EPC STORMWATER REVIEW COMMENTS IN ORANGE BOXES WITH BLACK TEXT

GALLOWAY RESPONSE

Galloway

FINAL DRAINAGE REPORT

FALCON RANCHETTES FILING NO. 2
MERIDIAN STORAGE
El Paso County, Colorado

~~*SF-23-XXX*~~

Add PCD File No. VR239

ADDED BOTH PCD FILING NUMBERS

PREPARED FOR:
Mike D. Texer
11750 Owl Place
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PREPARED BY:
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DATE:
April 24th, 2023

Signature Page
Falcon Ranchettes Filing No. 2 (Meridian Storage)

Engineer's Statement

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

Brady Shyrock, PE # 38164
For and on behalf of Galloway & Company, Inc.

Date

Developer's Certification

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

By:

Date

Address: Mike D. Texer
11750 Owl Place
Petyon, CO 80831

El Paso County Certification

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

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

Date

Conditions:

TABLE OF CONTENTS

I. Introduction

This document is the Final Drainage Report for Falcon Ranchettes Filing No. 2 (Meridian Storage). The project consists of two lots and public right-of-way that make up 9.604 acres. This project proposes storage units, an office building, roadway and utility infrastructure, a water quality treatment pond, and drainage channel improvements to the existing east branch of Unnamed Tributary to Black Squirrel Creek (UTBSC East Branch).

Purpose

The purpose of this report is to identify on and offsite drainage patterns and confirm that the new development has no significant changes to existing drainage patterns.

Previous Drainage Studies

- Falcon Drainage Basin Planning Study, dated September 2015 – Referred to as **Falcon DBPS** hereon.
- Bent Grass MDDP Amendment & DBPS Amendment, dated September 2021 – Referred to as **Bent Grass MDDP** hereon.
- Request for Conditional Letter of Map Revision, Unnamed Tributary to Black Squirrel Creek, Falcon Owl Place, dated October 25, 2022 – Referred to as Falcon **Owl Place CLOMR** hereon.
- Request for Letter of Map Revision, Unnamed Tributary to Black Squirrel Creek, Falcon Marketplace, dated March 15, 2021 – Referred to as **Falcon Marketplace LOMR** hereon.
- Final Drainage Report for Falcon Marketplace, dated November 4, 2019 – Referred to as **Falcon Marketplace FDR** hereon.

Relevant excerpts from existing drainage reports are provided in **Appendix B** for reference.

Location

Falcon Ranchettes Filing No. 2 is located in the Southeast Quarter of Section 1, Township 13 South, Range 65 West of the 6th Principal Meridian, County of El Paso, State of Colorado.

The project site is located at the northwest corner of Owl Place and Meridian Road, bounded to the North by Lot 2A Bent Grass East Commercial Fil No 2a and Tract A Bent Grass East Commercial Fil No 2, to the south by Lots 14 & 15 of Falcon Ranchettes, to the East by Meridian Road right-of-way, to the West by Lot 3 of Falcon Ranchettes. A Vicinity Map is provided in **Appendix A**.

Description of Property

The existing parcel is currently developed with two residential properties (*Lot 1 & 2 of Falcon Ranchettes*). Two single-family homes occupy the site, but the majority of the existing parcels are covered by native prairie grass land. An existing drainage-way flows north to south along the eastern property line adjacent to Meridian Road right-of-way, named “Unnamed Tributary to Black Squirrel Creek - East Branch”.

Soils

According to the U.S. Department of Agriculture Natural Resources Conservation Service Soil Survey of El Paso County, Colorado (See **Appendix A**) the primary soil found is Columbine gravelly sandy loam, classified as Soil Conservation Service (SCS) hydrologic soil group “A”.

Climate
This area of El Paso County is located at the foothills of the Southern Rocky Mountains. Classified as an alpine desert, Falcon, CO averages 300 days of sunshine with low humidity. Annual precipitation ranges between 10-16 inches, occurring mostly in spring and summer months.

Geotechnical Recommendations
Positive drainage away from the structures should be provided during construction and maintained throughout the life of the structures. Any downspouts, roof drains or scuppers should discharge into splash blocks or extensions and away from the structures. Backfill against footings, exterior walls and in utility trenches should be properly compacted and free of all construction debris to reduce the possibility of moisture infiltration. Refer to the Geotechnical Exploration Report prepared by Universal Engineering Sciences for more detailed information.

Flood Insurance Rate Map
According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) #08041C0553G, effective date December 7, 2018. The project site is located in Zone X (Areas determined to be outside of the 0.2% annual chance floodplain). A copy of the FIRM map is provided in **Appendix A** for reference.

Major Drainage Basin
Falcon Ranchettes Filing No. 2 is located within the MT060 drainage basin as described in the **Falcon DBPS**. The Falcon Watershed is located in the north central portion of El Paso County and flows southeasterly from the southern slope of the Black Forest. The Falcon watershed contains three perennial streams and has a contributing drainage area of approximately 10.6 square miles at its confluence with Black Squirrel Creek.

Detailed recommendations from the **Falcon DBPS** are included below under "*IV. Proposed Drainage Patterns and Features*".

II. Drainage Design Criteria

Development Criteria Reference
The analysis and design of the drainage concept and stormwater management system for this project was prepared in accordance with the criteria set forth in the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM) dated January 2016 and the adopted chapters 6 & 13 from the City of Colorado Springs Drainage Criteria Manual (DCM) Vol. 1, last revised January 2021

Hydrologic Criteria
The rational method was used to calculate peak flows as the tributary areas are less than 100 acres. An analysis of the hydrology using the rational method can be found in **Appendix C** - Hydrologic Calculations. The rational method has proved to be accurate for basins of this size and is based on the following formula:

$Q = CIA$

Where:

Q = Peak Discharge (cfs)
C = Runoff Coefficient
I = Runoff intensity (inches/hour)
A = Drainage area (acres)

The rainfall intensity calculations are based on the DCM Figure 6-5 and IDF equations. The one hour point rainfall data for the design are listed in Table 1 below.

Table 1 - Precipitation Data (Table 6.2 in DCM Vol. 1)

Return Period	One Hour Depth (in).	Intensity (in/hr)
5-year	1.50	5.17
100-year	2.52	8.68

Time of concentrations have been adapted from equation 6-7 of The City of Colorado Springs Drainage Criteria Manual, Volume 1 which are as follows:

$Tc=T_i + T_t$

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)

Overland (Initial) Flow Time: from equations 6-8 from the City of Colorado Springs Drainage Criteria Manual, Volume 1.

$$t_t = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

Where:

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

Travel Time

$V = C_v * S_w 0.5$

Where:

V = Velocity (ft/s)
C_v = conveyance coefficient
S_w = watercourse slope (ft/ft)

The runoff coefficients are calculated based on land use, percent imperviousness, and design storm for each basin, as shown in the DCM, (Table 6-6).

Hydraulic Criteria

Storm Pipe

Hydraulic design and analysis for this report were performed through the usage of StormCAD. A tabular summary from analysis performed by StormCAD can be found in **Appendix D** - Hydraulic Calculations. Additionally, the table below shows the parameters used for StormCAD Standard Method Coefficients taken from *DCM Vol 1 Chapter 9 Table 9-4.*

BEND LOSS		
BEND ANGLE	***K COEFFICIENT***	
0°	0.05	
22.5°	0.10	
45°	0.40	
60°	0.64	
90°	1.32	
LATERAL LOSS		
ONE LATERAL K COEFFICIENT		
BEND ANGLE	***NON -SURCHARGED***	***SURCHARGES***
45°	0.27	0.47
60°	0.52	0.90
90°	1.02	1.77
TWO LATERAL K COEFFICIENT		
45°	0.96	
60°	1.16	
90°	1.52	

Storm Inlets

CDOT-Type R Storm Curb Inlets were sized using the UD-Inlet_v5.02 spreadsheet from Mile High Flood District. Additionally, CDOT Type 13 area inlets were sized using a depth to capacity line graph. These calculations are provided in **Appendix D**.

Detention Pond

As shown in Part IV: Onsite PWQ Requirements, Documentation and Considerations of the PBMP Applicability Form, this project is required to provide treatment for the Water Quality Capture Volume (WQCV) Standard.

Proposed *Pond #1* was designed using the Mile High Flood District (MHFD) software spreadsheets; It is the recommended design software because it provides tabulated results of the WQCV, EURV, 2-, 5-, 10-,

25-, 50-, 100- and 500-year storm events routed through the pond. The detention criteria provided by the MHFD's design spreadsheets *MHFD-Detention_v4.06* was used to determine the adequate storage capacity of the detention pond, and the associated elements of the outlet structure. The UDFCD Manual provides approximate, empirical equations that are utilized in the spreadsheet provided by MHFD. These equations and methods are further described in the USDCM Vol. 2, Ch. 12. The required volume calculations as well as the outlet structure design calculations are provided in **Appendix E** – Pond Calculations of this report.

Detailed water surface elevations and pond design information are included below under "*IV. Proposed Drainage Patterns and Features*".

Drainage Channel

Proposed improvements to UTBSC East Branch was analyzed using Bentley software *FlowMaster* to properly size a trapezoidal channel to safely convey stormwater while providing 1.0-ft minimum of freeboard. Additionally, the 3 proposed grouted stepped boulder drop structures were designed using criteria set forth in USDCM from Mile High Flood District. FlowMaster calculations can be found in **Appendix D.**

Detailed steps of the Simplified Design Procedure as shown in the USDCM are included below under "*IV. Proposed Drainage Patterns and Features*".

Four Step Process

The Four Step Process is used to minimize the adverse impacts of urbanization and is a vital component of developing a balanced, sustainable project. Below identifies the approach to the four-step process:

1. **Employ Runoff Reduction Practices**
   This step uses low impact development (LID) practices to reduce runoff at the source. Generally, rather than creating point discharges that are directly connected to impervious areas runoff is routed through pervious areas to promote infiltration. The Impervious Reduction Factor (IRF) method was used and calculations can be found in Appendix E.

2. **Implement BMP's That Provide a Water Quality Capture Volume with Slow Release**
   This step utilizes formalized water quality capture volume to slow the release of runoff from the site, while the WQCV will release in no less than 40 hours. Proposed Pond #1 will provide water quality treatment for all developed areas prior to the runoff being released into existing sub-regional detention pond SR-4.

3. **Stabilize Drainageways**
   This step implements stabilization to channels to accommodate developed flows while protecting infrastructure and controlling sediment loading from erosion in the drainageways. Drainage channel improvements are proposed to the existing UTBSC East Branch (RMT064), including widening the existing channel with 3 proposed grouted stepped boulder drop structures.

4. **Implement Site Specific and Other Source Control BMPs**
   The biggest source control BMP is public education which can be found on the City of Colorado Springs website and discuss topics such as: pet waste, car washing, private maintenance

landscaping, fall leaves, and snow melt and deicer. A no vehicle maintenance policy will be enforced to avoid the potential contaminations caused from vehicle fluid replacement, and equipment replacement and repair. In addition, the landscaping and snow removal is handled completely by the property management to ensure proper lawn mowing and grass clipping disposal, lawn aeration, and fertilizer application is being followed. Snow removal will also be handled by the property manager to ensure proper consideration of snow pile placement and use of deicing chemicals.

Please see comment on the drainage plan regarding offsite upstream flow and revise accordingly.

III. Existing Drainage Patterns and Features

Existing Drainage Patterns

On-Site:

The existing drainage pattern sheet flows from north to south. Flows from basin **EX-1** sheet flow into the existing roadside ditch (RMT064) and then conveyed to **DP1** where existing 36" twin CMP culverts pipe flows under Owl Place. The culverts are severely undersized and parti
analysis of these culverts is provided in the **Owl Place CLOMR**. Basin
pool along the north edge Owl Place near **DP2** and **DP3**. Flows eventu
continue south.

ADDED OFFSITE BASIN UPSTREAM FROM SITE AND ADDED DISCUSSION FOR ASSOCIATED BASIN

Off-Site:

Basins **EX-4** and **OS-1** flow south and pool at **DP4**. These flows eventually overtop the gravel road and continue south.

Sub-Basin Descriptions

Note: an existing drainage map is provided in **Appendix F** and should be referenced when reading the basin descriptions below.

Basin EX-1 (4.97 acres, Q5 = 1.6 cfs, Q100 = 7.7 cfs): a basin that encompasses the northeast portion of the project site. Runoff sheet flows from north to south and eventually spills into the existing Meridian Road roadside ditch, RMT064. Flows continue south to **DP1** where existing 36" twin CMP culverts pipe flows under Owl Place.

Basin EX-2 (2.32 acres, Q5 = 0.6 cfs, Q100 = 3.2 cfs): a basin that encompasses a portion of the center of the site. Flows drain from north to south to **DP2** where flows pool along the north edge of Owl Place until eventually overtopping the gravel road and continuing south.

Basin EX-3 (2.85 acres, Q5 = 0.3 cfs, Q100 = 3.0 cfs): a basin that encompasses the west portion of the site. Flows drain from north to south to **DP3** where flows pool along the north edge of Owl Place until eventually overtopping the gravel road and continuing south.

Basin EX-4 (1.08 acres, Q5 = 0.0 cfs, Q100 = 0.9 cfs): a basin that encompasses the far west portion of the site. Flows drain from north to south to **DP4** where flows pool along the north edge of Owl Place until eventually overtopping the gravel road and continuing south.

Basin OS-1 (3.29 acres, Q5 = 0.6 cfs, Q100 = 4.0 cfs): a basin that is associated with Lot 3 Falcon Ranchettes, a parcel immediately west of the project site. Flows drain from north to south to **DP4** where flows pool along the north edge of Owl Place until eventually overtopping the gravel road and continuing south.

IV. Proposed Drainage Patterns and Features

Proposed Drainage Plan

On-Site:

The project site consists of 1 office building and 9 self-storage. Access is provided to Meridian Park Drive near the center of the site, with an emergency access drive to the north for emergency services only. Concrete valley gutters are used for all internal drive aisles to route runoff to proposed storm drain infrastructure and then piped to Pond #1 to provide detention and treatment for the WQCV. The pond outfall conveys flows south directly to an existing sub-regional pond (SR-4).

The proposed public roadway improvements convey runoff using curb and gutter and routing flows to proposed storm drain infrastructure and then piped to Pond #1 to provide detention and treatment for the WQCV. The pond outfall conveys flows south directly to an existing sub-regional pond (SR-4).

Drainage channel improvements to the existing RMT064 is discussed below under "*IV. Proposed Drainage Patterns and Features*", including the existing culvert crossing at Owl Place.

Off-Site:

The existing drainage pattern of OS-1 remains unchanged. However, to avoid the stormwater pooling and overtopping at Owl Place, a small Nyloplast Drain Basin (Public) is proposed to capture flows and route the runoff safely to Pond SR-4.

DISCUSSED ALL INLET BY PASS FLOW AS APPLICABLE

Sub-Basin Descriptions

discuss inlet bypass flow path, as applicable

Note: a proposed drainage map is provided in **Appendix F** and should be referenced when reading the basin descriptions below.

Basin A-1 (1.85 AC, Q_5 = 2.1 cfs, Q_{100} = 5.9 cfs): Located on the far east side of the site, this basin consists of the proposed drainage [illegible]m this basin will sheet flow into the drainage channel and then be conveyed south to **DP1** where existing 36" twin culverts will pipe flows under Owl Place.

DISCUSSED WHY CHANGE IN FLOWS

discuss why the flows changed and the ultimate outfall beyond owl place culverts.

Basin B-1 (1.54 AC, Q_5 = 6.5 cfs, Q_{100} = 11.5 cfs): Located at the northeast of the site, this basin consists of the [illegible]his basin will sheet flow south entering a propo[illegible] south toward the center of the site, to a propo[illegible].

ADDED MORE DETAIL TO EACH BASIN DESCRIPTION FOR WHERE FLOWS GO

discuss where flows go after DP and any WQ treatment.

Basin B-2 (1.26 AC, Q_5 = 5.3 cfs, Q_{100} = 9.4 cfs): Located on the southeast portion of the site, this basin consists of [illegible]n this basin will sheet flow south entering a p[illegible]yed south toward the south end of the site, to a pro[illegible]3.

ADDED MORE DETAIL TO EACH BASIN DESCRIPTION FOR WHERE FLOWS GO

discuss where flows go after DP and any WQ treatment.

see comment on drainage plan and revise accordingly.

Basin B-3 (1.05 AC, Q_5 = 4.7 cfs, Q_{100} = 8.1 cfs): Located in the center of the site, this basin consists of the west half po sting Owl Place centerline, west of the Meridian Pa basin will sheet flow from all directions onto proposed Type A curb and gutter. Flows will then be routed via curb & gutter, to a proposed 5' CDOT Type 'R' storm sump inlet (private), **DP4**.

ADDED MORE DETAIL TO EACH BASIN DESCRIPTION FOR WHERE FLOWS GO

discuss where flows go after DP and any WQ treatment.

figure calls out this inlet as public, please clarify

Basin B-4 (1.05 AC, Q_5 = 1.8 cfs, Q_{100} = 4.2 cfs): Located in the center of the site, this basin consists of the east half portion ed Owl Place corridor, east of the Meridian Park D n will sheet flow from all directions onto prop d via curb & gutter, to a proposed 10' CDOT Type 'R' storm sump inlet (private), **DP5**.

ADDED MORE DETAIL TO EACH BASIN DESCRIPTION FOR WHERE FLOWS GO

discuss where flows go after DP and any WQ treatment.

Is pond WQ only?

Basin B-5 (0.38 AC, Q_5 = 1.5 cfs, Q_{100} = 2.7 cfs): Located on the southeast portion of the site, this basin consists of the entire proposed detention pond. Runoff from this basin will sheet flow into Detention Pond #1. Flows will then be routed east to a proposed 35' X 68' CDOT Type 'D' storm inlet (public), **DP6**.

confirm dimensions

ADDED MORE DETAIL TO EACH BASIN DESCRIPTION FOR WHERE FLOWS GO

(TYPICAL) REVISED PUBLIC/PRIVATE DETENTION POND #1 IS FULL SPECTRUM EXTENDED DETENTION BASIN

ocated on the f from this ba & gutter, to a inlet (private), **DP5**.

discuss where flows go after DP and any WQ treatment.

Basin C-2 (2.02 AC, Q_5 = 0.0 cfs, Q_{100} = 0.6 cfs): Located on the Park Drive. Runoff from this basin will sheet flow into Detention Pond #1. Then, flows are conveyed east to a proposed 35' X 68' CDOT Type 'D' storm inlet (public), **DP6**.

west

REVISED, THANK YOU

Basin C-3 (0.20 AC, Q_5 = 0.0 cfs, Q_{100} = 0.2 cfs): Located on a sma east of Detention Pond #1. Runoff from this basin will sheet flow south into a proposed Type A curb and gutter and west into ~~Detention Pond #1. Then, flow into proposed Type A curb and gutter are conveyed to a~~ proposed 10' CDOT Type 'R' storm sump inlet (private), **DP5** and flows into Detention Pond #1 are conveyed to a proposed 35' X 68' CDOT Type 'D' storm inlet (public), **DP6**.

east

REVISED, THANK YOU

Basin C-4 (1.06 AC, Q_5 = 0.0 he east portion of the site, along the property boundary line. This basin consists of an existing drainage channel flowing north to south. Runoff from this basin will sheet flow to an existing drainage channel, then flow into a proposed 2' X 2' CDOT Nyloplast drain basin, **DP7**.

discuss where flows go after DP and any WQ treatment exclusions (i.e., I.7.1.B.7 - land disturbance to undeveloped land that will remain undeveloped)

Basin F-1 (0.04 AC, Q_5 = 0.2 cfs, portion of the west side of the centerline for the futur is basin will sheet flow south offsite to the adjacent

ADDED MORE DETAIL TO EACH BASIN DESCRIPTION FOR WHERE FLOWS GO AND ALSO ADDED ALL APPLICABLE EXCLUSIONS

Basin F-2 (0.03 AC, Q_5 = 0.1 cfs, portion of the east side of the centerline for the future development for Meridian Park Drive. Runoff from this basin will sheet flow south offsite to the adjacent parcel.

Basin OS-1(3.29 AC, Q_5 = 0.0 cfs, Q_{100} = 0.1 cfs): An off-site basin, located along the east portion of the site property boundary line. This basin consists of an existing drainage channel flowing north to south.

Please provide proof that the subregional pond is adequate to accept this site's developed flows. Identify whether or not any improvements are required to the existing pond. Did the DBPS and previous reports account for commercial development in this area? per the DBPS the curve number in this area (MT060) is 65. Is this representative of this area as proposed? please address.

THIS DEVELOPMENT AREA (ALL LOTS IN FALCON RANCHETTES) WERE NOT ACCOUNTED FOR COMMERCIAL. THEREFORE, FULL SPECTRUM EXTENDED DETENTION BASIN IS PROVIDED

2' X 2'

AC, Q_5 = 0.0 cfs, Q_{100} = 0.1 cfs): An off-site basin, located along the northeast portion boundary line. This basin consists of a 4:1 downslope from the berm of existing n Tract A of Bent Grass East Commercial Filing No. 2. Runoff from this basin will sheet outh onto proposed site.

discuss where flows go and any WQ treatment.

ADDED MORE DETAIL TO EACH BASIN DESCRIPTION FOR WHERE FLOWS GO

Basin OS-3 (0.01 AC, Q_5 = 0.0 cfs, Q_{100} = 0.1 cfs): An off-site ba of the site property boundary line. This basin consists of a 4:1 do detention pond from Tract A of Bent Grass East Commercial Filing No. 2. Runoff from this basin will sheet flow from north to south onto proposed site.

discuss where flows go and any WQ treatment.

ADDED MORE DETAIL TO EACH BASIN DESCRIPTION FOR WHERE FLOWS GO

ADDED MORE DETAIL TO EACH BASIN DESCRIPTION FOR WHERE FLOWS GO

= 0.1 cf on of the site property boundary line. Runoff from th sed site.

discuss where flows go and any WQ treatment.

Proposed Detention/Water Quality Pond

Pond #1 consists of a forebay, trickle channel, micropool, outlet structure (with trash rack, orifice plate, and overflow weir), and emergency spillway. The WQCV will be treated using an orifice plate, all other storm events are designed to spill into the overflow weir and into the outfall pipe and routed to sub-regional pond SR-4. The required WQCV is 0.307 ac-ft. The provided storage for the WQCV is 0.308 ac-ft.

Generally, the 500-year storm event is conveyed through the emergency spillway. However, because all adjacent roadways eventually drain back into Pond #1, the outlet structure is designed to handle the full 500-year storm event and safely convey flows to the existing sub-regional pond SR-4 by storm pipe.

All C-Group drainage ba ry drainage area and imperviousness for Pond #1. It is anticipated that all C-Group basins will ever develop into additional storage units or similar commercial use.

YES, ADDED TO DESCRIPTION

Were OS-2, OS-3, and OS-4 also included in design calcs?

Refer to **Appendix E** for Pond #1 calculations.

Drainage Channel Improvements – UTBSC East Branch (RMT064)

Falcon DBPS Analysis:

El Paso County completed hydrologic and hydraulic analyses summarized in the **Falcon DBPS**. The **Falcon DBPS** watershed encompasses three major basins, including the "Middle Tributary" which includes the subject property. The unnamed tributary to Black Squirrel Creek (UTBSC) in the Middle Tributary consists of an "East Branch" and "West Branch" that converges at the Falcon Marketplace site. The UTBSC East Branch is located along the eastern edge of the project site adjacent to Meridian Road, the West Branch does not cross the subject property.

The Falcon DBPS provides junctions north and south of the project site, named JMT050 and JMT060. These junctions are summarized below, also see **Appendix B** for Falcon DBPS excerpts showing the physical location of each junction.

Future Peak Discharges from Falcon DBPS				
Falcon DBPS Model Location	**Physical Location**	**Branch**	**Proximity to Project Site**	**Future Flow Q100 (cfs)**
JMT050	Bent Grass Meadows Drive & Meridian Road	East Branch	Upstream from Project Site	850
JMT060	Eastonville Road & Meridian Road	East and West Convergence	Downstream from Project Site	1,000

The **Falcon DBPS** specifies reach improvements between junctions JMT050 and JMT060, the reach between these two junctions is named “RMT064”. This is visually shown in the **Falcon DBPS***, Figure 6-1. Selected Plan*, located in **Appendix B**. These improvements include small drop structures w/ toe protection.

Bent Grass MDDP Analysis:

A drainage diversion took place as part of the Bent Grass Residential Filing No. 1 development. The UTBSC West Branch was rerouted to the East towards the intersection of Meridian Road and Bent Grass Meadows Drive. This diversion is discussed extensively in the **Bent Grass MDDP**.

Because of the diversion, a new junction was created in the Middle Tributary named JMT060a. This junction is primarily known as “Design Point 20” in the text and drainage maps in **Bent Grass MDDP**. This new junction is located just south of JMT050 from the **Falcon DBPS** and summarized in the table below.

Future Peak Discharges from Bent Grass MDDP				
Bent Grass MDDP Model Location	**Physical Location**	**Branch**	**Proximity to Project Site**	**Future Flow Q100 (cfs)**
JMT060a	Bent Grass Meadows Drive & Meridian Road	East Branch	Upstream from Project Site	909.3

The **Bent Grass MDDP** specifies a 15’ wide bottom channel with 4:1 side slopes, 6.5’ deep and a longitudinal slope of 0.30% for RMT064 of the UTBSC East Branch. An excerpt of these calculations is provided in **Appendix B**.

Owl Place CLOMR Analysis:

The Falcon Owl Place development (located south of the project site across Owl Place) includes regrading and rerouting a portion of the UTBSC East Branch. The improvements intercept the existing creek immediately north of Owl Place and conveys it via a 10’x6’ box culvert to the subregional detention pond (SR4). The box culvert is designed to convey the full 100-year discharge.

The **Falcon DBPS** did not include a junction on the East Branch immediately upstream of the convergence (Pond SR4). Therefore, the **Owl Place CLOMR** modified the HMS model to create a new junction located at the southern boundary of the Falcon Owl Place development, immediately upstream of Pond SR4. This junction is summarized in the table below.

Peak Discharges from Owl Place CLOMR				
Owl Place CLOMR Model Location	**Physical Location**	**Branch**	**Proximity to Project Site**	**Future Flow Q100 (cfs)**
JMT051	Immediately Upstream of Pond SR4	East Branch	Downstream from Project Site	920

Previous Reports Conclusions:

Per **Falcon DBPS**, channel improvements are required to stabilize the adjacent RMT064 of UTBSC East Branch. A design flow of 925 cfs was used as the design flow for these improvements, as specified in the **Bent Grass MDDP**. The table below compares the proposed design flow against previous reports.

Proposed Design Flow Comparison				
Model Location	**Physical Location**	**Branch**	**Proximity to Project Site**	**Future Flow Q100 (cfs)**
RMT064	North of Owl Place, South of Bent Grass Meadows Drive	East Branch	-	925
JMT050 (Falcon DBPS)	*Bent Grass Meadows Drive & Meridian Road*	*East Branch*	*Upstream from Project Site*	*850*
JMT060a (Bent Grass MDDP)	*Bent Grass Meadows Drive & Meridian Road*	*East Branch*	*Upstream from Project Site*	*909.3*
JMT051 (Owl Place CLOMR)	*Immediately Upstream of Pond SR4*	*East Branch*	*Downstream from Project Site*	*920*

Because of added junctions (JMT060a & JMT051) from **Bent Grass MDDP** and **Owl Place CLOMR**, no revisions to existing HMS models are needed for identifying the proposed design flow for RMT064. As shown above, the design flow of 925 cfs exceeds all projected HMS models for junctions north and south of RMT064.

Due to the design slope of 0.30%, 3 drop structures are required. The USDCM provides guidance for a “Simplified Design Procedure” for drop structure design that requires no hydraulic analysis. This method was used to design the grade control structures for RMT064.

Urban Storm Drainage Criteria Manual (USDCM) Design Guidance:

The USDCM Vol. 2, Chapter 9, Section 2 includes guidance and design procedures for Grade Control Structures.

The simplified design procedure can be used for grade control structures meeting design criteria provided in the table below and where all of the following criteria are met:

- Maximum unit discharge for the design event (typically the 100-year) over any portion of the drop structure is 35 cfs/ft or less,
- Net drop height (upstream channel invert less downstream channel invert exclusive of stilling basin depth) is 5 feet or less,
- Drop structure is constructed of GSB or SC,
- Drop structure is located within a tangent section and at least twice the distance of the width of the drop at the crest both upstream and downstream from a point of curvature,
- Drop structure is located in a reach that has been evaluated per the design requirements of the Open Channel chapter.

The table below summarizes the specific design and geometric parameters used for RMT064.

Note: Channel construction drawings were prepared for the RMT064 improvements and should be referenced when reading this table.

Design Parameter	**Requirement to Use Simplified Design Procedure (As shown in USDCM)**	**Proposed Design**	**Meets or Exceeds Criteria?**
Maximum Net Drop Height (Hd)	5 feet	3 feet	Yes
Maximum Unit Discharge over any Portion of Drop Width	35 cfs per foot of drop width	25.9 cfs*	Yes
Maximum Longitudinal Slope (Steepest Face Slope)	4(H):1(V)	4:1	Yes
Minimum Stilling Basin Depression (Db)	1 foot	N/A**	Yes
Minimum Length of Approach Riprap	8 feet	10 feet	Yes
Minimum Stilling Basin Length (Lb)	Determine using Figure 9-1	N/A**	Yes
Minimum Stilling Basin Width (B)	Same as crest width	N/A**	Yes
Minimum Cutoff Wall Depth	6 feet	6 feet	Yes

Minimum Length of Riprap Downstream of Stilling Basin	10 feet	N/A**	Yes
Minimum D50 for Approach and Downstream Riprap	12 inches	12 inches (Type M Riprap)	Yes
Minimum Boulder Size for Drop Structure	Per Figure 9-1	24" Boulder Size	Yes

*Results from FlowMa harge per foot of drop width

ADDED DISCUSSION FOR IF CULVERTS NOT CONSTRUCTED IN TIME

**Due to the sandy so s expected. Therefore, the stilling basins were removed and replaced with a sloping face extending five feet below the downstream toe invert of each drop structure.

Discuss what will happen if the proposed culvert replacements are not installed by the time the Meridian Storage project is finalized.

Existing 36" Twin Culverts

The two 36" CMP culverts located at the southeast end of the project site, crossing Owl Place are severely undersized and partially filled with sediment. As stated in the **Owl Place CLOMR**, the culverts only convey 86-95 cfs, depending on tailwater depth. The remaining flow (approximately 825-834 cfs) in the 100-year event overtops Owl Place.

The Falcon Owl Place development (located south of the project site across Owl Place) includes regrading and rerouting a portion of the UTBSC East Branch. The improvements intercept the existing creek immediately north of Owl Place and conveys it via a 10'x6' box culvert to the subregional detention pond (SR4). The proposed box culvert begins just north of Owl Place and will replace the undersized culverts. The exact construction schedule is unknown at this time but expected to run concurrently with the Meridian Storage project.

