PRELIMINARY DRAINAGE REPORT

for

THE COMMONS AT FALCON FIELD

El Paso County, Colorado

May 2024

PCD FILE NO. SP-232

Prepared for:

Falcon Field, LLC
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PRELIMINARY DRAINAGE REPORT

for

THE COMMONS AT FALCON FIELD

Falcon, Colorado

1.0 CERTIFICATION STATEMENTS

ENGINEER'S STATEMENT

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

_____

Tim D. McConnell, P.E. Date
Colorado P.E. License No. 33797
For and on Behalf of Drexel, Barrell & Co.

DEVELOPER'S STATEMENT

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

Business Name: Falcon Field, LLC.

By: _____

PJ Anderson Date
Title: Owner
Address: 30 N. Tejon St., #516
Colorado Springs, CO 80903

EL PASO COUNTY

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

_____

Joshua Palmer, P.E. Date
County Engineer/ECM Administrator
CONDITIONS:

PRELIMINARY DRAINAGE REPORT

for

THE COMMONS AT FALCON FIELD

Falcon, Colorado

2.0 PURPOSE

This report is prepared by Drexel, Barrel & Co in support of The Commons at Falcon Field project. The purpose of this report is to identify onsite and offsite drainage patterns, storm sewer, inlet locations, and areas tributary to the site, and to safely route developed storm water runoff to adequate outfall facilities.

3.0 GENERAL SITE DESCRIPTION

Location

The Commons at Falcon Field site is approximately 57.7 acres and is bounded by U.S. Highway 24 along the northwest, a school to the south, and a large-lot residential development to the east and northeast. The site is in the east half of Section 7, Township 13 South, Range 64 West of the 6th PM.

Drainage Fees will be assessed and paid according to the current rates at the time of platting. All easements for utilities and drainage features will be provided with the final plat process.

Existing Site Conditions

The site is currently open grass land with one single-family residence and barn. The residence is supported by a well and individual septic system. There are no known utilities on site. Offsite runoff enters the site through a box culvert under Highway 24, along the northern boundary of the property. The box culvert discharges through the site in an open drainage to the south. Smaller offsite basins, including Highway 24 along the northern boundary currently discharge onto the property, these basins are further described below.

Proposed Site Conditions

The Commons at Falcon Field is a proposed mixed-use commercial and residential development and is proposed to consist of 169 single-family lots and 8 commercial pads, along with associated roadways and open space. This development is anticipated to be phased into three separate areas – commercial, south residential and east residential.

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the site is partially underlain by

Blakeland Loamy Sand (Soil No. 8), and predominantly by Columbine gravelly sandy loam (Soil No. 19). Both soils are type 'A' hydrological soil group. See appendix for map.

Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region, roughly 15 inches annually. The climate of the site is typical of a sub-humid to semi-arid climate with mild summers and winters. The average temperature is 31 degrees F in the winter and 68.4 degrees F in the summer.

Floodplain Statement

The Flood Insurance Rate Maps (FIRM No. 08041C0553-G & 08041C0561-G both dated 12/7/18) indicate that there is a Zone A floodplain area that covers the "Falcon Creek East Tributary" that bisects the site, but this area is not a designated regulatory floodway. This reach of the channel is the subject of a FEMA floodplain study currently being completed by separate report and analysis.

Previous Drainage Studies

The site is located within the East Tributary Basin of the Falcon Basin Watershed, as studied in the Falcon Drainage Basin Planning Study, prepared by Matrix Design Group, September, 2015. DBPS recommendations are presented later in this report.

4.0 DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for historic and developed conditions using the Rational Method as required for basins containing less than 100 acres.

In addition, the following Mile High Flood District (MHFD) provided spreadsheet MHFD-Detention v4.04 was used for preliminary design of the detention facilities.

5.0 DBPS ANALYSIS

Existing Conditions

The Falcon DBPS watershed establishes three major basins, including the "East Tributary" which covers this property. The DBPS completed hydrologic analysis for the Falcon Basin Watershed, using HEC-HMS v.3.5 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 conveyance infrastructure.

As mentioned earlier, offsite flows from the Woodmen Hills Detention Pond #4 enter the Commons at Falcon Field site via two 4.83'x12' box culverts underneath U.S. Highway 24 (DBPS identifier ET14), these combine with onsite flows and follow the historic reach RET100 of the Falcon Creek East Tributary to the south.

The following table details the HEC-HMS analysis of existing conditions across the Commons at Falcon Field development.

Peak Discharges for the Existing Condition at Points of Interest in vicinity of The Commons at Falcon Field Development (DBPS)

Location	Existing Conditions (source: Falcon Basin, Drainage Planning Study, HEC-HMS model)							
	HEC-HMS Element	Area (sq mi)	Peak Flow (cfs)					
			2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
East tributary at North Property Line of Commons at Falcon Field	RET090	1.66	14	36	55	170	230	320
East tributary through Commons at Falcon Field	RET100	1.78	15	39	64	170	270	370
Local Basin	ET100	0.05	1	6	10	21	27	34
East tributary South of Commons at Falcon Field Property Line	RET110	1.83	15	40	65	170	270	380

The DBPS flow rates shown in the table above were used as the basis of the existing condition analysis of the Commons at Falcon Field development. Site specific basins have been allocated and referenced on the existing conditions map in the appendix.

The Falcon DBPS recommends junction and reach improvements for RET100 (reach through project site) and subsequent reach RET110 downstream junction ET13 at Pinto Pony to Falcon Highway. The existing culvert at Highway 24 was identified as undersized, but not included in the DBPS recommendations as it is a CDOT owned structure. The improvements include the following recommendations:

Reach RET100 – Installation of small drop structures with toe protection
Reach RET110 – Installation of small drop structures with toe protection
Junction ET13 (Pinto Pony) – replace existing crossing with (2) 6'x8' culverts
Junction ET11 (Falcon Highway) – replace existing crossing with (2) 6'x8' culverts

The Commons at Falcon Field development proposes regrading and rerouting a portion of the East Tributary. The proposed improvements will intercept the Highway 24 (CDOT owned) culvert immediately south of the Highway 24 and convey via a public 10'x4' concrete box culvert 750-lf to the south through the project site towards an open channel. The proposed public box culvert will discharge to the proposed open channel via a headwall. The proposed open channel conveys the flow 275-lf downstream to tie into the existing creek and will be vegetated with mowable short grasses. The open channel is proposed with a 20-foot bottom width in a v-shape with two 10-foot sections set as a 2% slope to the invert. As this is a public improvement to an existing drainageway identified in the DBPS the box culvert is proposed to be publicly owned and maintained.

Hydraulic analysis of the drainageway downstream of the Commons at Falcon Marketplace project will be completed at the final plat stage of development.

6.0 EXISTING CONDITION

In addition to the DBPS, a site specific analysis of the existing conditions was completed. The flows determined by the DBPS for the tributary entering the site from the north (RET090), were used in combination with rational method analysis for the surrounding onsite/offsite flows. For this preliminary analysis, the DBPS flows were directly added to the rational method flows. Further analysis of the flows will be completed with the CLOMR study.

Basin OS1 represents a portion of the southern half of U.S. Highway 24 along the northwest boundary for the Commons at Falcon Field site. Due to no curb and gutter along this stretch of U.S. Highway 24, flows from this basin discharge directly into basin E1 as overland flow and are represented by **Design Point DPA**. Runoff rates at existing DPA are Q_5=3.4 cfs and Q_{100}=7.6 cfs.

Basin E1 covers 13.85 acres of open space in the northwestern portion of the site. Flows from this basin combine with those from DPA and travel to the southwest towards the East Tributary of Falcon Creek. The east tributary bisects basin E1 running from northern most portion of the site south towards the bottom of Basin E1 where flows are discharged at rates of Q_5=3.2 cfs and Q_{100}=22.4 cfs. These flows are consistent with those established by the DBPS for the local basin, see table above. These flows combine with those from the DBPS RET090 at **Design Point DPB** with rates of Q_5=41.0 cfs and Q_{100}=346.4 cfs, and discharge to the south as defined channel flow. As previously mentioned for the purposes of this preliminary analysis, the DBPS flows were directly added to the Rational Method flows. Further detailed flow analysis will be completed as part of the CLOMR study.

Basin OS2 represents the remainder of the southern half of U.S. Highway 24 along the northwest boundary for the Commons at Falcon Field site. Due to no curb and gutter along this stretch of U.S. Highway 24, flows from this basin discharge as overland flow directly into basin E2 and are represented by **Design Point DPC**. Runoff rates at existing DPC are Q_5=1.4 cfs and Q_{100}=3.2 cfs.

Basin OS3 is located along the southeastern edge of Basin E2. This basin consists native grasses and vegetation, and a small outbuilding. The flows within this basin travel to the southwest where they will discharge as overland flow into basin E2 at **Design Point DPD**. The runoff rates entering basin E2 at DPD are Q_5=0.8 cfs and Q_{100}=5.6 cfs.

Basin E2 is 12.88 acres of open space located to the west of Basin E1. The basin is sloped to the southeast at roughly 3% before turning directly south upon reaching the eastern border of the basin. Flows combine with those from Basin OS2 then travel south until roughly halfway down the basin where Basin OS3 adds to the flows. From there the combined flows from Basins OS2, OS3, and E2 continue to the south as overland flow where they are released from the site at **Design Point DPE** at rates of Q_5=3.8 cfs and Q_{100}=23.9 cfs.

RATIONAL METHOD RUNOFF SUMMARY

BASIN & DESIGN POINT SUMMARY				
BASIN	**DP**	**AREA (AC)**	**Q5**	**Q100**
EXISTING BASINS				
OS1	A	1.34	3.4	7.6
E1		13.85	3.2	22.4
DPA+E1+RET090	B	15.19	41.0	346.4
OS2	C	0.60	1.4	3.2
OS3	D	2.56	0.8	5.6
E2		12.88	2.5	18.6
DPC+DPD+E2	E	16.04	3.8	23.9
E3	F	13.11	2.7	19.6
OS4	G	3.29	2.4	9.7
E4		1.57	0.3	2.6
DPG+E4	H	4.86	1.9	9.0
E5	I	5.91	2.2	11.7
OS5	J	5.50	6.6	6.6
OS6	K	0.91	2.6	5.5
E6		10.37	1.7	12.5
DPJ+DPL+E6	M	16.78	4.1	21.9

Basin E3 represents 13.11 acres in the southwest corner of the site. Basin E3 directs flows from the north and south to the southern border, exiting the site as overland flow with runoff rates of Q_5=2.7 cfs and Q_{100}=19.6 cfs at **Design Point DPF**.

Basin OS4 runs down the western side of the site and includes a portion of the southern edge of U.S. Highway 24. The 3.29-acre, offsite basin, generates flows that will travel to the south until they reach **Design Point DPG** at the bottom of the basin. Where they will enter Basin E4 as overland flow at rates of Q_5=2.4 cfs and Q_{100}=9.7 cfs.

Basin E4 is a small, 1.57-acre basin on the far western side of the site. The basin will receive offsite flows from Basin OS4 before directing all of flow south where it exits the western side of the site as overland flow at **Design Point DPH**, with runoff rates of Q_5=1.9 cfs and Q_{100}=9.0 cfs.

Basin E5 is 5.91 acres located on the eastern side of the site, sandwiched between the southern portions of Basin E1 and E6. The basin directs all of its flows south as overland flow towards the existing **Design Point DPG** which sits on the southern border of the site, directly in the middle of Basin E5. This basin generates runoff rates of Q_5=2.4 cfs and Q_{100}=9.7 cfs.

Basin OS5 is an offsite basin located to the north of Rio Lane and includes the northern half of Rio Lane. Runoff from this basin is captured by a roadside ditch and travels towards an existing 18" CMP culvert underneath Rio Lane, located approximately two-thirds of the way along the project boundary. The full-flow capacity of this existing 18"

CMP culvert at 1.0% (field-surveyed grade) has been conservatively used to determine the flows entering from the project site from this basin, rather than using the Rational Method calculation. This approach considers the existing roadside ditch along the north side of Rio Lane as emergency overflow for flows not captured by the existing culvert. Field observations indicate no evidence of roadway overtopping in this area. As a result, flows of Q_{100}=6.6 cfs exit the 18" CMP culvert and enter the project site at DPJ as concentrated flow.

Basin OS6 covers the southern half of Rio Lane along the northern boundary of the Commons at Falcon Field site. Due to no curb and gutter along Rio Lane, flows from this basin discharge as overland flow directly into Basin E6 and are represented by **Design Point DPL** with runoff rates of Q_5=2.6 cfs and Q_{100}=5.5 cfs.

Basin E6 represents the eastern most basin of the site. At 10.37 acres, the basin directs flows from its northwestern corner, and from Basins OS5, and OS6, southeast until they reach the existing **Design Point M** where they exit the site as overland flow. Runoff rates at DPM will be Q_5=4.1 cfs and Q_{100}=21.9 cfs.

7. DEVELOPED CONDITION

For the purposes of site specific analysis, the project site has been divided into several grouped drainage basins as shown on the proposed drainage plan.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm recurrence intervals. Mile High Flood District MHFD-Detention v,4.04 was used for preliminary pond sizing, see appendix for calculations and below for a summary runoff table.

A site investigation is currently underway to evaluate existing groundwater conditions. In order to mitigate potential issues, the site grading in several areas of the site will be raised from the existing condition and as such, will increase the separation above shallow water areas. The results of the groundwater monitoring will indicate whether further mitigation measures will be required on the site, particularly at the detention basins. This analysis will be completed at the final plat stage with the construction documents.

The existing channel through the site is proposed to be piped via 8'x4' box culvert from the existing outfall south of U.S. Highway 24, through the site before discharging into a redefined open channel to the south of the proposed Retail Row St. A CLOMR study is currently underway to determine the feasibility of this approach.

Any underdrain system to be installed will be the responsibility of the Falcon Field District. State and Groundwater District permitting for discharges will be the responsibility of the of the District.

A-group basins represent flows at the eastern residential portion of the site that will be intercepted by Pond A, ultimately discharging out to the redefined tributary open channel.

Rational Method Runoff Summary (A-group)

BASIN & DESIGN POINT SUMMARY				
BASIN	**DP**	**AREA (AC)**	**Q5**	**Q100**
A-BASINS				
A1	1	0.67	2.0	4.2
A2		1.51	2.5	6.8
DP1+A2	2	2.18	4.6	11.0
A3	3	1.49	3.2	6.9
A4	4	0.60	2.2	4.2
A5	5	2.47	4.0	9.0
A6	6	1.74	2.9	6.4
A7		1.47	2.4	5.3
DP5+DP6+A7	7	5.67	8.4	18.7
A8	8	0.65	1.4	3.0
A9		2.55	4.9	10.8
DP8+A9	9	3.21	6.4	14.1
A10	10	3.25	5.6	12.2
DP7+DP10	10A	8.92	17.8	39.4
A11		0.99	2.0	4.3
DP3+A11	11	2.48	5.3	11.5
DP10A+DP9+DP11	11A	14.61	28.8	63.4
A12		0.97	0.2	1.8
DP2+DP11A+A12	12	17.75	32.4	71.1
A13	13	2.39	1.4	7.7
A14	14	0.53	0.2	1.4

Basin A1 is located on the western side of Rio Lane. Runoff will flow south via curb and gutter at rates of Q_5=1.3 cfs and Q_{100}=2.5 cfs towards **Design Point DP1.** At DP1, flows will be captured by a proposed 5' Type R storm inlet located at the southwestern most point of Rio Lane.

Basin A2 covers the eastern side of Rio Lane and a portion of the rear of the lots along Jacamar Place. Flows of Q_5=2.5 cfs and Q_{100}=6.8 cfs will travel south overland and via curb and gutter towards the knuckle with Retail Row St. and **Design Point DP2.**

DP2 is a proposed 5' Type R storm inlet that is located at the very southeastern point of Rio Lane. The inlet will capture all of the runoff generated within basin A2, before combining that with the runoff captured by DP1. Together this runoff, at rates of Q_5=3.8 cfs and Q_{100}=9.3 cfs, will be expelled into the proposed full-spectrum detention facility **Pond A**.

Basin A3 is located between Rio Lane to the west and Jacamar Place to the east. Runoff flows overland and via curb and gutter from the northwest corner of the basin, down Jacamar Place, to the southeast corner at **DP3** with runoff rates of Q_5=3.2 cfs and

Q_{100}=6.9 cfs. From this point flows will continue to the east via curb and gutter flow to **DP11**.

As described in the existing conditions section of this report, an existing 18" CMP culvert currently discharges onto the project site. In the developed condition, it is proposed that this culvert flow be directed to the east via 18" RCP storm sewer extension, under the proposed Tody Way intersection with Rio Lane. The roadside ditch east of the proposed Tody Way and Rio Lane intersection is to be redefined with outfall protection to protect from downstream erosion and scour. Onsite and offsite drainage easements will be established at the final plat stage.

Basin A4 covers the south side of Rio Lane, which is to be upgraded to a local roadway section with curb and gutter and sidewalk on the south side. Runoff generated by this basin (Q_5=2.2 cfs and Q_{100}=4.2 cfs) is directed to the east via curb and gutter towards the intersection with Tody Way and **Design Point DP4.** From this point flows will continue to the south via curb and gutter flow.

Basin A5 is 2.47 acres made up of 10 residential lots on the north side of Sapoya Place. Runoff (Q_5=4.0 cfs and Q_{100}=9.0 cfs) flows from northwest to southeast as side lot flow and curb and gutter flow towards the intersection with Tody Way and **Design Point DP5.**

DP5 covers flows generated by Basin A4 (DP4) and Basin A5 and directs them to the south via cross-pan and curb and gutter flow.

Basin A6 covers 1.74-acres of lots along the east side of Motmot Way. Flows generated by this basin (Q_5=2.9 cfs and Q_{100}=6.4 cfs) are directed towards the south of the basin via side-lot swale and curb and gutter towards **Design Point DP6** at the intersection with Buteos Lane. From DP6 these flows will continue to the south via cross-pan and curb and gutter flow.

Basin A7 covers an area of residential lots along Tody Way and generates flows of Q_5=2.4 cfs and Q_{100}=5.3 cfs. Flows will generally travel as curb and gutter flows towards **Design Point DP7** at the southwest end of the basin.

DP7 consists of flows generated by Basins A5 (DP5), A6 (DP6), and A7. Flows at this design point are captured by a proposed public at-grade inlet. Flows captured by this inlet will discharge to the south via proposed public storm sewer. Bypass flows will continue on to the west towards a low point at DP9.

Basin A8 covers the front of a portion of residential lots along the east side of Jacamar Place. Flows from this basin (Q_5=1.4 cfs and Q_{100}=3.0 cfs) are directed south via curb and gutter towards **Design Point DP8.** From this point flows will continue to the east via curb and gutter flow.

Basin A9 covers the central portion of residential lots along Motmot Way and generates flows of Q_5=4.9 cfs and Q_{100}=10.8 cfs. Flows will generally travel as side-lot swale and curb and gutter flow to the east and south towards **Design Point DP9** at the southwest corner of the basin.

DP9 covers flow from Basin A8 (DP8), Basin A9 and bypass flows from DP7. Flows at this design point are captured by a proposed public sump curb inlet and will be discharged to the south via public storm system. In the case of this inlet getting clogged, the runoff will discharge over the curb into Pond A directly to the south.

Basin A10 covers 3.25 acres of residential lots along Tody Way. Flows from this basin will be directed via side lot swales and curb and gutter at rates of Q_5=5.6 cfs and Q_{100}=12.2 cfs, towards a proposed public at-grade curb inlet at **Design Point DP10.** Flows captured by this inlet will discharge to the north via proposed public storm sewer. Bypass flows will continue on to the west towards a low point at DP11A.

Design Point 10A represents the combining of flows from DP7 and DP10 at a proposed storm sewer manhole. Piped flows reaching this point will continue to the west via proposed storm sewer.

Basin A11 consists of residential lots along the south side of Buteos Lane. Flows from this basin travel via side-lot swale to the north and then as curb and gutter flow to the west at rates of Q_5=2.0 cfs and Q_{100}=4.3 cfs towards a proposed low point and public sump curb inlet at **Design Point DP11.** Flows captured by this inlet will discharge to the north via proposed public storm sewer.

Design Point 11A represents the combining of flows from DP9, DP10A, and DP11 at a proposed storm sewer manhole. Piped flows reaching this point will continue to the west via proposed storm sewer.

Basin A12 covers the area of the proposed full-spectrum detention facility **Pond A**. Flows generated by this basin (Q_5=0.2 cfs and Q_{100}=1.8 cfs) will be captured by the pond in their entirety.

Design Point DP12 represents all flows reaching the full-spectrum detention facility (Basins A1-A14). Pond A will discharge at historic rates into the redefined open channel. See further detention facility discussion below.

Basin A13 covers a portion of Tract A along the east and southern boundary. Flows generated by this 2.39-acre basin are directed offsite as overland sheet flow. The majority of this basin will be regraded but will remain undeveloped as an open space tract. A 0.25-acre portion of this basin covers the rear of the lots at the southeast corner of the property. It is anticipated that this area will fall under ECM 1.7.1.C.1. as the ability to capture and treat flows generated by Basin A13 is restricted due to grading constraints. Any area outside of the criteria exclusion limit will be considered for runoff reduction. This will be further analyzed at the final drainage report stage.

Basin A14 is 0.53-acres located between the 2 northern proposed full-spectrum detention facilities, **Pond A and B**. This basin will generate runoff at rates of Q_5=0.2 cfs and Q_{100}=1.4 cfs. All of the runoff generated and passed through this basin will be directed south where it will follow historical drainage patterns, eventually joining the East Tributary of Falcon Creek.

B-group basins represent the central commercial portion of the site that will be

intercepted by Pond B, ultimately discharging out to the redefined tributary open channel.

Basin OSB1 represents 2.09 acres of US-HWY 24, which acts as the northwestern boundary for the site. The runoff generated by this basin, Q_5=9.7 cfs and Q_{100}=17.4 cfs, is directed northeast via proposed curb and gutter towards a proposed sump curb inlet at **Design Point DP1**, where captured flows will continue to the southeast via proposed private storm sewer. The ultimate cross section of Highway 24 is unknown at the time of this Preliminary Drainage Report. Conversations are ongoing with CDOT regarding the timeline of improvements. The intention of this storm extension is to provide for an outlet at the associated low point.

Basin B1 is 2.15 acres at the northeast corner of the commercial area. Flows from this basin are intended to be captured and routed to a proposed storm sewer stub at the southwest corner. The runoff flows generated by this basin are Q_5=9.0 cfs and Q_{100}=16.4 cfs. Flows from this stub will travel to the southwest via proposed storm sewer towards **Design Point DP1A** where they combine with piped flows from DP1.

Basin B2 is located along the northern boundary of the commercial area. Flows of Q_5=4.6 cfs and Q_{100}=8.5 cfs are generated by this basin and are intended be captured and routed to a proposed storm sewer stub at the southwest corner at **Design Point 2** and routed to the southeast via private storm sewer**.**

The intent of the proposed storm sewer stubs at each of the commercial lots is to provide for a connection point to the storm sewer system, once development of the specific lot occurs. Overlot grading of each lot will need to provide for diversion swales to direct flows towards the storm sewer collection point in the interim.

Basin B3 covers a portion of the proposed Woodmen road right-of-way at the center of the commercial area. Flows of Q_5=1.8 cfs and Q_{100}=3.3 cfs are generated by this basin, and travel via curb and gutter to the south towards a proposed at-grade curb inlet at **Design Point 3.** Captured flows continue to the east via proposed storm sewer. Bypass flows will continue to the south as curb and gutter flow towards DP7.

Basin B4 is located along the northern boundary of the commercial area, to the southwest of Basin B2. Flows of Q_5=6.5 cfs and Q_{100}=11.8 cfs are generated by this basin, and travel overland to the southeast towards **Design Point 4** and a proposed storm sewer stub. As with the previous commercial lot basins, the intention is to provide a storm sewer stub for the future lot developer to connect to.

Design Point 4A represents the combining of flows from DP1A, DP2, DP3 and DP4 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer.

Rational Method Runoff Summary (B-group)

BASIN & DESIGN POINT SUMMARY				
BASIN	**DP**	**AREA (AC)**	**Q5**	**Q100**
B-BASINS				
OSB1	1	2.09	9.7	17.4
B1		1.82	7.6	13.9
	1A	3.91	16.8	30.3
B2	2	1.11	4.6	8.5
B3	3	0.39	1.8	3.3
B4	4	1.54	6.5	11.8
	4A	6.95	28.6	51.8
B5	5	2.13	8.9	16.3
	5A	9.09	36.0	65.4
B6	6	1.75	7.3	13.4
B7		0.91	4.2	7.6
	7	2.67	11.6	20.9
B8		0.75	3.5	6.2
	8	3.41	14.9	27.0
	8A	12.50	49.3	89.3
B9		1.42	0.6	4.3
	9	13.92	49.6	92.8

Basin B5 is located in the central portion of the commercial area. Flows of Q_5=8.9 cfs and Q_{100}=16.3 cfs are generated by this basin. Roadway flow is proposed to be captured by sump curb inlets located close to the intersection with Retail Row Street, **Design Point 5**. As with the previous commercial lot basins, the intention is to provide a storm sewer stub, located at the southeast corner for the future lot developer to connect to.

Design Point 5A represents the combining of flows from DP4A and Basin 5 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer.

Basin B6 covers 1.75-acres in the central portion of the commercial area. Flows of Q_5=7.3 cfs and Q_{100}=13.4 cfs are generated by this basin. As with the previous commercial lot basins, the intention is to provide a storm sewer stub, located at the southeast corner at **Design Point 6** for the future lot developer to connect to. Piped flows will discharge to the south via proposed storm sewer.

Basin B7 covers a portion of Woodmen Road and Retail Row St. right-of-way at the center of the commercial area. Flows of Q_5=4.2 cfs and Q_{100}=7.6 cfs are generated by this basin, and travel via curb and gutter to the south and northeast towards a proposed low point and public sump curb inlet at **Design Point DP7**. Captured flows at this inlet combine with those from DP6 and continue to the south via proposed storm sewer.

Basin B8 covers the southern portion of Retail Row St. right-of-way at the center of the commercial area, to the south of Basin B7. Flows of Q_5=3.5 cfs and Q_{100}=6.2 cfs are generated by this basin, and travel via curb and gutter to the northeast towards a proposed low point and public sump curb inlet at **Design Point DP8**. Flows captured by this inlet combine with the piped flows from DP7 and continue to the south and west via proposed storm sewer.

Design Point 8A represents the combining of piped flows from DP5A and DP8 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer towards the full-spectrum detention facility **Pond B.**

Basin B9 covers the area of the proposed full-spectrum detention facility Pond B. Flows generated by this basin (Q_5=0.6 cfs and Q_{100}=4.3 cfs) will be captured by the pond in their entirety.

Design Point DP9 represents all flows reaching the full-spectrum detention facility (Basins OSB1 & B1-B9). Pond B will discharge at historic rates into the redefined open channel. See further detention facility discussion below.

C-group basins represent the western commercial portion of the site that will be intercepted by Pond C, ultimately discharging out to follow historic conditions to the southeast.

Basin OSC1 represents 0.56-acres of US-HWY 24, which acts as the northwestern boundary for the site. The runoff generated by this basin, Q_5=2.6 cfs and Q_{100}=4.6 cfs, is directed northeast via proposed curb and gutter towards the proposed Woodmen Road extension and **Design Point DPC1.**

Basin C1 covers a portion of Woodmen Road right-of-way at the center of the commercial area, adjacent to Basin B3. Flows of Q_5=1.3 cfs and Q_{100}=2.3 cfs are generated by this basin, and travel via curb and gutter to the south towards a proposed at-grade public curb inlet at **Design Point DP1.**

Rational Method Runoff Summary (C-group)

BASIN & DESIGN POINT SUMMARY				
BASIN	**DP**	**AREA (AC)**	**Q5**	**Q100**
C-BASINS				
OSC1	C1	0.56	2.6	4.6
C1		0.27	1.3	2.3
	1	0.83	3.8	6.7
C2		2.24	9.4	17.1
	2	2.52	13.7	24.8
C3	3	1.32	5.5	10.1
C4		1.51	6.3	11.5
	4	5.34	24.0	43.7

OSC2		2.98	2.6	10.1
C5		0.88	4.1	7.3
	5	3.86	6.3	16.5
C6		0.66	3.1	5.5
	6	4.52	10.0	23.8
	6A	9.86	31.8	62.7

DP1 combines flows from DPC1 and Basin C1 at a proposed at-grade curb inlet. Captured flows will continue to the west via proposed storm sewer. Bypass flows will continue to the south via curb and gutter towards DP5.

Basin C2 covers 2.24-acres in the west-central portion of the commercial area. Flows of Q_5=9.4 cfs and Q_{100}=17.1 cfs are generated by this basin are intended be captured and routed to a proposed storm sewer stub at the southwest corner at **Design Point DP2.**

DP2 combines flows from DP1 and Basin C2 and continues on to the south via proposed storm sewer.

Basin C3 covers 1.32-acres in the commercial area. Runoff rates of Q_5=5.5 cfs and Q_{100}=10.1 cfs are generated by this basin and as with other commercial basins, are intended be captured and routed to a proposed storm sewer stub at the southwest corner at **Design Point DP3.**

Basin C4 is located along the western boundary of the commercial area. Runoff rates of Q_5=6.3 cfs and Q_{100}=11.5 cfs are generated by this basin as with other commercial basins, are intended be captured and routed to a proposed storm sewer stub at the southwest corner at **Design Point DP4.**

DP4 represents the combining of flows from DP2, DP3 and Basin C4 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer.

Basin OSC2 covers an offsite area along the western boundary of the project site, and includes a portion of U.S. Highway 24. The 2.98-acre offsite basin, will follow current conditions along the western property boundary of the site until they reach the southeast corner where they will enter Basin C5 at rates of Q_5=2.6 cfs and Q_{100}=10.1 cfs and be captured by the proposed public sump curb inlet at Design Point DP5.

Basin C5 covers a portion of Woodmen Road and Retail Row St. right-of-way to the west and south of the commercial area. Flows of Q_5=4.1 cfs and Q_{100}=7.3 cfs are generated by this basin, and travel via curb and gutter to the southwest towards a proposed lot point and public sump inlet at **Design Point DP5.** From this point flows will continue to the south via proposed storm sewer.

Basin C6 covers a portion of Retail Row St. right-of-way to the south of the commercial area. Flows of Q_5=3.1 cfs and Q_{100}=5.5 cfs are generated by this basin, and travel via curb and gutter to the southwest towards a proposed low point and public sump curb inlet at **Design Point DP6**. Flows captured by this inlet combine with the piped flows from DP5 and

continue to the south via proposed storm sewer.

Design Point 6A represents the combining of flows from DP4 and DP6 at a proposed storm sewer manhole. Piped flows reaching this Design Point will continue to the south via proposed storm sewer into the D-group basins.

D-group basins represent the southern residential portion of the site that will be intercepted by Pond C, ultimately discharging out to follow historic conditions to the southeast.

Basin D1 is located to the north of this residential portion of the development. Flows generated by this basin (Q_5=2.0 cfs and Q_{100}=5.0 cfs) travel to the southeast via side lot swale and curb and gutter towards **Design Point DP1**.

Basin D2 is located at the northwest corner of this residential portion of the development along Dovekie Drive. Flows generated by this basin (Q_5=3.1 cfs and Q_{100}=7.6 cfs) travel to the east and south via curb and gutter eventually reaching **Design Point DP2.**

DP2 combines flows from Basins D1 and D2, to be captured by a proposed public sump curb inlet at the intersection of Dovekie Drive and Becard Road. Captured flows will continue to the east via public storm sewer.

Basin D3 is located centrally within this residential portion of the development and covers the front of lots along the south side of Dovekie Drive. Flows generated by this basin (Q_5=1.4 cfs and Q_{100}=3.3 cfs) travel to the northwest via side lot swale and curb and gutter towards a low point and proposed inlet structure at **Design Point DP3.** Flows from this point continue to the west via proposed storm sewer.

Design Point 3A represents the combining of flows from DP6A(C-Basins), DP2 and DP3 at a proposed storm sewer manhole. Flows reaching this Design Point will continue to the south via proposed storm sewer.

Rational Method Runoff Summary (D-group)

BASIN & DESIGN POINT SUMMARY				
BASIN	**DP**	**AREA (AC)**	**Q5**	**Q100**
D-BASINS				
D1	1	1.35	2.0	5.0
D2		1.93	3.1	7.6
	2	3.28	4.8	11.9
D3	3	0.91	1.4	3.3
	3A	14.05	33.1	68.0
D4	4	2.75	4.2	10.3
D5		0.65	1.3	2.8
	5	3.40	5.4	13.0
D6	6	2.87	5.5	12.2
D7		0.70	2.5	4.7

	7	6.98	12.7	28.4
D8	8	0.42	0.8	1.7
D9	9	0.29	0.6	1.3
D10	10	1.31	2.7	6.0
D11		0.62	2.9	5.1
	11	1.93	5.3	10.6
D12		1.52	0.6	4.3
	12	25.18	53.8	115.5
OSD1	D1	2.94	1.0	7.3
D13		1.45	0.5	3.3
	13	4.39	1.4	9.6
D14	14	0.86	0.3	2.3

Basin D4 is located centrally within this residential portion of the development. Flows generated by this basin (Q_5=4.2 cfs and Q_{100}=10.3 cfs) travel to the south and east via side lot swale and curb and gutter towards **Design Point 4** at the intersection of Becard Road and Hoopoe Lane. Flows from this point continue to the south via cross-pan and curb and gutter flow.

Basin D5 is located centrally within this residential portion of the development, to the south of Basin D4 along Becard Road. Flows generated by this basin (Q_5=1.3 cfs and Q_{100}=2.8 cfs) travel to the north and east via side lot swale and curb and gutter towards **Design Point DP5**, where flows combine with those from DP4 and continue to the south.

Basin D6 is 2.87 acres along Hoopoe Lane at the eastern boundary. Flows of Q_5=5.5 cfs and Q_{100}=12.2 cfs travel to the west and south as curb and gutter flow towards a low point and proposed sump curb inlet at **Design Point DP6**.

Basin D7 covers the front of a portion of residential lots at the south of this residential area along Hoopoe Lane. Flows of Q_5=2.5 cfs and Q_{100}=4.7 cfs travel to the east and south as curb and gutter flow, combining with street flows from DP5 towards a proposed sump curb inlet at **Design Point DP7**. Captured flows combine with those from DP6 and continue via proposed storm sewer to the west.

Basin D8 covers the rear of a portion of residential lots directly south of Basin D5. Flows of Q_5=0.8 cfs and Q_{100}=1.7 cfs travel to the east and south towards **Design Point 8** and the adjacent detention facility. Final grading within this basin will be established at the final drainage report stage to ensure all flows generated by this basin are directed to the detention facility.

Basin D9 covers the rear of a portion of residential lots directly west of Basin D7. Flows of Q_5=0.6 cfs and Q_{100}=1.3 cfs travel to the west and south towards **Design Point DP9** and the adjacent detention facility. Final grading within this basin will be established at the final drainage report stage to ensure all flows generated by this basin are directed to the detention facility.

Basin D10 covers the southern portion along Dovekie Drive at the western boundary.

Flows of Q_5=2.7 cfs and Q_{100}=6.0 cfs generated by this basin will be directed east via side lot swale before traveling south via curb and gutter towards a low point and proposed inlet structure at **Design Point DP10**.

Basin D11 covers the southern portion of Dovekie Drive adjacent to Basin D10. Flows of Q_5=2.9 cfs and Q_{100}=5.1 cfs generated by this basin will travel south via curb and gutter towards a low point and proposed inlet structure at **Design Point DP11**. Captured flows will combine with those from DP10 and discharge directly into the proposed detention facility.

Basin D12 covers the area of the proposed full-spectrum detention facility **Pond C**. Flows generated by this basin (Q_5=0.6 cfs and Q_{100}=4.3 cfs) will be captured by the pond in their entirety.

Design Point D12 represents all flows reaching the full-spectrum detention facility (Basins OSC1-OSC2, C1-C6 & D1-D12). **Pond C** will discharge at historic rates to the south to follow historic drainage patterns. See further detention facility discussion below.

Basin OSD1 is located along the eastern side of the upper half of Basin D13. This basin consists almost entirely of native grasses and vegetation, aside from a single small shed. The flows within this basin will flow to the southwest where they will naturally gather and channel along the westerly edge of Basin D13 towards **Design Point DPD1**. The runoff rates entering Basin D13 at DPD2 are Q_5=1.0 cfs and Q_{100}=7.3 cfs.

Basin D13 covers Tract G along the eastern boundary of this residential area. Flows generated by this 1.45-acre basin are directed offsite as overland sheet flow. The majority of this basin will be regraded but will remain undeveloped as an open space tract. A 0.04-acre portion of this basin covers the rear of the lots at the northern corner of the basin. It is anticipated that this area will fall under ECM 1.7.1.C.1. as the ability to capture and treat flows generated by Basin D13 is restricted due to grading constraints. Any area outside of the criteria exclusion limit will be considered for runoff reduction. This will be further analyzed at the final drainage report stage.

Basin D14 covers a section of open space area along the southern boundary of this residential area. While this area will be regraded, the area will remain undeveloped. Flows generated by this 0.86-acre basin are directed offsite. It is anticipated that this area will fall under ECM 1.7.1.C.1. as the ability to capture and treat flows generated by Basin A15 is restricted due to grading constraints. Any area outside of the criteria exclusion limit will be considered for runoff reduction. This will be further analyzed at the final drainage report stage.

8.0 PROPOSED FULL-SPECTRUM DETENTION FACILITIES

As previously mentioned, three separate full-spectrum Extended Detention Basin facilities are proposed with this development. Further detailed design of these detention facilities will be coordinated with the CLOMR study and addressed at the Final Drainage Report stage.

Pond A , a private 1.91 ac-ft full-spectrum Extended Detention Basin is proposed in the southwestern corner of the A-basin neighborhood, to intercept and treat flows from the neighborhood area and discharge at historic rates into the adjacent redefined East Tributary. In accordance with El Paso County criteria, an outlet structure with a permanent micropool will release flows at or slightly below historic rates. An emergency spillway will be located on the western side of the pond, so in the case of an overflow, the runoff will be deposited between Pond's A and B. Pond design will be finalized with the final drainage report.

Pond B, is a proposed private 2.25 ac-ft full-spectrum Extended Detention Basin, designed to intercept the flows generated by the B-basin commercial region of the site, treat and discharge at historic rates into the adjacent redefined East Tributary. As with Pond A, in accordance with El Paso County criteria, an outlet structure with permanent micropool will release flows at or slightly below historic rates. An emergency spillway will be located on the eastern side of the pond, so in the case of an overflow, the runoff will be deposited between Pond's A and B. Pond design will be finalized with the final drainage report.

Pond C, is a proposed private 2.81 ac-ft full-spectrum Extended Detention Basin intended to intercept the flows generated by both the C and D-basin areas of the site. As with both other ponds, in accordance with El Paso County criteria, an outlet structure with permanent micropool will release flows at or slightly below historic rates. An emergency spillway will be located on the southern side of the pond, so in the case of an overflow, the runoff will be deposited to a similar location as the proposed outlet location. Pond design will be finalized with the final drainage report. The concentrated piped outflow from the detention facility will discharge onto a proposed grassed berm level spreader prior to discharge on to the adjacent properties to the south. The intention of this level spreader is to provide for stabilized conveyance at the historic level.

Maintenance access will be provided to each of the ponds. Private maintenance agreements and O&M manuals will be established for all 3 ponds prior to Final Plat.

9.0 FOUR-STEP PROCESS

1. ***Employ Runoff Reduction Practices*:** Proposed impervious areas on this site (roofs, asphalt/sidewalk) will be captured by onsite roadways and storm sewer systems as much as possible to slow runoff and increase time of concentration prior to being conveyed to the proposed detention ponds. This will minimize directly connected impervious areas within the project site.

2. ***Implement CM's that provide a Water Quality Capture Volume with slow release*:** The majority of runoff generated by this project will be treated through capture and slow release of the WQCV in one of 3 permanent full spectrum extended detention facility designed per current drainage criteria. The areas tributary to each of the detention facilities is described above.

3. ***Stabilize Drainage Ways*:** Stabilization of the existing drainageway through the site will occur via installation of a proposed 10'x4' concrete box culvert and a small section of open channel as the drainageway exits the property. Downstream

hydraulic analysis will be completed at the final plat stage.

4. ***Implement Site Specific and Other Source Control CM's:*** Standard residential and commercial source control will be utilized in order to minimize potential pollutants entering the storm system. Example source control measures consist of: indoor storage of household chemicals; and trash receptacles in common areas.

10.0 CONDITIONAL LETTER OF MAP REVISION (CLOMR)

A Conditional Letter of Map Revision (CLOMR) is currently in the design stage for the Falcon Creek East Tributary reach that bisects the site. Excerpts from the CLOMR report are included in the appendix, and a copy of the full report has been submitted as part of this Preliminary Plan application.

11.0 DRAINAGE/BRIDGE FEES

Design, phasing, responsibility for and maintenance of any proposed improvements will be discussed in the final drainage report(s) as development of the site proceeds. Fees will be assessed and paid according to the current rates at the time of platting.

The Falcon DBPS – Fee Development categorizes improvements into Developer Costs, County Costs and Metro District Costs. Items identified as Developer Costs (those incurred by the Developer) are currently eligible for reimbursement. Reach RET100 is identified as a County cost, and as such the developer intends to amend the Falcon DBPS to allow for the costs of the 1,000-lf of RET100 improvements to become reimbursable by the process outlined in County criteria.

12.0 CONCLUSIONS

The Commons at Falcon Field project has been designed in accordance with El Paso County criteria. The full-spectrum detention facilities have been designed to limit the release of storm runoff to historic flows. This development will not negatively impact the downstream facilities.

A small portion of the site will remain in the 100-year floodplain after grading is complete, and will be addressed further at the Final Drainage Report stage and by the CLOMR study currently underway. Upon completion, a LOMR will be submitted to FEMA after construction to revise the FIRM map. Future buildings will not be constructed in the floodplain.

