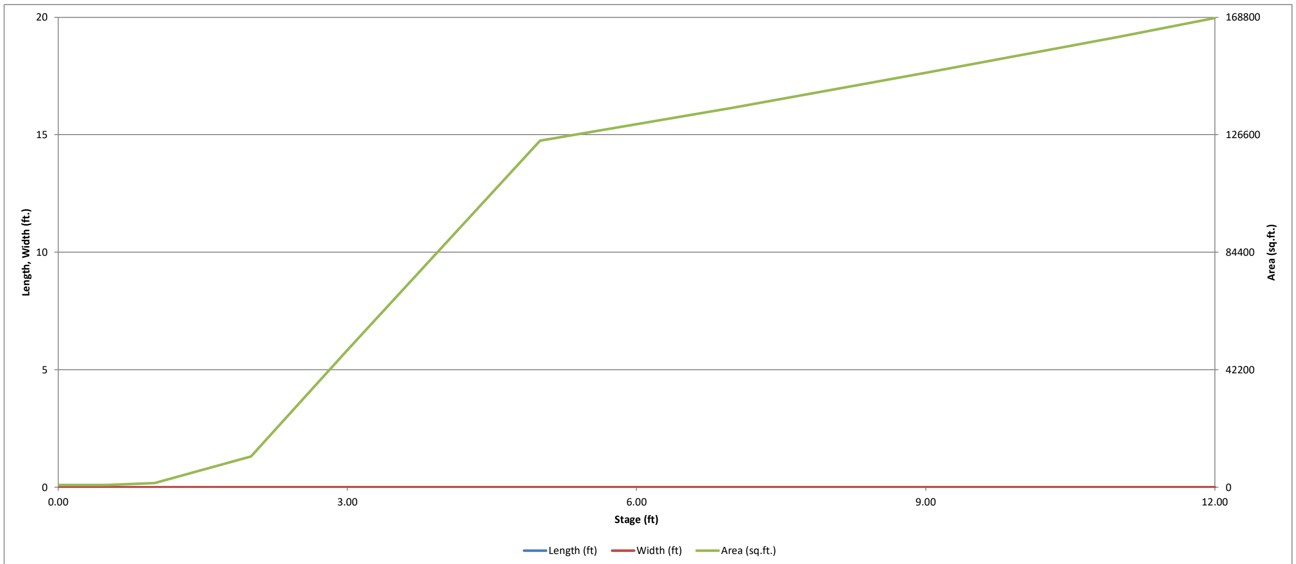
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10
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0.00
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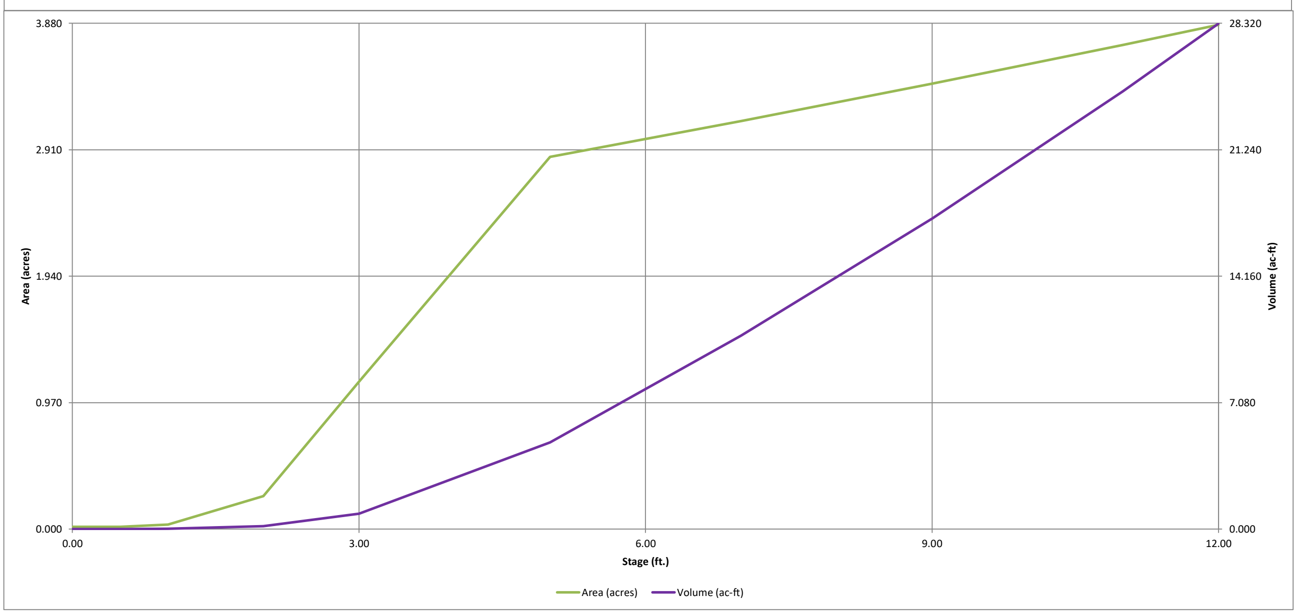
9.00
12.00
Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)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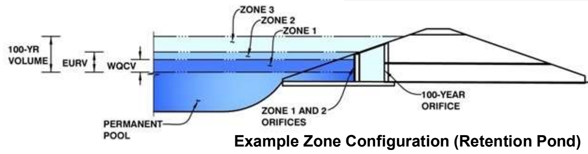
7.080
0.000
0.00
3.00
6.00
9.00
12.00
Area (acres)
Volume (ac-ft)
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **STERLING RANCH EAST PRELIMINARY PLAN NO. 1**

Basin ID: **POND FSD-14A**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.12	2.663	Orifice Plate
Zone 2 (EURV)	6.33	6.096	Orifice Plate
Zone 3 (100-year)	8.03	5.374	Weir&Pipe (Restrict)
Total (all zones)		14.133	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	6.80	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	20.40	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
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	1.70	3.40	5.10				
Orifice Area (sq. inches)	7.00	7.00	24.00	24.00				

	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)

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

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.80	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	20.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.80	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	5.79	N/A	
Overflow Grate Open Area w/o Debris =	55.68	N/A	ft^2
Overflow Grate Open Area w/ Debris =	27.84	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	42.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	42.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	9.62	N/A	ft^2
Outlet Orifice Centroid =	1.75	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.25	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	240.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.74	feet
Stage at Top of Freeboard =	10.99	feet
Basin Area at Top of Freeboard =	3.71	acres
Basin Volume at Top of Freeboard =	24.47	acre-ft

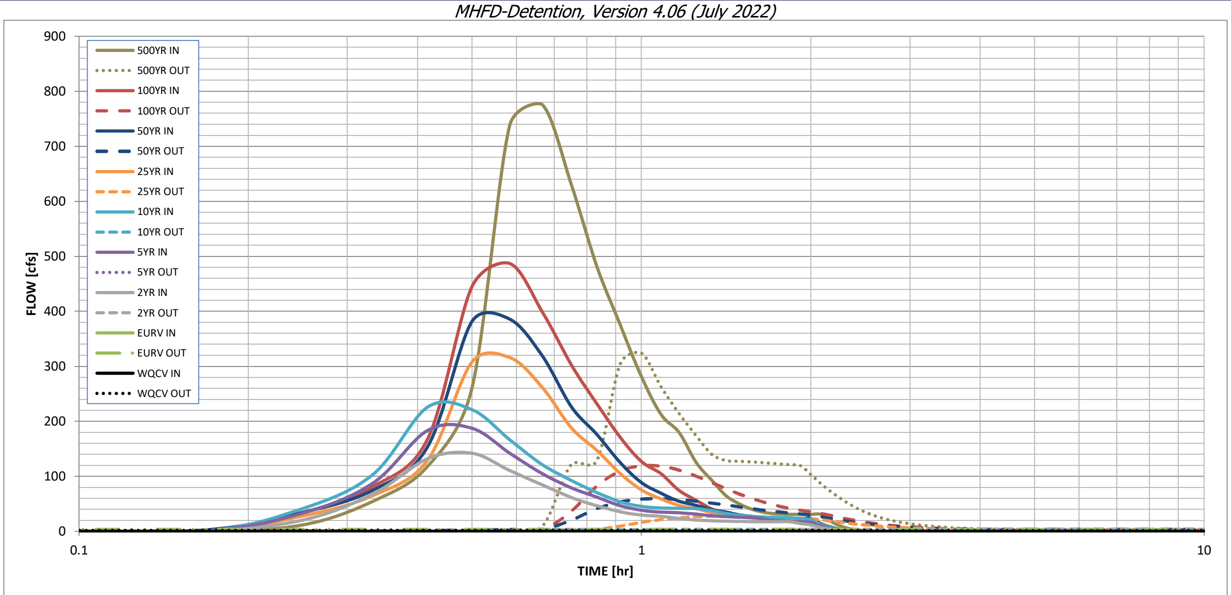
Routed Hydrograph Results

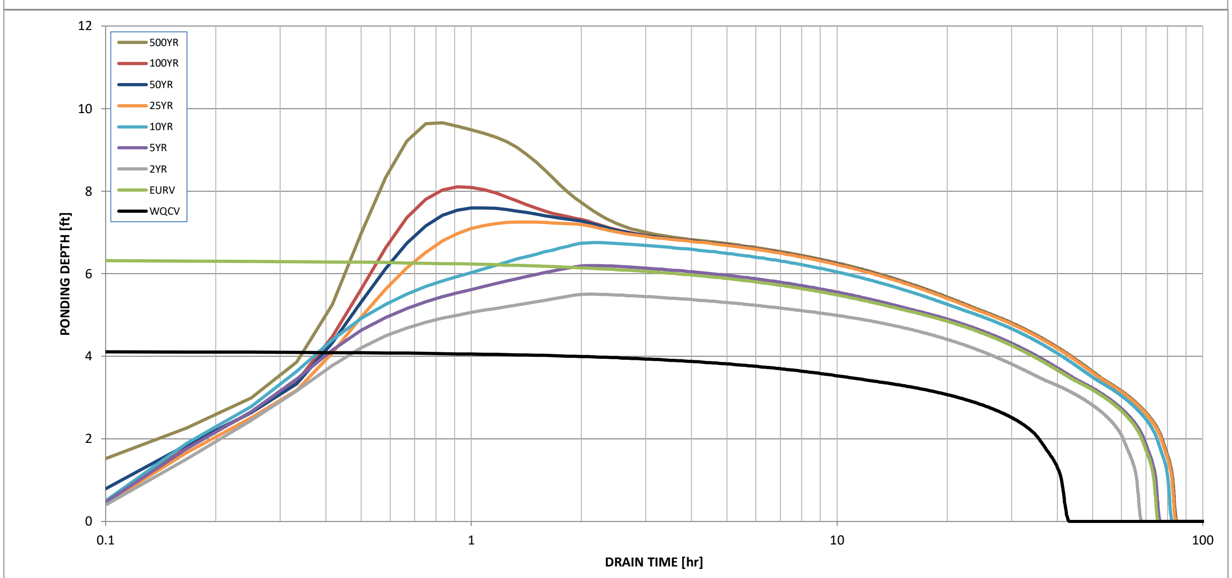
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

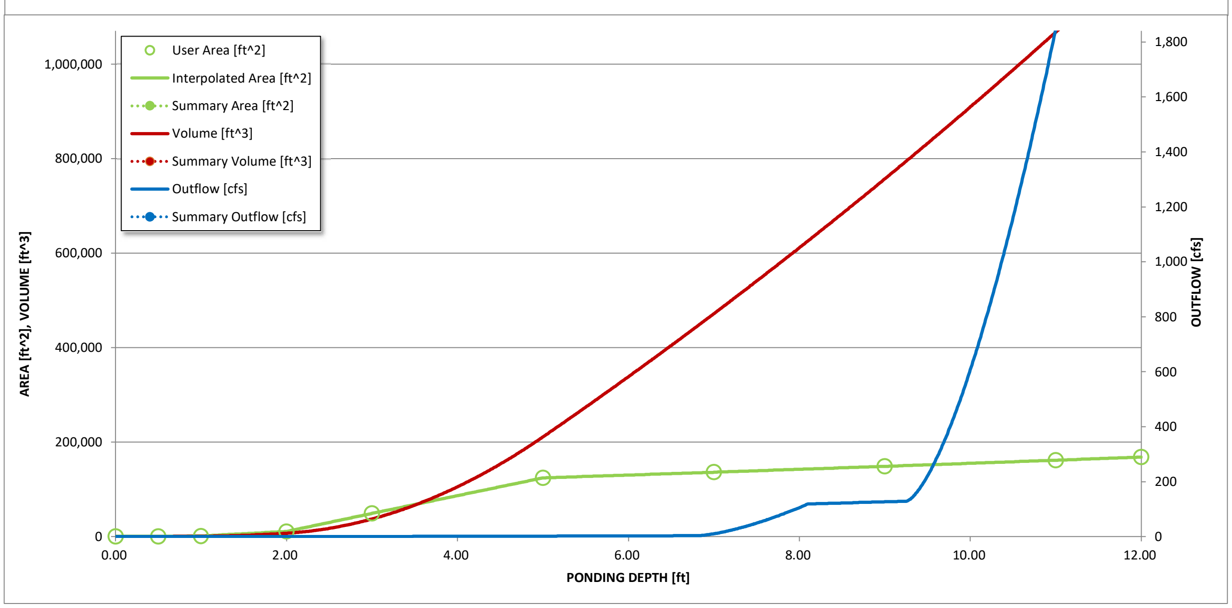
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.48
CUHP Runoff Volume (acre-ft) =	2.663	8.759	6.661	8.831	10.583	13.891	16.645	20.295	32.488
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.661	8.831	10.583	13.891	16.645	20.295	32.488
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.4	4.5	6.2	74.2	120.4	182.2	379.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.02	0.03	0.04	0.47	0.77	1.16	2.42
Peak Inflow Q (cfs) =	N/A	N/A	141.8	187.2	225.4	315.9	385.7	487.1	775.3
Peak Outflow Q (cfs) =	1.5	3.4	2.7	3.3	3.6	27.8	59.2	119.0	323.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.6	0.4	0.5	0.7	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.4	1.0	2.1	2.3
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	66	60	67	72	71	70	68	61
Time to Drain 99% of Inflow Volume (hours) =	**41**	71	64	72	77	78	77	76	74
Maximum Ponding Depth (ft) =	4.12	6.33	5.50	6.20	6.75	7.26	7.60	8.10	9.66
Area at Maximum Ponding Depth (acres) =	2.10	3.04	2.93	3.02	3.10	3.17	3.22	3.29	3.51
Maximum Volume Stored (acre-ft) =	2.667	8.767	6.292	8.373	10.056	11.621	12.706	14.364	19.669

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 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.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	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	2.33	0.23	11.56
	0:15:00	0.00	0.00	20.38	33.24	41.38	27.88	34.35	34.07	54.84
	0:20:00	0.00	0.00	68.09	88.10	103.50	65.05	75.24	81.59	117.87
	0:25:00	0.00	0.00	132.17	183.47	225.44	129.37	153.43	167.61	260.56
	0:30:00	0.00	0.00	141.83	187.22	220.83	307.62	381.56	444.86	738.28
	0:35:00	0.00	0.00	110.41	142.05	166.41	315.87	385.71	487.07	775.32
	0:40:00	0.00	0.00	84.16	104.51	121.05	261.25	318.54	398.70	631.14
	0:45:00	0.00	0.00	61.60	79.07	92.66	188.26	227.03	303.16	481.44
	0:50:00	0.00	0.00	46.52	62.08	70.37	147.05	176.00	231.85	375.68
	0:55:00	0.00	0.00	35.63	46.76	53.71	105.13	124.91	171.16	281.15
	1:00:00	0.00	0.00	29.51	38.10	45.10	75.22	88.55	126.70	212.27
	1:05:00	0.00	0.00	27.16	34.90	42.42	58.90	69.20	104.53	179.98
	1:10:00	0.00	0.00	23.05	33.87	41.59	47.22	54.70	74.31	125.55
	1:15:00	0.00	0.00	20.58	31.25	41.37	41.18	47.16	56.57	92.79
	1:20:00	0.00	0.00	19.18	28.29	37.73	34.47	39.19	40.87	64.25
	1:25:00	0.00	0.00	18.41	26.48	32.31	30.80	34.86	32.39	48.91
	1:30:00	0.00	0.00	17.90	25.47	28.83	26.33	29.68	27.01	39.00
	1:35:00	0.00	0.00	17.60	24.86	26.82	23.60	26.53	24.04	33.65
	1:40:00	0.00	0.00	17.51	21.47	25.63	22.04	24.78	22.83	31.66
	1:45:00	0.00	0.00	17.51	19.28	24.87	21.25	23.90	22.36	30.87
	1:50:00	0.00	0.00	17.51	18.02	24.54	20.85	23.45	22.26	30.74
	1:55:00	0.00	0.00	14.11	17.34	23.46	20.65	23.23	22.26	30.74
	2:00:00	0.00	0.00	11.82	16.03	20.76	20.61	23.19	22.26	30.74
	2:05:00	0.00	0.00	7.03	9.61	12.43	12.48	14.00	13.41	18.42
	2:10:00	0.00	0.00	3.97	5.42	6.99	7.06	7.89	7.54	10.29
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	2:25:00	0.00	0.00	0.39	0.65	0.75	0.83	0.91	0.86	1.11
	2:30:00	0.00	0.00	0.09	0.14	0.14	0.16	0.17	0.15	0.16
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	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	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
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	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
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	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
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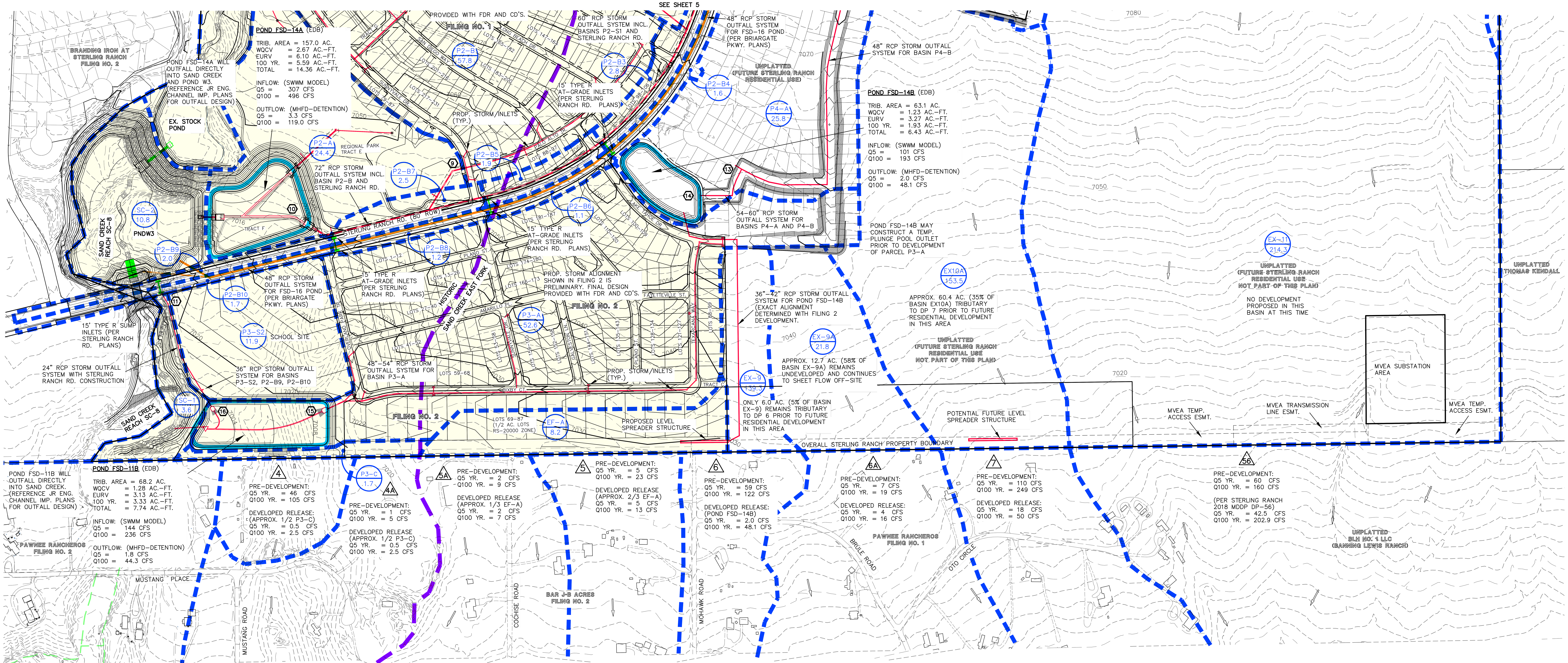