Construction plans for the culvert replacement and asso

The proposed pond and its storm sewer system with the exception of the inlets and 36" storm pipe within Meridian Park Drive shall be privately maintained. Please revise accordingly.

V. Ownership & Maintenance

After completion of construction and upon the Board of C anticipated all public drainage facilities are to be owned and maintained by El Paso County. All private drainage facilities are to be owned and maintained my M summary of each facilities' ownership & maintenance res

REVISED TABLE TO CORRECTLY REFLECT PRIVATE/PUBLIC

Drainage Facility	Ownership and Maintenance Entity
Drainage Channel (UTBSC East Branch) – RM1064	El Paso County
Pond #1	El Paso County
Public Storm Drain Infrastructure (See Construction Drawings, and "*VI. Fee Development*" below for breakdown)	El Paso County

Per ECM Appendix L 3.13a if a replat results in an increase in the impervious acreage, drainage basin fees shall be assessed on the additional impervious acreage. These two lots were platted as residential 5 acre lots. The fee shall be assessed on the additional impervious acreage of the two proposed lots.

Also lot 2 shall be assessed 95% impervious for commercial lots indicated in table 3-1 of Appendix L as actual impervious is not yet known.

if lot 2 is platted as a tract then drainage fees would not be due at this time but would be assessed in the future when it is replatted into a lot for development.

Private Storm Drain Infrastructure (See Construction Drawings, and "*VI. Fee Development*" below for breakdown)

VI. Fee Development

The project is located within the Falcon drainage basin. The property is already platted, therefore no drainage basin fees are required.

Full reimbursement for all drainage channel improve
accordance with DCM Section 3.3 is anticipated. Co
is requested to be adjusted accordingly.

ADDED DETAIL FEE BREAKDOWN AND EXHIBIT. BOTH LOTS PROPOSED TO BE PLATTED AS LOTS

Reimbursable Public Facilities Estimate Total				
Item	Quantity	Unit	Unit Cost	Cost
	700	LF	$ 100.00	$ 25,000.00
	180	CY	$ 135.00	$ 24,300.00
	514	SY	$ 225.00	$115,650.00
	106	CY	$ 631.00	$ 66,886.00
				$231,836.00
			%	$ 23,183.60
timate Total				**$255,019.60**

The DBPS channel improvements are listed as County improvements. Per the DBPS, county identified improvement cost are not indicated as reimbursable and would need approval from the drainage board prior to these being accepted for reimbursement.

Please provide discussion in your report regarding this if it is your intention to go before the board and request that these improvements be made reimbursable and provide an outline of the process that will be required. See example from Eagleview project drainage report (PCD File SF2242)

FOLLOWED FORMAT. DEVELOPER PLANS TO AMEND DBPS

Hand Rail Fence (Forebays)
Type M Riprap (Forebay Apron)
Type M Riprap (Emergency Spillv
Trickle Channel
Outlet Structure w/ Concrete Micr
Pond Access Road (CDOT Class
Subtotal
Storm Drain Improvements
12" HDPE Pipe

IMPROVEMENTS AND REIMBURSABLE COSTS

The Falcon Drainage Basin Study identifies two types improvements for the Site, County Costs or Developer Costs. Items identified as Developer Costs (those incurred by the Developer) are eligible for reimbursement. County Costs are not eligible for reimbursement. Each reach and feature was classified in the DBPS as follows:

Reach/Feature	Description	Type of Cost	Reimbursable
RWT094	South of SR1	Developer Cost	Yes
SR1	Sub-Regional Pond	County Cost	No
RWT080	Northwest of SR1	County Cost	No
RWT092	Northeast of SR1	County Cost	No

The developer intends to amend the DBPS to allow for the costs on reaches RWT080 and RWT092 and Sub-Regional Pond SR1 to become reimbursable by following the process outlined below:

1. Drainage reimbursement request application with PCD.
2. Amendment to the DBPS Memorandum requesting RWT080, RWT092 and Pond SR1 changed from a County Cost to Developer Cost
   - Amendment request hearing to the Drainage Board and Board of County Commissioners
3. The subsequent Final Drainage Report associated with the Final Plat application will include the following:
   - Channel analysis to determine the number of drop structures and locations needed to stabilize the channel/meet criteria.
   - Provide cost estimates for the reimbursable improvements.
   - Drainage fee section would reference the BoCC resolution (if approved).
4. Once construction of the reimbursable facilities is completed, procedures for Drainage Improvement Credits and Reimbursements outlined in Chapter 3 of the Drainage Criteria Manual will be in effect.

An Engineering Opinion of Probable Cost for all the stormwater improvements is provided for in the Appendix. See **Appendix F** for an Opinion of Probable Construction Cost (OPCC).

Add section in narrative and cost estimate for improvements needed at SR-4 to receive flows from stormwater pipe being routed in the to be acquired drainage easement.

ADDED NARRATIVE AND COST ESTIMATE BREAKDOWN FOR SR4 IMPROVEMENTS

30" Reinforced Concrete Pipe				$ 97,698.00
36" Reinforced Concrete Pipe				$ 12,600.00
30" Flared End Section				$ 612.00
2'x2' Nyloplast Drain Basin (Or Similar)	1	EA	$ 4,500.00	$ 4,500.00
5' CDOT Type R Curb Inlet	1	EA	$ 8,715.00	$ 8,715.00
10' CDOT Type R Curb Inlet	1	EA	$ 9,507.00	$ 9,507.00
Remove and Replace GSB	1	LS	$ 5,750.00	$ 5,750.00
Subtotal				**$139,382.00**
Total				**$211,054.00**
Contingency			10%	$ 21,105.40
Non-Reimbursable Public Facilities Estimate Total				**$232,159.40**

Private Facilities Estimate Total				
Item	**Quantity**	**Unit**	**Unit Cost**	**Cost**
Storm Drain Improvements				
18" Reinforced Concrete Pipe	298	LF	$ 76.00	$ 22,648.00
24" Reinforced Concrete Pipe	135	LF	$ 91.00	$ 12,285.00
CDOT Type 13 Area Inlet (Triple)	1	EA	$14,105.00	$ 14,105.00
Total				**$ 49,038.00**
Contingency				$ 4,903.80
Private Facilities Estimate Total				**$ 53,941.80**

PROVIDED BREAKDOWN OF FEE SCHEDULE FOR TOTAL COST AND LF COST FOR LENGTH OF REACH.

Cost Estimate Grand Total	**$**	**541,120.80**

Please also provide the estimated cost identified in the DBPS for the DBPS improvements.

VII. Conclusion

This Final Drainage Report for Falcon Ranchettes Filing No. 2 was prepared using the criteria and methods as described in the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM) and the adopted chapters 6 & 13 from the City of Colorado Springs Drainage Criteria Manual (DCM) Vol. 1. The downstream facilities are adequate to protect the runoff proposed from the site. The site runoff will not adversely affect the downstream and surrounding developments. This report is in general conformance with all previously prepared reports that included this site.

VIII. References

1. Drainage Criteria Manual Volume 1, City of Colorado Springs, May 2014, revised January 2021.

2. Drainage Criteria Manual Volume 2, City of Colorado Springs, May 2014, revised December 2020.

3. El Paso County Board Resolution No. 15-042: El Paso County adoption of Chapter and Section 3.2.1, Chapter 14 of the City of Colorado Springs Drainage Criteria Manual Volume 1, May 2014

4. Urban Storm Drainage Criteria Manuals, Mile High Flood District, latest revisions.

5. Flood Insurance Rate Map, El Paso County Area, Colorado and Incorporated Areas, Map Number 08041C0553G, Effective Date December 7, 2018

6. Soil Map, El Paso County Area, Colorado as available through the Natural Resources Conservation Service National Cooperative Soil Survey website via Web Soil Survey 2.0

7. Geotechnical Exploration Report for 11690 and 11750 Owl Place, Prepared by Universal Engineering Sciences, April 18, 2023

8. Falcon Drainage Basin Planning Study, Prepared by Matrix Design Group, September 2015

9. Bent Grass MDDP Amendment & DBPS Amendment, Prepared by Galloway & Company, Inc., September 2021

10. Request for Conditional Letter of Map Revision, Unnamed Tributary to Black Squirrel Creek, Falcon Owl Place, Prepared by Drexel, Barrel & Co., October 25, 2022

11. Request for Letter of Map Revision, Unnamed Tributary to Black Squirrel Creek, Falcon Marketplace, Prepared by Drexel, Barrel & Co., March 15, 2021

12. Final Drainage Report for Falcon Marketplace, Prepared by Drexel, Barrel & Co., November 4, 2019

APPENDIX A

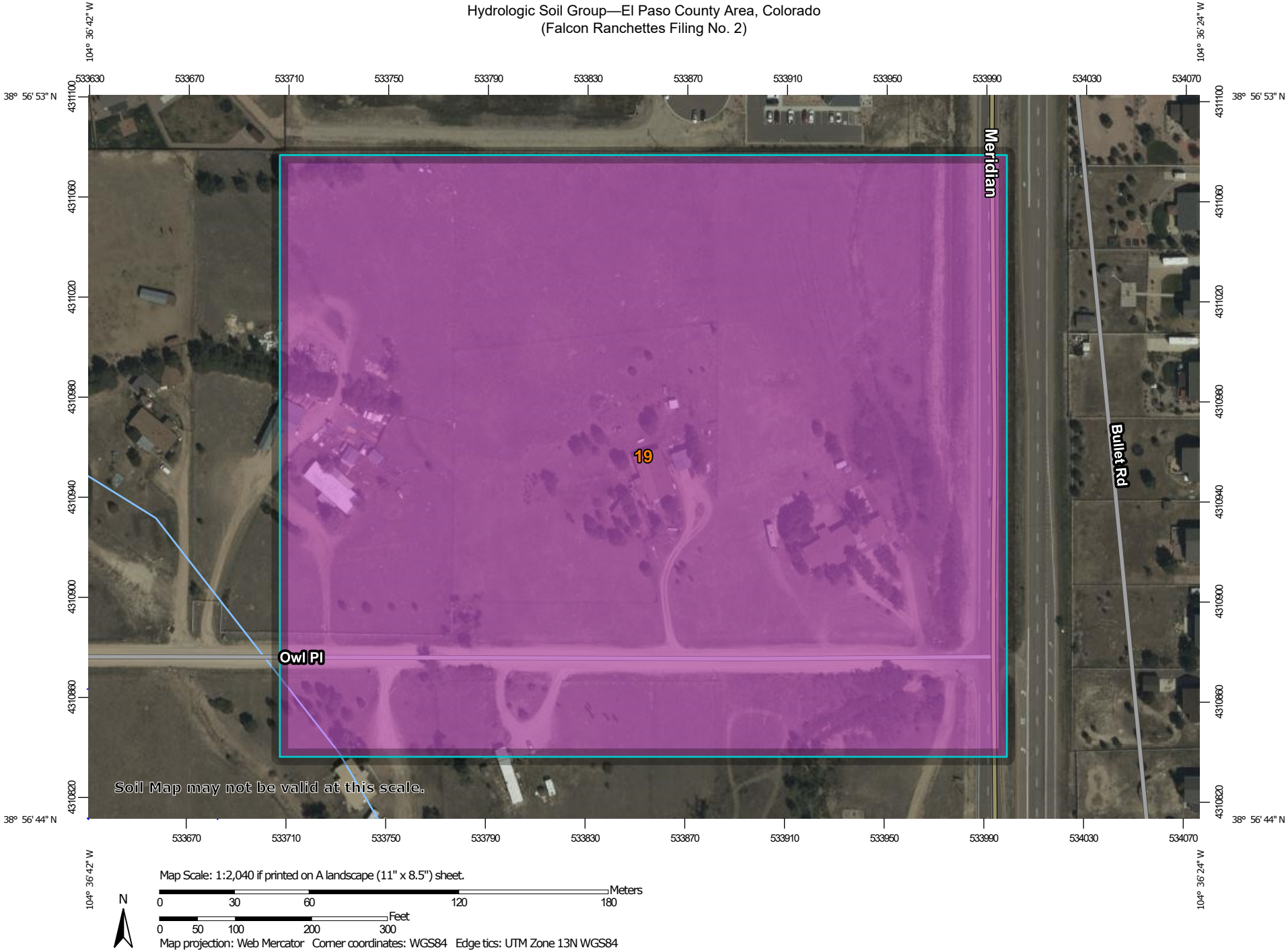
MERIDIAN STORAGE

VICINITY MAP

Project No:	MRS01
Drawn By:	CMWJ
Checked By:	RGD
Date:	12/13/2022

Galloway
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920
719.900.7220 • GallowayUS.com

Hydrologic Soil Group—El Paso County Area, Colorado
(Falcon Ranchettes Filing No. 2)



Map Scale: 1:2,040 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 50 100 200 300

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.

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	17.4	100.0%
Totals for Area of Interest			**17.4**	**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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

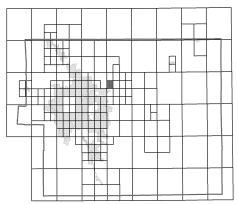
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

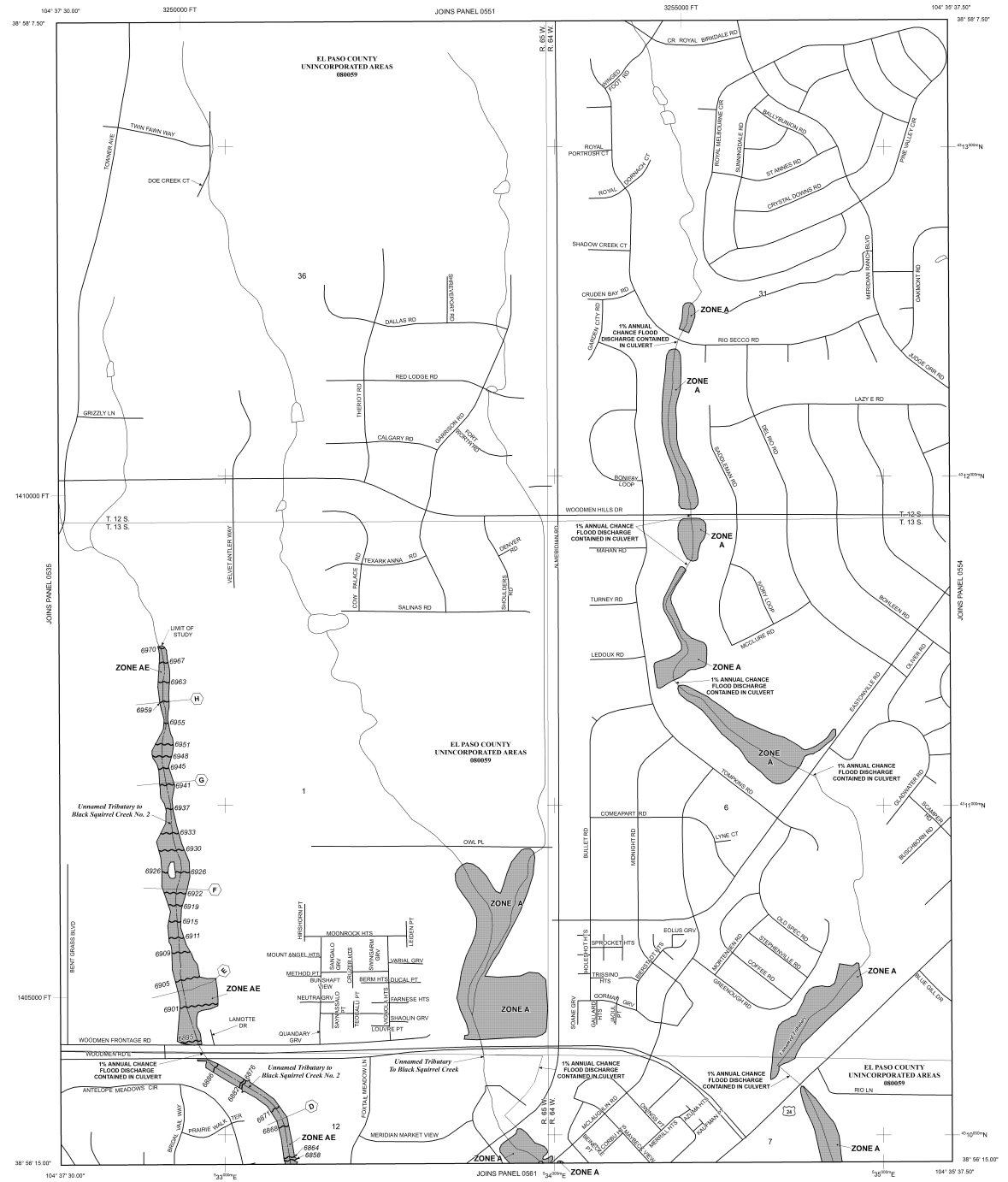
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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

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



LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988 (NAVD 88)
A — A — Cross section line
23 — 23 — Transect line
97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

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

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

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0553G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 553 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0553	G

Notes: This map was reissued on 05/15/2020 to make a correction. This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

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

MAP NUMBER
08041C0553G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

APPENDIX B

FALCON DRAINAGE BASIN PLANNING STUDY

SELECTED PLAN REPORT

FINAL - SEPTEMBER 2015

Prepared for:

El Paso County Public Services Department
3275 Akers Drive
Colorado Springs, CO 80922

Prepared By:

Matrix Design Group
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920

Matrix Project No. 10.122.003

LEGEND

«-- Subbasin ID
«-- Subbasin Area (square miles)

Existing Watershed Boundary
Historical and Future Watershed Boundary

Tributary Basin Boundary

East Tributary
Middle Tributary
West Tributary
Subbasin Boundary
Major Tributary
Elevation Contour (feet)

Falcon Drainage Basin	
Total Basin Area	10.7 mi^2
Average Subbasin Area	0.16 mi^2
Minimum Subbasin Area	0.03 mi^2
Maximum Subbasin Area	0.33 mi^2

East Tributary

West Tributary

Middle Tributary

BURGESS RD
GOODSON RD
MERIDIAN RD
RAYGOR RD
STAPLETON DR
EASTONVILLE RD
JUDGE ORR RD
WOODMEN RD
TAMLIN RD
FALCON HWY
GARRETT RD
MERIDIAN RD

WT020 0.07
WT010 0.14
WT030 0.08
WT040 0.19
WT050 0.19
WT070 0.17
WT060 0.20
WT080 0.07
WT090 0.15
WT110 0.19
WT100 0.19
WT140 0.13
WT150 0.23
WT120 0.05
WT130 0.10
WT160 0.11
WT170 0.12
WT180 0.10
WT190 0.06
WT200 0.30
WT210 0.27
WT220 0.19
WT230 0.20
WT240 0.08
WT250 0.15
WT260 0.14
WT270 0.03
WT280 0.27
WT290 0.10
WT300 0.10
WT310 0.28
WT320 0.21
WT330 0.33
WT340 0.28
WT350 0.30
WT360 0.07
WT370 0.21

ET010 0.15
ET020 0.21
MT020 0.09
MT040 0.31
ET030 0.20
MT010 0.29
MT030 0.16
ET040 0.15
ET050 0.12
ET060 0.29
MT050 0.12
MT060 0.19
ET070 0.25
ET090 0.12
ET080 0.29
MT070 0.20
MT080 0.06
MT090 0.04
ET130 0.13
ET100 0.05
MT100 0.06
ET110 0.23
ET140 0.27
MT110 0.12
ET120 0.11
ET150 0.18
ET160 0.19
FS010 0.12

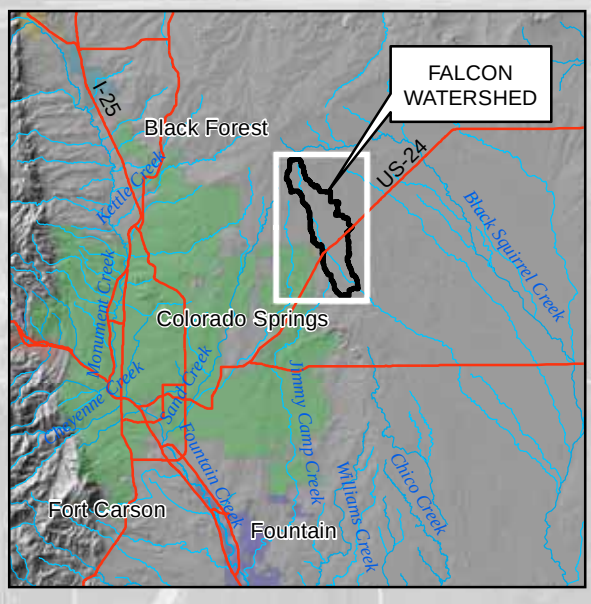


Figure 3-2
Drainage Basin Map
Falcon DBPS
El Paso County, CO

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Miles

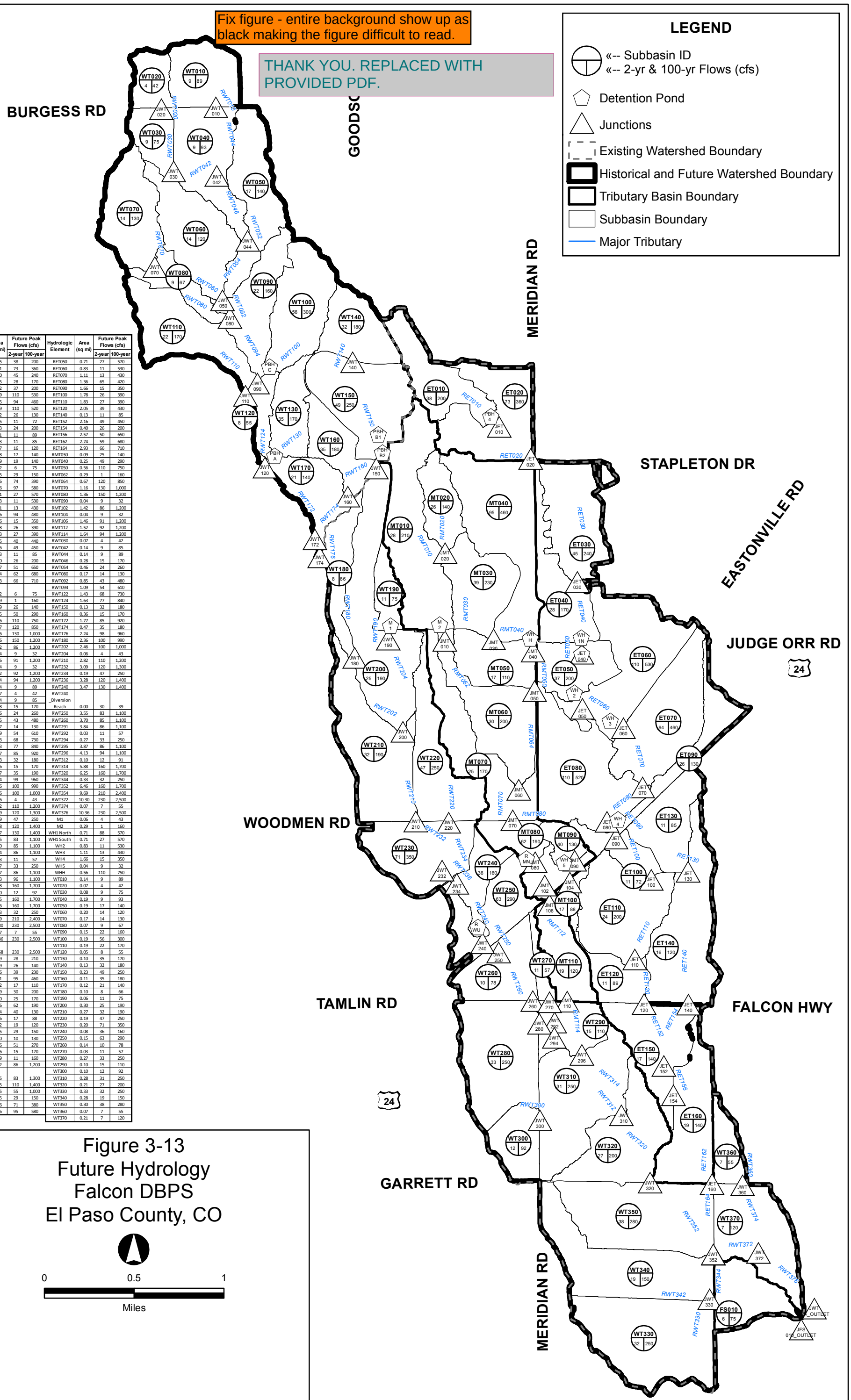
NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20110613\basin_map.mxd, 8/29/2011, wilson_wheeler

the attached PDF is the figure from the DBPS

Fix figure - entire background show up as black making the figure difficult to read.

THANK YOU. REPLACED WITH PROVIDED PDF.



Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)	
		2-year	100-year
ET010	0.15	38	200
ET020	0.21	73	360
ET030	0.20	45	240
ET040	0.15	28	170
ET050	0.12	37	200
ET060	0.29	110	530
ET070	0.25	94	460
ET080	0.29	110	520
ET090	0.12	26	130
ET100	0.05	11	72
ET110	0.23	24	200
ET120	0.11	11	89
ET130	0.13	11	85
ET140	0.27	16	120
ET150	0.18	17	140
ET160	0.19	19	140
FS010	0.12	6	75
JET010	0.15	29	150
JET020	0.36	74	390
JET030	0.56	97	580
JET040	0.71	27	570
JET050	0.83	11	530
JET060	1.11	13	430
JET070	1.36	94	480
JET080	1.66	15	350
JET090	1.78	26	390
JET100	1.83	27	390
JET110	2.05	40	440
JET120	2.16	49	450
JET130	0.13	11	85
JET140	0.40	26	200
JET152	2.57	51	650
JET154	2.74	62	680
JET160	2.93	66	710
JFS010 _OUTLET	0.12	6	75
JMT010	0.29	1	160
JMT020	0.09	26	140
JMT030	0.25	50	290
JMT040	0.56	110	750
JMT050	0.67	120	850
JMT060	1.16	130	1,000
JMT070	1.36	150	1,200
JMT080	1.42	86	1,200
JMT090	0.04	9	32
JMT102	1.46	91	1,200
JMT104	0.04	9	32
JMT106	1.46	91	1,200
JMT110	1.64	94	1,200
JWT010	0.14	9	89
JWT020	0.07	4	42
JWT030	0.14	9	85
JWT042	0.28	15	170
JWT050	0.85	43	480
JWT070	0.17	14	130
JWT080	1.09	54	610
JWT090	1.43	68	730
JWT110	1.63	77	840
JWT120	1.77	85	920
JWT140	0.13	32	180
JWT150	0.36	15	170
JWT160	0.47	35	190
JWT172	2.24	99	960
JWT174	2.36	100	990
JWT180	2.46	100	1,000
JWT190	0.06	4	43
JWT200	2.82	110	1,200
JWT210	3.09	120	1,300
JWT220	0.19	47	250
JWT232	3.28	120	1,400
JWT234	3.47	130	1,400
JWT240	3.55	83	1,100
JWT250	3.70	85	1,100
JWT260	3.84	86	1,100
JWT270	0.03	11	57
JWT280	0.27	33	250
JWT292	3.87	86	1,100
JWT294	4.13	96	1,100
JWT296	5.88	160	1,700
JWT300	0.10	12	92
JWT310	6.25	160	1,700
JWT320	6.46	160	1,700
JWT330	0.33	32	250
JWT352	9.69	210	2,400
JWT354	10.30	230	2,500
JWT360	0.07	7	55
JWT372	10.36	230	2,500
JWT374 _OUTLET	10.58	230	2,500
MT010	0.29	28	210
MT020	0.09	26	140
MT030	0.16	39	230
MT040	0.31	95	460
MT050	0.12	17	110
MT060	0.19	30	200
MT070	0.20	25	170
MT080	0.06	62	190
MT090	0.04	40	130
MT100	0.06	17	88
MT110	0.12	19	120
PBH4	0.15	29	150
PBHA	0.10	10	130
PBHB1	0.36	51	270
PBHB2	0.36	15	170
PBHC	0.19	11	160
RMN	1.42	86	1,200
RWU Diversion	3.55	83	1,300
RWU North	3.55	110	1,400
RWU South	3.55	55	1,000
RET020	0.15	29	150
RET030	0.36	71	380
RET040	0.56	95	580

Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs)	
		2-year	100-year
RET050	0.71	27	570
RET060	0.83	11	530
RET070	1.11	13	430
RET080	1.36	65	420
RET090	1.66	15	350
RET100	1.78	26	390
RET110	1.83	27	390
RET120	2.05	39	430
RET140	0.13	11	85
RET152	2.16	49	450
RET154	0.40	26	200
RET156	2.57	50	650
RET162	2.74	59	680
RET164	2.93	66	710
RMT030	0.09	25	140
RMT040	0.25	49	290
RMT050	0.56	110	750
RMT062	0.29	1	160
RMT064	0.67	120	850
RMT070	1.16	130	1,000
RMT080	1.36	150	1,200
RMT090	0.04	9	32
RMT102	1.42	86	1,200
RMT104	0.04	9	32
RMT106	1.46	91	1,200
RMT112	1.52	92	1,200
RMT114	1.64	94	1,200
RWT030	0.07	4	42
RWT042	0.14	9	85
RWT044	0.14	9	89
RWT046	0.28	15	170
RWT054	0.46	24	260
RWT080	0.17	14	130
RWT092	0.85	43	480
RWT094	1.09	54	610
RWT122	1.43	68	730
RWT124	1.63	77	840
RWT150	0.13	32	180
RWT160	0.36	15	170
RWT172	1.77	85	920
RWT174	0.47	35	180
RWT176	2.24	98	960
RWT180	2.36	100	990
RWT202	2.46	100	1,000
RWT204	0.06	4	43
RWT210	2.82	110	1,200
RWT232	3.09	120	1,300
RWT234	0.19	47	250
RWT240 _Diversion Reach	0.00	30	39
RWT250	3.55	83	1,100
RWT260	3.70	85	1,100
RWT291	3.84	86	1,100
RWT292	0.03	11	57
RWT294	0.27	33	250
RWT295	3.87	86	1,100
RWT296	4.13	94	1,100
RWT312	0.10	12	91
RWT314	5.88	160	1,700
RWT320	6.25	160	1,700
RWT344	0.33	32	250
RWT352	6.46	160	1,700
RWT354	9.69	210	2,400
RWT372	10.30	230	2,500
RWT376	0.07	7	55
RWT374	10.36	230	2,500
WT010	0.14	9	89
WT020	0.07	4	42
WT030	0.08	9	75
WT040	0.19	9	93
WT050	0.19	17	140
WT060	0.20	14	120
WT070	0.17	14	130
WT080	0.07	9	67
WT090	0.15	22	160
WT100	0.19	56	300
WT110	0.19	22	170
WT120	0.05	8	55
WT130	0.10	35	170
WT140	0.13	32	180
WT150	0.23	49	250
WT160	0.11	35	180
WT170	0.12	21	140
WT180	0.10	8	66
WT190	0.06	11	75
WT200	0.30	25	190
WT220	0.19	47	250
WT230	0.20	71	350
WT240	0.08	36	160
WT250	0.15	63	290
WT260	0.14	10	78
WT270	0.03	11	57
WT280	0.27	33	250
WT290	0.10	15	110
WT300	0.10	12	92
WT310	0.28	31	250
WT320	0.21	27	200
WT330	0.33	32	250
WT340	0.28	19	150
WT350	0.30	38	280
WT360	0.07	7	55
WT370	0.21	7	120

Figure 3-13
Future Hydrology
Falcon DBPS
El Paso County, CO

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Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

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Sub Regional Detention Alternative[1]						
Pond		Q_2 In (cfs)	Q_2 Out (cfs)	Q_{100} In (cfs)	Q_{100} Out (cfs)	Required Volume (AF)[2]
Paint Brush Hills Pond #4	PBH 4	38	29	200	150	1.34
Paint Brush Hills Pond A	PBH A	35	7	170	140	2.62
Paint Brush Hills Pond B1	PBH B1	80	51	420	270	9.17
Paint Brush Hills Pond B2	PBH B2	51	10	270	180	12.09
Paint Brush Hills Pond C	PBH C	56	3	300	140	6.77
Regional Pond MN	R MN	65	32	850	820	7.53
Regional Pond R1	R R1	110	77	1,600	1,500	25.00
Regional Pond R2	R R2	140	140	2,200	2,200	3.13
Regional Pond WU South	R WUs	47	22	1,100	930	39.54
Sub Regional Pond SR1	SR 1	54	42	610	510	11.03
Sub Regional Pond SR2	SR 2	65	65	840	840	2.05
Sub Regional Pond SR3	SR 3	72	72	910	910	1.03
Sub Regional Pond SR4	SR 4	130	27	1,000	730	19.37
Sub Regional Pond SR6	SR 6	74	9	390	200	11.82
The Meadows Pond #1	M 1	11	0	70	0	3.25
The Meadows Pond #2	M 2	28	5	210	100	7.94
Woodmen Hills Pond #1 North	WH 1N	65	61	390	260	7.13
Woodmen Hills Pond #1 South	WH 1S	61	10	260	260	8.78
Woodmen Hills Pond #2	WH 2	37	10	270	250	9.18
Woodmen Hills Pond #3	WH 3	110	13	530	360	8.35
Woodmen Hills Pond #4	WH 4	110	15	790	260	40.45
Woodmen Hills Pond #5	WH 5	40	1	130	20	4.10
Woodmen Hills Pond H	WH H	140	110	750	750	2.66

Notes

1: Represents future hydrology with retrofit existing detention ponds and 7 new sub regional detention ponds

2: Required volume to highest WSE not including embankment

Reach Alternative	Total (ft)
Natural Channel Design	13,216
Protect in Place	64,325
Roadside Ditch Improvement	7,519
Small Drop Structures w/ Toe Protection	50,750

BURGESS RD

GOODSON RD

MERIDIAN RD

STAPLETON DR

EASTONVILLE RD

JUDGE ORR RD

DIVERSION

WOODMEN RD

TAMLIN RD

FALCON HWY

GARRETT RD

MERIDIAN RD

24

LEGEND

Detention Pond

- Existing
- Proposed
- Existing Watershed Boundary
- Historical and Future Watershed Boundary
- Tributary Basin Boundary
- Subbasin Boundary
- Major Tributary
- Immediate Action Required to Preserve Existing Condition

Reach Alternative

- Natural Channel Design
- Protect In Place
- Roadside Ditch Improvement
- Small Drop Structures w/ Toe Protection

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

Figure 6-1
Selected Plan
Falcon DBPS
El Paso County, CO

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Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

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Sheet 6-23
Falcon DBPS
Conceptual Plan
Middle Tributary
El Paso County, CO

MT 6 - Woodmen Rd.
EX Size: 4' Circular RCP (x3)
PR Size: 5' Circular RCP (x3)
* Sub-Regional Pond SR4 will be designed to mitigate capacity issues.