13.0 REFERENCES

The sources of information used in the development of this study are listed below:

1. City of Colorado Springs/El Paso County Drainage Criteria Manual, May 2014.

2. Urban Storm Drainage Criteria Manuals, Urban Drainage and Flood Control District. June 2001, Revised April 2008.

3. Natural Resources Conservation Service (NRCS) Web Soil Survey

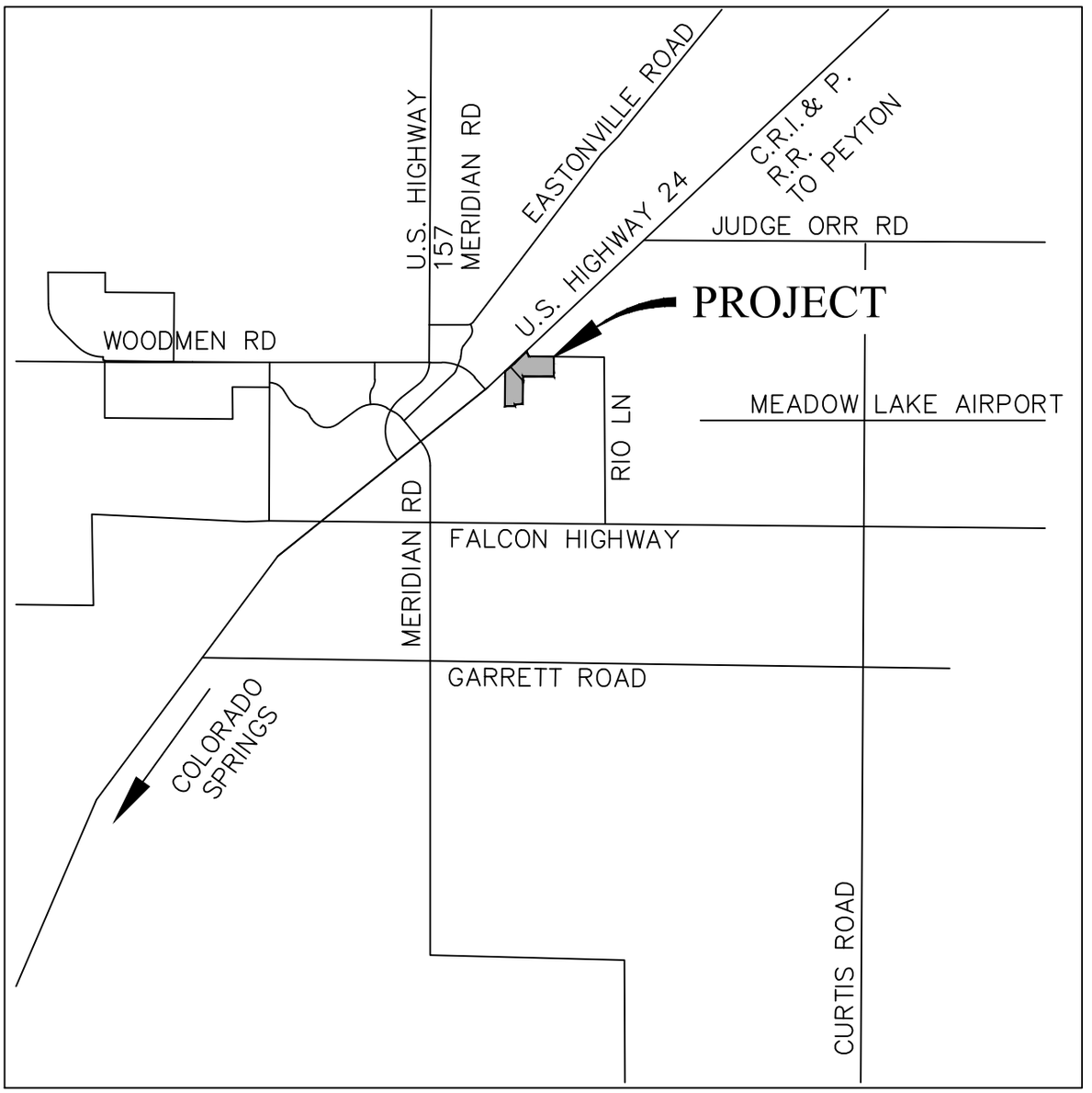
4. Federal Emergency Management Agency, Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Map Numbers 8041C0553G & 8041C0561G, Effective Date December 7, 2018.

6. EL Paso County Board Resolution No 15-042: El Paso County adoption of Chapter 6 and Section 3.2.1, Chapter 13 of the City of Colorado Springs Drainage Criteria Manual, May 2014.

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

Appendix

Vicinity Map



Vicinity Map
Not to scale

-N-

THE COMMONS AT FALCON FIELD
EL PASO COUNTY, CO
VICINITY MAP

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:

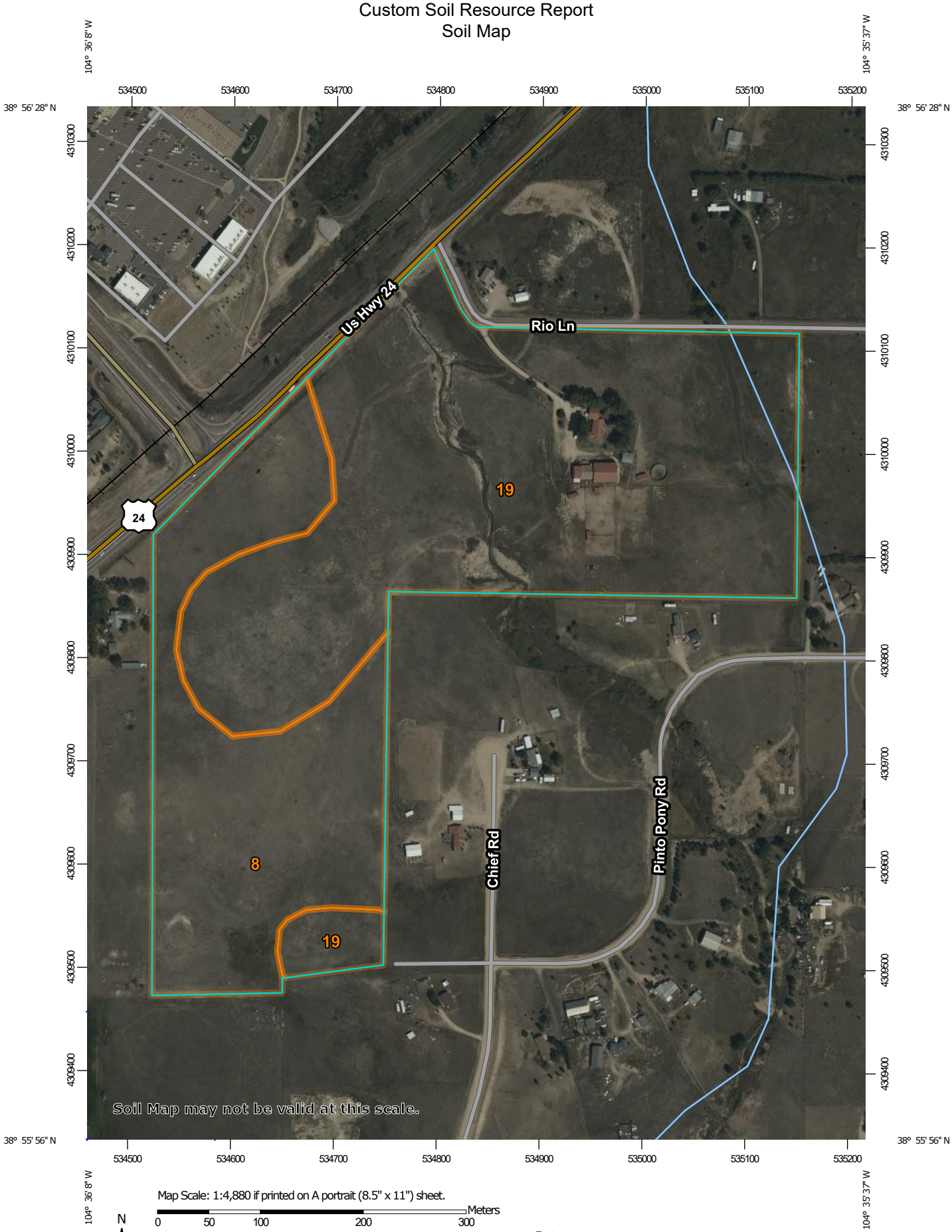
JOB NO: 21604-00CSCV

DWG. NO. VMAP

SHEET 1 OF 1

Soils Map

Custom Soil Resource Report
Soil Map



Map Scale: 1:4,880 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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 Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	18.8	32.8%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	38.6	67.2%
Totals for Area of Interest		**57.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Flood plains, fan terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XY214CO - Gravelly Foothill

Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Floodplain Map

National Flood Hazard Layer FIRMette

FEMA

104°36'16"W 38°56'26"N

104°35'38"W 38°55'58"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/12/2022 at 2:02 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Hydrology Calculations

PROJECT INFORMATION

PROJECT: Commons at Falcon Field
PROJECT NO: 21604-00
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 3/17/2024

Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Pasture/Meadow		0.08		0.35	0
Roofs		0.73		0.81	90
Lawns		0.08		0.35	0
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.59		0.70	80

EXISTING CONIDTION

SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
		ACRE	C2	C5	C10	C100	
OS1	Pasture/Meadow	0.67		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.67		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80
	WEIGHTED AVERAGE			0.49		0.66	50%
TOTAL OS1		1.34					
OS2	Pasture/Meadow	0.30		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.30		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80
	WEIGHTED AVERAGE			0.49		0.66	50%
TOTAL OS2		0.60					
OS3	Pasture/Meadow	2.56		0.08		0.35	0
	Roofs	0.04		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80
	WEIGHTED AVERAGE			0.09		0.36	1%
TOTAL OS3		2.56					
OS4	Pasture/Meadow	2.90		0.08		0.35	0
	Roofs	0.10		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.29		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80
	WEIGHTED AVERAGE			0.17		0.42	12%
TOTAL OS4		3.29					
OS5	Pasture/Meadow	5.22		0.08		0.35	0
	Roofs	0.05		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.23		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80

PROJECT INFORMATION

PROJECT: Commons at Falcon Field
PROJECT NO: 21604-00
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 3/17/2024

Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Pasture/Meadow		0.08		0.35	0
Roofs		0.73		0.81	90
Lawns		0.08		0.35	0
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.59		0.70	80

	WEIGHTED AVERAGE			0.12		0.38	5%
TOTAL OS5		5.50					
OS6	Pasture/Meadow	0.39		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.52		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80
	WEIGHTED AVERAGE			0.55		0.70	57%
TOTAL OS6		0.91					
E1	Pasture/Meadow	13.74		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.11		0.59		0.70	80
	WEIGHTED AVERAGE			0.08		0.35	1%
TOTAL E1		13.85					
E2	Pasture/Meadow	12.88		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL E2		12.88					
E3	Pasture/Meadow	13.11		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL E3		13.11					
E4	Pasture/Meadow	1.57		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0

PROJECT INFORMATION

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PROJECT NO: 21604-00
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 3/17/2024

Drexel, Barrell & Co.

		C2*	C5*	C10*	C100*	% IMPERV
Pasture/Meadow			0.08		0.35	0
Roofs			0.73		0.81	90
Lawns			0.08		0.35	0
Streets: Paved			0.90		0.96	100
Streets: Gravel			0.59		0.70	80

	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL E4		1.57					
E5	Pasture/Meadow	5.49		0.08		0.35	0
	Roofs	0.25		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.17		0.59		0.70	80
	WEIGHTED AVERAGE			0.12		0.38	6%
TOTAL E5		5.91					
E6	Pasture/Meadow	10.37		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Lawns	0.00		0.08		0.35	0
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.59		0.70	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL E6		10.37					

PROJECT INFORMATION

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REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 3/17/2024

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING TIME OF CONCENTRATION

SUB-BASIN DATA							INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				TIME OF CONCENTRATION		FINAL t_c
BASIN	DESIGN PT:	C_5	C_{100}	AREA	*COMP*		LENGTH	SLOPE	t_i	LENGTH	SLOPE	VEL.	t_t	COMP.	MINIMUM	
				Ac			Ft	%	Min	Ft	%	FPS	Min	t_c	t_c	Min
OS1	A	0.49	0.66	1.34	*0.66*	*0.88*	30	2.0	5.0					5.0	5.0	**5.0**
E1		0.08	0.35	13.85	*1.16*	*4.88*	300	3.0	22.8	530	3.0	3.5	2.5	25.3	5.0	**25.3**
DPA+E1	B	0.12	0.38	15.19			From E1							25.3	5.0	**25.3**
OS2	C	0.49	0.66	0.60	*0.29*	*0.39*	30	1.0	6.2				0.0	6.2	5.0	**6.2**
OS3	D	0.09	0.36	2.56	*0.23*	*0.91*	75	2.1	12.8				1.0	13.8	5.0	**13.8**
E2		0.08	0.35	12.88	*1.03*	*4.51*	300	2.3	24.9	1360	3.5	4.0	5.7	30.6	5.0	**30.6**
DPC+DPD+E2	E	0.10	0.36	16.04			From E2							30.6	5.0	**30.6**
E3	F	0.08	0.35	13.11	*1.05*	*4.59*	300	2.3	24.9	1120	4.2	5.0	3.7	28.6	5.0	**28.6**
OS4	G	0.17	0.42	3.29	*0.57*	*1.38*	75	3.9	9.5					9.5	5.0	**9.5**
E4		0.08	0.35	1.57	*0.13*	*0.55*	300	2.7	23.8	250	4.0	5.0	0.8	24.7	5.0	**24.7**
DPG+E4	H	0.14	0.40	4.86			From E4							24.7	5.0	**24.7**
E5	I	0.12	0.38	5.91	*0.72*	*2.24*	100	2.0	14.5	550	2.2	1.8	5.1	19.6	5.0	**19.6**
OS5	J	0.12	0.38	5.50	*0.66*	*2.09*	75	2.0	12.6					12.6	5.0	**12.6**
OS6	L	0.55	0.70	0.91	*0.50*	*0.63*	30	2.0	4.5					4.5	5.0	**5.0**
E6		0.08	0.35	10.37	*0.83*	*3.63*	300	2.3	24.9	1080	1.5	1.2	15.0	39.9	5.0	**39.9**
DPJ+DPL+E6	M	0.12	0.38	16.78			From E6							39.9	5.0	**39.9**

PROJECT INFORMATION

PROJECT: Commons at Falcon Field
PROJECT NO: 21604-00
DESIGN BY: KGV
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REPORT TYPE: Preliminary
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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING RUNOFF 5 YR STORM P1= 1.50

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
OS1	A	1.34	0.49	5.0	0.66	5.17	**3.4**
E1		13.85	0.08	25.3	1.16	2.73	**3.2**
RET090 (DBPS)							**36.0**
DPA+E1+RET090	B	15.19	0.12	25.3	1.82	2.73	**41.0**
OS2	C	0.60	0.49	6.2	0.29	4.83	**1.4**
OS3	D	2.56	0.09	13.8	0.23	3.65	**0.8**
E2		12.88	0.08	30.6	1.03	2.45	**2.5**
DPC+DPD+E2	E	16.04	0.10	30.6	1.55	2.45	**3.8**
E3	F	13.11	0.08	28.6	1.05	2.55	**2.7**
OS4	G	3.29	0.17	9.5	0.57	4.20	**2.4**
E4		1.57	0.08	24.7	0.13	2.78	**0.3**
DPG+E4	H	4.86	0.14	24.7	0.69	2.78	**1.9**
E5	I	5.91	0.12	19.6	0.72	3.12	**2.2**
OS5	J	5.50	0.12	12.6	0.66	3.78	**6.6**
OS6	L	0.91	0.55	5.0	0.50	5.17	**2.6**
E6		10.37	0.08	39.9	0.83	2.05	**1.7**
DPJ+DPL+E6	M	16.78	0.12	39.9	1.99	2.05	**4.1**

PROJECT INFORMATION

PROJECT: Commons at Falcon Field
PROJECT NO: 21604-00
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING RUNOFF 100 YR STORM P1= 2.52

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
OS1	A	1.34	0.66	5.0	0.88	8.68	**7.6**
E1		13.85	0.35	25.3	4.88	4.59	**22.4**
RET090 (DBPS)							**320.0**
DPA+E1+RET090	B	15.19	0.38	25.3	5.76	4.59	**346.4**
OS2	C	0.60	0.66	6.2	0.39	8.12	**3.2**
OS3	D	2.56	0.36	13.8	0.91	6.13	**5.6**
E2		12.88	0.35	30.6	4.51	4.12	**18.6**
DPC+DPD+E2	E	16.04	0.36	30.6	5.81	4.12	**23.9**
E3	F	13.11	0.35	28.6	4.59	4.28	**19.6**
OS4	G	3.29	0.42	9.5	1.38	7.05	**9.7**
E4		1.57	0.35	24.7	0.55	4.66	**2.6**
DPG+E4	H	4.86	0.40	24.7	1.93	4.66	**9.0**
E5	I	5.91	0.38	19.6	2.24	5.23	**11.7**
OS5	J	5.50	0.38	12.6	2.09	6.35	**6.6**
OS6	L	0.91	0.70	5.0	0.63	8.68	**5.5**
E6		10.37	0.35	39.9	3.63	3.44	**12.5**
DPJ+DPL+E6	M	16.78	0.38	39.9	6.35	3.44	**21.9**

PROJECT INFORMATION

PROJECT: Commons at Falcon Field - Overlot
PROJECT NO: 21604-00
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 3/17/2024

Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Roofs		0.73		0.81	90
Drive and Walks		0.90		0.96	100
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

DEVELOPED CONIDTION

SUB-BASIN	SURFACE DESIGNATION	AREA ACRE	COMPOSITE RUNOFF COEFFICIENTS C2	C5	C10	C100	% IMPERV
			A-BASINS				
A1	Open Space	17.73		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL A1		17.73					
A2	Open Space	2.45		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL A2		2.45					
B1	Open Space	12.47		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL B1		12.47					
OB1	Open Space	0.67		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.67		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.49		0.66	50%
TOTAL OB1		1.34					
OB2	Open Space	0.30		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.30		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.49		0.66	50%
TOTAL OB2		0.60					

PROJECT INFORMATION

PROJECT: Commons at Falcon Field - Overlot
PROJECT NO: 21604-00
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 3/17/2024

Drexel, Barrell & Co.

		C2*	C5*	C10*	C100*	% IMPERV
Open Space			0.08		0.35	0
Roofs			0.73		0.81	90
Drive and Walks			0.90		0.96	100
Streets: Paved			0.90		0.96	100
Streets: Gravel			0.80		0.85	80

C1	Open Space	6.29		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL C1		6.29					
OC	Open Space	2.55		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL OC		2.55					
D1	Open Space	15.99		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL D1		15.99					
D2	Open Space	2.81		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL D2		2.81					
OD	Open Space	2.70		0.08		0.35	0
	Roofs	0.00		0.73		0.81	90
	Drive and Walks	0.00		0.90		0.96	100
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL OD		2.70					

PROJECT INFORMATION

PROJECT:	Commons at Falcon Field - Overlot
PROJECT NO:	21604-00
DESIGN BY:	KGV
REV. BY:	TDM
AGENCY:	El Paso County
REPORT TYPE:	Preliminary
DATE:	3/17/2024

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED TIME OF CONCENTRATION

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				TIME OF CONCENTRATION		FINAL t_c
BASIN	DESIGN PT:	C_5	C_{100}	AREA	LENGTH	SLOPE	t_i	LENGTH	SLOPE	VEL.	t_t	COMP.	MINIMUM	
				Ac	Ft	%	Min	Ft	%	FPS	Min	t_c	t_c	Min
A1	1	0.08	0.35	17.73	100	1.0	18.7	1250	1.0	5.0	4.2	22.9	5.0	**22.9**
A2		0.08	0.35	2.45	100	1.0	18.7	150	25.0	10.0	0.3	19.0	5.0	**19.0**
B1		0.08	0.35	12.47	100	1.0	18.7	750	2.0	7.0	1.8	20.5	5.0	**20.5**
OB1	O1	0.49	0.66	1.34	30	2.0	4.9					4.9	5.0	**5.0**
OB2	O2	0.49	0.66	0.60	30	1.0	6.1					6.1	5.0	**6.1**
B1+O1+O2	2	0.14	0.39	14.41	From Basin B1		20.5					20.5	5.0	**20.5**
C1		0.08	0.35	6.29	100	1.0	18.7	860	1.5	6.0	2.4	21.1	5.0	**21.1**
OC		0.08	0.35	2.55	100	1.0	18.7	756	1.5	6.0	2.1	20.8	5.0	**20.8**
C1+OC	3	0.08	0.35	8.85	From Basin C1		21.1					21.1	5.0	**21.1**
D1	4	0.08	0.35	15.99	100	1.0	18.7	1350	1.5	6.0	3.8	22.5	5.0	**22.5**
D2		0.08	0.35	2.81	100	1.0	18.7	150	0.5	3.8	0.7	19.4	5.0	**19.4**
OD		0.08	0.35	2.70	100	1.0	18.7	660	1.5	6.0	1.8	20.5	5.0	**20.5**
D2+OD	5	0.08	0.35	5.51	From Basin D2		19.4					19.4	5.0	**19.4**

PROJECT INFORMATION

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PROJECT NO:	21604-00
DESIGN BY:	KGV
REV. BY:	TDM
AGENCY:	El Paso County
REPORT TYPE:	Preliminary
DATE:	3/17/2024

Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 5 YR STORM P1= 1.50

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
A1	1	17.73	0.08	22.9	1.42	2.89	**4.1**
A2		2.45	0.08	19.0	0.20	3.17	**0.6**
B1		12.47	0.08	20.5	1.00	3.05	**3.0**
OB1	O1	1.34	0.49	5.0	0.66	5.17	**3.4**
OB2	O2	0.60	0.49	6.1	0.29	4.86	**1.4**
B1+O1+O2	2	14.41	0.14	20.5	1.95	3.05	**5.9**
C1		6.29	0.08	21.1	0.50	3.01	**1.5**
OC		2.55	0.08	20.8	0.20	3.03	**0.6**
C1+OC	3	8.85	0.08	21.1	0.71	3.01	**2.1**
D1	4	15.99	0.08	22.5	1.28	2.92	**3.7**
D2		2.81	0.08	19.4	0.23	3.14	**0.7**
OD		2.70	0.08	20.5	0.22	3.05	**0.7**
D2+OD	5	5.51	0.08	19.4	0.44	3.14	**1.4**

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 100 YR STORM P1= 2.52

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
A1	1	17.73	0.35	22.9	6.21	4.85	**30.1**
A2		2.45	0.35	19.0	0.86	5.32	**4.6**
B1		12.47	0.35	20.5	4.37	5.13	**22.4**
OB1	O1	1.34	0.66	5.0	0.88	8.68	**7.6**
OB2	O2	0.60	0.66	6.1	0.39	8.17	**3.2**
B1+O1+O2	2	14.41	0.39	20.5	5.63	5.13	**28.9**
C1		6.29	0.35	21.1	2.20	5.05	**11.1**
OC		2.55	0.35	20.8	0.89	5.09	**4.5**
C1+OC	3	8.85	0.35	21.1	3.10	5.05	**15.6**
D1	4	15.99	0.35	22.5	5.60	4.89	**27.4**
D2		2.81	0.35	19.4	0.99	5.27	**5.2**
OD		2.70	0.35	20.5	0.94	5.12	**4.8**
D2+OD	5	5.51	0.35	19.4	1.93	5.27	**10.2**

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Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

DEVELOPED CONIDTION

SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
		ACRE	C2	C5	C10	C100	
A-BASINS							
A1	Open Space	0.06		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.24		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.74		0.84	80%
TOTAL A1		0.30					
A2	Open Space	0.12		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.26		0.45		0.59	65
	Streets: Paved	0.26		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.56		0.70	67%
TOTAL A2		0.64					
A3	Open Space	0.60		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.74		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.28		0.48	36%
TOTAL A3		1.34					
A4	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.25		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL A4		0.25					
A5	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.23		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL A5		0.23					

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Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

A6	Open Space	0.12		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.48		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.74		0.84	80%
TOTAL A6		0.60					
A7	Open Space	0.81		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	2.04		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.34		0.52	46%
TOTAL A7		2.85					
A8	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	1.74		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL A8		1.74					
A9	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	1.47		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL A9		1.47					
A10	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.65		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL A10		0.65					
A11	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95

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Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

	Residential (< 1/8 Acre)	2.55		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL A11		2.55					
A12	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	3.25		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL A12		3.25					
A13	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	1.22		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL A13		1.22					
A14	Open Space	0.97		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL A14		0.97					
A15	Open Space	2.16		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.23		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.12		0.37	6%
TOTAL A15		2.39					
A16	Open Space	0.53		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80

PROJECT INFORMATION

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Drexel, Barrell & Co.

			C2*	C5*	C10*	C100*	% IMPERV
Open Space				0.08		0.35	0
Commercial Development				0.81		0.88	95
Residential (< 1/8 Acre)				0.45		0.59	65
Streets: Paved				0.90		0.96	100
Streets: Gravel				0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL A16		0.53					
	Area tributary to Pond A	**18.07**		0.45		0.63	0.59

B-BASINS							
OSB1	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	2.09		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL OSB1		2.09					
B1	Open Space	0.00		0.08		0.35	0
	Commercial Development	2.15		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.81		0.88	95%
TOTAL B1		2.15					
B2	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.11		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.81		0.88	95%
TOTAL B2		1.11					
B3	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.39		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%

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	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

TOTAL B3		0.39					
B4	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.54		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.81		0.88	95%
TOTAL B4		1.54					
B5	Open Space	0.00		0.08		0.35	0
	Commercial Development	2.13		0.81		0.88	95
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.81		0.88	95%
TOTAL B5		2.13					
B6	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.75		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.81		0.88	95%
TOTAL B6		1.75					
B7	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.90		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL B7		0.90					
B8	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Streets: Paved	0.72		0.90		0.96	100

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	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL B8		0.72					
B9	Open Space	1.42		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL B9		1.42					
	Area tributary to Pond B	**14.21**		**0.76**		**0.85**	**0.87**

C-BASINS							
OSC1	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.56		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL OSC1		0.56					
OSC2	Open Space	2.59		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.39		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.19		0.43	13%
TOTAL OSC2		2.98					
C1	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.27		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80

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	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL C1		0.27					
C2	Open Space	0.00		0.08		0.35	0
	Commercial Development	2.24		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.81		0.88	95%
TOTAL C2		2.24					
C3	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.32		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.81		0.88	95%
TOTAL C3		1.32					
C4	Open Space	0.00		0.08		0.35	0
	Commercial Development	1.51		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.81		0.88	95%
TOTAL C4		1.51					
C5	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Streets: Paved	0.88		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL C5		0.88					
C6	Open Space	0.00		0.08		0.35	0

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Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.66		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL C6		0.66					
D-BASINS							
OSD1	Open Space	2.94		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL OSD1		2.94					
D1	Open Space	0.38		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.96		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.35		0.52	47%
TOTAL D1		1.35					
D2	Open Space	0.38		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	1.55		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.38		0.54	52%
TOTAL D2		1.93					
D3	Open Space	0.13		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.78		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100

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	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.40		0.56	56%
TOTAL D3		0.91					
D4	Open Space	0.63		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	2.11		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.36		0.53	50%
TOTAL D4		2.75					
D5	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.65		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL D5		0.65					
D6	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	2.87		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL D6		2.87					
D7	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.25		0.45		0.59	65
	Streets: Paved	0.45		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.74		0.83	87%
TOTAL D7		0.70					

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	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

D8	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.42		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL D8		0.42					
D9	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.29		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL D9		0.29					
D10	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	1.31		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL D10		1.31					
D11	Open Space	0.00		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.62		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL D11		0.62					
D12	Open Space	1.52		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65

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Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.08		0.35	0
Commercial Development		0.81		0.88	95
Residential (< 1/8 Acre)		0.45		0.59	65
Streets: Paved		0.90		0.96	100
Streets: Gravel		0.80		0.85	80

	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL D12		1.52					
D13	Open Space	1.38		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.07		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.10		0.36	3%
TOTAL D13		1.45					
D14	Open Space	0.86		0.08		0.35	0
	Commercial Development	0.00		0.81		0.88	95
	Residential (< 1/8 Acre)	0.00		0.45		0.59	65
	Streets: Paved	0.00		0.90		0.96	100
	Streets: Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL D14		0.86					
	Area tributary to Pond C	**35.56**		**0.37**		**0.50**	**0.45**

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RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED TIME OF CONCENTRATION

SUB-BASIN DATA							INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				PIPE TRAVEL TIME (t_t)				TIME OF CONCENTRATION		FINAL
BASIN	DESIGN PT:	C_5	C_{100}	AREA	*COMP*		LENGTH	SLOPE	t_i	LENGTH	SLOPE	VEL.	t_t	LENGTH	SLOPE	VEL.	t_t	COMP.	MINIMUM	
				Ac			Ft	%	Min	Ft	%	FPS	Min	Ft	%	FPS	Min	t_c	t_c	Min
A-BASINS																				
A1	1	0.74	0.84	0.30	*0.22*	*0.25*	20	2.0	2.4	560	4.0	8.0	1.2					3.5	5.0	**5.0**
A2	2	0.56	0.70	0.64	*0.36*	*0.45*	20	2.0	3.5	500	4.0	8.0	1.0					4.5	5.0	**5.0**
A3	3	0.28	0.48	1.34	*0.38*	*0.65*	100	3.0	10.4	525	2.3	6.2	1.4					11.8	5.0	**11.8**
A4		0.90	0.96	0.25	*0.23*	*0.24*	20	2.0	1.3	145	1.5	5.5	0.4					1.7	5.0	**5.0**
DP1+DP2+DP3+A4	4	0.47	0.63	2.53	*1.19*	*1.59*	From DP3			100	2.0	5.8	0.3					12.1	5.0	**12.1**
A5		0.90	0.96	0.23	*0.21*	*0.22*	20	2.0	1.3	135	1.4	5.2	0.4					1.7	5.0	**5.0**
DP4+A5	5	0.51	0.65	2.76	*1.40*	*1.81*	From DP4							75	1.0	5.9	0.2	12.3	5.0	**12.3**
A6	6	0.74	0.84	0.60	*0.44*	*0.50*	40	1.8	3.5	820	1.8	6.3	2.2					5.7	5.0	**5.7**
A7		0.34	0.52	2.85	*0.98*	*1.49*	100	1.0	13.8	750	0.5	3.8	3.3					17.1	5.0	**17.1**
DP6+A7	7	0.41	0.58	3.45	*1.42*	*1.99*	From A7											17.1	5.0	**17.1**
A8	8	0.45	0.59	1.74	*0.78*	*1.03*	100	1.0	11.9	435	1.8	5.7	1.3					13.2	5.0	**13.2**
A9		0.45	0.59	1.47	*0.66*	*0.86*	100	1.5	10.4	700	0.5	3.8	3.1					13.5	5.0	**13.5**
DP7+DP8+A9	9	0.43	0.58	6.66	*2.87*	*3.88*	From DP7			700	0.5	3.8	3.1					20.2	5.0	**20.2**
A10	10	0.45	0.59	0.65	*0.29*	*0.39*	40	2.0	6.0	390	1.8	5.7	1.1					7.1	5.0	**7.1**
A11		0.45	0.59	2.55	*1.15*	*1.51*	100	4.1	7.4	540	1.8	5.7	1.6					9.0	5.0	**9.0**
DP10+A11	11	0.45	0.59	3.21	*1.44*	*1.89*	From DP9			250	0.5	3.8	1.1					14.3	5.0	**14.3**
A12	12	0.45	0.59	3.25	*1.46*	*1.92*	100	2.0	9.5	880	0.5	4.9	3.0					12.5	5.0	**12.5**
DP9+DP12	12A	0.44	0.59	9.91	*4.33*	*5.80*	From DP8							30	0.5	5.8	0.1	20.3	5.0	**20.3**
A13	13	0.45	0.59	1.22	*0.55*	*0.72*	100	2.0	9.5	580	0.5	4.9	2.0					11.4	5.0	**11.4**
DP12A+DP11+DP13	13A	0.44	0.59	14.34	*6.32*	*8.41*	From DP12A							206	0.5	5.8	0.6	20.9	5.0	**20.9**
A14		0.08	0.35	0.97	*0.08*	*0.34*	100	1.0	18.7	280	2.8	5.8	0.8					19.5	5.0	**19.5**
DP5+DP13A+A14	14	0.43	0.58	18.07	*7.80*	*10.56*	From DP13A							150	0.5	5.8	0.4	21.3	5.0	**21.3**
A15	15	0.12	0.37	2.39	*0.28*	*0.89*	25	18.0	3.4	72	10.0	14.0	0.1					3.5	5.0	**5.0**
A16	16	0.08	0.35	0.53	*0.04*	*0.19*	25	2.1	7.3	311	3.0	5.8	0.9					8.2	5.0	**8.2**
B-BASINS																				
OSB1	1	0.90	0.96	2.09	*1.88*	*2.01*	40	2.0	1.9	362	1.0	6.1	1.0					2.9	5.0	**5.0**
B1		0.81	0.88	2.15	*1.74*	*1.90*	60	2.3	3.2	511	3.3	6.6	1.3					4.5	5.0	**5.0**
DP1+B1	1A	0.85	0.92	4.25	*3.63*	*3.90*	From DP1							250	1.0	7.2	0.6	5.6	5.0	**5.6**
B2	2	0.81	0.88	1.11	*0.90*	*0.98*	40	4.0	2.2	308	4.0	7.0	0.7					2.9	5.0	**5.0**
B3	3	0.90	0.96	0.39	*0.35*	*0.38*	20	2.0	1.3	199	2.0	7.0	0.5					1.8	5.0	**5.0**
B4	4	0.81	0.88	1.54	*1.25*	*1.36*	50	3.5	2.5	326	3.3	6.3	0.9					3.4	5.0	**5.0**
DP1A+DP2+DP3+DP4	4A	0.84	0.91	7.29	*6.13*	*6.61*	From DP1A							195	1.0	7.2	0.5	6.0	5.0	**6.0**
B5	5	0.81	0.88	2.13	*1.73*	*1.88*	60	3.5	2.8	286	2.6	5.5	0.9					3.6	5.0	**5.0**
DP4A+DP5	5A	0.83	0.90	9.42	*7.86*	*8.49*	From DP4A							245	1.0	7.2	0.6	6.6	5.0	**6.6**
B6	6	0.81	0.88	1.75	*1.42*	*1.54*	50	3.9	2.4	388	3.6	6.9	0.9					3.4	5.0	**5.0**
B7		0.90	0.96	0.90	*0.81*	*0.86*	40	2.0	1.9	762	2.3	7.0	1.8					3.7	5.0	**5.0**
DP6+B7	7	0.84	0.91	2.65	*2.23*	*2.40*	From DP6							20	1.0	7.2	0.0	5.0	5.0	**5.0**
B8		0.90	0.96	0.72	*0.65*	*0.69*	40	1.0	2.4	544	2.8	7.0	1.3					3.7	5.0	**5.0**
DP7+DP8	8	0.85	0.92	3.37	*2.88*	*3.10*	From DP7							50	1.0	7.2	0.1	5.2	5.0	**5.2**
DP8+DP5A	8A	0.84	0.91	12.79	*10.73*	*11.59*	From DP5A							115	1.0	7.2	0.3	6.9	5.0	**6.9**
B9		0.08	0.35	1.42	*0.11*	*0.50*	30	13.0	4.4	259	20.0	14.0	0.3					4.8	5.0	**5.0**
DP8A+B9	9	0.76	0.85	14.21	*10.85*	*12.08*	From DP8A							46	1.0	7.2	0.1	7.0	5.0	**7.0**
C-BASINS																				
OSC1	C1	0.90	0.96	0.56	*0.50*	*0.53*	40	2.5	1.7	165	2.0	5.2	0.5					2.3	5.0	**5.0**
C1		0.90	0.96	0.27	*0.25*	*0.26*	40	2.5	1.7	193	2.0	5.2	0.6					2.4	5.0	**5.0**
DPC1+C1	1	0.90	0.96	0.83	*0.75*	*0.80*	From OSC1			185	2.0	5.2	0.5					5.5	5.0	**5.5**
C2		0.81	0.88	2.24	*1.82*	*1.97*	60	3.2	2.9	412	3.0	6.5	1.1					3.9	5.0	**5.0**
DP1+C2	2	1.12	1.21	2.52	*2.81*	*3.03*	From DP1							260	1.0	7.2	0.6	6.1	5.0	**6.1**
C3	3	0.81	0.88	1.32	*1.07*	*1.16*	70	2.6	3.3	496	2.7	5.8	1.4					4.7	5.0	**5.0**

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DEVELOPED TIME OF CONCENTRATION

SUB-BASIN DATA							INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				PIPE TRAVEL TIME (t_t)				TIME OF CONCENTRATION		FINAL
BASIN	DESIGN PT:	C_5	C_{100}	AREA	COMP		LENGTH	SLOPE	t_i	LENGTH	SLOPE	VEL.	t_t	LENGTH	SLOPE	VEL.	t_t	COMP.	MINIMUM	t_c
				Ac			Ft	%	Min	Ft	%	FPS	Min	Ft	%	FPS	Min	t_c	t_c	Min
C4		0.81	0.88	1.51	*1.22*	*1.33*	60	4.8	2.5	371	4.7	7.5	0.8					3.3	5.0	**5.0**
DP2+DP3+C4	4	0.95	1.03	5.34	*5.10*	*5.52*	From DP2							286	1.0	7.2	0.7	6.8	5.0	**6.8**
OSC2		0.19	0.43	2.98	*0.56*	*1.28*	50	2.5	8.9	575	2.0	5.2	1.8					6.8	5.0	**6.8**
C5		0.90	0.96	0.88	*0.79*	*0.84*	40	2.0	1.9	938	2.0	5.2	3.0					4.9	5.0	**5.0**
OSC2+C5	5	0.35	0.55	3.86	*1.35*	*2.13*	From OSC2			100	2.0	5.2	0.3					7.2	5.0	**7.2**
C6		0.90	0.96	0.66	*0.59*	*0.63*	40	2.0	1.9	703	2.0	5.2	2.3					4.1	5.0	**5.0**
DP5+C6	6	0.43	0.61	4.52	*1.94*	*2.76*	From DP5							58	1.0	7.2	0.1	5.1	5.0	**5.1**
DP4+DP6	6A	0.71	0.84	9.86	*7.04*	*8.28*	From DP4							430	1.0	7.2	1.0	7.8	5.0	**7.8**
D-BASINS																				
D1	1	0.35	0.52	1.35	*0.46*	*0.70*	70	2.7	8.5	594	2.6	9.6	1.0					9.5	5.0	**9.5**
D2		0.38	0.54	1.93	*0.73*	*1.05*	60	2.7	7.5	559	1.2	7.2	1.3					8.8	5.0	**8.8**
DP1+D2	2	0.36	0.53	3.28	*1.19*	*1.75*	From DP1			430	1.2	7.2	1.0					10.5	5.0	**10.5**
D3	3	0.40	0.56	0.91	*0.36*	*0.51*	70	1.2	10.3	592	1.4	6.4	1.5					11.9	5.0	**11.9**
DP6A(C)+DP2+DP3	3A	0.61	0.75	14.05	*8.60*	*10.53*	From DP3							83	1.0	7.2	0.2	12.1	5.0	**12.1**
D4	4	0.36	0.53	2.75	*1.00*	*1.47*	70	2.3	8.8	475	3.3	8.8	0.9					9.7	5.0	**9.7**
D5		0.45	0.59	0.65	*0.29*	*0.39*	50	1.5	7.5	386	1.9	7.2	0.9					8.4	5.0	**8.4**
DP4+D5	5	0.38	0.55	3.40	*1.30*	*1.86*	From DP4			30	1.9	7.2	0.1					9.7	5.0	**9.7**
D6	6	0.45	0.59	2.87	*1.29*	*1.69*	60	3.0	6.5	1520	3.2	10.1	2.5					9.0	5.0	**9.0**
D7		0.74	0.83	0.70	*0.52*	*0.58*	100	2.0	5.4	587	3.8	11.6	0.8					6.2	5.0	**6.2**
DP5+DP6+D7	7	0.45	0.59	6.98	*3.11*	*4.13*	From DP5			307	3.8	11.6	0.4					10.2	5.0	**10.2**
D8	8	0.45	0.59	0.42	*0.19*	*0.25*	80	1.5	9.5	362	1.5	6.4	0.9					10.4	5.0	**10.4**
D9	9	0.45	0.59	0.29	*0.13*	*0.17*	80	4.0	6.8	229	5.5	12.2	0.3					7.2	5.0	**7.2**
D10	10	0.45	0.59	1.31	*0.59*	*0.78*	70	3.9	6.5	479	4.5	11.6	0.7					7.2	5.0	**7.2**
D11		0.90	0.96	0.62	*0.56*	*0.59*	40	3.9	1.5	429	4.1	11.6	0.6					2.1	5.0	**5.0**
DP10+D11	11	0.59	0.71	1.93	*1.15*	*1.37*	From DP10							50	1.0	7.2	0.1	7.3	5.0	**7.3**
D12		0.08	0.35	1.52	*0.12*	*0.53*	80	25.0	5.8	166	25.0	4.0	0.7					6.5	5.0	**6.5**
DP3A+DP7+DP8+DP9+DP11+D12	12	0.53	0.67	25.18	*13.29*	*16.98*	From DP7							150	1.0	7.2	0.3	10.5	5.0	**10.5**
OSD1	D1	0.08	0.35	2.94	*0.24*	*1.03*	40	2.5	8.9	165	2.0	7.0	0.4					9.3	5.0	**9.3**
D13		0.10	0.36	1.45	*0.14*	*0.52*	80	5.9	9.3	1093	2.7	5.4	3.4					12.6	5.0	**12.6**
DPD2+D13	13	0.09	0.35	4.39	*0.38*	*1.56*	From D13			430	1.2	7.2	1.0					13.6	5.0	**13.6**
D14	14	0.08	0.35	0.86	*0.07*	*0.30*	80	15.0	6.9	183	6.5	6.8	0.4					7.4	5.0	**7.4**

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AGENCY: El Paso County
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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 5 YR STORM P1= 1.50

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
A-BASINS							
A1	1	0.30	0.74	5.0	0.22	5.17	**1.1**
A2	2	0.64	0.56	5.0	0.36	5.17	**1.9**
A3	3	1.34	0.28	11.8	0.38	3.88	**1.5**
A4		0.25	0.90	5.0	0.23	5.17	**1.2**
DP1+DP2+DP3+A4	4	2.53	0.47	12.1	1.19	3.85	**4.6**
A5		0.23	0.90	5.0	0.21	5.17	**1.1**
DP4+A5	5	2.76	0.51	12.3	1.40	3.82	**5.3**
A6	6	0.60	0.74	5.7	0.44	4.98	**2.2**
A7		2.85	0.34	17.1	0.98	3.32	**3.3**
DP6+A7	7	3.45	0.41	17.1	1.42	3.32	**4.7**
A8	8	1.74	0.45	13.2	0.78	3.71	**2.9**
A9		1.47	0.45	13.5	0.66	3.68	**2.4**
DP7+DP8+A9	9	6.66	0.43	20.2	2.87	3.07	**8.8**
A10	10	0.65	0.45	7.1	0.29	4.64	**1.4**
A11		2.55	0.45	9.0	1.15	4.28	**4.9**
DP10+A11	11	3.21	0.45	14.3	1.44	3.59	**5.2**
A12	12	3.25	0.45	12.5	1.46	3.80	**5.6**
DP9+DP12	12A	9.91	0.44	20.3	4.33	3.07	**13.3**
A13	13	1.22	0.45	11.4	0.55	3.93	**2.2**
DP12A+DP11+DP13	13A	14.34	0.44	20.9	6.32	3.02	**19.1**
A14		0.97	0.08	19.5	0.08	3.13	**0.2**
DP5+DP13A+A14	14	18.07	0.43	21.3	7.80	2.99	**23.3**
A15	15	2.39	0.12	5.0	0.28	5.17	**1.4**
A16	16	0.53	0.08	8.2	0.04	4.43	**0.2**
B-BASINS							
OSB1	1	2.09	0.90	5.0	1.88	5.17	**9.7**
B1		2.15	0.81	5.0	1.74	5.17	**9.0**
DP1+B1	1A	4.25	0.85	5.6	3.63	5.00	**18.2**
B2	2	1.11	0.81	5.0	0.90	5.17	**4.6**
B3	3	0.39	0.90	5.0	0.35	5.17	**1.8**
B4	4	1.54	0.81	5.0	1.25	5.17	**6.5**
DP1A+DP2+DP3+DP4	4A	7.29	0.84	6.0	6.13	4.89	**30.0**
B5	5	2.13	0.81	5.0	1.73	5.17	**8.9**
DP4A+DP5	5A	9.42	0.83	6.6	7.86	4.75	**37.3**