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pond FSD-14A Tributary Area

Subcatchment	Area (Ac.)	Avg. Lot size (AC)	Effective Imperv. (%)
P1-A1	5.0	N/A	70%
P1-A2	6.4	N/A	70%
P1-A3	1.8	N/A	70%
P1-A4	2.0	N/A	70%
P1-A5	5.7	N/A	70%
P1-A6	2.8	N/A	70%
P2-S1	35.6	School	50%
P2-A	24.4	Park	7%
P2-B	57.8	7,000	57%
P2-B1	2.5	N/A	50%
P2-B2	1.9	N/A	70%
P2-B3	2.8	N/A	50%
P2-B4	1.6	N/A	70%
P2-B5	1.9	N/A	50%
P2-B6	1.1	N/A	70%
P2-B7	2.5	N/A	25%
P2-B8	1.2	N/A	70%
TOTAL	**157.0**		**49%**

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pond FSD-14B Tributary Area

Subcatchment	Area (Ac.)	Avg. Lot size (AC)	Effective Imperv. (%)
P4-A	25.8	7,000	57%
P4-B	37.3	6,500	60%
TOTAL	**63.1**		**59%**

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pond FSD-11B Tributary Area

Subcatchment	Area (Ac.)	Avg. Lot size (AC)	Effective Imperv. (%)
P2-B9	2.0	N/A	70%
P2-B10	1.7	N/A	70%
P3-S2	11.9	School	50%
P3-A	52.6	7,000	57%
TOTAL	**68.2**		**56%**

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWWM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EF-A	8.2	15%	7	20
EX10A ++	60.4	5%	18	50
EX-9 ++	6.0	5%	2	8
EX-9A ++	12.7	5%	4	16
P1-A	12.7	8%	6	19
P1-A1	5.0	70%	15	29
P1-A2	6.4	70%	16	32
P1-A3	1.8	70%	6	12
P1-A4	2.0	70%	7	13
P1-A5	5.7	70%	18	35
P1-A6	2.8	70%	9	18
P1-B (Dev.)	35.5	55%	71	140
P1-B (Un-dev.)	35.5	5%	10	23
P1-C	8.9	70%	31	59
P1-D	31.4	60%	72	142
P1-E1	30.4	50%	66	128
P1-E2	21.8	55%	53	102
P1-F1 (Dev.)	31.2	35%	54	106
P1-F2 (Dev.)	45.5	35%	77	149
P1-F1 (Un-dev.)	31.2	5%	9	28
P1-F2 (Un-dev.)	45.5	5%	13	37
P2-A	24.4	7%	11	37
P2-B	57.8	57%	114	229
P2-B1	2.5	50%	7	13
P2-B10	1.7	70%	6	12
P2-B2	1.9	70%	7	13
P2-B3	2.8	50%	7	14
P2-B4	1.6	70%	6	11
P2-B5	1.9	50%	5	10
P2-B6	1.1	70%	4	8
P2-B7	2.5	25%	3	8
P2-B8	1.2	70%	4	8
P2-B9	2.0	70%	7	14
P2-S1	35.6	50%	82	158
P3-A	52.6	57%	107	213
P3-C	1.7	11%	1	5
P3-S2	11.9	50%	30	59
P4-A	25.8	57%	59	115
P4-B	37.3	60%	97	188
SC-1 +	3.6	8%	2	6
SC-2 +	10.8	8%	6	20
SC-3 +	27.2	8%	12	26
SC-4 +	16.4	8%	8	27
TR-V	2.1	27%	3	7
TR-W	1.4	32%	2	5

\+ Basin not changed from pre-development conditions
++ Remaining undeveloped portion of the pre-development Basin

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Developed Surface Routing

Design Point (On-Site)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
DP-1	132	242
DP-1A	77	149
DP-2	69	133
DP-3	53	102
DP-4	167	376
DP-5	72	142
DP-6	71	140
DP-7	28	53
DP-8	82	158
DP-9	114	229
DP-10	282	456
DP-11	14	26
DP-12	97	188
DP-13	59	115
DP-14	101	193
DP-15	107	213
DP-16	43	84
Pond FSD-11B	144	236
Pond FSD-14A	290	488
Pond FSD-14B	101	193
Pond FSD-16 (Ultimate)	307	496
Pond FSD-16 (Interim)	197	410

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWMM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	105	222
EX10A	153.5	5%	46	103
EX-11 *	214.3	4%	54	129
EX-13 *	94.8	6%	36	85
EX-4A	44.2	8%	19	50
EX-5	26.2	8%	12	32
EX-7	152.8	5%	46	105
EX-7A	2.4	2%	1	5
EX-8	32.2	2%	5	23
EX-8A	6.6	2%	2	9
EX-9	139.3	8%	59	122
EX-9A	21.8	5%	7	19
TR-12 *	4.7	5%	2	9
TR-20 *	23.2	7%	10	32
TR-4 *	4.4	5%	2	9
TR-5 *	13.7	5%	5	17
TR-6 *	1.5	5%	1	4
TR-7 *	2.6	5%	1	5

* Basins with no change upon developed condition

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Flow Comparison along South Boundary

	This Report (SWMM 5.1) Pre-Dev. Conditions		This Report (SWMM 5.1) Developed Conditions		2018 SR MDDP (HEC-HMS) Pre-Dev. Conditions	
Design Point (South Bndy.)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
4	46	105	0.5	2.5	21.5	107.4
4A	1	5	0.5	2.5		
5	5	23	5	13	1.7	20.5
5A	2	9	2	7		
6	59	122	2.0	48.1	23.9	125.2
6A	7	19	4	16		
7	110	249	18	50	57.1	277.9
56	60	160	60	160	42.5	202.9

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
EAST FORK BASIN BOUNDARY	
DESIGN POINT (ON-SITE)	15
DESIGN POINT (MATCHING PRE-DEV) LOCATION ALONG SOUTH BOUNDARY)	4
BASIN IDENTIFIER AREA IN ACRES	B8 10.0
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
PROPOSED STORM SEWER	
PROPOSED STORM SEWER PER JR ENG. PLANS	
PROPOSED POND OUTFALL PER JR ENG. PLANS	
STERLING RANCH EAST PRELIMINARY PLAN NO. 1 AREA	

N

200 100 0 200 400

SCALE: 1" = 200'

CLASSIC CONSULTING ENGINEERS & SURVEYORS
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799 (Fax)

STERLING RANCH EAST PRELIMINARY PLAN NO. 1 PRELIMINARY DRAINAGE REPORT DEVELOPED DRAINAGE MAP			
DESIGNED BY MAW	SCALE	DATE 4-1-22	
DRAWN BY MAW	(H) 1"= 200'	SHEET 6 OF 6	
CHECKED BY	(V) 1"= N/A	JOB NO. 1183.22	

INNOVATIVE DESIGN. CLASSIC RESULTS.

FINAL DRAINAGE REPORT
FOR
STERLING RANCH EAST FILING NO. 1

November 2022

Prepared for:
CLASSIC SRJ LAND, LLC
2138 Flying Horse Club Dr.
COLORADO SPRINGS CO 80921
(719) 592-9333

Prepared by:
CLASSIC CONSULTING ENGINEERS & SURVEYORS
619 N. CASCADE AVENUE, SUITE 200
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Job no. 2183.30
PCD File # SF2235

CLASSIC CONSULTING

DETENTION & STORMWATER

QUALITY POND '14A'

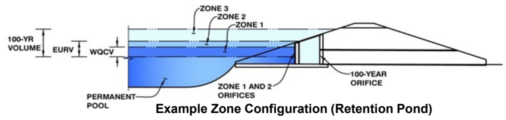
CLASSIC
CONSULTING
ENGINEERS & SURVEYORS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **STERLING RANCH EAST FILING NO. 1**

Basin ID: **POND 14A**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	156.85	acres
Watershed Length =	2,650	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	48.80%	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) =	2.653	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	8.766	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	6.608	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	8.791	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	10.519	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	13.327	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	16.062	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	19.552	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.48 in.) =	31.496	acre-feet	3.48	inches
Approximate 2-yr Detention Volume =	5.631	acre-feet		
Approximate 5-yr Detention Volume =	7.417	acre-feet		
Approximate 10-yr Detention Volume =	9.062	acre-feet		
Approximate 25-yr Detention Volume =	11.103	acre-feet		
Approximate 50-yr Detention Volume =	12.408	acre-feet		
Approximate 100-yr Detention Volume =	14.024	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.653	acre-feet
Zone 2 Volume (EURV - Zone 1) =	6.112	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	5.258	acre-feet
Total Detention Basin Volume =	14.024	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 = 0.25 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)
Top of Micropool	--	0.00	--	--	--	1,070	0.025		
7017.5	--	0.50	--	--	--	1,070	0.025	535	0.012
7018	--	1.00	--	--	--	1,835	0.042	1,261	0.029
7019	--	2.00	--	--	--	15,728	0.361	10,043	0.231
7020	--	3.00	--	--	--	47,089	1.081	41,451	0.952
7022	--	5.00	--	--	--	103,984	2.387	192,524	4.420
7024	--	7.00	--	--	--	129,654	2.976	426,162	9.783
7026	--	9.00	--	--	--	144,608	3.320	700,424	16.080
7028	--	11.00	--	--	--	160,255	3.679	1,005,287	23.078
7029	--	12.00	--	--	--	168,321	3.864	1,169,575	26.850
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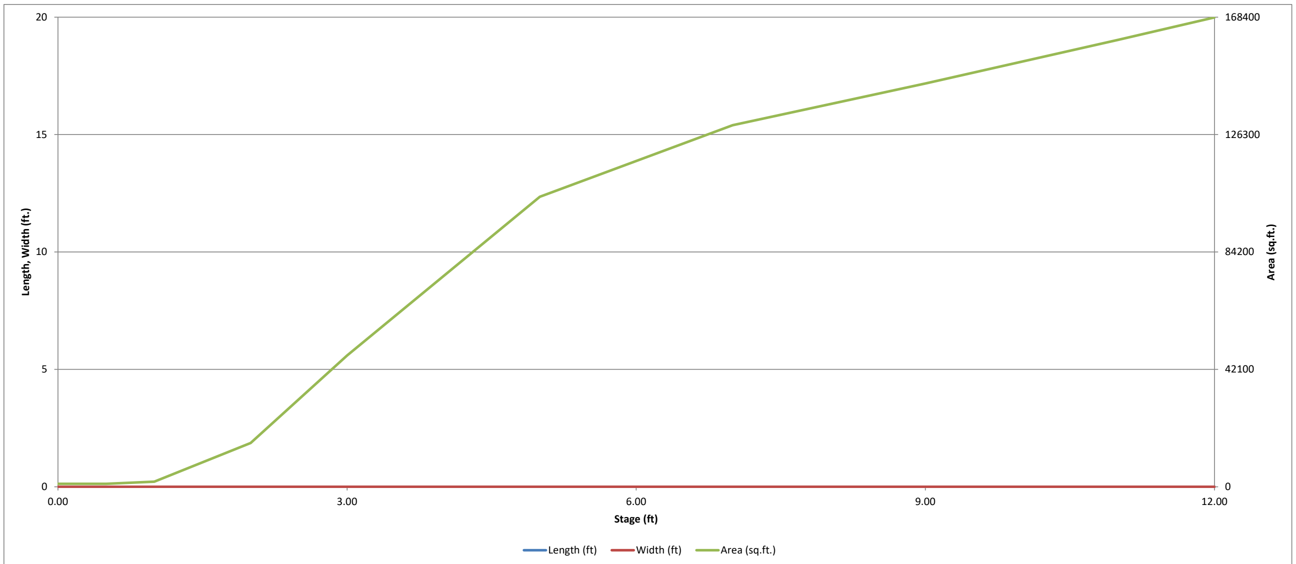
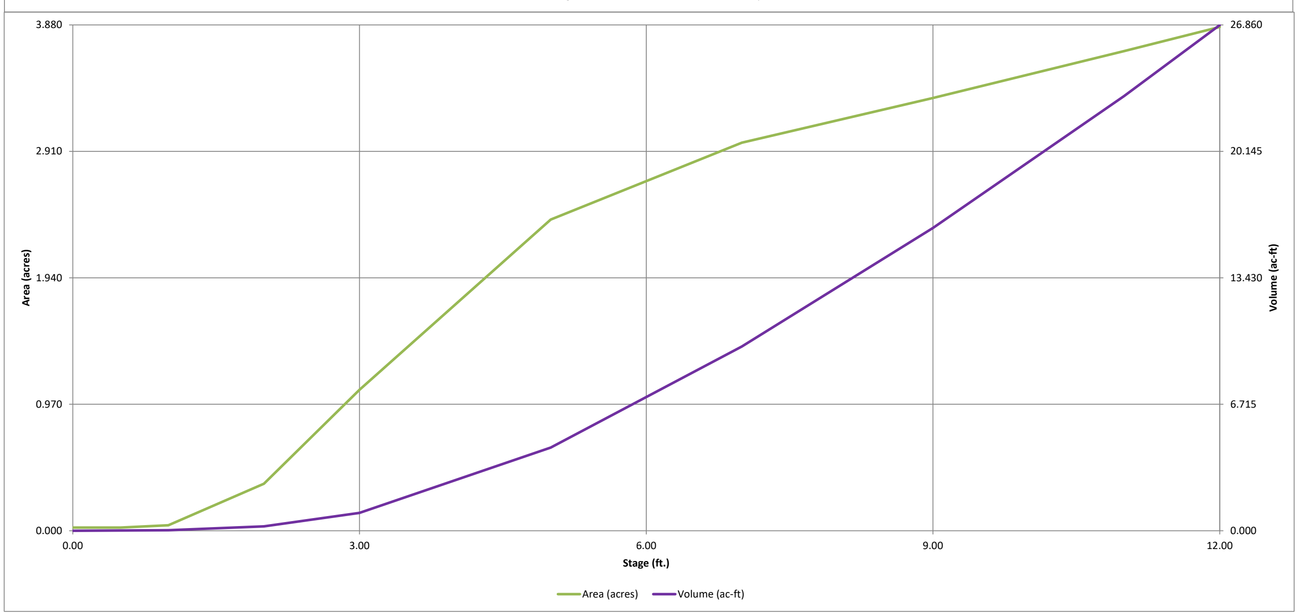
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



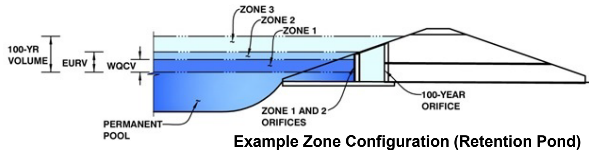


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: STERLING RANCH EAST FILING NO. 1

Basin ID: POND 14A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.17	2.653	Orifice Plate
Zone 2 (EURV)	6.66	6.112	Orifice Plate
Zone 3 (100-year)	8.38	5.258	Weir&Pipe (Restrict)
Total (all zones)		14.024	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	6.80	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	25.00	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
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	2.27	4.53					
Orifice Area (sq. inches)	6.00	20.00	24.00					

	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)

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

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.80	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	30.00	N/A	feet
Overflow Weir Grate Slope =	3.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	8.13	N/A	feet
Overflow Weir Slope Length =	4.22	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.01	N/A	
Overflow Grate Open Area w/o Debris =	88.04	N/A	ft^2
Overflow Grate Open Area w/ Debris =	44.02	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	48.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	48.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	12.57	N/A	ft^2
Outlet Orifice Centroid =	2.00	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	180.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.80	feet
Stage at Top of Freeboard =	10.80	feet
Basin Area at Top of Freeboard =	3.64	acres
Basin Volume at Top of Freeboard =	22.35	acre-ft

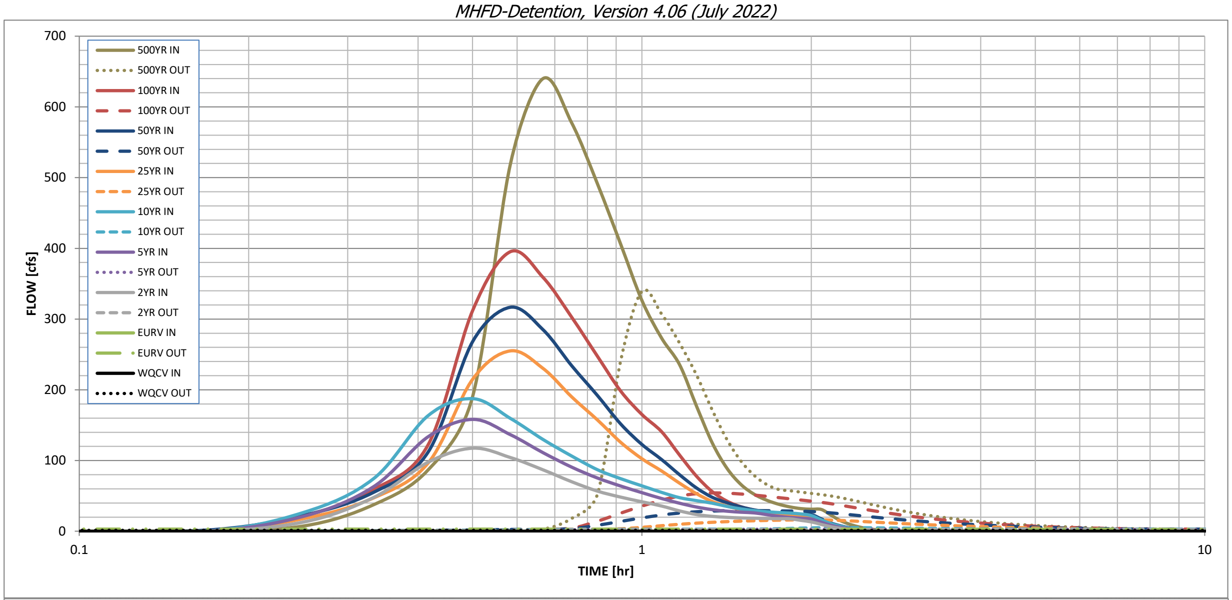
Routed Hydrograph Results

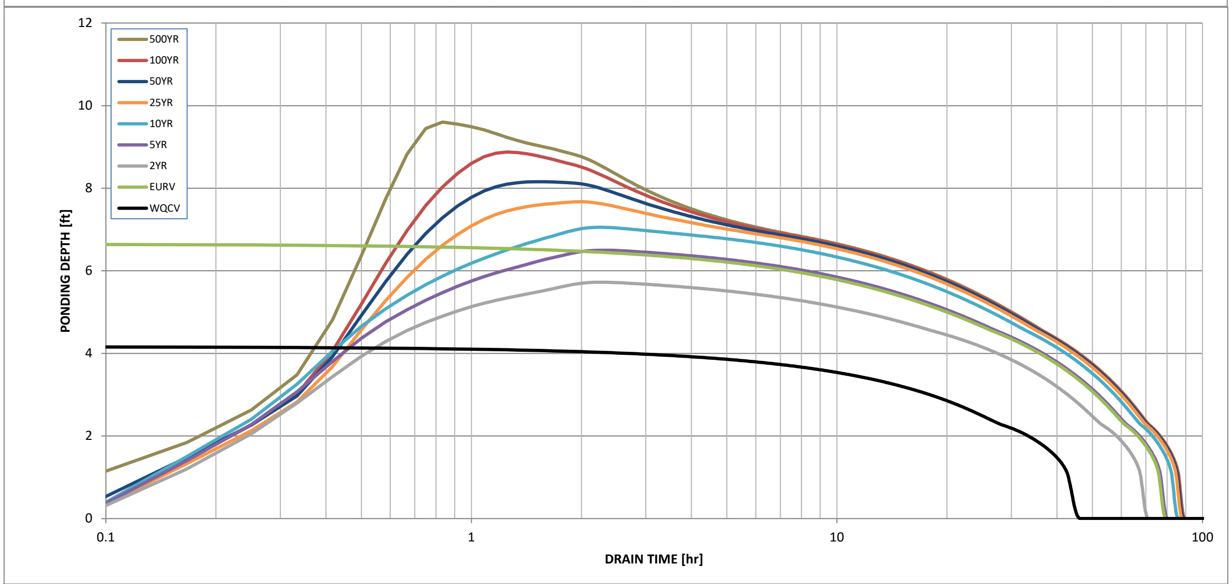
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