Floodplain Enters Underground Storm System

Sub Regional Pond SR4
WQCV = 7.3 AF
100-yr Volume = 19 AF
$Q_{2\ in}$ = 130 cfs
$Q_{2\ out}$ = 27 cfs
$Q_{100\ in}$ = 1000 cfs
$Q_{100\ out}$ = 730 cfs
See Detail on Sheet 6-55

MT 7 - Owl Place
EX Size: 1.75' (W) x 1.25' (H) CMP Elliptical (x4)
PR Size: 4' (W) x 2' (H) Concrete Box (x9)
* Road profile would need to be raised to implement a feasible solution.

MT 6-2 - Woodmen Rd.
EX Size: 4' Circular RCP (x3)
PR Size: 5' Circular RCP (x3)
* Sub-Regional Pond SR4 will be designed to mitigate capacity issues.

Small Drop Structure
See Detail on Sheet 6-54

Future conveyance from Meridian Rd roadside ditch TBD

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

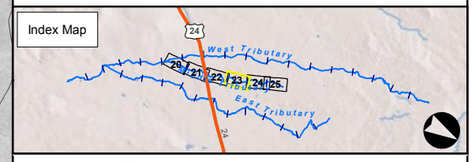
Storm Sewer
Inlet
Manhole
Pipe

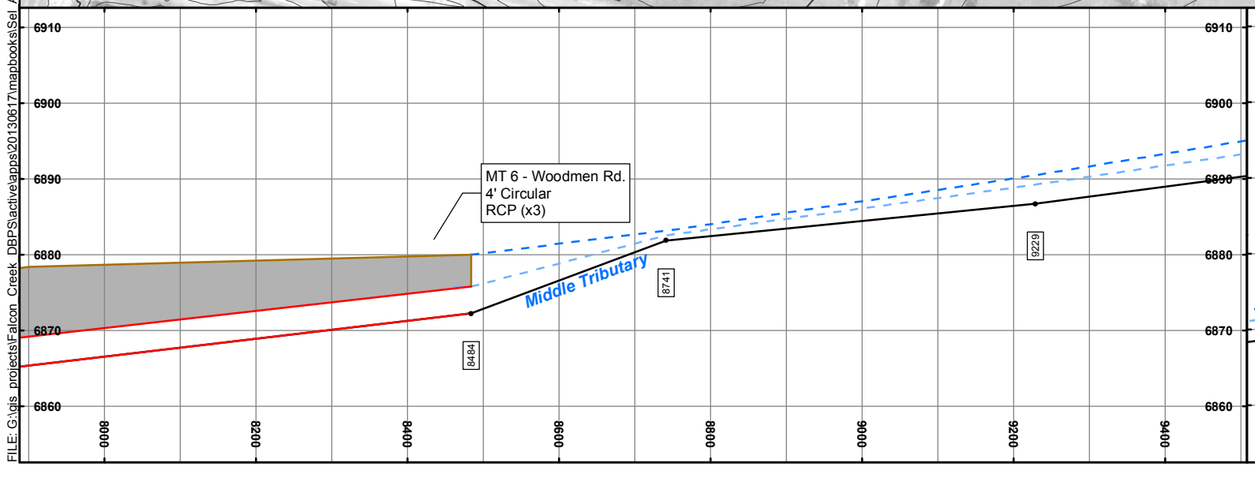
Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

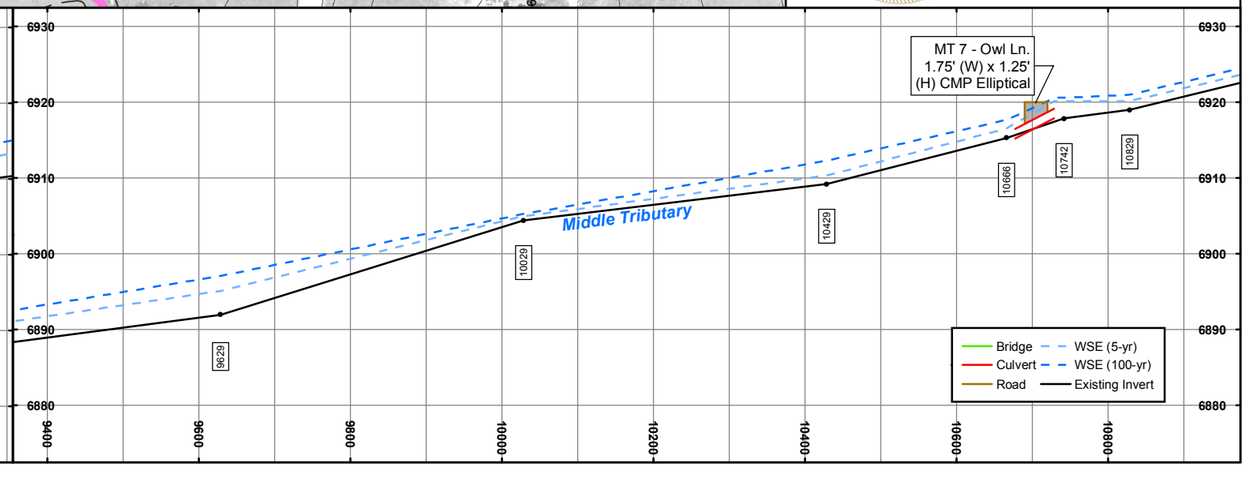
0 100 200 Feet

* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map







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Sheet 6-24
Falcon DBPS
Conceptual Plan
Middle Tributary
El Paso County, CO

Drainageway Crossing
Stream Centerline
Existing Approximate 100-yr Floodplain*
Floodplain Study Limit

Storm Sewer
Inlet
Manhole
Pipe

Reach Improvements
Natural Channel Design
Protect In Place
Roadside Ditch Improvement
Small Drop Structures w/ Toe Protection
Existing Detention
Proposed Detention
Proposed Detention Grading
Small Drop Structure
Cross Vane
Immediate Action Required to Preserve Existing Condition

0 100 200 Feet

* These approximate 100-yr floodplain boundaries are for planning purposes only. This information is not intended to replace the information provided on the FEMA Flood Insurance Rate Maps for this area.
** These are conceptual design drawings and are subject to change. These drawings are not intended for construction purposes.

Index Map

Small Drop Structure
See Detail on Sheet 6-54

Approximate Limits of Split Flow for Existing 100-yr Floodplain

Note:
Infrastructure and channel improvements shown may vary slightly from the final list published in the accompanying report as a result of fee revisions that have occurred following the preparation of this figure. For current information as of September 2015, please see tables in Section 6 of the accompanying report.

matchline - see Sheet 6-23

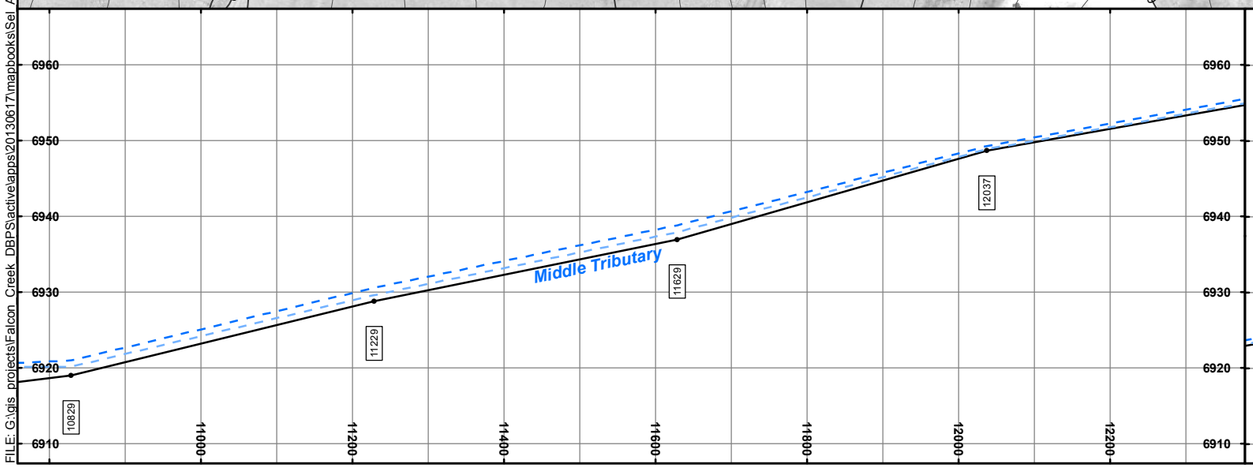
matchline - see Sheet 6-25

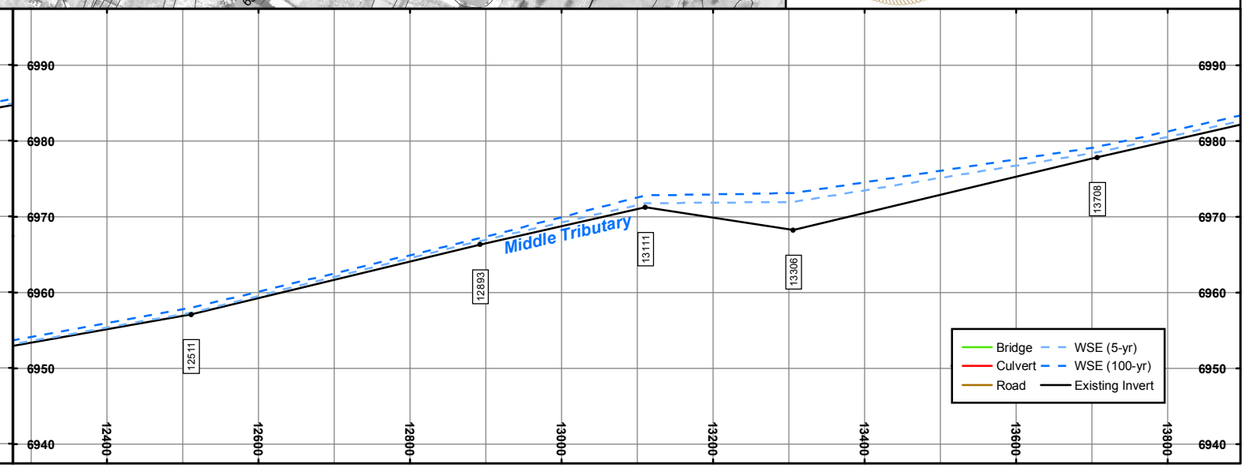
Middle Tributary

RMT062

Cow Palace Rd

Salinas Rd





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7.0 FEE DEVELOPMENT

7.1. Introduction

The objective of the fee development exercise was to determine the equitable share of drainage improvement costs that a developer is responsible for paying to El Paso County if they wish to plat a property. This fee is a function of the total cost for the selected plan outlined in Section 6 and will be used by the County to pay for drainage improvements that are necessary as a result of development. The product of this calculation is a unit fee (cost/impervious acre) that is a one-time charge to the developer based on the number of impervious acres within the platted property.

7.2. Developable Land

The Falcon Watershed has a total area of 6,847 acres. The entirety of the watershed is within the County with 1,969 acres unplatted, according to the GIS dataset received from the County. This dataset also includes unplatted areas that can't be developed because of specific land use designations. Table 7-1 provides a summary of land classifications in the Falcon Watershed. A complete summary of unplatted area land use is provided in Appendix E.

Table 7-1. Land Classification

Classification	Area (acres)
Platted	3,670
Unplatted	1,969
Other	1,208
Total	**6,847**

The projected impervious acreage within unplatted areas totals 645.58 acres. A summary of land classification within the Falcon Watershed is provided in Figure 7-3.

7.3. Fee Calculation & County Cost

The total cost for the Selected Plan was separated into a Development Fee, County Cost, Metropolitan District Cost, and Drainage and Bridge Funds. A description of how the aforementioned were defined is as follows:

- **County Cost** – Drainage improvement costs that are the responsibility of the County as shown in Figure 7-1.
- **Metropolitan District Cost** – Drainage improvement costs that are the responsibility of a metropolitan district as shown in Figure 7-2.
- **Development Fee** – All drainage improvement costs that are directly associated with new development.
- **Drainage and Bridge Funds** – The balance of drainage and bridge funds as of August 2015 was $584,134 and $510,777, respectively, with a liability of $300,000 cost for this DBPS (an additional contract amendment increased the cost of this DBPS to $339,088).

The anticipated reimbursements due for work completed in the Falcon Watershed are approximately equivalent to the available drainage and bridge funds. As a result, reimbursements were not included in the fee calculation. Drainage improvements that are required as a result of new development are listed in Appendix E.

The costs apportioned to County and metropolitan district drainage improvements are provided in Table 7-2 and Table 7-3. The bridge improvement fees shown in Table 7-2 and Table 7-3 were determined by classification of the crossing as either a bridge or a culvert. This classification was based on the DCM criteria.

Table 7-2. County Cost

Drainage Improvements	$ 24,051,349
Bridge Improvements	$ 2,887,437
Total Cost	**$ 26,938,786**

Table 7-3. Metropolitan District Cost

Drainage Improvements	$ 3,972,407
Bridge Improvements	$ 1,855,620
Total Cost	**$ 5,828,027**

The development cost and corresponding fee calculations based on impervious acreage are provided in Table 7-4 and 7-5.

Table 7-4. Development Drainage Cost and Fee

Drainage Improvements	$ 14,649,163
DBPS Cost	$ 339,088
Total Cost	**$ 14,988,251**
Drainage Fee (per imp. ac.)	**$ 23,217**

Table 7-5. Development Bridge Cost and Fee

Bridge Improvements	$ 2,058,474
Total Cost	**$ 2,058,474**
Bridge Fee (per imp. ac.)	**$ 3,189**

LEGEND

- Public Cost Reach Improvement
- Public Cost Detention Pond
- Public Cost Crossing
- Crossing

Detention Pond

- Existing
- Proposed
- Existing Watershed Boundary
- Historical and Future Watershed Boundary
- Tributary Basin Boundary
- Subbasin Boundary
- Major Tributary

Figure 7-1
County Cost Improvements
Falcon DBPS
El Paso County, CO

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Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\Fig_7-1_County_Costs_20151229_JKC.mxd, 12/29/2015, jeff_clonts

Falcon DBPS
County Costs

Drainage Fees			
Reach/Pond	**Reach Length (ft)**	**Improvement**	**Cost**
RWT344	1,379	Roadside Ditch Improvement	$ 167,006
RET140	4,052	Roadside Ditch Improvement	$ 295,914
RET164	2,072	Roadside Ditch Improvement	$ 132,703
RET100	1,791	Small Drop Structures w/Toe Protection	$ 1,342,120
RET110	2,751	Small Drop Structures w/Toe Protection	$ 1,055,516
RET152	2,030	Small Drop Structures w/Toe Protection	$ 1,081,390
RET120	1,379	Natural Channel Design	$ 72,798
RET162	3,256	Small Drop Structures w/Toe Protection	$ 656,460
RMT050	1,568	Small Drop Structures w/Toe Protection	$ 814,189
RMT062	5,688	Small Drop Structures w/Toe Protection	$ 2,381,127
RMT064	3,358	Small Drop Structures w/Toe Protection	$ 1,231,110
RMT112	3,372	Small Drop Structures w/Toe Protection	$ 1,276,142
RWT054	2,497	Small Drop Structures w/Toe Protection	$ 1,414,531
RWT080	3,494	Small Drop Structures w/Toe Protection	$ 2,345,153
RWT092	626	Small Drop Structures w/Toe Protection	$ 414,434
RWT372	1,377	Small Drop Structures w/Toe Protection	$ 947,221
RMT102	1,021	Small Drop Structures w/Toe Protection	$ 636,082
RMT104	874	Small Drop Structures w/Toe Protection	$ 186,349
RET154	2,357	Natural Channel Design	$ 468,927
RET156	942	Natural Channel Design	$ 73,722
WT 5	43	Crossing - Culvert	$ 8,651
ET 13	50	Crossing - Culvert	$ 113,991
ET 11	40	Crossing - Culvert	$ 84,348
ET 9	40	Crossing - Culvert	$ 84,102
ET 4	61	Crossing - Culvert	$ 106,060
Sub Regional Pond SR1		Detention Pond	$ 405,769
The Meadows Pond #2		Detention Pond	$ 20,000
		Subtotal	$ 17,815,814
		Engineering/Construction Admin (15%)	$ 2,672,372
		Contingency (20%)	$ 3,563,163
		Total	**$ 24,051,349**

Bridge Fees			
Reach/Pond	**Reach Length (ft)**	**Improvement**	**Cost**
WT 6	43	Crossing - Bridge	$ 249,775
WT 4	48	Crossing - Bridge	$ 528,324
WT 3	46	Crossing - Bridge	$ 218,292
WT 1	40	Crossing - Bridge	$ 636,648
MT 2	83	Crossing - Bridge	$ 343,147
ET 10	44	Crossing - Bridge	$ 162,656
		Subtotal	$ 2,138,842
		Engineering/Construction Admin (15%)	$ 320,826
		Contingency (20%)	$ 427,768
		Total	**$ 2,887,437**

MDDP & DBPS AMENDMENT

BENT GRASS DEVELOPMENT

El Paso County, Colorado

PREPARED FOR:
Challenger Communities, LLC
8605 Explorer Dr., Suite 250
Colorado Springs, CO 80920

PREPARED BY:
Galloway & Company, Inc.
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920

DATE:
January 2021
Revised: March 2021
Revised: April 2021
Revised: June 2021
Revised: August 2021
Revised: September 2021

PUDSP-20-005

recommendations from the Falcon DBPS, when additional land is obtained to expand the ROW along the southbound portion of Meridian Road.

In the interim condition, it has been proposed to add a temporary lining to the existing channel to handle the excess velocities and depth associated with the DBPS flows and Bent Grass development re-routed flows. This analysis has been included in the Appendix.

The West Tributary Channel will be natural, vegetated facility, helping to ensure that the overall velocities will be reduced, flow depth will not exceed 5' and minimize any potential for scour. If needed, grade control structures may be designed as proposed in the DBPS to ensure these criteria are met.

3. Implement BMPs That Provide a Water Quality Capture Volume with Slow Release

This step utilizes formalized water quality capture volume to slow the release of runoff from the site. The WQCV will release in no less than 40 hours. On-site water quality control volume detention ponds will provide water quality treatment prior to the runoff being released into the channel. WQCV facilities will be designed as Extended Detention Basins.

The Falcon Meadows at Bent Grass development, west of Bent Grass Residential, Filing No. 1 and No. 2, will include several water quality ponds throughout the site to ensure flows will be treated prior to being released into the West Tributary Channel, running through the site. Only a small area, less than 1.0 acres will not be treated prior to releasing into the channel.

Currently, the existing Meridian Road roadside ditch, ultimately conveys runoff to the existing detention and water quality pond MN, as shown and discussed in the Falcon DBPS. The Falcon DBPS also shows a future detention and water quality pond SR-4 that is to receive flows from basin MT060 and discharge into basin MT070, ultimately routing to existing Pond MN. Flows from Bent Grass Meadows Drive are listed in basin MT060 but are being routed to the existing roadside ditch along Meridian Road, which is in basin MT070. The flows from the "School Site" and upstream basins will release into the east side of Pond SR-4 (west of Falcon Market Place). Pond SR-4 is currently under construction. The proposed improvements impact on the existing drainage basin and both Pond MN and Pond SR-4 are discussed later in the report.

4. Consider Need for Industrial and Commercial BMPs

Source control BMPs for homeowners include the use of garages as the primary area where pollutants can be stored. The single-family detached homes provide garages which can act as storage areas. The proposed development does not include outdoor storage or the potential for introduction of contaminants to the Counties' MS4, thus no targeted source control BMPs are necessary. The biggest source control BMP is public education and discuss topics such as: pet waste, car washing, lawn care, fall leaves, and snow melt and deicer.

Bent Grass East Commercial Filing No. 1 contains commercial development. This area will need to consider the need for Industrial & Commercial BMPs. No industrial uses or outside storage is proposed for this area. Drainage will be routed through water quality ponds prior to leaving the site to minimize contaminants into the public system.

VII. Future Drainage Conditions

MIDDLE TRIBUTARY

Design Point 30 and Basins OS-25 and OS-26 are as described under Existing Drainage Conditions. However, Basins OS-25 and OS-26 now route through proposed “future” detention pond, on what’s been previously referred to as the “School Site”, north of Bent Grass Meadows Drive and just west of Bent Grass Filing No. 2. This “future” pond will replace the current sedimentation pond on the “School Site”. Upon any additional development within the Middle Tributary area of the Bent Grass Development and north of Bent Grass Meadows Drive, this pond will need to be constructed to accommodate the re-routed flows from the Meadows Pond #2 at DP 30.

This future facility will need to provide 2.76 ac-ft of water quality, 6.26 ac-ft for EURV and 11.98 ac-ft for 100-year storage volume. Preliminary release rates for the 5 and 100-year storms are 3.8 cfs and 32.2 cfs. These flows were then routed to Bent Grass Meadows to the south. With the decrease in flows, flows will not overtop Bent Grass Meadows Drive and continue east to the future box culvert under Bent Grass Meadows Drive at DP BG20 (5-year flow=292.5 cfs, 100-year flow=909.3 cfs). Flows were still checked against street capacity on the north and south side of Bent Grass Meadows Drive, as it continues to the east. With the construction of the future pond, Bent Grass Meadows Drive will be able to adequately handle the flows and no additional storm infrastructure would need to be built to carry these future developed flows. Any area north of Bent Grass Meadows Drive that will develop in the future will need to provide its own on-site detention. Should future development not be able to release flows into Bent Grass Meadows Drive, a 42” RCP would be able to convey the flows of DP BG 15n (Q100=40.9 cfs, Q5=8.8 cfs) to the northwest corner of the Bent Grass Meadows Drive and Meridian Road intersection. Analysis for this culvert sizing has been included in the appendix.

At the Bent Grass Meadows Drive/Meridian Road intersection, the elliptical rcp’s will need to be replaced with a double 16’ x 4’ rcbc. The future roadside ditch will have a 15’ wide bottom channel with 4:1 side slope, 6.5’ deep and a longitudinal slope of 0.30%. This will result is a flow depth of 5.15’ and velocity of 5.04 fps. This channel will direct flows to Owl Place where the existing twin cmp’s will be replaced with a 20’ x 4’ rcbc or equivalent. This structure will need to be built when any development west of Meridian Road at the intersection of Owl Place happens. With future development, it is anticipated that the existing channel conveying flows to the south will be removed to accommodate the new development. The new channel will need to be a 35’ wide bottom channel with 4:1 sides, 5’ deep and a longitudinal slope of 0.30%. This will produce a flow depth of 3.7’ and a velocity of 4.6 fps. If the channel option is not viable, twin 78” rcp’s at a minimum 0.50% slope would be able to handle this future flow. Analysis for this design option has been included in the appendix.

Calculations are provided in Appendix C for the future culverts and roadside channel.

WEST TRIBUTARY

Offsite flows entering the west tributary location of Bent Grass have not changed from what was discussed under Current Conditions. Reach RWT202 at the northwest corner of the development has a 100-year flow of 1000 cfs and Reach RWT204 has a flow of 43 cfs. These were obtained from the DBPS by Matrix. The Flood Insurance Study (FIS) by FEMA does not have flows evaluated this far north. The have a flow of 1482 cfs beginning at RWT210. The 8 undeveloped on-site basins for Bent Grass West have been replaced with 17 developed basins. These basins are found in the Falcon Meadows for Bent Grass PDR. A summary of these basins is provided below and are part of the hydrology analysis provided in Appendix B.