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 5 YR STORM P1= 1.50

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
B6	6	1.75	0.81	5.0	1.42	5.17	**7.3**
B7		0.90	0.90	5.0	0.81	5.17	**4.2**
DP6+B7	7	2.65	0.84	5.0	2.23	5.16	**11.5**
B8		0.72	0.90	5.0	0.65	5.17	**3.4**
DP7+DP8	8	3.37	0.85	5.2	2.88	5.12	**14.7**
DP8+DP5A	8A	12.79	0.84	6.9	10.73	4.69	**50.4**
B9		1.42	0.08	5.0	0.11	5.17	**0.6**
DP8A+B9	9	14.21	0.76	7.0	10.85	4.67	**50.7**
C-BASINS							
OSC1	C1	0.56	0.90	5.0	0.50	5.17	**2.6**
C1		0.27	0.90	5.0	0.25	5.17	**1.3**
DPC1+C1	1	0.83	0.90	5.5	0.75	5.03	**3.8**
C2		2.24	0.81	5.0	1.82	5.17	**9.4**
DP1+C2	2	2.52	1.12	6.1	2.81	4.87	**13.7**
C3	3	1.32	0.81	5.0	1.07	5.17	**5.5**
C4		1.51	0.81	5.0	1.22	5.17	**6.3**
DP2+DP3+C4	4	5.34	0.95	6.8	5.10	4.72	**24.0**
OSC2		2.98	0.19	6.8	0.56	4.70	**2.6**
C5		0.88	0.90	5.0	0.79	5.17	**4.1**
OSC2+C5	5	3.86	0.35	7.2	1.35	4.63	**6.3**
C6		0.66	0.90	5.0	0.59	5.17	**3.1**
DP5+C6	6	4.52	0.43	5.1	1.94	5.13	**10.0**
DP4+DP6	6A	9.86	0.71	7.8	7.04	4.51	**31.8**
D-BASINS							
D1	1	1.35	0.35	9.5	0.46	4.20	**2.0**
D2		1.93	0.38	8.8	0.73	4.32	**3.1**
DP1+D2	2	3.28	0.36	10.5	1.19	4.06	**4.8**
D3	3	0.91	0.40	11.9	0.36	3.87	**1.4**
DP6A(C)+DP2+DP3	3A	14.05	0.61	12.1	8.60	3.85	**33.1**
D4	4	2.75	0.36	9.7	1.00	4.18	**4.2**
D5		0.65	0.45	8.4	0.29	4.39	**1.3**
DP4+D5	5	3.40	0.38	9.7	1.30	4.17	**5.4**

PROJECT INFORMATION

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 5 YR STORM P1= 1.50

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
D6	6	2.87	0.45	9.0	1.29	4.28	**5.5**
D7		0.70	0.74	6.2	0.52	4.84	**2.5**
DP5+DP6+D7	7	6.98	0.45	10.2	3.11	4.10	**12.7**
D8	8	0.42	0.45	10.4	0.19	4.06	**0.8**
D9	9	0.29	0.45	7.2	0.13	4.63	**0.6**
D10	10	1.31	0.45	7.2	0.59	4.63	**2.7**
D11		0.62	0.90	5.0	0.56	5.17	**2.9**
DP10+D11	11	1.93	0.59	7.3	1.15	4.61	**5.3**
D12		1.52	0.08	6.5	0.12	4.77	**0.6**
DP3A+DP7+DP8+DP9+DP11+D12	12	25.18	0.53	10.5	13.29	4.05	**53.8**
OSD1	D1	2.94	0.08	9.3	0.24	4.24	**1.0**
D13		1.45	0.10	12.6	0.14	3.78	**0.5**
DPD2+D13	13	4.39	0.09	13.6	0.38	3.66	**1.4**
D14	14	0.86	0.08	7.4	0.07	4.59	**0.3**

PROJECT INFORMATION

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 100 YR STORM P1= 2.52

			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A	I (IN/HR)	Q (CFS)
A-BASINS							
A1	1	0.30	0.84	5.0	0.25	8.68	**2.2**
A2	2	0.64	0.70	5.0	0.45	8.68	**3.9**
A3	3	1.34	0.48	11.8	0.65	6.52	**4.2**
A4		0.25	0.96	5.0	0.24	8.68	**2.1**
DP1+DP2+DP3+A4	4	2.53	0.63	12.1	1.59	6.46	**10.2**
A5		0.23	0.96	5.0	0.22	8.68	**1.9**
DP4+A5	5	2.76	0.65	12.3	1.81	6.42	**11.6**
A6	6	0.60	0.84	5.7	0.50	8.36	**4.2**
A7		2.85	0.52	17.1	1.49	5.57	**8.3**
DP6+A7	7	3.45	0.58	17.1	1.99	5.57	**11.1**
A8	8	1.74	0.59	13.2	1.03	6.23	**6.4**
A9		1.47	0.59	13.5	0.86	6.18	**5.3**
DP7+DP8+A9	9	6.66	0.58	20.2	3.88	5.16	**20.0**
A10	10	0.65	0.59	7.1	0.39	7.79	**3.0**
A11		2.55	0.59	9.0	1.51	7.19	**10.8**
DP10+A11	11	3.21	0.59	14.3	1.89	6.03	**11.4**
A12	12	3.25	0.59	12.5	1.92	6.38	**12.2**
DP9+DP12	12A	9.91	0.59	20.3	5.80	5.15	**29.9**
A13	13	1.22	0.59	11.4	0.72	6.60	**4.8**
DP12A+DP11+DP13	13A	14.34	0.59	20.9	8.41	5.08	**42.7**
A14		0.97	0.35	19.5	0.34	5.25	**1.8**
DP5+DP13A+A14	14	18.07	0.58	21.3	10.56	5.02	**53.1**
A15	15	2.39	0.37	5.0	0.89	8.68	**7.7**
A16	16	0.53	0.35	8.2	0.19	7.43	**1.4**
B-BASINS							
OSB1	1	2.09	0.96	5.0	2.01	8.68	**17.4**
B1		2.15	0.88	5.0	1.90	8.68	**16.4**
DP1+B1	1A	4.25	0.92	5.6	3.90	8.40	**32.8**
B2	2	1.11	0.88	5.0	0.98	8.68	**8.5**
B3	3	0.39	0.96	5.0	0.38	8.68	**3.3**
B4	4	1.54	0.88	5.0	1.36	8.68	**11.8**
DP1A+DP2+DP3+DP4	4A	7.29	0.91	6.0	6.61	8.21	**54.3**
B5	5	2.13	0.88	5.0	1.88	8.68	**16.3**
DP4A+DP5	5A	9.42	0.90	6.6	8.49	7.98	**67.8**

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RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 100 YR STORM P1= 2.52

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
B6	6	1.75	0.88	5.0	1.54	8.68	**13.4**
B7		0.90	0.96	5.0	0.86	8.68	**7.5**
DP6+B7	7	2.65	0.91	5.0	2.40	8.66	**20.8**
B8		0.72	0.96	5.0	0.69	8.68	**6.0**
DP7+DP8	8	3.37	0.92	5.2	3.10	8.60	**26.6**
DP8+DP5A	8A	12.79	0.91	6.9	11.59	7.88	**91.3**
B9		1.42	0.35	5.0	0.50	8.68	**4.3**
DP8A+B9	9	14.21	0.85	7.0	12.08	7.84	**94.8**
C-BASINS							
OSC1	C1	0.56	0.96	5.0	0.53	8.68	**4.6**
C1		0.27	0.96	5.0	0.26	8.68	**2.3**
DPC1+C1	1	0.83	0.96	5.5	0.80	8.44	**6.7**
C2		2.24	0.88	5.0	1.97	8.68	**17.1**
DP1+C2	2	2.52	1.21	6.1	3.03	8.18	**24.8**
C3	3	1.32	0.88	5.0	1.16	8.68	**10.1**
C4		1.51	0.88	5.0	1.33	8.68	**11.5**
DP2+DP3+C4	4	5.34	1.03	6.8	5.52	7.92	**43.7**
OSC2		2.98	0.43	6.8	1.28	7.89	**10.1**
C5		0.88	0.96	5.0	0.84	8.68	**7.3**
OSC2+C5	5	3.86	0.55	7.2	2.13	7.77	**16.5**
C6		0.66	0.96	5.0	0.63	8.68	**5.5**
DP5+C6	6	4.52	0.61	5.1	2.76	8.61	**23.8**
DP4+DP6	6A	9.86	0.84	7.8	8.28	7.57	**62.7**
D-BASINS							
D1	1	1.35	0.52	9.5	0.70	7.06	**5.0**
D2		1.93	0.54	8.8	1.05	7.25	**7.6**
DP1+D2	2	3.28	0.53	10.5	1.75	6.81	**11.9**
D3	3	0.91	0.56	11.9	0.51	6.50	**3.3**
DP6A(C)+DP2+DP3	3A	14.05	0.75	12.1	10.53	6.46	**68.0**
D4	4	2.75	0.53	9.7	1.47	7.01	**10.3**
D5		0.65	0.59	8.4	0.39	7.37	**2.8**
DP4+D5	5	3.40	0.55	9.7	1.86	7.00	**13.0**
D6	6	2.87	0.59	9.0	1.69	7.19	**12.2**

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RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 100 YR STORM P1= 2.52

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
D7		0.70	0.83	6.2	0.58	8.12	**4.7**
DP5+DP6+D7	7	6.98	0.59	10.2	4.13	6.88	**28.4**
D8	8	0.42	0.59	10.4	0.25	6.82	**1.7**
D9	9	0.29	0.59	7.2	0.17	7.77	**1.3**
D10	10	1.31	0.59	7.2	0.78	7.78	**6.0**
D11		0.62	0.96	5.0	0.59	8.68	**5.1**
DP10+D11	11	1.93	0.71	7.3	1.37	7.74	**10.6**
D12		1.52	0.35	6.5	0.53	8.01	**4.3**
DP3A+DP7+DP8+DP9+DP11+D12	12	25.18	0.67	10.5	16.98	6.80	**115.5**
OSD1	D1	2.94	0.35	9.3	1.03	7.12	**7.3**
D13		1.45	0.36	12.6	0.52	6.34	**3.3**
DPD2+D13	13	4.39	0.35	13.6	1.56	6.15	**9.6**
D14	14	0.86	0.35	7.4	0.30	7.70	**2.3**

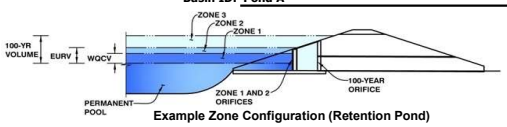
Hydraulic Calculations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **The Commons at Falcon Field**

Basin ID: **Pond A**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	18.09	acres
Watershed Length =	1,191	ft
Watershed Length to Centroid =	550	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	59.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.351	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.289	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.932	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.229	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.466	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.795	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.119	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.519	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.49 in.) =	3.908	acre-feet	3.49	inches
Approximate 2-yr Detention Volume =	0.835	acre-feet		
Approximate 5-yr Detention Volume =	1.094	acre-feet		
Approximate 10-yr Detention Volume =	1.325	acre-feet		
Approximate 25-yr Detention Volume =	1.604	acre-feet		
Approximate 50-yr Detention Volume =	1.776	acre-feet		
Approximate 100-yr Detention Volume =	1.965	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.351	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.938	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.676	acre-feet
Total Detention Basin Volume =	1.965	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

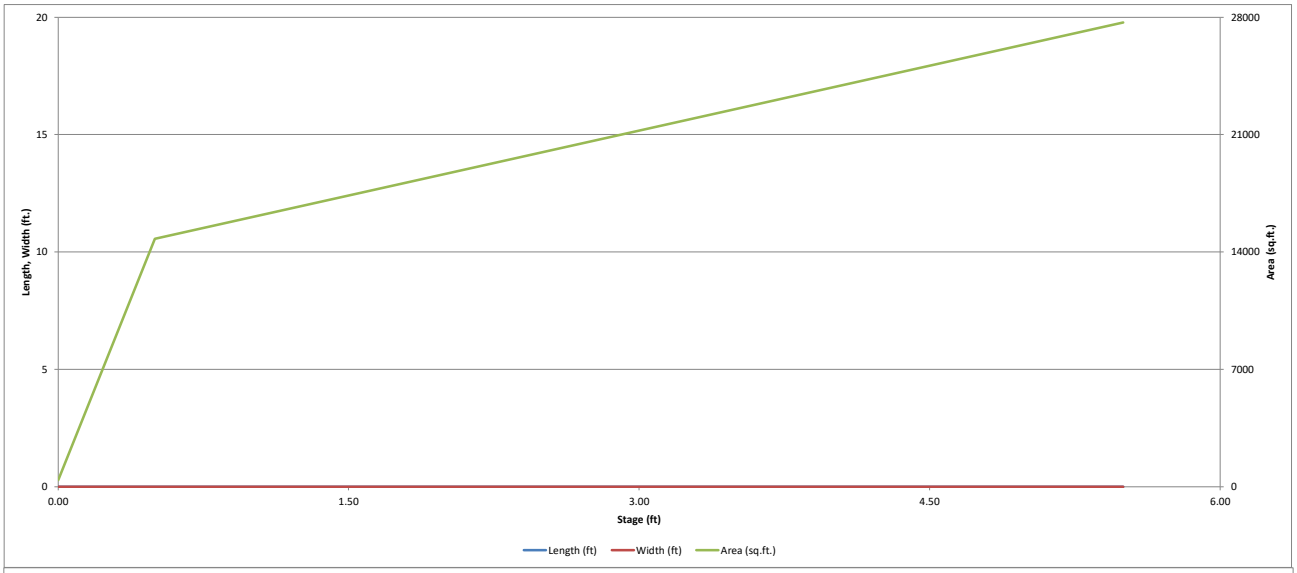
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

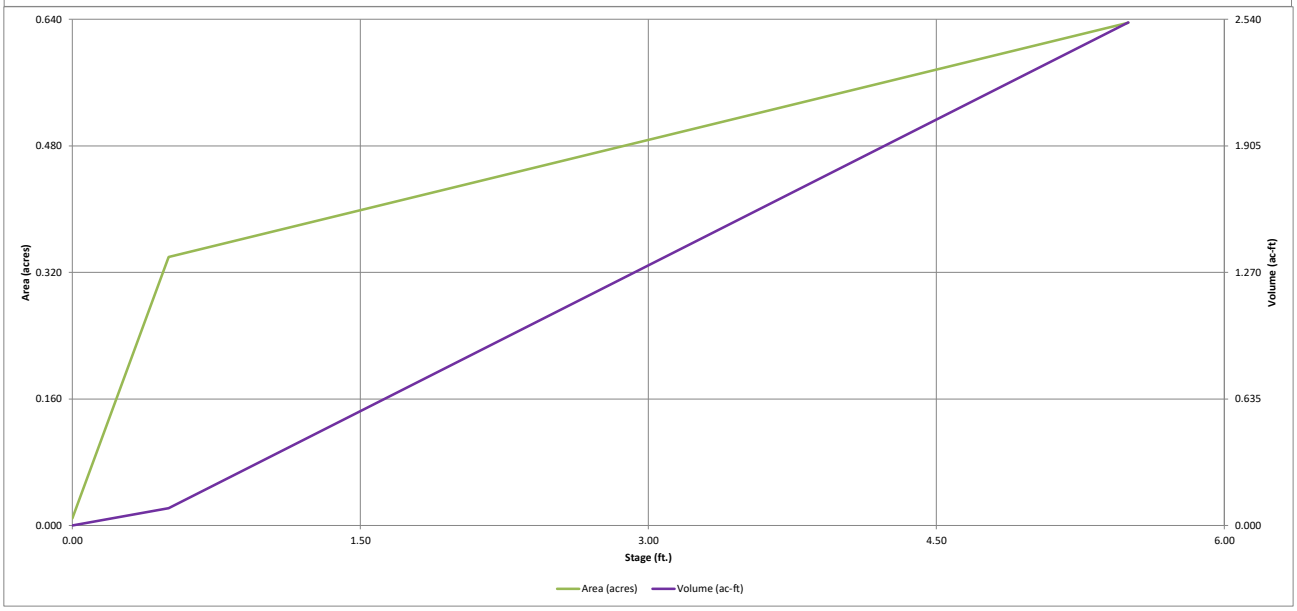
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	400	0.009		
6828	--	0.50	--	--	--	14,788	0.339	3,797	0.087
6835.5	--	5.50	--	--	--	27,694	0.636	110,002	2.525

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



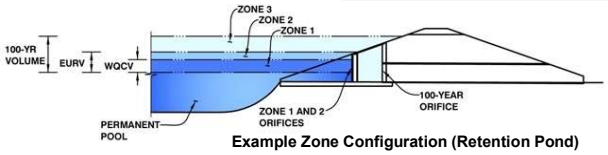


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **The Commons at Falcon Field**

Basin ID: **Pond A**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.24	0.351	Orifice Plate
Zone 2 (EURV)	3.34	0.938	Orifice Plate
Zone 3 (100-year)	4.58	0.676	Weir&Pipe (Restrict)
Total (all zones)		1.965	

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

Underdrain Orifice Invert Depth = [ ] ft (distance below the filtration media surface)

Underdrain Orifice Diameter = [ ] inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = [ ] ft^2

Underdrain Orifice Centroid = [ ] feet

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

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 3.34 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = 13.00 inches

Orifice Plate: Orifice Area per Row = N/A inches

Calculated Parameters for Plate

WQ Orifice Area per Row = N/A ft^2

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.11	2.23					
Orifice Area (sq. inches)	3.92	3.75	1.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	2.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.50	N/A	feet
Overflow Weir Slope Length =	2.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	4.53	N/A	
Overflow Grate Open Area w/o Debris =	5.93	N/A	ft^2
Overflow Grate Open Area w/ Debris =	2.97	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	12.50		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.31	N/A	ft^2
Outlet Orifice Centroid =	0.58	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.97	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= 4.35 ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = 75.00 feet

Spillway End Slopes = 4.00 H:V

Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= 0.35 feet

Stage at Top of Freeboard = 5.70 feet

Basin Area at Top of Freeboard = 0.64 acres

Basin Volume at Top of Freeboard = 2.53 acre-ft

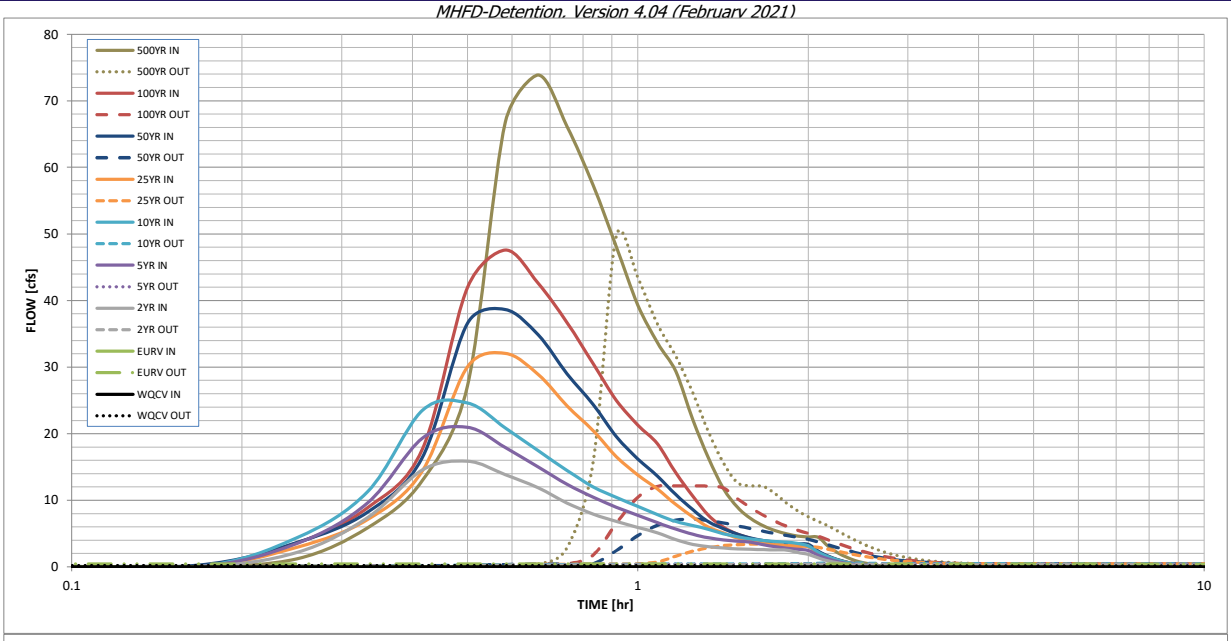
Routed Hydrograph Results

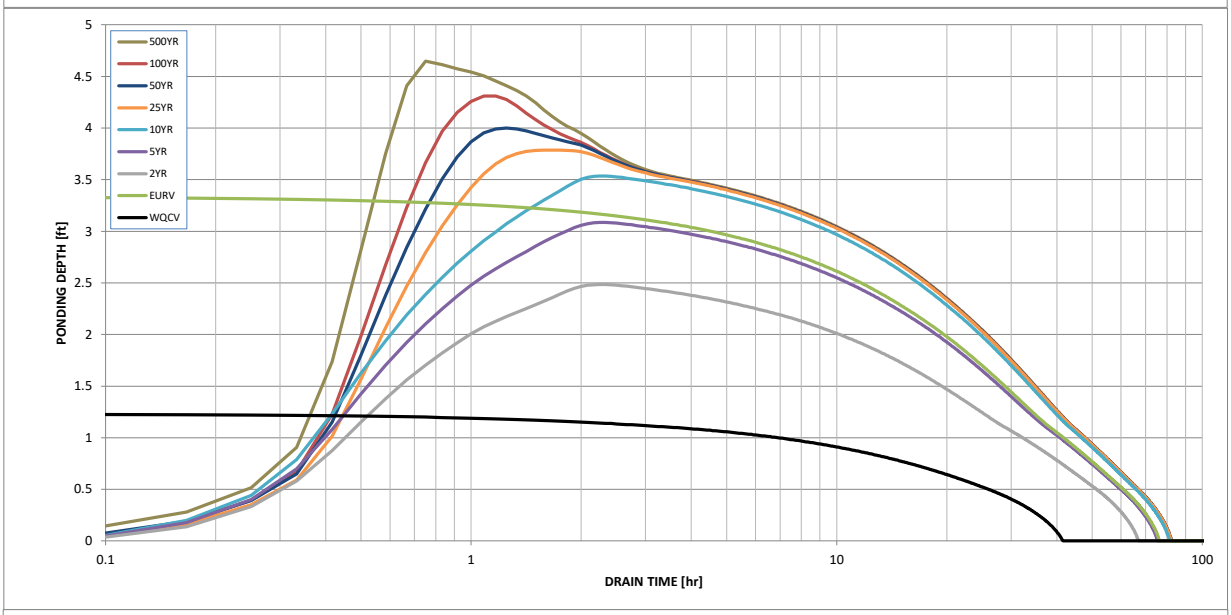
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

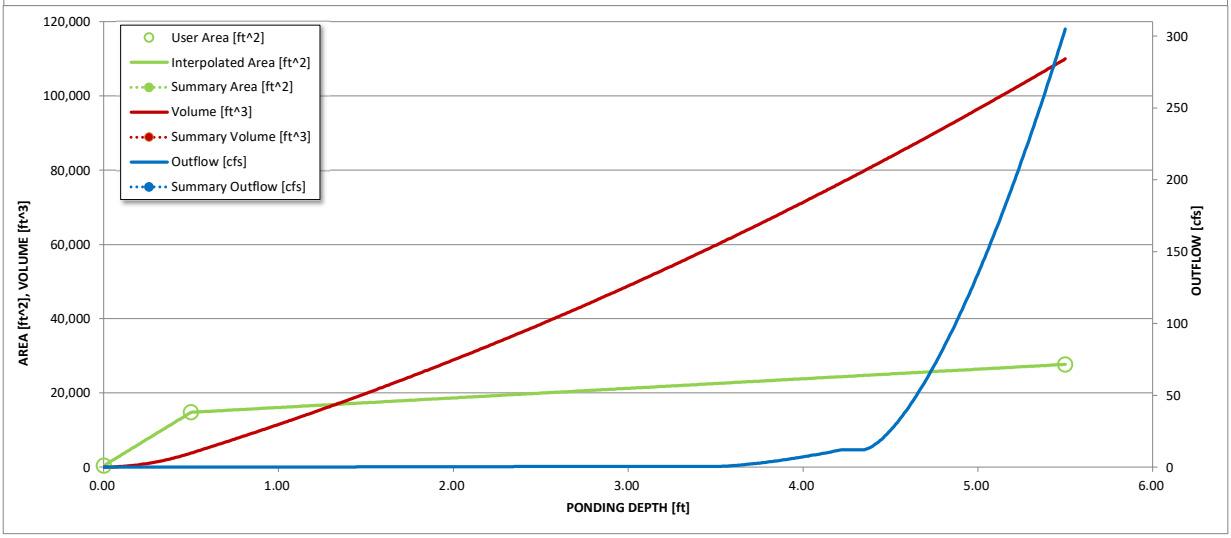
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.351	1.289	0.932	1.229	1.466	1.795	2.119	2.519	3.908
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.932	1.229	1.466	1.795	2.119	2.519	3.908
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.3	0.4	3.8	7.5	12.3	28.0
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	0.02	0.21	0.42	0.68	1.55
Peak Inflow Q (cfs) =	N/A	N/A	15.9	20.9	24.6	32.1	38.7	47.6	73.9
Peak Outflow Q (cfs) =	0.2	0.5	0.4	0.4	0.6	3.4	7.2	12.2	49.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	1.5	0.9	1.0	1.0	1.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.5	1.1	2.0	2.0
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	68	60	67	72	71	70	68	63
Time to Drain 99% of Inflow Volume (hours) =	**40**	73	64	72	77	77	77	76	74
Maximum Ponding Depth (ft) =	1.24	3.34	2.48	3.08	3.53	3.79	4.00	4.31	4.65
Area at Maximum Ponding Depth (acres) =	0.38	0.51	0.46	0.49	0.52	0.53	0.55	0.57	0.58
Maximum Volume Stored (acre-ft) =	0.355	1.290	0.875	1.160	1.388	1.519	1.633	1.811	2.000

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.02	1.23
	0:15:00	0.00	0.00	2.17	3.53	4.38	2.95	3.65	3.60	5.89
	0:20:00	0.00	0.00	7.42	9.63	11.30	7.11	8.25	8.89	12.99
	0:25:00	0.00	0.00	14.55	19.34	23.49	14.43	16.44	17.71	27.18
	0:30:00	0.00	0.00	15.87	20.94	24.62	30.06	36.58	41.95	66.74
	0:35:00	0.00	0.00	13.86	17.91	20.88	32.08	38.67	47.57	73.87
	0:40:00	0.00	0.00	11.87	15.00	17.43	28.90	34.83	42.58	66.15
	0:45:00	0.00	0.00	9.59	12.40	14.49	24.16	28.99	36.70	57.37
	0:50:00	0.00	0.00	7.94	10.48	12.03	20.50	24.42	30.55	48.06
	0:55:00	0.00	0.00	6.83	8.96	10.41	16.54	19.55	24.99	39.32
	1:00:00	0.00	0.00	5.94	7.73	9.08	13.81	16.21	21.29	33.65
	1:05:00	0.00	0.00	5.12	6.62	7.84	11.68	13.63	18.45	29.35
	1:10:00	0.00	0.00	4.08	5.70	6.82	9.38	10.85	14.12	22.10
	1:15:00	0.00	0.00	3.39	4.89	6.23	7.51	8.59	10.64	16.35
	1:20:00	0.00	0.00	3.02	4.36	5.64	5.96	6.76	7.72	11.74
	1:25:00	0.00	0.00	2.82	4.06	4.98	5.09	5.75	5.97	8.94
	1:30:00	0.00	0.00	2.71	3.86	4.52	4.34	4.89	4.93	7.24
	1:35:00	0.00	0.00	2.64	3.72	4.19	3.85	4.33	4.27	6.17
	1:40:00	0.00	0.00	2.59	3.32	3.96	3.52	3.96	3.83	5.44
	1:45:00	0.00	0.00	2.55	3.02	3.80	3.31	3.72	3.53	4.95
	1:50:00	0.00	0.00	2.53	2.81	3.69	3.16	3.55	3.34	4.63
	1:55:00	0.00	0.00	2.16	2.65	3.50	3.07	3.45	3.24	4.49
	2:00:00	0.00	0.00	1.88	2.46	3.15	3.01	3.39	3.21	4.44
	2:05:00	0.00	0.00	1.33	1.73	2.21	2.12	2.38	2.26	3.13
	2:10:00	0.00	0.00	0.91	1.20	1.53	1.47	1.65	1.57	2.16
	2:15:00	0.00	0.00	0.62	0.81	1.05	1.01	1.13	1.08	1.49
	2:20:00	0.00	0.00	0.41	0.53	0.69	0.67	0.75	0.71	0.98
	2:25:00	0.00	0.00	0.26	0.34	0.45	0.44	0.49	0.46	0.64
	2:30:00	0.00	0.00	0.15	0.22	0.28	0.28	0.31	0.29	0.40
	2:35:00	0.00	0.00	0.08	0.12	0.15	0.16	0.17	0.16	0.22
	2:40:00	0.00	0.00	0.03	0.05	0.06	0.07	0.08	0.07	0.09
	2:45:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

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

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

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

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

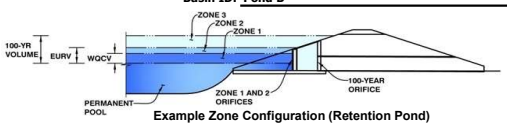
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **The Commons at Falcon Field**

Basin ID: **Pond B**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	13.74	acres
Watershed Length =	915	ft
Watershed Length to Centroid =	450	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	86.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.423	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.586	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.078	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.392	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.645	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.928	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.205	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.520	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.49 in.) =	3.625	acre-feet	3.49	inches
Approximate 2-yr Detention Volume =	1.044	acre-feet		
Approximate 5-yr Detention Volume =	1.356	acre-feet		
Approximate 10-yr Detention Volume =	1.613	acre-feet		
Approximate 25-yr Detention Volume =	1.907	acre-feet		
Approximate 50-yr Detention Volume =	2.078	acre-feet		
Approximate 100-yr Detention Volume =	2.230	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.423	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.163	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.644	acre-feet
Total Detention Basin Volume =	2.230	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

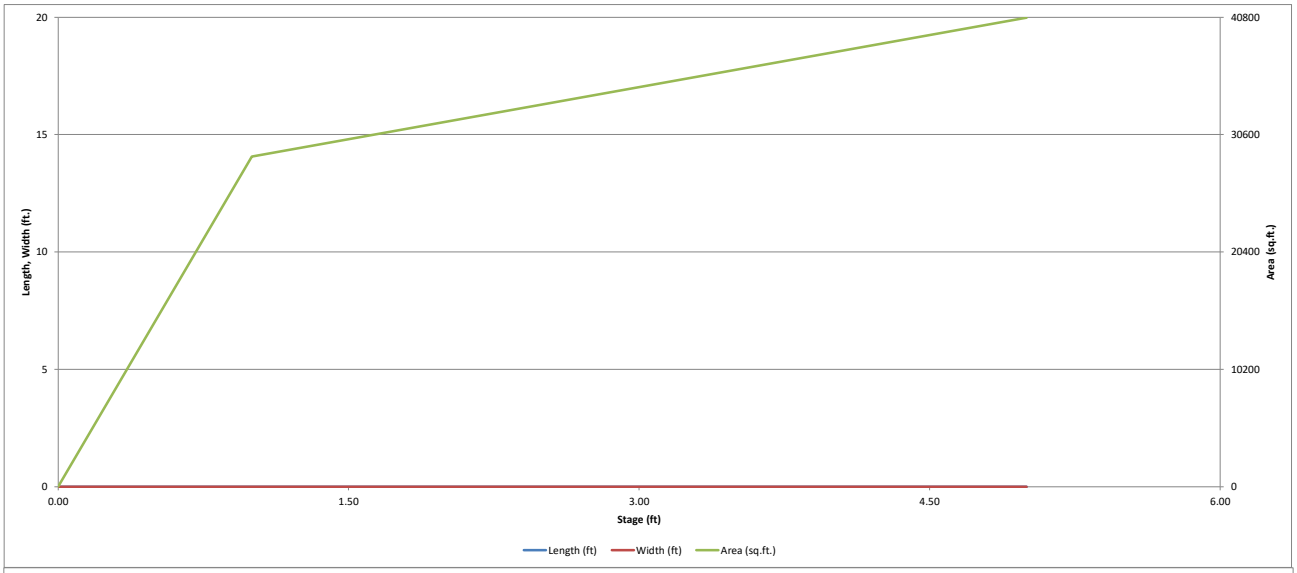
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

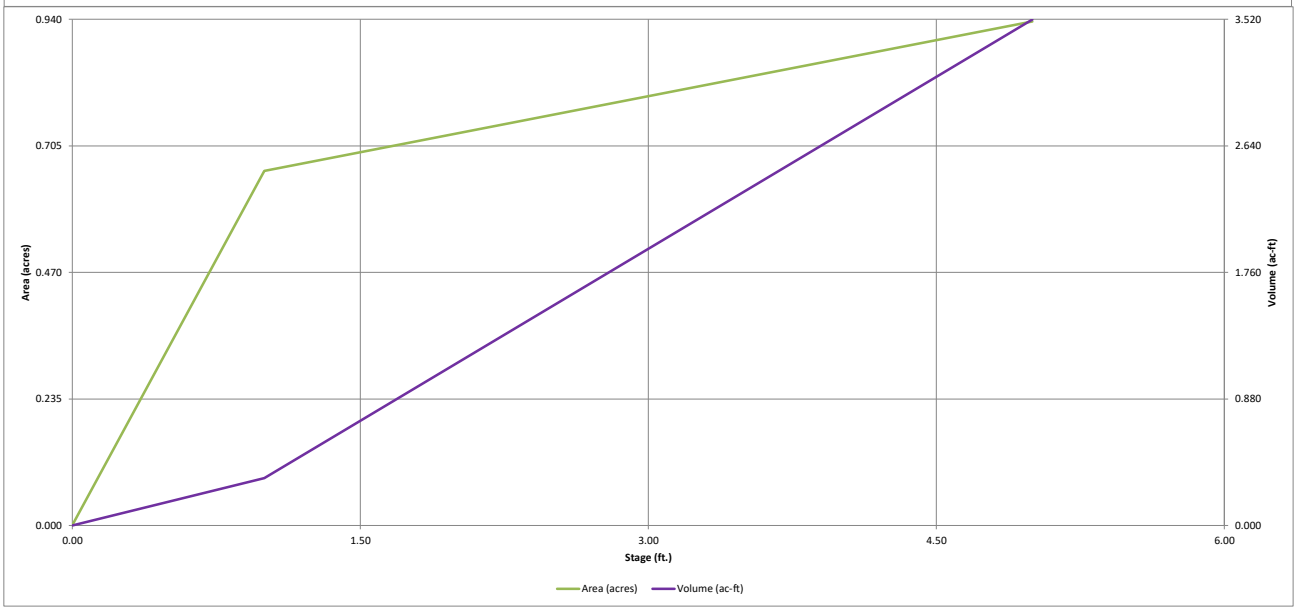
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	40	0.001		
6832	--	1.00	--	--	--	28,695	0.659	14,367	0.330
6836	--	5.00	--	--	--	40,779	0.936	153,315	3.520

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



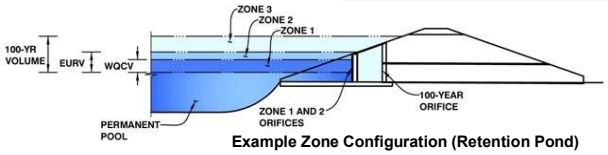


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **The Commons at Falcon Field**

Basin ID: **Pond B**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.15	0.423	Orifice Plate
Zone 2 (EURV)	2.75	1.163	Orifice Plate
Zone 3 (100-year)	3.55	0.644	Weir&Pipe (Circular)
Total (all zones)		2.230	

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 Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.021E-02	ft^2
Depth at top of Zone using Orifice Plate =	2.75	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	11.10	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.35	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.92	1.83					
Orifice Area (sq. inches)	4.35	4.35	4.35					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.80	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.80	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	14.18	N/A	
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	25.06	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	12.53	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Circular	Not Selected			Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A	ft^2
Circular Orifice Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.25	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.74	feet
Spillway Crest Length =	25.00	feet	Stage at Top of Freeboard =	4.99	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.94	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.51	acre-ft

Calculated Parameters for Spillway

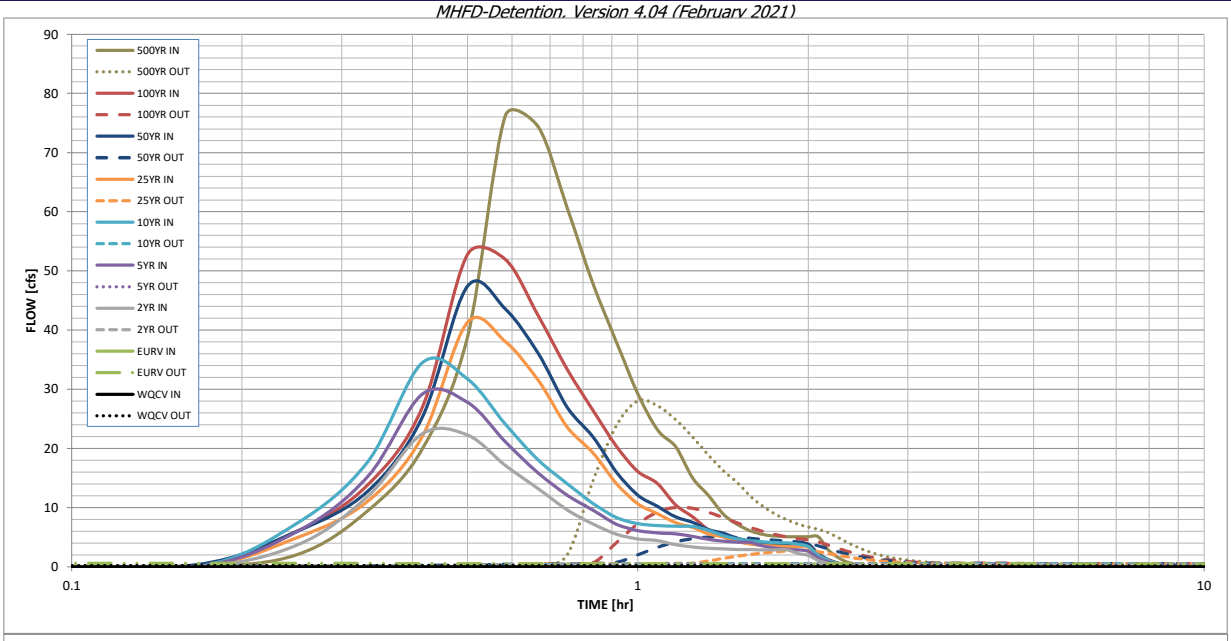
Routed Hydrograph Results

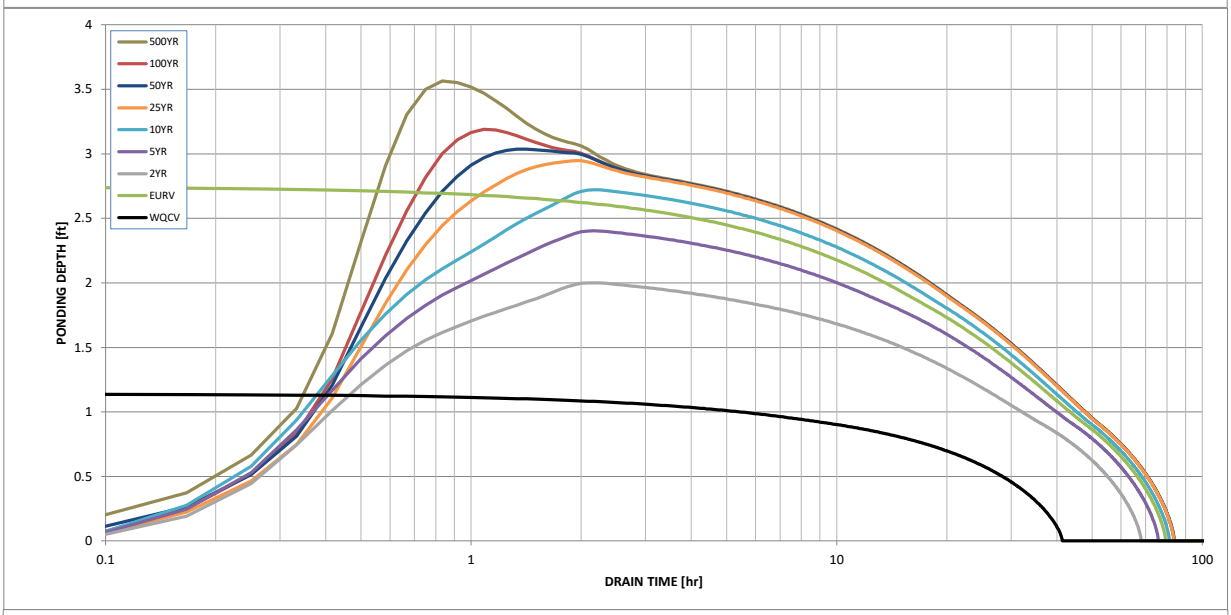
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

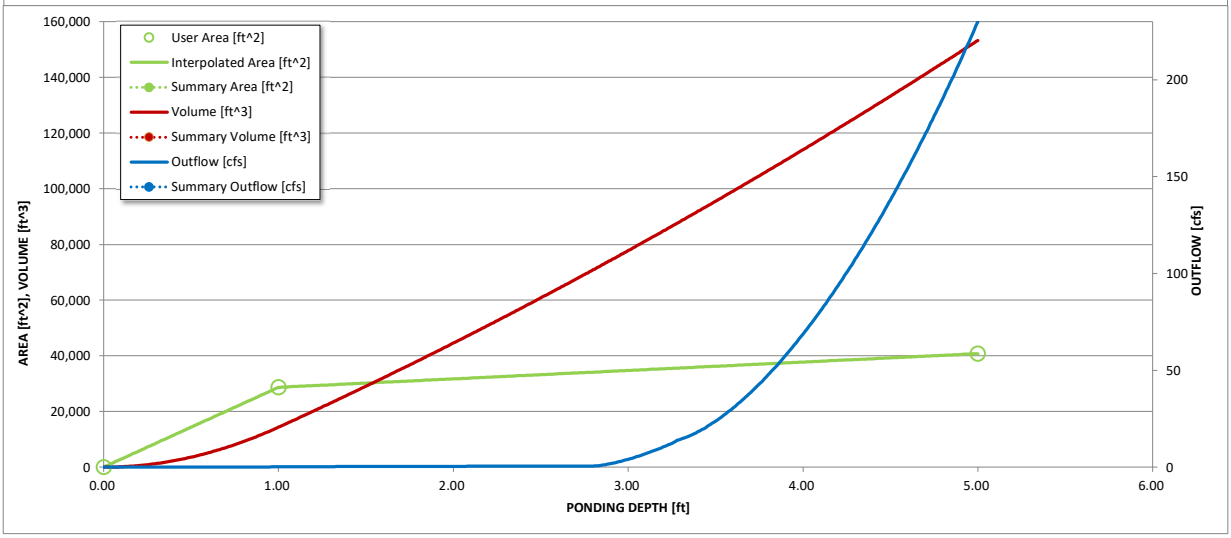
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.423	1.586	1.078	1.392	1.645	1.928	2.205	2.520	3.625
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.078	1.392	1.645	1.928	2.205	2.520	3.625
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.3	0.4	3.2	6.3	10.4	23.5
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	0.46	0.76	1.71
Peak Inflow Q (cfs) =	N/A	N/A	22.5	29.2	34.5	41.3	47.4	52.8	76.2
Peak Outflow Q (cfs) =	0.2	0.6	0.4	0.5	0.6	2.8	5.1	10.0	28.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.0	1.6	0.9	0.8	1.0	1.2
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.2	0.4	0.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	71	62	68	73	74	73	72	68
Time to Drain 99% of Inflow Volume (hours) =	**40**	76	65	73	77	79	79	78	77
Maximum Ponding Depth (ft) =	1.15	2.75	2.00	2.40	2.72	2.95	3.04	3.19	3.56
Area at Maximum Ponding Depth (acres) =	0.67	0.78	0.73	0.76	0.78	0.79	0.80	0.81	0.84
Maximum Volume Stored (acre-ft) =	0.429	1.589	1.023	1.320	1.565	1.738	1.810	1.931	2.243

