FINAL DRAINAGE REPORT

for

FALCON FIRE STATION NO. 3
7030 OLD MERIDIAN ROAD, FALCON, CO 80831

Prepared for:

Falcon Fire Protection District
7030 Old Meridian Road
Peyton, CO 80831

July 17, 2020
Revised September 18, 2020

Prepared by:

19 E. Willamette Ave.
Colorado Springs, CO 80903
(719)-477-9429
www.jpsengr.com

JPS Project No. 042001
PCD Project No. PPR-20-024

FALCON FIRE STATION NO. 3 – 7030 OLD MERIDIAN ROAD
FINAL DRAINAGE REPORT
TABLE OF CONTENTS

PAGE

DRAINAGE STATEMENT i

I. INTRODUCTION 1

II. EXISTING DRAINAGE CONDITIONS 2

III. PROPOSED DRAINAGE CONDITIONS 2

IV. DRAINAGE PLANNING FOUR STEP PROCESS 3

V. FLOODPLAIN IMPACTS 4

VI. STORMWATER DETENTION AND WATER QUALITY 4

VII. SUMMARY 5

APPENDICES

APPENDIX A Hydrologic Calculations
APPENDIX B Hydraulic Calculations
APPENDIX C Detention Pond Calculations

APPENDIX D Figures
Figure FIRM Floodplain Map
Sheet EX1 Existing Conditions Drainage Plan
Sheet D1 Developed Drainage Plan
Sheet C3.1 Detention Pond A Plan & Details

DRAINAGE STATEMENT

Engineer's Statement:

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

COLORADO REGISTERED JOHN P. SCHWAB 29891 PROFESSIONAL ENGINEER

John P. Schwab, P.E. #29891 10/27/20

Developer's Statement:

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

By: for 10-29-20

Chief Trent Harwig Date
Falcon Fire Protection District
7030 Old Meridian Road
Peyton, CO 80831

El Paso County's Statement

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

APPROVED
Engineering Department

11/06/2020 7:48:05 AM
dsdnijkamp
EPC Planning & Community Development Department

Jennifer Irvine, P.E. Date
County Engineer / ECM Administrator

Conditions:

I. INTRODUCTION

A. Property Location and Description

The Falcon Fire Protection District is planning to construct a new Fire Station No. 3 on their existing fire station site at 7030 Old Meridian Road The property is a partially developed 5.4-acre unplatted site (El Paso County Assessor's Parcel No. 53124-00-015) located at the northwest corner of US Highway 24 (US24) and Meridian Road in the Falcon area of El Paso County, Colorado. The site is zoned Planned Unit Development (PUD), and the District has processed an Approval of Location and Subdivision Exemption in advance of the Site Development Plan for the proposed site improvements.

The property is currently described as Lot 1, Falcon Fire Protection District Station No. 3 Exemption Plat. The property is located in Section 7, Township 13S, Range 64W, and a portion of Section 12, Township 13S, Range 65W of the 6th P.M., El Paso County, Colorado.

The southeast boundary of the property adjoins US Highway the northeast boundary adjoins Old Meridian Road. Existing commercial development is located across Old Meridian Road to the northeast and also along the northwest boundary of the site. The southwest boundary of the site adjoins the currently undeveloped right-of-way for the future Meridian Road.

The proposed Site Development Plan consists of constructing a new 8,382 square-foot fire station, along with associated parking and site improvements. In conjunction with the new fire station building project, the existing fire station building in the northeast corner of the site will be remodeled to serve as an Administration Building. Access will continue to be provided by the existing private access drive connection to Old Meridian Road along the northeast property boundary.

B. Scope

In support of the Site Development Plan submittal to El Paso County, this report is intended to meet the requirements of a Final Drainage Report in accordance with El Paso County drainage criteria. This report will provide a summary of site drainage issues impacting the proposed development. The report will analyze impacts from upstream drainage patterns, site-specific developed drainage patterns, and impacts on downstream facilities. This report is based on the guidelines and criteria presented in the City of Colorado Springs and El Paso County "Drainage Criteria Manual."