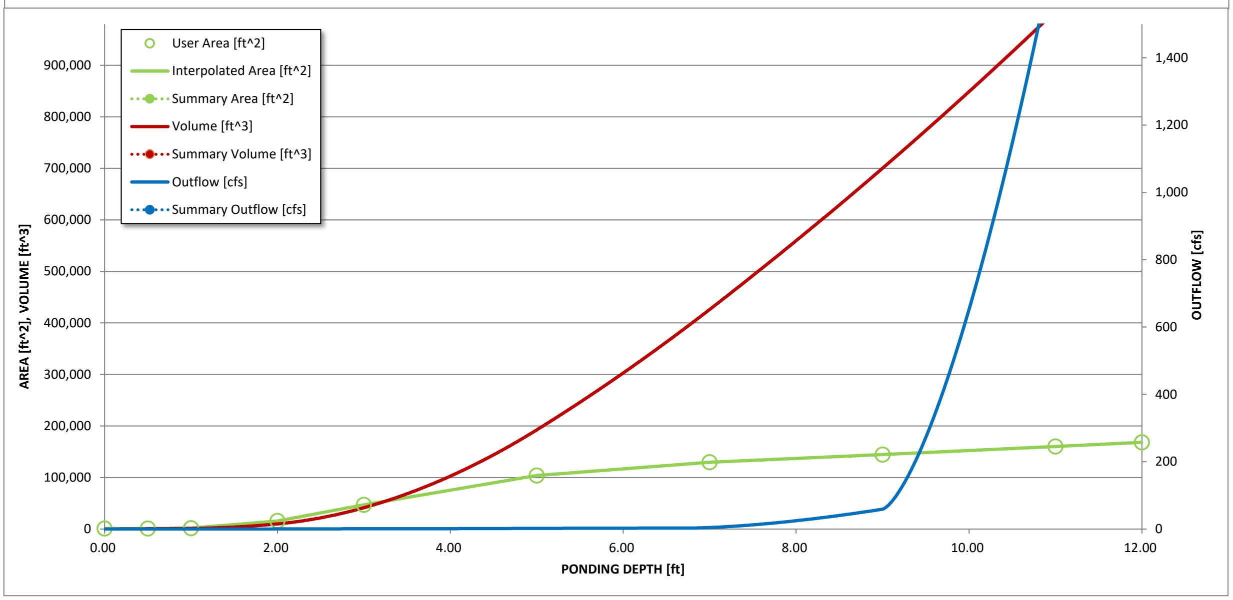
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.48
CUHP Runoff Volume (acre-ft) =	2.653	8.766	6.608	8.791	10.519	13.327	16.062	19.552	31.496
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.608	8.791	10.519	13.327	16.062	19.552	31.496
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.5	3.0	4.2	38.6	76.4	124.7	281.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.25	0.49	0.80	1.80
Peak Inflow Q (cfs) =	N/A	N/A	117.5	158.2	187.5	255.0	316.7	395.2	639.9
Peak Outflow Q (cfs) =	1.3	3.1	2.6	3.0	5.2	16.4	29.3	54.2	339.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.2	0.4	0.4	0.4	1.2
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.1	0.3	0.6	0.9
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) =	40	65	60	66	70	69	68	66	61
Time to Drain 99% of Inflow Volume (hours) =	**43**	73	66	74	79	80	79	78	73
Maximum Ponding Depth (ft) =	4.17	6.66	5.72	6.50	7.05	7.68	8.16	8.88	9.60
Area at Maximum Ponding Depth (acres) =	1.85	2.88	2.60	2.83	2.99	3.09	3.17	3.30	3.43
Maximum Volume Stored (acre-ft) =	2.663	8.788	6.215	8.304	9.932	11.816	13.320	15.649	18.104

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 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.

Time Interval
5.00 min

SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
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]
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	1.50	0.15	7.43
0:15:00	0.00	0.00	12.98	21.09	26.48	17.87	22.49	21.92	37.49
0:20:00	0.00	0.00	47.71	63.00	74.33	47.13	55.01	59.00	86.67
0:25:00	0.00	0.00	97.60	133.60	163.41	96.30	111.77	122.02	190.19
0:30:00	0.00	0.00	117.50	158.21	187.49	214.78	268.03	311.84	518.20
0:35:00	0.00	0.00	104.35	136.69	159.74	255.04	316.70	395.22	639.90
0:40:00	0.00	0.00	86.99	111.26	129.92	230.45	285.20	359.20	577.50
0:45:00	0.00	0.00	70.08	90.74	106.43	190.08	234.15	302.73	491.41
0:50:00	0.00	0.00	56.84	75.34	87.08	157.49	192.05	247.53	405.83
0:55:00	0.00	0.00	48.30	63.98	74.38	125.76	151.69	198.22	326.18
1:00:00	0.00	0.00	41.71	54.62	64.25	102.54	122.72	165.09	273.35
1:05:00	0.00	0.00	35.75	46.38	55.04	85.34	101.52	140.94	235.39
1:10:00	0.00	0.00	28.80	39.67	47.52	67.98	79.89	107.65	177.06
1:15:00	0.00	0.00	23.69	34.31	43.36	53.16	61.27	77.90	124.89
1:20:00	0.00	0.00	21.10	30.65	39.73	42.14	48.08	56.06	88.86
1:25:00	0.00	0.00	19.71	28.41	35.16	35.60	40.34	42.58	66.04
1:30:00	0.00	0.00	18.89	26.98	31.63	30.50	34.43	34.70	52.31
1:35:00	0.00	0.00	18.43	26.02	29.27	26.84	30.24	29.91	43.87
1:40:00	0.00	0.00	18.07	23.51	27.63	24.54	27.62	26.70	38.23
1:45:00	0.00	0.00	17.81	21.18	26.52	23.04	25.91	24.55	34.43
1:50:00	0.00	0.00	17.66	19.62	25.74	22.01	24.73	23.18	32.06
1:55:00	0.00	0.00	15.45	18.52	24.51	21.40	24.04	22.61	31.21
2:00:00	0.00	0.00	13.27	17.25	22.21	21.01	23.62	22.37	30.86
2:05:00	0.00	0.00	9.67	12.73	16.14	15.59	17.50	16.65	22.89
2:10:00	0.00	0.00	6.46	8.48	10.86	10.43	11.69	11.16	15.28
2:15:00	0.00	0.00	4.31	5.64	7.31	7.04	7.87	7.52	10.26
2:20:00	0.00	0.00	2.82	3.64	4.78	4.62	5.15	4.91	6.66
2:25:00	0.00	0.00	1.74	2.31	3.04	2.95	3.28	3.12	4.22
2:30:00	0.00	0.00	1.02	1.45	1.86	1.86	2.06	1.95	2.60
2:35:00	0.00	0.00	0.50	0.80	0.98	1.02	1.11	1.05	1.37
2:40:00	0.00	0.00	0.20	0.34	0.39	0.43	0.46	0.42	0.52
2:45:00	0.00	0.00	0.05	0.08	0.08	0.09	0.09	0.07	0.07
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
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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


OUTFALL 1
PIPE 98

System Input Summary

POND OUTFALL   100-YR HGL

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.1
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 0.00

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	**Ground Elevation (ft)**	**Total Known Flow (cfs)**	**Local Contribution (cfs)**	**Drainage Area (Ac.)**	**Runoff Coefficient**	**5yr Coefficient**	**Overland Length (ft)**	**Overland Slope (%)**	**Gutter Length (ft)**	**Gutter Velocity (fps)**
OUTFALL 1	7015.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPE 98	7023.50	54.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	**Overland Time (min)**	**Gutter Time (min)**	**Basin Tc (min)**	**Intensity (in/hr)**	**Local Contrib (cfs)**	**Coeff. Area**	**Intensity (in/hr)**	**Manhole Tc (min)**	**Peak Flow (cfs)**	**Comment**
OUTFALL 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PIPE 98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.20	Surface Water Present (Downstream)

Sewer Input Summary:

	Elevation	Loss Coefficients	Given Dimensions

Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
PIPE 98	58.94	7016.04	1.2	7016.75	0.013	0.03	1.00	CIRCULAR	48.00 in	48.00 in

---

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
PIPE 98	157.78	12.56	26.55	7.60	19.40	11.39	1.82	Supercritical	54.20	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
PIPE 98	54.20	CIRCULAR	48.00 in	48.00 in	33.00 in	33.00 in	48.00 in	48.00 in	12.57	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 0.00

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
PIPE 98	7016.04	7016.75	0.00	0.00	7017.66	7018.96	7019.67	0.19	7019.86

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

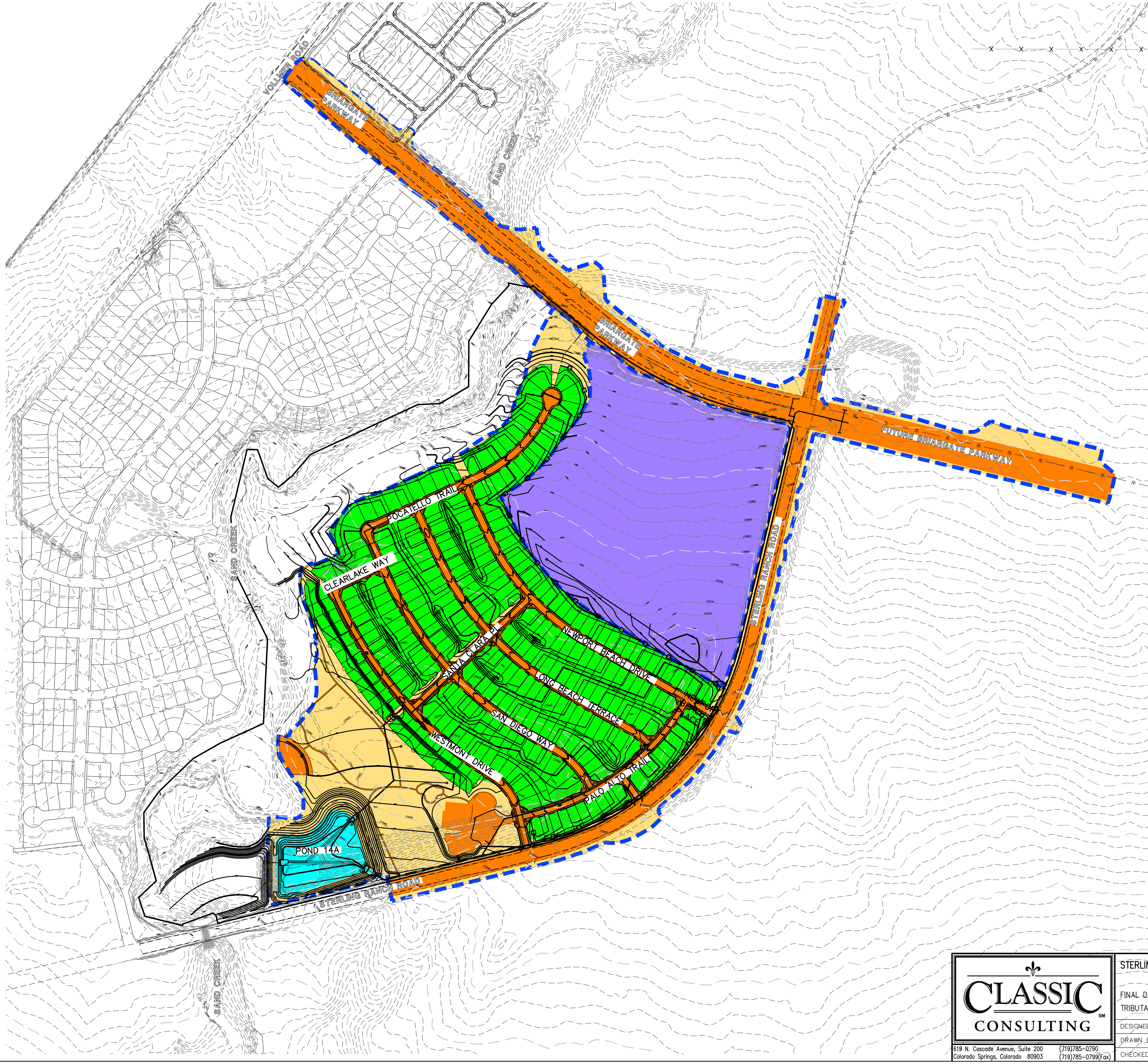
					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
PIPE 98	58.94	5.00	6.00	7.83	0.00	0.37	0.00	10.50	7.67	2.33	70.69	Sewer Too Shallow

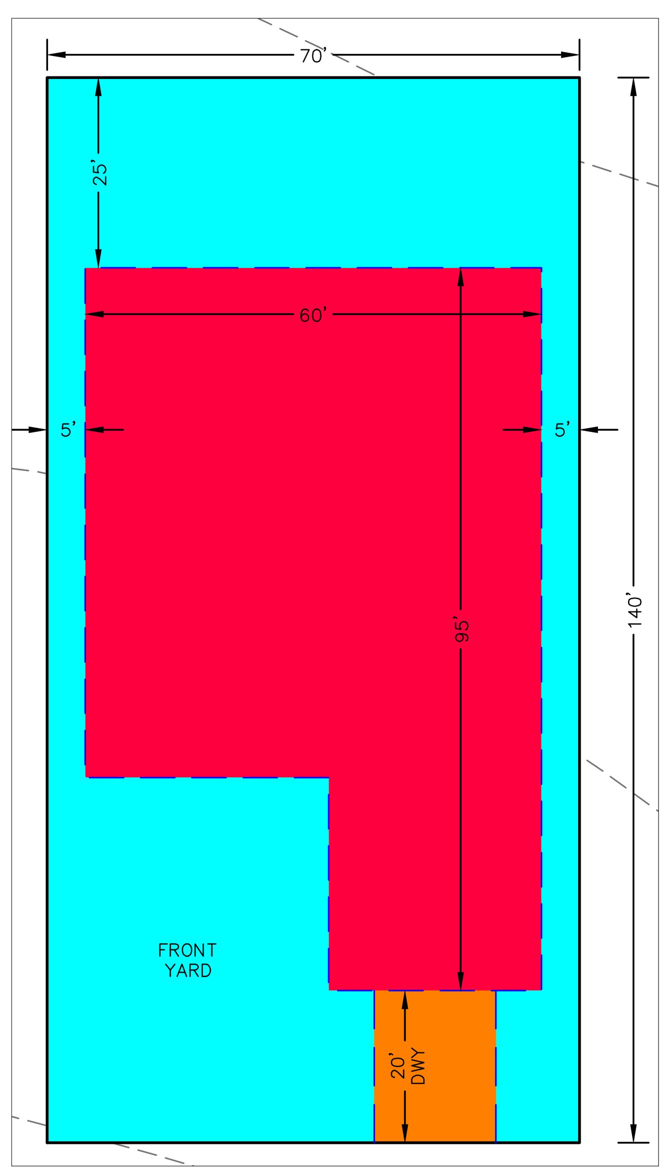
Total earth volume for sewer trenches = 71 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
    - Four inches for pipes less than 33 inches.
    - Six inches for pipes less than 60 inches.
    - Eight inches for all larger sizes.

DRAINAGE MAPS

CLASSIC CONSULTING ENGINEERS & SURVEYORS





TYPICAL HOME LOT

UIA = 55% OF LOT AREA
DCIA = 0.72% OF LOT AREA
RPA = 44.28% OF LOT AREA

- FUTURE SCHOOL SITE – ESTIMATED 13.94 AC. DCIA, 1.51 AC. UIA, 3.46 AC. RPA, 17.68 AC. SPA
- HOME LOTS (SEE BREAKDOWN ABOVE)
- SPA – SEPARATE PERVIOUS AREA
- UIA – UNCONNECTED IMPERVIOUS AREA
- DCIA – DIRECTLY CONNECTED IMPERVIOUS AREA
- RPA – RECEIVING PERVIOUS AREA

CLASSIC CONSULTING
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799(Fax)

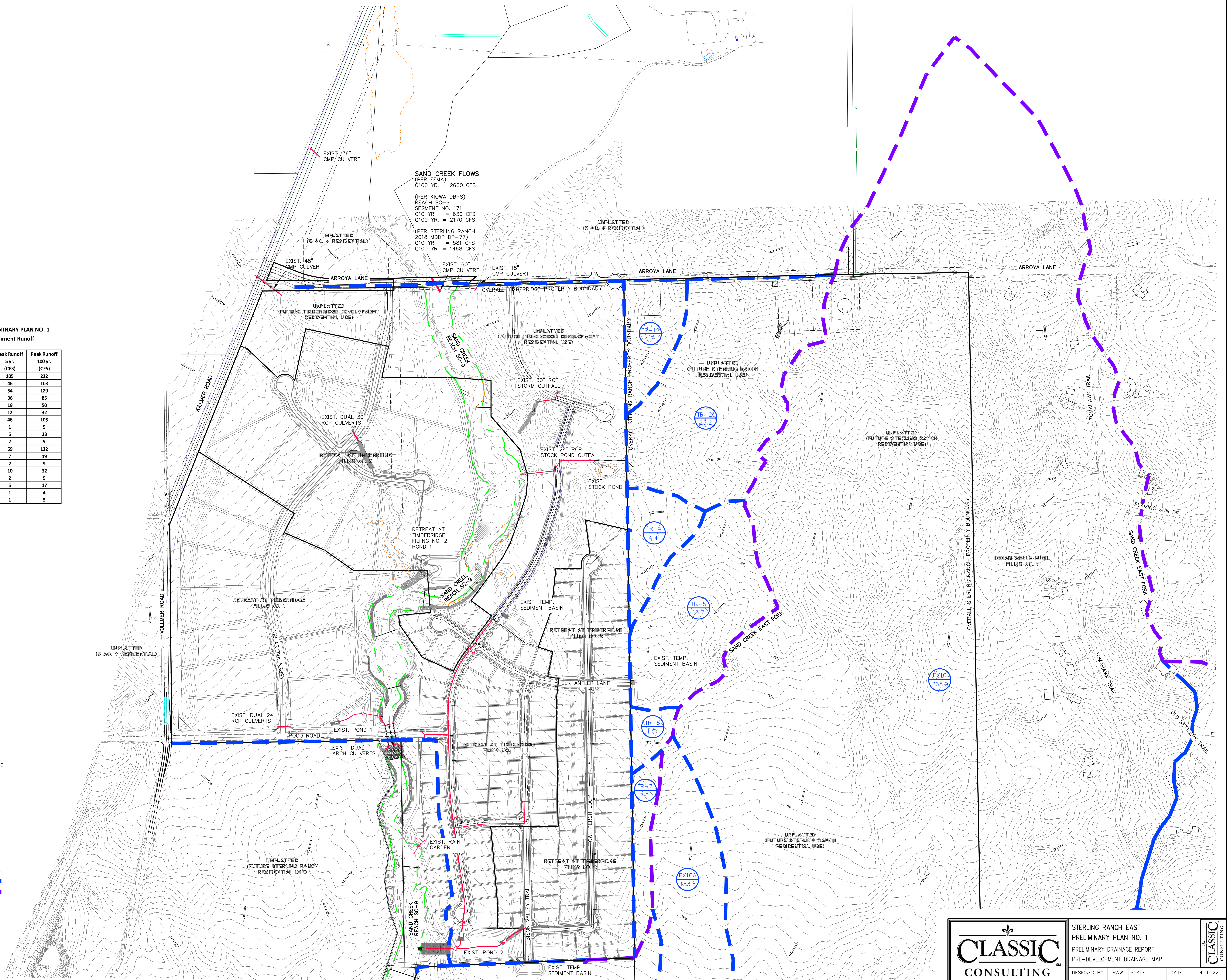
STERLING RANCH EAST FILING NO. 1

FINAL DRAINAGE REPORT
TRIBUTARY AREA TO PROPOSED POND 14A

DESIGNED BY	MAL	SCALE	DATE 10/27/22
DRAWN BY	MAL	(H) 1"= 250'	SHEET 1 OF 1
CHECKED BY		(V) 1"= N/A	JOB NO. 1183.30

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWMM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	105	222
EX10A	153.5	5%	46	103
EX-11	214.3	4%	54	129
EX-13	94.8	6%	36	85
EX-4A	44.2	8%	19	50
EX-5	26.2	8%	12	32
EX-7	152.8	5%	46	105
EX-7A	2.4	2%	1	5
EX-8	32.2	2%	5	23
EX-8A	6.6	2%	2	9
EX-9	139.3	8%	59	122
EX-9A	21.8	5%	7	19
TR-12	4.7	5%	2	9
TR-20	23.2	7%	10	32
TR-4	4.4	5%	2	9
TR-5	13.7	5%	5	17
TR-6	1.5	5%	1	4
TR-7	2.6	5%	1	5



LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
SUB-BASIN BOUNDARY	
SAND CREEK EAST FORK BASIN LINE	
DESIGN POINT	4
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
EXISTING STORM SEWER	
FEMA 100-YR FLOODPLAIN	

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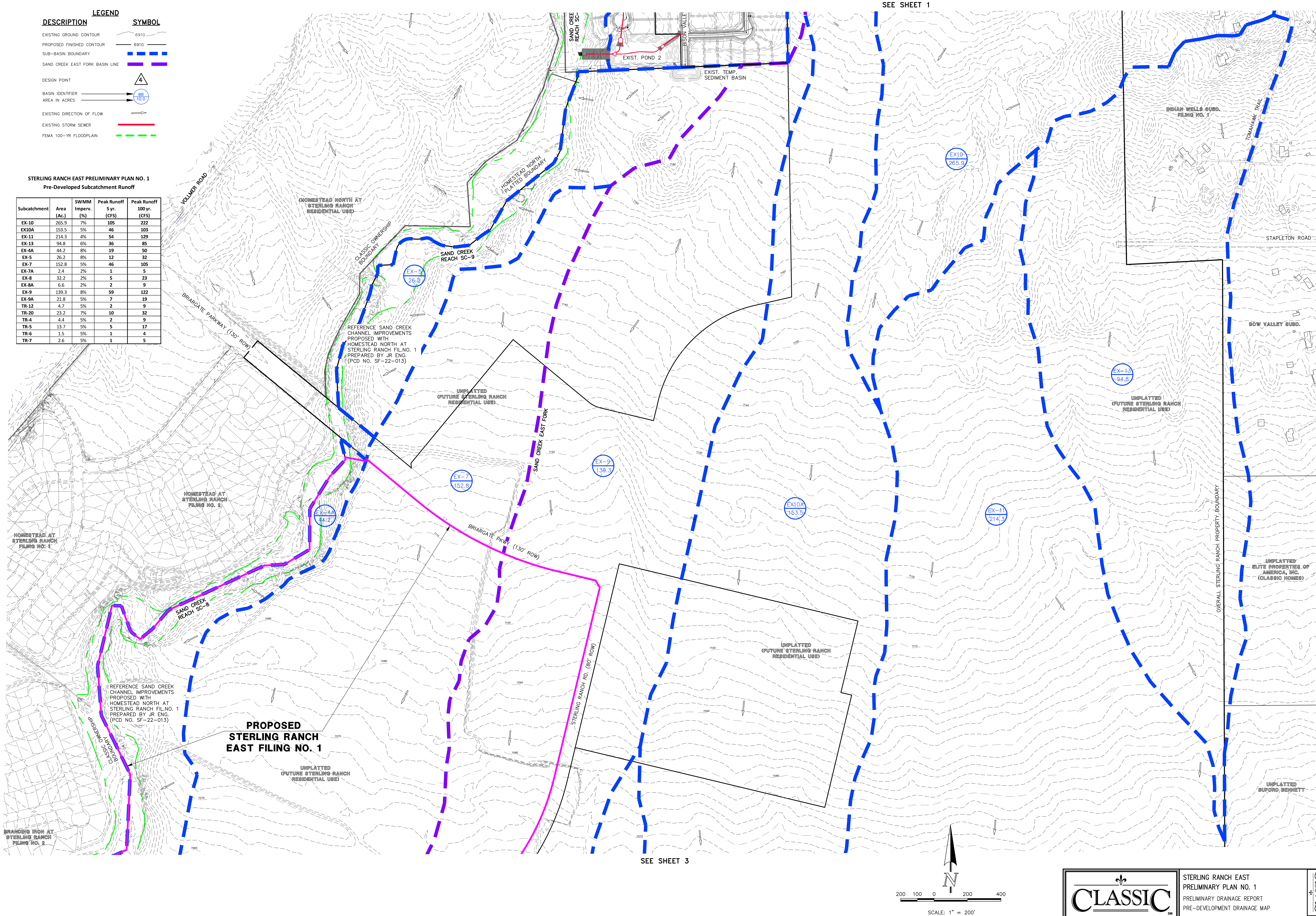
STERLING RANCH EAST
PRELIMINARY PLAN NO. 1
PRELIMINARY DRAINAGE REPORT
PRE-DEVELOPMENT DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE 4-1-22
DRAWN BY	MAW	(H) 1"= 200'	SHEET 1 OF 6
CHECKED BY		(V) 1"= N/A	JOB NO. 1183.22



STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWMM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	105	222
EX10A	153.5	5%	46	103
EX-11	214.3	4%	54	129
EX-13	94.8	6%	36	85
EX-4A	44.2	8%	19	50
EX-5	26.2	8%	12	32
EX-7	152.8	5%	46	105
EX-7A	2.4	2%	1	5
EX-8	32.2	2%	5	23
EX-8A	6.6	2%	2	9
EX-9	139.3	8%	59	122
EX-9A	21.8	5%	7	19
TR-12	4.7	5%	2	9
TR-20	23.2	7%	10	32
TR-4	4.4	5%	2	9
TR-5	13.7	5%	5	17
TR-6	1.5	5%	1	4
TR-7	2.6	5%	1	5

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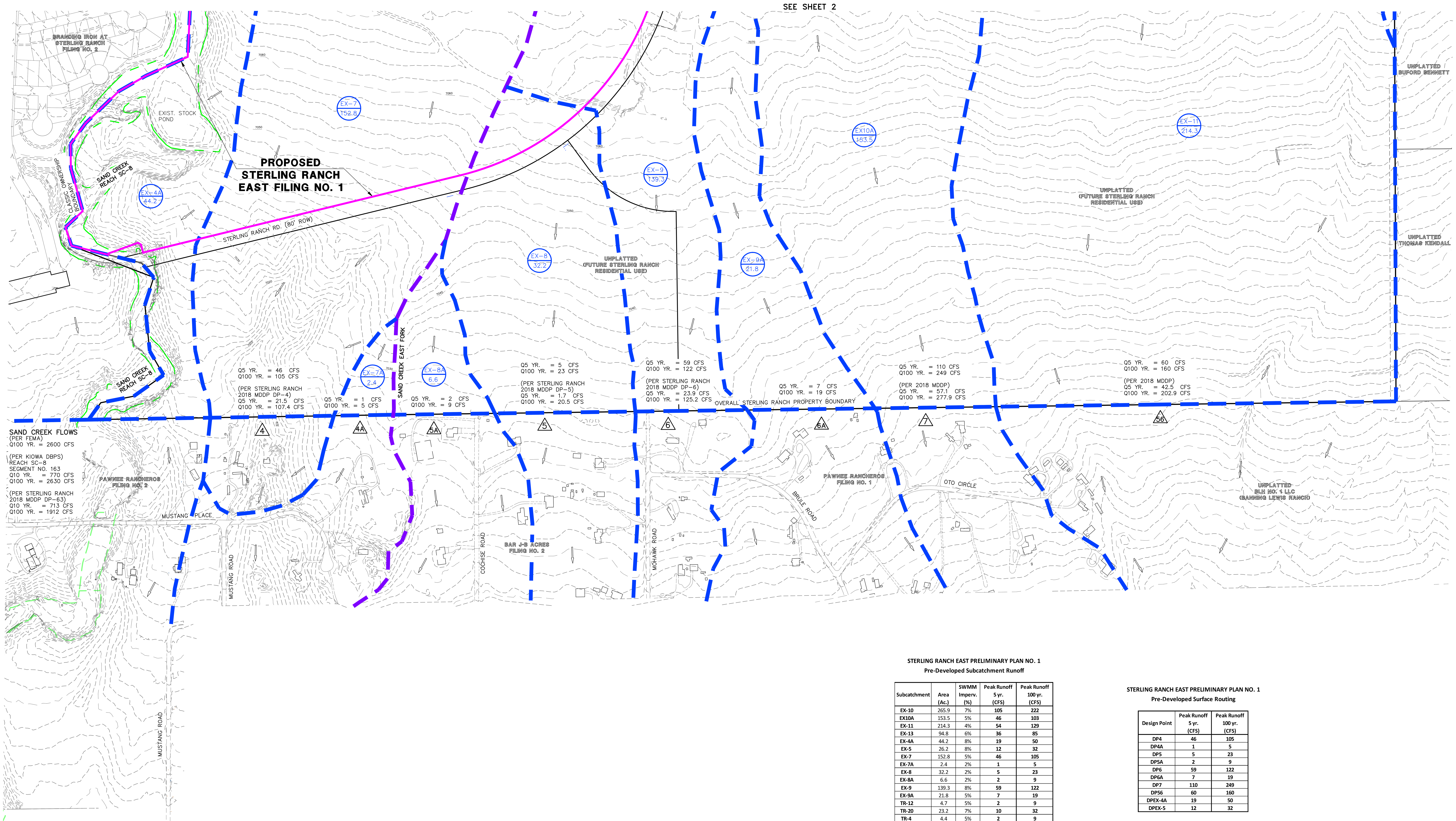
STERLING RANCH EAST
PRELIMINARY PLAN NO. 1
PRELIMINARY DRAINAGE REPORT
PRE-DEVELOPMENT DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE 4-1-22
DRAWN BY	MAW	(H) 1"= 200'	SHEET 2 OF 6
CHECKED BY		(V) 1"= N/A	JOB NO. 1183.22



STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Subcatchment Runoff

Subcatchment	Area (Ac.)	SWMM Imperv. (%)	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
EX-10	265.9	7%	105	222
EX10A	153.5	5%	46	103
EX-11	214.3	4%	54	129
EX-13	94.8	6%	36	85
EX-4A	44.2	8%	19	50
EX-5	26.2	8%	12	32
EX-7	152.8	5%	46	105
EX-7A	2.4	2%	1	5
EX-8	32.2	2%	5	23
EX-8A	6.6	2%	2	9
EX-9	139.3	8%	59	122
EX-9A	21.8	5%	7	19
TR-12	4.7	5%	2	9
TR-20	23.2	7%	10	32
TR-4	4.4	5%	2	9
TR-5	13.7	5%	5	17
TR-6	1.5	5%	1	4
TR-7	2.6	5%	1	5

STERLING RANCH EAST PRELIMINARY PLAN NO. 1
Pre-Developed Surface Routing

Design Point	Peak Runoff 5 yr. (CFS)	Peak Runoff 100 yr. (CFS)
DP4	46	105
DP4A	1	5
DP5	5	23
DP5A	2	9
DP6	59	122
DP6A	7	19
DP7	110	249
DP56	60	160
DPEX-4A	19	50
DPEX-5	12	32

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
SUB-BASIN BOUNDARY	
SAND CREEK EAST FORK BASIN LINE	
DESIGN POINT	4
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
EXISTING STORM SEWER	
FEMA 100-YR FLOODPLAIN	

N

200 100 0 200 400

SCALE: 1" = 200'

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PRELIMINARY PLAN NO. 1
PRELIMINARY DRAINAGE REPORT
PRE-DEVELOPMENT DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE 4-1-22
DRAWN BY	MAW	(H) 1"= 200'	SHEET 3 OF 6
CHECKED BY		(V) 1"= N/A	JOB NO. 1183.22

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS

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UTILITY NOTIFICATION CENTER OF COLORADO
IT'S THE LAW

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NO.	REVISION	DATE

REVIEW:

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

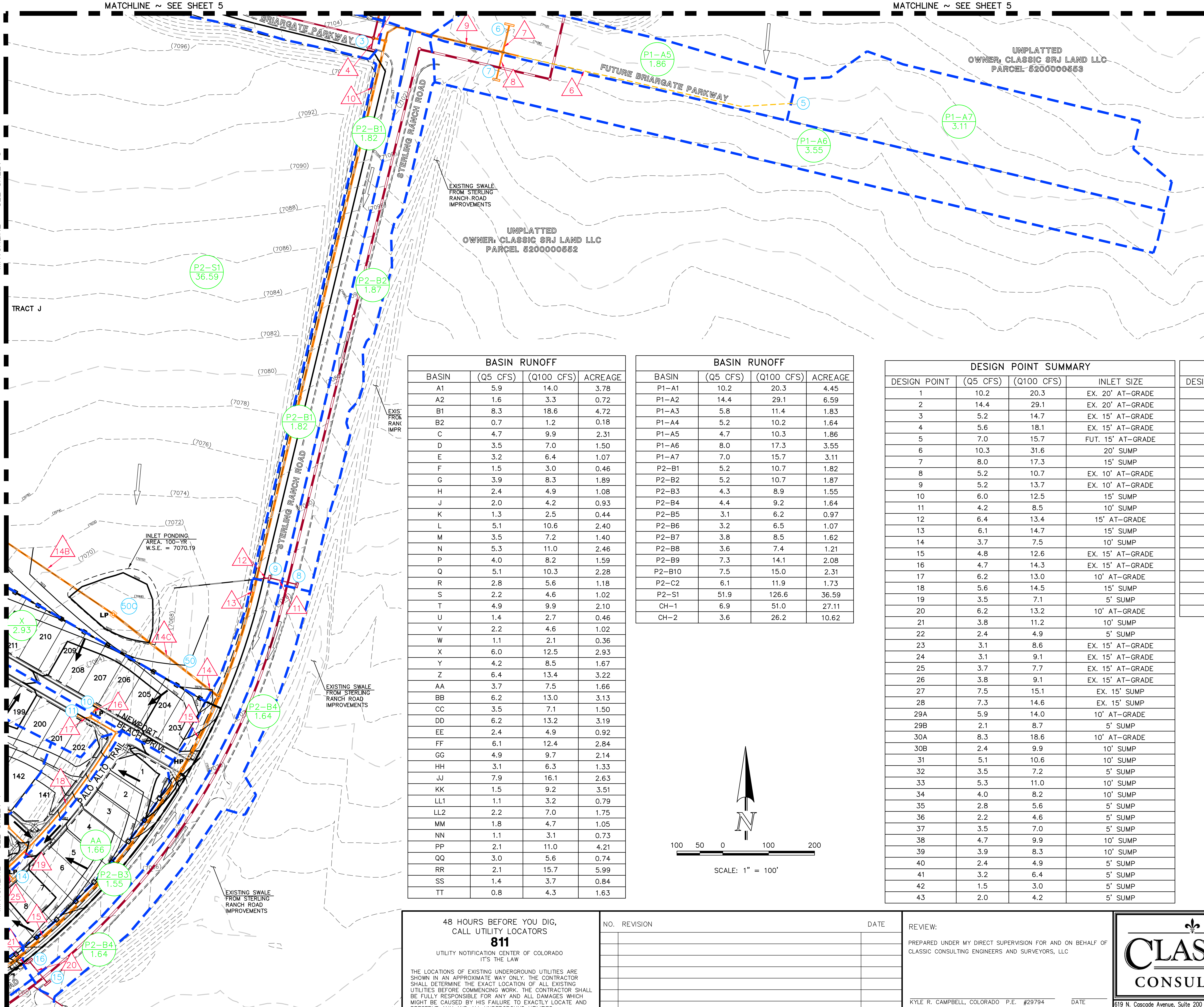
KYLE R. CAMPBELL, COLORADO P.E. #29794 DATE

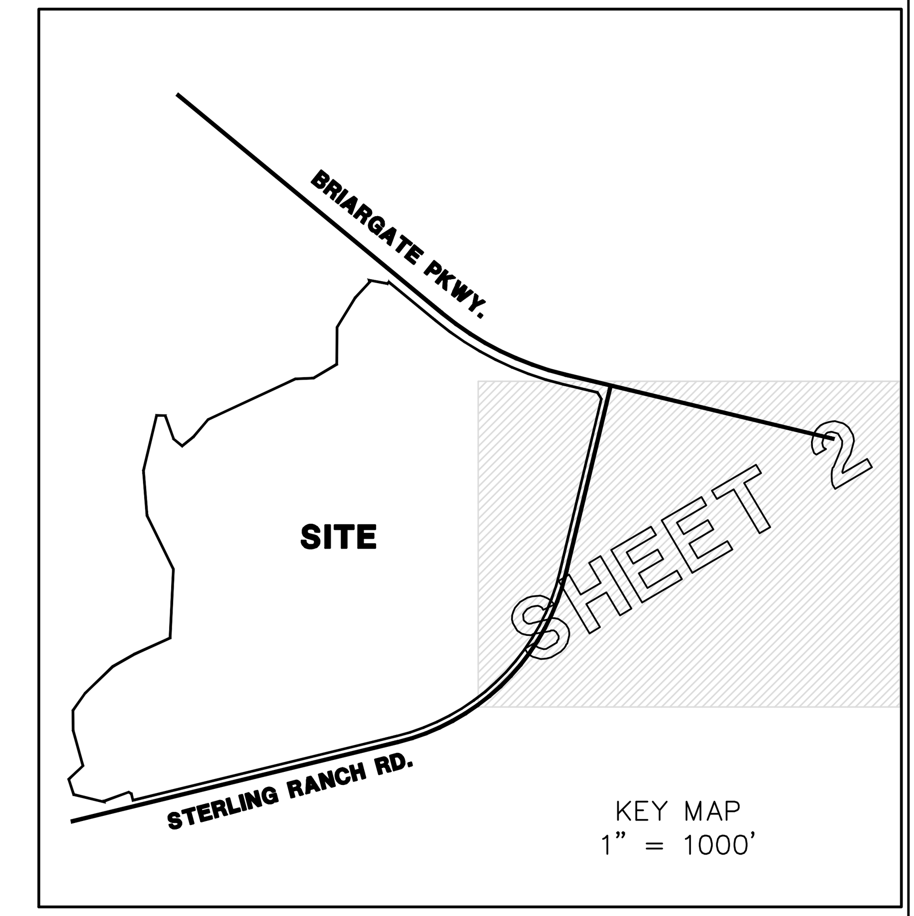
CLASSIC CONSULTING
619 N. Cascade Avenue, Suite 200 (719)785-0790
Colorado Springs, Colorado 80903 (719)785-0799(Fax)

STERLING RANCH EAST FILING NO. 1

FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS DRAINAGE MAP

DESIGNED BY	MAL	SCALE		DATE	11/04/22
DRAWN BY	MAL	(H) 1"= 100'		SHEET 1 OF 5	
CHECKED BY		(V) 1"= N/A		JOB NO.	1183.30





KEY MAP
1" = 1000'