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.04	2.04
	0:15:00	0.00	0.00	3.66	5.95	7.35	4.93	6.02	5.99	9.45
	0:20:00	0.00	0.00	11.90	15.24	17.77	11.10	12.78	13.86	19.93
	0:25:00	0.00	0.00	22.52	29.19	34.48	22.07	25.33	26.98	38.83
	0:30:00	0.00	0.00	22.25	27.79	31.75	41.29	47.40	52.76	76.18
	0:35:00	0.00	0.00	17.16	21.14	24.13	38.06	43.58	51.95	74.37
	0:40:00	0.00	0.00	13.22	15.87	18.07	31.53	36.08	42.45	60.71
	0:45:00	0.00	0.00	9.64	12.13	14.07	23.65	27.00	33.39	47.84
	0:50:00	0.00	0.00	7.24	9.56	10.72	19.28	21.98	26.47	38.04
	0:55:00	0.00	0.00	5.53	7.22	8.35	14.09	16.03	20.37	29.23
	1:00:00	0.00	0.00	4.73	6.13	7.30	10.66	12.11	16.12	23.13
	1:05:00	0.00	0.00	4.45	5.73	6.97	8.97	10.20	14.07	20.26
	1:10:00	0.00	0.00	3.74	5.58	6.86	7.44	8.43	10.44	14.97
	1:15:00	0.00	0.00	3.37	5.12	6.82	6.65	7.52	8.45	12.07
	1:20:00	0.00	0.00	3.15	4.63	6.18	5.58	6.30	6.27	8.87
	1:25:00	0.00	0.00	3.03	4.35	5.27	5.04	5.68	5.10	7.16
	1:30:00	0.00	0.00	2.94	4.19	4.73	4.29	4.83	4.34	6.05
	1:35:00	0.00	0.00	2.90	4.09	4.40	3.87	4.35	3.93	5.45
	1:40:00	0.00	0.00	2.89	3.50	4.21	3.62	4.08	3.76	5.21
	1:45:00	0.00	0.00	2.89	3.16	4.09	3.50	3.94	3.68	5.10
	1:50:00	0.00	0.00	2.89	2.96	4.05	3.44	3.87	3.67	5.09
	1:55:00	0.00	0.00	2.28	2.85	3.86	3.41	3.83	3.67	5.09
	2:00:00	0.00	0.00	1.93	2.63	3.40	3.40	3.83	3.67	5.09
	2:05:00	0.00	0.00	1.09	1.50	1.95	1.96	2.21	2.12	2.93
	2:10:00	0.00	0.00	0.61	0.85	1.10	1.13	1.26	1.21	1.68
	2:15:00	0.00	0.00	0.31	0.45	0.58	0.60	0.67	0.64	0.89
	2:20:00	0.00	0.00	0.14	0.23	0.29	0.31	0.35	0.34	0.46
	2:25:00	0.00	0.00	0.05	0.09	0.10	0.12	0.13	0.13	0.18
	2:30:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

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

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

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

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

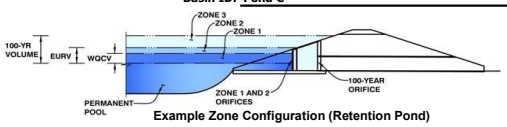
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **The Commons at Falcon Field**

Basin ID: **Pond C**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	36.97	acres
Watershed Length =	1,500	ft
Watershed Length to Centroid =	650	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	45.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.594	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.862	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.363	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.823	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.189	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.818	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.430	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.220	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.49 in.) =	6.954	acre-feet	3.49	inches
Approximate 2-yr Detention Volume =	1.192	acre-feet		
Approximate 5-yr Detention Volume =	1.574	acre-feet		
Approximate 10-yr Detention Volume =	1.930	acre-feet		
Approximate 25-yr Detention Volume =	2.377	acre-feet		
Approximate 50-yr Detention Volume =	2.669	acre-feet		
Approximate 100-yr Detention Volume =	3.048	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.594	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.268	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.185	acre-feet
Total Detention Basin Volume =	3.048	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

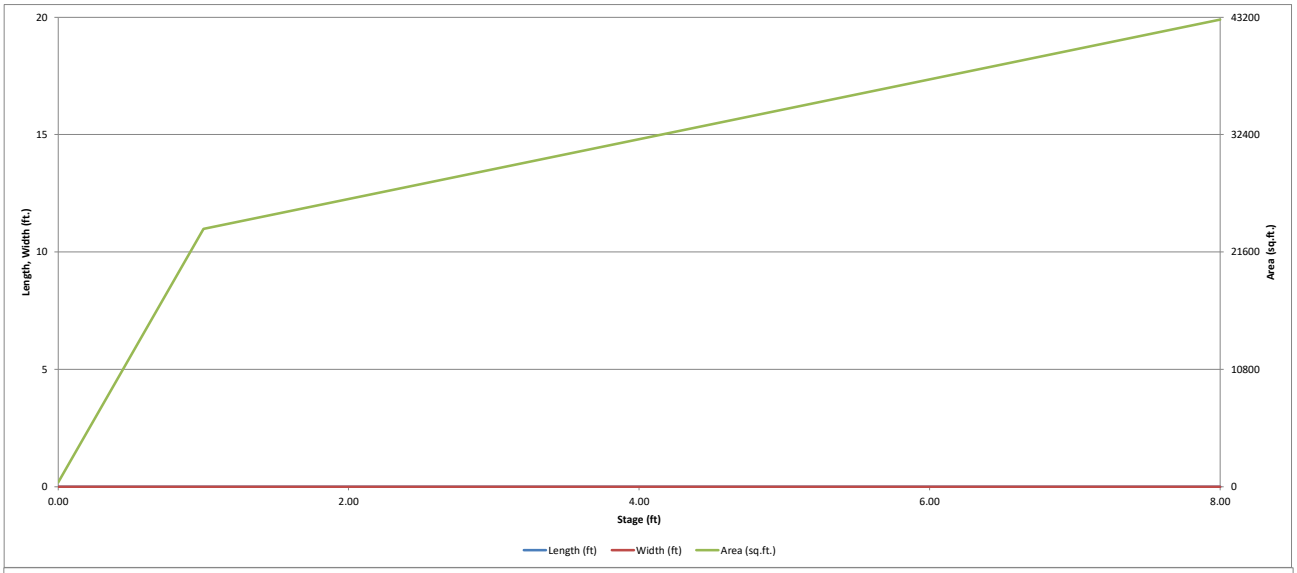
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

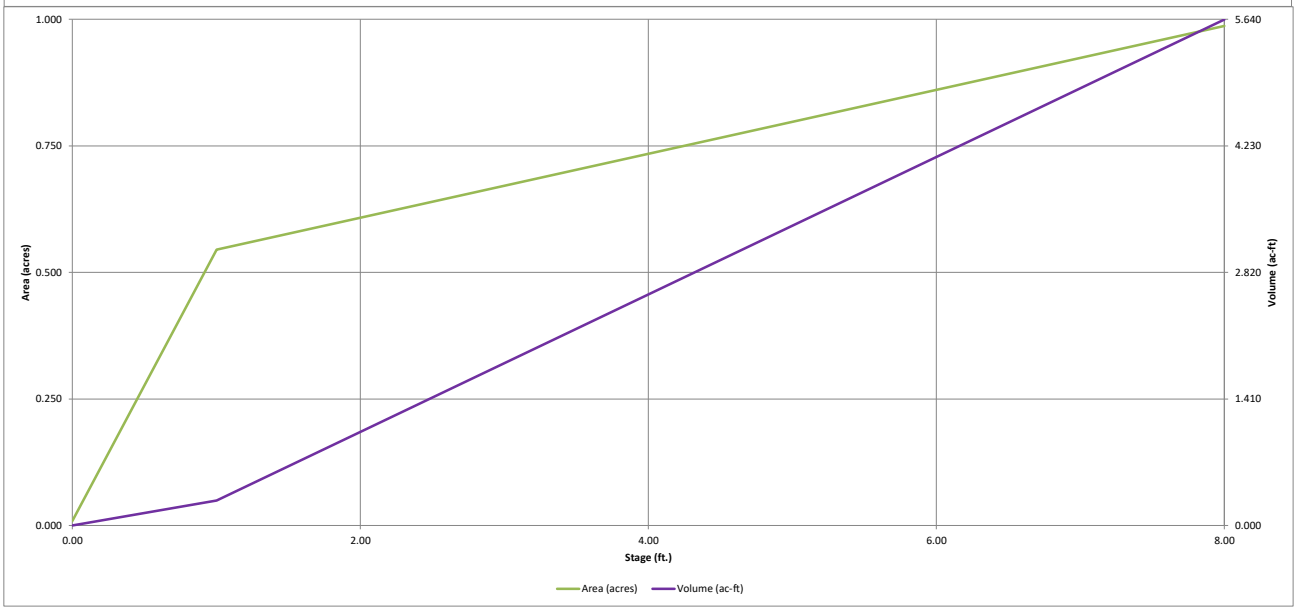
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	400	0.009		
6805	--	1.00	--	--	--	23,745	0.545	12,072	0.277
6812	--	8.00	--	--	--	42,990	0.987	245,645	5.639

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



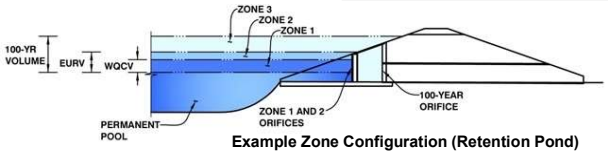


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **The Commons at Falcon Field**

Basin ID: **Pond C**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.57	0.594	Orifice Plate
Zone 2 (EURV)	3.54	1.268	Orifice Plate
Zone 3 (100-year)	5.11	1.185	Weir&Pipe (Circular)
Total (all zones)		3.048	

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 Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	3.708E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.59	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	5.34	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.20	2.39					
Orifice Area (sq. inches)	5.34	5.34	5.34					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.90	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.90	N/A	feet
Overflow Weir Front Edge Length =	4.92	N/A	feet	Overflow Weir Slope Length =	4.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	9.53	N/A	
Horiz. Length of Weir Sides =	4.92	N/A	feet	Overflow Grate Open Area w/o Debris =	16.85	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	8.42	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Circular	Not Selected			Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	2.83	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A	ft^2
Circular Orifice Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.00	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	7.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.92	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	4.68	acre-ft

Calculated Parameters for Spillway

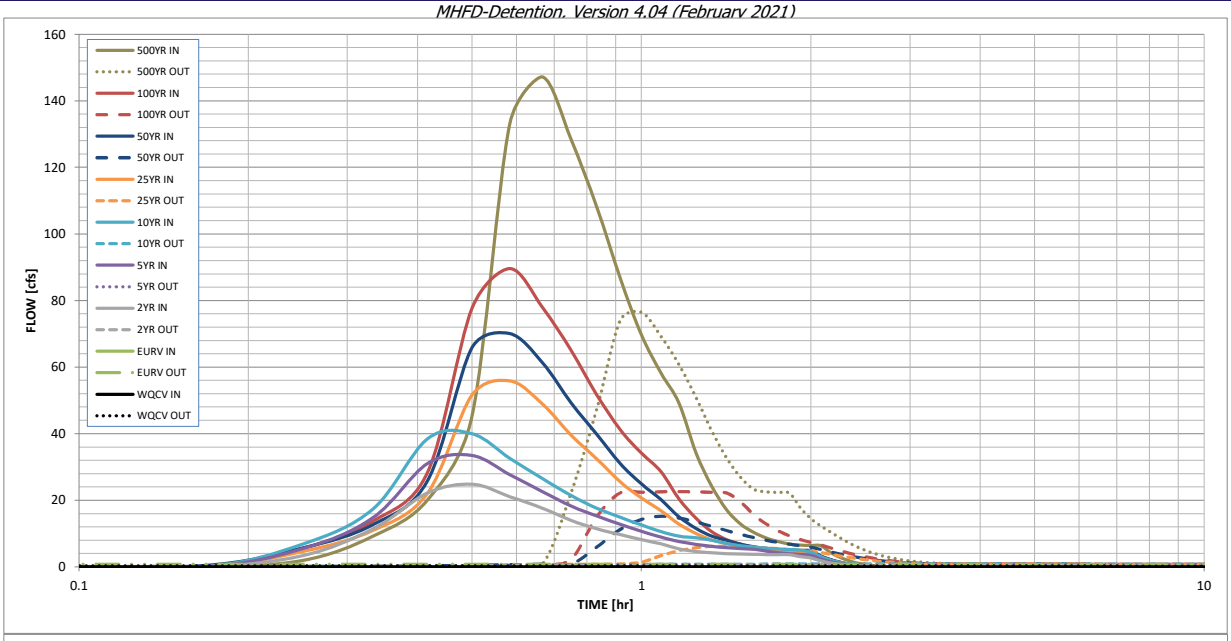
Routed Hydrograph Results

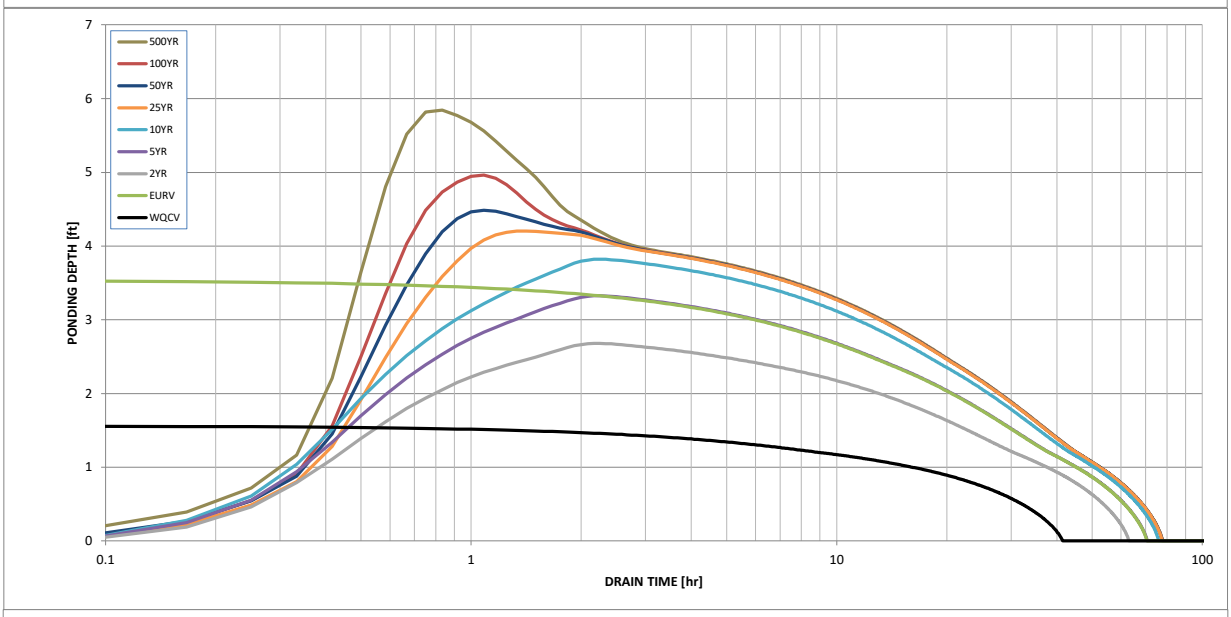
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

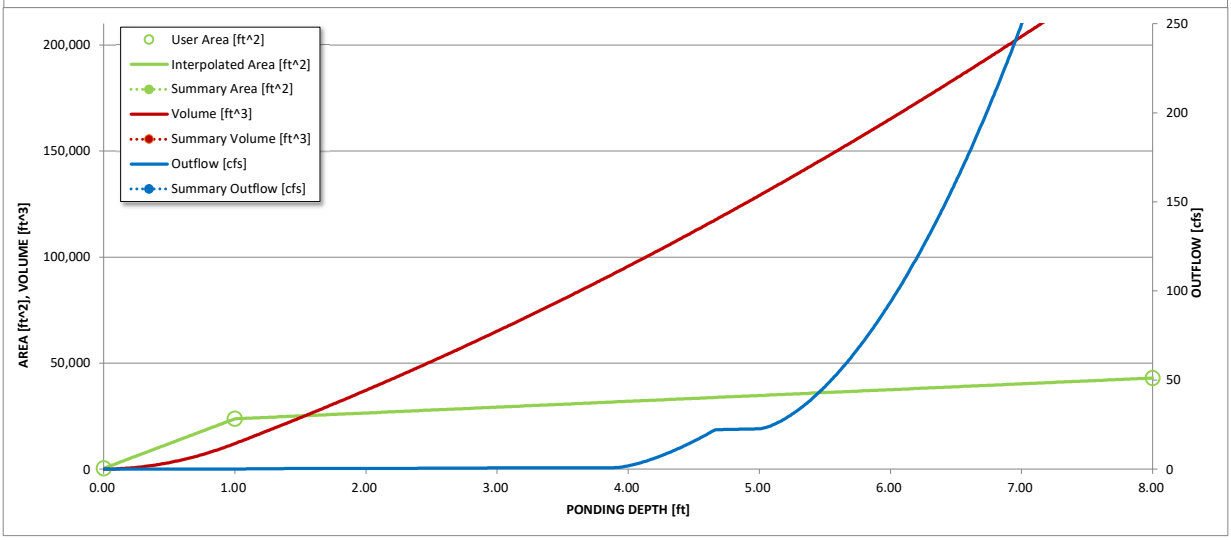
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.594	1.862	1.363	1.823	2.189	2.818	3.430	4.220	6.954
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.363	1.823	2.189	2.818	3.430	4.220	6.954
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	0.8	1.1	9.7	19.2	31.5	71.0
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	0.26	0.52	0.85	1.92
Peak Inflow Q (cfs) =	N/A	N/A	24.8	33.5	39.9	55.9	70.0	89.6	147.2
Peak Outflow Q (cfs) =	0.3	0.8	0.6	0.8	0.9	6.2	15.2	22.6	76.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.8	0.6	0.8	0.7	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.9	1.3	1.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	63	57	63	67	67	66	64	57
Time to Drain 99% of Inflow Volume (hours) =	**40**	67	60	67	72	73	72	72	69
Maximum Ponding Depth (ft) =	1.57	3.54	2.68	3.32	3.82	4.20	4.49	4.96	5.84
Area at Maximum Ponding Depth (acres) =	0.58	0.71	0.65	0.69	0.72	0.75	0.76	0.80	0.85
Maximum Volume Stored (acre-ft) =	0.598	1.865	1.275	1.712	2.065	2.345	2.556	2.931	3.655

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.04	1.93
	0:15:00	0.00	0.00	3.36	5.46	6.80	4.59	5.68	5.62	9.20
	0:20:00	0.00	0.00	11.41	14.77	17.39	10.96	12.73	13.76	20.13
	0:25:00	0.00	0.00	22.19	31.05	38.49	22.12	25.83	28.33	45.28
	0:30:00	0.00	0.00	24.85	33.49	39.94	51.59	65.81	77.69	133.04
	0:35:00	0.00	0.00	21.09	27.67	32.62	55.89	70.03	89.59	147.17
	0:40:00	0.00	0.00	17.62	22.61	26.50	48.90	61.37	77.97	128.29
	0:45:00	0.00	0.00	13.96	18.23	21.40	39.54	49.22	64.99	108.06
	0:50:00	0.00	0.00	11.42	15.28	17.60	32.41	39.77	51.65	86.76
	0:55:00	0.00	0.00	9.67	12.81	14.91	25.56	31.06	41.21	69.62
	1:00:00	0.00	0.00	8.16	10.69	12.56	20.66	24.88	34.17	58.19
	1:05:00	0.00	0.00	6.88	8.91	10.56	16.84	20.14	28.56	49.16
	1:10:00	0.00	0.00	5.42	7.63	9.19	12.83	15.04	20.39	34.25
	1:15:00	0.00	0.00	4.62	6.77	8.72	10.04	11.56	14.64	24.26
	1:20:00	0.00	0.00	4.23	6.15	8.01	8.11	9.25	10.58	17.22
	1:25:00	0.00	0.00	3.98	5.75	7.04	7.02	7.95	8.18	12.85
	1:30:00	0.00	0.00	3.85	5.48	6.37	6.02	6.80	6.80	10.34
	1:35:00	0.00	0.00	3.76	5.30	5.92	5.34	6.02	5.89	8.66
	1:40:00	0.00	0.00	3.69	4.70	5.60	4.94	5.56	5.29	7.57
	1:45:00	0.00	0.00	3.64	4.26	5.39	4.65	5.23	4.90	6.85
	1:50:00	0.00	0.00	3.62	3.96	5.24	4.47	5.02	4.70	6.51
	1:55:00	0.00	0.00	3.06	3.75	4.97	4.36	4.91	4.63	6.41
	2:00:00	0.00	0.00	2.65	3.48	4.46	4.30	4.84	4.60	6.37
	2:05:00	0.00	0.00	1.82	2.38	3.04	2.93	3.29	3.14	4.33
	2:10:00	0.00	0.00	1.20	1.58	2.03	1.96	2.19	2.09	2.87
	2:15:00	0.00	0.00	0.79	1.03	1.34	1.30	1.45	1.38	1.88
	2:20:00	0.00	0.00	0.49	0.65	0.85	0.82	0.91	0.87	1.17
	2:25:00	0.00	0.00	0.29	0.41	0.52	0.52	0.58	0.55	0.74
	2:30:00	0.00	0.00	0.15	0.24	0.29	0.30	0.33	0.31	0.41
	2:35:00	0.00	0.00	0.07	0.11	0.13	0.14	0.15	0.14	0.18
	2:40:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.05
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

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

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

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

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

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

DBPS Excerpts

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

0 0.5 1

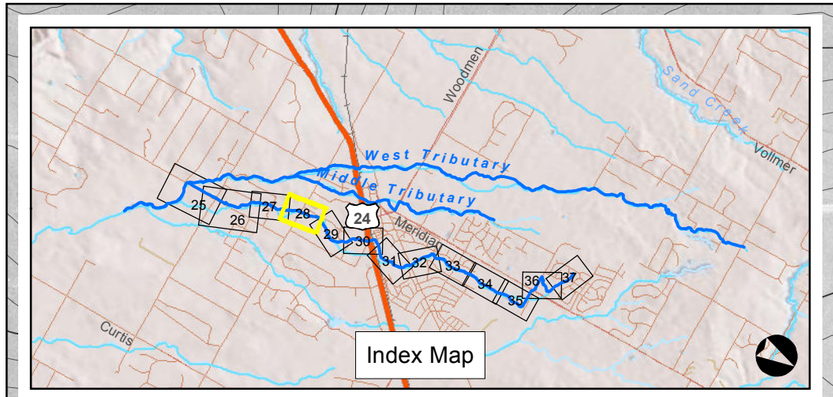
Miles

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20130617\Fig_6-1_selected_plan_20150925.mxd, 9/25/2015, jeff_clonts

Sheet 4-28

East Tributary Floodplain
Falcon DBPS
El Paso County, CO



Chief Rd
Falcon Hwy
Flow Diverted from East Tributary
8000
8200
8400
8600
8800
9000
9200
9400
9600
9800
7800
7600
7400
7200
7292
7692
8088
8268
8332
8488
8888
9292
9632

RAS Flow Chan Station	100-yr (Ex)	100-yr (Fut)
32631.8	150	200
31304.7	280	390
26646.3	460	580
23184.6	534	693
21057.8	489	585
19619.0	529	558
17786.6	490	480
15716.6	761	712
14440.0	370	390
14092.0	380	390
12092.0	410	440
9292.0	430	450
8087.7	590	680
5003.4	620	710
1984.9	620	710

Legend

- Approximate 100-yr Floodplain Existing
- Approximate 100-yr Floodplain Existing (Based on Assumed Split Flow Condition)
- Approximate 100-yr Floodplain Future
- Approximate 100-yr Floodplain Future (Based on Assumed Split Flow Condition)
- Shallow Flooding
- HEC-RAS Centerline
- XSCutLines (East Trib)
- FEMA Regulatory Floodplain (Effective as of 1999)*
- Study Limit

*Letters of Map Change completed after 1999 are not shown

N

0 100 200 400
Feet

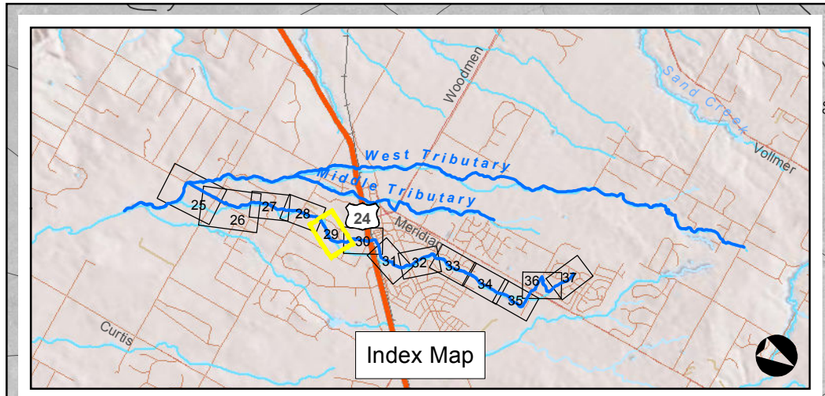
EL PASO COUNTY COLORADO EST. 1861

Matrix DESIGN GROUP

FILE: G:\gis_projects\Falcon_Creek_DBPStactive\apps\20111222\MapBook_FP_East_Trib.mxd, 12/22/2011, wilson_wheeler

Sheet 4-29

East Tributary Floodplain
Falcon DBPS
El Paso County, CO



Flow Diverted
from East Tributary

Chief Rd

Pinto Pony Rd

9692
9800
10000
10200
10400
10600
10800
11000
11200
11600
11800
12000
12200
12396
12457
12800
10092
10492
10892
11146
11425
11517
11552
11692
12092

RAS Flow Chan Station	100-yr (Ex)	100-yr (Fut)
32631.8	150	200
31304.7	280	390
26646.3	460	580
23184.6	534	693
21057.8	489	585
19619.0	529	558
17786.6	490	480
15716.6	761	712
14440.0	370	390
14092.0	380	390
12092.0	410	440
9292.0	430	450
8087.7	590	680
5003.4	620	710
1984.9	620	710

Legend

- Approximate 100-yr Floodplain Existing
- Approximate 100-yr Floodplain Existing (Based on Assumed Split Flow Condition)
- Approximate 100-yr Floodplain Future
- Approximate 100-yr Floodplain Future (Based on Assumed Split Flow Condition)
- Shallow Flooding
- HEC-RAS Centerline
- XSCutLines (East Trib)
- FEMA Regulatory Floodplain (Effective as of 1999)*
- Study Limit

*Letters of Map Change completed after 1999 are not shown

N

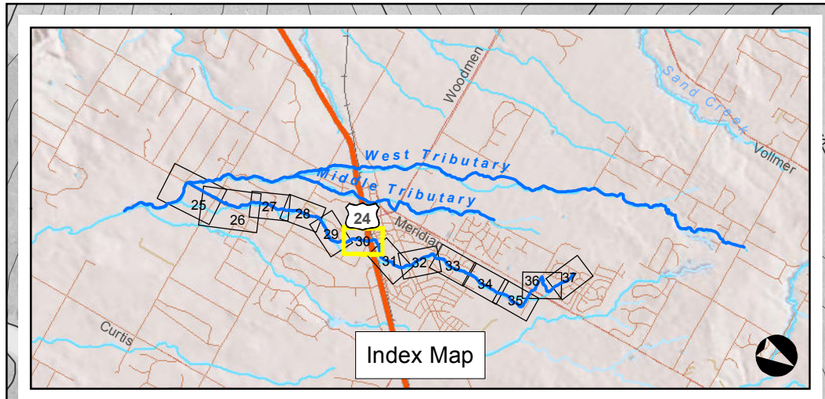
0 100 200 400

Feet

EL PASO COUNTY COLORADO EST. 1861

Matrix DESIGN GROUP

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20111222\MapBook_FP_East_Trib.mxd, 12/22/2011, wilson_wheeler



RAS Flow Chan Station	100-yr (Ex)	100-yr (Fut)
32631.8	150	200
31304.7	280	390
26646.3	460	580
23184.6	534	693
21057.8	489	585
19619.0	529	558
17786.6	490	480
15716.6	761	712
14440.0	370	390
14092.0	380	390
12092.0	410	440
9292.0	430	450
8087.7	590	680
5003.4	620	710
1984.9	620	710

Sheet 4-30

East Tributary Floodplain
Falcon DBPS
El Paso County, CO

Legend

- Approximate 100-yr Floodplain Existing
- Approximate 100-yr Floodplain Existing (Based on Assumed Split Flow Condition)
- Approximate 100-yr Floodplain Future
- Approximate 100-yr Floodplain Future (Based on Assumed Split Flow Condition)
- Shallow Flooding
- HEC-RAS Centerline
- XSCutLines (East Trib)
- FEMA Regulatory Floodplain (Effective as of 1999)*
- Study Limit

*Letters of Map Change completed after 1999 are not shown

N

0 100 200 400
Feet

EL PASO COUNTY COLORADO EST. 1861

Matrix DESIGN GROUP

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20111222\MapBook_FP_East_Trib.mxd, 12/22/2011, wilson_wheeler

CLOMR Excerpts

REQUEST FOR CONDITIONAL LETTER OF MAP REVISION
UNNAMED TRIBUTARY TO BLACK SQUIRREL CREEK
FALCON OWL PLACE

1.0 INTRODUCTION

1.1 Background

The following report and supporting documentation are being submitted to FEMA for the purpose of requesting a Conditional Letter of Map Revision (CLOMR) for a portion of the Unnamed Tributary to Black Squirrel Creek (UTBSC) in El Paso County, Colorado.

The Falcon Owl Place consists of approximately 4.6 acres at the southwest corner of Owl Place and Meridian Road as shown in **Figure 1**. The property currently has an address of 11745 Owl Place, and is currently known as Lot 15 of the Falcon Ranchettes. The East Branch of the UTBSC flows southwest across the property and is proposed to be contained within a 10'x6' box culvert that will discharge into the Subregional Pond SR4 recently constructed on the Falcon Marketplace property. A general site layout of the Falcon Owl Place development is shown in the construction drawings included in **Appendix 1**.

The improvements associated with Falcon Owl Place are in general conformance with the Falcon Basin, Drainage Basin Planning Study (Falcon DBPS), prepared by El Paso County in 2015. The hydrologic analysis completed for the Falcon DBPS was used as the basis for the current CLOMR.

The Effective FEMA Flood Insurance Rate Map (FIRM) Number 08041C0553G in **Appendix 7** shows the East Branch of the UTBSC 100-year Zone A floodplain across the western portion of the Owl Place site. This report presents hydrologic and hydraulic study results showing that the proposed 100-year floodplain will be confined within a piped storm drain system (10'x 6' box culvert).

It is the Owner/Developer's intent to comply with all floodplain regulations.

1.2 General Location and Project Description

This CLOMR is limited to the 4.6-acre parcel located at the southwest corner of Owl Place and Meridian Road, SE 1/4 of the SE 1/4 of Section 1, Township 13 S, Range 65 W of the 6th P.M., El Paso County, Colorado. The subject property will be developed with a multi-pad shopping center (Falcon Owl Place).

The Falcon Owl Place development includes regrading the site and rerouting the East Branch of the UTBSC across the site. Approximately 1022 feet of the creek will be impacted by the development, which intercepts the existing creek north of Owl Place and conveys it via a 10'x6' box culvert to an off-site subregional detention pond (SR4). The box culvert is designed to convey the full 100-year discharge.

Figure 1 – Vicinity Map

1.3 Regulatory Floodplain

The Effective Zone A limits for the East Branch of the UTBSC on the Falcon Owl Place site are defined on Map Number 8041C0553G dated December 7, 2018. No flow rates, floodway data or flood profiles were defined for this section of UTBSC in the effective FIS for El Paso County, Colorado, Revised December 7, 2018.

2.0 PREVIOUS STUDIES

El Paso County completed hydrologic and hydraulic analyses summarized in a report titled Falcon Basin, Drainage Basin Planning Study, Selected Plan Report, Final, September 2015 (Falcon DBPS). The Falcon DBPS encompasses three unnamed tributaries to Black Squirrel Creek, including the "Middle Tributary" which flows across the subject property. Select output from the Falcon DBPS is included in **Appendix 3**.

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)

5.0 NFIP REGULATION COMPLIANCE

5.1 Floodplain Work Map and Annotated FIRM

The effective Zone AE 100-year floodplain delineation for the UTBSC terminates at the boundary between the Falcon Marketplace and Falcon Owl Place properties and represents flows from both West and East branches. No changes are proposed to the Zone AE floodplain. The 100-year flood discharge for the East Branch is contained in the proposed culvert. Therefore, the Zone A floodplain for this branch has been removed, and the split between the Zone A floodplains for the West and East branches is denoted in the Annotated FIRM. The effective and proposed UTBSC floodplains are delineated on the Floodplain Work Map and Annotated FIRM in **Appendix 7**.

5.2 Forms and Notifications

The appropriate FEMA forms are located in **Appendix 6**. Modifications to 100-year floodplain elevations and delineations are limited to the Falcon Owl Place development. Furthermore, there are no proposed increases to the BFE's or floodplain extents. Therefore, individual legal notices are not required for this CLOMR submittal.

5.3 Compliance with Section 65.12

Although there are no increases to BFE's due to the proposed project, an alternatives evaluation was performed to evaluate options for closed conduit and open channel conveyance of the East Branch of the UTBSC. The alternatives evaluation can be provided upon request.

Furthermore, no structures are located in areas that would be impacted by the floodplain modifications proposed by this CLOMR.

5.4 Endangered Species Act (ESA)

ESA Compliance information is provided in **Appendix 8**.

6.0 CONCLUSIONS

The Falcon Owl Place development will relocate a portion of the East Branch of an Unnamed Tributary of Black Squirrel Creek (Middle Tributary). This report and supporting documentation are being submitted to FEMA for the purpose of requesting a CLOMR to conditionally change the floodplain in accordance with NFIP regulations.

7.0 REFERENCES

City of Colorado Springs/El Paso County, *Drainage Criteria Manual*, Revised January 2021.

FEMA, *FIRM Number 08041C0553G, El Paso County, Colorado and Incorporated Areas,* Revised December 7, 2018.

FEMA, *FIS Number 08041CV001A, El Paso County, Colorado and Incorporated Areas,* Revised December 7, 2018.

Hydraflow Storm Sewers Extension for Autodesk Civil 3D, Version 12.

Matrix Design Group, *Falcon Drainage Basin Planning Study, Selected Plan Report, Final,* September 2015.

Olsson, *ALTA Survey for Lot 15, Falcon Ranchettes*, September 30, 2021.

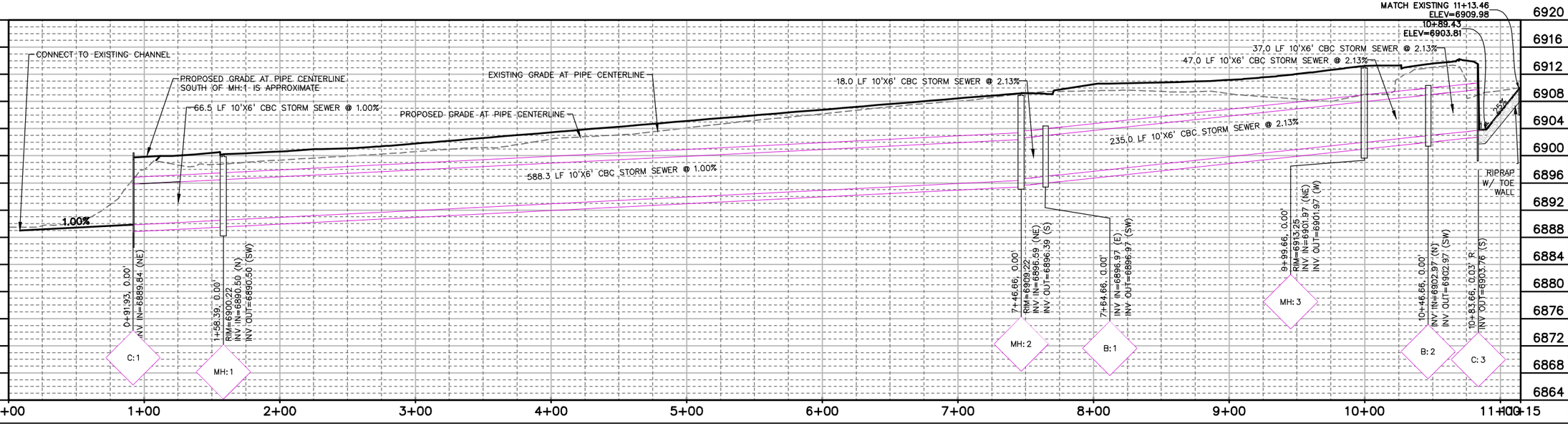
USACE, *Hydraulic Modeling System (HEC-HMS), Version 4.7.1, Build 11161,* January 14, 2021.

APPENDICES

APPENDIX 1

CONSTRUCTION DRAWINGS

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:

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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

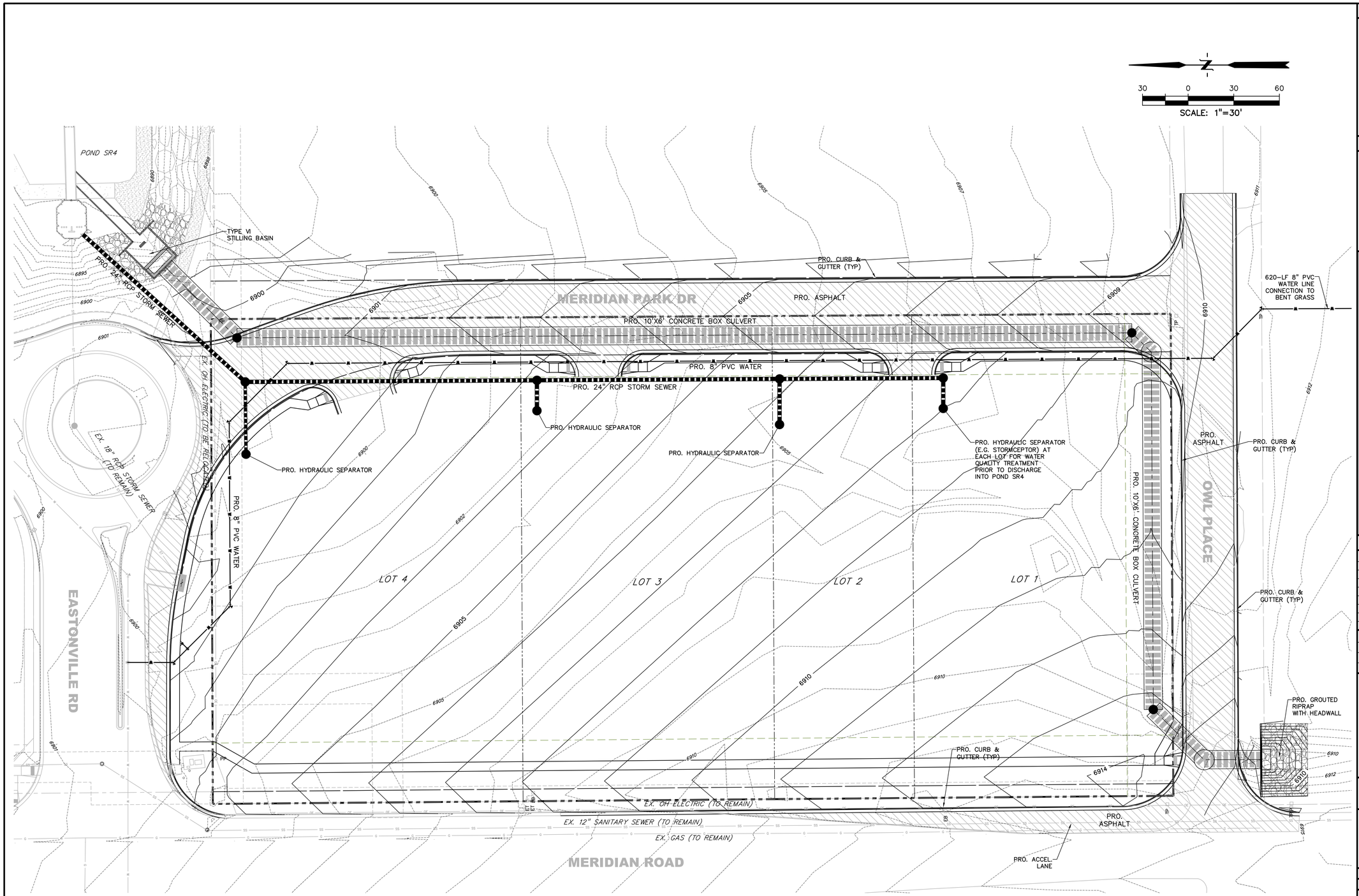
NOT FOR CONSTRUCTION

DRAWING SCALE:
HORIZONTAL: SEE PLAN
VERTICAL: SEE PLAN

PIPE SYSTEM EXHIBIT

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

H:\21611-00BLWR\Plans\Sheets\EX01.dwg, 10/14/2022 7:46:58 AM



PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

CONSTRUCTION PLANS FOR:

FALCON OWL PLACE

FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/14/22

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	21611-SP

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 30'
VERTICAL: N/A

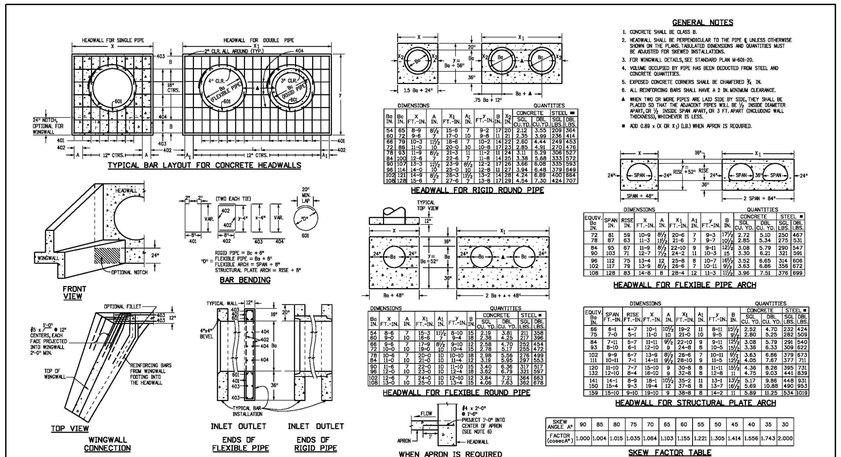
PRELIMINARY SITE PLAN

PROJECT NO. 21611-01CSCV

DRAWING NO.