C. References

City of Colorado Springs & El Paso County "Drainage Criteria Manual," revised November, 1991.

City of Colorado Springs "Drainage Criteria Manual, Volumes 1 and 2," revised May, 2014.

FEMA, Flood Insurance Rate Map (FIRM) Number 08041C0561G, December 7, 2018.

Matrix Design Group, "Falcon Drainage Basin Planning Study," September, 2015.

USDA/NRCS, "Custom Soil Resource Report for El Paso County Area, Colorado," May 22, 2020.

II. EXISTING DRAINAGE CONDITIONS

The existing site topography generally slopes downward to the southwest with grades in the range of 1-3 percent. According to the Soil Survey of El Paso County prepared by the Soil Conservation Service (SCS), on-site soils are comprised of Columbine gravelly sandy loam soils, and these well-drained soils are classified as hydrologic soils group "A" (see Appendix A).

As shown on the enclosed Existing Conditions Drainage Plan (Sheet EX1, Appendix D), the site has been delineated as a single on-site drainage basin, and the site is not impacted by any off-site drainage basins.

According to the 2015 "Falcon Drainage Basin Planning Study" (DBPS) by Matrix Design Group, this site is located between the West and Middle Tributary Channels of the Falcon Drainage Basin, and there are no DBPS improvements associated with this site.

The existing site has been delineated as Basin A, which generally sheet flows in a southerly direction across the site towards the southeast boundary of the property. The northeast part of existing Basin A is developed with the existing fire station building and associated parking and driveway areas. Existing flows from Basin A drain to Design Point #1, with peak flows calculated as $Q_5 = 2.8$ cfs and $Q_{100} = 11.4$ cfs. Hydrologic calculations are enclosed in Appendix A.

III. PROPOSED DRAINAGE CONDITIONS

As shown on the enclosed Drainage Plan (Figure D1, Appendix D), the site has been delineated as two on-site drainage basins. Developed flows have been calculated based on the impervious areas associated with the proposed building and parking improvements.

The developed area on the northeast side of the property (Basin A) will continue to drain southwesterly across the site to a proposed stormwater detention pond on the southwest side of the new fire station building. The proposed building pad will be graded with protective slopes to provide positive drainage away from the building.

Surface drainage swales and a private storm sewer system will be convey developed flows to the proposed extended detention basin (EDB) along the southwest boundary of

the site. Site grades will slope to storm inlets and curb openings at selected locations, collecting surface drainage and conveying stormwater to the proposed detention basin.

Private Storm Inlet A1 (5' Type R) will intercept surface drainage from the parking area along the northeast side of the new fire station building, and Private Storm Sewer A1 (18") will flow southwesterly to Inlet A2 (5' Type R) in the southwest corner of the parking area on the southwest side of the building. Private Storm Sewer A2 (18") will convey the combined flow westerly into Extended Detention Basin A.

Private Storm Inlet A3 (5' Type R) will intercept surface drainage from the parking area on the northwest side of the new fire station building, and Private Storm Sewer A3 (12") will flow southwesterly into Extended Detention Basin A.

Developed peak flows at Design Point #A are calculated as $Q_5 = 6.3$ cfs and $Q_{100} = 13.1$ cfs. After routing through Extended Detention Basin A, detained peak flows at Design Point #1 are calculated as $Q_5 = 0.1$ cfs and $Q_{100} = 0.7$ cfs (see Detention Pond Calculations in Appendix C). The proposed 12" discharge pipe from Detention Basin A will flow southeast into the existing grass-lined drainage swale along the northwest side of US Highway 24.

Basin B will remain as the undeveloped area on the southwest side of the property, which will continue to sheet flows towards the southeast boundary of the property. Developed flows from Basin B will continue to drain to Design Point #B, with peak flows calculated as $Q_5 = 0.8$ cfs and $Q_{100} = 5.8$ cfs.

Developed flows from Basins A and B combine at Design Point #1, with peak flows calculated as $Q_5 = 7.1$ cfs and $Q_{100} = 18.7$ cfs.

Hydrologic calculations for the site are detailed in the attached spreadsheets (Appendix A), and peak flows are identified on Figures EX1 and D1 (Appendix D).