SCALE: 1" = 100'

BASIN RUNOFF

BASIN	(Q5 CFS)	(Q100 CFS)	ACREAGE
A1	5.9	14.0	3.78
A2	1.6	3.3	0.72
B1	8.3	18.6	4.72
B2	0.7	1.2	0.18
C	4.7	9.9	2.31
D	3.5	7.0	1.50
E	3.2	6.4	1.07
F	1.5	3.0	0.46
G	3.9	8.3	1.89
H	2.4	4.9	1.08
J	2.0	4.2	0.93
K	1.3	2.5	0.44
L	5.1	10.6	2.40
M	3.5	7.2	1.40
N	5.3	11.0	2.46
P	4.0	8.2	1.59
Q	5.1	10.3	2.28
R	2.8	5.6	1.18
S	2.2	4.6	1.02
T	4.9	9.9	2.10
U	1.4	2.7	0.46
V	2.2	4.6	1.02
W	1.1	2.1	0.36
X	6.0	12.5	2.93
Y	4.2	8.5	1.67
Z	6.4	13.4	3.22
AA	3.7	7.5	1.66
BB	6.2	13.0	3.13
CC	3.5	7.1	1.50
DD	6.2	13.2	3.19
EE	2.4	4.9	0.92
FF	6.1	12.4	2.84
GG	4.9	9.7	2.14
HH	3.1	6.3	1.33
JJ	7.9	16.1	2.63
KK	1.5	9.2	3.51
LL1	1.1	3.2	0.79
LL2	2.2	7.0	1.75
MM	1.8	4.7	1.05
NN	1.1	3.1	0.73
PP	2.1	11.0	4.21
QQ	3.0	5.6	0.74
RR	2.1	15.7	5.99
SS	1.4	3.7	0.84
TT	0.8	4.3	1.63

BASIN RUNOFF

BASIN	(Q5 CFS)	(Q100 CFS)	ACREAGE
P1-A1	10.2	20.3	4.45
P1-A2	14.4	29.1	6.59
P1-A3	5.8	11.4	1.83
P1-A4	5.2	10.2	1.64
P1-A5	4.7	10.3	1.86
P1-A6	8.0	17.3	3.55
P1-A7	7.0	15.7	3.11
P2-B1	5.2	10.7	1.82
P2-B2	5.2	10.7	1.87
P2-B3	4.3	8.9	1.55
P2-B4	4.4	9.2	1.64
P2-B5	3.1	6.2	0.97
P2-B6	3.2	6.5	1.07
P2-B7	3.8	8.5	1.62
P2-B8	3.6	7.4	1.21
P2-B9	7.3	14.1	2.08
P2-B10	7.5	15.0	2.31
P2-C2	6.1	11.9	1.73
P2-S1	51.9	126.6	36.59
CH-1	6.9	51.0	27.11
CH-2	3.6	26.2	10.62

DESIGN POINT SUMMARY

DESIGN POINT	(Q5 CFS)	(Q100 CFS)	INLET SIZE
1	10.2	20.3	EX. 20' AT-GRADE
2	14.4	29.1	EX. 20' AT-GRADE
3	5.2	14.7	EX. 15' AT-GRADE
4	5.6	18.1	EX. 15' AT-GRADE
5	7.0	15.7	FUT. 15' AT-GRADE
6	10.3	31.6	20' SUMP
7	8.0	17.3	15' SUMP
8	5.2	10.7	EX. 10' AT-GRADE
9	5.2	13.7	EX. 10' AT-GRADE
10	6.0	12.5	15' SUMP
11	4.2	8.5	10' SUMP
12	6.4	13.4	15' AT-GRADE
13	6.1	14.7	15' SUMP
14	3.7	7.5	10' SUMP
15	4.8	12.6	EX. 15' AT-GRADE
16	4.7	14.3	EX. 15' AT-GRADE
17	6.2	13.0	10' AT-GRADE
18	5.6	14.5	15' SUMP
19	3.5	7.1	5' SUMP
20	6.2	13.2	10' AT-GRADE
21	3.8	11.2	10' SUMP
22	2.4	4.9	5' SUMP
23	3.1	8.6	EX. 15' AT-GRADE
24	3.1	9.1	EX. 15' AT-GRADE
25	3.7	7.7	EX. 15' AT-GRADE
26	3.8	9.1	EX. 15' AT-GRADE
27	7.5	15.1	EX. 15' SUMP
28	7.3	14.6	EX. 15' SUMP
29A	5.9	14.0	10' AT-GRADE
29B	2.1	8.7	5' SUMP
30A	8.3	18.6	10' AT-GRADE
30B	2.4	9.9	10' SUMP
31	5.1	10.6	10' SUMP
32	3.5	7.2	5' SUMP
33	5.3	11.0	10' SUMP
34	4.0	8.2	10' SUMP
35	2.8	5.6	5' SUMP
36	2.2	4.6	5' SUMP
37	3.5	7.0	5' SUMP
38	4.7	9.9	10' SUMP
39	3.9	8.3	10' SUMP
40	2.4	4.9	5' SUMP
41	3.2	6.4	5' SUMP
42	1.5	3.0	5' SUMP
43	2.0	4.2	5' SUMP

DESIGN POINT SUMMARY

DESIGN POINT	(Q5 CFS)	(Q100 CFS)	INLET SIZE
44	1.3	2.5	5' SUMP
45	2.2	4.6	5' SUMP
46	1.4	2.7	5' SUMP
47A	5.1	10.3	10' AT-GRADE
47B	5.3	13.0	10' SUMP
48	1.1	2.1	5' SUMP
50	51.9	126.6	FUTURE STORM
50B	3.6	26.6	TYPE C INLET
50C	3.6	26.6	TYPE C INLET
51	7.9	16.1	FUTURE STORM
52	1.8	4.7	TYPE C INLET
53	1.1	3.1	TYPE C INLET
54	1.4	3.7	TYPE C INLET
55A	1.1	3.2	TYPE C INLET
55B	2.2	7.0	TYPE C INLET
56	0.8	4.3	FUTURE STORM
57	2.1	11.0	FUTURE STORM
58	3.0	5.6	FUTURE STORM
59	1.5	9.2	FUTURE STORM
60	232.0	520.5	PROPOSED POND 14A

LEGEND

- EXISTING GROUND CONTOUR (7000)
- PROPOSED FINISHED GRADE CONTOURS 7000
- SUBDIVISION BOUNDARY
- 100-YR FLOODPLAIN LIMITS
- EXISTING STORM SEWER
- EXISTING STORM INLET
- PROPOSED STORM SEWER
- PROPOSED STORM INLET
- FUTURE STORM SEWER
- PROPOSED BASIN BOUNDARY
- BASIN IDENTIFIER / AREA IN ACRES — D 1.41
- DIRECTION OF DRAINAGE
- DESIGN POINT — 1
- PIPE RUN — 1
- EXISTING RIPRAP
- PROPOSED RIPRAP

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NO.	REVISION	DATE

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KYLE R. CAMPBELL, COLORADO P.E. #29794 DATE

CLASSIC CONSULTING
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799(Fax)

STERLING RANCH EAST FILING NO. 1

FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS DRAINAGE MAP

DESIGNED BY MAL	SCALE	DATE	11/04/22
DRAWN BY MAL	(H) 1"= 100'	SHEET	2 OF 5
CHECKED BY	(V) 1"= N/A	JOB NO.	1183.30

SCALE: 1" = 100'

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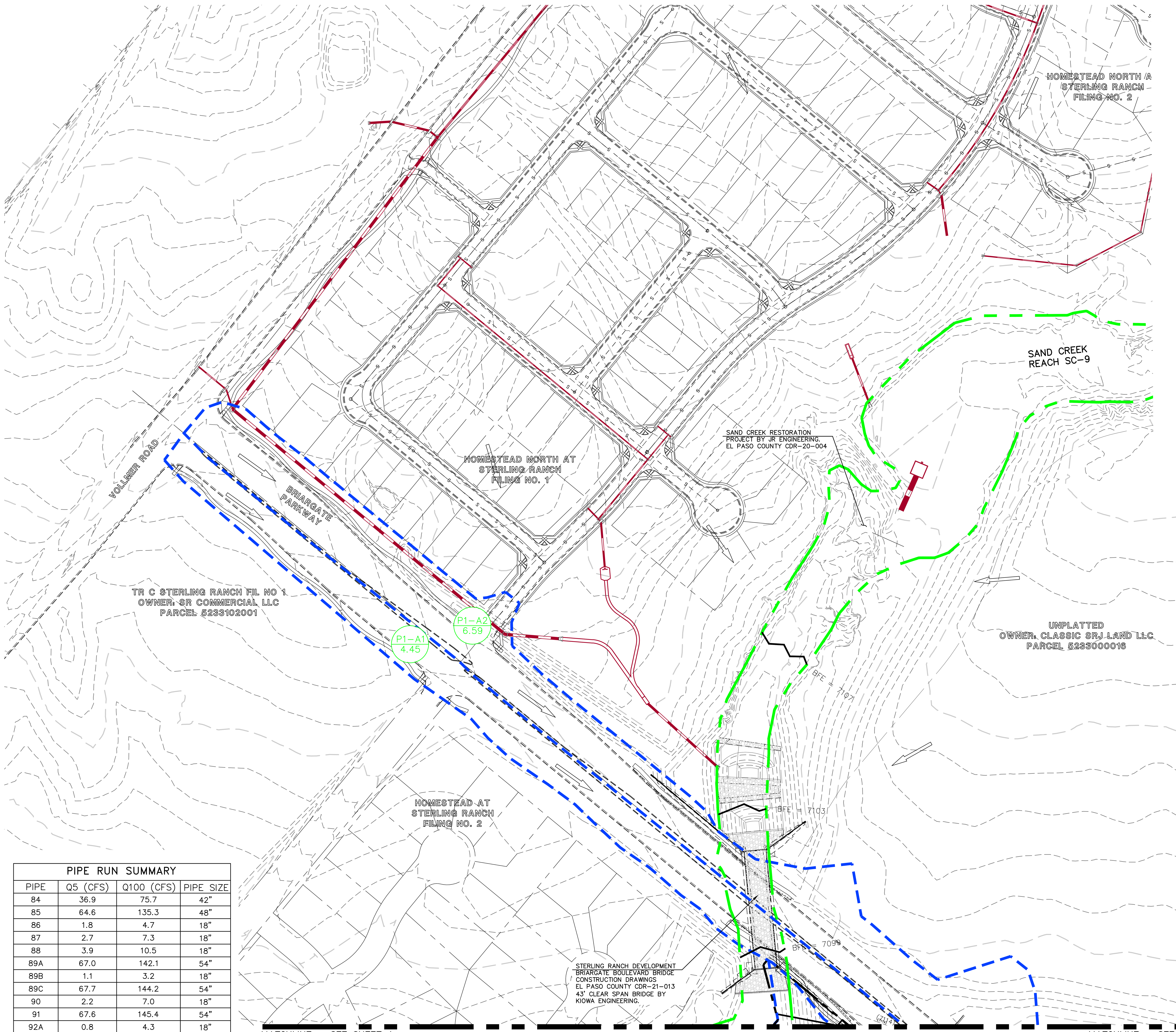
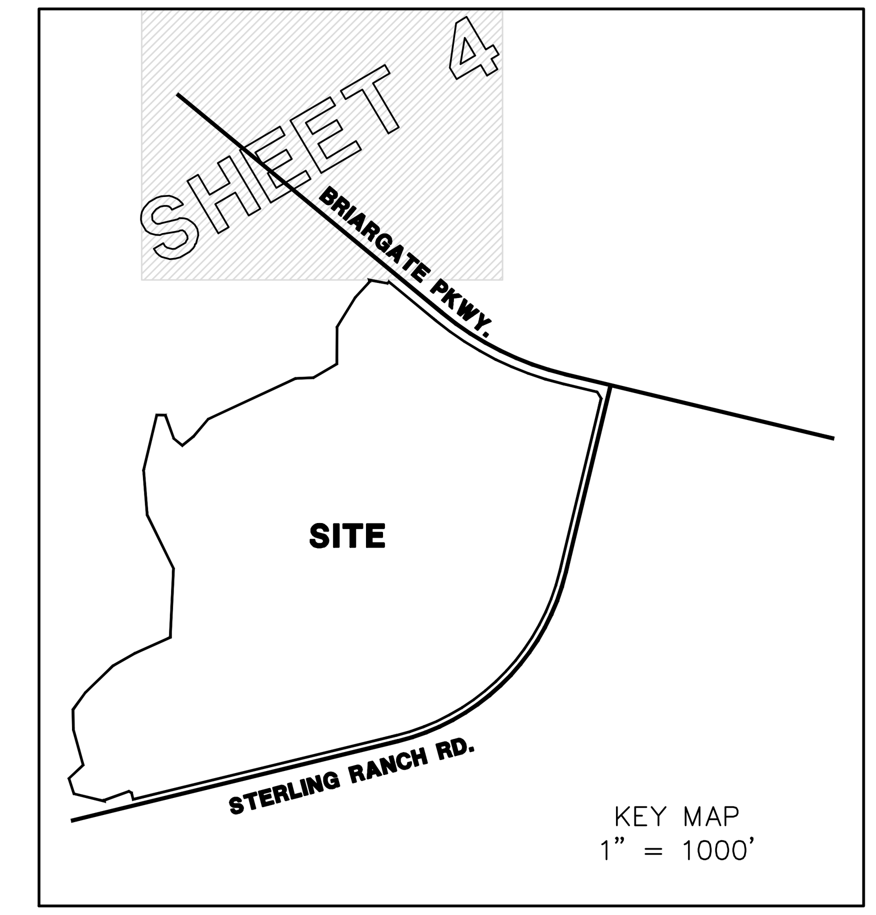
DEVELOPED CONDITIONS DRAINAGE MAP

DESIGNED BY	MAL	SCALE	DATE	11/04/22
DRAWN BY	MAL	(H) 1"= 100'	SHEET	3 OF 5
CHECKED BY		(V) 1"= N/A	JOB NO.	1183.30

PIPE RUN SUMMARY

PIPE	Q5 (CFS)	Q100 (CFS)	PIPE SIZE
1	13.2	19.7	EX. 30"
2	23.4	36.6	EX. 30"
3	5.6	13.1	24"
4	5.2	11.7	EX. 18"
5	33.0	58.6	36"
6	7.0	12.1	24"
7	10.3	31.6	30"
8	8.0	17.3	24"
9	23.3	56.0	36"
10	52.3	105.0	42"
11	4.8	7.3	EX. 18"
12	9.6	15.6	EX. 18"
13	57.2	112.2	48"
14	51.9	126.6	48"
14B	3.6	26.6	30"
14C	7.2	53.2	36"
15	108.1	236.5	60"
16	6.0	12.5	24"
17	4.2	8.5	18"
18	9.7	20.0	24"
19	15.7	30.4	30"
20	4.8	10.7	EX. 18"
21	9.5	22.2	18"
22	112.8	247.8	60"
23	6.4	11.1	18"
24	6.1	14.7	24"
25	3.7	7.5	18"
26	25.2	52.0	36"
27	29.9	58.8	36"
28	5.4	8.1	18"
29	5.6	14.5	24"
30	3.5	7.1	18"
31	38.6	79.4	42"
32	5.4	8.1	18"
33	6.0	15.6	24"
34	3.8	11.2	24"
35	2.4	4.9	18"
36A	48.6	100.4	48"
36B	54.7	112.7	48"
37	3.1	8.3	EX. 18"
38	6.2	16.9	EX. 18"
39A	114.9	254.6	60"
39B	162.0	351.4	72"
40	3.7	7.6	EX. 18"
41	7.5	16.2	EX. 18"
42	166.2	364.8	72"
43	7.3	14.6	EX. 24"
44	14.8	29.7	EX. 24"
45	5.2	8.4	18"
46	6.4	9.6	18"
47	11.6	18.0	24"
48	2.1	8.7	18"
49	2.4	9.9	18"
50	16.1	36.5	30"
51	3.5	7.0	18"
52	4.7	9.9	18"
53	23.3	51.1	36"
54	3.9	8.3	18"
55	2.4	4.9	18"
56	6.3	13.1	24"
57	23.0	50.5	36"
58	1.5	3.0	18"
59	23.8	52.1	36"
60	3.2	6.4	18"
61	26.1	56.6	42"
62	2.0	4.2	18"
63	1.3	2.5	18"
64	28.3	61.1	42"
65	2.2	4.6	18"
66	1.4	2.7	18"
67	30.7	65.8	42"
68	5.1	10.6	18"
69	3.5	7.2	18"
70	8.1	16.8	24"
71	5.3	11.0	18"
72	4.0	8.2	18"
73	8.8	18.1	24"
74	16.5	34.1	30"
75	4.6	6.9	18"
76	20.9	40.4	30"
77	2.8	5.6	18"
78	2.2	4.6	18"
79	11.2	23.3	24"
80	31.4	62.3	42"
81	5.3	13.0	24"
82	1.1	2.1	18"
83	6.2	14.7	24"





KEY MAP
1" = 1000'

PIPE RUN SUMMARY

PIPE	Q5 (CFS)	Q100 (CFS)	PIPE SIZE
84	36.9	75.7	42"
85	64.6	135.3	48"
86	1.8	4.7	18"
87	2.7	7.3	18"
88	3.9	10.5	18"
89A	67.0	142.1	54"
89B	1.1	3.2	18"
89C	67.7	144.2	54"
90	2.2	7.0	18"
91	67.6	145.4	54"
92A	0.8	4.3	18"
92B	2.9	15.2	24"
93	3.0	5.6	18"
94	5.4	20.0	24"
95	71.1	159.8	54"
96	1.5	9.2	18"
97	11.7	162.0	EX. 54"
98	3.0	54.2	48"
100	7.9	16.1	24"

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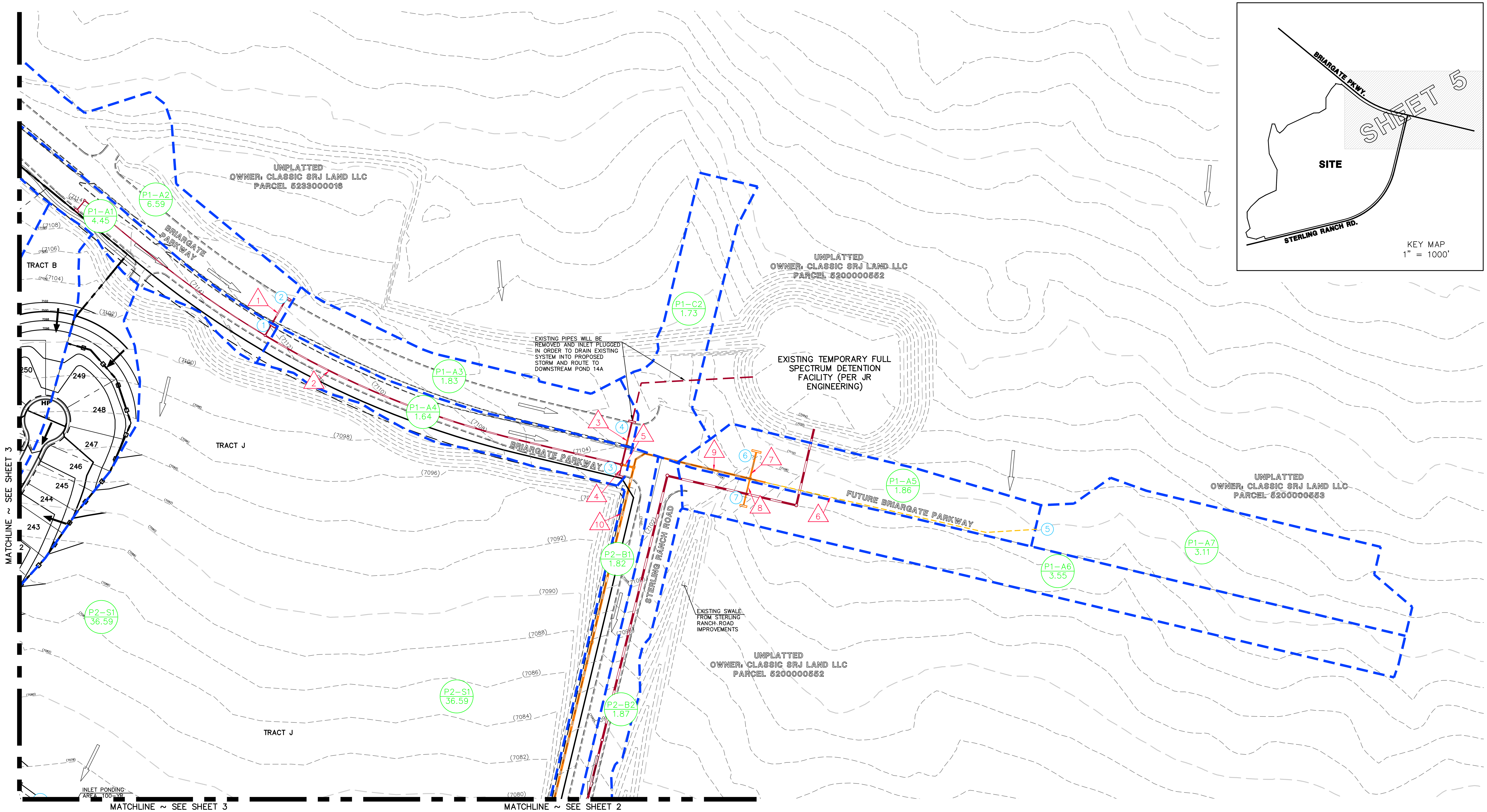
(719)785-0799(Fax)