Sub Regional Detention Alternative[1]						
Pond		Q_2 In (cfs)	Q_2 Out (cfs)	Q_{100} In (cfs)	Q_{100} Out (cfs)	Required Volume (AF)[2]
Paint Brush Hills Pond #4	PBH 4	38	29	200	150	1.34
Paint Brush Hills Pond A	PBH A	35	7	170	140	2.62
Paint Brush Hills Pond B1	PBH B1	80	51	420	270	9.17
Paint Brush Hills Pond B2	PBH B2	51	10	270	180	12.09
Paint Brush Hills Pond C	PBH C	56	3	300	140	6.77
Regional Pond MN	R MN	65	32	850	820	7.53
Regional Pond R1	R R1	110	77	1,600	1,500	25.00
Regional Pond R2	R R2	140	140	2,100	2,100	7.90
Regional Pond WU South	R WU	47	22	1,070	930	39.54
Sub Regional Pond SR1	SR 1	54	42	610	510	11.03
Sub Regional Pond SR2	SR 2	65	65	840	840	2.05
Sub Regional Pond SR3	SR 3	72	72	910	910	1.03
Sub Regional Pond SR4	SR 4	130	27	1,000	730	19.37
Sub Regional Pond SR6	SR 6	74	9	390	200	11.82
The Meadows Pond #1	M 1	11	0	75	2	3.25
The Meadows Pond #2	M 2	28	5	210	99	7.94
Woodmen Hills Pond #1 North	WH 1N	65	61	390	260	7.13
Woodmen Hills Pond #1 South	WH 1S	61	10	260	260	8.78
Woodmen Hills Pond #2	WH 2	37	10	270	250	9.18
Woodmen Hills Pond #3	WH 3	105	13	530	360	8.35
Woodmen Hills Pond #4	WH 4	110	15	790	260	40.45
Woodmen Hills Pond #5	WH 5	40	1	130	19	4.10
Woodmen Hills Pond H	WH H	140	110	750	750	2.66

Notes
1: Represents future hydrology with retrofit existing detention ponds and 5 new subregional detention ponds
2: Required volume to highest WSE

Reach Alternative	Total (ft)
Protect In Place	30,066
Natural Channel Design	32,359
Small Drop Structures w/ Toe Protection	76,812
Large Drop Structures w/ Toe Protection	0

BURGESS RD
GOODSON RD
STAPLETON DR
EASTONVILLE RD
JUDGE ORR RD
WOODMEN RD
TAMLIN RD
FALCON HWY
GARRETT RD
MERIDIAN RD
DIVERSION
CHANGE DUE TO BENT GRASS R2 (RWT200)
DELETE POND WITH WQCV REPLACEMENTS & CHANNEL IMPROVEMENTS
CHANGE DUE TO BENT GRASS R1 (RMT063)

LEGEND

Detention Pond
- Existing
- Proposed
- Existing Watershed Boundary
- Historical and Future Watershed Boundary
- Tributary Basin Boundary
- Subbasin Boundary
- Major Tributary
- Immediate Action Required to Preserve Existing Condition

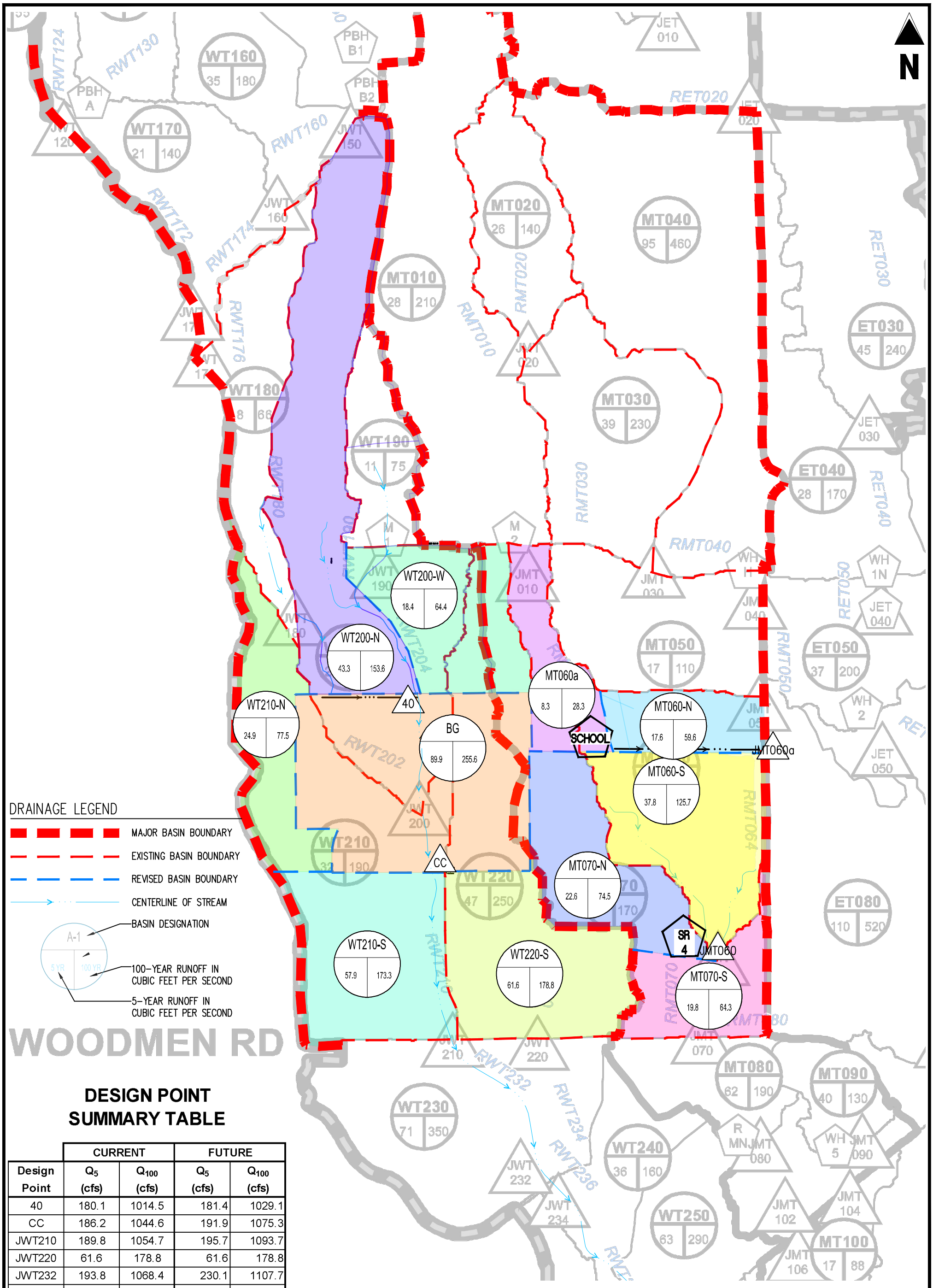
Reach Alternative
- Protect In Place
- Natural Channel Design
- Small Drop Structures w/ Toe Protection

Figure 5-3
Sub-Regional Detention Alternative
Falcon DBPS
El Paso County, CO

0 0.5 1
Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20111215_alternatives\subregional_detention_alt.mxd, 12/19/2011, ron_ramold



DESIGN POINT SUMMARY TABLE

	CURRENT		FUTURE	
Design Point	Q_5 (cfs)	Q_{100} (cfs)	Q_5 (cfs)	Q_{100} (cfs)
40	180.1	1014.5	181.4	1029.1
CC	186.2	1044.6	191.9	1075.3
JWT210	189.8	1054.7	195.7	1093.7
JWT220	61.6	178.8	61.6	178.8
JWT232	193.8	1068.4	230.1	1107.7
JMT060a	292.1	908.7	292.1	908.9
JMT060	43.3	700.4	43.7	700.3
JMT070	44.9	717.6	45.3	717.5
JMT080	47.3	692.3	47.8	691.7

FALCON MEADOWS AT BENT GRASS
MDDP

REVISED BASIN HYDROLOGY - HMS MODEL

Project No:	CLH0017
Drawn By:	CMD
Checked By:	GD
Date:	06/16/21

Galloway
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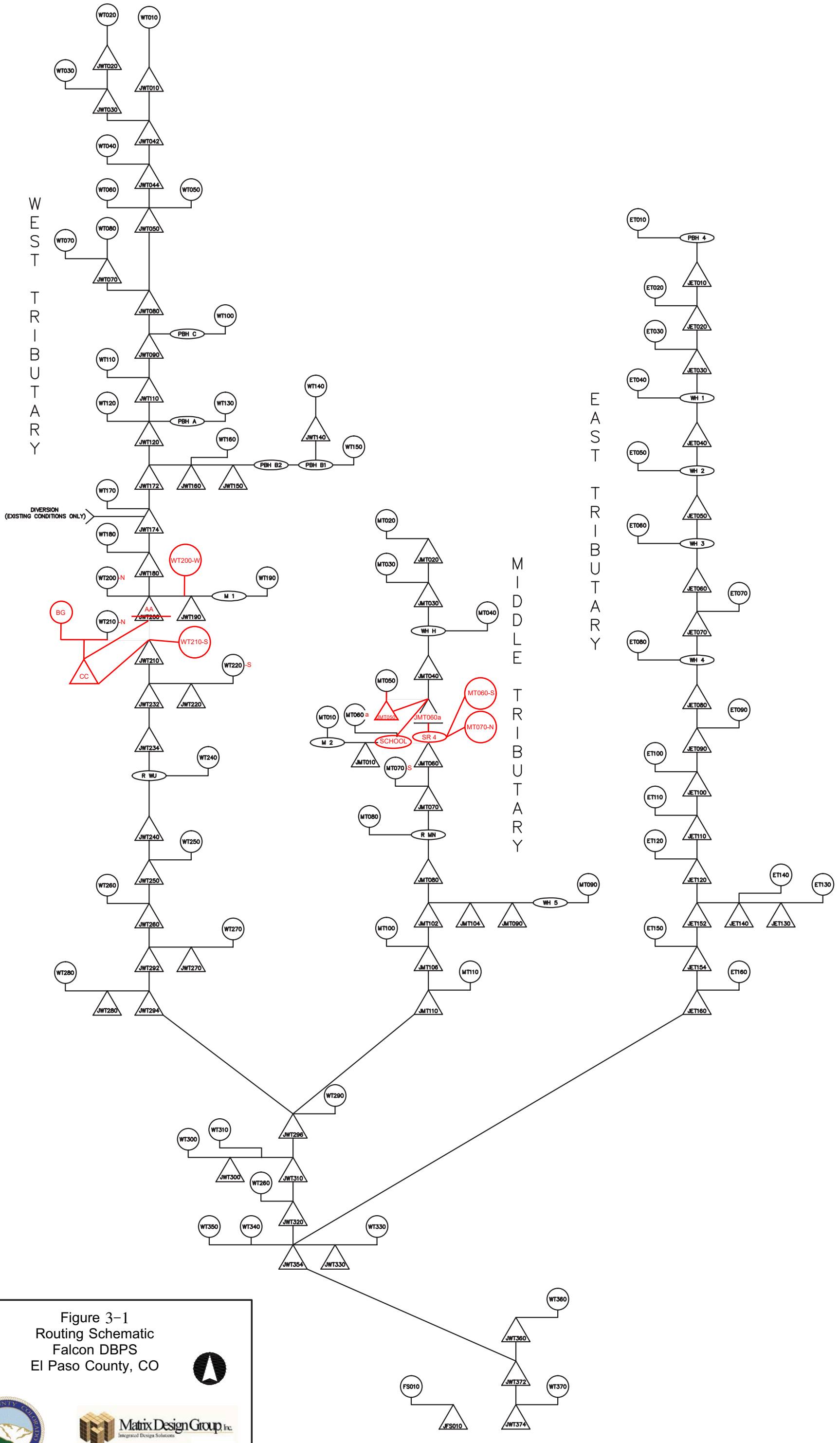


Figure 3-1
Routing Schematic
Falcon DBPS
El Paso County, CO

DRAWING NOT TO SCALE

MERIDIAN ROAD

Worksheet for Fut Channel - Pr 100 Yr Flow-MR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.30	%
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	15.00	ft
Discharge	925.00	ft³/s

Results

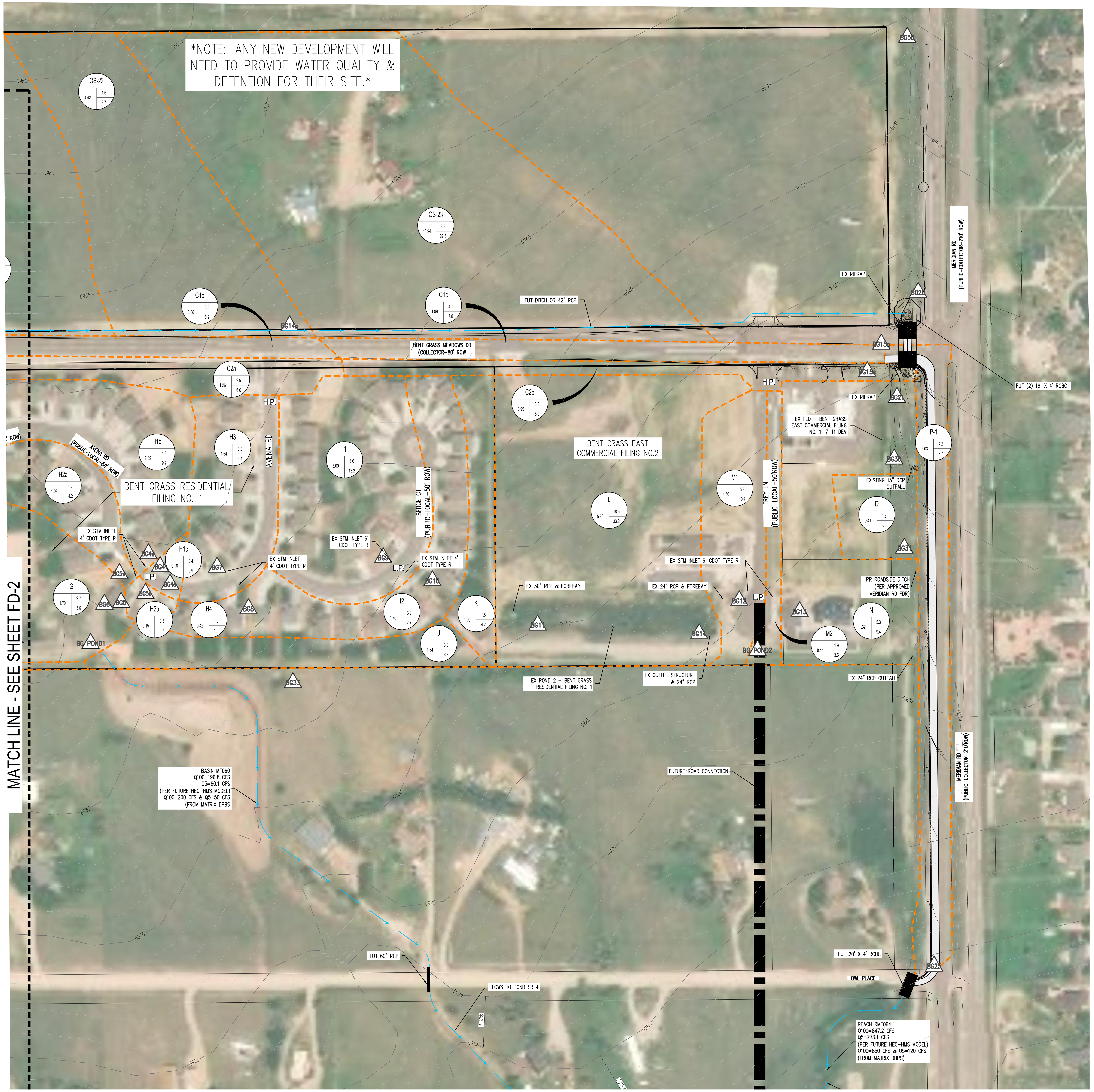
Normal Depth	5.15	ft
Flow Area	183.50	ft²
Wetted Perimeter	57.49	ft
Hydraulic Radius	3.19	ft
Top Width	56.22	ft
Critical Depth	3.58	ft
Critical Slope	0.01368	ft/ft
Velocity	5.04	ft/s
Velocity Head	0.39	ft
Specific Energy	5.55	ft
Froude Number	0.49	
Flow Type	Subcritical	

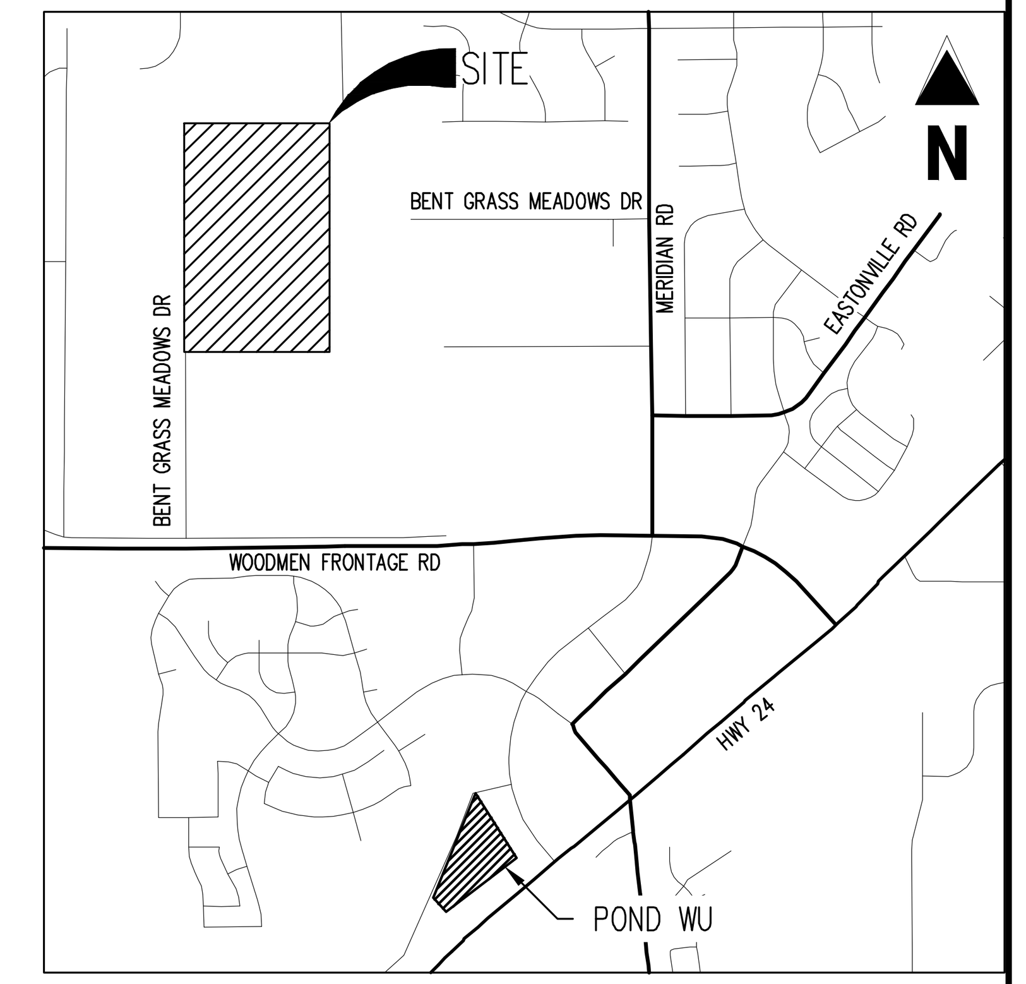
GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	5.15	ft
Critical Depth	3.58	ft
Channel Slope	0.30	%





VICINITY MAP
1"=2,000'

N
0 20 50 100
SCALE: 1"=100'

DRAINAGE LEGEND

- PROPERTY LINE
- 6485 EXISTING MAJOR CONTOUR
- 6483 EXISTING MINOR CONTOUR
- 6485 PROPOSED/FUTURE MAJOR CONTOUR
- 6483 PROPOSED/FUTURE MINOR CONTOUR
- BASIN BOUNDARY LINE
- 100YR FEMA EFFECTIVE 100-YR FLOODPLAIN
- CENTERLINE OF STREAM
- 1 — BASIN DESIGNATION
- 1.8 — 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 4.8 — 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 0.71 — BASIN AREA IN ACRES
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Q_5 (cfs)	Q_{100} (cfs)
RWT202	1574.40	220.0	1000.0
RWT204	38.40	7.0	43.0
WT200	192.00	52.0	190.0
OS-2	20.08	9.0	43.4
OS-3	10.62	4.7	22.7
OS-25	18.74	6.3	35.8
OS-26	5.81	1.9	12.6
H5	6.37	3.2	15.1
OS-22	4.42	1.5	9.7
OS-23	10.24	3.3	22.5
C1a	0.48	1.8	3.4
C1b	0.88	3.3	6.2
C1c	1.09	4.1	7.8
D1a	0.56	1.6	3.5
D1b	0.68	2.0	4.2
D1c	1.20	3.2	6.6
D1d	2.79	6.7	13.6
C2a	1.26	2.9	6.0
C2b	0.99	3.3	6.0
D2a	1.00	1.8	4.8
D2b	0.41	1.0	2.3
H1a	0.40	1.0	2.3
H1b	2.52	4.3	9.9
H1c	0.16	0.4	0.9
H2a	1.09	1.7	4.2
H2b	0.15	0.3	0.7
F	1.37	2.6	5.9
G	1.70	2.7	5.6
H3	1.54	3.2	6.4
H4	0.42	1.0	1.9
I1	3.00	6.6	13.2
I2	1.70	3.9	7.7
J	1.64	3.0	6.8
K	1.00	1.8	4.2
L	5.90	18.5	33.2
M1	1.56	5.9	10.4
M2	0.44	1.9	3.5
N	1.32	5.3	9.4
D	0.41	1.8	3.0
OS-1	33.07	15.5	66.7
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3
A-1	2.70	3.3	8.6
A-2	1.19	1.5	4.2
A-3	1.57	2.1	5.0
A-4	2.24	2.9	7.5
C-1	1.35	2.6	5.9
C-2	6.80	7.1	18.5
C-3	2.38	3.3	7.8
C-4	3.61	5.3	12.0
C-5	7.86	10.9	24.9
C-6	5.54	7.0	16.9
C-7	0.89	0.3	2.1
E-1	1.71	3.6	7.7
E-2	0.68	2.4	4.6
E-3	0.78	2.9	5.3
E-4	0.91	3.0	5.7
E-5	0.89	3.3	6.1
F-1	0.44	0.6	1.6
F-2	0.55	1.5	3.1
G-1	1.47	1.3	4.5
H-1	0.52	0.2	1.4
I-1	0.31	1.0	2.1
AA-1	2.57	4.2	9.9
AA-2	2.28	4.2	9.3
B-1	5.25	2.3	10.7
B-2	4.16	1.4	9.1
CC-1	9.07	16.9	36.0
CC-2	1.53	4.6	9.8
CC-3	1.88	6.4	12.1
CC-4	3.64	6.2	16.0
CC-5	0.45	0.2	1.4
D-1	9.07	11.2	26.6
D-2	7.42	15.5	32.2
D-3	2.03	0.8	2.3
D-4	4.38	7.8	16.6
D-5	1.08	2.2	4.6
D-6	4.01	8.2	17.2
D-7	6.39	3.2	14.8
D-8	1.69	1.3	4.5
P-1	2.03	4.2	8.7

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)	REV HMS FLOWS Q_5 (cfs)	REV HMS FLOWS Q_{100} (cfs)
40	278.1	1227.8	181.4	1029.1
1	3.1	8.6		
2	4.3	11.9		
3	5.9	15.9		
4	8.3	22.3		
9	1.1	2.4		
11	6.0	15.5		
13	7.6	19.0		
5	10.9	27.1		
6	4.1	9.4		
7	2.9	5.5		
8	20.0	50.5		
12	4.6	10.2		
15	20.9	45.4		
10	23.9	52.7		
10A	6.0	21.9		
14	33.0	81.1		
14A	12.2	37.0		
AA	270.3	1188.7		
BB	269.5	1186.4		
16	16.6	39.4		
17	10.6	26.8		
18	13.5	39.2		
19	9.5	29.7		
20	1.3	4.6		
20A	18.4	57.1		
20B	21.3	66.0		
28	8.6	42.8		
29	12.2	60.9		
21	15.0	32.5		
22	10.5	26.0		
23	12.2	59.7		
24	2.1	15.9		
25	3.3	10.7		
26	8.0	41.7		
42	7.5	16.5		
43	10.0	21.8		
44	1.2	4.5		
45	53.8	173.9		
45A	1.1	45.8		
CC	268.2	1183.4	191.9	1075.3
30	2.1	63.5		
31	5.8	67.4		
32	6.5	64.8		
32A	4.9	34.5		
32A-N	4.9	33.2		
32A-S	12.5	3.6		
BG 1a-Os	0.0	0.0		
BG 1a-Ose	0.0	0.0		
BG 1a-Osw	0.0	0.0		
BG 4a	0.6	1.5		
BG 1b	1.3	2.8		
BG 1c	3.3	7.1		
BG 1	8.3	17.6		
BG 2e	1.8	5.0		
BG 2w	1.0	2.4		
BG 2	2.8	7.3		
BG 4e	0.4	0.9		
BG 4w	3.8	9.0		
BG 4	4.0	9.5		
BG 5e	0.3	0.7		
BG 5w	1.7	4.2		
BG 5	1.9	4.7		
BG 3	16.2	58.7		
BG 6	5.4	13.2		
BG POND1	0.3	2.9		
BG 14n	9.2	42.7		
BG 15n	8.8	40.9		
BG 50	280.0	850.0		
BG 20	292.5	909.3		
BG 14s	15.0	7.8		
BG 15s	16.8	12.4		
BG 21	304.6	915.3		
BG 32	2.6	6.1		
BG 33	2.9	7.0		
BG 7	3.1	6.4		
BG 8	1.0	2.0		
BG 9	6.5	13.4		
BG 10	3.8	7.9		
BG 11	13.5	27.8		
BG 12	5.8	10.7		
BG 13	7.0	13.0		
BG 14	12.3	22.8		
BG 15	42.2	82.0		
BG POND2	0.4	10.0		
BG 30	3.0	5.0		
BG 31	1.8	3.1		
BG 25	252.0	751.4		

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CHALLENGER HOMES

MASTER DRAINAGE DEVELOPMENT PLAN
FALCON MEADOWS AT BENT GRASS
FOR
CHALLENGER COMMUNTIES, LLC

BENT GRASS MEADOWS DRIVE & MERDIAN ROAD
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No: CLH000014.20
Drawn By: CMWJ
Checked By: SMB
Date: OCTOBER 2019

FUTURE CONDITIONS DRAINAGE MAP

FD-3
Sheet 3 OF 5

REQUEST FOR
CONDITIONAL LETTER OF MAP REVISION

UNNAMED TRIBUTARY TO
BLACK SQUIRREL CREEK,
FALCON OWL PLACE

Falcon, Colorado
October 25, 2022

Prepared by:

Drexel, Barrell & Co.
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(303) 442-4338

Contact: Michelle Iblings, P.E., CFM

Prepared for:

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106 S. Kyrene Road, Suite 2
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(480) 590-8403

Contacts: Lubertus Hayenga, Brian Zurek

DBC Project No. 21611-00BLWR

3.0 HYDROLOGIC ANALYSIS

3.1 Falcon DBPS

The Falcon DBPS completed hydrologic analysis for the Falcon Basin Watershed, using HEC-HMS v3.5 software, for historical, existing, and future land use conditions by applying a 24-hour storm event with 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals and current drainage infrastructure. Chapter 3 and Appendix A of the Falcon DBPS include a detailed discussion of the hydrologic analysis. An electronic copy of the HEC-HMS model (File: Aug15_Working_Falcon_DBPS_S.hms) is also provided.

The Falcon DBPS identified Subregional Pond SR4 to be installed on the Falcon Marketplace property. Pond SR4 was constructed in early 2021 and the property floodplain mapping was updated in LOMR Case Number 21-08-0534P.

El Paso County requires regional drainage infrastructure to be sized for future land use conditions. Therefore, peak discharges with existing drainage infrastructure and future land use conditions near Owl Place are summarized in Table 3-1.

Table 3-1. Future Land Use Conditions Peak Discharges near Falcon Owl Place on the Middle Tributary, Falcon DBPS

Model Location	Physical Location	Branch	Proximity to Owl Place	Q100 (cfs)
JMT050	Bent Grass Meadows Drive	Only East Branch	Upstream of Site	850
JMT060	Eastonville Road (Pond SR4 inflow)	Both East and West Branches	Downstream of Site	1,000

3.2 Falcon Owl Place

The Falcon DBPS HEC-HMS model with existing drainage infrastructure and future land use (Existing Conditions) was used as the basis for the Falcon Owl Place hydrologic analysis. The Existing Conditions model was replicated in HEC-HMS version 4.7.1, due to instabilities and runtime issues with the prior, outdated model version (3.5). The Existing model produced 100-year peak flows of 859 and 1,023 cfs upstream (JMT050) and downstream (JMT060) of the site, which are comparable to and more conservative than the 850 and 1,000 cfs in the DBPS. It should be noted that in Existing Conditions, JMT050 is on the East Branch of the Middle Tributary, whereas JMT060 includes flows from both the West and East Branches, immediately upstream of Pond SR4.

The Falcon watershed did not include a design point on the East Branch immediately upstream of Pond SR4. Therefore, it was necessary to modify the HMS model to obtain a design flow for Owl Place. In the Proposed Conditions basin model, the junction JMT051 was created on the East Branch of the UTBSC at the southern boundary of the Falcon Owl Place property, immediately upstream of Pond SR4.

The lag time and drainage area for Basin MT060 were reduced to 0.077 square miles and 17 minutes, respectively. The length and slope of Routing RMT060 were also updated. The NRCS soils for the proposed basin are Columbine gravelly sandy loam with a Hydrologic Soil Group (HSG) A. The basin is zoned for a combination of 5-acre residential, commercial, and planned unit development (PUD). The nearby PUD (Bent Grass Meadows) is residential with an average lot size of 0.22 acres. Based on TR-55 Table 2-2a, areas with 0.22-acre lots and HSG A have a Curve Number (CN) of 65. However, it is unknown how and when this area will develop in the future. For example, the Owl Place site is currently being rezoned from RR-5 to CS, which would increase the CN from 46 to 89. The future conditions CN of 66 used in the Falcon DBPS is a reasonable representation of the future development potential in the basin and was used in the proposed conditions model.

The hydrologic parameter calculations, base mapping, and select output from the HEC-HMS model is included in **Appendix 4,** and the model files (HEC-HMS file: Falcon_OwlCLOMR.hms) are provided. Proposed peak discharges used for the Falcon Owl Place development are summarized in Table 3-2.

Table 3-2. Proposed Peak Discharges at Falcon Owl Place (East Branch of the UTBSC)

Recurrence Interval	Q100 (cfs)
100-year	920
5-year	288.5

4.0 HYDRAULIC ANALYSIS

4.1 General

The effective FIRM identifies an approximate Zone A floodplain across the Falcon Owl Place property with no flood profiles, discharges, or BFE's defined. The Falcon Owl Place development includes filling and regrading the site and rerouting the East Branch of the UTBSC through a box culvert across the site.

4.2 Vertical Datum

The effective FIRM is on the North American Vertical Datum of 1988 (NAVD88). The ALTA survey completed for the site (Olsson, 2021) and the design and construction

drawings are on the National Geodetic Vertical Datum of 1929 (NGVD29). The Falcon DBPS and the hydraulic analysis for this CLOMR were both completed on the NGVD29. The difference between the NGVD29 and NAVD88 is 3.8 feet on the Falcon Owl Place.

4.3 Horizontal Datum

The field survey, design, construction drawings and hydraulic modeling for the Falcon Owl Place project were completed on the North American Datum of 1983 (NAD83), Colorado State Plane coordinate system, Central Zone.

4.4 Box Culvert Hydraulic Analysis

Under existing and proposed conditions, the East Branch of the UTBSC leaving the Falcon Owl Place site discharges to Pond SR4 on the Falcon Marketplace. The pond was designed for a 100-year discharge of 1,016 cfs, which includes both West and East branches of the UTBSC. The 100-year water surface elevation upstream of the pond as shown in the LOMR is 6902.5 (NAVD88), or 6898.7 (NGVD29). The starting HGL for the box culvert analysis was conservatively placed at the top of pipe elevation of 6895.84 feet (NGVD29) for analyzing flows to the East branch only. However, an additional analysis was performed with a starting HGL of 6898.7, to evaluate the backwater effects from the pond.

StormCAD was used to evaluate the hydraulic performance of the 10'x6' box culvert. The profile and output for the 100-year storm event is included in **Appendix 5**, and the model files are provided.

4.5 Existing and Proposed Owl Place Culverts

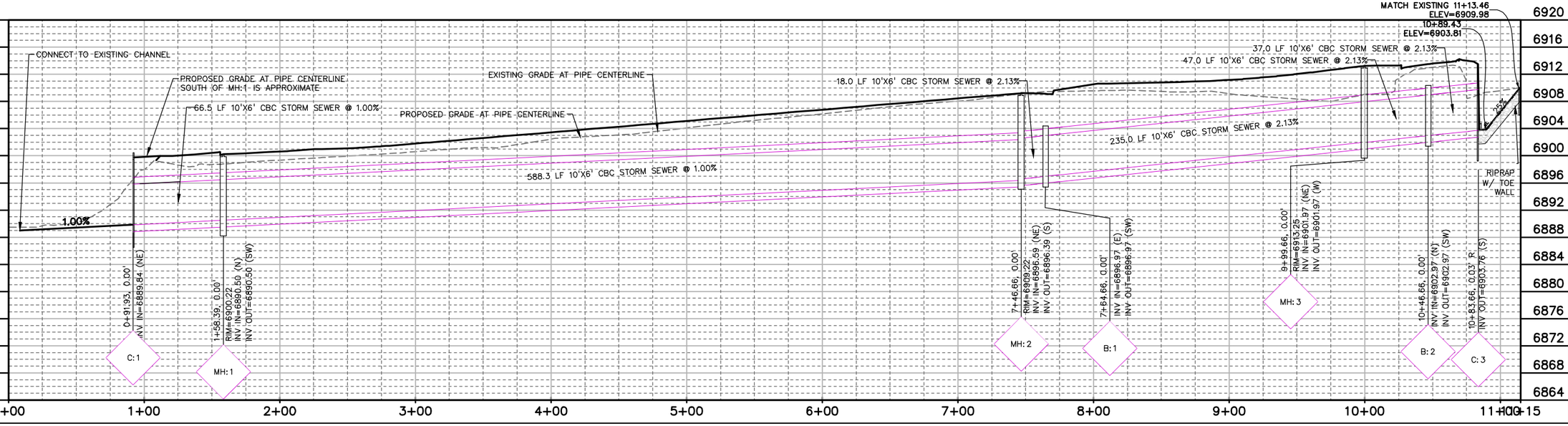
The East Branch of the UTBSC is currently conveyed under Owl Place via two 36" CMP near the northeast corner of the site. The HY-8 software was used to analyze the existing culverts for the 100-year storm event.