The contractor will be required to implement standard best management practices for erosion control during construction.

IV. DRAINAGE PLANNING FOUR STEP PROCESS

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

As stated in ECM Appendix I.7., the Four Step Process is applicable to all new and re-development projects with construction activities that disturb 1 acre or greater or that disturb less than 1 acre but are part of a larger common plan of development. The Four Step Process has been implemented as follows in the planning of this project:

Step 1: Employ Runoff Reduction Practices

- Minimize Impacts: The proposed fire station facility is being constructed on a previously developed site, so this project will inherently minimize drainage impacts in comparison to development of a vacant site.

Step 2: Stabilize Drainageways

- There are no drainageways directly adjacent to this project site. Implementation of the proposed on-site drainage improvements and Detention Basin will minimize the downstream drainage impact from this site.

Step 3: Provide Water Quality Capture Volume (WQCV)

- EDB: The developed site will drain through a proposed Extended Detention Basin (EDB) along the southeast boundary of the property. Site drainage will be routed through the extended detention basin, which will capture and slowly release the WQCV over an extended release period.

Step 4: Consider Need for Industrial and Commercial BMPs

- No outside storage or industrial uses are proposed for this site.
- The project will implement a Stormwater Management Plan including proper housekeeping practices and spill containment procedures.
- On-site drainage will be routed through the Extended Detention Basin (EDB) to minimize introduction of contaminants to the County's public drainage system.

V. FLOODPLAIN IMPACTS

Floodplain limits in vicinity of this site are delineated in the applicable Flood Insurance Rate Map, FIRM Panel No. 08041C0561G dated December 7, 2018. As depicted in the FIRM exhibit enclosed in Appendix D, this site is not impacted by any delineated 100-year FEMA floodplains.

VI. STORMWATER DETENTION AND WATER QUALITY

The proposed drainage and grading plan for the site includes a private Extended Detention Basin (EDB) at the south boundary of the site. This facility has been designed to provide the required stormwater detention and water quality mitigation for this site in accordance with El Paso County drainage criteria. The required on-site detention volume has been calculated based on the developed impervious area of the site.

As detailed in the detention pond hydraulic calculations in Appendix C, the required 100-year Full-Spectrum Detention Volume has been calculated as 0.33 acre-feet. The proposed on-site Extended Detention Basin (EDB) A has been designed for a storage volume of 0.39 acre-feet, which meets the required full-spectrum detention volume, and the outlet structure has been designed to discharge well below the existing peak flow rates.

The proposed pond outlet structure has been designed using the UDFCD "UD-Detention" calculation spreadsheets, providing for a 40-hour release of the WQCV, and outlet structure sizing to maintain maximum allowable release rates from the pond. The EDB will have a grass-lined bottom to encourage infiltration of stormwater prior to discharging into the downstream public drainage system.

The proposed stormwater detention facility will be owned and maintained by the Fire District, and maintenance access will be provided from the adjacent parking lot.

According to the 2015 "Falcon Drainage Basin Planning Study" (DBPS) by Matrix Design Group, a future Regional Detention Pond R1 is planned at the downstream confluence of the West and Middle Tributary Channels.