STERLING RANCH EAST FILING NO. 1

FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS DRAINAGE MAP

DESIGNED BY	MAL	SCALE	DATE 11/04/22
DRAWN BY	MAL	(H) 1"=	SHEET 4 OF 5
CHECKED BY		(V) 1"=	JOB NO. 1183.30



LEGEND

EXISTING GROUND CONTOUR	(7000)
PROPOSED FINISHED GRADE CONTOURS	7000
SUBDIVISION BOUNDARY	
100-YR FLOODPLAIN LIMITS	
EXISTING STORM SEWER	
EXISTING STORM INLET	
PROPOSED STORM SEWER	
PROPOSED STORM INLET	
FUTURE STORM SEWER	
PROPOSED BASIN BOUNDARY	
BASIN IDENTIFIER / AREA IN ACRES	D 1.41
DIRECTION OF DRAINAGE	
DESIGN POINT	1
PIPE RUN	1
EXISTING RIPRAP	
PROPOSED RIPRAP	

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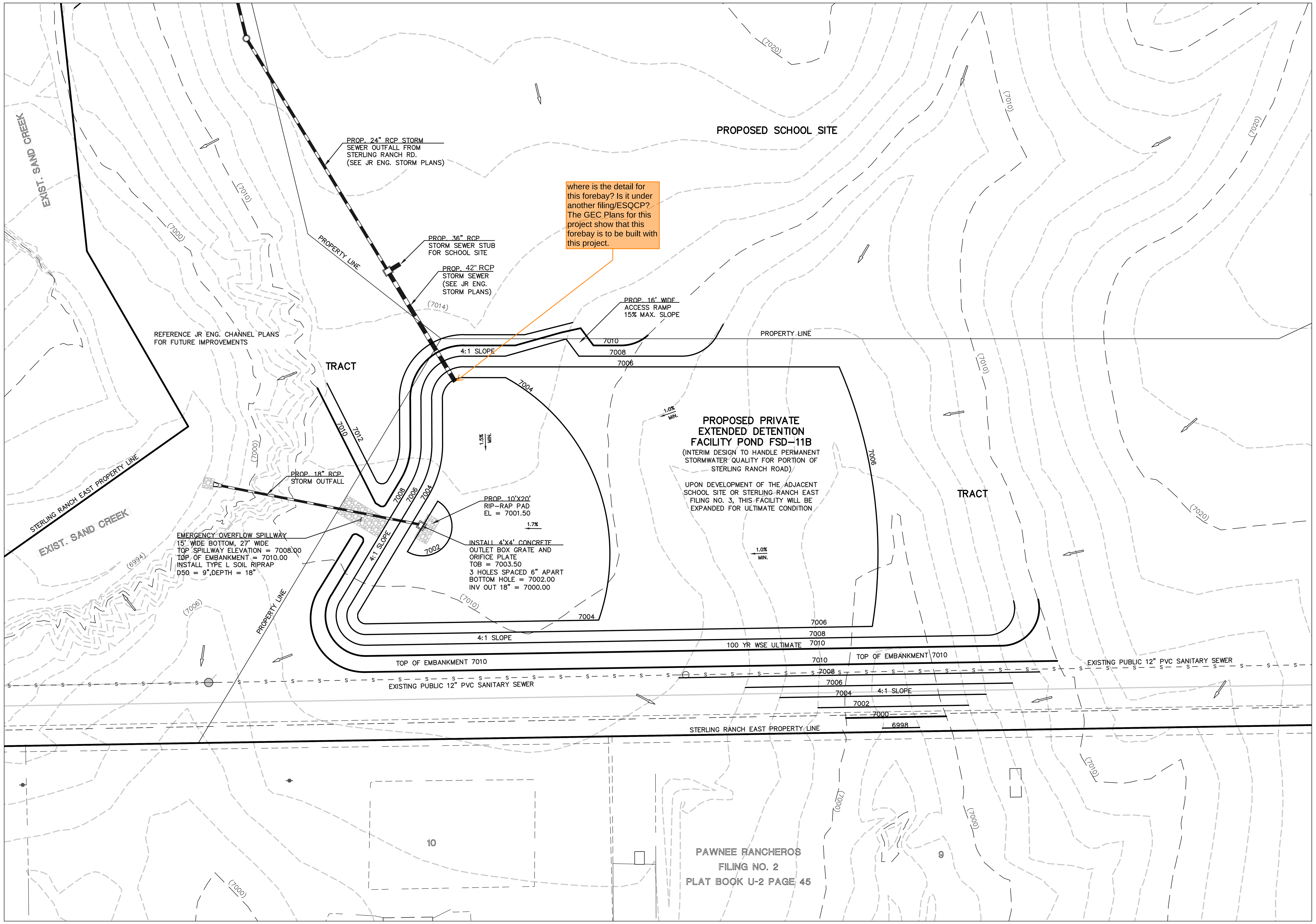
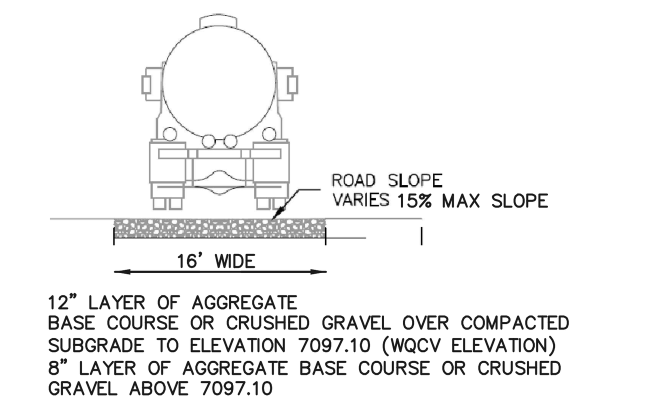
DEVELOPED CONDITIONS DRAINAGE MAP

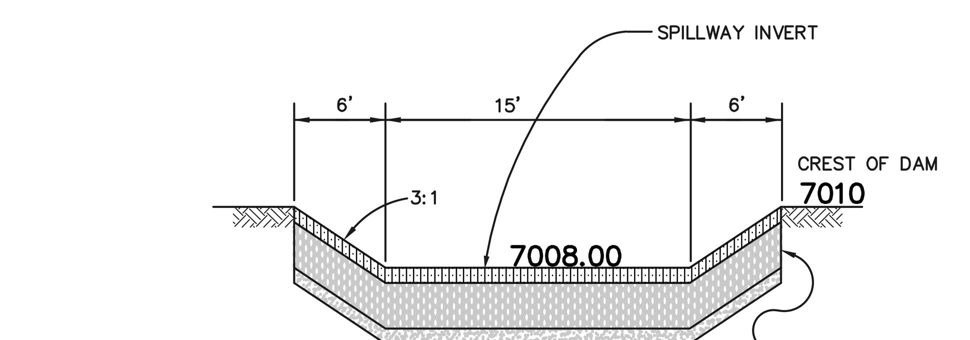
DESIGNED BY	MAL	SCALE	DATE 11/04/22
DRAWN BY	MAL	(H) 1"= 100'	SHEET 5 OF 5
CHECKED BY		(V) 1"= N/A	JOB NO. 1183.30



POND FSD-11B (INTERIM DESIGN)



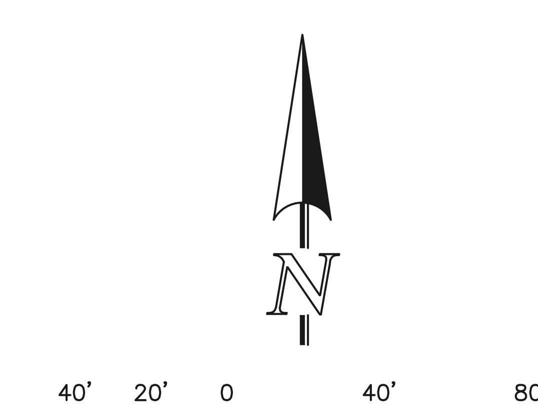
ACCESS ROAD



EMERGENCY SPILLWAY SECTION

SCALE: N.T.S.

100 YEAR WATER SURFACE = 7004.98 (PONDING PER UD-DETENTION)



SCALE: 1" = 40'

BOUNDARY LINE

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MARC A. WHORTON, COLORADO P.E. #37155 DATE

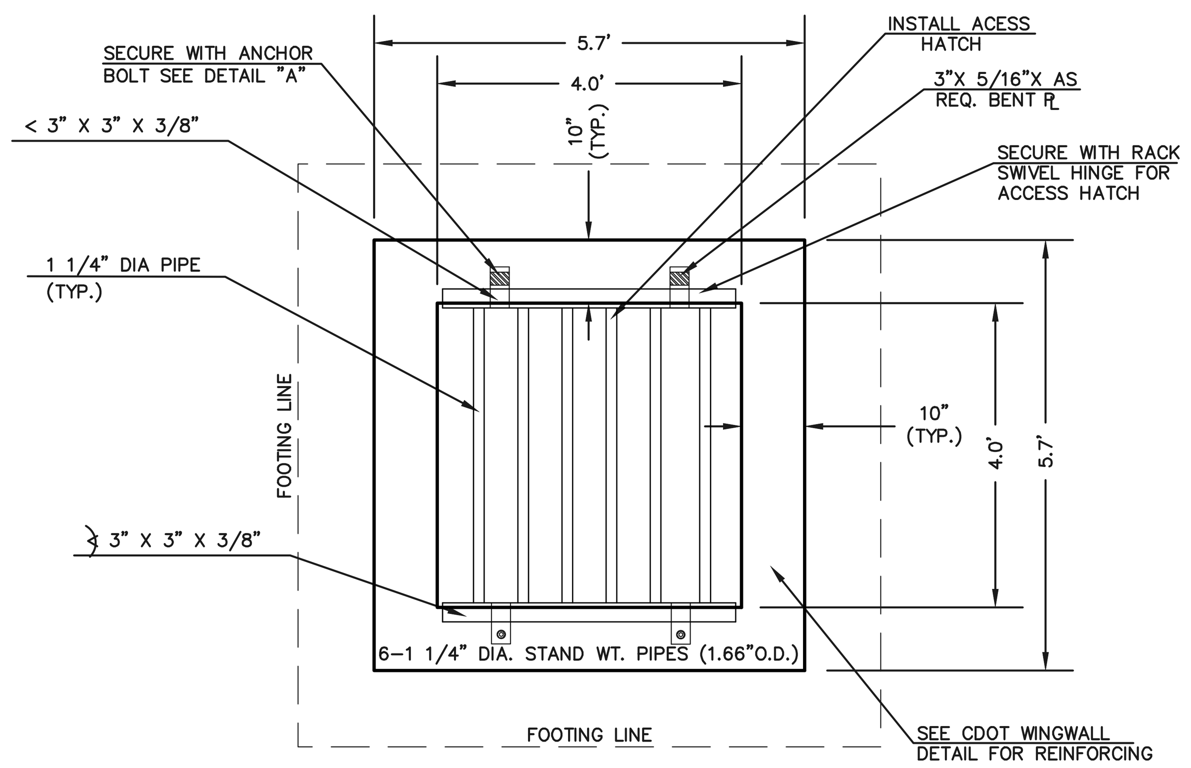
CLASSIC CONSULTING ENGINEERS & SURVEYORS
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799(Fax)

STERLING RANCH ROAD & BRIARGATE PARKWAY STORM PLANS
PRIVATE POND FSD-11B (INTERIM DESIGN)
POND PLAN

DESIGNED BY	MAW	SCALE		DATE	4/5/23
DRAWN BY	ESO	(H) 1"= 40'		SHEET	OF
CHECKED BY		(V) 1"= N/A		JOB NO.	25188.03

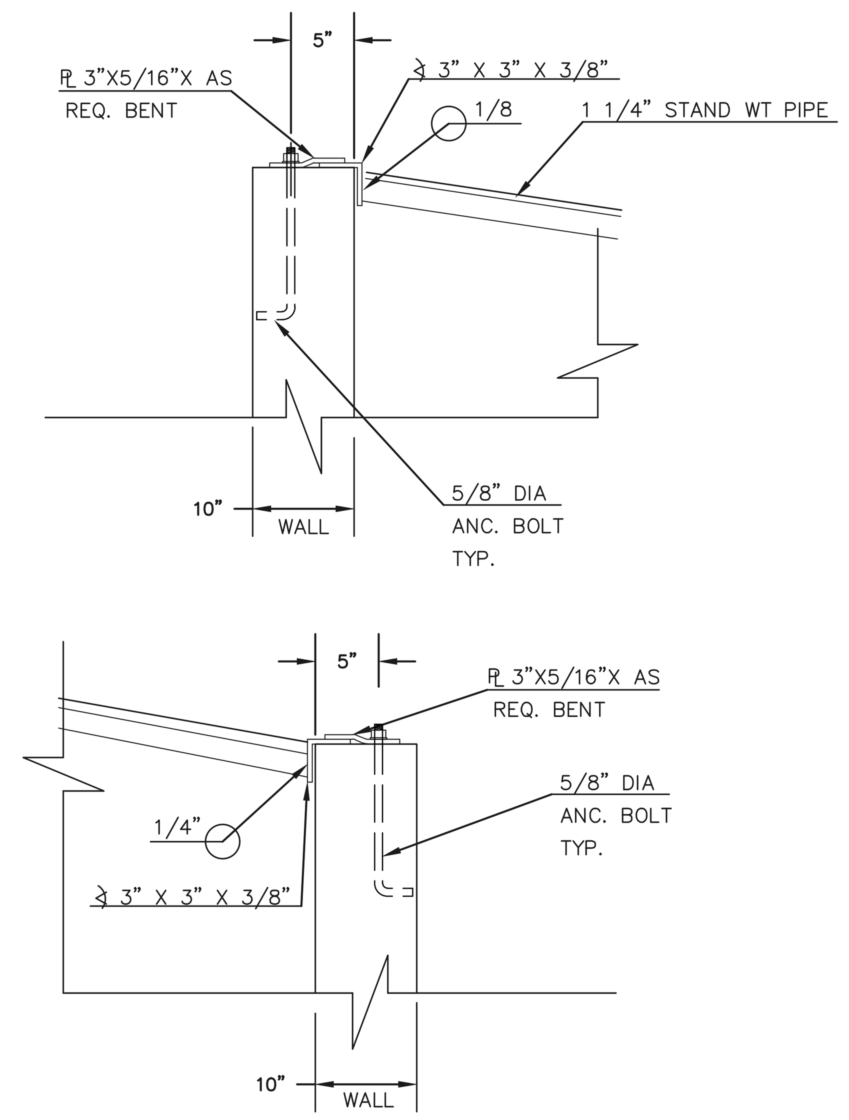
NOTES:

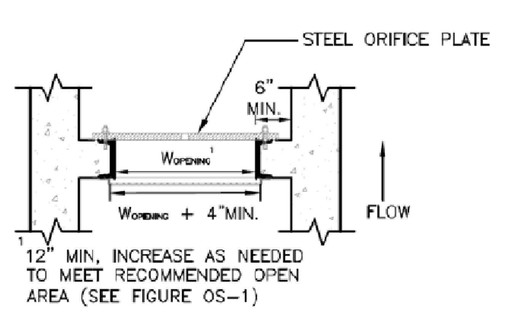
1. WELD PLATES MAY BE SUBSTITUTED FOR PIPE EMBEDDMENT.
2. DESIGN CRITERIA SHALL BE IN ACCORDANCE WITH AASHTO STANDARDS.
3. HANDRAIL DESIGN SHALL BE COMPATIBLE WITH THE DESIGN OF THE WINGWALLS AND HEADWALLS.
4. RAILING POSTS SHALL BE SET TO NORMAL TO GRADE. RAILS SHALL RUN PARALLEL TO THE SLOPES OF TOPS OF THE WALLS.
5. ALL RAILS SHALL HAVE EXPANSION JOINTS SPACED AT 40'-0 MAX. JOINT ENDS SHALL BE FREE OF ANY SHARP EDGES OR CORNERS.