SP

SHEET: 1 OF 1



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Last Modification Date: 07/04/12	Initials: LTA
Full Path:www.coloradodot.info/business/designsupport	
Drawing File Name: 60101001.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

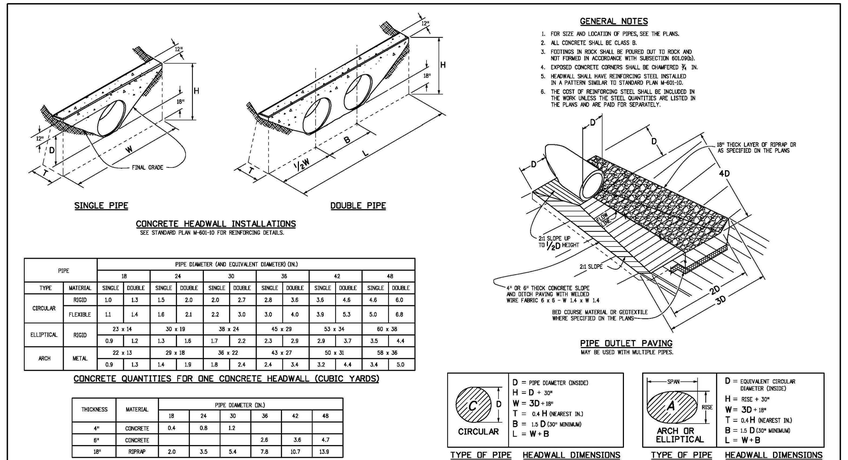
Sheet Revisions	
Dates	Comments

Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-9083
Fax: (303) 757-9820
Project Development Branch DD/LTA

HEADWALL FOR PIPES

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-601-10
Sheet No. 1 of 1



PIPE		PIPE DIAMETER (AND EQUIVALENT DIAMETERS) (IN.)									
		18		24		30		36		42	48
TYPE	MATERIAL	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE
CIRCULAR	RIGID	1.0	1.3	1.5	2.0	2.0	2.7	2.8	3.6	3.6	4.6	4.6	6.0
	FLEXIBLE	1.1	1.4	1.6	2.1	2.2	3.0	3.0	4.0	3.9	5.3	5.0	6.8
ELLIPTICAL	RIGID	23 x 14		30 x 19		38 x 24		45 x 29		53 x 34		60 x 38	
ARCH	METAL	22 x 13		29 x 18		36 x 22		43 x 27		50 x 30		58 x 36	
		0.9	1.2	1.3	1.8	1.7	2.2	2.3	2.9	2.9	3.7	3.5	4.4
		0.9	1.3	1.4	1.8	1.8	2.4	2.4	3.4	3.2	4.4	3.6	5.0

THICKNESS	MATERIAL	PIPE DIAMETER (IN.)					
		18	24	30	36	42	48
4"	CONCRETE	0.4	0.8	1.2			
6"	CONCRETE				2.8	3.6	4.7
18"	RIPRAP	2.0	3.5	5.4	7.8	10.7	13.9

Computer File Information	
Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/04/12	Initials: LTA
Full Path:www.coloradodot.info/business/designsupport	
Drawing File Name: 60101201.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

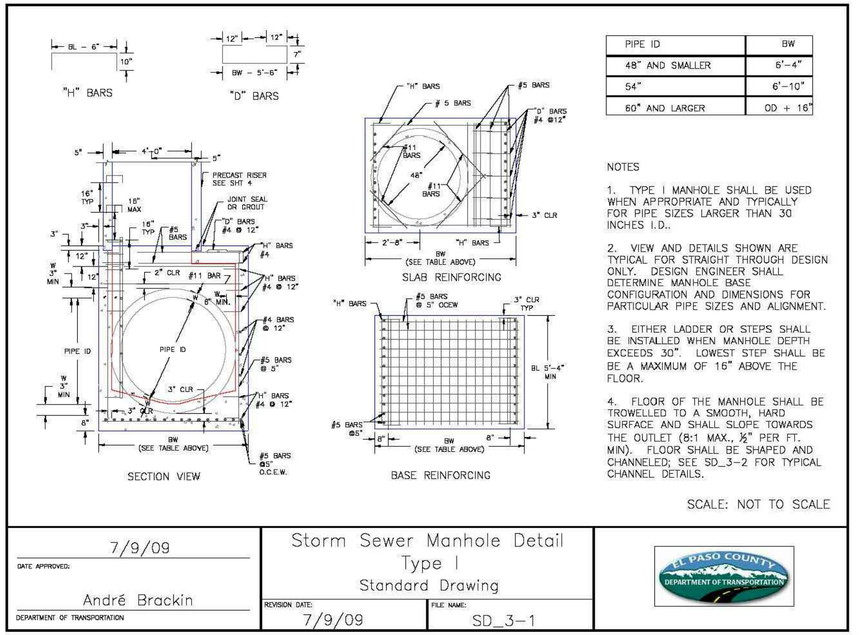
Sheet Revisions	
Dates	Comments

Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-9083
Fax: (303) 757-9820
Project Development Branch DD/LTA

HEADWALLS AND PIPE OUTLET PAVING

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-601-12
Sheet No. 1 of 1

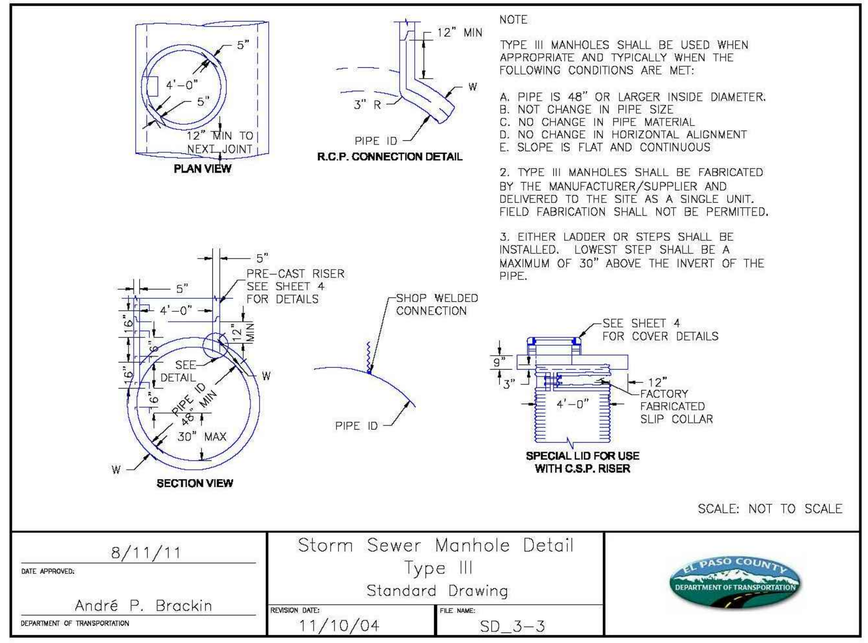


PIPE ID	BW
48" AND SMALLER	5'-4"
54"	6'-10"
60" AND LARGER	OD + 16"

7/9/09
DATE APPROVED:
André Brackin
DEPARTMENT OF TRANSPORTATION

Storm Sewer Manhole Detail Type I Standard Drawing

REVISION DATE: 7/9/09
FILE NAME: SD_3-1



8/11/11
DATE APPROVED:
André P. Brackin
DEPARTMENT OF TRANSPORTATION

Storm Sewer Manhole Detail Type III Standard Drawing

REVISION DATE: 11/10/04
FILE NAME: SD_3-3

PREPARED BY:

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(719)260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

CONSTRUCTION PLANS FOR:

FALCON OWL PLACE

FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/14/22

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	21611-STDT

NOT FOR CONSTRUCTION

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 10'
VERTICAL: N/A

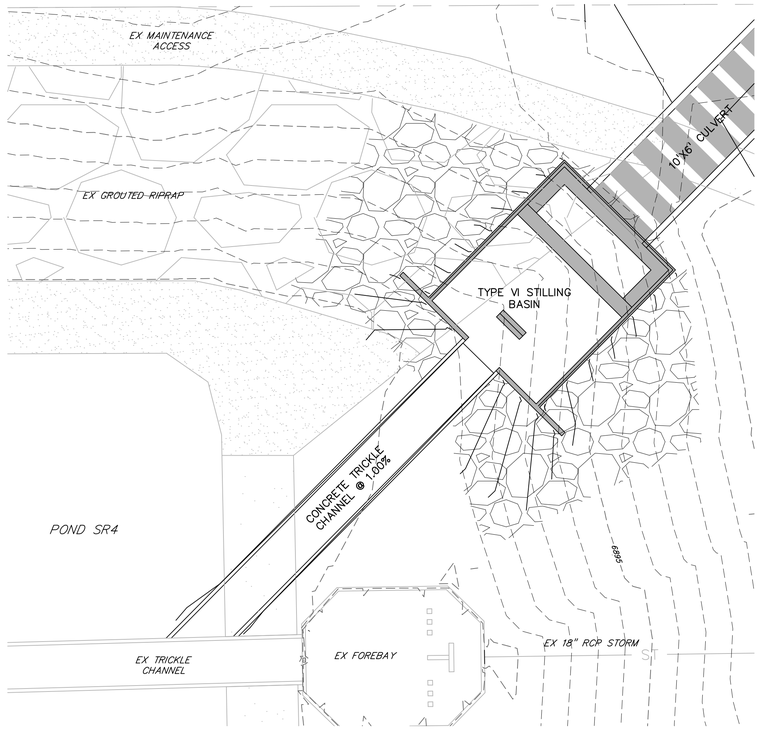
PRELIMINARY STORM CULVERT DETAILS

PROJECT NO. 21611-01CSCV

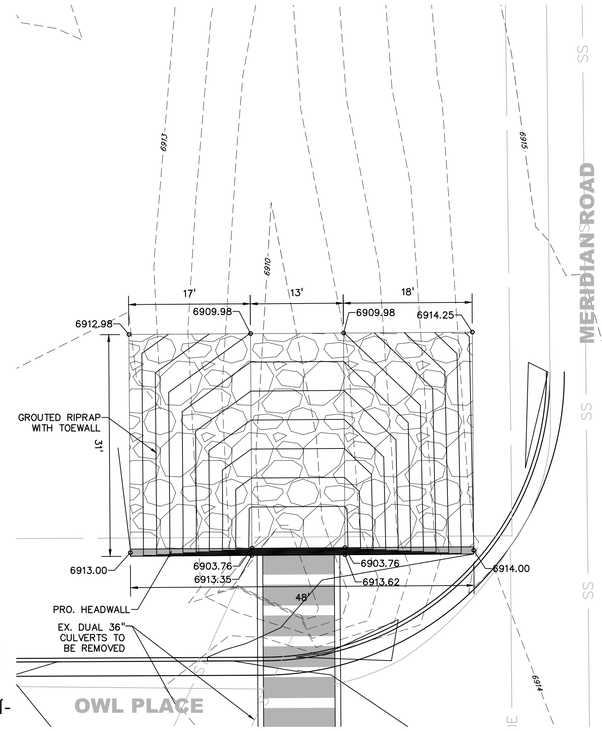
DRAWING NO.

DT1

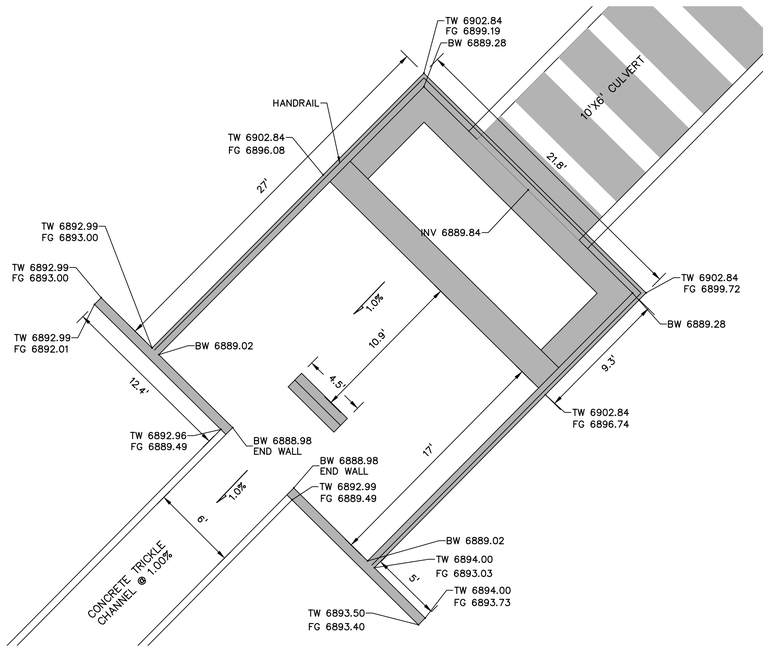
SHEET: 1 OF 2



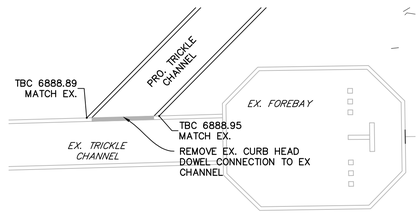
10'X6' CULVERT OUTLET
SCALE: 1"=10'



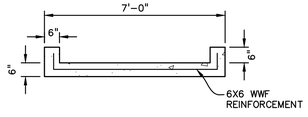
10'X6' CULVERT INLET
SCALE: 1"=10'



STILLING BASIN DETAIL
SCALE: 1"=5'



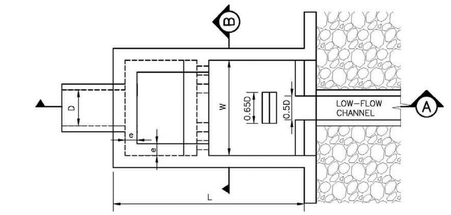
TRICKLE CHANNEL CONNECTION
NO SCALE



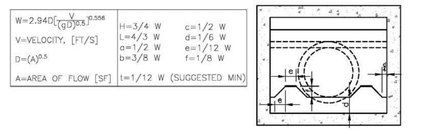
CONCRETE TRICKLE CHANNEL SECTION
NO SCALE

NOTES:

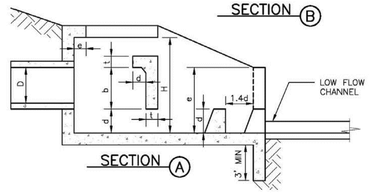
1. ALL ELEVATIONS ARE REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29)



PLAN VIEW



SECTION B



SECTION A

Figure 9-45. UDFCD modified USBR type VI impacts stilling basin (general design dimensions)

PREPARED BY:
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(719)260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

CONSTRUCTION PLANS FOR:

FALCON OWL PLACE

FALCON, COLORADO

ISSUE	DATE
EXHIBIT	10/14/22

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	21611-STDT

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 10'
VERTICAL: N/A

PRELIMINARY STORM CULVERT DETAILS

PROJECT NO. 21611-01CSCV

DRAWING NO.

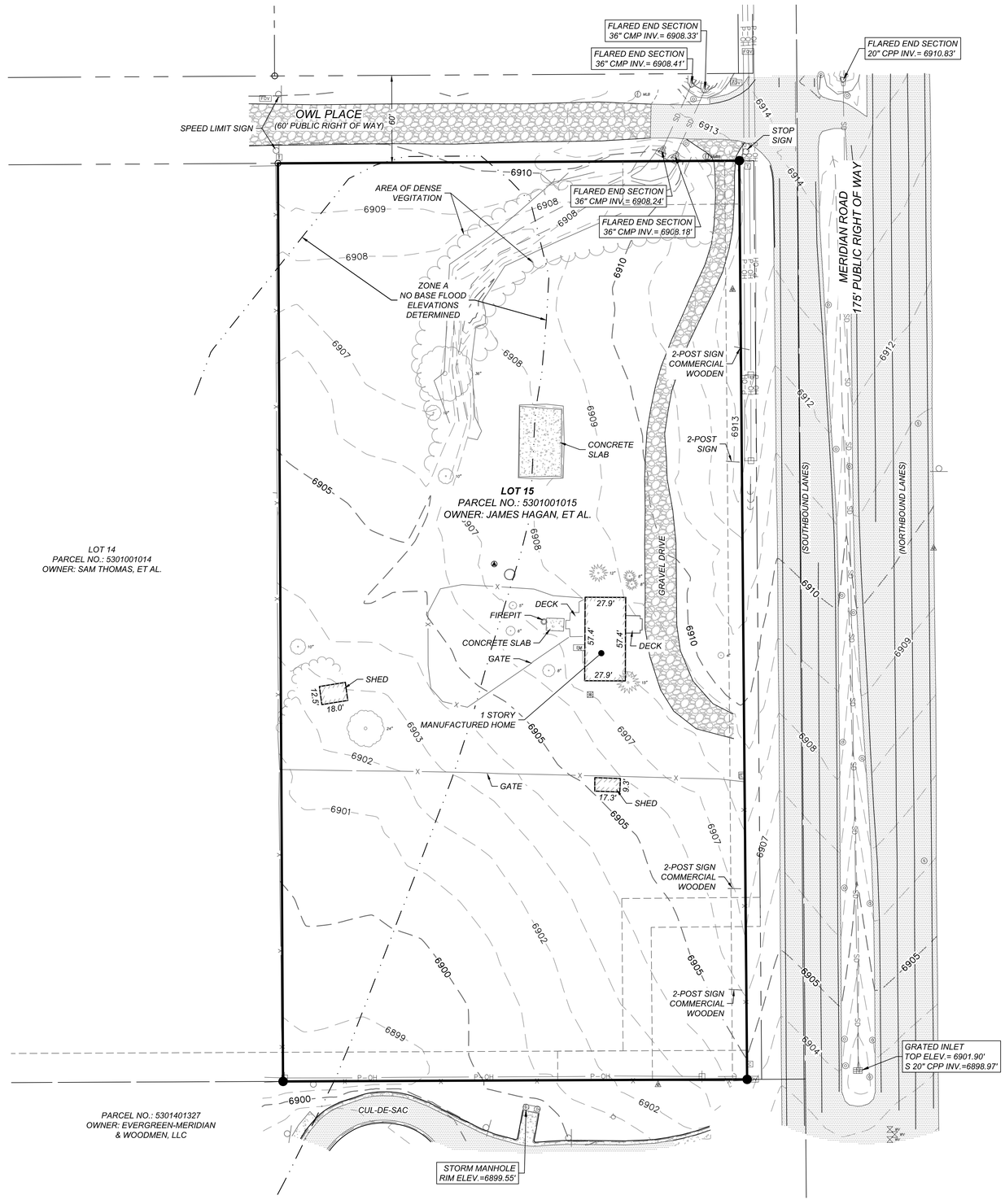
DT2

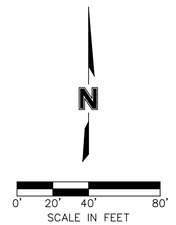
SHEET: 2 OF 2

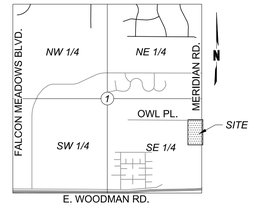
ALTA / NSPS Survey

LOT 15, FALCON RANCHETTES

Part of the Southeast Quarter of Section 1, Township 13 South, Range 65 West of the 6th Principal Meridian
Located in the Town of Falcon, County of El Paso, Colorado







SECTION MAP
SECTION 1-T13S-R65W of the Sixth Principal Meridian
-Not To Scale-

LEGEND

- Control Point (As-Described)
- Found Monument
- Section Corner
- Bollard
- Electric Meter
- Electric Transformer
- Fiber-Optic Vault
- Fiber-Optic Valve
- Guy Wire
- Mailbox
- Power Pole
- Reflector Post
- Sanitary Manhole
- Storm Manhole
- Single Support Sign
- Telephone Pedestal
- Water Manhole
- Water Valve
- Storm Drain Pipe (As-Described)
- Right-of-Way Line
- Parcel Line
- Easement Line
- Underground Gas
- Overhead Power
- Barbed-Wire Fence
- Chain Link Fence
- Wrought Iron Fence

olsson
1525 Raleigh Street
Suite 400
Denver, CO 80204
TEL 303.237.2072
www.olsson.com

OLSSON ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS (HORIZONTAL OR VERTICAL). THE EXISTING UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS HOWEVER THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES.

811 Know what's below. Call before you dig.
CALL 811 SEVENTY-TWO HOURS PRIOR TO DIGGING, GRADING OR EXCAVATING FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

ALTA / NSPS LAND TITLE SURVEY
JB Partners CS, LLC

PROJECT TITLE
PHASE OR ADDITION

FALCON, COLORADO

2021

drawn by:	DMW
checked by:	EJD
approved by:	EJD
QA/QC by:	EJD
project no.:	021-06643
drawing no.:	V_XALT_02106643
date:	09.29.2021

COLORADO LICENSED
ELI J. DONALDSON
38755
PROFESSIONAL LAND SURVEYOR

SHEET
3 of 3

DWG: F:\2021\06501-07000\021-06643\40-Design\Survey\SRVY\Sheets\V_XALT_02106643.dwg USER: edonaldson
DATE: Oct 01, 2021 12:03pm XREFS: V_XTOPO_02106643 V_XBNDY_02106643

APPENDIX 2

FEMA COMMENT RESPONSES

DBC
Drexel, Barrell & Co.
Traditional Services, Innovative Solutions Since 1949

1376 Miners Dr., Suite 107 • Lafayette, CO 80026 • 303.442.4338 • 303.442.4373 fax
3 South 7th St. • Colorado Springs, CO 80905 • 719-260-0887 • 719-260-8352 fax

October 17, 2022

Subject: Falcon Owl Place CLOMR Application, Case No. 22-08-0669R
Response to FEMA A.D. Request dated August 19, 2022

Dear Ms. Duran:

Drexel, Barrell & Co. (DBC) received a letter from FEMA and CWCB on August 19, 2022 which provides comments on the ***Falcon Owl Place CLOMR***, originally submitted on June 27, 2022. CDM/CWCB evaluated the submittal and requires corrections and additional data within 90 days. The comments are summarized below, followed by DBC responses in ***bold italics***.

1. Our review of the submitted proposed conditions HEC-HMS hydrologic analysis revealed the following issues. Please submit a revised hydrologic analysis that corrects these issues.
    a. Please submit a duplicate effective model of the effective hydrologic analysis completed with LOMR 21-08-0534P. Please do not truncate this model when making revisions. Please add the proposed subbasin and junctions upstream of Pond SR4 in the proposed condition HEC-HMS model.

The effective hydrologic analysis was performed in an outdated version of HEC-HMS (3.5), and it is not feasible or practical to revise this version. For this reason, a duplicate effective (DE) model was recreated in a newer version of HEC-HMS (4.7.1), and a comparison was provided between effective and duplicate effective model results. The prior effective model in version 3.5 has been submitted for reference. The existing conditions DE basin model was revised to keep the effective junction locations, and a new junction was added for proposed conditions.

    b. Our review revealed that the basins in the HEC-HMS hydrologic model were not given descriptive names and it is difficult to determine which basin should be reviewed. For the basins, please use descriptive names such as “Existing Conditions” and “Proposed Conditions”.

The basin names have been revised to existing and proposed.

    c. Our review of the certified drainage area map revealed that the sub basins do not appear to be supported by the topographic contours included. Please provide a revised drainage area map that clearly follows contours and is smooth.

The topographic contours provide a general direction of surface flow. However, there are streets, culverts, and storm drainage infrastructure that informed the proposed basin delineation (in addition to the contours). In addition, the existing basin delineation for MT060 was taken from the Falcon DBPS. Notes have been added to the DA map for clarity.

    d. Our review of your submittal revealed that backup information for the parameters in the hydrologic model was not provided. This information includes curve number calculations for the new subbasin. Please provide this information to support the hydrologic analysis.

The CN value of 66 for Basin MT060 used in the effective model was used for both existing and proposed conditions. More supporting soils and land use information for this value has been provided.

2. Our review of the submitted existing conditions HY-8 hydraulic analysis for the Owl Place culvert revealed the following issues. Please submit a revised analysis that corrects the following.
    a. Please adjust the model to calculate results for a design flow of 920 cubic feet per second (cfs).

The HY-8 model was adjusted to include the design flow of 920 cfs.

    b. Please provide supporting documentation verifying that the overtopped flow from the Owl Place culvert is fully captured in the proposed junction box. If it is determined that the flood waters are not captured in the junction box, please provide a floodplain analysis and subsequent floodplain delineation that follows the corresponding flow path. The modeling of the Owl Place culvert in the submitted existing conditions HY-8 model does not agree with the submitted as-built drawings for the culvert. Our review revealed the culvert length shown on the submitted proposed plans entitled, “Pipe System Exhibit,” prepared by Drexel, Barrel

& Co., dated June 2022, is 47.2 feet, but the HY-8 models the Outlet Station is 50 feet. Please adjust the outlet station to be consistent with the as-built plans.

The culvert was extended further upstream under Owl Place to ensure that the floodplain is contained through the crossing and within the roadside ditch along Meridian Drive.

c. Please show the vertical datum, North American Vertical Datum of 1988 (NAVD88), in the description box of the HY-8 model or provide a statement certifying the datum of this model.

The vertical datum was added to the HY-8 model.

3. Our review revealed that the hydraulic model submitted is not a FEMA accepted model. Please refer to the attached, "Numerical Models Meeting the Minimum Requirements of National Flood Insurance Program," and submit a hydraulic analysis using one of these approaches. Also, please submit any backup information required for the modeling. Please submit an existing and proposed conditions hydraulic model so that the project impacts can be determine.

There is no existing pipe system. The proposed pipe system was modeled in StormCAD.

4. Our review of the submitted certified topographic work map entitled, "CLOMR Floodplain Work Map," prepared by Drexel, Barrel & Co., dated May 2022, revealed the following issues. Please submit a revised work map that has been certified by a Professional Engineer registered in the State of Colorado (P.E.).
   a. Our review revealed the proposed floodplain boundary does not follow contours. Please show smooth graphical tie-ins between the proposed and effective flood hazard boundary delineations at the upstream end of the revised reach. Please ensure that the proposed delineations tie-in directly to the effective delineations and follow the proposed conditions topographic contours. Please ensure enough contours are provided to verify the placement of the proposed floodplain delineation.

Contours have been added to the work map for clarity.

   b. Please remove the historic effective floodplain delineation, labeled "Effective 100-YR Floodplain", and only show the currently effective delineation from LOMR 21-08-0534P.

The historic floodplain has been removed.

   c. Please show the proposed topographic contours in a different color than the existing contours and show how the proposed contours tie-in with the existing.

The proposed topographic contours were added to the work map and differentiated from the existing contours by line type.

   d. Please submit a revised work map that has been certified by a registered P.E.

The revised work map is provided and stamped.

5. To assist our review and to expedite processing of this request, please provide digital Computer-Aided Design (CAD) or Geographic Information System (GIS) data that reflect the revised topographic work map. Please ensure the digital data are spatially referenced and cite what projection (coordinate system, example: UTM/State Plane) was used, so that the data may be used for accurate mapping. The important data to show on the digital work map are the contour information, the stream centerline, the road crossings and hydraulic structures, the effective and proposed flood hazard delineations and the tie-in locations. Everything should be clearly labeled, and all information should be contained within the drawing and not externally referenced.

The digital CAD data is provided.

6. Based on any changes to the certified work map due to the resolution of the items above, please submit an updated annotated Flood Insurance Rate Map (FIRM) on the FIRM panel 08041C0553G revised by effective LOMR 21-08-0534P. Please ensure that the annotated FIRMs show graphical tie-ins at the upstream and downstream extents of the revision reach and reflect any changes that result from resolving comments above. Please include the title block of the FIRM on the exhibit

The updated annotated FIRM is provided.

Please contact us with any questions or matters needing clarification.

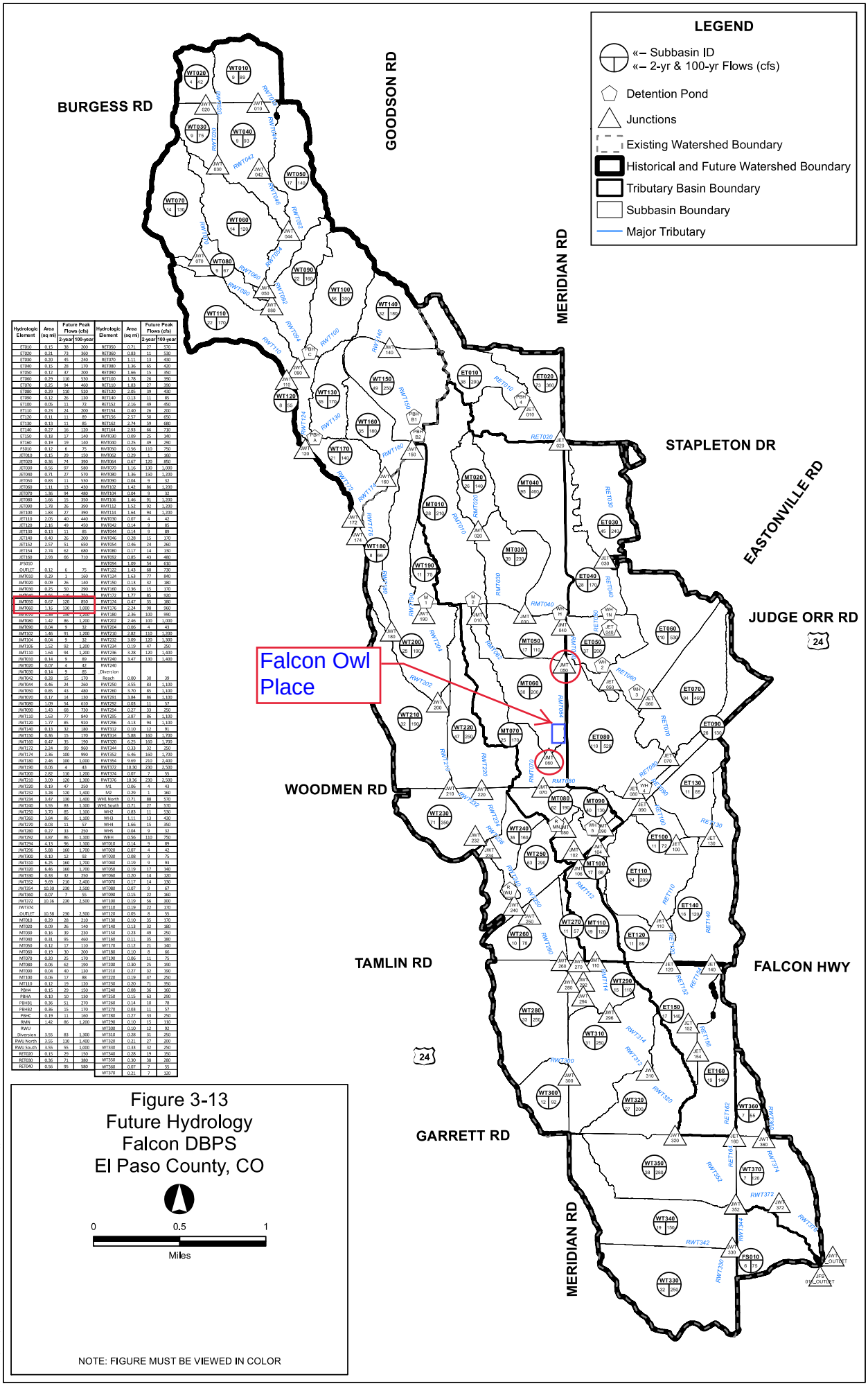
Sincerely,
Drexel, Barrell & Co.

Michelle Iblings

Michelle Iblings, P.E., CFM
Associate, Water Resources Group Leader

APPENDIX 3

FALCON DBPS



Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) 2-year	Future Peak Flows (cfs) 100-year	Hydrologic Element	Area (sq mi)	Future Peak Flows (cfs) 2-year	Future Peak Flows (cfs) 100-year
ET010	0.15	38	200	RET050	0.71	27	570
ET020	0.21	73	360	RET060	0.83	11	530
ET030	0.20	45	240	RET070	1.13	19	430
ET040	0.15	28	170	RET080	1.36	65	420
ET050	0.12	37	200	RET090	1.66	15	350
ET060	0.29	110	530	RET100	1.78	26	390
ET070	0.25	94	460	RET110	1.83	27	390
ET080	0.29	110	520	RET120	2.05	39	430
ET090	0.12	26	130	RET140	0.13	11	85
ET100	0.05	11	72	RET152	2.16	65	450
ET110	0.23	24	200	RET154	0.40	26	200
ET120	0.11	11	89	RET156	2.57	50	650
ET130	0.13	11	85	RET162	2.74	59	680
ET140	0.27	16	120	RET164	2.93	66	710
ET150	0.18	17	140	RMT030	0.09	25	140
ET160	0.19	19	140	RMT040	0.25	69	290
FS010	0.12	6	75	RMT050	0.56	110	750
JET010	0.35	29	160	RMT062	0.29	5	160
JET020	0.36	74	390	RMT064	0.67	120	850
JET030	0.56	97	580	RMT070	1.16	130	1,000
JET040	0.71	27	570	RMT080	1.36	150	1,200
JET050	0.83	11	530	RMT090	0.04	9	32
JET060	1.11	13	430	RMT102	1.42	86	1,200
JET070	1.36	94	480	RMT104	0.04	4	32
JET080	1.66	15	350	RMT106	1.46	91	1,200
JET090	1.78	26	390	RMT112	1.52	92	1,200
JET100	1.83	27	350	RMT114	1.64	94	1,200
JET110	2.05	40	440	RMT030	0.07	4	42
JET120	2.16	49	450	RWT042	0.14	9	85
JET130	0.13	11	85	RWT044	0.14	9	89
JET140	0.40	26	200	RWT046	0.28	15	170
JET152	2.57	51	650	RWT054	0.46	24	260
JET154	2.74	62	680	RWT080	0.17	14	130
JET160	2.93	66	710	RWT092	0.85	43	480
JFS010				RWT094	1.09	54	610
OUTLET	0.12	6	75	RWT122	1.43	68	730
JMT010	0.29	1	160	RWT124	1.63	77	840
JMT020	0.09	26	140	RWT150	0.13	32	180
JMT030	0.25	50	290	RWT160	0.36	15	170
JMT040	0.56	110	360	RWT172	1.77	85	920
JMT050	0.67	120	850	RWT174	0.47	35	180
JMT060	1.16	130	1,000	RWT176	2.24	98	960
JMT070	1.39	150	1,200	RWT180	2.36	100	990
JMT080	1.42	86	1,200	RWT202	2.46	100	1,000
JMT090	0.04	9	32	RWT204	0.06	4	43
JMT102	1.46	91	1,200	RWT210	2.82	110	1,200
JMT104	0.04	9	32	RWT232	3.09	120	1,300
JMT106	1.52	92	1,200	RWT234	0.19	47	250
JMT110	1.64	94	1,200	RWT236	3.28	120	1,400
JWT010	0.14	9	89	RWT240	3.47	130	1,400
JWT020	0.07	4	42	Diversion			
JWT030	0.14	9	85	Reach	0.00	30	39
JWT042	0.28	15	170	RWT250	3.55	83	1,100
JWT044	0.46	24	260	RWT260	3.70	85	1,100
JWT050	0.85	43	480	RWT291	3.84	86	1,100
JWT070	0.17	14	130	RWT292	0.03	11	57
JWT080	1.09	54	610	RWT294	0.27	33	250
JWT090	1.43	68	730	RWT295	3.87	86	1,100
JWT110	1.63	77	840	RWT296	4.13	94	1,100
JWT120	1.77	85	920	RWT312	0.10	12	91
JWT140	0.13	32	180	RWT314	5.88	160	1,700
JWT150	0.96	15	170	RWT320	6.25	160	1,700
JWT160	0.47	35	190	RWT344	0.33	32	250
JWT172	2.24	99	960	RWT352	6.46	160	1,700
JWT174	2.36	100	990	RWT354	9.69	210	2,400
JWT180	2.46	100	1,000	RWT372	10.30	230	2,500
JWT190	0.06	4	43	RWT374	0.07	7	55
JWT200	2.82	110	1,200	RWT376	10.36	230	2,500
JWT210	3.09	120	1,300	M1	0.06	4	43
JWT220	0.19	47	250	M2	0.29	15	160
JWT232	3.28	120	1,400	WH1 North	0.71	88	570
JWT234	3.47	130	1,400	WH1 South	0.71	27	570
JWT240	3.55	83	1,100	WH2	0.83	11	530
JWT250	3.70	85	1,100	WH3	1.11	13	430
JWT260	3.84	86	1,100	WH4	1.66	15	350
JWT270	0.27	33	250	WH5	0.04	9	32
JWT292	3.87	86	1,100	WH6	0.96	110	750
JWT294	4.13	94	1,100	WT010	0.14	9	89
JWT295	5.88	160	1,700	WT020	0.07	4	42
JWT300	0.10	12	92	WT030	0.08	9	75
JWT320	6.25	160	1,700	WT040	0.19	9	93
JWT325	6.46	160	1,700	WT050	0.19	17	140
JWT330	0.33	32	250	WT060	0.20	14	120
JWT352	9.69	210	2,400	WT070	0.17	13	130
JWT354	10.30	230	2,500	WT080	0.07	9	67
JWT360	0.07	7	55	WT090	0.15	22	160
JWT372	10.36	230	2,500	WT100	0.19	56	300
JWT374				WT110	0.19	22	170
OUTLET	10.58	230	2,500	WT120	0.05	8	55
MT010	0.29	28	210	WT130	0.10	35	170
MT020	0.09	26	140	WT140	0.13	32	180
MT030	0.16	39	230	WT150	0.23	49	250
MT040	0.31	55	460	WT160	0.11	35	180
MT050	0.12	17	110	WT170	0.12	21	140
MT060	0.19	30	200	WT180	0.10	8	66
MT070	0.20	25	170	WT190	0.06	11	75
MT080	0.06	62	190	WT200	0.30	25	190
MT090	0.04	40	130	WT210	0.32	32	190
MT100	0.06	17	88	WT220	0.19	47	250
MT110	0.12	19	120	WT230	0.20	71	350
PBH4	0.15	29	150	WT240	0.08	36	160
PBHA	0.10	30	130	WT250	0.15	63	290
PBHB1	0.36	51	270	WT260	0.14	10	78
PBHB2	0.36	15	170	WT270	0.03	11	57
PBHC	0.19	11	160	WT280	0.27	33	250
RMN	1.42	86	1,200	WT290	0.10	15	110
RWU				WT300	0.10	12	92
Diversion	3.55	83	1,300	WT310	0.28	31	250
RWU North	3.55	110	1,400	WT320	0.21	27	200
RWU South	3.55	55	1,000	WT330	0.33	32	250
RET020	0.15	29	150	WT340	0.28	19	150
RET030	0.36	71	380	WT350	0.30	38	280
RET040	0.56	95	580	WT360	0.07	7	55
				WT370	0.21	7	120

Figure 3-13
Future Hydrology
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\20110613\hydrology_future.mxd, 12/22/2011, wilson_wheeler

Sheet 4-22

Middle Tributary Floodplain
Falcon DBPS
El Paso County, CO

Legend

- Approximate 100-yr Floodplain Existing
- Approximate 100-yr Floodplain Existing (Based on Assumed Split Flow Condition)
- Approximate 100-yr Floodplain Future
- Approximate 100-yr Floodplain Future (Based on Assumed Split Flow Condition)
- Shallow Flooding
- HEC-RAS Centerline
- XSCutLines (Middle Trib)
- FEMA Regulatory Floodplain (Effective as of 1999)*
- Study Limit

*Letters of Map Change completed after 1999 are not shown

N

0 100 200 400
Feet

Index Map

RAS Flow Change Statio	100-yr (Ex)	100-yr (Fut)
15477.3	160	160
14907.6	259	360
9628.6	760	1200
6738.8	776	1184
6346.7	770	1200
6210.5	770	1200
5363.0	800	1200
4905.9	820	1200
1489.7	820	1200

FALCON OWL PLACE

Meridian Rd N

Moonrock Hts

Leiden Pt

Owl Pl

Spane Grv

Curtis

Woodmen

Sand Creek

Vollmer

Meridian

West Tributary

Middle Tributary

East Tributary

FILE: G:\gis_projects\Falcon_Creek_DBPS\active\apps\20111222\MapBook_FP_Middle_Trib.mxd, 12/22/2011, wilson_wheeler

Falcon DBPS

Subbasin Properties

Subbasin ID	Area (mi^2)[2]	Existing % Impervious[3]	Curve Number[3]			Lag Time (min)		
			Historical	Existing	Future	Historical[4]	Existing[2]	Future[5]
ET010	0.15	21.72%	61	69	72	33.64	25.23	18.92
ET020	0.21	19.07%	61	68	73	23.15	17.37	13.02
ET030	0.20	27.31%	41	71	72	42.61	31.96	23.97
ET040	0.15	20.35%	42	69	69	29.71	22.28	22.28
ET050	0.12	19.07%	39	68	68	10.36	7.77	7.77
ET060	0.29	21.94%	39	69	69	7.38	5.54	5.54
ET070	0.25	26.60%	39	71	71	10.51	7.88	7.88
ET080	0.29	37.81%	39	75	76	25.98	19.49	14.61
ET090	0.12	12.34%	39	61	74	54.90	41.18	30.88
ET100	0.05	3.12%	39	48	63	10.67	8.00	6.00
ET110[1]	0.23	1.49%	39	54	61	25.68	25.68	19.26
ET120	0.11	6.79%	39	60	61	38.28	28.71	21.53
ET130	0.13	6.57%	39	61	63	61.63	46.22	34.67
ET140	0.27	3.21%	39	61	63	92.13	69.09	51.82
ET150[1]	0.18	1.79%	39	62	62	25.39	25.39	25.39
ET160	0.19	3.36%	42	64	64	41.04	30.78	30.78
FS010	0.12	1.16%	44	49	56	41.23	30.92	23.19
MT010	0.29	6.99%	45	64	64	42.16	31.62	31.62
MT020[1]	0.09	1.48%	57	62	68	12.94	12.94	9.71
MT030	0.16	13.35%	54	66	67	19.92	14.94	11.21
MT040	0.31	7.07%	55	64	75	35.44	26.58	19.93
MT050	0.12	16.00%	39	67	67	34.84	26.13	26.13
MT060[1]	0.19	1.83%	39	55	66	27.90	27.90	20.93
MT070	0.20	5.68%	42	59	67	54.09	40.57	30.42
MT080	0.06	63.24%	48	86	87	6.91	5.18	3.88
MT090	0.04	60.08%	39	83	85	4.92	3.69	2.77
MT100	0.06	13.21%	39	67	70	21.19	15.89	11.92
MT110	0.12	18.56%	39	68	68	32.51	24.38	24.38
WT010[1]	0.14	2.31%	56	58	58	24.38	24.38	24.38
WT020[1]	0.07	2.39%	56	59	59	27.95	27.95	27.95
WT030	0.08	3.57%	57	59	59	17.99	13.49	13.49
WT040[1]	0.19	2.72%	56	58	58	34.99	34.99	34.99
WT050[1]	0.19	1.60%	60	62	62	26.99	26.99	26.99
WT060	0.20	2.35%	59	61	61	44.53	33.40	33.40
WT070[1]	0.17	1.31%	56	58	58	18.77	18.77	18.77
WT080[1]	0.07	1.95%	60	62	62	17.52	17.52	17.52
WT090[1]	0.15	0.66%	61	62	63	21.52	21.52	16.14
WT100[1]	0.19	1.28%	61	62	69	13.65	13.65	10.24
WT110[1]	0.19	2.04%	60	61	63	29.57	29.57	22.18
WT120[1]	0.05	2.96%	43	54	63	19.24	19.24	14.43

Falcon DBPS

Subbasin Properties

Subbasin ID	Area (mi^2)[2]	Existing % Impervious[3]	Curve Number[3]			Lag Time (min)		
			Historical	Existing	Future	Historical[4]	Existing[2]	Future[5]
WT130	0.10	28.51%	60	72	72	15.26	11.44	11.44
WT140[1]	0.13	1.68%	61	62	70	21.46	21.46	16.09
WT150	0.23	9.68%	61	65	74	54.71	41.04	30.78
WT160	0.11	20.33%	61	69	69	10.10	7.58	7.58
WT170[1]	0.12	2.54%	55	58	64	18.61	18.61	13.96
WT180[1]	0.10	0.12%	39	41	61	38.49	38.49	28.87
WT190	0.06	7.96%	39	64	64	15.16	11.37	11.37
WT200	0.30	4.15%	39	57	64	67.27	50.45	37.84
WT210	0.27	12.12%	40	56	70	77.09	57.82	43.37
WT220	0.19	12.58%	47	61	72	35.69	26.77	20.08
WT230	0.20	26.68%	51	70	73	21.17	15.88	11.91
WT240	0.08	27.03%	58	71	74	11.27	8.45	6.34
WT250	0.15	17.91%	53	67	73	13.46	10.10	7.57
WT260	0.14	5.48%	59	63	63	54.23	40.67	40.67
WT270	0.03	18.71%	47	67	71	17.02	12.76	9.57
WT280	0.27	2.41%	61	63	63	26.29	19.72	19.72
WT290[1]	0.10	2.45%	51	63	63	16.05	16.05	16.05
WT300	0.10	4.24%	58	63	63	26.25	19.69	19.69
WT310	0.28	1.45%	46	60	62	36.15	27.12	20.34
WT320	0.21	2.03%	41	61	63	33.29	24.97	18.72
WT330[1]	0.33	2.03%	40	58	63	36.05	36.05	27.03
WT340	0.28	2.24%	42	63	63	57.87	43.40	43.40
WT350	0.30	3.10%	48	62	64	39.68	29.76	22.32
WT360	0.07	2.82%	47	62	62	29.93	22.45	22.45
WT370	0.21	1.34%	40	45	52	33.48	25.11	18.83

Notes:

[1] Based on observation Longest Flow Path delineation and Time of Concentration Calculation are not impacted by development for Existing conditions.