The 2-36" CMP culverts are severely undersized and partially filled with sediment as shown in the photo below. The culverts only convey 86-95 cfs, depending on tailwater depth. The remaining flow (approximately 825-834 cfs) in the 100-year event overtops Owl Place. The proposed box culvert will convey the entire 100-year event (920 cfs) with an HGL of 6911.31 at the proposed headwall upstream of Owl Place, which is more than one foot below Owl Place and contained within the existing and proposed channel upstream. Channel grading will be required for approximately 30 feet to tie into the existing creek profile upstream. The channel side slopes will be reduced from approximately 5.5H:1V to 1.8H:1V and protected with riprap.

The HY-8 output is included in **Appendix 5** and the model file (Owl Place.hy8) is provided.

Existing 2-36” CMP under Owl Place (Upstream Inlets)

GROUTED RIPRAP/REGRADE POND
TYPE VI STILLING BASIN (SEE CONSTRUCTION PLAN DETAILS)
HEADWALL WITH HANDRAIL (SEE CONSTRUCTION PLAN DETAILS)
66.5 LF 10'X6' CBC STORM SEWER @ 1.00%
588.3 LF 10'X6' CBC STORM SEWER @ 1.00%
FALCON LOMR_FP SEPT 2021
PROPOSED 25' WIDE STORM EASEMENT
CONCRETE TRICKLE CHANNEL (SEE CONSTRUCTION PLAN DETAILS)
MERIDIAN PARK DRIVE
EASTONVILLE ROAD
OWL PLACE
MERIDAN ROAD
C: 1
STA. 0+91.93, 0.00'
CONNECT TO HEADWALL
INV. IN= 6889.84' (NE)
N: 1405845.62
E: 3253372.49
MH: 1
STA. 1+58.39, 0.00'
10'X6' CBC 45 DEG BEND
W/ MH ACCESS
RIM= 6900.22'
INV. IN= 6890.50' (N)
INV. OUT= 6890.50' (SW)
N: 1405892.88
E: 3253419.22
STORM MANHOLE
RIM ELEV.=6899.55'
ZONE A
NO BASE FLOOD ELEVATIONS DETERMINED
MH: 3
STA. 9+99.66, 0.00'
10'X6' CBC 45 DEG BEND
W/ MH ACCESS
RIM= 6913.25'
INV. IN= 6901.97' (NE)
INV. OUT= 6901.97(W)
N: 1406495.26
E: 3253663.59
B: 2
STA. 10+46.66, 0.00'
10'x6' CBC 45 DEG BEND
INV. IN= 6902.97' (N)
INV. OUT= 6902.97'(SW)
N: 1406528.68
E: 3253696.64
STA. 7+46.66, 0.00'
MANHOLE (SPECIAL)
(SEE CONSTRUCTION SET DETAILS)
RIM= 6909.22'
INV. IN= 6896.59' (NE)
INV. OUT= 6896.39' (S)
N: 1406481.15
E: 3253415.93
MH: 2
18.0 LF 10'X6' CBC STORM SEWER @ 2.13%
STA. 7+64.66, 0.00'
10'x6' CBC 45 DEG BEND
INV. IN= 6896.97' (E)
INV. OUT= 6896.97' (SW)
N: 1406493.94
E: 3253428.59
B: 1
PROPOSED 25' WIDE STORM EASEMENT
235.0 LF 10'X6' CBC STORM SEWER @ 2.13%
47.0 LF 10'X6' CBC STORM SEWER @ 2.13%
37.0 LF 10'X6' CBC STORM SEWER @ 2.13%
PROPOSED HEADWALL (SEE CONTRUCTION PLANS FOR DETAIL)
RIPRAP W/ TOE WALL
FLARED END SECTION 36" CMP INV.= 6908.24'
FLARED END SECTION 36" CMP INV.= 6908.18'
FLARED END SECTION 36" CMP INV.= 6908.41'
FLARED END SECTION 36" CMP INV.= 6908.33'
STA. 10+83.66, 0.03' R
CONNECT TO HEADWALL
INV. OUT= 6903.76' (S)
N: 1406565.68
E: 3253696.43
C: 3
40 20 0 40 80
SCALE IN FEET



LEGEND

- PR. STORM SEWER
- PR. JUNCTION BOX
- PR. RIPRAP
- PR. ACCESS MH
- PR. STORM EASEMENT
- EX. CONTOUR 6905
- PR. CONTOUR 6908
- EX. ROW LINE
- EX. PROPERTY LINE

NOTES

1. SPATIAL PROJECTION IS NAD83 COLORADO STATE PLANE, CENTRAL ZONE (FEET).
2. VERTICAL DATUM IS NGVD29.

PREPARED BY:

DBC
Drexel, Barrell & Co.
Traditional Service, Innovative Solutions
Since 1978

Drexel, Barrell & Co.
Engineers • Surveyors
1376 MINERS DRIVE, STE 107
LAFAYETTE, COLORADO 80026
CONTACT: MICHELLE IBLINGS, P.E.
(303) 442-4338
LAFAYETTE
COLORADO SPRINGS

OWNER/CLIENT:

LUBERTUS HAYENGA
BH RE INVESTMENTS, LLC
106 S. KYRENE RD., STE 2
CHANDLER, AZ 85226

EXHIBIT FOR:
FALCON OWL PLACE
FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/17/22

DESIGNED BY:	MLI
DRAWN BY:	CAF
CHECKED BY:	MLI
FILE NAME:	EX01

NOT FOR CONSTRUCTION

DRAWING SCALE:
HORIZONTAL: SEE PLAN
VERTICAL: SEE PLAN

PIPE SYSTEM EXHIBIT

PROJECT:21611-00BLWR
DRAWING NO.
EX01
SHEET: 1 OF 1

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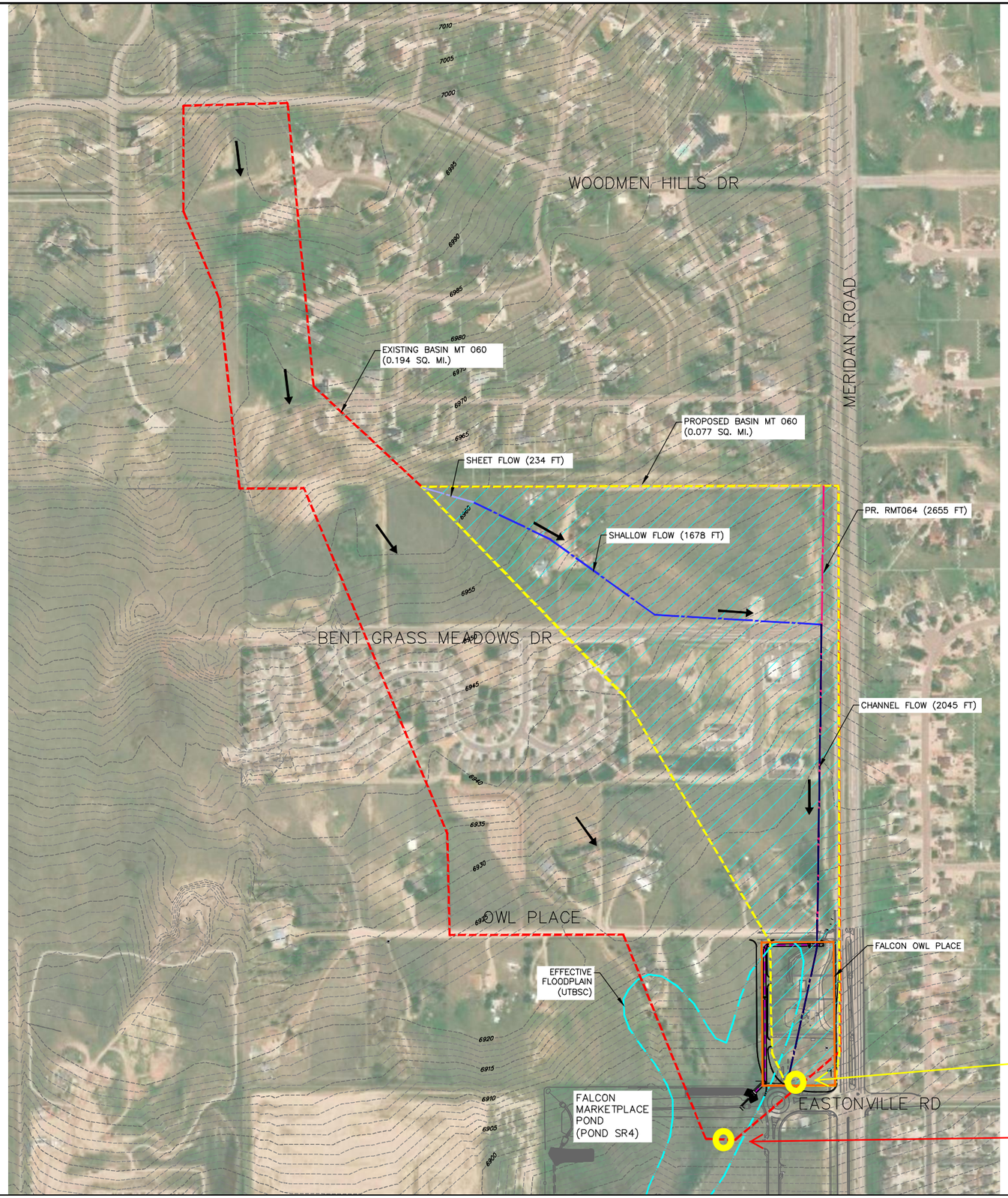

LEGEND

- EX. CONTOUR — 6925
- PR. STORM SEWER
- EFFECTIVE 100-YR FLOODPLAIN
- EX. BASIN MT060
- PR. BASIN MT060
- PR. BASIN MT060 AREA
- PR. SHEET FLOW
- PR. SHALLOW FLOW
- PR. CHANNEL FLOW
- PR. RMT064
- EX. FALCON OWL PLACE PROPERTY BOUNDARY
- FLOW DIRECTION

NOTES

1. SPATIAL PROJECTION IS NAD83 COLORADO STATE PLANE, CENTRAL ZONE (FEET).
2. VERTICAL DATUM IS NGVD29.

The existing basin delineation is approximated from the Falcon DBPS, which was developed in 2015.

The existing conditions contours are from Lidar, and may not reflect roadway and drainage infrastructure that is shown on the aerial image.

The proposed basin delineation is based on a combination of Lidar contours, drainage and roadway infrastructure, aerial mapping, and site survey.

N

250 0 250 500

SCALE IN FEET

PREPARED BY:

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Drexel, Barrell & Co.
Traditional Surveying, Innovative Solutions
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(303) 442-4338
BOULDER
COLORADO SPRINGS
GREELEY

OWNER/CLIENT:

EXHIBIT FOR:
FALCON
OWL PLACE
FALCON, COLORADO

ISSUE	DATE
EXHIBIT	06/07/22

DESIGNED BY:	MLI
DRAWN BY:	CAF
CHECKED BY:	MLI
FILE NAME:	HBM

NOT
FOR
CONSTRUCTION

DRAWING SCALE:
HORIZONTAL: SEE PLAN
VERTICAL: N/A

HYDROLOGIC
BASE MAP

PROJECT:21611-00BLWR
DRAWING NO.

HBM

SHEET: 1 OF 1

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PROPOSED FLOODPLAIN CONTAINED IN 10'X6' BOX CULVERT

OWL PLACE

MERIDAN PARK DRIVE

MERIDAN ROAD

FALCON MARKETPLACE POND (POND SR4)

EASTONVILLE RD

FALCON MARKET PLACE

LEGEND

- EX. CONTOUR — 6905
- PR. CONTOUR — 6905
- EX. STORM SEWER — ST
- OR
- PR. STORM SEWER
- EFFECTIVE FEMA STREAMLINE
- EFFECTIVE LOMR FLOODPLAIN
- FALCON OWL PLACE PROPERTY BOUNDARY
- PROPOSED 100-YEAR FLOODPLAIN
- PROPOSED 100-YEAR FLOODPLAIN
- PROPOSED CURB LINE
- EX. ROW LINE
- EX. PROPERTY LINE
- EX. EASEMENT

NOTES

1. SPATIAL PROJECTION IS NAD83 COLORADO STATE PLANE, CENTRAL ZONE (FEET).
2. VERTICAL DATUM IS NGVD29.

N

60 30 0 60 120

SCALE IN FEET

PREPARED BY:

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(303) 442-4338

LAFAYETTE
COLORADO SPRINGS

OWNER/CLIENT:

LUBERTUS HAYENGA
BH RE INVESTMENTS, LLC
106 S. KYRENE RD., STE 2
CHANDLER, AZ 85226

EXHIBIT FOR:
FALCON OWL PLACE
FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/25/22

DESIGNED BY:	MLI
DRAWN BY:	CAF
CHECKED BY:	MLI
FILE NAME:	FPWM

COLORADO LICENSED
MICHELLE IBLINGS
43515
Michelle Iblings
Digitally signed by Michelle Iblings
Date: 2022.10.25 14:14:49 -06'00'
PROFESSIONAL ENGINEER

DRAWING SCALE:
HORIZONTAL: SEE PLAN
VERTICAL: N/A

CLOMR
FLOODPLAIN
WORK MAP

PROJECT:21611-00BLWR
DRAWING NO.

FPWM

SHEET: 1 OF 1

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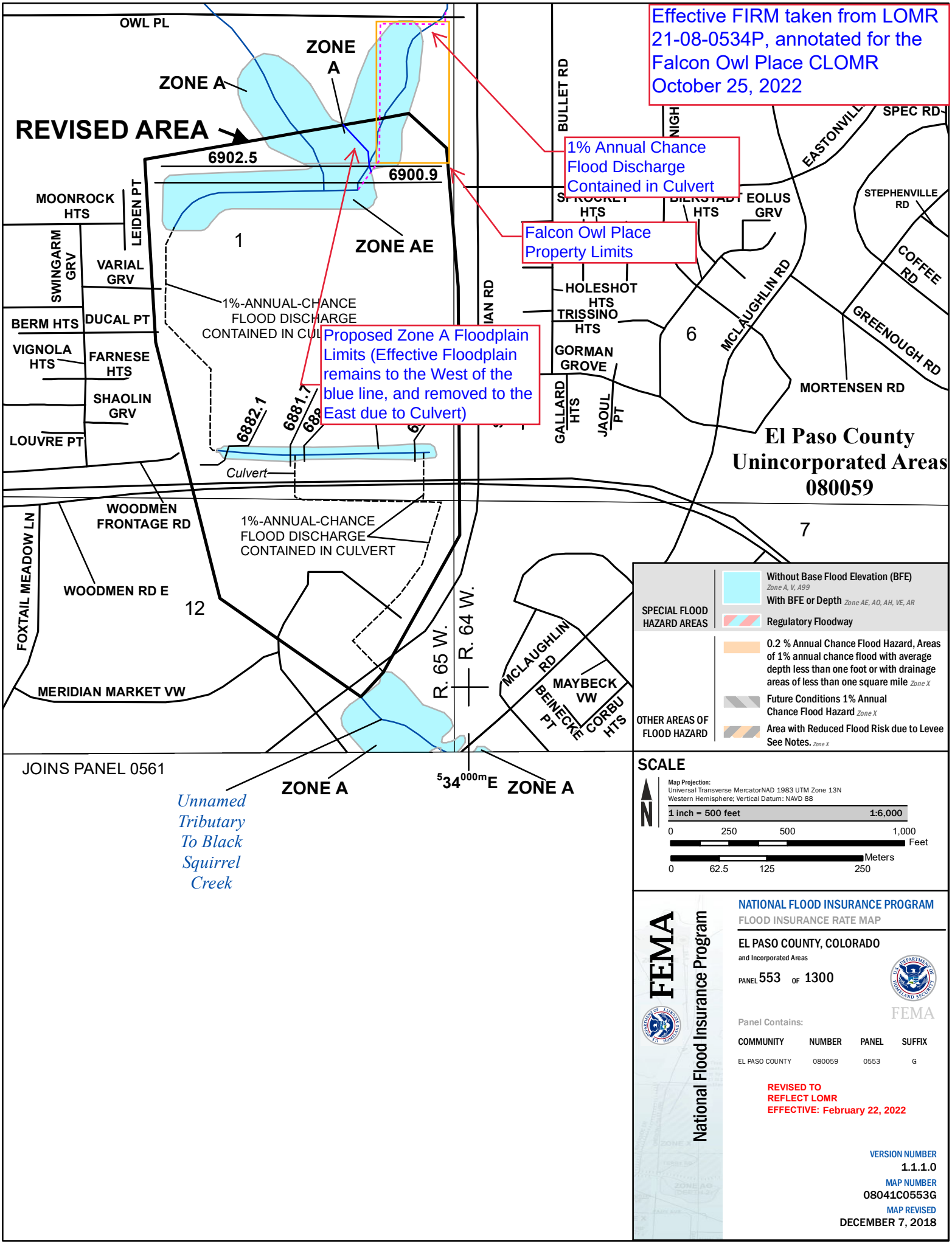
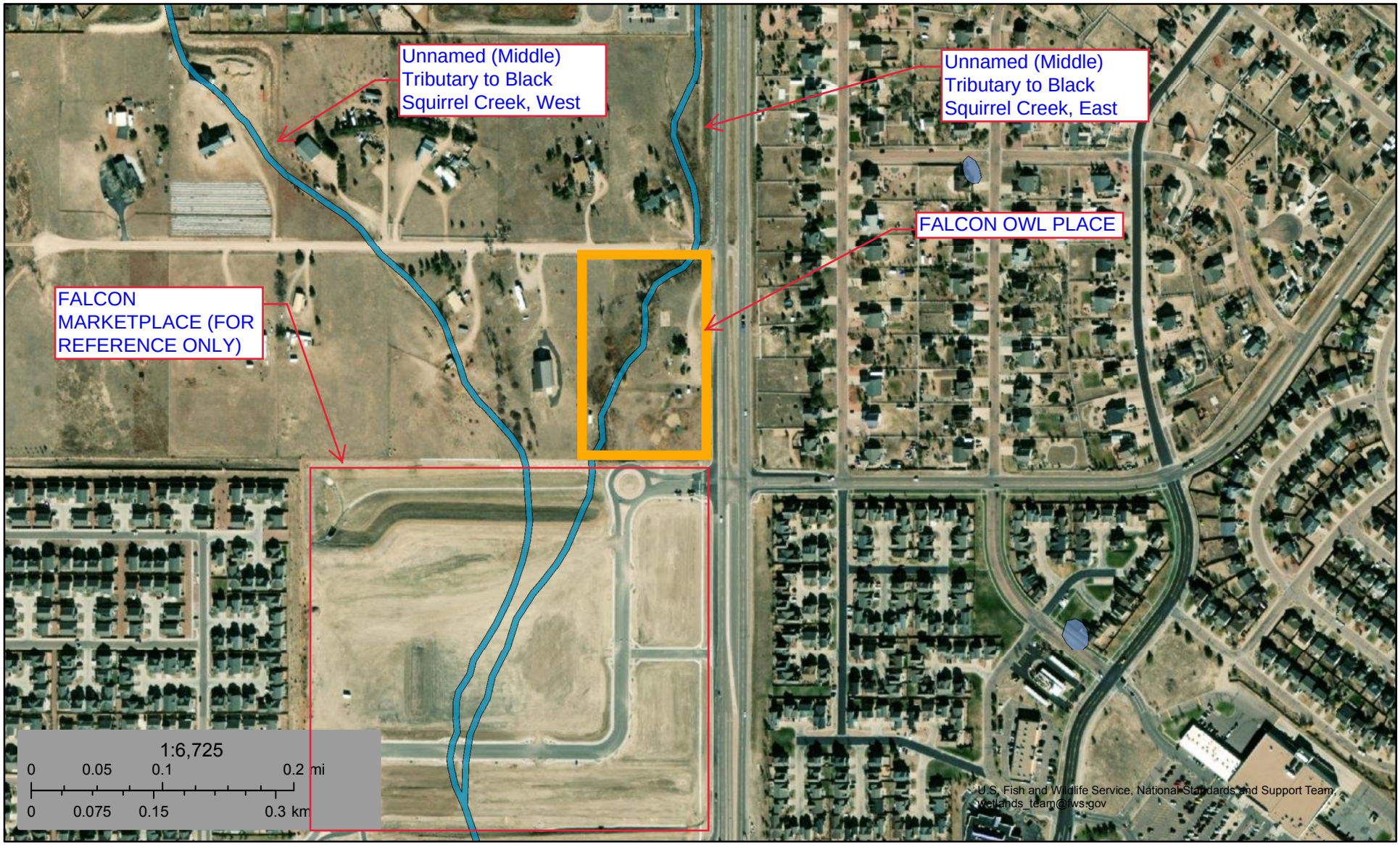

Effective FIRM taken from LOMR 21-08-0534P, annotated for the Falcon Owl Place CLOMR October 25, 2022
1% Annual Chance Flood Discharge Contained in Culvert
Falcon Owl Place Property Limits
Proposed Zone A Floodplain Limits (Effective Floodplain remains to the West of the blue line, and removed to the East due to Culvert)
REVISED AREA
ZONE A
ZONE AE
6902.5
6900.9
6882.1
6881.7
Culvert
1%-ANNUAL-CHANCE FLOOD DISCHARGE CONTAINED IN CULVERT
OWL PL
BULLET RD
EASTONVILLE
SPEC RD
STEPHENVILLE RD
COFFEE RD
GREENOUGH RD
MCLAUGHLIN RD
MORTENSEN RD
EOLUS GRV
SPROCKET HTS
BIERSTADT HTS
HOLESHOT HTS
TRISSINO HTS
GORMAN GROVE
GALLARD HTS
JAOUL PT
MOONROCK HTS
LEIDEN PT
SWINGARM GRV
VARIAL GRV
BERM HTS
DUCAL PT
VIGNOLA HTS
FARNESE HTS
SHAOLIN GRV
LOUVRE PT
WOODMEN FRONTAGE RD
WOODMEN RD E
FOXTAIL MEADOW LN
MERIDIAN MARKET VW
MAYBECK VW
BEINECKE PT
CORBU HTS
1
6
7
12
R. 65 W.
R. 64 W.
534000mE
El Paso County Unincorporated Areas 080059
JOINS PANEL 0561
Unnamed Tributary To Black Squirrel Creek
SPECIAL FLOOD HAZARD AREAS
Without Base Flood Elevation (BFE) Zone A, V, A99
With BFE or Depth Zone AE, AO, AH, VE, AR
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2 % Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
Future Conditions 1% Annual Chance Flood Hazard Zone X
Area with Reduced Flood Risk due to Levee See Notes. Zone X
SCALE
Map Projection: Universal Transverse MercatorNAD 1983 UTM Zone 13N Western Hemisphere; Vertical Datum: NAVD 88
1 inch = 500 feet 1:6,000
0 250 500 1,000 Feet
0 62.5 125 250 Meters
FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
and Incorporated Areas
PANEL 553 OF 1300
Panel Contains:
COMMUNITY NUMBER PANEL SUFFIX
EL PASO COUNTY 080059 0553 G
REVISED TO REFLECT LOMR EFFECTIVE: February 22, 2022
VERSION NUMBER 1.1.1.0
MAP NUMBER 08041C0553G
MAP REVISED DECEMBER 7, 2018

U.S. Fish and Wildlife Service
National Wetlands Inventory

Falcon Owl Place NWI



May 27, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

APPENDIX C

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Falcon Ranchettes Filing No. 2
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/23/23

Basin ID	Total Area (ac)	Roads			Lawns			Roofs			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
EX-1	4.97	100	0.68	13.7	2	4.27	1.7	100	0.02	0.40	15.8
EX-2	2.32	80	0.26	9.0	2	1.99	1.7	100	0.07	3.00	13.7
EX-3	2.85	80	0.12	3.4	2	2.67	1.9	100	0.06	2.10	7.4
EX-4	1.08	80	0.01	0.7	2	1.07	2.0	100	0.00	0.00	2.7
OS-1	3.29	80	0.31	7.5	2	2.92	1.8	100	0.06	1.80	11.1
A-1	1.85	100	0.68	36.8	2	1.17	1.3	100	0.00	0.00	38.1
B-1	1.54	100	0.90	58.4	2	0.06	0.1	100	0.58	37.70	96.2
B-2	1.26	100	0.59	46.8	2	0.00	0.0	100	0.67	53.20	100.0
B-3	1.05	100	0.54	51.4	2	0.51	1.0	100	0.00	0.00	52.4
B-4	1.05	100	0.97	92.4	2	0.08	0.2	100	0.00	0.00	92.6
B-5	0.38	100	0.05	13.2	2	0.33	1.7	100	0.00	0.00	14.9
C-1	0.78	100	0.00	0.0	2	0.78	2.0	100	0.00	0.00	2.0
C-2	2.02	100	0.00	0.0	2	2.02	2.0	100	0.00	0.00	2.0
C-3	0.20	100	0.00	0.0	2	0.20	2.0	100	0.00	0.00	2.0
C-4	1.06	100	0.00	0.0	2	1.06	2.0	100	0.00	0.00	2.0
F-1	0.04	100	0.04	100.0	2	0.00	0.0	100	0.00	0.00	100.0
F-2	0.03	100	0.03	100.0	2	0.00	0.0	100	0.00	0.00	100.0
OS-2	0.09	100	0.00	0.0	2	0.09	2.0	100	0.00	0.00	2.0
OS-3	0.10	100	0.00	0.0	2	0.10	2.0	100	0.00	0.00	2.0
OS-4	0.07	100	0.00	0.0	2	0.07	2.0	100	0.00	0.00	2.0

**Impervious values are taken directly from "Table 6-6 Runoff Coefficients for Rational Method"*

Galloway

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Falcon Ranchettes Filing No. 2
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/23/23

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_{100}	C_5	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	Cv	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH (FT)	Urbanized T_c (MIN)	T_c (MIN)
EX-1	4.97	A	15.8	0.23	0.08	25	15.0	3.8	830	1.8	15.0	2.0	6.9	10.7	855.0	14.8	10.7
EX-2	2.32	A	13.7	0.22	0.07	15	1.0	7.3	540	1.9	5.0	0.7	13.1	20.4	555.0	13.1	13.1
EX-3	2.85	A	7.4	0.17	0.03	25	15.0	4.0	650	2.2	5.0	0.7	14.6	18.6	675.0	13.8	13.8
EX-4	1.08	A	2.7	0.13	0.01	25	1.0	10.0	620	2.3	5.0	0.8	13.6	23.6	645.0	13.6	13.6
OS-1	3.29	A	11.1	0.20	0.05	100	3.5	12.7	600	1.9	15.0	2.1	4.8	17.5	700.0	13.9	13.9
A-1	1.85	A	38.1	0.41	0.25	25	25.0	2.7	620	1.3	20.0	2.2	4.6	7.3	645.0	13.6	7.3
B-1	1.54	A	96.2	0.86	0.82	60	7.0	2.1	350	2.0	20.0	2.8	2.1	4.1	410.0	12.3	5.0
B-2	1.26	A	100.0	0.89	0.86	12.5	2.0	1.2	335	1.2	20.0	2.2	2.5	3.8	347.5	11.9	5.0
B-3	1.05	A	52.4	0.52	0.38	20	2.0	4.7	618	3.2	20.0	3.6	2.9	7.6	638.0	13.5	7.6
B-4	1.05	A	92.6	0.83	0.78	20	2.0	2.1	618	3.2	20.0	3.6	2.9	5.0	638.0	13.5	5.0
B-5	0.38	A	14.9	0.23	0.08	45	25.0	4.3	70	0.5	20.0	1.4	0.8	5.1	115.0	10.6	5.1
C-1	0.78	A	2.0	0.13	0.01	100	2.0	15.8	335	2.0	5.0	0.7	7.9	23.7	435.0	12.4	12.4
C-2	2.02	A	2.0	0.13	0.01	100	2.3	15.1	400	2.3	5.0	0.8	8.8	23.9	500.0	12.8	12.8
C-3	0.20	A	2.0	0.13	0.01	100	2.5	14.7	100	2.5	5.0	0.8	2.1	16.8	200.0	11.1	11.1
C-4	1.06	A	2.0	0.13	0.01	100	2.3	15.1	550	2.3	20.0	3.0	3.0	18.1	650.0	13.6	13.6
F-1	0.04	A	100.0	0.89	0.86	24	2.0	1.7	46	1.0	20.0	2.0	0.4	2.1	70.0	10.4	5.0
F-2	0.03	A	100.0	0.89	0.86	24	2.0	1.7	46	1.0	20.0	2.0	0.4	2.1	70.0	10.4	5.0
OS-2	0.09	A	2.0	0.13	0.01	25	15.0	4.0	1	1.0	5.0	0.5	0.0	4.1	26.0	10.1	5.0
OS-3	0.10	A	2.0	0.13	0.01	25	15.0	4.0	1	1.0	5.0	0.5	0.0	4.1	26.0	10.1	5.0
OS-4	0.07	A	2.0	0.13	0.01	25	15.0	4.0	1	1.0	5.0	0.5	0.0	4.1	26.0	10.1	5.0

NOTES:

T_i = (0.395*(1.1 - C_5)*(L)^0.5)/((S)^0.33), S in ft/ft

T_t=L/60V (Velocity From Fig. 501)

Velocity V=Cv*S^0.5, S in ft/ft

Tc Check = 10+L/180

For Urbanized basins a minimum T_c of 5.0 minutes is required.