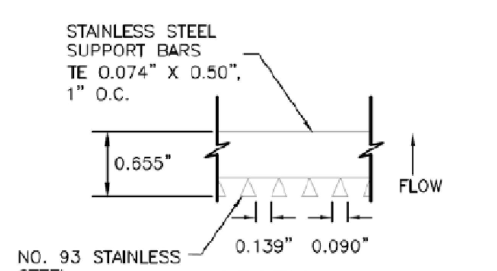
4'X4' OUTLET BOX OVERFLOW TRASH RACK

SCALE 1" = 2'





SECTION B
NTS



SECTION C
NTS

R VALUE = (NET OPEN AREA)/(GROSS RACK AREA) = 0.50

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Basin ID: POND FSD-11B (Interim)

Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	27.20	acres
Watershed Length =	1,750	ft
Watershed Length to Centroid =	800	ft
Watershed Slope =	0.027	ft/ft
Watershed Imperviousness =	10.00%	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 =	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) =	0.152	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.256	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.363	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.801	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.239	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.019	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.551	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.317	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.48 in.) =	5.500	acre-feet	3.48	inches
Approximate 2-yr Detention Volume =	0.163	acre-feet		
Approximate 5-yr Detention Volume =	0.256	acre-feet		
Approximate 10-yr Detention Volume =	0.531	acre-feet		
Approximate 25-yr Detention Volume =	0.742	acre-feet		
Approximate 50-yr Detention Volume =	0.776	acre-feet		
Approximate 100-yr Detention Volume =	1.004	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.152	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.104	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.748	acre-feet
Total Detention Basin Volume =	1.004	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 = 1.00 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)
Top of Micropool	--	0.00	--	--	--	525	0.012		
7004	--	2.00	--	--	--	23,357	0.536	23,882	0.548
7006	--	4.00	--	--	--	68,200	1.566	115,439	2.650
7008	--	6.00	--	--	--	111,935	2.570	295,574	6.785
7010	--	8.00	--	--	--	135,327	3.107	542,836	12.462
	--		--	--	--				

118333 MHFD-Detention_v4-06 - FSD-11B -Interim, Basin   4/14/2023, 9:55 AM

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: STERLING RANCH EAST PRELIMINARY PLAN NO. 1

Basin ID: POND FSD-11B (Interim)

Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.04	0.152	Orifice Plate
Zone 2 (EURV)	1.36	0.104	Orifice Plate
Zone 3 (100-year)	2.65	0.748	Weir&Pipe (Restrict)
Total (all zones)		1.004	

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 =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	1.50	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	6.00	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 (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)	1.22	1.38	1.38					

	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)

	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 =	1.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.50	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.30	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	11.14	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	5.57	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 =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A	feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

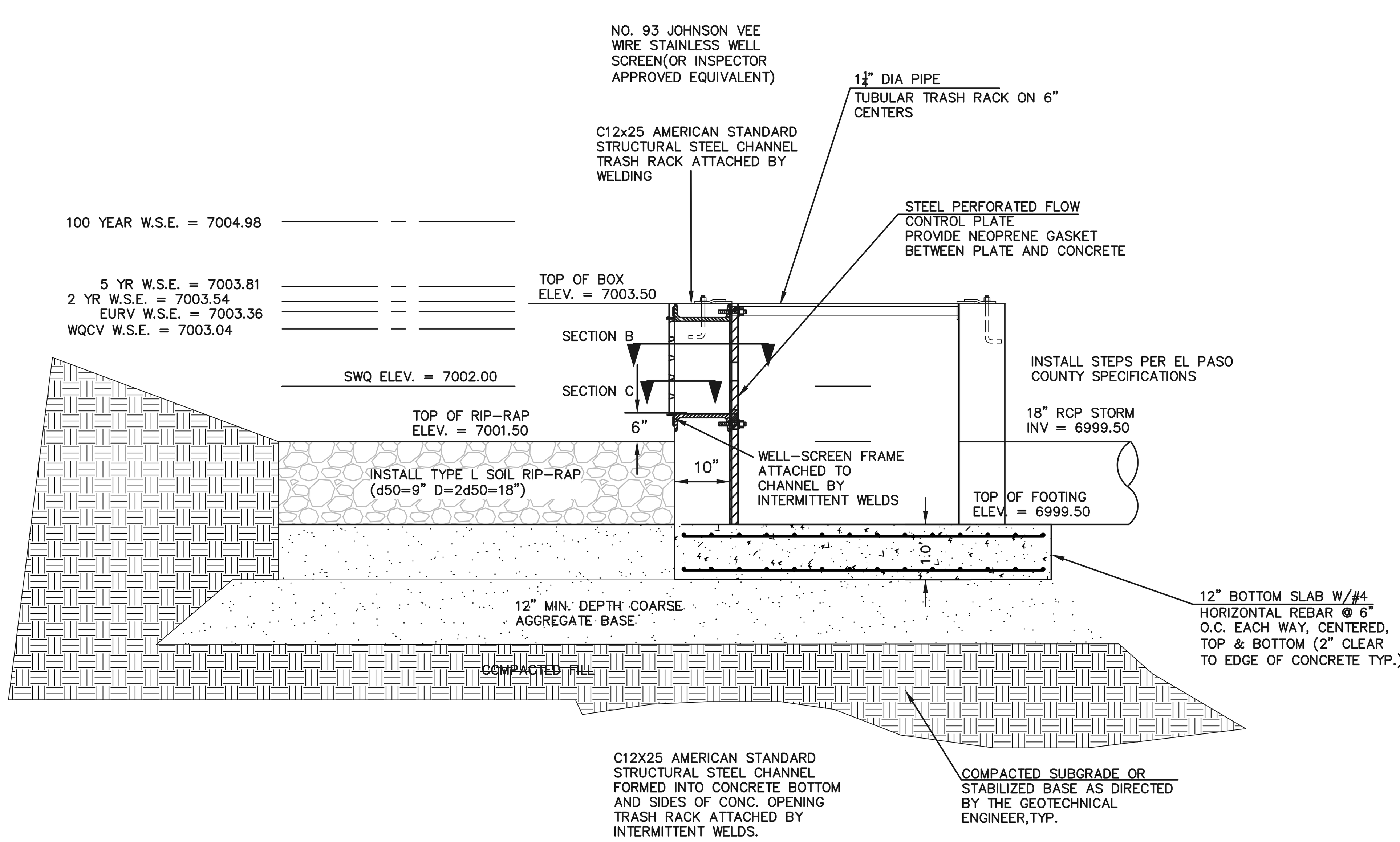
			Calculated Parameters for Spillway		
Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.81	feet
Spillway Crest Length =	15.00	feet	Stage at Top of Freeboard =	9.81	feet
Spillway End Slopes =	3.00	H:V	Basin Area at Top of Freeboard =	3.11	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	12.46	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).

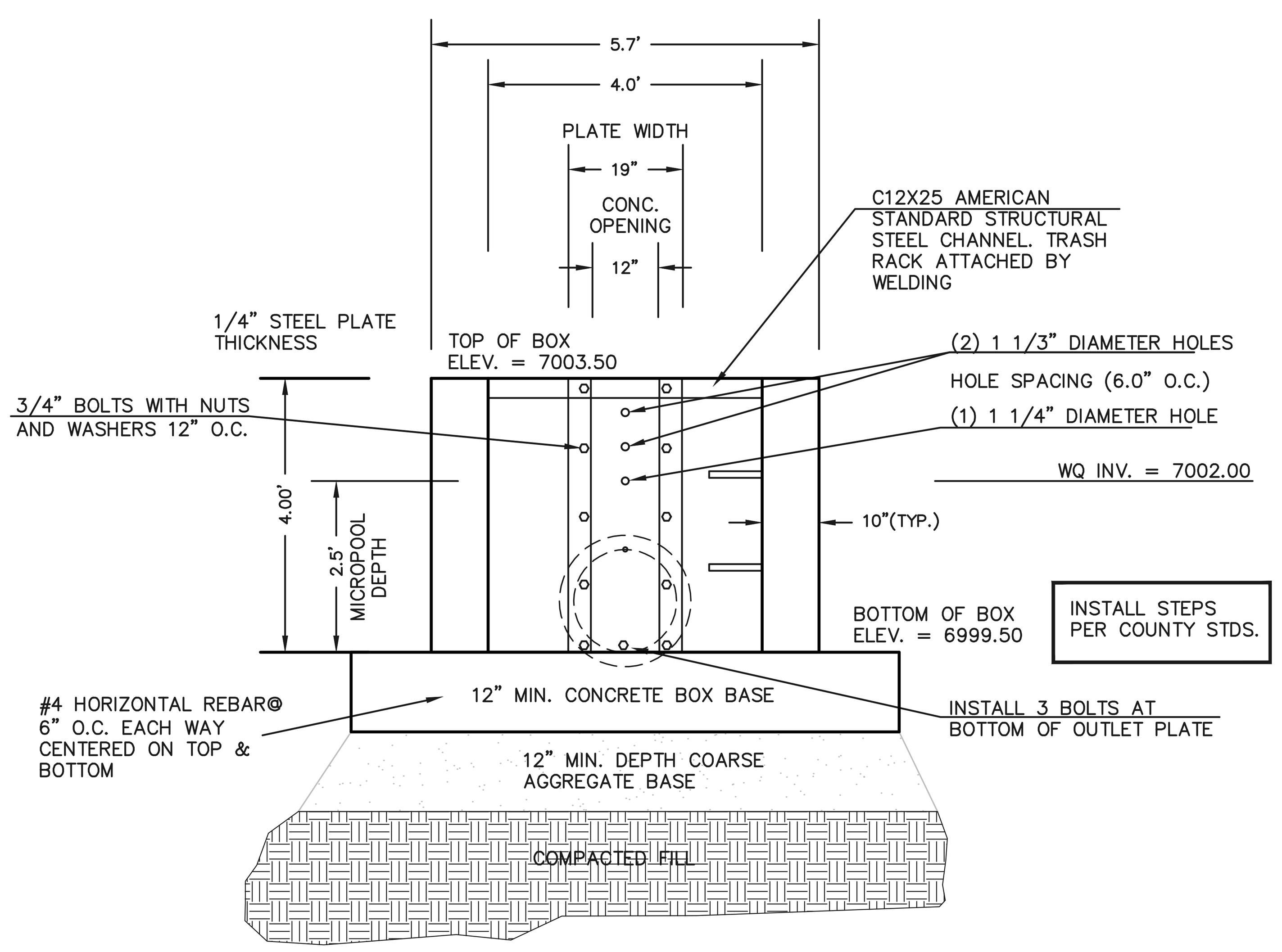
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.48
CUHP Runoff Volume (acre-ft) =	0.152	0.256	0.363	0.801	1.239	2.019	2.551	3.317	5.500
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.363	0.801	1.239	2.019	2.551	3.317	5.500
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.9	8.1	12.3	22.0	27.5	35.2	57.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.30	0.45	0.81	1.01	1.30	2.10
Peak Inflow Q (cfs) =	N/A	N/A	4.7	10.1	14.3	23.8	29.4	37.2	59.1
Peak Outflow Q (cfs) =	0.1	0.1	0.4	4.5	8.5	16.9	17.6	18.5	20.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.7	0.8	0.6	0.5	0.4
Structure Controlling Flow =	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	0.02	0.4	0.7	1.5	1.6	1.6	1.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	41	52	59	53	47	40	36	32	22
Time to Drain 99% of Inflow Volume (hours) =	44	55	64	61	59	55	52	49	43
Maximum Ponding Depth (ft) =	1.04	1.36	1.54	1.81	1.97	2.25	2.51	2.98	4.08
Area at Maximum Ponding Depth (acres) =	0.28	0.37	0.42	0.48	0.53	0.66	0.80	1.04	1.61
Maximum Volume Stored (acre-ft) =	0.154	0.259	0.329	0.446	0.532	0.692	0.889	1.311	2.777

118333 MHFD-Detention_v4-06 - FSD-11B -Interim, Outlet Structure   4/14/2023, 9:54 AM



4'X4' OUTLET BOX SECTION A

SCALE 1" = 2'



4X4' OUTLET BOX ORIFICE PLATE

SCALE 1" = 2'

(ALL MATERIALS PER EL PASO COUNTY SPECIFICATIONS)

ORIFICE PLATE NOTES:

1. INSTALL HOLES AS SHOWN ON DETAIL TO LEFT.
2. PROVIDE GASKET MATERIAL BETWEEN THE ORIFICE PLATE AND CONCRETE

EURV AND WQCV TRASH RACKS:

3. WELL-SCREEN TRASH RACKS SHALL BE STAINLESS STEEL AND SHALL BE ATTACHED BY INTERMITTENT WELDS ALONG THE EDGE OF THE MOUNTING FRAME.
4. BAR GRATE TRASH RACKS SHALL BE ALUMINUM AND SHALL BE BOLTED USING STAINLESS STEEL HARDWARE.
5. STRUCTURAL DESIGN OF TRASH RACKS SHALL BE BASED ON FULL HYDROSTATIC HEAD WITH ZERO HEAD DOWNSTREAM OF RACK

OVERFLOW TRASH RACKS:

1. ALL TRASH RACKS SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH HINGED AND LOCKABLE OR BOLTABLE ACCESS PANELS
2. TRASH RACKS SHALL BE STAINLESS STEEL, ALUMINUM, OR STEEL. STEEL TRASH RACKS SHALL BE HOT DIP GALVANIZED AND MAY BE HOT POWDER COATED AFTER GALVANIZING.
3. TRASH RACKS SHALL BE DESIGNED SUCH THAT THE DIAGONAL DIMENSION OF EACH OPENING IS SMALLER THAN THE DIAMETER OF THE OUTLET PIPE.
4. STRUCTURAL DESIGN OF THE TRASH RACKS SHALL BE BASED ON FULL HYDROSTATIC HEAD WITH ZERO HEAD DOWNSTREAM OF THE RACK.

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
811
UTILITY NOTIFICATION CENTER OF COLORADO
IT'S THE LAW

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NO.	REVISION	DATE

REVIEW:

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

MARC A. WHORTON, COLORADO P.E. #37155   DATE

CLASSIC CONSULTING
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799(Fax)

STERLING RANCH ROAD & BRIARGATE PARKWAY STORM PLANS
PRIVATE POND FSD-11B (INTERIM DESIGN)
OUTLET STRUCTURE DETAILS

DESIGNED BY	MAW	SCALE		DATE	4/5/23
DRAWN BY	MAW	(H) 1"= N/A		SHEET	OF
CHECKED BY		(V) 1"= N/A		JOB NO.	25188.03

Appendix E
Drainage Maps

STERLING RANCH ROAD & BRIARGATE PARKWAY
WATER QUALITY DRAINAGE MAP

POND 14A

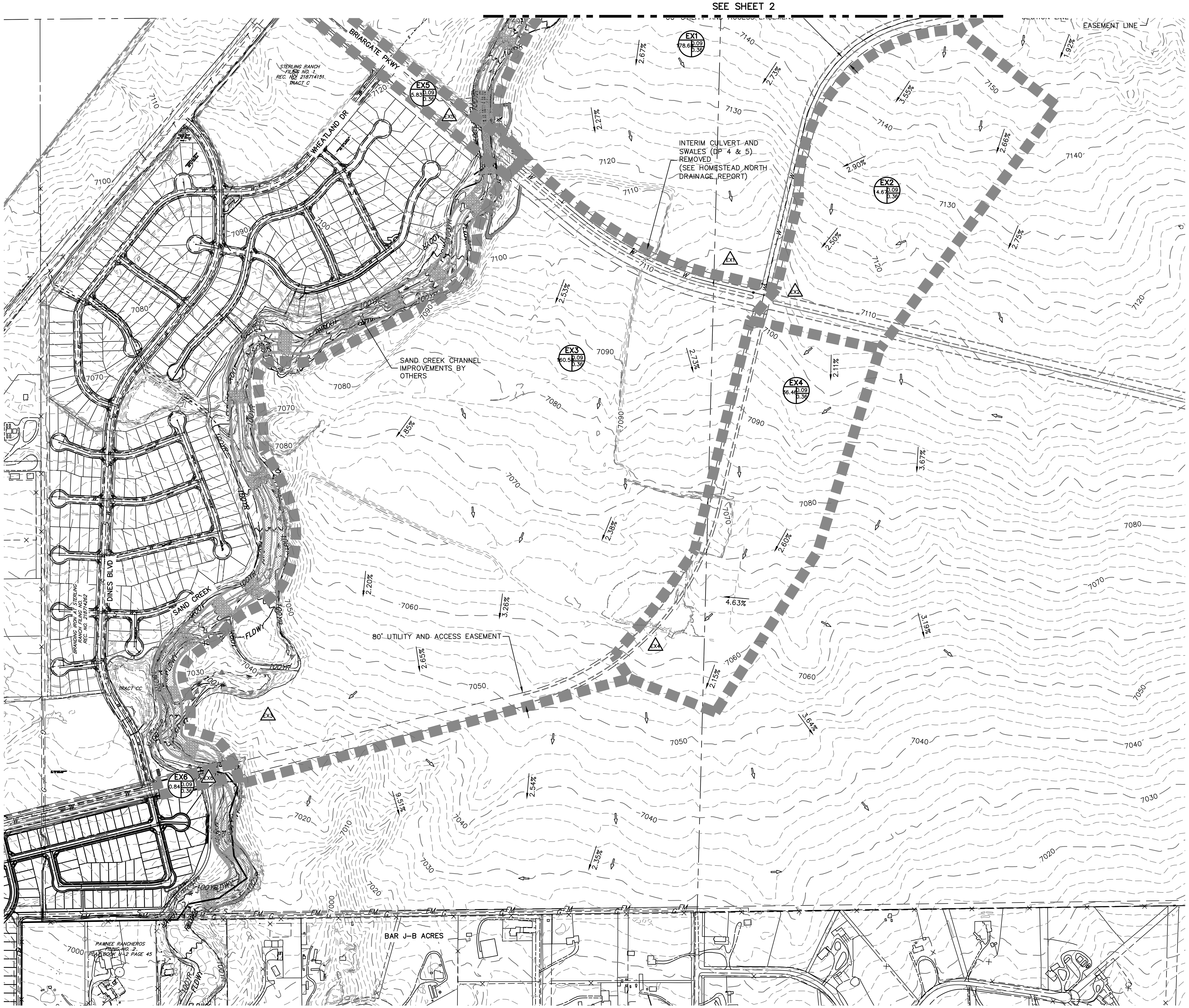
INTERIM POND 11B

200 100 0 200 400
ORIGINAL SCALE: 1" = 200'

STERLING RANCH ROAD &
BRIARGATE PARKWAY
WATER QUALITY DRAINAGE MAP
JOB NO. 25188.03
05/08/23
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com



LEGEND:

- PROPOSED STORM SEWER
- 5000 FUTURE RD MAJOR CONTOUR
- FUTURE RD MINOR CONTOUR
- 5000 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 5000 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- DRAINAGE BASIN
- A = BASIN DESIGNATION; B = AREA IN ACRES; C = 5-YR RUNOFF COEFFICIENT; D = 100-YR RUNOFF COEFFICIENT
- DESIGN POINT
- HP HIGH POINT
- LP LOW POINT
- DRAINAGE ARROW
- EXISTING DRAINAGE ARROW
- PROPOSED DRAINAGE SWALE
- SECTION LINE
- EXISTING EASEMENT
- EXISTING FENCE
- EXISTING WATERLINE
- 100 YEAR FLOODPLAIN
- FLOODWAY
- EXISTING WETLAND

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EX1	178.68	2%	0.09	0.36	29.2	40.5	272.1
EX2	14.67	2%	0.09	0.36	19.2	4.2	27.9
EX3	160.58	2%	0.09	0.36	25.9	39.0	262.0
EX4	36.46	2%	0.09	0.36	21.0	9.9	66.5
EX5	4.28	2%	0.09	0.36	16.6	1.3	8.7
EX6	0.56	2%	0.09	0.36	9.5	0.2	1.4

DESIGN POINT

DP	Q5 Total	Q100 Total
EX1	40.5	272.1
EX2	4.2	27.9
EX3	39.0	262.0
EX4	9.9	66.5
EX5	1.3	8.7
EX6	0.2	1.4

300 150 0 300 600
ORIGINAL SCALE: 1" = 300'

Know what's **below.** **Call** before you dig.