[2] Calculated in Geo-HMS

[3] Calculated in GIS

[4] Calculated value by setting the decrease in lag time to existing conditions equal to 25%. Only applied to basins that are developed in existing conditions.

[5] Calculated value by decreasing the existing lag time by 25%. Only applied to subbasins where additional development occurred in the future condition.

Falcon DBPS
Curve Numbers

Historical Curve Numbers

Land Use	Hydrologic Soil Group			
	A	B	C	D
Rangeland Good Condition	39	61	74	80
Woods Good Condition	30	55	70	77
Water	98	98	98	98

Notes:

1 Rangeland Good Condition values from Aerawide Urban Runoff Conrol Manual, Pg. 26-27

2 Other values from TR55, Table 2-2

Existing Curve Numbers

Land Use	Hydrologic Soil Group			
	A[1]	B	C	D
Rangeland Good Condition	39	61	74	80
Woods Good Condition	30	55	70	77
Open Space Good Condition	39	61	74	80
Gravel Roads	76	85	89	91
Water	98	98	98	98
Impervious Area	98	98	98	98

Notes:

[1] All HSG Type A soils that have been graded shall be considered HSG Type B soils

2 Rangeland Good Condition values from Aerawide Urban Runoff Conrol Manual, Pg. 26-27

3 Other values from TR55, Table 2-2

Future Curve Numbers

Land Use	Average CN
0.50 Acre Residential	71
2.5 Acre Rural Residentail	64
5 Acre Rural Residentail - Woods	58
5 Acre Rural Residential - Rangeland	62
Community Commercial/Service Commercial	81
Light Industrial	96
Single Family Urban	79

Notes:

1 Values represent the average CN values that were developed for Existing Conditions for each corresponding land use

Falcon DBPS

Ia Adjustment

Subbasin ID	Historical CN	Ia (in)	Existing CN	Ia (in)	Future CN	Ia (in)
ET010	61	0.64	69	0.45	72	0.39
ET020	61	0.64	68	0.47	73	0.37
ET030	41	1.44	71	0.41	72	0.39
ET040	42	1.38	69	0.45	69	0.45
ET050	39	1.56	68	0.47	68	0.47
ET060	39	1.56	69	0.45	69	0.45
ET070	39	1.56	71	0.41	71	0.41
ET080	39	1.56	75	0.33	76	0.32
ET090	39	1.56	61	0.64	74	0.35
ET100	39	1.56	48	1.08	63	0.59
ET110	39	1.56	54	0.85	61	0.64
ET120	39	1.56	60	0.67	61	0.64
ET130	39	1.56	61	0.64	63	0.59
ET140	39	1.56	61	0.64	63	0.59
ET150	39	1.56	62	0.61	62	0.61
ET160	42	1.38	64	0.56	64	0.56
FS010	44	1.27	49	1.04	56	0.79
MT010	45	1.22	64	0.56	64	0.56
MT020	57	0.75	62	0.61	68	0.47
MT030	54	0.85	66	0.52	67	0.49
MT040	55	0.82	64	0.56	75	0.33
MT050	39	1.56	67	0.49	67	0.49
MT060	39	1.56	55	0.82	66	0.52
MT070	42	1.38	59	0.69	67	0.49
MT080	48	1.08	86	0.16	87	0.15
MT090	39	1.56	83	0.20	85	0.18
MT100	39	1.56	67	0.49	70	0.43
MT110	39	1.56	68	0.47	68	0.47
WT010	56	0.79	58	0.72	58	0.72
WT020	56	0.79	59	0.69	59	0.69
WT030	57	0.75	59	0.69	59	0.69
WT040	56	0.79	58	0.72	58	0.72
WT050	60	0.67	62	0.61	62	0.61
WT060	59	0.69	61	0.64	61	0.64
WT070	56	0.79	58	0.72	58	0.72
WT080	60	0.67	62	0.61	62	0.61
WT090	61	0.64	62	0.61	63	0.59
WT100	61	0.64	62	0.61	69	0.45
WT110	60	0.67	61	0.64	63	0.59
WT120	43	1.33	54	0.85	63	0.59
WT130	60	0.67	72	0.39	72	0.39
WT140	61	0.64	62	0.61	70	0.43
WT150	61	0.64	65	0.54	74	0.35

Falcon DBPS

Ia Adjustment

Subbasin ID	Historical CN	Ia (in)	Existing CN	Ia (in)	Future CN	Ia (in)
WT160	61	0.64	69	0.45	69	0.45
WT170	55	0.82	58	0.72	64	0.56
WT180	39	1.56	41	1.44	61	0.64
WT190	39	1.56	64	0.56	64	0.56
WT200	39	1.56	57	0.75	64	0.56
WT210	40	1.50	56	0.79	70	0.43
WT220	47	1.13	61	0.64	72	0.39
WT230	51	0.96	70	0.43	73	0.37
WT240	58	0.72	71	0.41	74	0.35
WT250	53	0.89	67	0.49	73	0.37
WT260	59	0.69	63	0.59	63	0.59
WT270	47	1.13	67	0.49	71	0.41
WT280	61	0.64	63	0.59	63	0.59
WT290	51	0.96	63	0.59	63	0.59
WT300	58	0.72	63	0.59	63	0.59
WT310	46	1.17	60	0.67	62	0.61
WT320	41	1.44	61	0.64	63	0.59
WT330	40	1.50	58	0.72	63	0.59
WT340	42	1.38	63	0.59	63	0.59
WT350	48	1.08	62	0.61	64	0.56
WT360	47	1.13	62	0.61	62	0.61
WT370	40	1.50	45	1.22	52	0.92

Notes:

[1] Ia (in) = 0.10*(1000/CN)-10

Falcon DBPS

Existing Time of Concentration Calculations

Worksheet for computation of time of travel according to TR-55 methodology

Blue - GIS defined, Green - user specified, White and yellow - calculated, Red - final result

Watershed Name	WT060	WT050	WT080	WT090	WT110	WT100	ET070	WT150	WT140	MT010	ET060	WT170
Watershed ID	**177**	**66**	**342**	**69**	**70**	**71**	**83**	**332**	**146**	**151**	**210**	**282**
Sheet Flow Characteristics												
Manning's Roughness Coefficient	0.4	0.15	0.15	0.15	0.4	0.011	0.011	0.011	0.15	0.15	0.011	0.15
Flow Length (ft)	100	297	152	131	125	47.4265	100	100	252.4879	220.7734	44.6252	120.7109
Two-Year 24-hour Rainfall (in)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Land Slope (ft/ft)	0.0776	0.0316	0.0712	0.0669	0.0937	0.0401	0.0437	0.0174	0.0715	0.0874	0.1261	0.0224
Sheet Flow Tt (hr)	0.26	0.40	0.17	0.15	0.29	0.01	0.02	0.03	0.25	0.21	0.01	0.22
Shallow Concentrated Flow Characteristics												
Surface Description (1 - unpaved, 2 - paved)	1	1	1	1	1	1	1	1	1	1	1	1
Flow Length (ft)	629	630	921	4216	2838	625.1232	564.9179	0	340.5642	3491.1034	278.3003	723.4077
Watercourse Slope (ft/ft)	0.0429	0.0401	0.0474	0.0339	0.034	0.0471	0.0115	0	0.0301	0.0267	0.0446	0.0168
Average Velocity - computed (ft/s)	3.34	3.23	3.51	2.97	2.98	3.50	1.73	0.00	2.80	2.64	3.41	2.09
Shallow Concentrated Flow Tt (hr)	0.05	0.05	0.07	0.39	0.26	0.05	0.09	0.00	0.03	0.37	0.02	0.10
Channel Flow Characterisitics												
Cross-sectional Flow Area (ft2)	3.82	102.48	26.55	41.73	5.37	112.64	9.62	9	3.47	60.78	15.9	76.89
Wetted Perimeter (ft)	12.23	70.06	41.28	84.92	11.19	110.27	11	14.04	12.11	77.26	14.14	58.7
Hydraulic Radius - computed (ft)	0.31	1.46	0.64	0.49	0.48	1.02	0.87	0.64	0.29	0.79	1.12	1.31
Channel Slope (ft/ft)	0.0344	0.024	0.0247	0.012	0.0219	0.021	0.013	0.0036	0.0255	0.0226	0.0132	0.0184
Manning's Roughness Coefficient	0.06	0.05	0.05	0.03	0.05	0.05	0.013	0.05	0.05	0.05	0.013	0.05
Average Velocity - computed (ft/s)	2.12	5.95	3.49	3.39	2.70	4.38	11.95	1.33	2.07	3.82	14.24	4.84
Flow Length (ft)	4722	6298	3073	604	2635	5032.4692	4731.5554	5328.7401	2294.7909	4121.0832	6400.2723	3430.8373
Channel Flow Tt (hr)	0.62	0.29	0.24	0.05	0.27	0.32	0.11	1.11	0.31	0.30	0.12	0.20
Watershed Time of travel (hr)	**0.93**	**0.75**	**0.49**	**0.60**	**0.82**	**0.38**	**0.22**	**1.14**	**0.60**	**0.88**	**0.15**	**0.52**
Watershed Lag Time (min)	**33.40**	**26.99**	**17.52**	**21.52**	**29.57**	**13.65**	**7.88**	**41.04**	**21.46**	**31.62**	**5.54**	**18.61**

Number of watersheds	64
MXD Path	Falcon_DBPS.mxd
Stored workbook	
$AVHOME directory	
Name of the table to store the results of the calculation	Subbasin1
Workspace path	C:\GeoHMS\Falcon_DBPS\Falcon_DBPS.mdb

Notes:

[1] Sheet Flow Manning's n values from Table 3-1 in TR55

[2] For LFP's with no Shallow Concentrated Flow length, slopes were manually changed from NaN (default) to 0 and Shallow Concentrated Flow Tc was changed to 0 so Watershed Time of Travel could be computed.

[3] Channel Flow Manning's n values were selected from multiple sources and are documented in the Manning's n Value Selection Quality Assurance packet

[4] Watershed Lag Time = 0.6*Watershed Time of Travel

Falcon DBPS

Existing Time of Concentration Calculations

Worksheet for computation of time of travel according to TR-55 methodology

Blue - GIS defined, Green - user specified, White and yellow - calculated, Red - final result

Watershed Name	WT120	ET030	WT160	ET150	MT100	MT090	MT080	MT030	MT060	ET080	MT070	MT110	WT310	WT300
Watershed ID	**284**	**303**	**298**	**551**	**612**	**608**	**613**	**633**	**643**	**94**	**157**	**167**	**171**	**173**
Sheet Flow Characteristics														
Manning's Roughness Coefficient	0.15	0.011	0.011	0.15	0.15	0.011	0.011	0.15	0.011	0.24	0.15	0.011	0.011	0.15
Flow Length (ft)	191.3389	20.537	26.2133	100	142.9726	100	119.91	88.6543	43.2844	141.055	145.5913	54.54	37.3701	292.2798
Two-Year 24-hour Rainfall (in)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Land Slope (ft/ft)	0.057	0.0182	0.0352	0.0443	0.0452	0.0054	0.0008	0.0979	0.0326	0.0316	0.0154	0.067	0.0459	0.0418
Sheet Flow Tt (hr)	0.22	0.01	0.01	0.15	0.19	0.04	0.10	0.10	0.01	0.32	0.30	0.01	0.01	0.35
Shallow Concentrated Flow Characteristics														
Surface Description (1 - unpaved, 2 - paved)	1	1	2	1	1	2	2	1	1	1	1	1	1	1
Flow Length (ft)	515.1666	710.4925	0	2978.6929	0	259.7955	0	1309.2521	6116.429	844.1173	6399.686	3391.19	1766.78	883.1998
Watercourse Slope (ft/ft)	0.021	0.0337	0	0.0221	0	0.0253	0	0.032	0.0194	0.0183	0.0204	0.012	0.0273	0.0351
Average Velocity - computed (ft/s)	2.34	2.96	0.00	2.40	0.00	3.23	0.00	2.89	2.25	2.18	2.30	1.77	2.67	3.02
Shallow Concentrated Flow Tt (hr)	0.06	0.07	0.00	0.34	0.00	0.02	0.00	0.13	0.76	0.11	0.77	0.53	0.18	0.08
Channel Flow Characterisitics														
Cross-sectional Flow Area (ft2)	39.43	20.5	4.39	18.39	6.31	25.13	64	19.13	19.69	15.9	4.9	19.9	6.02	3.64
Wetted Perimeter (ft)	101.84	42.22	23.26	32.36	22.61	25.13	32	49.99	35.22	14.14	26.77	39.66	24.31	13.97
Hydraulic Radius - computed (ft)	0.39	0.49	0.19	0.57	0.28	1.00	2.00	0.38	0.56	1.12	0.18	0.50	0.25	0.26
Channel Slope (ft/ft)	0.0154	0.0093	0.0249	0.0094	0.0105	0.0093	0.014	0.0207	0.0355	0.0124	0.012	0.013	0.015	0.0239
Manning's Roughness Coefficient	0.03	0.07	0.013	0.05	0.03	0.013	0.013	0.03	0.06	0.013	0.03	0.07	0.06	0.03
Average Velocity - computed (ft/s)	3.27	1.27	5.95	1.98	2.17	11.05	21.53	3.77	3.18	13.80	1.75	1.53	1.20	3.13
Flow Length (ft)	2950.9478	3715.1193	4363.7964	1523.8687	1939.0988	1519.2867	3055.11	2604.7205	97.6779	5559.793	335.5838	744.17	2422.127	1259.995
Channel Flow Tt (hr)	0.25	0.81	0.20	0.21	0.25	0.04	0.04	0.19	0.01	0.11	0.05	0.13	0.56	0.11
Watershed Time of travel (hr)	**0.53**	**0.89**	**0.21**	**0.71**	**0.44**	**0.10**	**0.14**	**0.42**	**0.78**	**0.54**	**1.13**	**0.68**	**0.75**	**0.55**
Watershed Lag Time (min)	**19.24**	**31.96**	**7.58**	**25.39**	**15.89**	**3.69**	**5.18**	**14.94**	**27.90**	**19.49**	**40.56**	**24.38**	**27.12**	**19.69**

Number of watersheds
MXD Path
Stored workbook
$AVHOME directory
Name of the table to store the results of the calculation
Workspace path

Falcon DBPS

Existing Time of Concentration Calculations

Worksheet for computation of time of travel according to TR-55 methodology

Blue - GIS defined, Green - user specified, White and yellow - calculated, Red - final result

Watershed Name	WT010	WT280	ET140	ET130	WT230	WT040	MT020	MT050	WT240	WT250	ET110	ET100	WT220	WT370	WT350	WT340	WT330
Watershed ID	**183**	**247**	**351**	**353**	**407**	**588**	**635**	**649**	**663**	**667**	**681**	**682**	**267**	**114**	**214**	**116**	**123**
Sheet Flow Characteristics																	
Manning's Roughness Coefficient	0.4	0.15	0.15	0.15	0.24	0.4	0.15	0.24	0.011	0.011	0.15	0.011	0.011	0.15	0.15	0.15	0.15
Flow Length (ft)	146.5688	68.6391	118.6398	119.4977	45.0001	128.3412	16.2369	167.7821	54	110.7786	296.0756	48.2844	56.2392	148.5814	199.706	296.2138	298.7012
Two-Year 24-hour Rainfall (in)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Land Slope (ft/ft)	0.0766	0.0321	0.0214	0.0243	0.1104	0.0443	0.0215	0.0209	0.037	0.0125	0.0362	0.1191	0.019	0.0363	0.024	0.0345	0.05
Sheet Flow Tt (hr)	0.35	0.12	0.22	0.22	0.08	0.39	0.05	0.44	0.01	0.03	0.38	0.01	0.02	0.22	0.33	0.39	0.34
Shallow Concentrated Flow Characteristics																	
Surface Description (1 - unpaved, 2 - paved)	1	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	1
Flow Length (ft)	742.1945	1860.327	1172.282	828.555	181.5689	984.9924	3260.587	275.2087	0	0	2365.505	762.0473	5060.256	0	3420.637	4497.88	5188.524
Watercourse Slope (ft/ft)	0.04	0.0259	0.0172	0.0128	0.0228	0.0516	0.032	0.0239	0	0	0.0271	0.0225	0.021	0	0.0467	0.0237	0.0225
Average Velocity - computed (ft/s)	3.23	2.60	2.12	1.83	3.07	3.67	2.89	3.14	0.00	0.00	2.66	2.42	2.34	0.00	3.49	2.48	2.42
Shallow Concentrated Flow Tt (hr)	0.06	0.20	0.15	0.13	0.02	0.07	0.31	0.02	0.00	0.00	0.25	0.09	0.60	0.00	0.27	0.50	0.60
Channel Flow Characterisitics																	
Cross-sectional Flow Area (ft2)	3.99	2.43	25.47	21.02	4.39	8.4	20.97	2.91	4.39	4.39	39.65	4.58	6.73	30.81	59.79	6.55	12.59
Wetted Perimeter (ft)	15.4	9.26	84.23	169.15	23.26	26.23	40.88	6.68	23.26	23.26	105.42	8.91	12.27	26.96	38.47	17.42	25.95
Hydraulic Radius - computed (ft)	0.26	0.26	0.30	0.12	0.19	0.32	0.51	0.44	0.19	0.19	0.38	0.51	0.55	1.14	1.55	0.38	0.49
Channel Slope (ft/ft)	0.0324	0.0179	0.0113	0.0144	0.009	0.026	0	0.0173	0.0175	0.0112	0.0114	0.0119	0.0108	0.0119	0.0088	0.0209	0.0119
Manning's Roughness Coefficient	0.06	0.03	0.06	0.05	0.013	0.05	0.05	0.03	0.013	0.013	0.03	0.03	0.03	0.05	0.05	0.03	0.05
Average Velocity - computed (ft/s)	1.82	2.72	1.19	0.89	3.58	2.25	0.00	3.75	4.99	3.99	2.76	3.48	3.46	3.55	3.75	3.74	2.01
Flow Length (ft)	1719.181	2209.347	6595.197	3022.555	4460.603	4086.883	0	3582.906	4002.366	3560.407	866.4156	1602.548	1573.016	6132.815	3083.294	4257.557	508.9379
Channel Flow Tt (hr)	0.26	0.23	1.54	0.94	0.35	0.50	0.00	0.27	0.22	0.25	0.09	0.13	0.13	0.48	0.23	0.32	0.07
Watershed Time of travel (hr)	**0.68**	**0.55**	**1.92**	**1.28**	**0.44**	**0.97**	**0.36**	**0.73**	**0.23**	**0.28**	**0.71**	**0.22**	**0.74**	**0.70**	**0.83**	**1.21**	**1.00**
Watershed Lag Time (min)	**24.38**	**19.72**	**69.09**	**46.22**	**15.88**	**34.99**	**12.94**	**26.13**	**8.45**	**10.10**	**25.68**	**8.00**	**26.77**	**25.11**	**29.76**	**43.40**	**36.05**

Number of watersheds	
MXD Path	
Stored workbook	
$AVHOME directory	
Name of the table to store the results of the calculation	
Workspace path	

Falcon DBPS

Existing Time of Concentration Calculations

Worksheet for computation of time of travel according to TR-55 methodology

Blue - GIS defined, Green - user specified, White and yellow - calculated, Red - final result

Watershed Name	WT030	WT020	WT210	ET160	WT360	WT260	WT290	WT270	ET120	ET090	WT180	MT040	WT200	WT190	WT130	WT320	ET010
Watershed ID	**187**	**189**	**199**	**221**	**227**	**256**	**238**	**242**	**252**	**262**	**848**	**272**	**276**	**278**	**288**	**308**	**318**
Sheet Flow Characteristics																	
Manning's Roughness Coefficient	0.15	0.4	0.15	0.15	0.011	0.15	0.011	0.011	0.011	0.24	0.25	0.15	0.15	0.011	0.15	0.15	0.15
Flow Length (ft)	141.2626	266.2251	285.0006	80.005	87.4266	100	100	40.3554	61.2133	138.9952	296	75.2183	183.5462	100	88.7973	261.2747	78
Two-Year 24-hour Rainfall (in)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Land Slope (ft/ft)	0.103	0.1066	0.0231	0.0189	0.0402	0.0508	0.0513	0.0274	0.0332	0.0589	0.027	0.0608	0.0297	0.0174	0.0421	0.0858	0.0256
Sheet Flow Tt (hr)	0.14	0.50	0.44	0.17	0.02	0.14	0.02	0.01	0.01	0.25	0.64	0.10	0.28	0.03	0.14	0.24	0.15
Shallow Concentrated Flow Characteristics																	
Surface Description (1 - unpaved, 2 - paved)	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1
Flow Length (ft)	432.1399	295.3505	4198.315	3912.236	2241.548	1133.028	267.4881	0	5817.561	0	4489.17	3144.352	9180.05	0	0	2919.894	528
Watercourse Slope (ft/ft)	0.0424	0.0619	0.0198	0.0146	0.0171	0.0154	0.0196	0	0.0164	0	0.024	0.03	0.0209	0	0	0.0372	0.0303
Average Velocity - computed (ft/s)	3.32	4.01	2.27	1.95	2.11	2.00	2.26	0.00	2.07	0.00	3.15	2.79	2.33	0.00	0.00	3.11	2.81
Shallow Concentrated Flow Tt (hr)	0.04	0.02	0.51	0.56	0.30	0.16	0.03	0.00	0.78	0.00	0.40	0.31	1.09	0.00	0.00	0.26	0.05
Channel Flow Characterisitics																	
Cross-sectional Flow Area (ft2)	6.12	8.51	39.77	22.37	10.27	0.82	41.59	9.66	25.13	9.72	163.44	4.32	25.69	3.88	4.39	28.9	15.97
Wetted Perimeter (ft)	11.83	29.87	160.6	24.5	37.46	3.97	114.48	33.28	25.13	31.92	140.79	7.39	57.74	14.09	23.26	26.6	31.94
Hydraulic Radius - computed (ft)	0.52	0.28	0.25	0.91	0.27	0.21	0.36	0.29	1.00	0.30	1.16	0.58	0.44	0.28	0.19	1.09	0.50
Channel Slope (ft/ft)	0.0224	0.0271	0.0145	0.0093	0.0083	0.0082	0.0107	0.0147	0.005	0.0096	0.0135	0.0172	0.0316	0.0232	0.0249	0.0101	0.0217
Manning's Roughness Coefficient	0.05	0.06	0.06	0.03	0.05	0.06	0.05	0.03	0.013	0.03	0.05	0.03	0.05	0.03	0.013	0.05	0.05
Average Velocity - computed (ft/s)	2.87	1.77	1.18	4.51	1.15	0.79	1.57	2.64	8.10	2.20	3.82	4.55	3.09	3.20	5.95	3.17	2.77
Flow Length (ft)	2076.623	1662.612	2770.435	2028.925	1285.17	2358.52	2236.363	3268.233	47.5001	7102.49	443	5292.631	316	3336.891	3894.055	2166.302	4966.49
Channel Flow Tt (hr)	0.20	0.26	0.65	0.13	0.31	0.83	0.40	0.34	0.00	0.90	0.03	0.32	0.03	0.29	0.18	0.19	0.50
Watershed Time of travel (hr)	**0.37**	**0.78**	**1.61**	**0.85**	**0.62**	**1.13**	**0.45**	**0.35**	**0.80**	**1.14**	**1.07**	**0.74**	**1.40**	**0.32**	**0.32**	**0.69**	**0.70**
Watershed Lag Time (min)	**13.49**	**27.95**	**57.82**	**30.78**	**22.45**	**40.67**	**16.05**	**12.76**	**28.71**	**41.18**	**38.49**	**26.58**	**50.45**	**11.37**	**11.44**	**24.97**	**25.23**

Number of watersheds
MXD Path
Stored workbook
$AVHOME directory
Name of the table to store the results of the calculation
Workspace path

Falcon DBPS

Existing Time of Concentration Calculations

Worksheet for computation of time of travel according to TR-55 methodology

Blue - GIS defined, Green - user specified, White and yellow - calculated, Red - final result

Watershed Name	ET020	WT070	ET050	ET040	FS010
Watershed ID	**328**	**343**	**467**	**468**	**5**
Sheet Flow Characteristics					
Manning's Roughness Coefficient	0.15	0.4	0.011	0.011	0.011
Flow Length (ft)	43.6613	45.0001	47.0712	301.3711	29
Two-Year 24-hour Rainfall (in)	2.1	2.1	2.1	2.1	2.1
Land Slope (ft/ft)	0.1105	0.0566	0.0263	0.052	0.0552
Sheet Flow Tt (hr)	0.05	0.15	0.01	0.04	0.01
Shallow Concentrated Flow Characteristics					
Surface Description (1 - unpaved, 2 - paved)	2	1	1	1	1
Flow Length (ft)	0	861.3369	1478.833	0	0
Watercourse Slope (ft/ft)	0	0.0441	0.0202	0	0
Average Velocity - computed (ft/s)	0.00	3.39	2.29	0.00	0.00
Shallow Concentrated Flow Tt (hr)	0.00	0.07	0.18	0.00	0.00
Channel Flow Characterisitics					
Cross-sectional Flow Area (ft2)	3.55	13.56	12.57	2.07	10
Wetted Perimeter (ft)	9.58	20.48	12.57	6.76	40.01
Hydraulic Radius - computed (ft)	0.37	0.66	1.00	0.31	0.25
Channel Slope (ft/ft)	0.0211	0.0236	0.0125	0.0171	0.0208
Manning's Roughness Coefficient	0.03	0.05	0.013	0.03	0.06
Average Velocity - computed (ft/s)	3.72	3.48	12.81	2.95	1.42
Flow Length (ft)	5760.795	3717.648	1130.583	6137.448	4362
Channel Flow Tt (hr)	0.43	0.30	0.02	0.58	0.85
Watershed Time of travel (hr)	**0.48**	**0.52**	**0.22**	**0.62**	**0.86**
Watershed Lag Time (min)	**17.37**	**18.77**	**7.77**	**22.28**	**30.92**

Number of watersheds	1
MXD Path	Falcon_DBPS.mxd
Stored workbook	
$AVHOME directory	
Name of the table to store the results of the calculation	Subbasin3
Workspace path	C:\GeoHMS\Falcon_DBPS_South\Falcon_DBPS_South.mdb

Falcon DBPS

Manning's n Values

Manning's n Description	Selected Value
Vegetated Roadside Ditch	**0.03**
Grass Swale	**0.06**
Channel - Sand	**0.03**
Channel - Grass	**0.05**
Channel - Willow	**0.07**
Floodplain - Grass	**0.08**
Floodplain - Willow	**0.15**

References:

1 Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Floodplains, USGS Water Supply Paper 2339

2 City of Colorado Springs DCM

3 CDOT DCM

4 UDFCD DCM

5 Guide for Selecting Roughness Coefficient "n" Values For Channels, NRCS (SCS), 1963

6 Cottonwood Creek DBPS

Falcon DBPS

Routing Description

Reach	Length (ft)	Slope (ft/ft)	Manning's n	Invert (ft)	Shape	Diameter (ft)	Width (ft)	Side Slope (h:v)	L.B. Manning's n	R.B. Manning's n
RET020	3063.9	0.0186036	0.05	7113.75	Eight Point	--	--	--	0.08	0.08
RET030	5307.2	0.0146972	0.07	7019.43	Eight Point	--	--	--	0.08	0.08
RET040	1951	0.0194768	0.07	6958.54	Eight Point	--	--	--	0.15	0.15
RET050	1877.3	0.0207744	0.07	6938.26	Eight Point	--	--	--	0.08	0.08
RET060	1866	0.0117898	0.05	6896.01	Eight Point	--	--	--	0.08	0.08
RET070	2209.2	0.0185584	0.07	6868.86	Eight Point	--	--	--	0.08	0.08
RET080	1569.2	0.0044608	0.07	6855.75	Eight Point	--	--	--	0.15	0.15
RET090	378.7	0.0052812	0.07	6854.04	Eight Point	--	--	--	0.15	0.15
RET100	1916.5	0.0203494	0.03	6832.6	Eight Point	--	--	--	0.08	0.08
RET110	2956.5	0.0145443	0.03	6780.51	Eight Point	--	--	--	0.08	0.08
RET120	1474.5	0.0047475	0.03	6766.26	Eight Point	--	--	--	0.08	0.08
RET140	4052.5	0.0134575	0.03	6779.63	Eight Point	--	--	--	0.08	0.08
RET152	2217.2	0.0175895	0.03	6755.38	Eight Point	--	--	--	0.08	0.08
RET154	2358.2	0.0132409	0.05	6743.88	Eight Point	--	--	--	0.08	0.08
RET156	1006.8	0.0079457	0.03	6727.09	Eight Point	--	--	--	0.08	0.08
RET162	3410.6	0.0108486	0.05	6699.33	Eight Point	--	--	--	0.08	0.08
RET164	2094.9	0.0124114	0.03	6671.23	Eight Point	--	--	--	0.08	0.08
RMT030	3636.4	0.0202839	0.03	7033.46	Eight Point	--	--	--	0.08	0.08
RMT040	1310.1	0.0091599	0.03	6984	Eight Point	--	--	--	0.08	0.08
RMT050	1567.7	0.0191364	0.03	6965.39	Eight Point	--	--	--	0.08	0.08
RMT062	6001.9	0.0201602	0.05	6928.82	Eight Point	--	--	--	0.08	0.08
RMT064	3355.9	0.0160912	0.05	6911.23	Eight Point	--	--	--	0.08	0.08
RMT070	1118.3	0.0107303	0.05	6881.93	Eight Point	--	--	--	0.08	0.08
RMT080	2187.7	0.0118848	0.013		Rectangle	--	8	--		
RMT090	284.64	0.0105	0.013		Circle	3	--	--		
RMT102	1101.3	0.0208837	0.07	6840.11	Eight Point	--	--	--	0.15	0.15
RMT104	866.69	0.015	0.05	6846	Eight Point	--	--	--	0.08	0.08
RMT106	234.5	0.0042644	0.07	6831.79	Eight Point	--	--	--	0.15	0.15
RMT112	3556.1	0.0143416	0.07	6802.15	Eight Point	--	--	--	0.15	0.15
RMT114	1760.2	0.0170437	0.05	6758.55	Eight Point	--	--	--	0.08	0.08
RWT030	2078.5	0.0232	0.05	7392.86	Eight Point	--	--	--	0.08	0.08
RWT042	1561.2	0.0263708	0.05	7366.57	Eight Point	--	--	--	0.08	0.08
RWT044	2369.4	0.0291215	0.05	7367.84	Eight Point	--	--	--	0.08	0.08
RWT046	2587.6	0.0212553	0.05	7294.2	Eight Point	--	--	--	0.08	0.08
RWT054	2699.213562	0.021117	0.05	7267.87	Eight Point	--	--	--	0.08	0.08
RWT080	3461.5	0.0271559	0.05	7253.59	Eight Point	--	--	--	0.08	0.08
RWT092	651.99	0.0184053	0.03	7224.51	Eight Point	--	--	--	0.08	0.08
RWT094	2357.7	0.0114517	0.03	7190.23	Eight Point	--	--	--	0.08	0.08
RWT122	561.63	0.0124637	0.03	7184.96	Eight Point	--	--	--	0.08	0.08
RWT124	2423.9	0.0165024	0.03	7153.3	Eight Point	--	--	--	0.08	0.08
RWT150	2608	0.019	0.05	7174.97	Eight Point	--	--	--	0.08	0.08
RWT160	1565.7	0.0204375	0.05	7114.22	Eight Point	--	--	--	0.08	0.08
RWT172	3101.9	0.0190205	0.05	7114.4	Eight Point	--	--	--	0.08	0.08

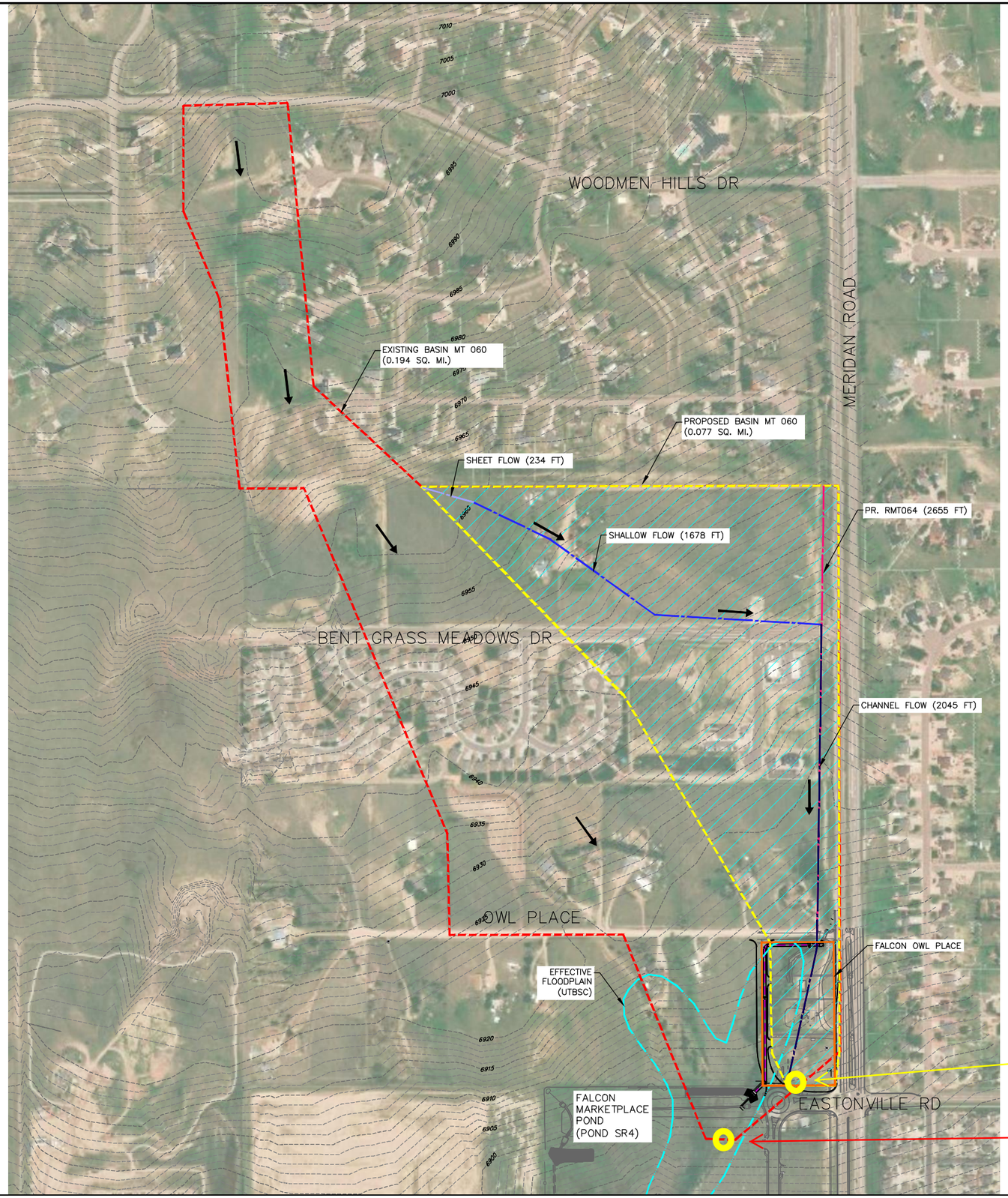
Falcon DBPS

Routing Description

Reach	Length (ft)	Slope (ft/ft)	Manning's n	Invert (ft)	Shape	Diameter (ft)	Width (ft)	Side Slope (h:v)	L.B. Manning's n	R.B. Manning's n
RWT174	1869.6	0.0160463	0.05	7105.07	Eight Point	--	--	--	0.08	0.08
RWT176	326.42	0.0122541	0.03	7079.07	Eight Point	--	--	--	0.08	0.08
RWT180	3727.614345	0.0204	0.05	7015.13	Eight Point	--	--	--	0.08	0.08
RWT202	3011.790196	0.0212	0.05	6953.23	Eight Point	--	--	--	0.08	0.08
RWT204	3538.4	0.0218	0.05	6952	Eight Point	--	--	--	0.08	0.08
RWT210	2914.7	0.0133803	0.03	6906.35	Eight Point	--	--	--	0.08	0.08
RWT232	2180	0.0178898	0.05	6861.66	Eight Point	--	--	--	0.08	0.08
RWT234	2126.1	0.0201117	0.05	6860	Eight Point	--	--	--	0.08	0.08
RWT236	124.98	0.008	0.013		Rectangle		42		--	--
RWT240	1044	0.013	0.05	6837.41	Eight Point	--	--	--	0.08	0.08
RWT240_Diversion Reach	929	0.013	0.07	6826	Eight Point	--	--	--	0.15	0.15
RWT250	184.35	0.0054245	0.07	6818.14	Eight Point	--	--	--	0.15	0.15
RWT260	2371.1	0.015183	0.05	6800.68	Eight Point	--	--	--	0.08	0.08
RWT291	986.55	0.0223001	0.05	6780.96	Eight Point	--	--	--	0.08	0.08
RWT292	733.2	0.0165	0.05	6779.41	Eight Point	--	--	--	0.08	0.08
RWT294	536.02	0.0149	0.05	6772.93	Eight Point	--	--	--	0.08	0.08
RWT295	217	0.0091575	0.05	6763.06	Eight Point	--	--	--	0.08	0.08
RWT296	1202.594155	0.0091575	0.05	6763.06	Eight Point	--	--	--	0.08	0.08
RWT312	3295.8	0.0265	0.05	6731.53	Eight Point	--	--	--	0.08	0.08
RWT314	2428.7	0.0148227	0.05	6734.64	Eight Point	--	--	--	0.08	0.08
RWT320	2459.5	0.0093515	0.05	6692.49	Eight Point	--	--	--	0.08	0.08
RWT344	1380.563492	0.010865	0.03	6666	Eight Point	--	--	--	0.08	0.08
RWT352	3134.2	0.0121	0.05	6662.01	Eight Point	--	--	--	0.08	0.08
RWT354	14.142	0.0121	0.05	6658.11	Eight Point	--	--	--	0.08	0.08
RWT372	1466.3	0.0184133	0.07	6642.65	Eight Point	--	--	--	0.15	0.15
RWT374	2309.9	0.016	0.05	6659.99	Eight Point	--	--	--	0.08	0.08
RWT376	2601.5	0.0103788	0.05	6623.3	Eight Point	--	--	--	0.08	0.08

APPENDIX 4

HEC-HMS MODELING



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:

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

Drexel, Barrell & Co.
Engineers • Surveyors
1800 38TH STREET
BOULDER, COLORADO 80301
CONTACT: MICHELLE IBLINGS, P.E.
(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

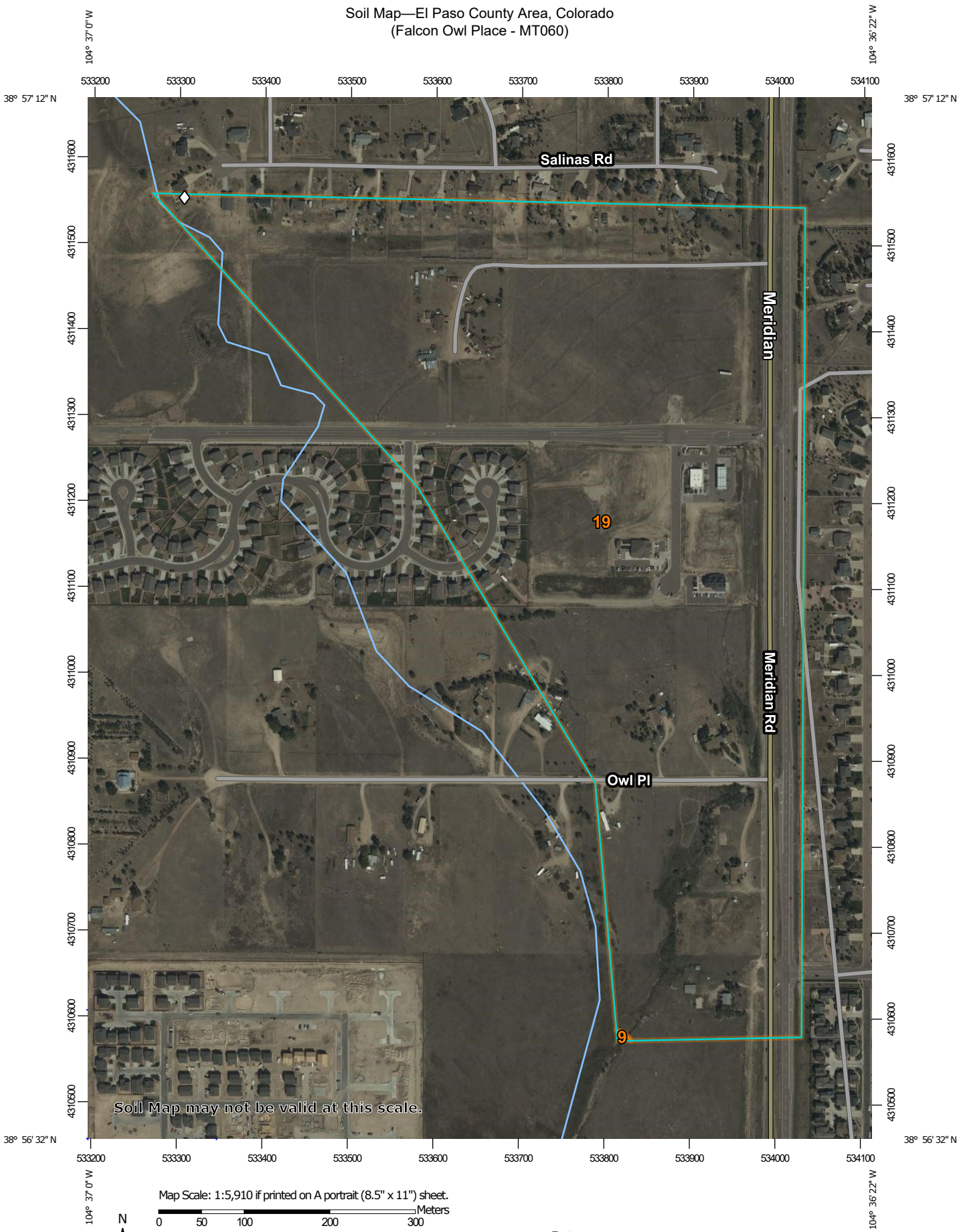
PROJECT:21611-00BLWR
DRAWING NO.