For non-urbanized basins a minimum T_c of 10.0 minutes is required

Galloway

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

Subdivision: Falcon Ranchettes Filing No. 2
Location: CO, Colorado Springs
Design Storm: 5-Year

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/23/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
	1	EX-1	4.97	0.08	10.7	0.40	4.03	1.6													Flows from project site at DP1 = 1.6 cfs
	1											120.0									Total flow at DP1 specified in DBPS = 120 cfs
	2	EX-2	2.32	0.07	13.1	0.16	3.73	0.6													Total flow at DP2 = 0.6 cfs
	3	EX-3	2.85	0.03	13.8	0.09	3.65	0.3													Total flow at DP3 = 0.3 cfs
	4	EX-4	1.08	0.01	13.6	0.01	3.67	0.0													Flows from basin at DP4 = 0 cfs
	4	OS-1	3.29	0.05	13.9	0.16	3.64	0.6													Flows from basin at DP4 = 0.6 cfs
	4								13.9	0.17	3.64	0.6									Total flow at DP4 = 0.6 cfs
	1	OS-4	0.07	0.01	5.0	0.00	5.17	0.0													Flows from basin at DP1 = 0 cfs
	1	A-1	1.85	0.25	7.3	0.46	4.60	2.1													Flows from basin at DP1 = 2.1 cfs
	1											120.0									Total flow at DP1 specified in DBPS = 120 cfs
	2	B-1	1.54	0.82	5.0	1.26	5.17	6.5							6.5	3.0		300	3.5	1.4	Total flow captured by inlet, DP2 = 6.5 cfs
	3	B-2	1.26	0.86	5.0	1.08	5.17	5.6													Total flow captured by inlet, DP3 = 5.6 cfs
	3								6.4	2.34	4.79	11.2			11.2	3.0		130	3.5	0.6	Total flow in storm system, DP3 = 11.2 cfs
	4	B-3	1.05	0.38	7.6	0.40	4.55	1.8													Flows from basin at DP4 = 1.8 cfs
	4	F-1	0.04	0.86	5.0	0.03	5.17	0.2					1	0.2				100	2.0	0.8	Flows from basin = 0.2 cfs
	4								7.6	0.43	4.55	2.0									Total flow captured by inlet, DP4 = 2 cfs
	4								8.2	2.77	4.43	12.3			12.3	1.0		41	2.0	0.3	Total flow in storm system at DP4 = 12.3 cfs
	5	B-4	1.05	0.78	5.0	0.82	5.17	4.2													Flows from basin at DP5 = 4.2 cfs
	5	C-1	0.78	0.01	12.4	0.01	3.80	0.0													Flows from basin = 0 cfs
	5	C-3	0.20	0.01	11.1	0.00	3.97	0.0					1.0	0.0				200	2.0	1.7	Flows from basin = 0 cfs
	5	F-2	0.03	0.86	5.0	0.03	5.17	0.2					1	0.2				100	2.0	0.8	Flows from basin = 0.2 cfs
	5	OS-3	0.10	0.01	5.0	0.00	5.17	0.0					2.8	0.0				600	3.3	3.0	Flows from basin = 0 cfs
	5								12.8	0.86	3.76	3.2									Total flow captured by inlet, DP5 = 3.2 cfs
	5								13.1	3.63	3.72	13.5			13.5	1.0		135	2.0	1.1	Total flow in storm system at DP5 = 13.5 cfs
	6	B-5	0.38	0.08	5.1	0.03	5.14	0.2													Flows from basin at DP6 = 0.2 cfs
	6	C-2	2.02	0.01	12.8	0.02	3.76	0.1													Flows from basin = 0.1 cfs
	6	OS-2	0.09	0.01	5.0	0.00	5.17	0.0													Flows from basin = 0 cfs
Flow taken from UD-Detention Worksheet	6											20.5									Total Flow entering Pond #1 = 20.5 cfs
Flow taken from UD-Detention Worksheet	6											7.6									Peak Outflow from Pond #1 = 7.6 cfs
	7	C-4	1.06	0.01	13.6	0.01	3.67	0.0													Flows from basin at DP7 = 0 cfs
	7	OS-1	3.29	0.05	13.9	0.16	3.64	0.6													Flows from basin at DP7 = 0.6 cfs
	7								13.9	0.17	3.64	0.6			0.6	10.0		40	6.3	0.1	Total flow captured by inlet, DP7 = 0.6 cfs
	8								14.0	0.17	3.63	8.2									Total flow at manhole, DP8 = 8.2 cfs and conveyed to Subregional Pond SR4

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

Subdivision: Falcon Ranchettes Filing No. 2
Location: CO, Colorado Springs
Design Storm: 100-Year

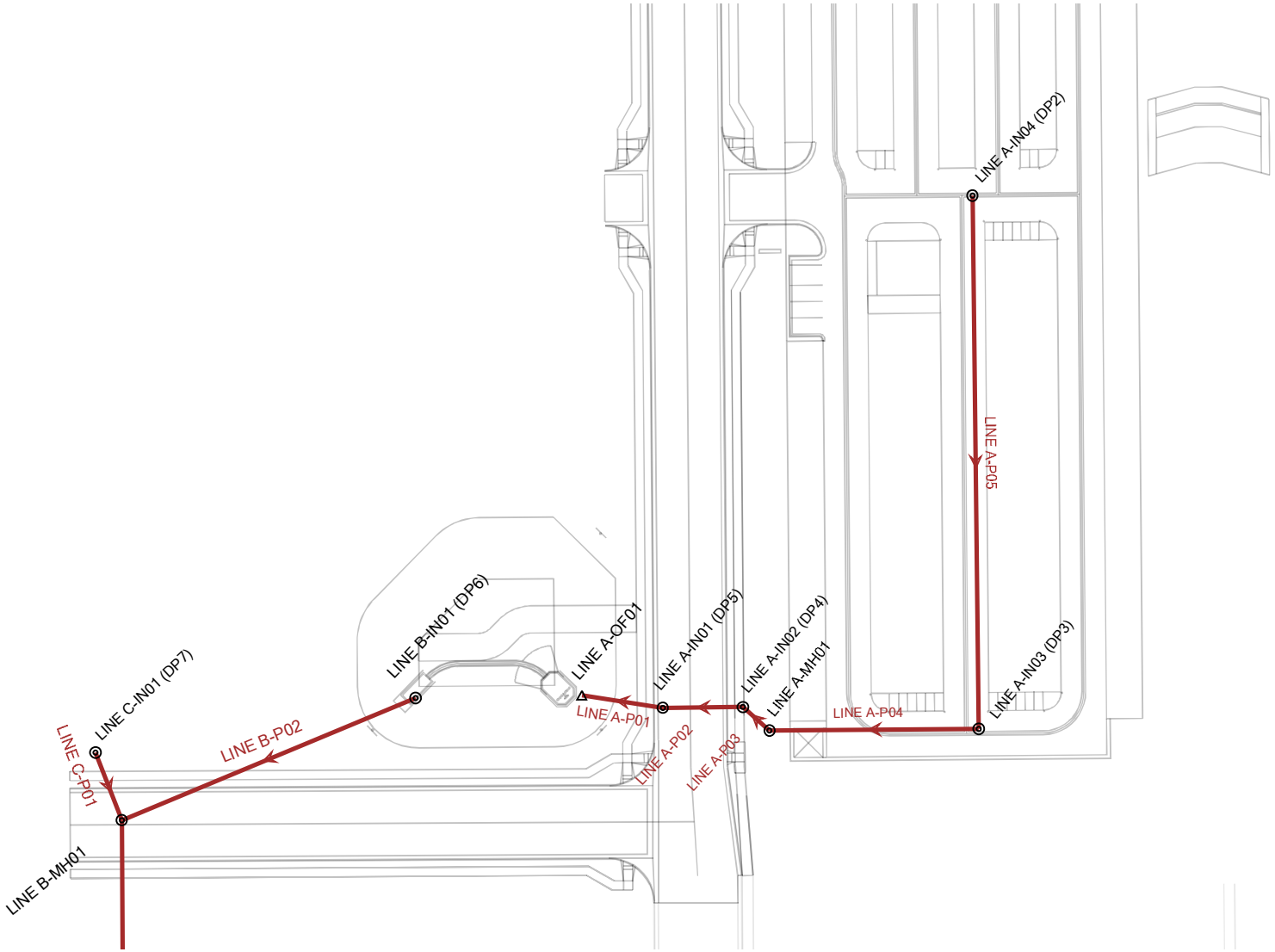
Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: BAS
Date: 4/23/23

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
	1	EX-1	4.97	0.23	10.7	1.14	6.77	7.7													Flows from project site at DP1 = 7.7 cfs
	1											850.0									Total flow at DP1 specified in DBPS = 850 cfs
	2	EX-2	2.32	0.22	13.1	0.51	6.26	3.2													Total flow at DP2 = 3.2 cfs
	3	EX-3	2.85	0.17	13.8	0.48	6.13	2.9													Total flow at DP3 = 2.9 cfs
	4	EX-4	1.08	0.13	13.6	0.14	6.16	0.9													Flows from basin at DP4 = 0.9 cfs
	4	OS-1	3.29	0.20	13.9	0.66	6.10	4.0													Flows from basin at DP4 = 4 cfs
	4								13.9	0.80	6.10	4.9									Total flow at DP4 = 4.9 cfs
	1	OS-4	0.07	0.13	5.0	0.01	8.68	0.1													Flows from basin at DP1 = 0.1 cfs
	1	A-1	1.85	0.41	7.3	0.76	7.73	5.9													Flows from basin at DP1 = 5.9 cfs
	1											850.0									Total flow at DP1 specified in DBPS = 850 cfs
	2	B-1	1.54	0.86	5.0	1.32	8.68	11.5							11.5	3.0		300	3.5	1.4	Total flow captured by inlet, DP2 = 11.5 cfs
	3	B-2	1.26	0.89	5.0	1.12	8.68	9.7													Total flow captured by inlet, DP3 = 9.7 cfs
	3								6.4	2.44	8.04	19.6			19.6	3.0		130	3.5	0.6	Total flow in storm system, DP3 = 19.6 cfs
	4	B-3	1.05	0.52	7.6	0.55	7.64	4.2													Flows from basin at DP4 = 4.2 cfs
	4	F-1	0.04	0.89	5.0	0.04	8.68	0.3					1	0.3				100	2.0	0.8	Flows from basin = 0.3 cfs
	4								7.6	0.59	7.64	4.5									Total flow captured by inlet, DP4 = 4.5 cfs
	4								8.2	3.03	7.44	22.5			22.5	1.0		41	2.0	0.3	Total flow in storm system at DP4 = 22.5 cfs
	5	B-4	1.05	0.83	5.0	0.87	8.68	7.6													Flows from basin at DP5 = 7.6 cfs
	5	C-1	0.78	0.13	12.4	0.10	6.39	0.6													Flows from basin = 0.6 cfs
	5	C-3	0.20	0.13	11.1	0.03	6.67	0.2					1.0	0.2				200	2.0	1.7	Flows from basin = 0.2 cfs
	5	F-2	0.03	0.89	5.0	0.03	8.68	0.3					1	0.3				100	2.0	0.8	Flows from basin = 0.3 cfs
	5	OS-3	0.10	0.13	5.0	0.01	8.68	0.1					2.8	0.1				600	3.3	3.0	Flows from basin = 0.1 cfs
	5								12.8	1.04	6.31	6.6									Total flow captured by inlet, DP5 = 6.6 cfs
	5								13.1	4.07	6.25	25.4			25.4	1.0		135	2.0	1.1	Total flow in storm system at DP5 = 25.4 cfs
	6	B-5	0.38	0.23	5.1	0.09	8.62	0.8													Flows from basin at DP6 = 0.8 cfs
	6	C-2	2.02	0.13	12.8	0.26	6.31	1.6													Flows from basin = 1.6 cfs
	6	OS-2	0.09	0.13	5.0	0.01	8.68	0.1													Flows from basin = 0.1 cfs
Flow taken from UD-Detention Worksheet	6											36.7									Total Flow entering Pond #1 = 36.7 cfs
Flow taken from UD-Detention Worksheet	6											26.5									Peak Outflow from Pond #1 = 26.5 cfs
	7	C-4	1.06	0.13	13.6	0.14	6.16	0.9													Flows from basin at DP7 = 0.9 cfs
	7	OS-1	3.29	0.20	13.9	0.66	6.10	4.0													Flows from basin at DP7 = 4 cfs
	7								13.9	0.80	6.10	4.9			4.9	10.0		40	6.3	0.1	Total flow captured by inlet, DP7 = 4.9 cfs
	8								14.0	0.80	6.09	31.4									Total flow at manhole, DP8 = 31.4 cfs
																					and conveyed to Subregional Pond SR4

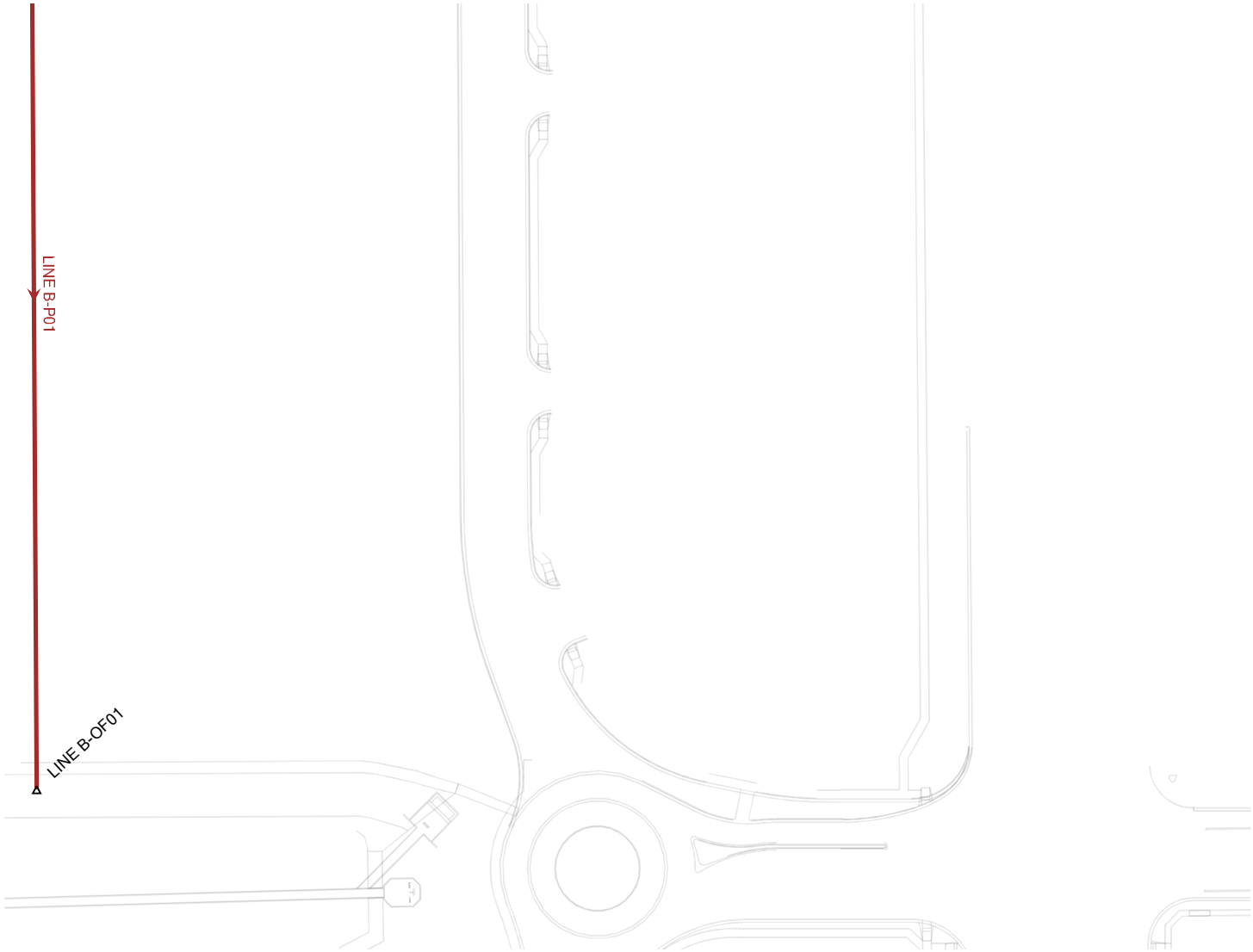
Galloway

APPENDIX D

Storm Drain Layout



Storm Drain Layout



FlexTable: Conduit Table

Active Scenario: 5-Year

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
LINE A-P04	LINE A-IN03 (DP3)	LINE A-MH01	6,905.39	6,904.23	115.8	0.010	Circle	24.0	0.013	11.20	7.18	22.61	6,906.59	6,905.22	6,907.09	6,906.03
LINE B-P02	LINE B-IN01 (DP6)	LINE B-MH01	6,899.75	6,898.88	174.6	0.005	Circle	30.0	0.013	7.60	4.97	28.95	6,900.67	6,899.89	6,901.00	6,900.15
LINE B-P01	LINE B-MH01	LINE B-OF01	6,898.58	6,892.00	682.1	0.010	Circle	30.0	0.013	8.20	6.44	40.28	6,899.53	6,892.77	6,899.89	6,893.41
LINE C-P01	LINE C-IN01 (DP7)	LINE B-MH01	6,907.29	6,900.38	39.7	0.174	Circle	15.0	0.013	0.60	8.98	26.95	6,907.59	6,900.51	6,907.70	6,901.76
LINE A-P03	LINE A-MH01	LINE A-IN02 (DP4)	6,903.93	6,903.74	18.5	0.010	Circle	24.0	0.013	11.20	7.18	22.61	6,905.13	6,904.79	6,905.63	6,905.49
LINE A-P02	LINE A-IN02 (DP4)	LINE A-IN01 (DP5)	6,902.74	6,902.30	44.3	0.010	Circle	36.0	0.013	12.30	7.18	66.44	6,903.85	6,903.20	6,904.27	6,903.94
LINE A-P01	LINE A-IN01 (DP5)	LINE A-OF01	6,902.20	6,901.75	45.4	0.010	Circle	36.0	0.013	13.50	7.37	66.42	6,903.37	6,902.70	6,903.80	6,903.47
LINE A-P05	LINE A-IN04 (DP2)	LINE A-IN03 (DP3)	6,911.46	6,905.89	297.5	0.019	Circle	18.0	0.013	6.50	7.93	14.37	6,912.45	6,907.25	6,912.88	6,907.48

FlexTable: Manhole Table

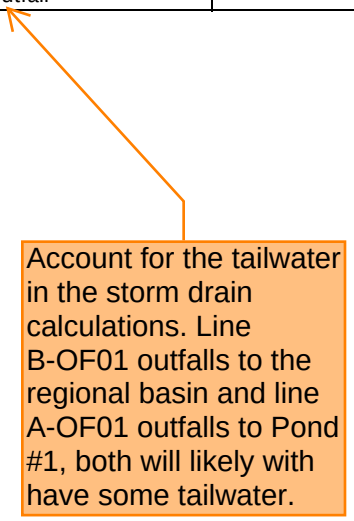
Active Scenario: 5-Year

Label	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
LINE A-IN03 (DP3)	6,912.83	11.20	Standard	1.320	0.66	6,907.25	6,906.59	6,907.48	6,907.09
LINE B-MH01	6,911.59	8.20	Standard	1.020	0.36	6,899.89	6,899.53	6,900.15	6,899.89
LINE C-IN01 (DP7)	6,910.67	0.60	Standard	0.000	0.00	6,907.59	6,907.59	6,907.70	6,907.70
LINE A-MH01	6,910.14	11.20	Standard	0.400	0.20	6,905.33	6,905.13	6,906.13	6,905.63
LINE A-IN02 (DP4)	6,908.59	12.30	Standard	0.400	0.16	6,904.02	6,903.85	6,904.72	6,904.27
LINE A-IN01 (DP5)	6,908.59	13.50	Standard	0.100	0.04	6,903.41	6,903.37	6,904.15	6,903.80
LINE B-IN01 (DP6)	6,905.51	7.60	Standard	0.000	0.00	6,900.67	6,900.67	6,901.00	6,901.00
LINE A-IN04 (DP2)	6,916.23	6.50	Standard	0.000	0.00	6,912.45	6,912.45	6,912.88	6,912.88

FlexTable: Outfall Table

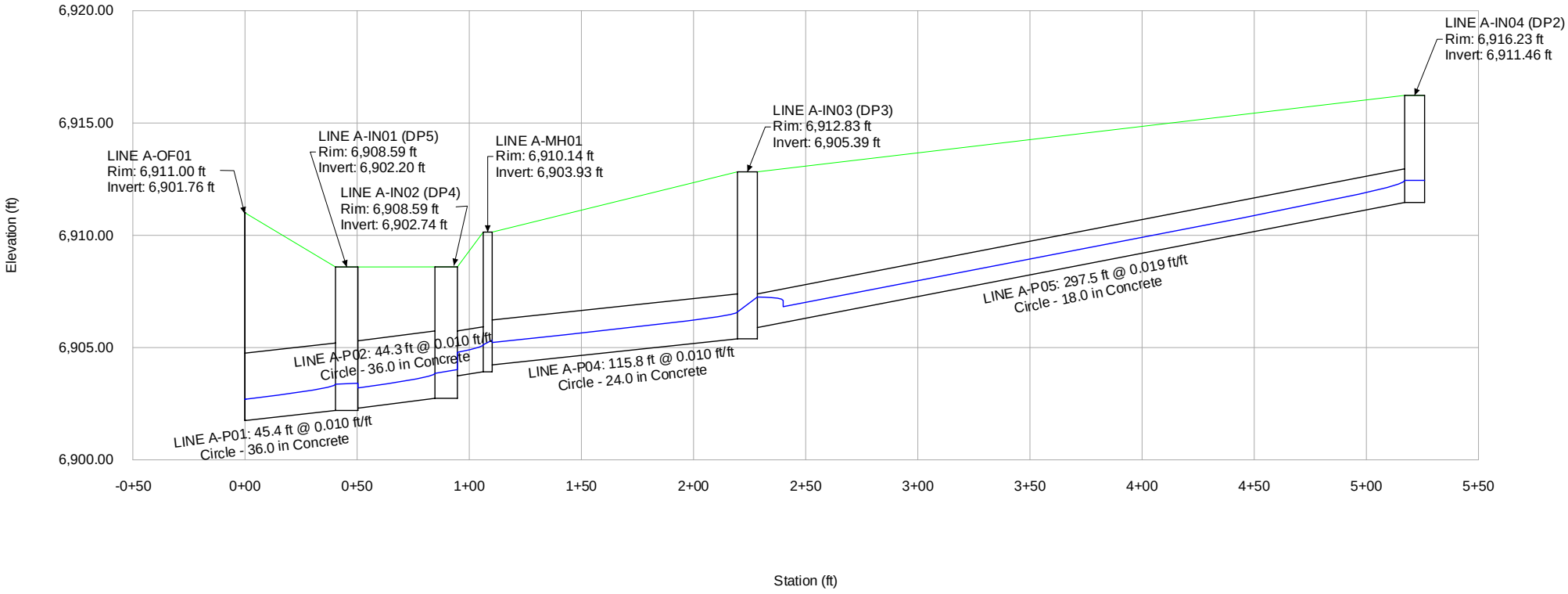
Active Scenario: 5-Year

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
LINE B-OF01	6,901.00	6,892.01	Free Outfall		6,892.77	6,892.77	8.20
LINE A-OF01	6,911.00	6,901.76	Free Outfall		6,902.70	6,902.70	13.50

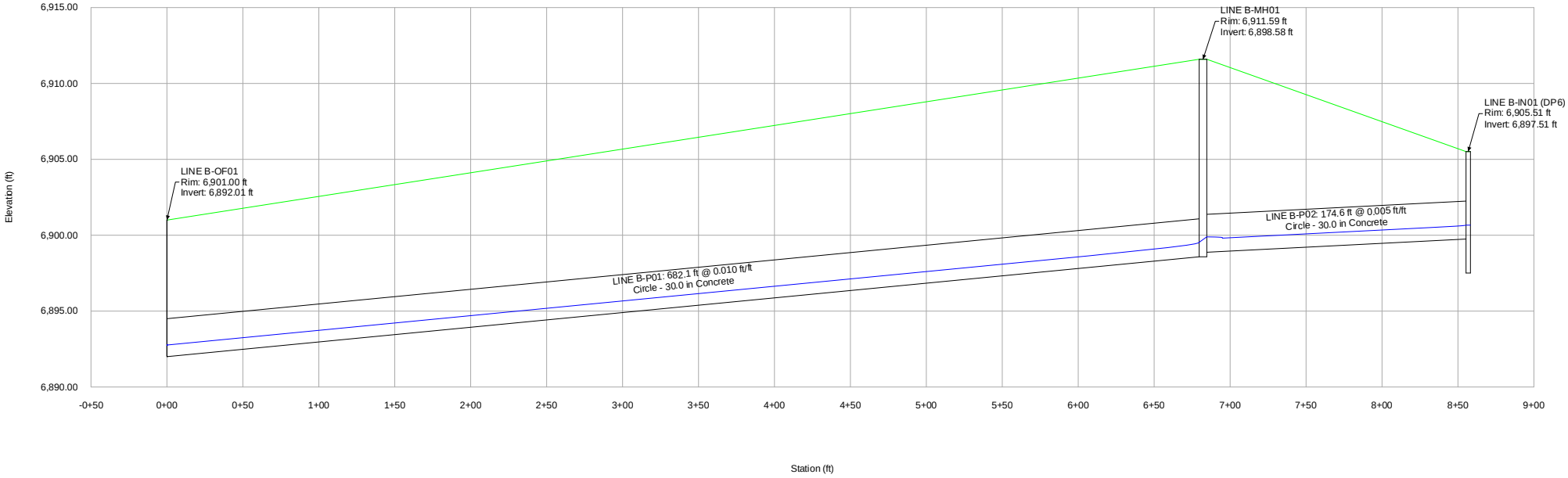


NOTED, USED 5-YEAR TAIL WATER FROM SR4 POND

Profile Report
Engineering Profile - LINE A (MRS01_StormCAD.stsw)
Active Scenario: 5-Year



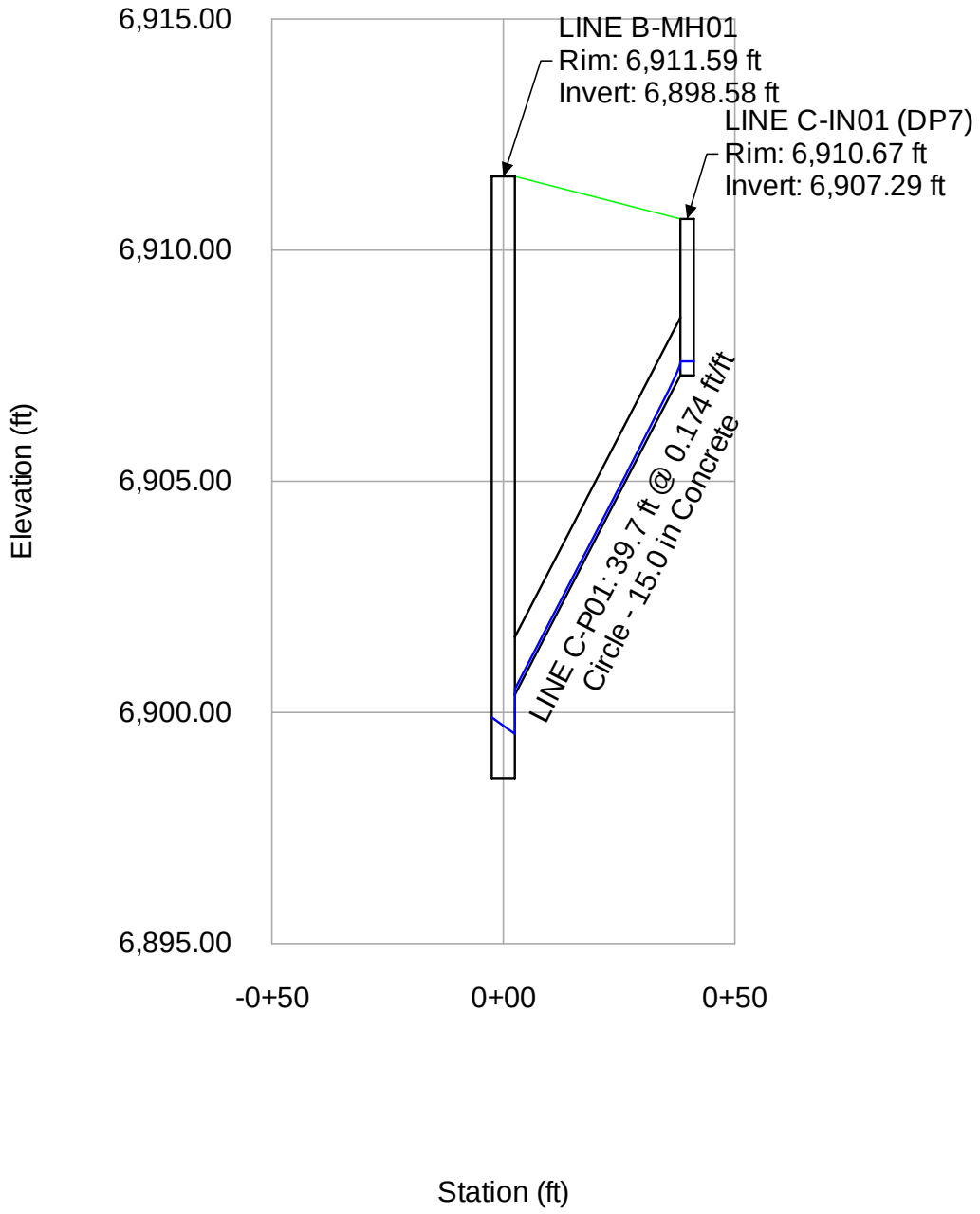
Profile Report
Engineering Profile - LINE B (MRS01_StormCAD.stsw)
Active Scenario: 5-Year



Profile Report

Engineering Profile - LINE C (MRS01_StormCAD.stsw)

Active Scenario: 5-Year



FlexTable: Conduit Table

Active Scenario: 100-Year

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Section Type	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
LINE A-P04	LINE A-IN03 (DP3)	LINE A-MH01	6,905.39	6,904.23	115.8	0.010	Circle	24.0	0.013	19.60	6.24	22.61	6,908.34	6,907.47	6,908.94	6,908.08
LINE B-P02	LINE B-IN01 (DP6)	LINE B-MH01	6,899.75	6,898.88	174.6	0.005	Circle	30.0	0.013	26.50	5.40	28.95	6,902.37	6,901.64	6,902.82	6,902.09
LINE B-P01	LINE B-MH01	LINE B-OF01	6,898.58	6,892.00	682.1	0.010	Circle	30.0	0.013	31.40	9.07	40.28	6,900.97	6,897.00	6,901.63	6,897.64
LINE C-P01	LINE C-IN01 (DP7)	LINE B-MH01	6,907.29	6,900.38	39.7	0.174	Circle	15.0	0.013	4.90	16.69	26.95	6,908.19	6,901.64	6,908.61	6,901.89
LINE A-P03	LINE A-MH01	LINE A-IN02 (DP4)	6,903.93	6,903.74	18.5	0.010	Circle	24.0	0.013	19.60	6.24	22.61	6,907.23	6,907.09	6,907.83	6,907.69
LINE A-P02	LINE A-IN02 (DP4)	LINE A-IN01 (DP5)	6,902.74	6,902.30	44.3	0.010	Circle	36.0	0.013	22.50	3.18	66.44	6,907.03	6,906.98	6,907.18	6,907.13
LINE A-P01	LINE A-IN01 (DP5)	LINE A-OF01	6,902.20	6,901.75	45.4	0.010	Circle	36.0	0.013	25.40	3.59	66.42	6,906.96	6,906.89	6,907.16	6,907.09
LINE A-P05	LINE A-IN04 (DP2)	LINE A-IN03 (DP3)	6,911.46	6,905.89	297.5	0.019	Circle	18.0	0.013	11.50	9.04	14.37	6,912.75	6,909.14	6,913.54	6,909.80