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
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SUITE 201
COLORADO SPRINGS, CO 80903
JAMES F. MORLEY
(719) 471-1742

J·R ENGINEERING
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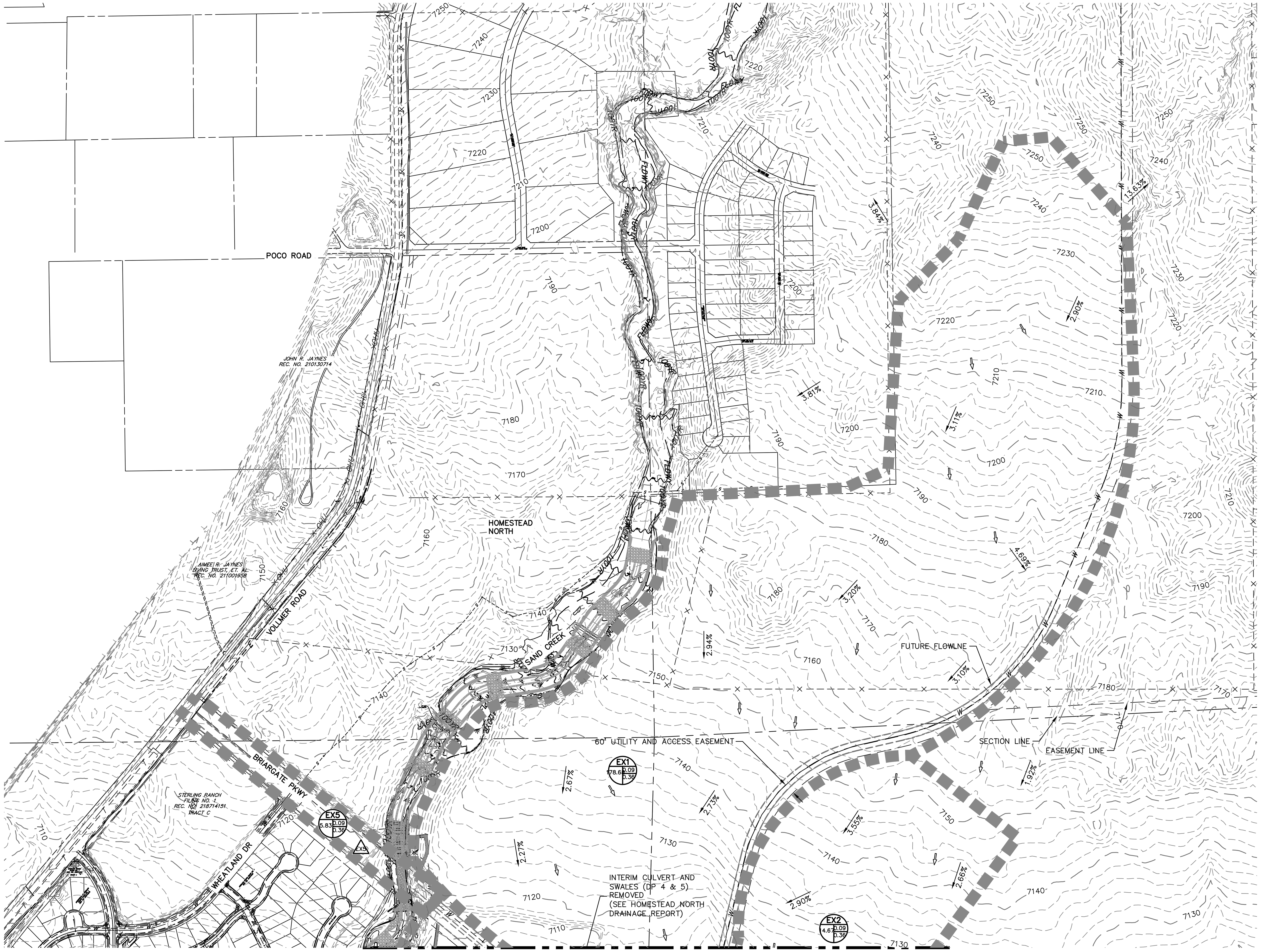
Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

H-SCALE	1"=300'
V-SCALE	N/A
DATE	3/11/22
DESIGNED BY	RAB
DRAWN BY	CGV
CHECKED BY	

STERLING RANCH ROAD & BRIARGATE DRAINAGE MAPS
EXISTING DRAINAGE MAP

SHEET 1 OF 6
JOB NO. 25188.03



SEE SHEET 1

LEGEND:

- PROPOSED STORM SEWER
- 5000 FUTURE RD MAJOR CONTOUR
- FUTURE RD MINOR CONTOUR
- 5000 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 5000 EXISTING MAJOR CONTOUR
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EX2	14.67	2%	0.09	0.36	19.2	4.2	27.9
EX3	160.58	2%	0.09	0.36	25.9	39.0	262.0
EX4	36.46	2%	0.09	0.36	21.0	9.9	66.5
EX5	4.28	2%	0.09	0.36	16.6	1.3	8.7
EX6	0.56	2%	0.09	0.36	9.5	0.2	1.4

DESIGN POINT

DP	Q5 Total	Q100 Total
EX1	40.5	272.1
EX2	4.2	27.9
EX3	39.0	262.0
EX4	9.9	66.5
EX5	1.3	8.7
EX6	0.2	1.4

300 150 0 300 600

ORIGINAL SCALE: 1" = 300'

Know what's **below.**
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No.	REVISION	BY	DATE

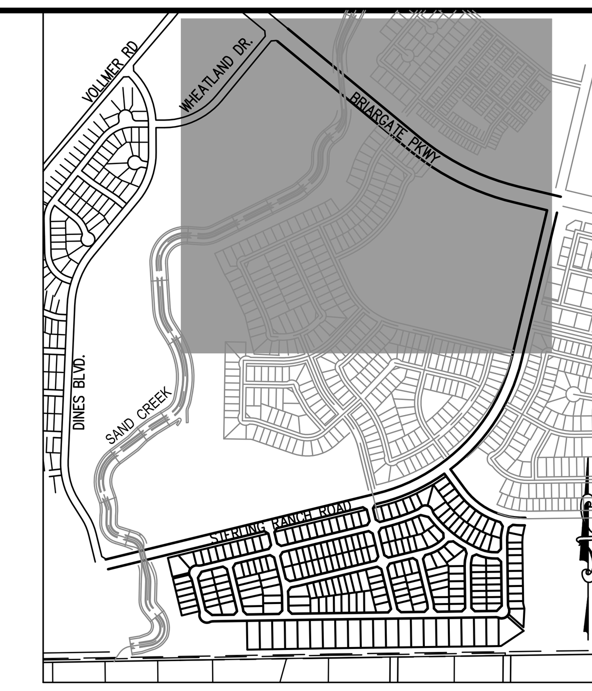
H–SCALE	1"=300'
V–SCALE	N/A
DATE	3/11/22
DESIGNED BY	RAB
DRAWN BY	CGV
CHECKED BY	

STERLING RANCH ROAD & BRIARGATE DRAINAGE MAPS

EXISTING DRAINAGE MAP

SHEET 2 OF 6

JOB NO. 25188.03



KEY MAP

SCALE: NTS

LEGEND

BASIN ID A: BASIN LABEL B: AREA C: C -100 YR D: C-5 YR	
DESIGN POINT	
PROPOSED FLOW DIRECTION	
BASIN DRAINAGE AREA	
EXISTING STORM SEWER	
STORM SEWER PROPOSED	
PROPOSED R.O.W	
PROPOSED PROPERTY LINES	
PROPOSED SIDEWALK	
EXISTING PROPERTY LINE	
ROW EXISTING	
FL EXISTING	
SIDEWALK EXISTING	
SECTION LINE	
DRAINAGE ACCESS & MAINTENANCE EASEMENT	
100 YEAR FLOODPLAIN	100YR

EXISTING 6100 PROPOSED 6100

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	4.09	70%	0.65	0.78	13.3	9.9	19.7
A2	5.05	67%	0.62	0.76	17.0	10.5	21.4
A3	1.94	64%	0.60	0.74	8.6	5.1	10.5
A4	1.52	70%	0.65	0.78	9.6	4.9	8.3
A5	0.63	88%	0.80	0.88	5.0	2.6	4.9
B1	1.82	68%	0.64	0.77	7.6	5.3	10.6
B2	1.90	64%	0.61	0.74	7.9	5.2	10.6
B3	1.27	64%	0.60	0.74	8.6	3.3	6.9
B4	1.33	61%	0.58	0.72	9.0	3.3	6.9
B5	0.89	61%	0.58	0.72	7.6	2.4	4.9
B6	0.91	63%	0.60	0.74	7.1	2.5	5.2
B7	1.08	52%	0.50	0.67	8.0	2.4	5.4
B8	1.16	58%	0.55	0.70	7.6	2.9	6.2
B9	1.98	51%	0.49	0.66	7.9	4.4	9.8
B10	2.19	53%	0.51	0.67	7.8	5.0	11.1
B11	3.53	26%	0.29	0.51	13.5	3.8	11.1
OS1	176.86	2%	0.09	0.35	29.2	40.1	261.9
OS2	39.27	2%	0.09	0.35	16.6	11.9	77.7

DESIGN POINT

DP	Q5 Total	Q100 Total
1	2.6	4.9
2	10.5	21.4
4	4.9	8.3
5	6.7	13.2
6	28.6	41.8
7	5.2	10.6
8	5.3	10.6
10	3.3	6.9
11	3.3	7.0
14	2.5	6.2
15	2.4	6.2
18	2.9	6.7
19	2.4	6.0
21	9.9	19.7
22	4.4	9.8
23	5.0	11.1
24	30.0	59.0
1A	19.7	34.0
OS1	40.1	261.9
OS2	42.7	311.7

Values in RED are from the "Sterling Ranch MDDP Amendment No. 2 & Preliminary Drainage Report for Sterling Ranch East Prelimininary Plan No. 1" by Classic Consulting.

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

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Fort Collins 970-491-9888 • www.jrengineering.com

No.	REVISION	BY	DATE

H-SCALE	1"=100'
V-SCALE	N/A
DATE	05/02/23
DESIGNED BY	RAB
DRAWN BY	CGV
CHECKED BY	

STERLING RANCH ROAD & BRIARGATE DRAINAGE MAPS
PROPOSED DRAINAGE MAP

SHEET 3 OF 6
JOB NO. 25188.03

KEY MAP
SCALE: NTS

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C -100 YR
D: C-5 YR

DESIGN POINT
PROPOSED FLOW DIRECTION
BASIN DRAINAGE AREA
EXISTING STORM SEWER
STORM SEWER PROPOSED
PROPOSED R.O.W
PROPOSED PROPERTY LINES
PROPOSED SIDEWALK
EXISTING PROPERTY LINE
ROW EXISTING
FL EXISTING
SIDEWALK EXISTING
SECTION LINE
DRAINAGE ACCESS & MAINTENANCE EASEMENT
100 YEAR FLOODPLAIN

EXISTING 6100
PROPOSED 6100

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	4.09	70%	0.65	0.78	13.3	9.9	19.7
A2	5.05	67%	0.62	0.76	17.0	10.5	21.4
A3	1.94	64%	0.60	0.74	8.6	5.1	10.5
A4	1.52	70%	0.65	0.78	9.6	4.9	8.3
A5	0.63	88%	0.80	0.88	5.0	2.6	4.9
B1	1.82	68%	0.64	0.77	7.6	5.3	10.6
B2	1.90	64%	0.61	0.74	7.9	5.2	10.6
B3	1.27	64%	0.60	0.74	8.6	3.3	6.9
B4	1.33	61%	0.58	0.72	9.0	3.3	6.9
B5	0.89	61%	0.58	0.72	7.6	2.4	4.9
B6	0.91	63%	0.60	0.74	7.1	2.5	5.2
B7	1.08	52%	0.50	0.67	8.0	2.4	5.4
B8	1.16	58%	0.55	0.70	7.6	2.9	6.2
B9	1.98	51%	0.49	0.66	7.9	4.4	9.8
B10	2.19	53%	0.51	0.67	7.8	5.0	11.1
B11	3.53	26%	0.29	0.51	13.5	3.8	11.1
OS1	176.86	2%	0.09	0.35	29.2	40.1	261.9
OS2	39.27	2%	0.09	0.35	16.6	11.9	77.7

DESIGN POINT

DP	Q5 Total	Q100 Total
1	2.6	4.9
2	10.5	21.4
4	4.9	8.3
5	6.7	13.2
6	28.6	41.8
7	5.2	10.6
8	5.3	10.6
10	3.3	6.9
11	3.3	7.0
14	2.5	6.2
15	2.4	6.2
18	2.9	6.7
19	2.4	6.0
21	9.9	19.7
22	4.4	9.8
23	5.0	11.1
24	30.0	59.0
1A	19.7	34.0
OS1	40.1	261.9
OS2	42.7	311.7

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100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

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No.	REVISION	BY	DATE

H-SCALE 1"=100'
V-SCALE N/A
DATE 05/02/23
DESIGNED BY RAB
DRAWN BY CGV
CHECKED BY

STERLING RANCH ROAD & BRIARGATE DRAINAGE MAPS
PROPOSED DRAINAGE MAP

SHEET 4 OF 6
JOB NO. 25188.03

KEY MAP

SCALE: NTS

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C -100 YR
D: C-5 YR

DESIGN POINT
PROPOSED FLOW DIRECTION
BASIN DRAINAGE AREA
EXISTING STORM SEWER
STORM SEWER PROPOSED
PROPOSED R.O.W
PROPOSED PROPERTY LINES
PROPOSED SIDEWALK
EXISTING PROPERTY LINE
ROW EXISTING
FL EXISTING
SIDEWALK EXISTING
SECTION LINE
DRAINAGE ACCESS & MAINTENANCE EASEMENT
100 YEAR FLOODPLAIN

EXISTING 6100 — PROPOSED 6100

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	4.09	70%	0.65	0.78	13.3	9.9	19.7
A2	5.05	67%	0.62	0.76	17.0	10.5	21.4
A3	1.94	64%	0.60	0.74	8.6	5.1	10.5
A4	1.52	70%	0.65	0.78	9.6	4.9	8.3
A5	0.63	88%	0.80	0.88	5.0	2.6	4.9
B1	1.82	68%	0.64	0.77	7.6	5.3	10.6
B2	1.90	64%	0.61	0.74	7.9	5.2	10.6
B3	1.27	64%	0.60	0.74	8.6	3.3	6.9
B4	1.33	61%	0.58	0.72	9.0	3.3	6.9
B5	0.89	61%	0.58	0.72	7.6	2.4	4.9
B6	0.91	63%	0.60	0.74	7.1	2.5	5.2
B7	1.08	52%	0.50	0.67	8.0	2.4	5.4
B8	1.16	58%	0.55	0.70	7.6	2.9	6.2
B9	1.98	51%	0.49	0.66	7.9	4.4	9.8
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B11	3.53	26%	0.29	0.51	13.5	3.8	11.1
OS1	176.86	2%	0.09	0.35	29.2	40.1	261.9
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DESIGN POINT

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15	2.4	6.2
18	2.9	6.7
19	2.4	6.0
21	9.9	19.7
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No.	REVISION	BY	DATE

H-SCALE	1"=100'
V-SCALE	N/A
DATE	05/02/23
DESIGNED BY	RAB
DRAWN BY	CGV
CHECKED BY	

STERLING RANCH ROAD & BRIARGATE DRAINAGE MAPS

PROPOSED DRAINAGE MAP

SHEET 5 OF 6

JOB NO. 25188.03

BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
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A5	0.63	88%	0.80	0.88	5.0	2.6	4.9
B1	1.82	68%	0.64	0.77	7.6	5.3	10.6
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10	3.3	6.9
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15	2.4	6.2
18	2.9	6.7
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LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C -100 YR
D: C-5 YR

DESIGN POINT

PROPOSED FLOW DIRECTION

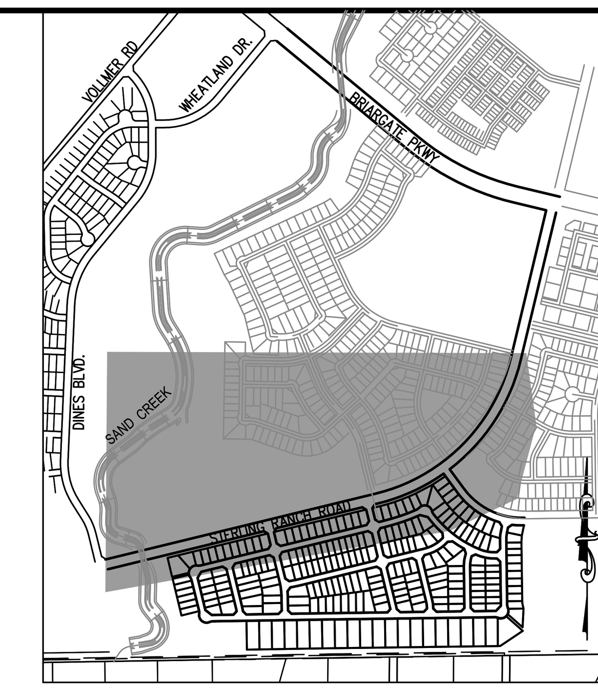
BASIN DRAINAGE AREA

EXISTING STORM SEWER

STORM SEWER PROPOSED

PROPOSED R.O.W
PROPOSED PROPERTY LINES
PROPOSED SIDEWALK
EXISTING PROPERTY LINE
ROW EXISTING
FL EXISTING
SIDEWALK EXISTING
SECTION LINE
DRAINAGE ACCESS & MAINTENANCE EASEMENT
100 YEAR FLOODPLAIN

EXISTING 6100
PROPOSED 6100



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No.	REVISION	BY	DATE

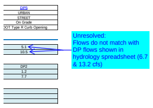
H-SCALE	1"=100'
V-SCALE	N/A
DATE	05/02/23
DESIGNED BY	RAB
DRAWN BY	CGV
CHECKED BY	

STERLING RANCH ROAD & BRIARGATE DRAINAGE MAPS
PROPOSED DRAINAGE MAP

SHEET 6 OF 6
JOB NO. 25188.03

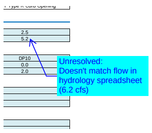
v5_FDR.pdf Markup Summary

Callout (6)



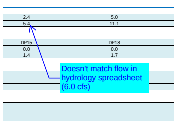
Subject: Callout
Page Label: 1
Author: CDurham
Date: 5/30/2023 4:56:26 PM
Status:
Color:
Layer:
Space:

Unresolved:
Flows do not match with DP flows shown in hydrology spreadsheet (6.7 & 13.2 cfs)



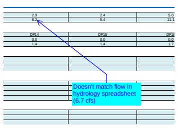
Subject: Callout
Page Label: 2
Author: CDurham
Date: 5/30/2023 4:58:10 PM
Status:
Color:
Layer:
Space:

Unresolved:
Doesn't match flow in hydrology spreadsheet (6.2 cfs)



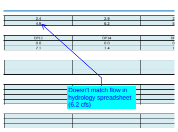
Subject: Callout
Page Label: 1
Author: CDurham
Date: 5/30/2023 5:00:09 PM
Status:
Color:
Layer:
Space:

Doesn't match flow in hydrology spreadsheet (6.0 cfs)



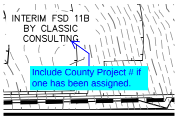
Subject: Callout
Page Label: 1
Author: CDurham
Date: 5/30/2023 5:00:32 PM
Status:
Color:
Layer:
Space:

Doesn't match flow in hydrology spreadsheet (6.7 cfs)



Subject: Callout
Page Label: 1
Author: CDurham
Date: 5/30/2023 5:00:52 PM
Status:
Color:
Layer:
Space:

Doesn't match flow in hydrology spreadsheet (6.2 cfs)



Subject: Callout
Page Label: [3] 5 DR03
Author: CDurham
Date: 5/30/2023 5:48:04 PM
Status:
Color:
Layer:
Space:

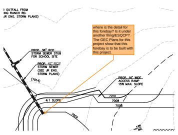
Include County Project # if one has been assigned.

SW - Highlight (1)

Subject: SW - Highlight
Page Label: 10
Author: Glenn Reese - EPC Stormwater
Date: 5/31/2023 10:46:54 AM
Status:
Color:
Layer:
Space:

nterim Pond 11B is sized to provide WQCV on
CCES
sheets, final design will be with Sterling Ranch East Filing 3 in the future. Flows to interim Pond 11B will enter into a concrete-bottom forebay sized for the interim condition provided by Classic Engineering. Forebay sizing calculations are provided in Appendix C, and pond design sheets are
provided in Appendix D.

SW - Textbox with Arrow (2)



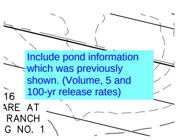
Subject: SW - Textbox with Arrow
Page Label: 319
Author: Glenn Reese - EPC Stormwater
Date: 5/31/2023 10:45:56 AM
Status:
Color:
Layer:
Space:

where is the detail for this forebay? Is it under another filing/ESQCP? The GEC Plans for this project show that this forebay is to be built with this project.

Subject: SW - Textbox with Arrow
Page Label: 10
Author: Glenn Reese - EPC Stormwater
Date: 5/31/2023 5:13:35 PM
Status:
Color:
Layer:
Space:

I see the forebay sizing calcs in App C and Pond calcs in App D, but I don't see any details for the forebay. Please provide.

Text Box (2)



Subject: Text Box
Page Label: [2] 4 DR02
Author: CDurham
Date: 5/30/2023 5:10:01 PM
Status:
Color:
Layer:
Space:

Include pond information which was previously shown. (Volume, 5 and 100-yr release rates)

Subject: Text Box
Page Label: 1
Author: CDurham
Date: 5/30/2023 5:46:11 PM
Status:
Color:
Layer:
Space:

Add back in calculations for Pond 16 from FDR for Sterling Ranch East Filing 2 & Foursquare at Sterling Ranch East Filing 1 (SF-22-037 & SF-22-036) at the end of Appendix D