HBM

SHEET: 1 OF 1

H:\21611-00BLWR\Plans\Sheets\Hydrologic Base Map\HBM.dwg, 6/7/2022 8:28:16 AM

Soil Map—El Paso County Area, Colorado
(Falcon Owl Place - MT060)



Map Scale: 1:5,910 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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 Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
9	Blakeland-Fluvaquentic Haplaquolls	0.0	0.0%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	96.5	100.0%
Totals for Area of Interest		**96.5**	**100.0%**

El Paso County Area, Colorado

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Flood plains, fan terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent

Landform: Swales
Hydric soil rating: Yes

Other soils
Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

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

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2/]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

PUD avg 0.22 ac

1 Average runoff condition, and $I_a = 0.2S$.

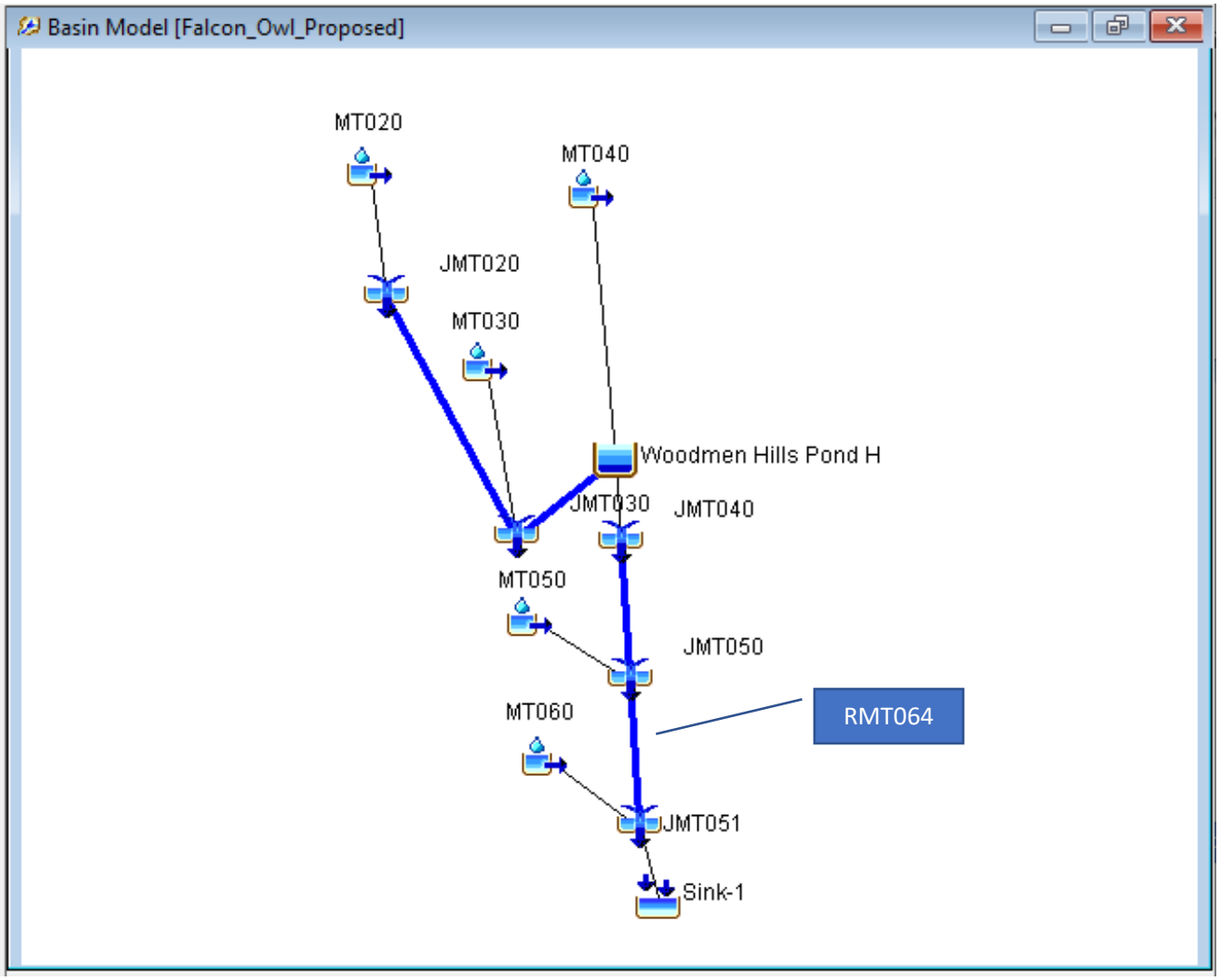
2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Falcon Owl Place CLOMR
HEC-HMS v4.7.1
October 17, 2022



Future Land Use Hydrologic Parameters used in HEC-HMS

Basin	CN	Ia	Area (mi2)	SCS Lag (Min)
Mt010	64	0.56	0.2899	31.62
Mt020	68	0.47	0.0902	9.71
Mt030	67	0.49	0.1566	11.21
Mt040	75	0.33	0.3084	19.93
Mt050	67	0.49	0.1186	26.13
Mt060	66	0.52	0.1942*	20.93*

*Proposed conditions area and lag time are reduced to 0.077 mi2 and 17 mintues, respectively.

RMT064 Proposed Conditions Parameters used in HEC-HMS

Length (ft)	2629.3
US Invert	6944
DS Invert	6900
Slope	0.0167

Basin MT060 Proposed Conditions CN used in HEC-HMS

Land Use	HSG	Area (sf)	Area (sm)	CN	CN * Area
PUD*	A	1070371	0.038	65	2.5
RR-5	A	533825	0.019	46	0.9
Commercial	A	539165	0.019	89	1.7
		2143360	0.077		66

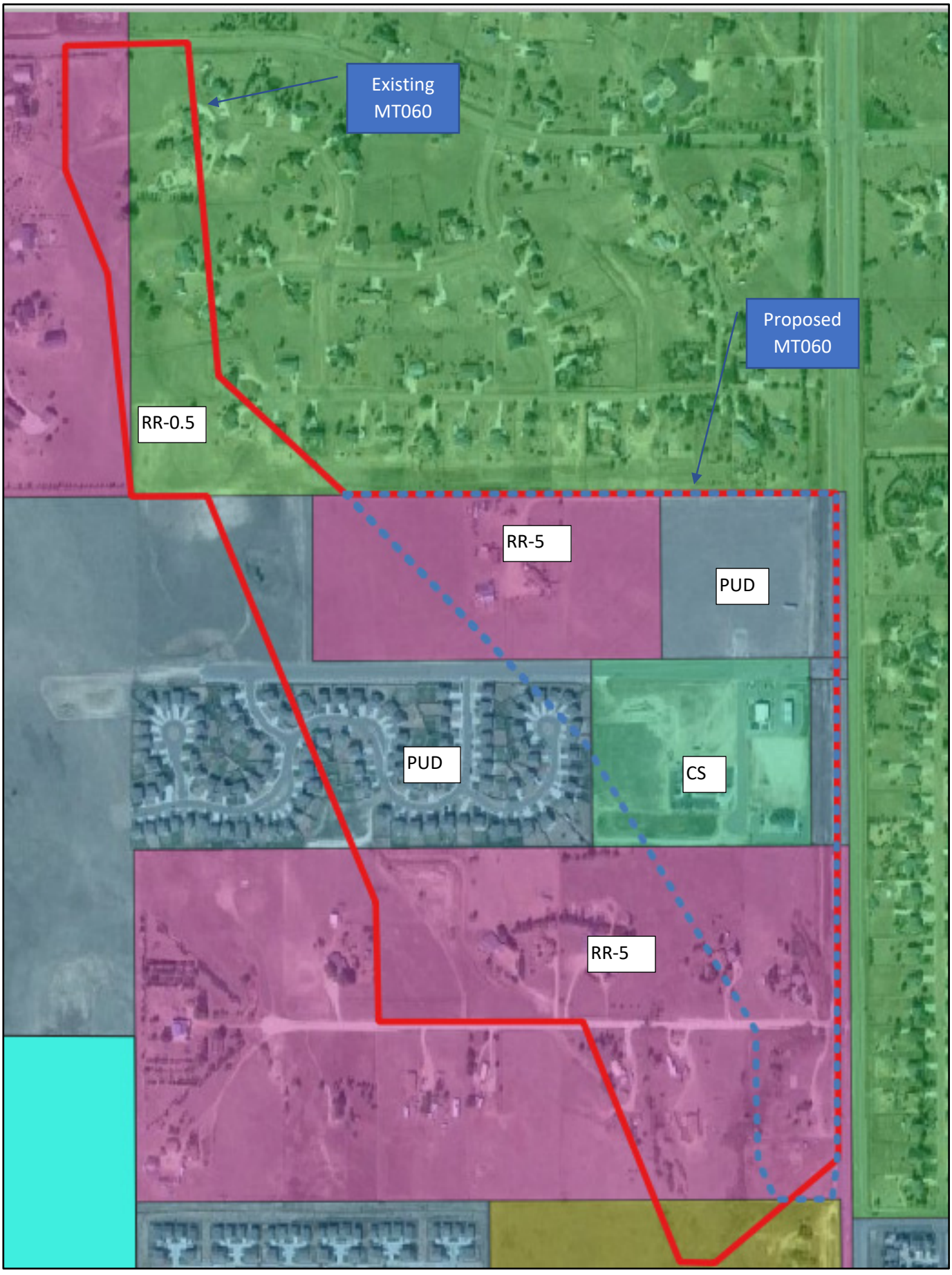
*PUD CN of 65 is based on the average lot size (0.22 ac) of the nearby Bent Grass Meadows.

MT060 Proposed Conditions Lag Time Calculation used in HEC-HMS

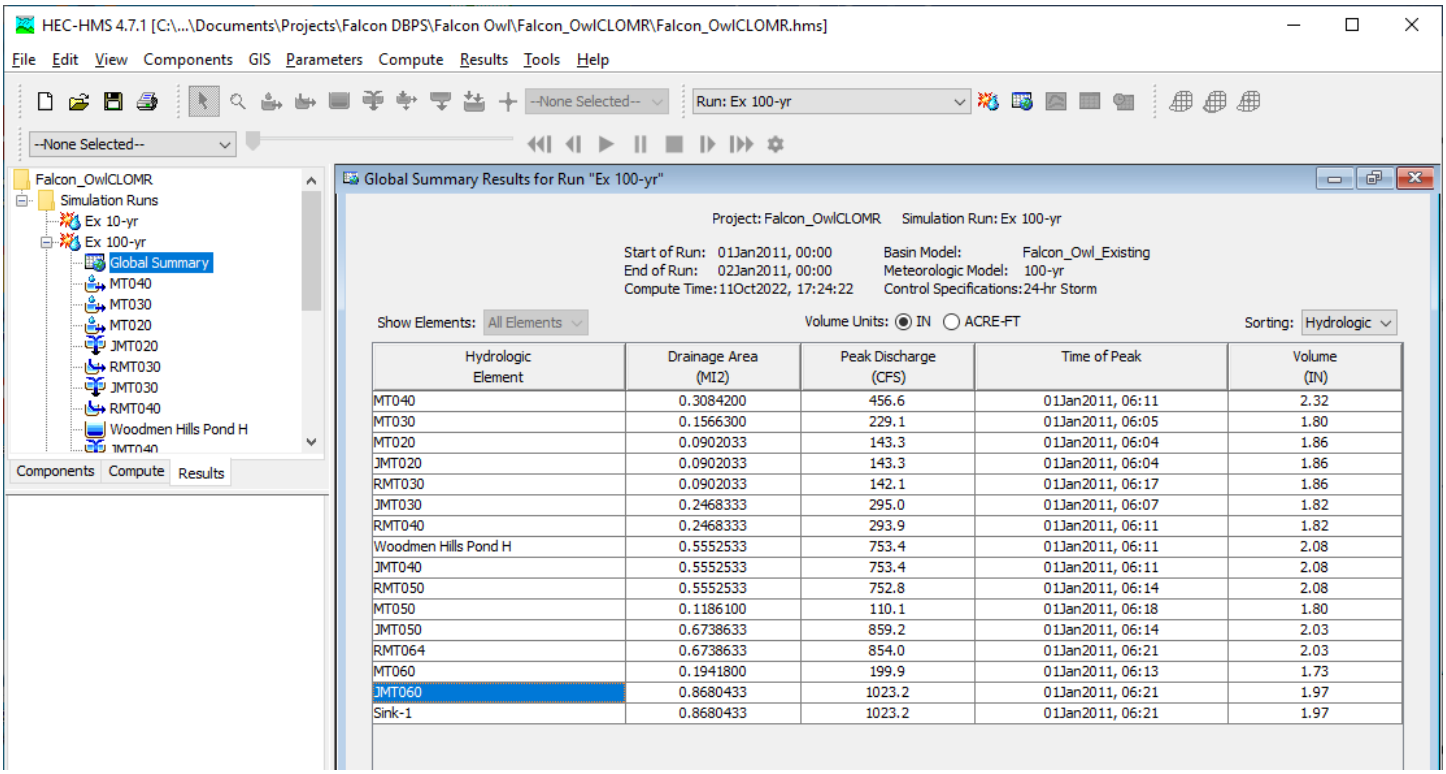
Sheet Flow	
n	0.011
Length (ft)	234
2-yr 24-hr rain	2.1
Slope	0.00855
Tt (min)	4.15
Shallow Flow	
Unpaved	1
Length (ft)	1678
Slope	0.0167
Velocity (fps)	2.084
Tt (min)	13.42
Channel Flow	
Length (ft)	2044.8
Velocity (fps)	3.18
Tt (min)	10.72

Total Tt (min)	28.29
Tlag (min)	17.0

MT060 Proposed Conditions Land Use (based on El Paso County GIS Zoning)

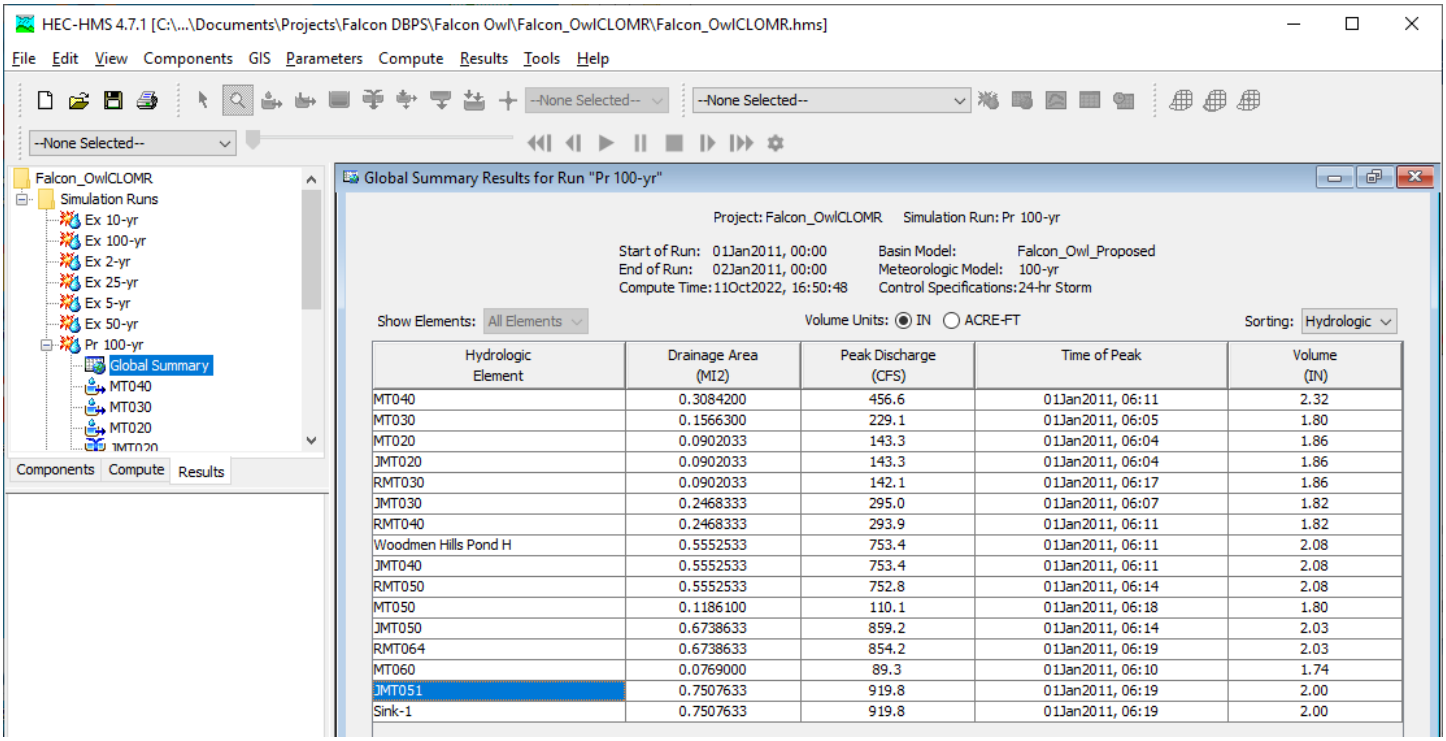


Existing Conditions 100-year HMS Global Summary



Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
MT040	0.3084200	456.6	01Jan2011, 06:11	2.32
MT030	0.1566300	229.1	01Jan2011, 06:05	1.80
MT020	0.0902033	143.3	01Jan2011, 06:04	1.86
JMT020	0.0902033	143.3	01Jan2011, 06:04	1.86
RMT030	0.0902033	142.1	01Jan2011, 06:17	1.86
JMT030	0.2468333	295.0	01Jan2011, 06:07	1.82
RMT040	0.2468333	293.9	01Jan2011, 06:11	1.82
Woodmen Hills Pond H	0.5552533	753.4	01Jan2011, 06:11	2.08
JMT040	0.5552533	753.4	01Jan2011, 06:11	2.08
RMT050	0.5552533	752.8	01Jan2011, 06:14	2.08
MT050	0.1186100	110.1	01Jan2011, 06:18	1.80
JMT050	0.6738633	859.2	01Jan2011, 06:14	2.03
RMT064	0.6738633	854.0	01Jan2011, 06:21	2.03
MT060	0.1941800	199.9	01Jan2011, 06:13	1.73
JMT060	0.8680433	1023.2	01Jan2011, 06:21	1.97
Sink-1	0.8680433	1023.2	01Jan2011, 06:21	1.97

Proposed Conditions 100-year HMS Global Summary

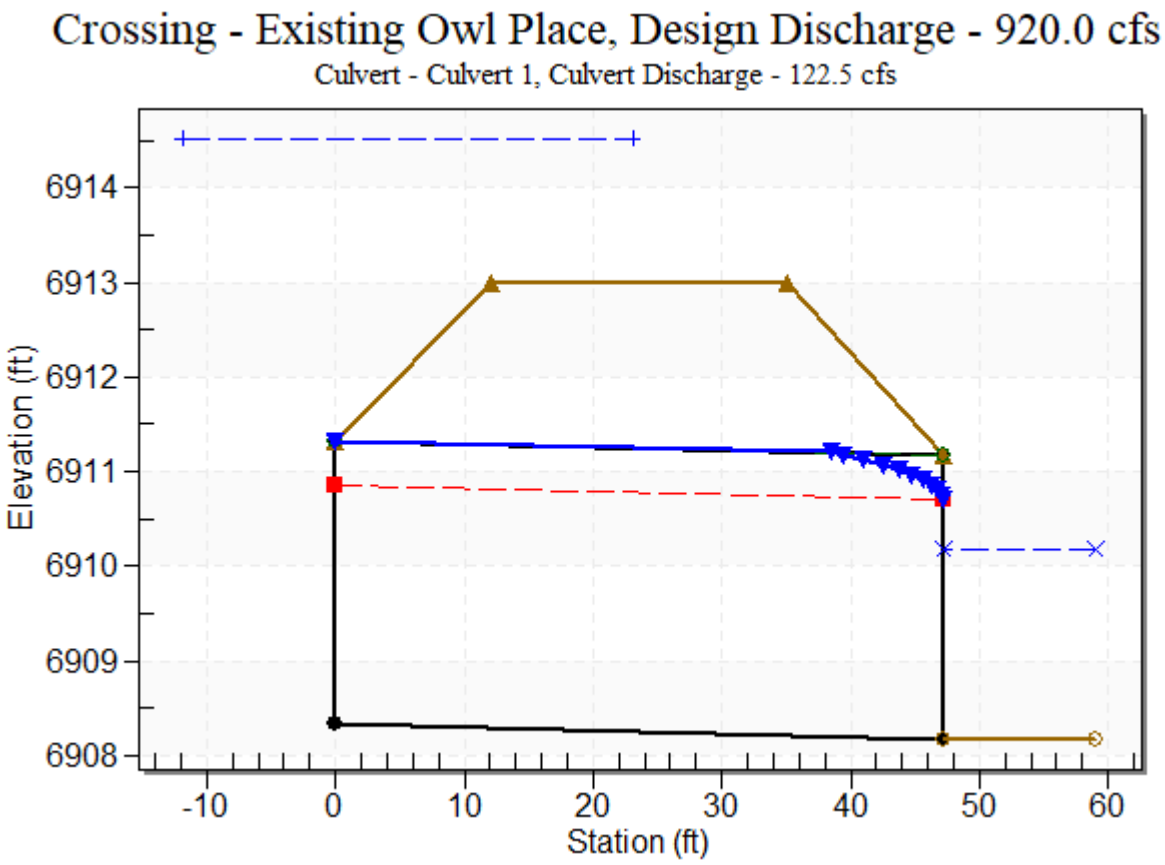


Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
MT040	0.3084200	456.6	01Jan2011, 06:11	2.32
MT030	0.1566300	229.1	01Jan2011, 06:05	1.80
MT020	0.0902033	143.3	01Jan2011, 06:04	1.86
JMT020	0.0902033	143.3	01Jan2011, 06:04	1.86
RMT030	0.0902033	142.1	01Jan2011, 06:17	1.86
JMT030	0.2468333	295.0	01Jan2011, 06:07	1.82
RMT040	0.2468333	293.9	01Jan2011, 06:11	1.82
Woodmen Hills Pond H	0.5552533	753.4	01Jan2011, 06:11	2.08
JMT040	0.5552533	753.4	01Jan2011, 06:11	2.08
RMT050	0.5552533	752.8	01Jan2011, 06:14	2.08
MT050	0.1186100	110.1	01Jan2011, 06:18	1.80
JMT050	0.6738633	859.2	01Jan2011, 06:14	2.03
RMT064	0.6738633	854.2	01Jan2011, 06:19	2.03
MT060	0.0769000	89.3	01Jan2011, 06:10	1.74
JMT051	0.7507633	919.8	01Jan2011, 06:19	2.00
Sink-1	0.7507633	919.8	01Jan2011, 06:19	2.00

APPENDIX 5

HYDRAULIC MODELING

Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6908.33 ft

Outlet Station: 47.20 ft

Outlet Elevation: 6908.18 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Tailwater Channel Data - Existing Owl Place

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 6910.18 ft

Roadway Data for Crossing: Existing Owl Place

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 140.00 ft

Crest Elevation: 6913.00 ft

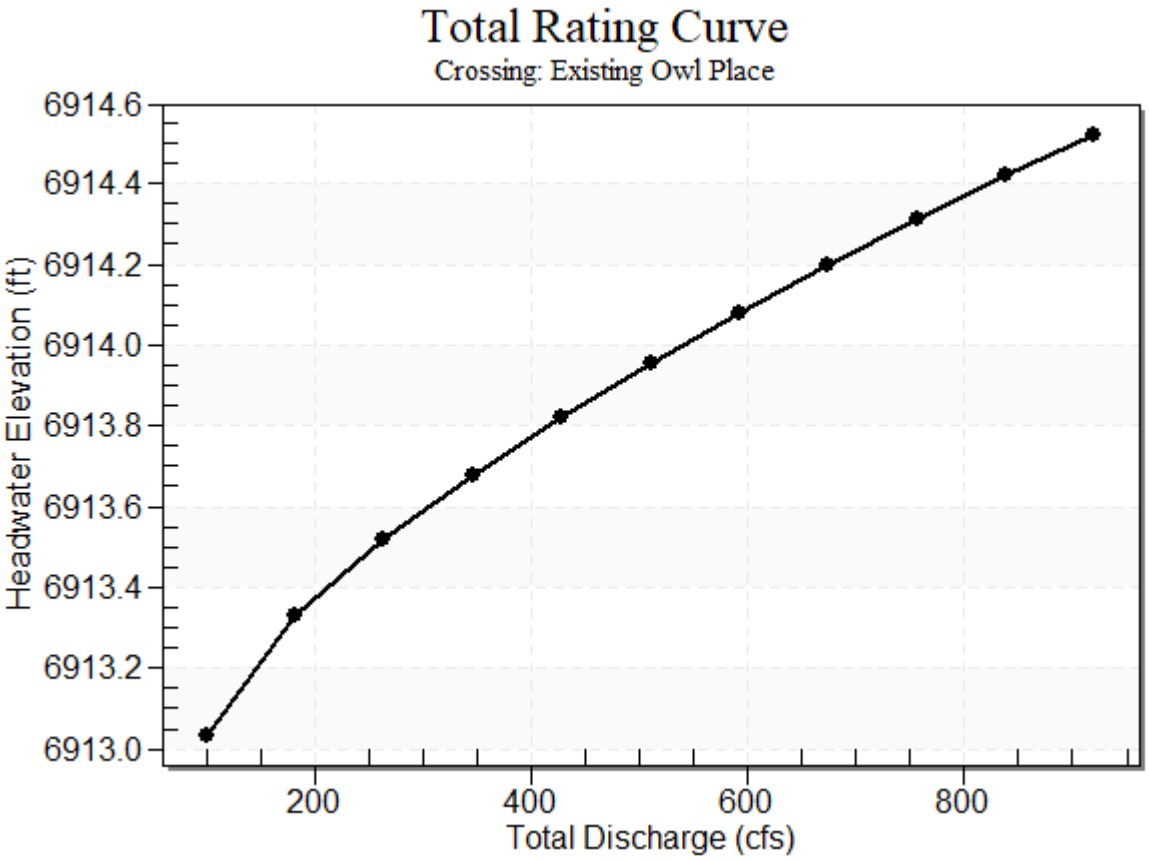
Roadway Surface: Paved

Roadway Top Width: 23.00 ft

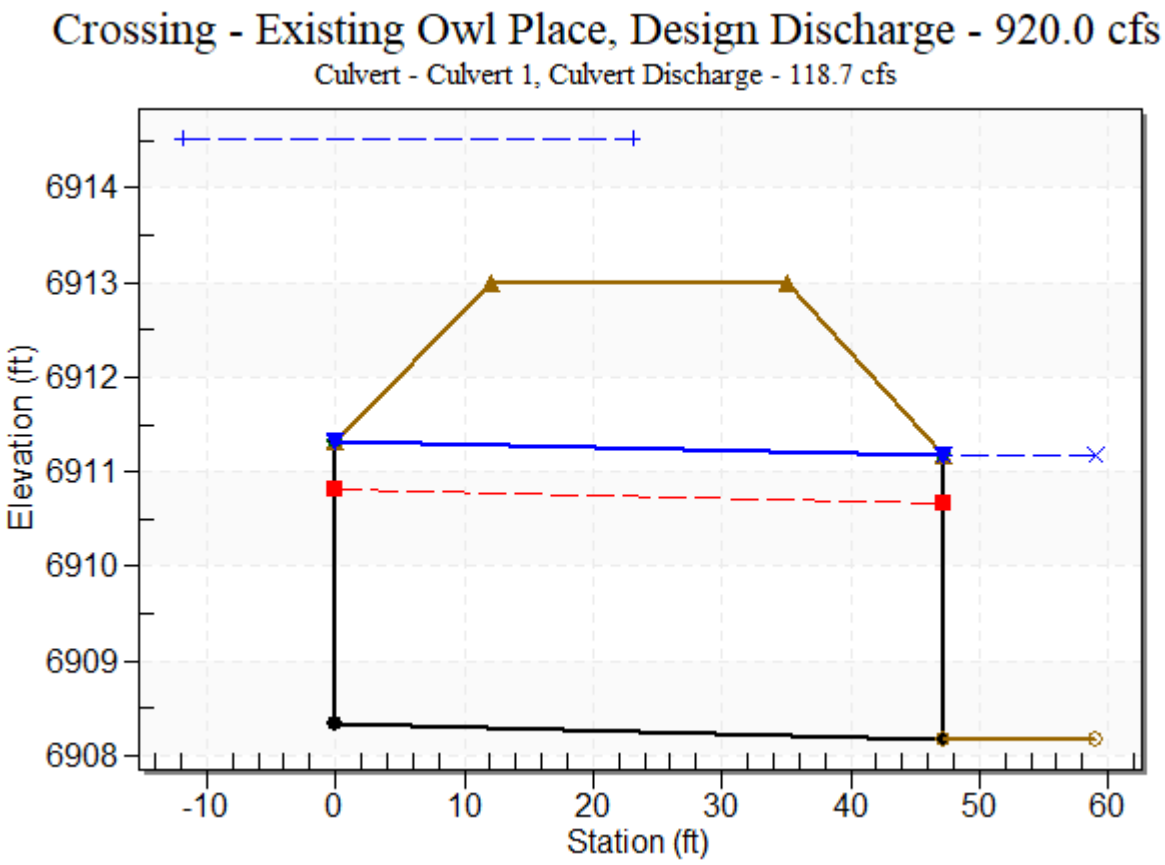
Table 1 - Summary of Culvert Flows at Crossing: Existing Owl Place

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6913.04	100.00	97.23	2.67	15
6913.33	182.00	102.18	79.37	6
6913.52	264.00	105.86	157.82	5
6913.68	346.00	108.49	237.36	5
6913.82	428.00	111.07	316.40	4
6913.96	510.00	113.11	396.63	4
6914.08	592.00	115.36	476.52	4
6914.20	674.00	117.11	556.16	3
6914.31	756.00	118.99	636.67	3
6914.42	838.00	120.83	717.02	3
6914.52	920.00	122.48	797.47	3
6913.00	96.57	96.57	0.00	Overtopping

Rating Curve Plot for Crossing: Existing Owl Place



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6908.33 ft

Outlet Station: 47.20 ft

Outlet Elevation: 6908.18 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Tailwater Channel Data - Existing Owl Place

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 6911.18 ft

Roadway Data for Crossing: Existing Owl Place

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 140.00 ft

Crest Elevation: 6913.00 ft

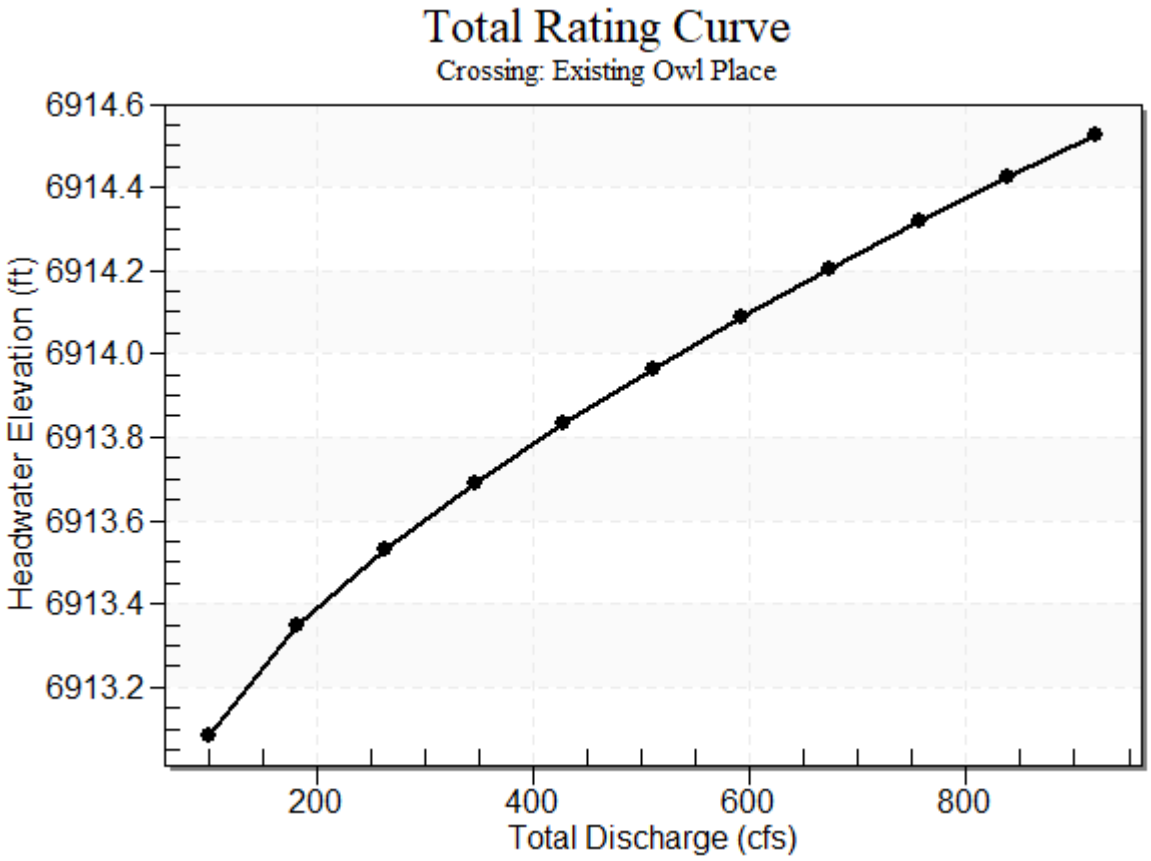
Roadway Surface: Paved

Roadway Top Width: 23.00 ft

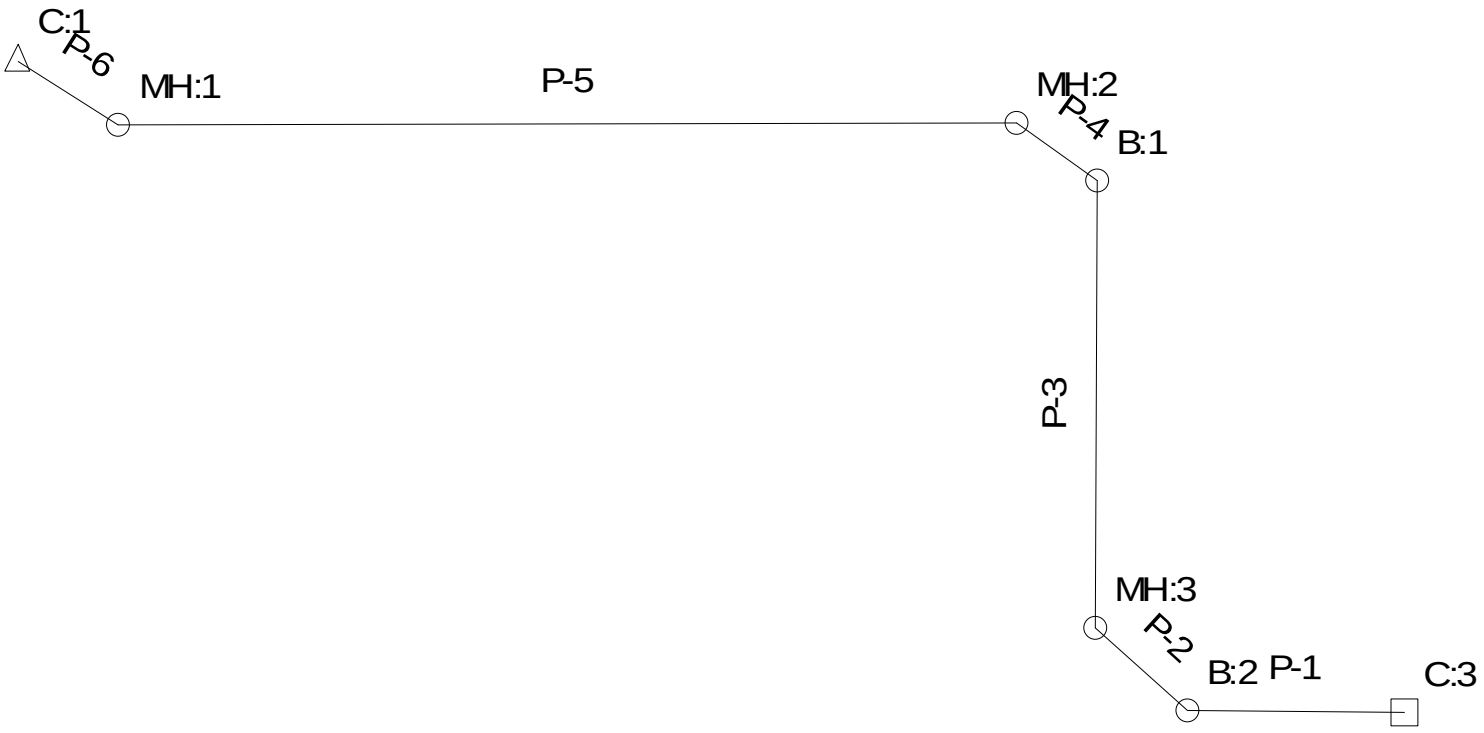
Table 1 - Summary of Culvert Flows at Crossing: Existing Owl Place

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6913.09	100.00	89.58	10.34	8
6913.35	182.00	95.54	86.21	6
6913.53	264.00	99.51	164.21	5
6913.69	346.00	102.79	243.06	5
6913.83	428.00	105.65	321.85	4
6913.96	510.00	108.26	401.51	4
6914.09	592.00	110.63	481.25	4
6914.20	674.00	112.83	560.58	3
6914.32	756.00	114.90	640.77	3
6914.42	838.00	116.85	721.00	3
6914.53	920.00	118.71	801.25	3
6913.00	87.53	87.53	0.00	Overtopping

Rating Curve Plot for Crossing: Existing Owl Place



Scenario: Base



Drexel Barrell & Co
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

```
================================================================
Scenario: Base


>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.


================================================================
Gravity subnetwork discharging at: C:1
----------------------------------------------------------------
>>>> Info: Loading and hydraulic computations completed
     successfully.
>>>> Warning: P-1 Pipe fails maximum velocity constraint.
>>>> Warning: P-2 Pipe fails maximum velocity constraint.
>>>> Warning: P-3 Pipe fails maximum velocity constraint.
>>>> Warning: P-4 Pipe fails maximum velocity constraint.
>>>> Warning: P-5 Pipe fails maximum velocity constraint.
>>>> Warning: P-6 Pipe fails maximum velocity constraint.

CALCULATION SUMMARY FOR SURFACE NETWORKS
```

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
C:3	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00

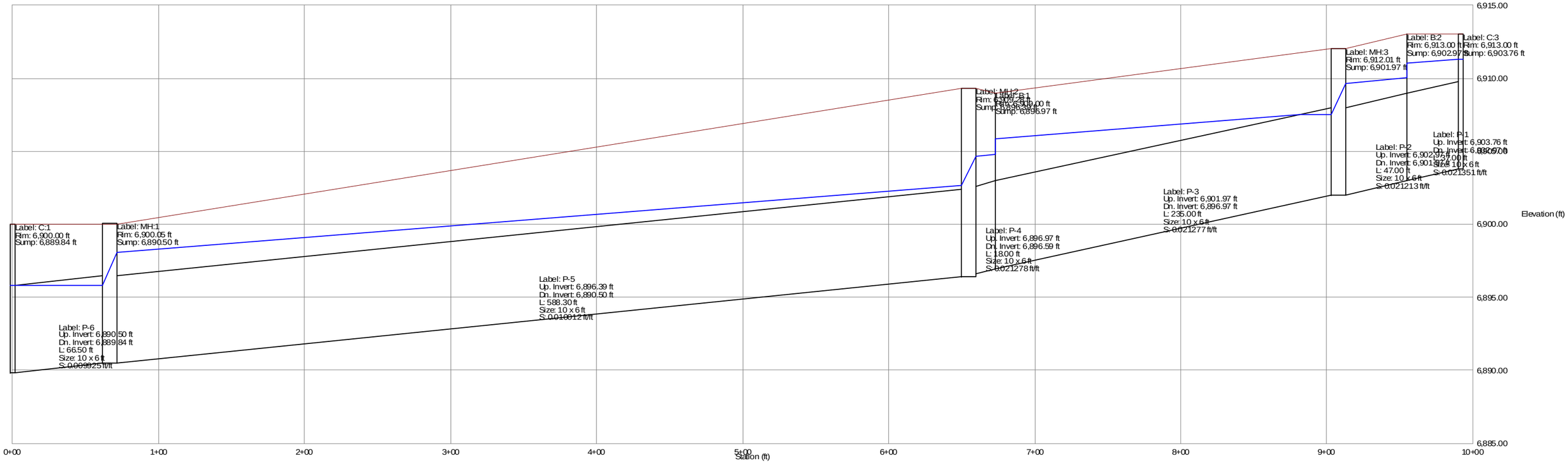
```
CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: C:1
```

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-6	1	10 x 6 ft	Box	66.50	920.00	16.28	6,895.84	6,895.84
P-5	1	10 x 6 ft	Box	588.30	920.00	15.33	6,902.66	6,898.08
P-4	1	10 x 6 ft	Box	18.00	920.00	15.33	6,904.76	6,904.62
P-3	1	10 x 6 ft	Box	235.00	920.00	15.99	6,907.50	6,905.84
P-2	1	10 x 6 ft	Box	47.00	920.00	15.33	6,910.00	6,909.64
P-1	1	10 x 6 ft	Box	37.00	920.00	15.33	6,911.31	6,911.02

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
C:1	920.00	6,900.00	6,895.84	6,895.84
MH:1	920.00	6,900.00	6,898.08	6,895.84
MH:2	920.00	6,909.28	6,904.62	6,902.66
B:1	920.00	6,909.00	6,905.84	6,904.76
MH:3	920.00	6,912.01	6,909.64	6,907.50
B:2	920.00	6,913.00	6,911.02	6,910.00
C:3	920.00	6,913.00	6,911.31	6,911.31

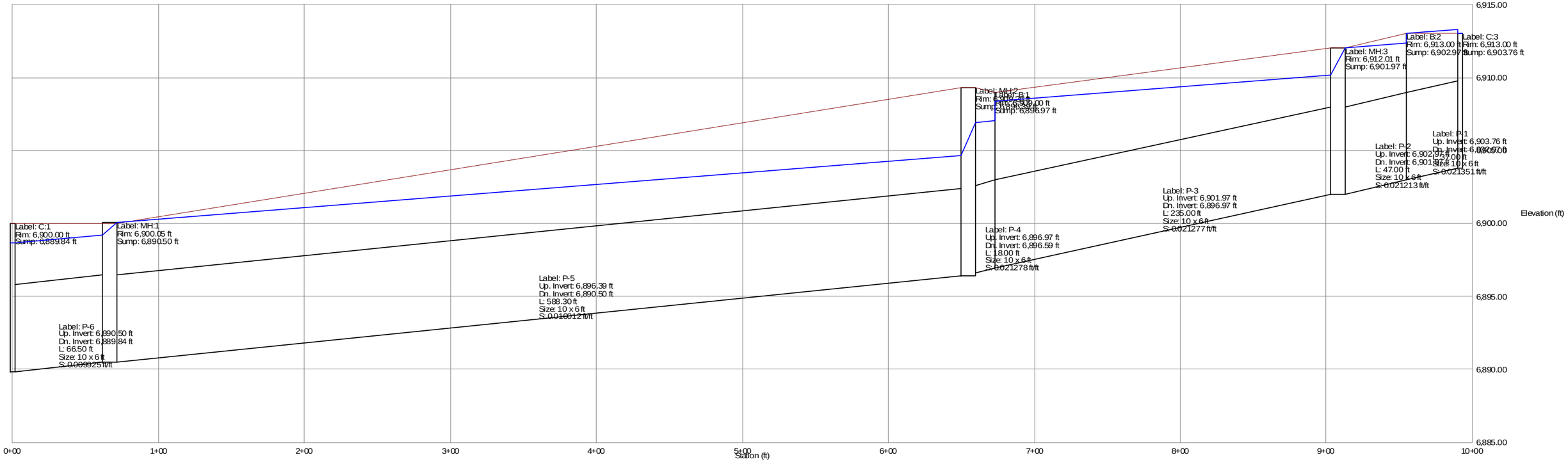
```
================================================================
Completed: 10/13/2022 02:38:50 PM
```

Profile
Scenario: Base



Profile

Pond SR4 Backwater Condition



APPENDIX 6

FEMA MT-2 FORMS

APPENDIX 7

FPWM & ANNOTATED FIRM

PROPOSED FLOODPLAIN CONTAINED IN 10'X6' BOX CULVERT

OWL PLACE

MERIDIAN PARK DRIVE

MERIDIAN 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.