FlexTable: Manhole Table

Active Scenario: 100-Year

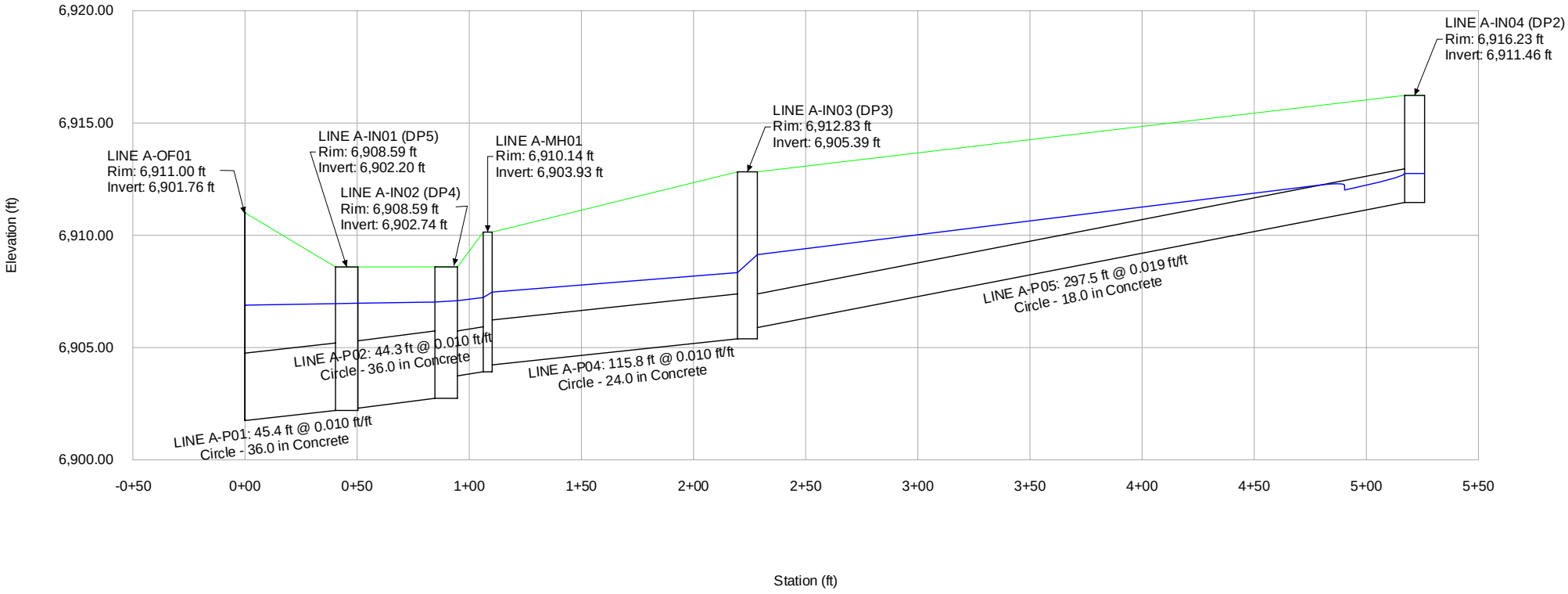
Label	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
LINE A-IN03 (DP3)	6,912.83	19.60	Standard	1.320	0.80	6,909.14	6,908.34	6,909.80	6,908.94
LINE B-MH01	6,911.59	31.40	Standard	1.020	0.67	6,901.64	6,900.97	6,901.89	6,901.63
LINE C-IN01 (DP7)	6,910.67	4.90	Standard	0.000	0.00	6,908.19	6,908.19	6,908.61	6,908.61
LINE A-MH01	6,910.14	19.60	Standard	0.400	0.24	6,907.47	6,907.23	6,908.08	6,907.83
LINE A-IN02 (DP4)	6,908.59	22.50	Standard	0.400	0.06	6,907.09	6,907.03	6,907.69	6,907.18
LINE A-IN01 (DP5)	6,908.59	25.40	Standard	0.100	0.02	6,906.98	6,906.96	6,907.13	6,907.16
LINE B-IN01 (DP6)	6,905.51	26.50	Standard	0.000	0.00	6,902.37	6,902.37	6,902.82	6,902.82
LINE A-IN04 (DP2)	6,916.23	11.50	Standard	0.000	0.00	6,912.75	6,912.75	6,913.54	6,913.54

FlexTable: Outfall Table

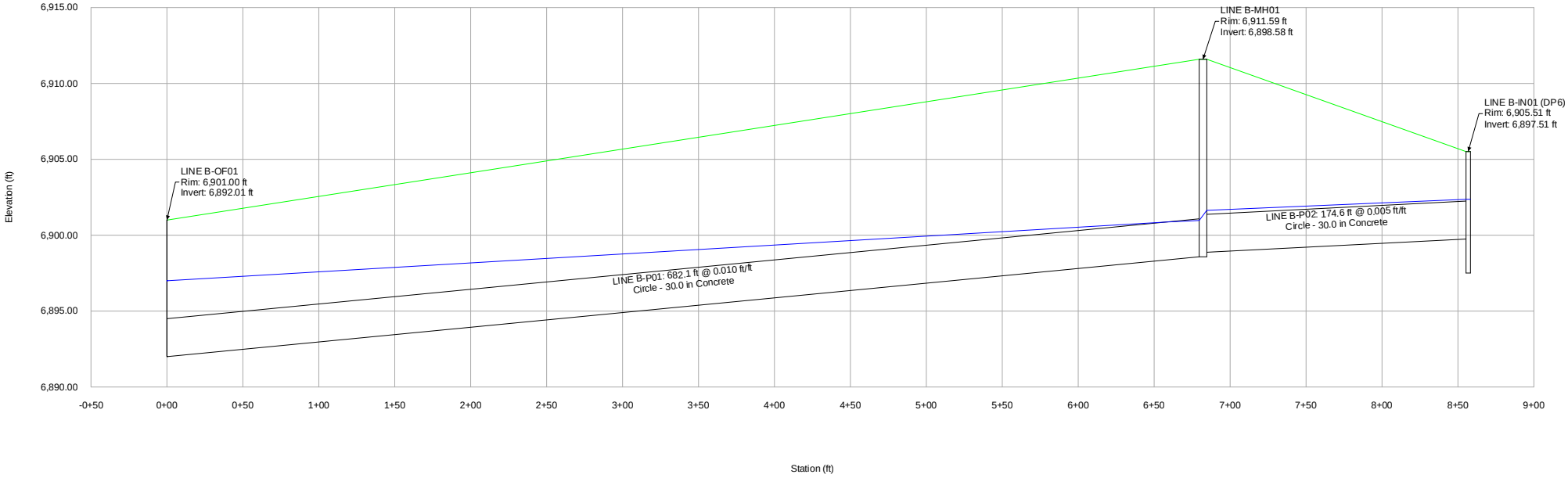
Active Scenario: 100-Year

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Energy Grade Line (ft)	Flow (Total Out) (cfs)
LINE B-OF01	6,901.00	6,892.01	User Defined Tailwater	6,897.00	6,897.00	6,897.00	31.40
LINE A-OF01	6,911.00	6,901.76	User Defined Tailwater	6,906.89	6,906.89	6,906.89	25.40

Profile Report
Engineering Profile - LINE A (MRS01_StormCAD.stsw)
Active Scenario: 100-Year



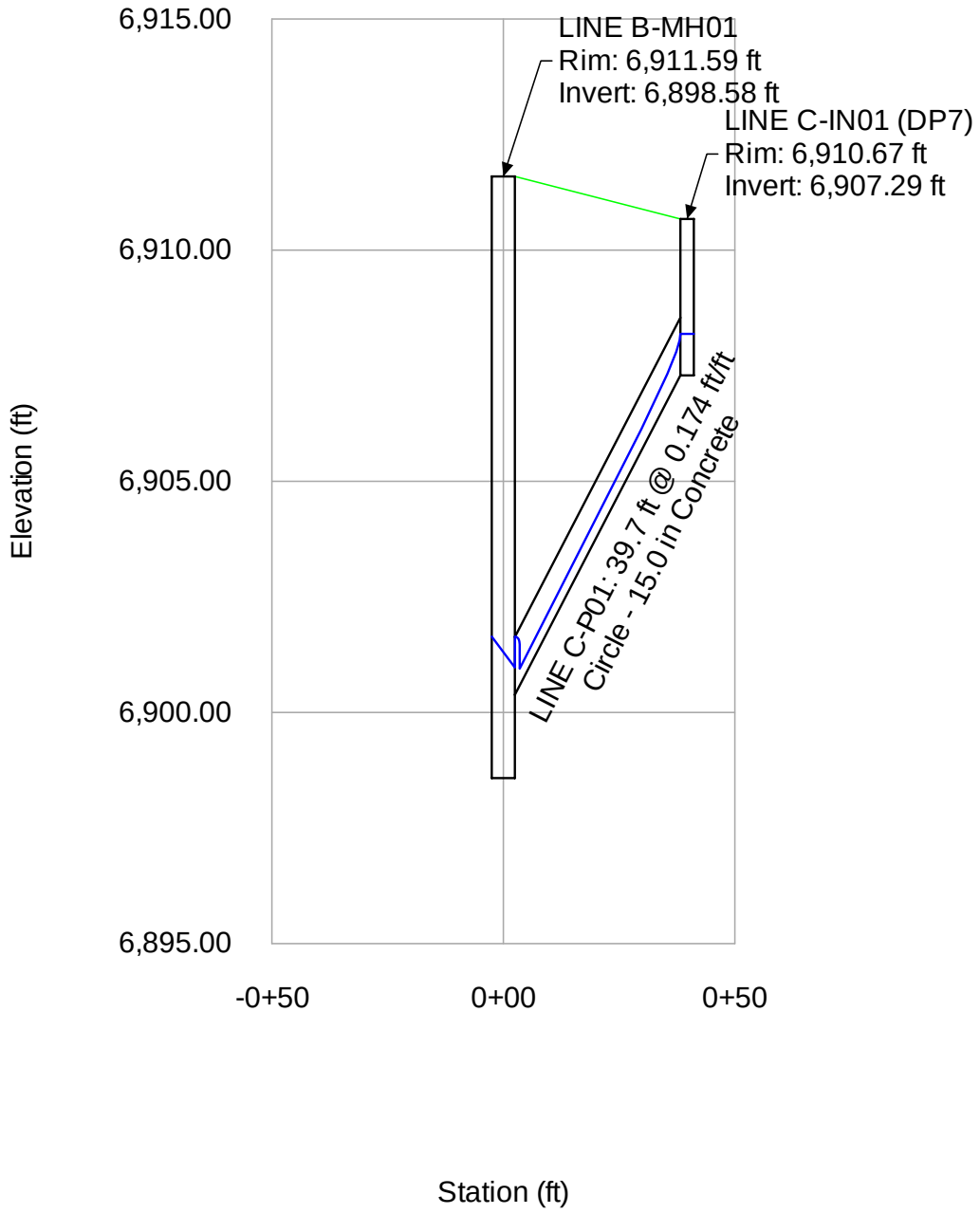
Profile Report
Engineering Profile - LINE B (MRS01_StormCAD.stsw)
Active Scenario: 100-Year



Profile Report

Engineering Profile - LINE C (MRS01_StormCAD.stsw)

Active Scenario: 100-Year

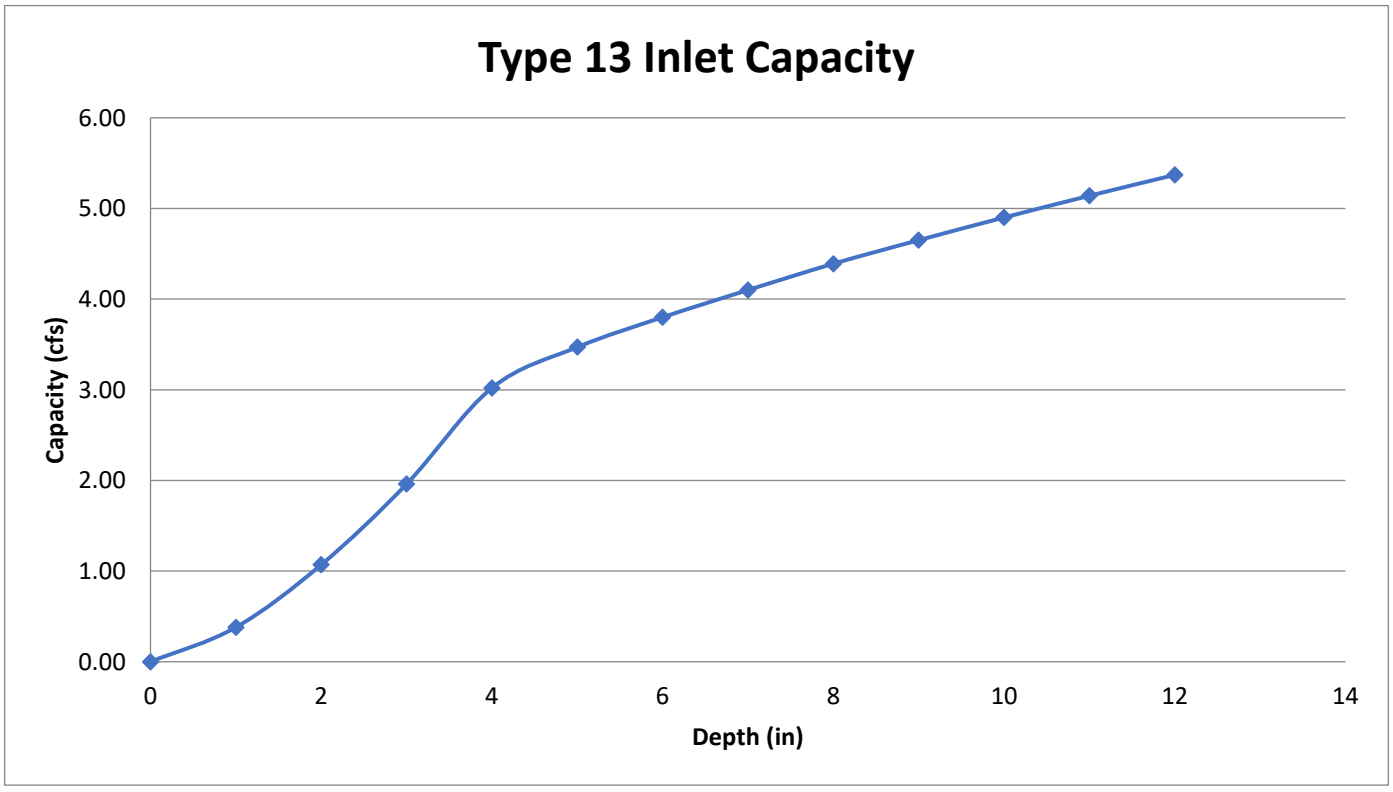


Type 13 Inlet Capacity Chart

Subdivision:	Falcon Ranchettes Filing No. 2	**Project Name:**	Meridian Storage
Location:	El Paso County, CO	**Project No.:**	MRS02
		Calculated By:	CMWJ
		Checked By:	RGD
		Date:	3/23/23

Type 13 Inlet Capacity

Depth (in)	Single	Double	Triple
	Capacity (cfs)	Capacity (cfs)	Capacity (cfs)
0	0.00	0.00	0.00
1	0.38	0.76	1.14
2	1.07	2.14	3.21
3	1.96	3.92	5.88
4	3.02	6.04	9.06
5	3.47	6.94	10.41
6	3.80	7.60	11.40
7	4.10	8.20	12.30
8	4.39	8.78	13.17
9	4.65	9.30	13.95
10	4.90	9.80	14.70
11	5.14	10.28	15.42
12	5.37	10.74	16.11



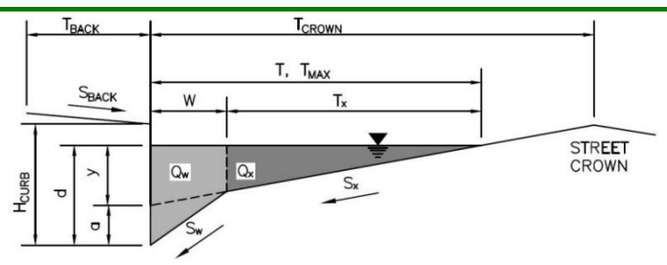
Calculations include a 50% clogging factor.

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

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

Project: **Meridian Storage**

Inlet ID: **DP4**



Gutter Geometry:

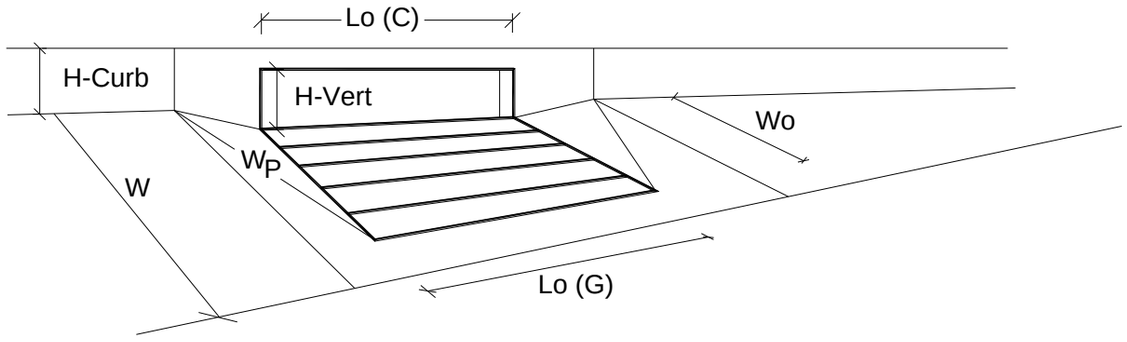
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.3	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
Open Area 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	0.36	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**6.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.9	4.4	cfs

The narrative indicates that Basin B-3 flow is conveyed to this inlet. The flow at basin B-3 is 4.7cfs/8.1cfs (5yr/100yr). Please revise accordingly as it does not appear that the entire flow is being accounted for in this design.

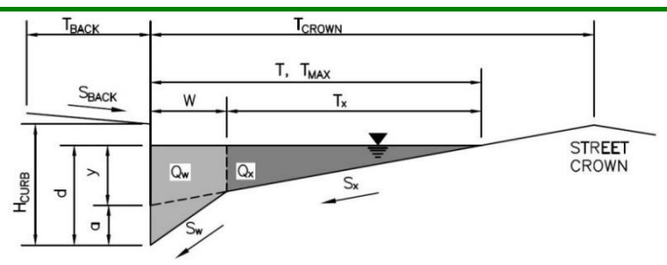
REVISED BASINS AND CORRECTED INLET CALCS.

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

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

Project: **Meridian Storage**

Inlet ID: **DP5**



Gutter Geometry:

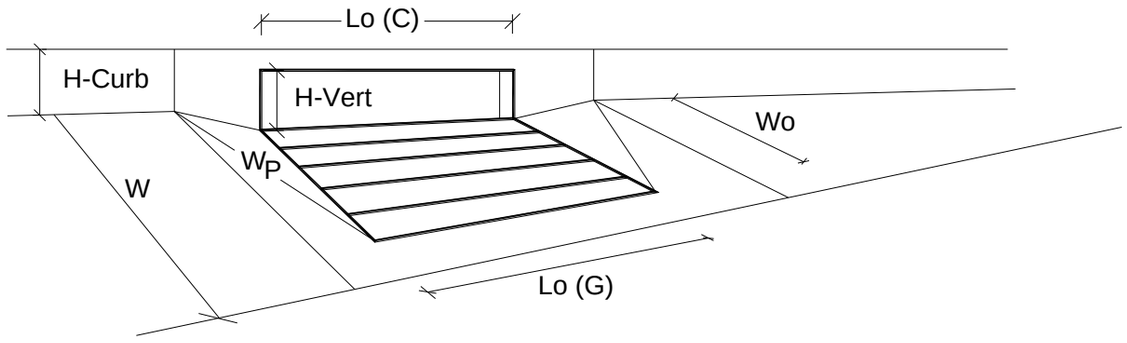
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.3	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
Open Area 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) =	10.00	10.00	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	0.36	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.95	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**9.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.2	6.6	cfs

Unnamed Tributary to Black Squirrel Creek - East Branch (RMT064)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00300	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	15.00	ft
Discharge	925.00	ft^3/s

Results

Normal Depth	5.15	ft
Flow Area	183.50	ft^2
Wetted Perimeter	57.49	ft
Hydraulic Radius	3.19	ft
Top Width	56.22	ft
Critical Depth	3.58	ft
Critical Slope	0.01368	ft/ft
Velocity	5.04	ft/s
Velocity Head	0.39	ft
Specific Energy	5.55	ft
Froude Number	0.49	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	5.15	ft
Critical Depth	3.58	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.01368	ft/ft

PROVIDED REQUESTED CALCULATIONS

PPENDIX E

Please provide forebay design calculations. The minimum forebay volumes are shown on MHFD T-5 Table EDB-4. The forebay outlet should be sized to release 2% of the undetained peak 100-year discharge.

For projects with two forebay weirs (one notch and one overflow weir that spans wider than the notch), on the UD-BMP spreadsheet use the Forebay Depth to calc the Forebay Discharge Design Flow. But then in a separate spreadsheet, copy over the MHFD's Notch Width formula to calc the notch width using the actual height of the notch (which will be less than the Forebay Depth), instead of the Forebay Depth that the MHFD formula defaults to use.

provide trickle channel and micropool sizing design.

provide spillway riprap size calcs

DETENTION POND TRIBUTARY AREAS

Subdivision: Falcon Ranchettes Filing No. 2
Location: CO, Colorado Springs

Project Name: Meridian Storage
Project No.: MRS01
Calculated By: CMWJ
Checked By: RGD
Date: 3/10/23

Detention Pond #1

	Basin	Area	% Imp
	B-1	2.87	95.97
	B-2	1.05	51.6
	B-3	1.05	92.58
	B-4	0.38	14.86
*	C-1	0.78	100
*	C-2	2.02	100
*	C-3	0.2	100
*	C-4	1.06	100
	F-1	0.04	100
	F-2	0.03	100
	OS-2	0.09	2
	OS-3	0.1	2
	Total	**9.67**	**87.5**

*All "C" group basins' imperviousness changed to 100%. This will accomdate the future build out of the associated lot and provide detention and treatment for the Water Quality Capture Volume and avoid construction of an additional pond.

FULL SPECTRUM DETENTION PROVIDED WITH POND #1

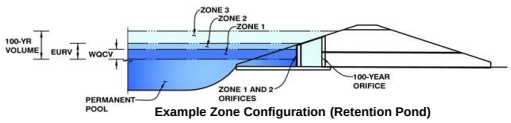
Galloway

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Meridian Storage

Basin ID: Pond #1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	9.67	acres
Watershed Length =	900	ft
Watershed Length to Centroid =	250	ft
Watershed Slope =	0.015	ft/ft
Watershed Imperviousness =	87.50%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.307	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.141	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.770	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.994	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.174	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.373	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.569	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.789	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	2.720	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	0.752	acre-feet	
Approximate 5-yr Detention Volume =	0.976	acre-feet	
Approximate 10-yr Detention Volume =	1.160	acre-feet	
Approximate 25-yr Detention Volume =	1.370	acre-feet	
Approximate 50-yr Detention Volume =	1.492	acre-feet	
Approximate 100-yr Detention Volume =	1.599	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.307	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.307	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

Total detention volume is less than 100-year volume.

Depth Increment = ft

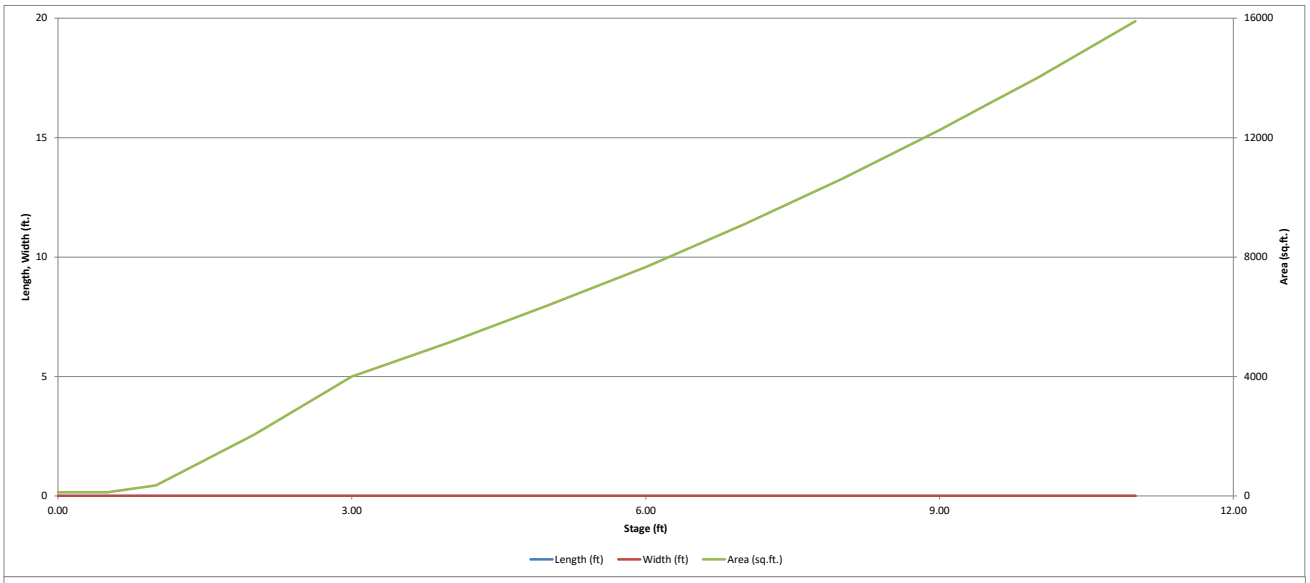
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	6900.00	0.00	--	--	--	120	0.003		
Trickle Chan. Inv.	6900.50	0.50	--	--	--	120	0.003	60	0.001
6901	6901	1.00	--	--	--	352	0.008	178	0.004
6902	6902	2.00	--	--	--	2,041	0.047	1,374	0.032
6903	6903	3.00	--	--	--	3,999	0.092	4,394	0.101
6904	6904	4.00	--	--	--	5,145	0.118	8,966	0.206
6905	6905	5.00	--	--	--	6,374	0.146	14,726	0.338
6906	6906	6.00	--	--	--	7,666	0.176	21,746	0.499
6907	6907	7.00	--	--	--	9,091	0.209	30,124	0.692
6908	6908	8.00	--	--	--	10,615	0.244	39,977	0.918
6909	6909	9.00	--	--	--	12,256	0.281	51,413	1.180
Spillway Invert	6909.5	9.50	--	--	--	13,133	0.301	57,760	1.326
6910	6910	10.00	--	--	--	14,000	0.321	64,543	1.482
Top of Pond	6911	11.00	--	--	--	15,899	0.365	79,493	1.825

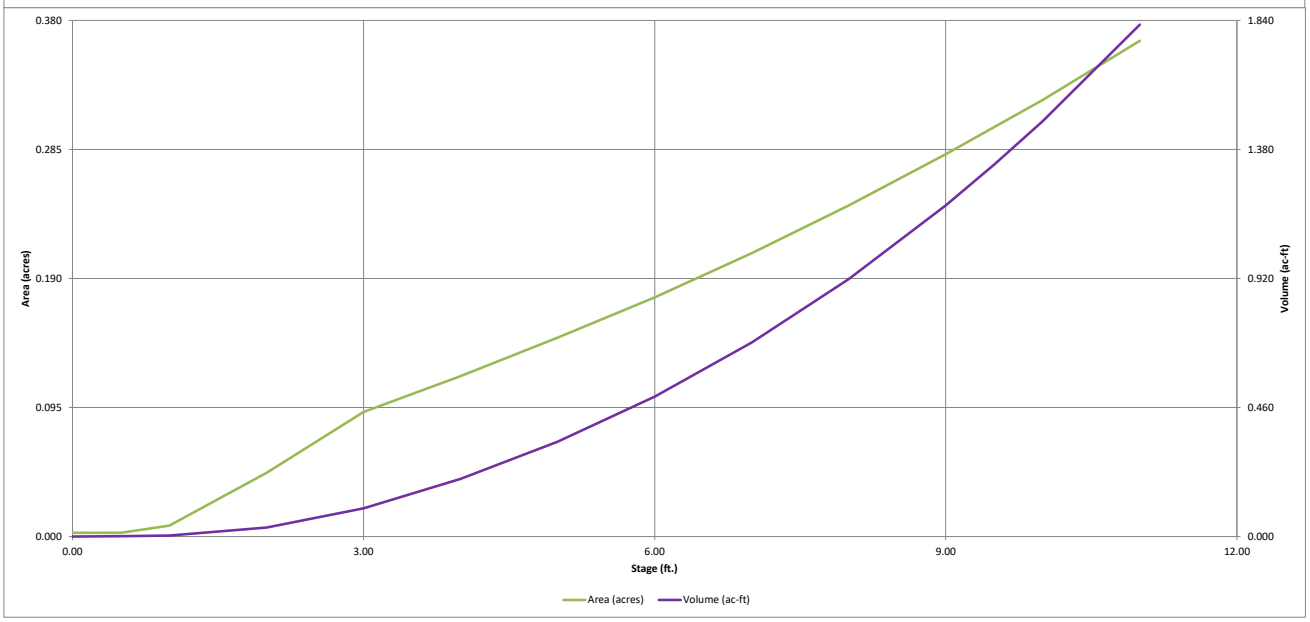
This pond is >10' and therefore considered a Jurisdictional Damn. Please revise pond design so that the height is less than 10' and submit a State Non-Jurisdictional Water Impoundment Structure Application

REVISED TO LESS THAN 10'. NOTE, THAT THE POND IS DUG DOWN, ACTUAL BERM ADJACENT TO ROADWAY IS LESS THAN 2'

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



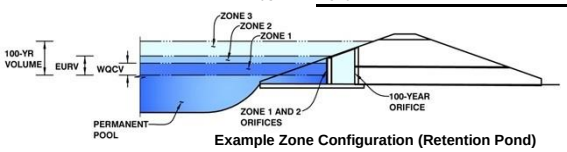


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Meridian Storage

Basin ID: Pond #1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.79	0.307	Orifice Plate
Zone 2			
Zone 3			
Total (all zones)		0.307	

fill in all stages and outlet type

COMPLETED ALL STAGES AND OUTLET TYPES

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	inch

REVISED SO PLAN AND CALCS MATCH

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir ... edimentation BMP)

			Calculated Parameters for Plate		
Centroid of Lowest Orifice =	0.00	ft (	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	5.00	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Pond details show 4.79'. Verify and update

Fill out N/As. There are orifices so these should not be N/A.