VII. SUMMARY

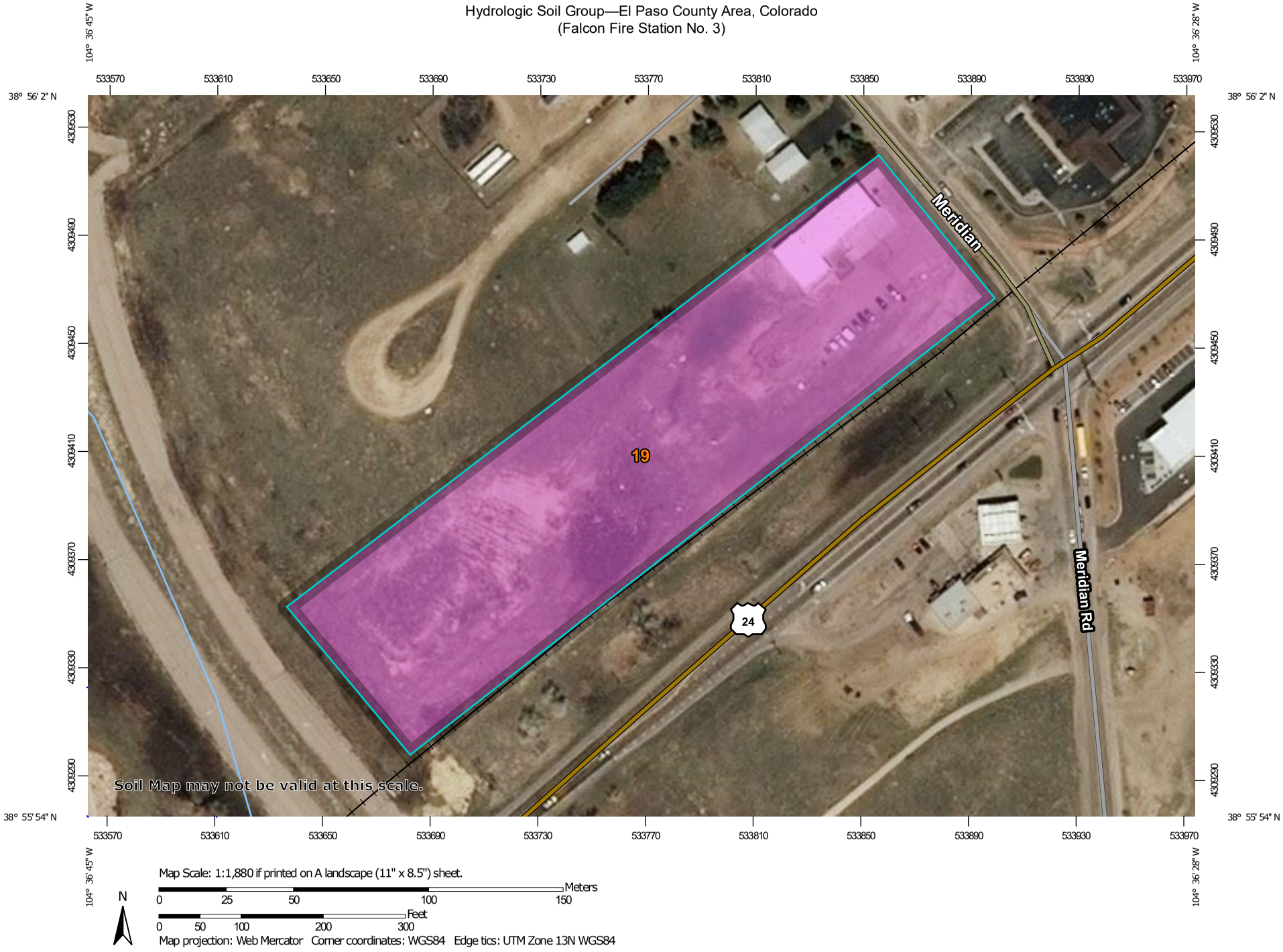
The developed drainage patterns associated with the proposed Falcon Fire Station No. 3 project at the northwest corner of US24 and Old Meridian Road will remain consistent with existing conditions and the overall drainage plan for area. Developed flows from the site will drain through a proposed stormwater Detention Pond along the southeast boundary of the property prior to discharging to the existing downstream drainage system.

The proposed stormwater detention and water quality facilities have been designed to mitigate developed flow impacts and meet the County's stormwater detention and water quality requirements. Construction and proper maintenance of the proposed Extended Detention Basin, in conjunction with proper erosion control practices, will ensure that this developed site has no significant adverse drainage impact on downstream or surrounding areas.