60 30 0 60 120

SCALE IN FEET

PREPARED BY:

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

Drexel, Barrell & Co.
Engineers • Surveyors
1376 MINERS DRIVE, STE 107
LAFAYETTE, COLORADO 800026
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	10/25/22

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

COLORADO LICENSED
MICHELLE IBLINGS
43515
PROFESSIONAL ENGINEER

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

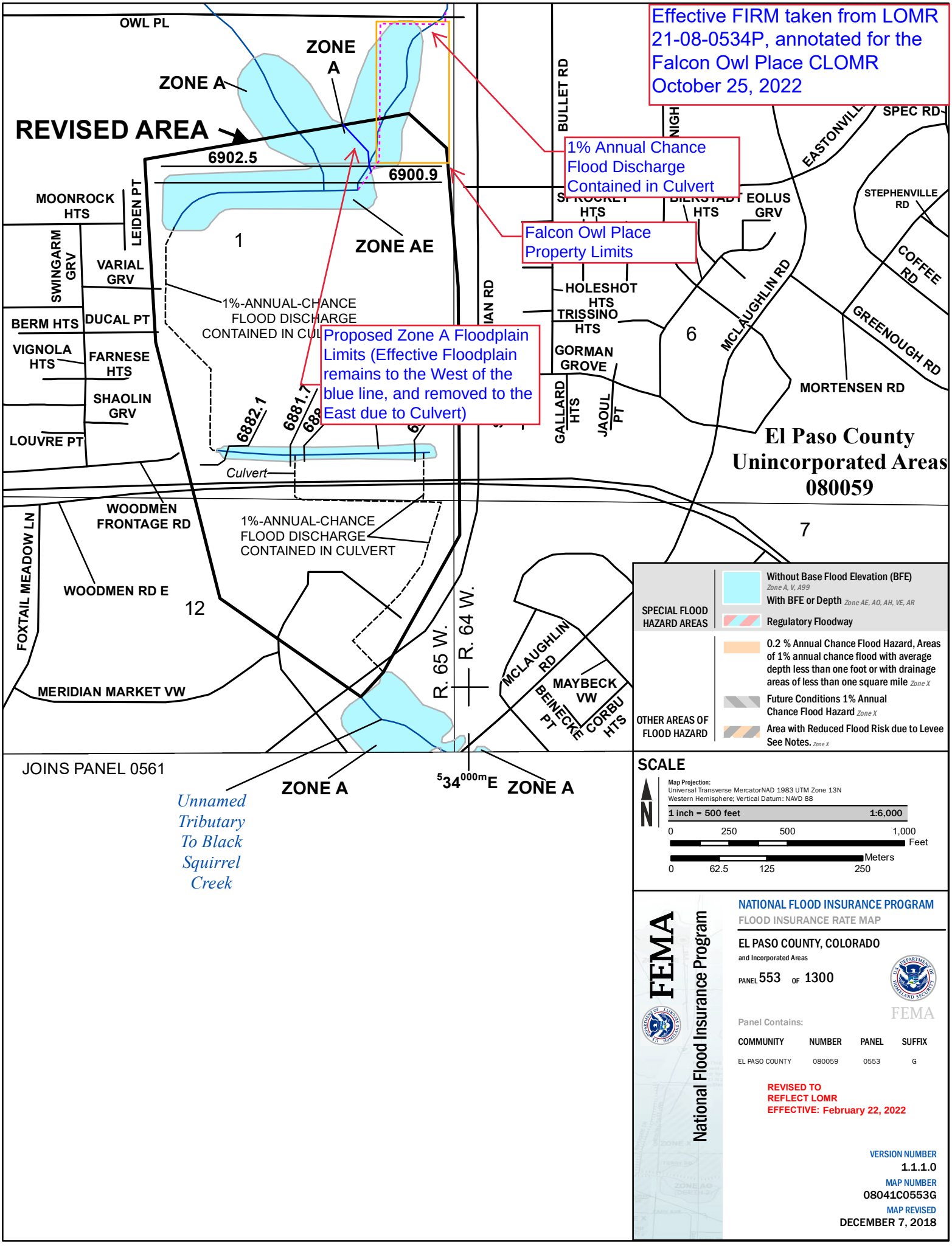
CLOMR
FLOODPLAIN
WORK MAP

PROJECT:21611-00BLWR
DRAWING NO.

FPWM

SHEET: 1 OF 1

H:\21611-00BLWR\Plans\Sheets\FPWM\FPWM.dwg, 10/25/2022 12:13:59 PM


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

APPENDIX 8

ENDANGERED SPECIES ACT

DBC
Drexel, Barrell & Co.
Traditional Services, Innovative Solutions Since 1949

1800 38th St. • Boulder, CO 80301 • 303.442.4338 • 303.442.4373 fax
3 South 7th St. • Colorado Springs, CO 80905 • 719-260-0887 • 719-260-8352 fax
6513 W. 4th Street • Greeley, CO 80634 • 970-351-0645

May 31, 2022

Attention: *FEMA, CWCB, PPRBD*

Subject: *Falcon Owl Place CLOMR Submittal Request:*
Endangered Species Act (ESA) Compliance

On behalf of BH RE Investments, LLC, Drexel, Barrell & Co. is requesting a review of the following supplemental documentation regarding the above site for compliance with the ESA. Based on the below findings, the project will not result in the taking of any threatened or endangered species.

Federal Nexus
The project area is southwest of the intersection of Owl Place and Meridian Road in Falcon, Colorado (Figure 1). The East Branch of a seasonal drainageway associated with an unnamed tributary to Black Squirrel Creek flows southwest through the site. The site is immediately upstream and adjacent to the Falcon Marketplace (formerly known as the Gaddie Property), recently approved in the attached LOMR dated March 1, 2022.

On August 23, 2016, Van Truan, Chief of Southern Colorado Regulatory Branch of the U.S. Army Corps of Engineers, provided an Approved Jurisdictional Ruling determining that ***"the [Falcon Marketplace] site contains no jurisdictional waters of the United States that are subject to regulation under Section 404 of the Clean Water Act***". Because the sites are similar and adjacent, we propose that no known federal nexus is associated with either project.

Project Location and Description
The Owl Place property is located at 11745 Owl Place in Falcon, Colorado. The legal description of the project area is Section 1, Township 13 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The latitude/longitude of the project area is approximately 38.946°N/104.6085°W. The elevation of the project area varies but is on average approximately 6,900 feet above sea level.

The proposed project consists of constructing a commercial/retail development, with associated roadways, parking areas, landscaping and utility infrastructure.

Endangered Species Act (ESA) Compliance
The project area does not fall within U.S. Fish and Wildlife Service (Service) habitat or survey guidelines for the majority of the species listed by the Service as potentially occurring in El Paso County (Table 1).

The interior least tern, piping plover, whooping crane, pallid sturgeon, and western prairie fringed orchid are species affected by water depletions from the South Platte River. The project area is not within the Platte River Basin and there would be no depletions of the Platte River.

Table 1. Federally threatened, endangered, and candidate species potentially found in El Paso County or potentially affected by projects in El Paso County.

Common Name	Scientific Name	Status*	Habitat	Potential Effect on Species
		Mammals		
Black-footed ferret	*Mustela nigripes*	EXPN, XN	Prairie and grassland ranging from midwestern to western U.S.	No effect, habitat not present
North American wolverine	*Gulo gulo luscus*	P	Deep, persistent, and reliable spring snow cover	No effect, habitat not present
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	T	Shrub riparian / wet meadows	No effect, in block clearance area
		Birds		
Interior least tern**	*Sterna antillarum athalassos*	E	Sandy/pebble beaches on lakes, reservoirs, and rivers	No effect, not in Platte River Basin
Mexican spotted owl	*Strix occidentalis*	T	Closed canopy forests in steep canyons	No effect, no habitat present
Piping plover**	*Charadrius melodus*	T	Sandy lakeshore beaches and river sandbars	No effect, not in Platte River Basin
Whooping crane**	*Grus americana*	E	Mudflats around reservoirs and in agricultural areas	No effect, not in Platte River Basin
		Fish		
Arkansas darter	*Etheostoma cragini*	C	Clear waters, low current with sandy bottoms, abundant aquatic vegetation	No, project area lacks flows and there is no continuous surface water connection to the Arkansas River
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	T	Cold, clear, oxygenated streams of moderate gradient	No effect, no habitat present
Pallid sturgeon**	*Scaphirhynchus albus*	E	Large, turbid, free-flowing rivers with a strong current and gravel or sandy substrate	No effect, not in Platte River Basin
		Plants		
Ute ladies' -tresses orchid	*Spiranthes diluvialis*	T	Moist to wet alluvial meadows, floodplains of perennial streams, and around springs and lakes below 6,500 feet	No habitat present – above species' elevation range
Western prairie fringed orchid**	*Platanthera praeclara*	T	Moist to wet tallgrass prairies and sedge meadows, mostly in relatively undisturbed grasslands	No effect, not in Platte River Basin

*T = Federally Threatened; E = Federally Endangered; C = Federal Candidate; P = Federal Proposed; EXPN, XN = Experimental Non-Essential Population.
**Water depletions in the North Platte, South Platte, and Laramie River basins may affect the species and/or critical habitat in downstream reaches in other counties or states.
Source: Service 2016.

The proposed project would not directly affect the black-footed ferret, North American wolverine, or Mexican spotted owl because of the lack of potentially suitable habitat in the project area. The project area is within the Preble's meadow jumping mouse (Preble's) Colorado Springs block clearance area, within which Preble's is assumed to be absent. The project area would not likely support the Arkansas darter because the darter is not known to occur in Black Squirrel Creek or its tributaries within the Arkansas River Basin and the

project area consists of only small seasonal pooled areas. The greenback cutthroat trout is primarily a high-elevation species, and the project area is outside the range of this species. The project area is not conducive to the establishment of Ute ladies'-tresses orchid (*Spiranthes diluvialis* or ULTO) and differs from the criteria of the Service's November 1992 (Service 1992) *Interim Survey Requirements for Spiranthes diluvialis* because the project area is above the elevation range and occurs outside of the 100-year floodplain of Fountain Creek.

Conclusions

There is no suitable habitat for threatened or endangered species in the project area. Therefore, the proposed development of the property would likely have no effect on species listed by the Service as potentially being present in El Paso County.

Please do not hesitate to contact me if you have any questions or require additional information. We look forward to working with you in processing this CLOMR.

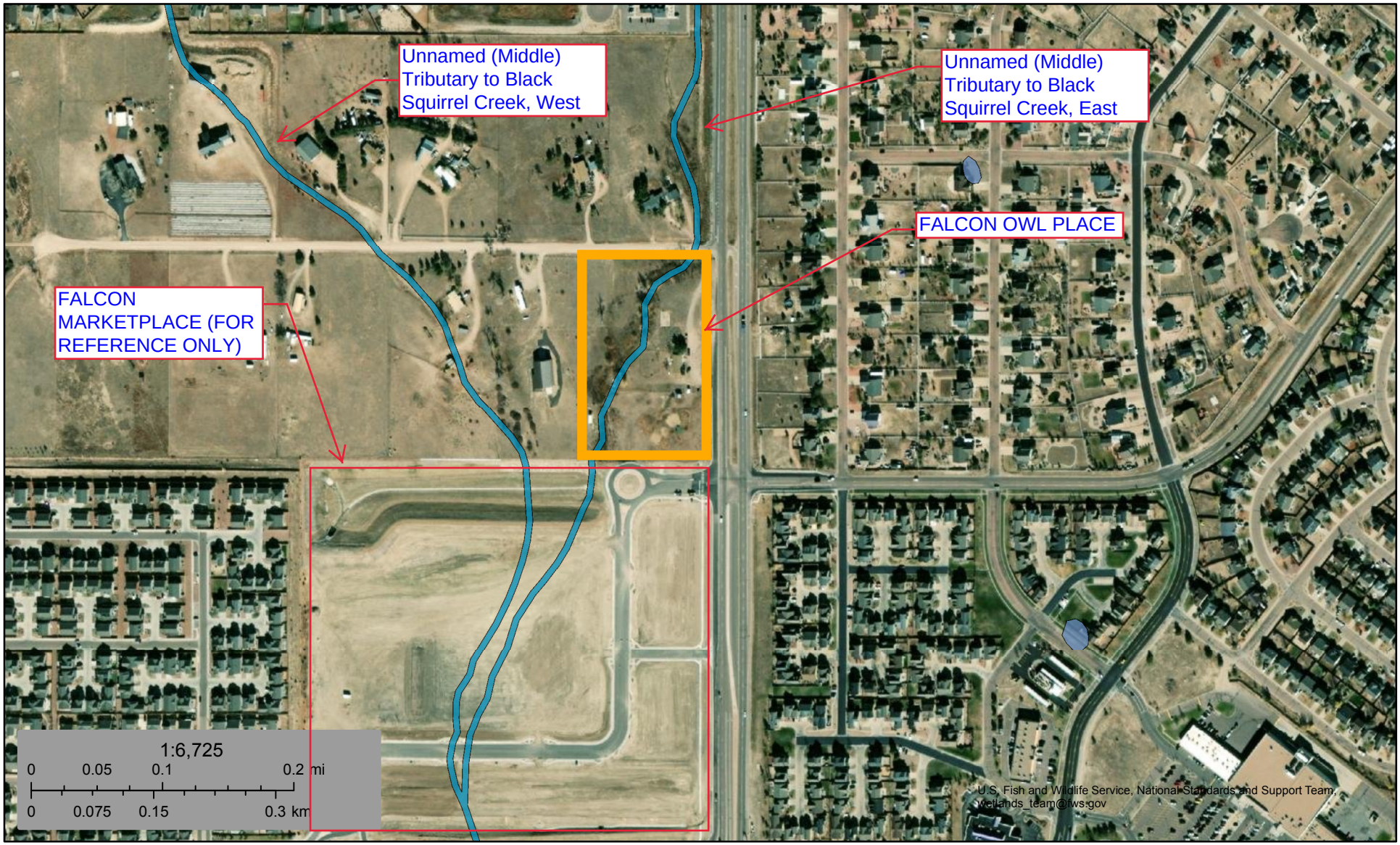
Respectfully,
Drexel, Barrell & Co.

Michelle Iblings, P.E., CFM
Associate, Water Resources Group Leader
miblings@drexelbarrell.com

Encl: Falcon Marketplace USACE Jurisdictional Ruling 8-23-16
NWI for Falcon Owl Place 5-27-22

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.

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
SOUTHERN COLORADO REGULATORY OFFICE
200 S. SANTA FE AVENUE, SUITE 301
PUEBLO, COLORADO 81003

REPLY TO ATTENTION OF

August 23, 2016

Regulatory Division

SUBJECT: Approved Jurisdictional Determination – Action No. SPA-2016-00278-SCO, Gaddie Property in Falcon, El Paso County, Colorado

Tim McConnell
Drexel, Barrell & Co.
3 S. 7th Street
Colorado Springs, CO 80905

Mr. McConnell:

I am writing this letter in response to your request for a jurisdictional determination (JD) for the Gaddie Property in Falcon, El Paso County, Colorado. We have assigned Action No. SPA-2016-00278-SCO to your request. Please reference this number in all future correspondence concerning the site.

Based on the information provided, we have determined that the site contains no jurisdictional waters of the United States that are subject to regulation under Section 404 of the Clean Water Act.

The basis for this approved JD (attached) is that the project site contains waters with no nexus to interstate or foreign commerce. This approved JD is valid for five years unless new information warrants revision of the determination before the expiration date.

You may accept or appeal this approved JD or provide new information in accordance with the attached Notification of Administration Appeal Options and Process and Request for Appeal (NAAOP-RFA). If you elect to appeal this approved JD, you must complete Section II of the form and return it to the Army Engineer Division, South Pacific, CESPD-PDS-O, Attn: Tom Cavanaugh, Administrative Appeal Review Officer, 1455 Market Street, Room 1760, San Francisco, CA 94103-1399 within 60 days of the date of this notice. Failure to notify the Corps within 60 days of the date of this notice means that you accept the approved JD in its entirety and waive all rights to appeal the approved JD.

If you have any questions, please contact me at 719-543-6915 or by e-mail at

van.a.truan@usace.army.mil. At your convenience, please complete a Customer Service Survey at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

Sincerely,

Van Truan
Chief, Southern Colorado
Regulatory Branch

U.S. Fish and Wildlife Service

National Wetlands Inventory

Gaddie Property NWI

July 5, 2016

- 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.

Drainage Maps

120 60 0 120 240

SCALE: 1"=120'

LEGEND

- EX. MINOR CONTOUR
- 6800 EX. MAJOR CONTOUR
- EX. FENCE LINE
- ST EX. STORM DRAIN
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT
- BASIN
- AREA (ACRE)
- C5
- C100

E5 5.91 0.12 0.38

BASIN & DESIGN POINT SUMMARY

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1	A	1.34	3.4	7.6
E1		13.85	3.2	22.4
DPA+E1+RET090	B	15.19	41.0	346.4
OS2	C	0.60	1.4	3.2
OS3	D	2.56	0.8	5.6
E2		12.88	2.5	18.6
DPC+DPD+E2	E	16.04	3.8	23.9
E3	F	13.11	2.7	19.6
OS4	G	3.29	2.4	9.7
E4		1.57	0.3	2.6
DPG+E4	H	4.86	1.9	9.0
E5	I	5.91	2.2	11.7
OS5	J	5.50	6.6	6.6
OS6	L	0.91	2.6	5.5
E6		10.37	1.7	12.5
DPJ+DPL+E6	M	16.78	4.1	21.9

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
101 SAHWATCH STREET, STE #100
COLORADO SPGS, COLORADO 80903
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

FALCON FIELD, LLC.

3230 ELECTRA DR N.
COLORADO SPRINGS, CO 80906
(719) 475-7474
CONTACT: PJ ANDERSON

DRAINAGE PLANS FOR
THE COMMONS AT FALCON FIELD
12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	1/31/24
RESUBMITTAL	5/30/24

DESIGNED BY:	TDM
DRAWN BY:	CGH
CHECKED BY:	KGV
FILE NAME:	21604-00EDR

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 120'
VERTICAL: N/A

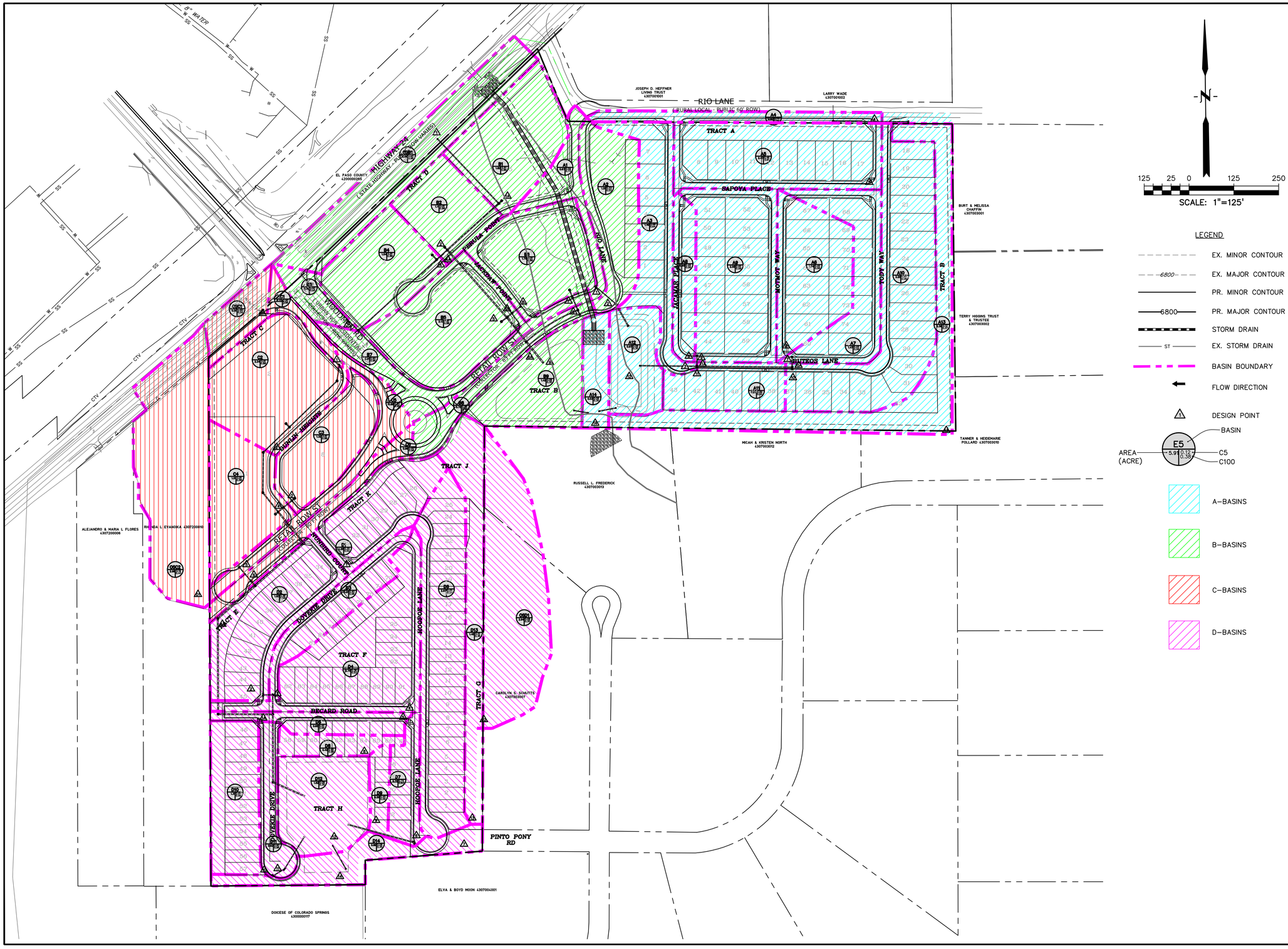
OVERALL EXISTING DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

EDR1

SHEET: 1 OF 6



PREPARED BY:

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Engineers • Surveyors
101 SAHWATCH STREET, STE #100
COLORADO SPGS, COLORADO 80903
CONTACT: TIM D. McCONNELL, P.E.
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3230 ELECTRA DR N.
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DRAINAGE PLANS FOR

THE COMMONS AT FALCON FIELD

12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	1/31/24
RESUBMITTAL	5/30/24

DESIGNED BY:	TDM
DRAWN BY:	CGH
CHECKED BY:	KGV
FILE NAME:	21604-00DR

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 125'
VERTICAL: N/A

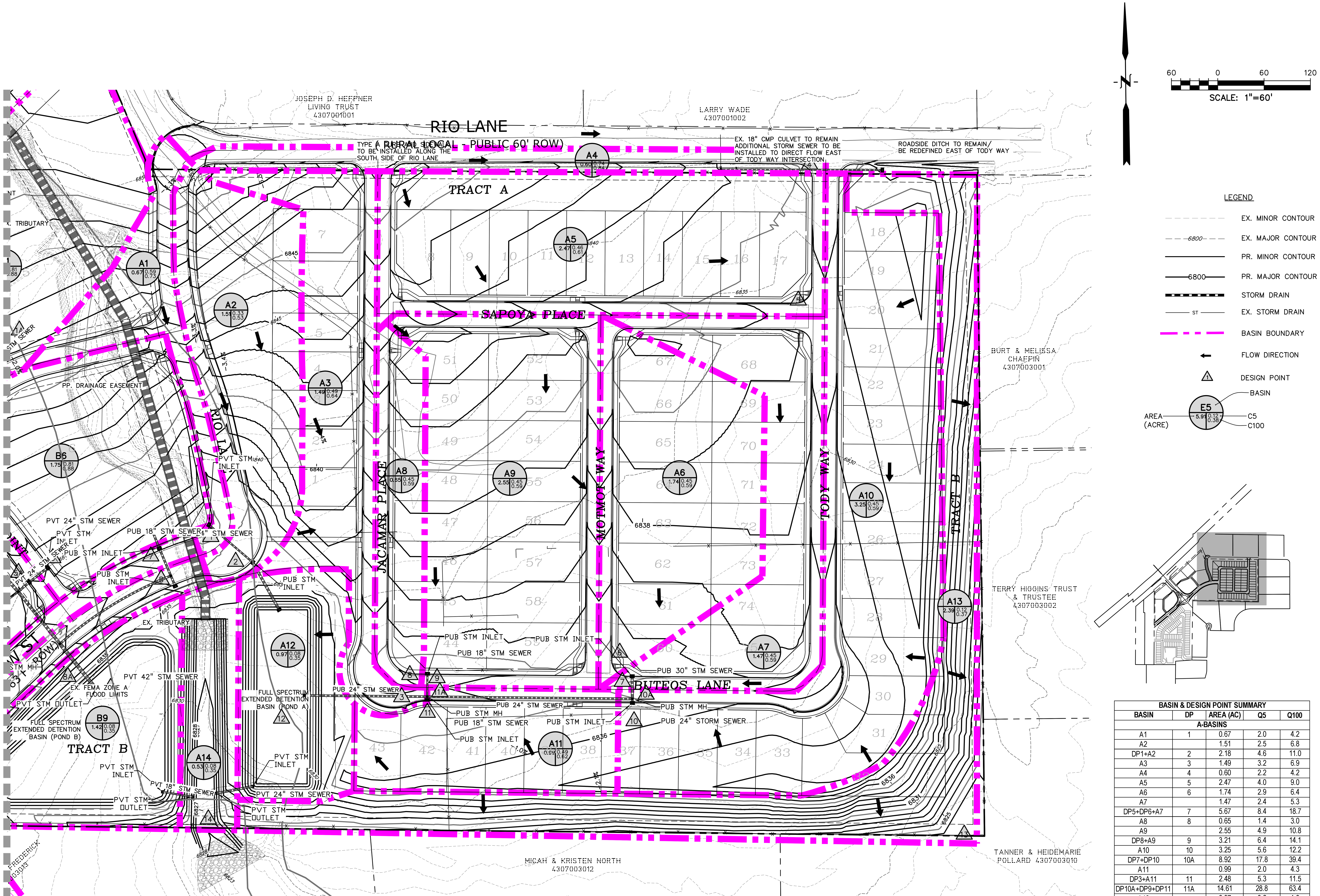
OVERALL PROPOSED DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

DR1

SHEET: 2 OF 6



BASIN & DESIGN POINT SUMMARY				
BASIN	DP	AREA (AC)	Q5	Q100
A-BASINS				
A1	1	0.67	2.0	4.2
A2		1.51	2.5	6.8
DP1+A2	2	2.18	4.6	11.0
A3	3	1.49	3.2	6.9
A4	4	0.60	2.2	4.2
A5	5	2.47	4.0	9.0
A6	6	1.74	2.9	6.4
A7		1.47	2.4	5.3
DP5+DP6+A7	7	5.67	8.4	18.7
A8	8	0.65	1.4	3.0
A9		2.55	4.9	10.8
DP8+A9	9	3.21	6.4	14.1
A10	10	3.25	5.6	12.2
DP7+DP10	10A	8.92	17.8	39.4
A11		0.99	2.0	4.3
DP3+A11	11	2.48	5.3	11.5
DP10A+DP9+DP11	11A	14.61	28.8	63.4
A12		0.97	0.2	1.8
DP2+DP11A+A12	12	17.75	32.4	71.1
A13	13	2.39	1.4	7.7
A14	14	0.53	0.2	1.4

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
101 SAHWATCH STREET, STE #100
COLORADO SPGS, COLORADO 80903
CONTACT: TIM D. McCONNELL, P.E.
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DRAINAGE PLANS FOR

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12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	1/31/24
RESUBMITTAL	5/30/24

DESIGNED BY:	TDM
DRAWN BY:	CGH
CHECKED BY:	KGV
FILE NAME:	21604-00DR

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 60'
VERTICAL: N/A

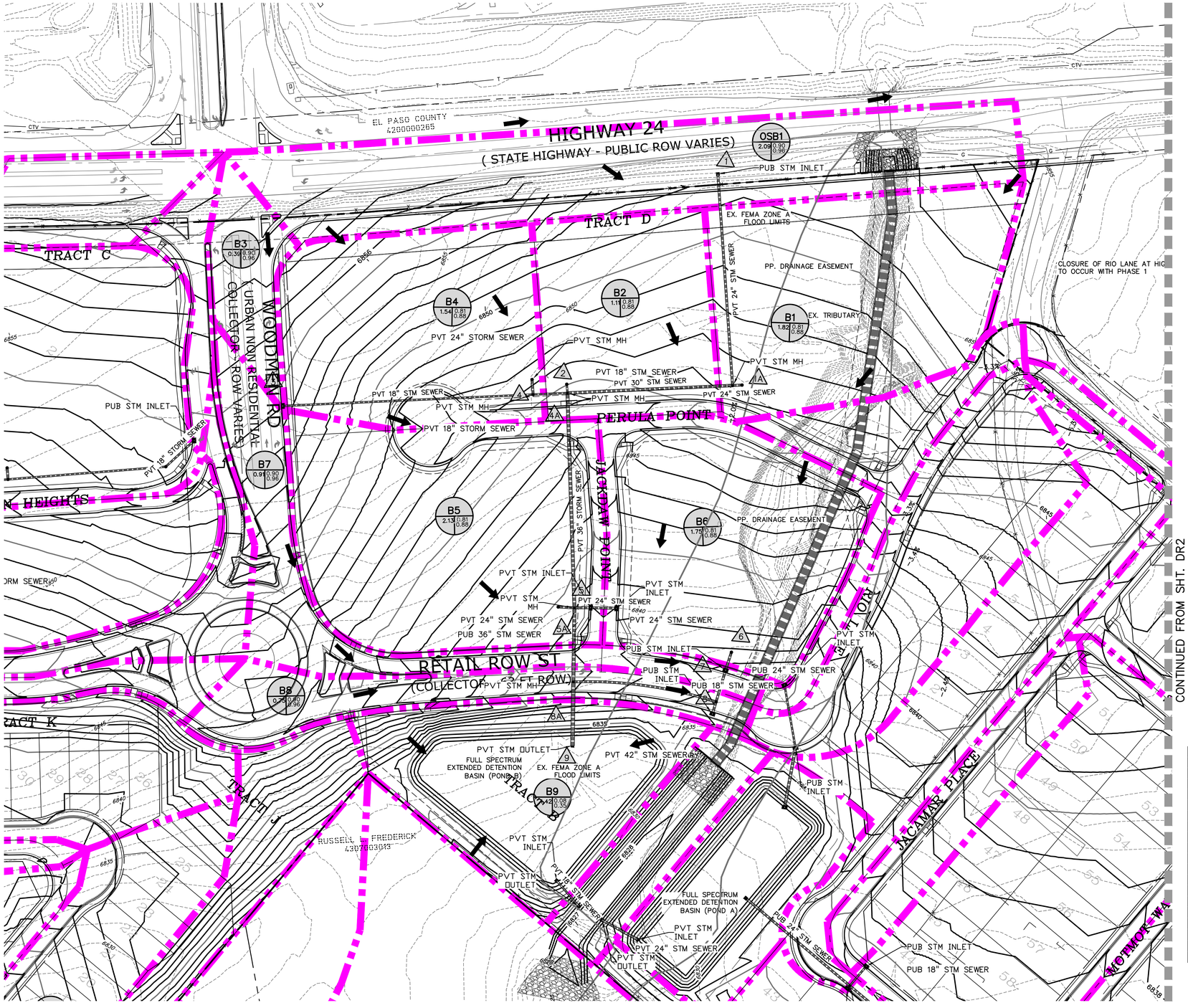
PROPOSED DRAINAGE MAP

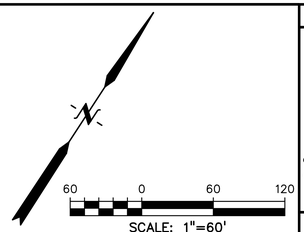
PROJECT NO. 21604-00CSCV

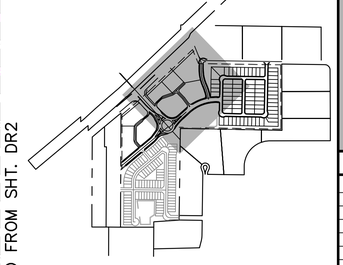
DRAWING NO.

DR2

SHEET: 3 OF 6







BASIN & DESIGN POINT SUMMARY				
BASIN	DP	AREA (AC)	Q5	Q100
B-BASINS				
OSB1	1	2.09	9.7	17.4
B1		1.82	7.6	13.9
	1A	3.91	16.8	30.3
B2	2	1.11	4.6	8.5
B3	3	0.39	1.8	3.3
B4	4	1.54	6.5	11.8
	4A	6.95	28.6	51.8
B5	5	2.13	8.9	16.3
	5A	9.09	36.0	65.4
B6	6	1.75	7.3	13.4
B7		0.91	4.2	7.6
	7	2.67	11.6	20.9
B8		0.75	3.5	6.2
	8	3.41	14.9	27.0
	8A	12.50	49.3	89.3
B9		1.42	0.6	4.3
	9	13.92	49.6	92.8

PREPARED BY:

DREXEL, BARRELL & CO.
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101 SAHWATCH STREET, STE #100
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CLIENT:

FALCON FIELD, LLC.

3230 ELECTRA DR N.
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CONTACT: PJ ANDERSON

DRAINAGE PLANS FOR
THE COMMONS AT FALCON FIELD
12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	1/31/24
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FILE NAME:	21604-00DR

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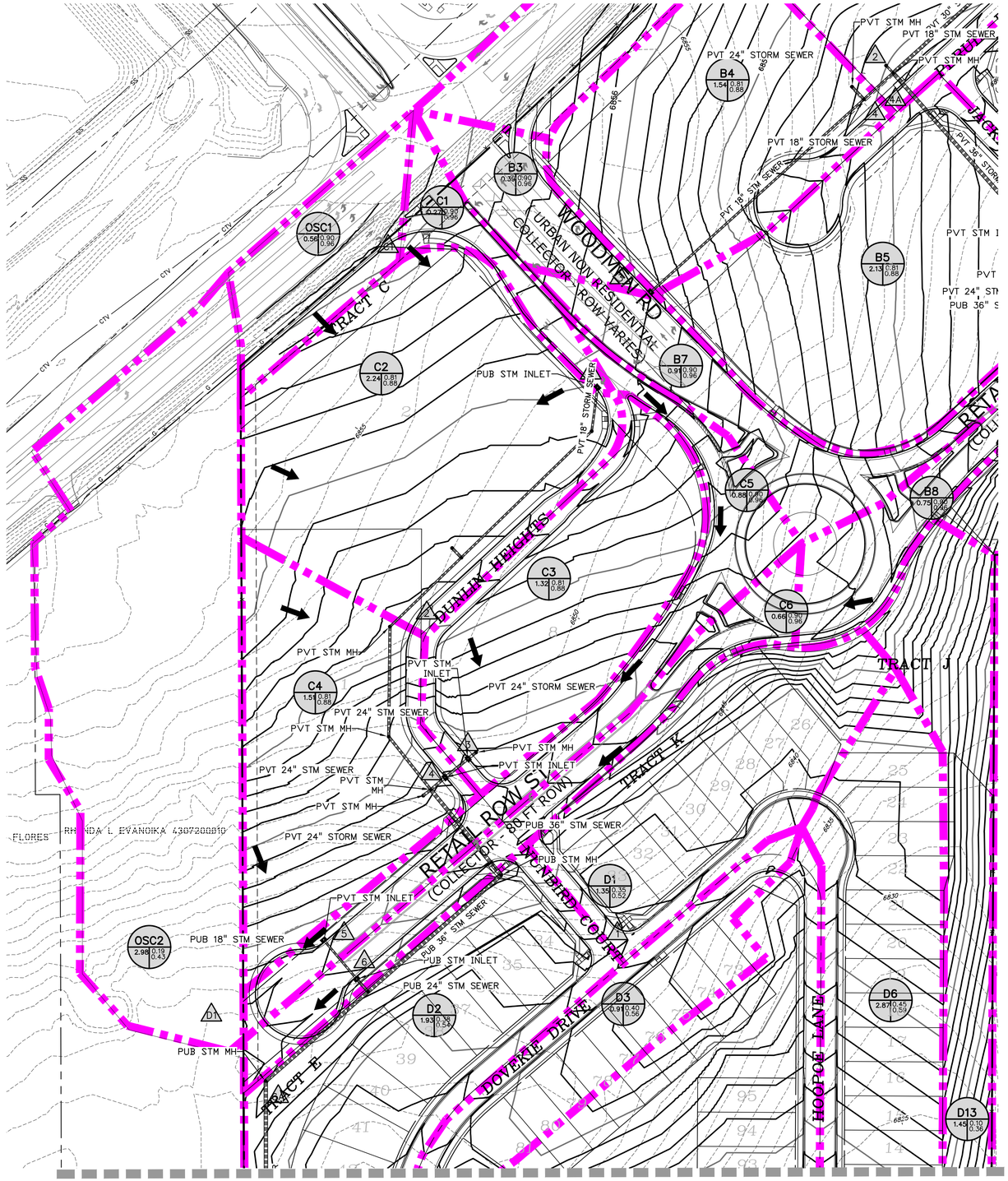
DRAWING SCALE:
HORIZONTAL: 1" = 60'
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

DR3

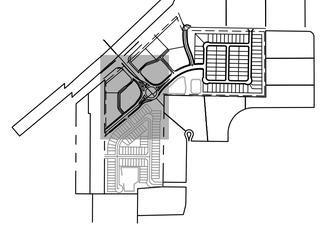


60 0 60 120

SCALE: 1"=60'

LEGEND

- EX. MINOR CONTOUR
- 6800 EX. MAJOR CONTOUR
- PR. MINOR CONTOUR
- 6800 PR. MAJOR CONTOUR
- STORM DRAIN
- ST EX. STORM DRAIN
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT
- BASIN
- AREA (ACRE)
- C5
- C100



BASIN & DESIGN POINT SUMMARY				
BASIN	DP	AREA (AC)	Q5	Q100
C-BASINS				
OSC1	C1	0.56	2.6	4.6
C1		0.27	1.3	2.3
	1	0.83	3.8	6.7
C2		2.24	9.4	17.1
	2	2.52	13.7	24.8
C3	3	1.32	5.5	10.1
C4		1.51	6.3	11.5
	4	5.34	24.0	43.7
OSC2		2.98	2.6	10.1
C5		0.88	4.1	7.3
	5	3.86	6.3	16.5
C6		0.66	3.1	5.5
	6	4.52	10.0	23.8
	6A	9.86	31.8	62.7

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DRAINAGE PLANS FOR
THE COMMONS AT FALCON FIELD
12445 RIO LANE, AND VACANT LAND
PEYTON, EL PASO COUNTY, COLORADO

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DRAWING SCALE:
HORIZONTAL: 1" = 60'
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21604-00CSCV

DRAWING NO.

DR4

MATCHLINE – 2
SCALE: 1"=80'

MATCHLINE – 1
SCALE: 1"=80'

MATCHLINE – 1

MATCHLINE – 2

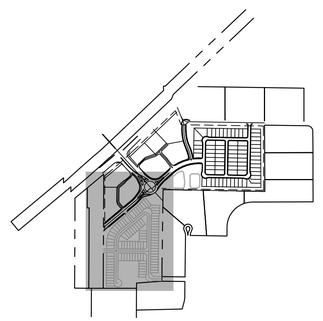
CONTINUED FROM SHT. DR4

BASIN & DESIGN POINT SUMMARY				
BASIN	DP	AREA (AC)	Q5	Q100
D-BASINS				
D1	1	1.35	2.0	5.0
D2		1.93	3.1	7.6
	2	3.28	4.8	11.9
D3	3	0.91	1.4	3.3
	3A	14.05	33.1	68.0
D4	4	2.75	4.2	10.3
D5		0.65	1.3	2.8
	5	3.40	5.4	13.0
D6	6	2.87	5.5	12.2
D7		0.70	2.5	4.7
	7	6.98	12.7	28.4
D8	8	0.42	0.8	1.7
D9	9	0.29	0.6	1.3
D10	10	1.31	2.7	6.0
D11		0.62	2.9	5.1
	11	1.93	5.3	10.6
D12		1.52	0.6	4.3
	12	25.18	53.8	115.5
OSD1	D1	2.94	1.0	7.3
D13		1.45	0.5	3.3
	13	4.39	1.4	9.6
D14	14	0.86	0.3	2.3

SCALE: 1"=60'

LEGEND

- EX. MINOR CONTOUR
- EX. MAJOR CONTOUR
- PR. MINOR CONTOUR
- PR. MAJOR CONTOUR
- STORM DRAIN
- EX. STORM DRAIN
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT
- BASIN
- AREA (ACRE)
- C5
- C100



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DRAWING SCALE:
HORIZONTAL: 1" = 60'
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21604–00CSCV

DRAWING NO.

DR5

SHEET: 6 OF 6