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 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.75	3.50			
Orifice Area (sq. inches)	0.99	0.79	0.79			

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

WHEN ORIFICE SEPARATION IS NOT THE SAME THIS IS ALWAYS N/A

User Input: Vertical Orifice (Circular or Rectangular) ... ameters for Vertical Orifice

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

3.42 per pond details. Verify and update so both match.

REVISED SO PLAN AND CALCS MATCH

REVISED TO 50%

assume 50%

User Input: ... ith Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Not Selected	Not Selected			Not Selected	Not Selected	
...ght, Ho =	5.50		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.23		feet
...Length =	5.67		feet	Overflow Weir Slope Length =	3.01		feet
Overflow Weir Grate Slope =	4.00		H:V	Grate Open Area / 100-yr Orifice Area =	3.78		
Horiz. Length of Weir Sides =	2.92		feet	Overflow Grate Open Area w/o Debris =	11.88		ft²
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	11.88		ft²
Debris Clogging % =	0%		%				

Pond details show 1.75'

Pond details call for a CDOT Type D Grate

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

	Not Selected	Not Selected			Not Selected	Not Selected	
...tlet Pipe =	0.25		ft (distance below basin bottom at Stage =				ft²
...Diameter =	24.00		inches				feet
					N/A	N/A	radians

REVISED SO PLAN AND CALCS MATCH

REVISED SO PLAN AND CALCS MATCH

REVISED SO PLAN AND CALCS MATCH

Pond details show 30" RCP

User Input: Emergency Spillway (Rectangular or Trapezoidal) ... culated Parameters for Spillway

Spillway Invert Stage=	9.50	ft (relative to basin bottom at Stage = 0 ft)		0.34	feet
Spillway Crest Length =	60.00	feet	Stage at Top of Freeboard =	10.84	feet
Spillway End Slopes =	4.00	H:V	Ba...		acres
Freeboard above Max Water Surface =	1.00	feet	Basin		acre-ft

Pond details call out 1.16'. Verify and update so both match.

Side slopes are not shown on plans. Update and verify both match.

REVISED SO PLAN AND CALCS MATCH

REVISED SO PLAN AND CALCS MATCH

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

...d =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
...h) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.307	1.141	0.770	0.994	1.174	1.373	1.569	1.789	2.720
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.770	0.994	1.174	1.373	1.569	1.789	2.720
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.2	2.2	4.3	7.1	17.9
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	0.23	0.45	0.73	1.86
Peak Inflow Q (cfs) =	N/A	N/A	15.8	20.5	24.1	28.8	33.0	36.7	56.0
Peak Outflow Q (cfs) =	0.1	41.6	3.8	7.6	10.6	17.4	21.5	26.5	39.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	42.7	43.1	8.0	5.0	3.7	2.2
Structure Controlling Flow =	Plate	Outlet Plate 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	3.61	0.31	0.6	0.9	1.4	1.8	2.2	3.3
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) =	38	43	46	44	43	42	41	40	36
Time to Drain 99% of Inflow Volume (hours) =	40	48	50	50	49	49	48	47	45
Maximum Ponding Depth (ft) =	4.79	8.86	5.95	6.18	6.32	6.59	6.73	6.89	7.64
Area at Maximum Ponding Depth (acres) =	0.14	0.28	0.17	0.18	0.19	0.20	0.20	0.21	0.23
	0.308	1.141	0.489	0.530	0.555	0.609	0.636	0.669	0.830

REVISED TO FULL SPECTRUM

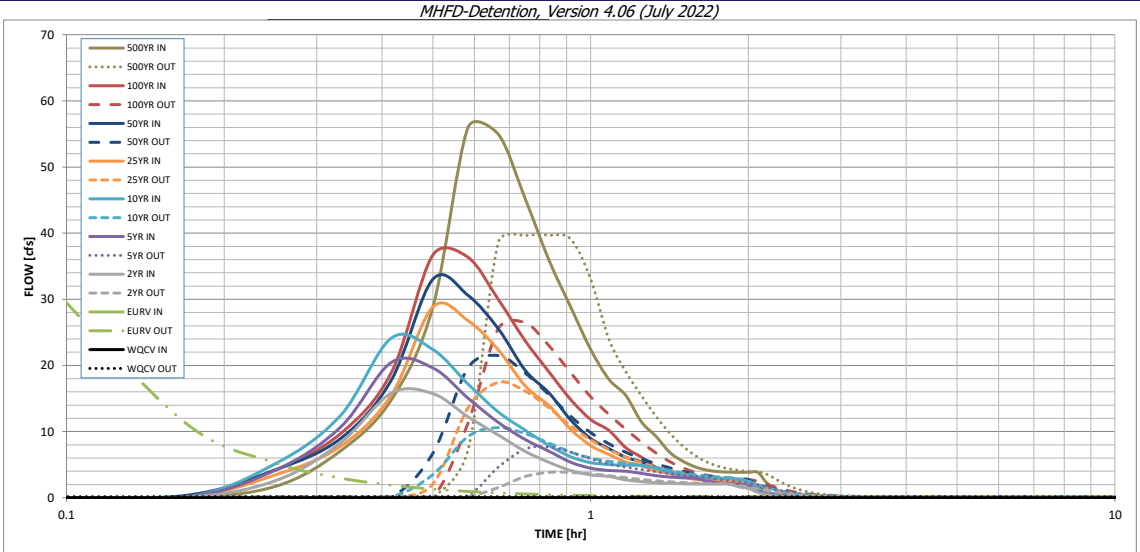
this flow seems very high, please confirm

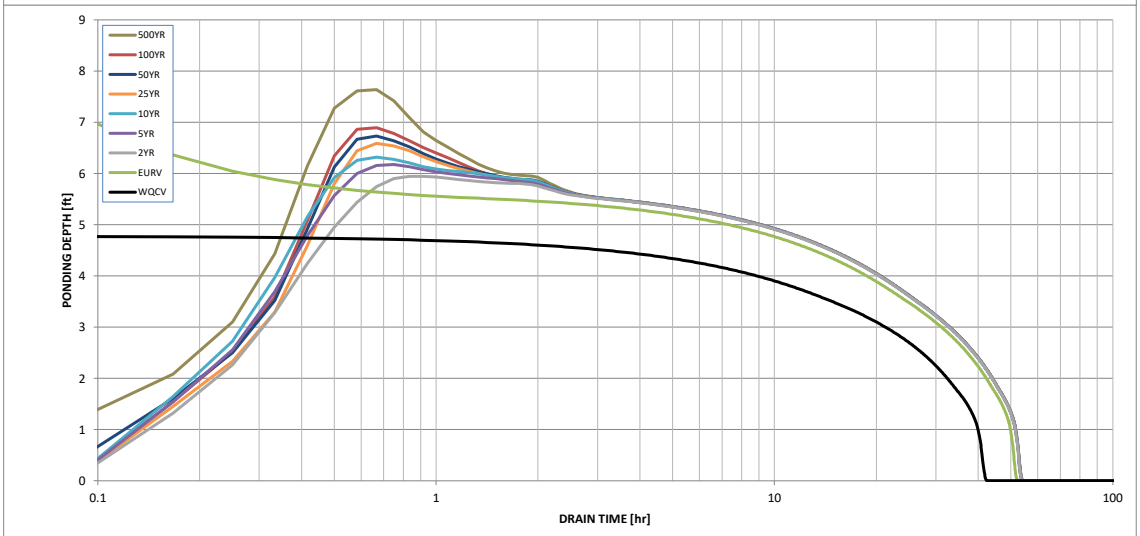
add a note stating that detention will be addressed with regional pond

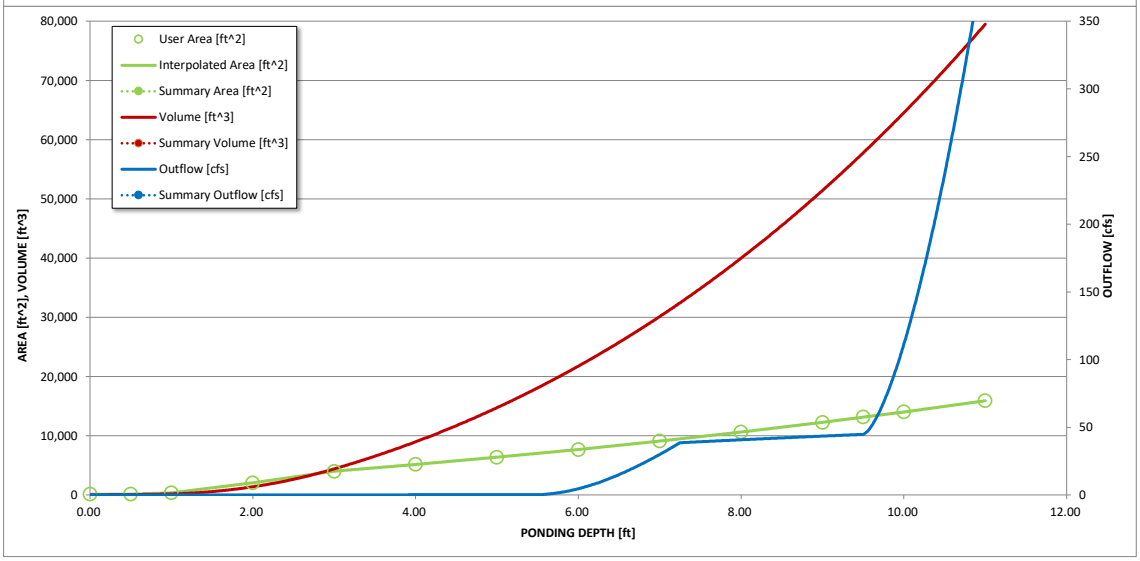
REVISED TO FULL SPECTRUM

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			

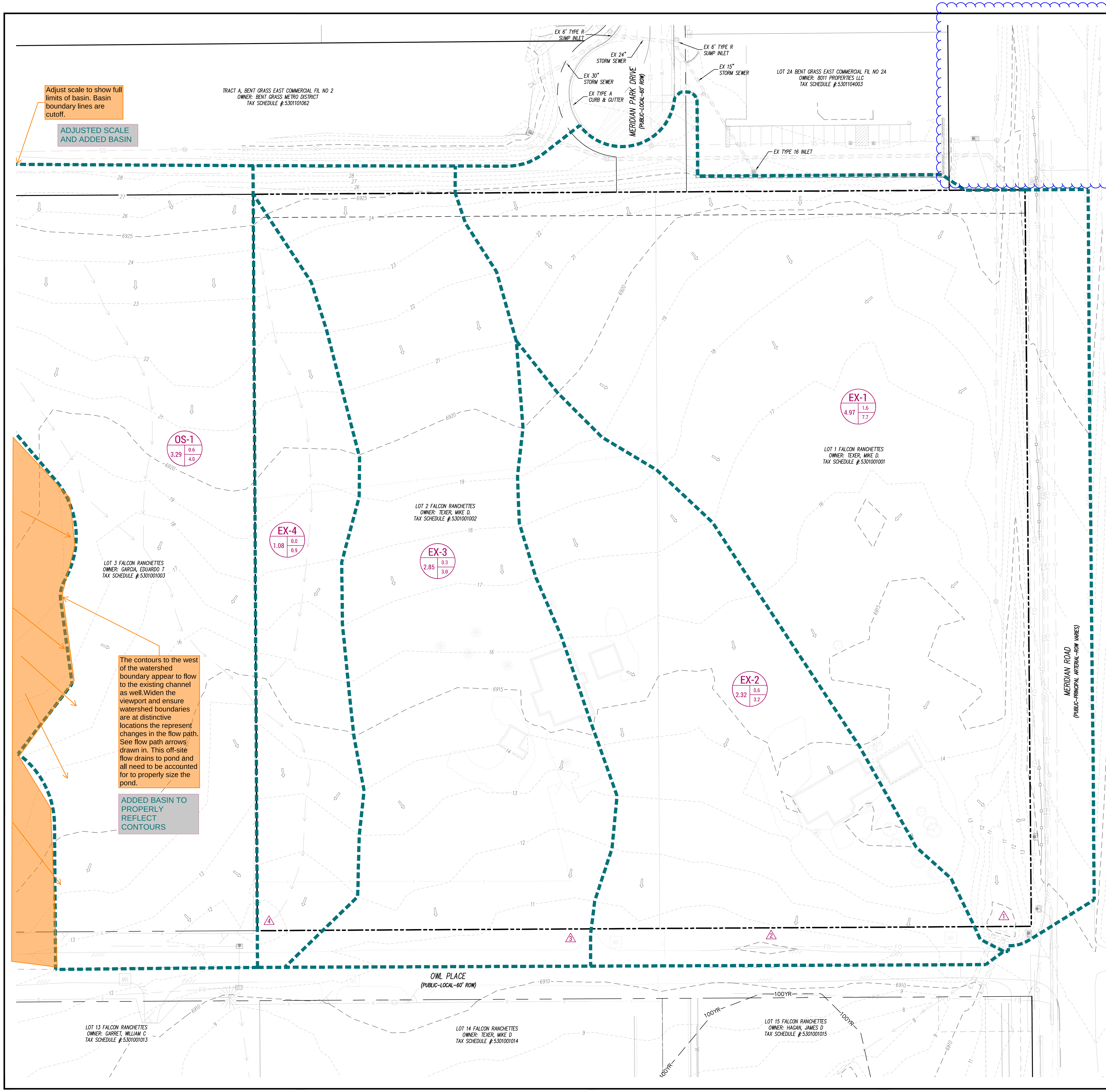
ADDED WATER QUALITY MAP AND ASSOCIATED TABLE

APPENDIX F

We need to know how much disturbed area is untreated and if there are any exclusions that apply to those areas. So please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PBMP (pond, runoff reduction, etc.) and those disturbed areas that are not treated by a PBMP, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 and exclusions listed in ECM App I.7.1.B.#). An accompanying summary table on this map would also be very helpful (example provided):

Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Trib to Pond A (ac)	Disturbed Area Treated via Runoff Reduction (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.C.1 (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.B.# (ac)	Applicable WQ Exclusions (App I.7.1.B.#)
A	4.50	4.50	4.50	-	-	-	
B	1.25	1.25	-	1.00	0.25	-	
C	6.00	4.00	-	-	-	4.00	ECM App I.7.1.B.5
D	2.50	2.50	1.00	-	0.50	1.00	ECM App I.7.1.B.7
E	3.00	-	3.00	-	-	-	
F	8.25	-	-	-	-	-	
Total	25.50	12.25	8.50	1.00	0.75	5.00	
Comments		*[For each row, the sum of the values in Columns 4-7 must be greater than or equal to the value in Column 3 above.]*	*[Values in this column can be more than Column 3 if over-treating non-disturbed areas of the same land-use.]*	*[See RR calc spreadsheet.]*	*[Total must be <20% of site and <1ac.]*		

Total Disturbed Area Treated (ac)	Total Disturbed Area Excluded from WQ (ac)	Non-Excluded Area to be Treated (value must exceed Total Proposed Disturbed Area) (ac)
9.50	5.75	15.25



Adjust scale to show full limits of basin. Basin boundary lines are cutoff.
ADJUSTED SCALE AND ADDED BASIN
Please account for upstream flow within the channel and from the Bent Grass Commercial pond that is out-falling at this location. Provide the flow entering the site at this location.
ADDED UPSTREAM BASIN AND ACCOMDATED BENT GRASS COMMERCIAL OUTFALL
The contours to the west of the watershed boundary appear to flow to the existing channel as well.Widen the viewport and ensure watershed boundaries are at distinctive locations the represent changes in the flow path. See flow path arrows drawn in. This off-site flow drains to pond and all need to be accounted for to properly size the pond.
ADDED BASIN TO PROPERLY REFLECT CONTOURS
TRACT A, BENT GRASS EAST COMMERCIAL FIL NO 2
OWNER: BENT GRASS METRO DISTRICT
TAX SCHEDULE #5301101062
LOT 2A BENT GRASS EAST COMMERCIAL FIL NO 2A
OWNER: 8011 PROPERTIES LLC
TAX SCHEDULE #5301104003
MERIDIAN PARK DRIVE
(PUBLIC-LOCAL-60' ROW)
EX 6' TYPE R SUMP INLET
EX 24" STORM SEWER
EX 30" STORM SEWER
EX TYPE A CURB & GUTTER
EX 15" STORM SEWER
EX TYPE 16 INLET
LOT 1 FALCON RANCHETTES
OWNER: TEXER, MIKE D.
TAX SCHEDULE #5301001001
LOT 2 FALCON RANCHETTES
OWNER: TEXER, MIKE D.
TAX SCHEDULE #5301001002
LOT 3 FALCON RANCHETTES
OWNER: GARCIA, EDUARDO T
TAX SCHEDULE #5301001003
EX-1 4.97 1.6 7.7
EX-2 2.32 0.6 3.2
EX-3 2.85 0.3 3.0
EX-4 1.08 0.0 0.9
OS-1 3.29 0.6 4.0
MERIDIAN ROAD
(PUBLIC-PRINCIPAL ARTERIAL-ROW VARIES)
OWL PLACE
(PUBLIC-LOCAL-60' ROW)
100YR
LOT 13 FALCON RANCHETTES
OWNER: GARRET, WILLIAM C
TAX SCHEDULE #5301001013
LOT 14 FALCON RANCHETTES
OWNER: TEXER, MIKE D
TAX SCHEDULE #5301001014
LOT 15 FALCON RANCHETTES
OWNER: HAGAN, JAMES D
TAX SCHEDULE #5301001015
N
SCALE: 1"=40'

SITE LEGEND

- PROPERTY BOUNDARY LINE
- ADJACENT PROPERTY BOUNDARY LINE
- RIGHT OF WAY BOUNDARY LINE
- EXISTING ADJACENT LOT LINE
- EXISTING EASEMENT LINE
- EXISTING SWALE LINE
- FLOODPLAIN BOUNDARY
- EXISTING CURB AND GUTTER
- EXISTING SIGN

UTILITY LEGEND

- EXISTING WATER LINE
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING GAS LINE
- EXISTING UNDERGROUND TELEPHONE
- EXISTING OVERHEAD ELECTRIC
- EXISTING FIBER OPTIC LINE
- EXISTING FIBER OPTIC STRUCTURES
- EXISTING TELEPHONE PEDESTAL
- EXISTING ELECTRIC TRANSFORMER
- EXISTING POWER POLE
- EXISTING STREET LIGHT
- EXISTING WATER VALVE
- EXISTING FIRE HYDRANT
- EXISTING STORM SEWER MANHOLE
- EXISTING SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER CLEANOUT

DRAINAGE LEGEND

- 5460 — EXISTING MAJOR CONTOUR
- 52 — EXISTING MINOR CONTOUR
- BASIN BOUNDARY
- 100YR — EXISTING 100-YEAR FLOODPLAIN
- EXISTING FLOW DIRECTION
- A — BASIN DESIGNATION
- 5 — 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100 — 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- AC — BASIN AREA IN ACRES
- DESIGN POINT

DESIGN POINT TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
EXISTING		
1	1.6	7.7
2	0.6	3.2
3	0.3	2.9
4	0.6	4.9
PROPOSED		
1	2.1	5.9
2	6.5	11.5
3 (Inlet)	5.6	9.7
3 (Pipe)	11.2	19.6
4 (Inlet)	2.0	4.5
4 (Pipe)	12.3	22.5
5 (Inlet)	3.2	6.6
5 (Pipe)	13.5	25.4
6 (Inflow)	20.5	36.7
6 (Outflow)	7.6	26.5
7	0.6	4.9
8	8.2	31.4

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EX-1	4.97	0.08	0.23	10.7	1.6	7.7
EX-2	2.32	0.07	0.22	13.1	0.6	3.2
EX-3	2.85	0.03	0.17	13.8	0.3	3.0
EX-4	1.08	0.01	0.13	13.6	0.0	0.9
OS-1	3.29	0.05	0.20	13.9	0.6	4.0
A-1	1.85	0.25	0.41	7.3	2.1	5.9
B-1	1.54	0.82	0.86	5.0	6.5	11.5
B-2	1.26	0.82	0.86	5.0	5.3	9.4
B-3	1.05	0.86	0.89	5.0	4.7	8.1
B-4	1.05	0.38	0.52	7.6	1.8	4.2
B-5	0.38	0.78	0.83	5.0	1.5	2.7
C-1	0.78	0.01	0.13	12.4	0.0	0.6
C-2	2.02	0.01	0.13	12.8	0.1	1.7
C-3	0.20	0.01	0.13	11.1	0.0	0.2
C-4	1.06	0.01	0.13	13.6	0.0	0.8
F-1	0.04	0.86	0.89	5.0	0.2	0.3
F-2	0.03	0.86	0.89	5.0	0.1	0.2
OS-2	0.09	0.01	0.13	5.0	0.0	0.1
OS-3	0.10	0.01	0.13	5.0	0.0	0.1
OS-4	0.07	0.01	0.13	5.0	0.0	0.1

Galloway
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920
719.900.7220
GallowayUS.com

FALCON RANCHETTES FILING NO. 2 MERIDIAN STORAGE DRAINAGE MAP FOR M.D. ROOFING

11750 OWL PLACE
PEYTON, CO 80831

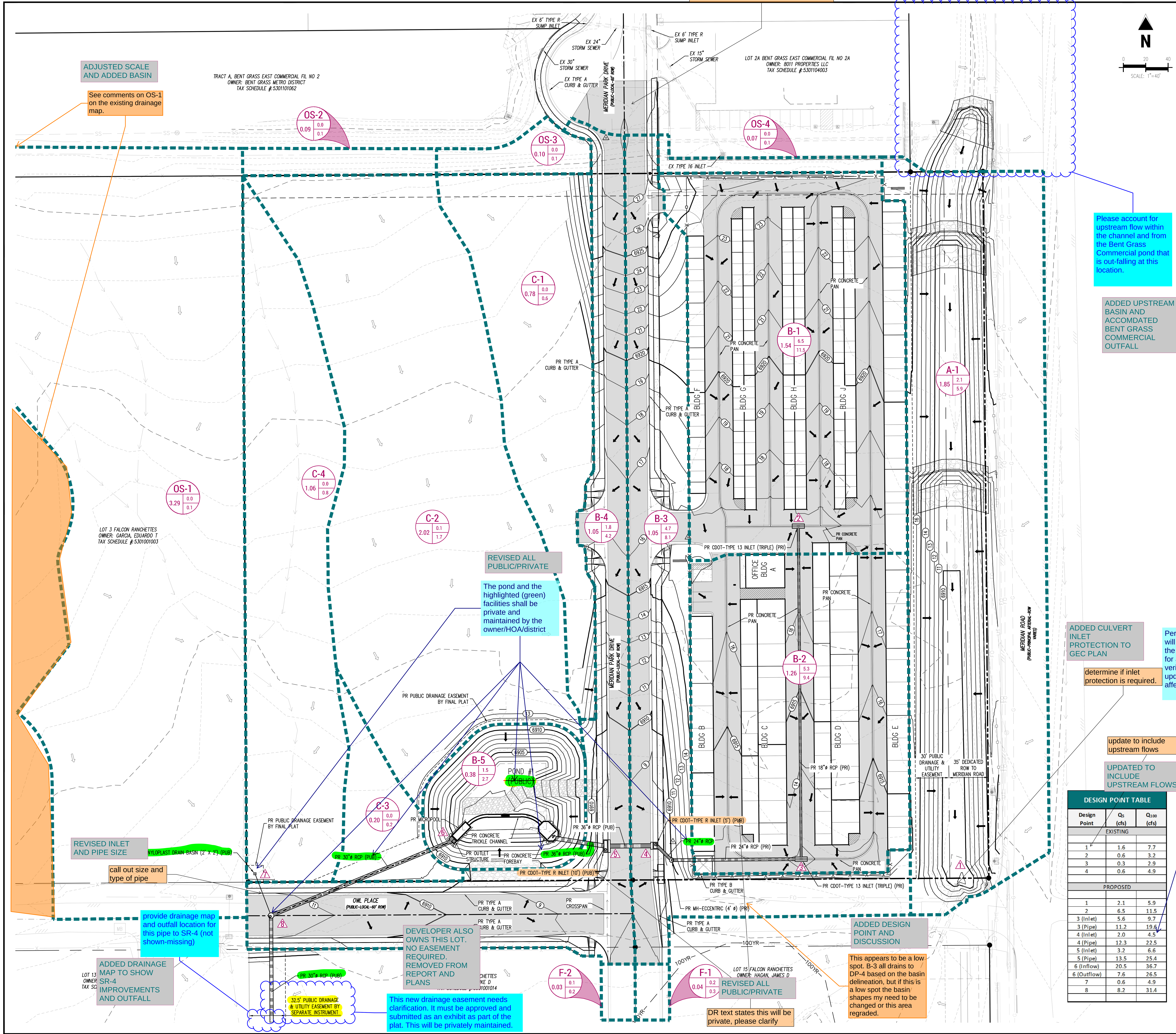
#	Date	Issue / Description	Init.

Project No:	MRS01
Drawn By:	BLB
Checked By:	CMWJ
Date:	04/23/2023

EXISTING DRAINAGE MAP

DR-1

SHEET 1 OF 2



this portion of work should be included in a basin and discussed in the DR text
ADJUSTED SCALE AND ADDED BASIN
See comments on OS-1 on the existing drainage map.
TRACT A, BENT GRASS EAST COMMERCIAL FIL NO 2 OWNER: BENT GRASS METRO DISTRICT TAX SCHEDULE # 5301101062
LOT 2A BENT GRASS EAST COMMERCIAL FIL NO 2A OWNER: 8011 PROPERTIES LLC TAX SCHEDULE # 5301104003
LOT 3 FALCON RANCHETTES OWNER: GARCIA, EDUARDO T TAX SCHEDULE # 5301001003
MERIDIAN PARK DRIVE
MERIDIAN ROAD
OWL PLACE
POND #1 (PUBLIC)
REVISED ALL PUBLIC/PRIVATE
The pond and the highlighted (green) facilities shall be private and maintained by the owner/HOA/district
REVISED INLET AND PIPE SIZE
call out size and type of pipe
provide drainage map and outfall location for this pipe to SR-4 (not shown-missing)
ADDED DRAINAGE MAP TO SHOW SR-4 IMPROVEMENTS AND OUTFALL
DEVELOPER ALSO OWNS THIS LOT. NO EASEMENT REQUIRED. REMOVED FROM REPORT AND PLANS
This new drainage easement needs clarification. It must be approved and submitted as an exhibit as part of the plat. This will be privately maintained.
32.5' PUBLIC DRAINAGE & UTILITY EASEMENT BY SEPARATE INSTRUMENT
REVISED ALL PUBLIC/PRIVATE
DR text states this will be private, please clarify
ADDED DESIGN POINT AND DISCUSSION
This appears to be a low spot. B-3 all drains to DP-4 based on the basin delineation, but if this is a low spot the basin shapes my need to be changed or this area regraded.
Please account for upstream flow within the channel and from the Bent Grass Commercial pond that is out-falling at this location.
ADDED UPSTREAM BASIN AND ACCOMODATED BENT GRASS COMMERCIAL OUTFALL
ADDED CULVERT INLET PROTECTION TO GEC PLAN
determine if inlet protection is required.
REVISED BASINS AND ALL TABLES
Per the narrative B-3 basin flow will be conveyed to the inlet yet the design point does not account for all of Basin B-3 flow. Please verify and revise accordingly. update pipe flow that may be affected as well.
update to include upstream flows
UPDATED TO INCLUDE UPSTREAM FLOWS

N
SCALE: 1"=40'

SITE LEGEND

- PROPERTY BOUNDARY LINE
- ADJACENT PROPERTY BOUNDARY LINE
- RIGHT OF WAY BOUNDARY LINE
- EXISTING ADJACENT LOT LINE
- EXISTING EASEMENT LINE
- EXISTING SWALE LINE
- FLOODPLAIN BOUNDARY
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- EXISTING SIGN

UTILITY LEGEND

- EXISTING WATER LINE
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING GAS LINE
- EXISTING UNDERGROUND TELEPHONE
- EXISTING OVERHEAD ELECTRIC
- EXISTING FIBER OPTIC LINE
- EXISTING FIBER OPTIC STRUCTURES
- EXISTING TELEPHONE PEDESTAL
- EXISTING ELECTRIC TRANSFORMER
- EXISTING POWER POLE
- EXISTING STREET LIGHT
- EXISTING WATER VALVE
- EXISTING FIRE HYDRANT
- EXISTING STORM SEWER MANHOLE
- EXISTING SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER CLEANOUT

PAVING LEGEND

- PROPOSED CONCRETE
- EXISTING CONCRETE
- PROPOSED ASPHALT PAVING

DRAINAGE LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- BASIN BOUNDARY
- EXISTING 100-YEAR FLOODPLAIN
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT

DESIGN POINT TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
EXISTING		
1	1.6	7.7
2	0.6	3.2
3	0.3	2.9
4	0.6	4.9
PROPOSED		
1	2.1	5.9
2	6.5	11.5
3 (Inlet)	5.6	9.7
3 (Pipe)	11.2	19.6
4 (Inlet)	2.0	4.5
4 (Pipe)	12.3	22.5
5 (Inlet)	3.2	6.6
5 (Pipe)	13.5	25.4
6 (Inflow)	20.5	36.7
6 (Outflow)	7.6	26.5
7	0.6	4.9
8	8.2	31.4

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EX-1	4.97	0.08	0.23	10.7	1.6	7.7
EX-2	2.32	0.07	0.22	13.1	0.6	3.2
EX-3	2.85	0.03	0.17	13.8	0.3	3.0
EX-4	1.08	0.01	0.13	13.6	0.0	0.9
OS-1	3.29	0.05	0.20	13.9	0.6	4.0
A-1	1.85	0.25	0.41	7.3	2.1	5.9
B-1	1.54	0.82	0.86	5.0	6.5	11.5
B-2	1.26	0.82	0.86	5.0	5.3	9.4
B-3	1.05	0.86	0.89	5.0	4.7	8.1
B-4	1.05	0.38	0.52	7.6	1.8	4.2
B-5	0.38	0.78	0.83	5.0	1.5	2.7
C-1	0.78	0.01	0.13	12.4	0.0	0.6
C-2	2.02	0.01	0.13	12.8	0.1	1.7
C-3	0.20	0.01	0.13	11.1	0.0	0.2
C-4	1.06	0.01	0.13	13.6	0.0	0.8
F-1	0.04	0.86	0.89	5.0	0.2	0.3
F-2	0.03	0.86	0.89	5.0	0.1	0.2
OS-2	0.09	0.01	0.13	5.0	0.0	0.1
OS-3	0.10	0.01	0.13	5.0	0.0	0.1
OS-4	0.07	0.01	0.13	5.0	0.0	0.1

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FALCON RANCHETTES FILING NO. 2 MERIDIAN STORAGE DRAINAGE MAP FOR M.D. ROOFING

11750 OWL PLACE
PEYTON, CO 80831

#	Date	Issue / Description	Init.

Project No:	MRS01
Drawn By:	BLB
Checked By:	CMWJ
Date:	04/23/2023

PROPOSED DRAINAGE MAP

DR-2

SHEET 2 OF 2