APPENDIX A

HYDROLOGIC CALCULATIONS

Hydrologic Soil Group—El Paso County Area, Colorado
(Falcon Fire Station No. 3)



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

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	4.8	100.0%
Totals for Area of Interest			**4.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

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

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

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

Where:

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

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

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

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

Table 6-7. Conveyance Coefficient, C_v

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

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

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

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

Where:

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

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional "calibration" of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

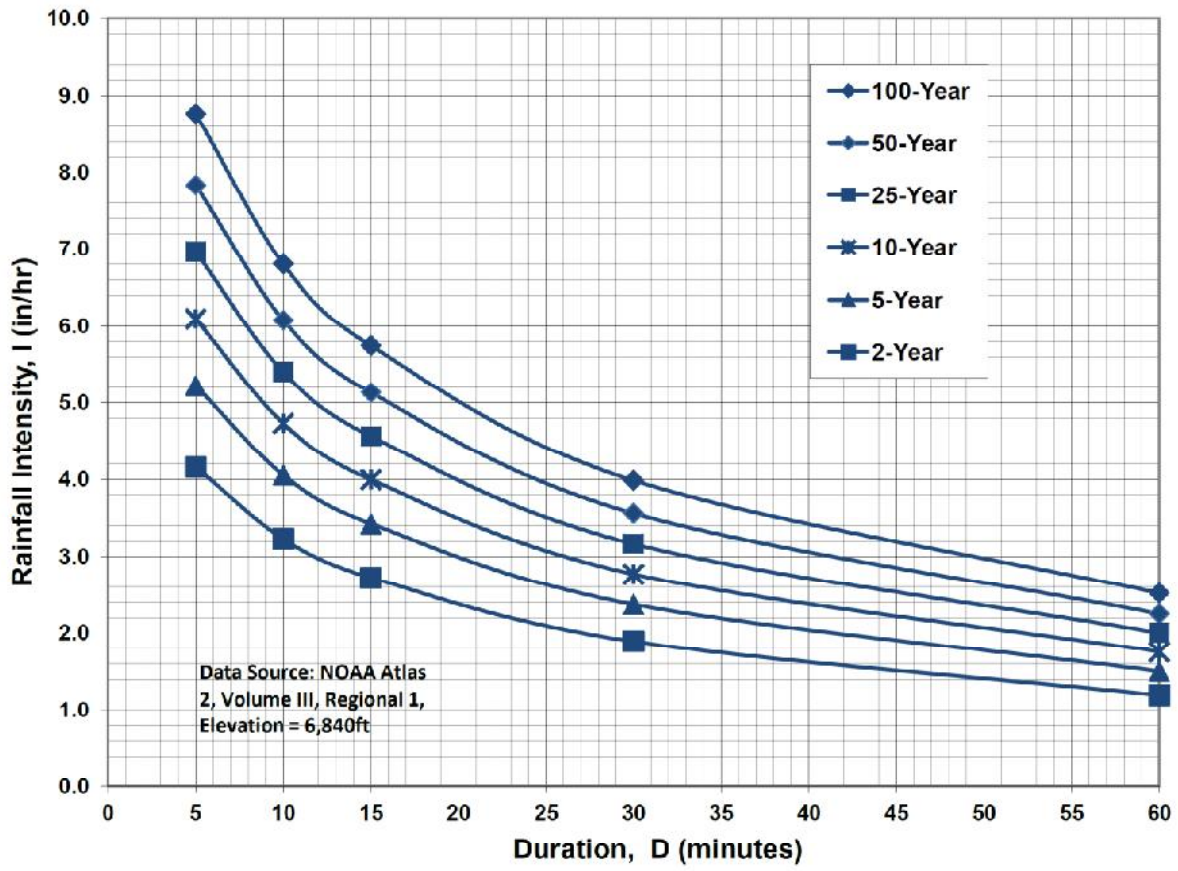
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

FALCON FIRE STATION NO. 3
COMPOSITE RUNOFF COEFFICIENTS

EXISTING CONDITIONS

5-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
A	5.42	0.60	BUILDINGS/IMPERVIOUS	0.9	4.82	LANDSCAPED	0.08				0.171

100-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
A	5.42	0.60	BUILDINGS/IMPERVIOUS	0.96	4.82	LANDSCAPED	0.35				0.418

IMPERVIOUS AREAS

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
A	5.42	0.60	BUILDINGS/IMPERVIOUS	100	4.82	LANDSCAPED	0				11.070

FALCON FIRE STATION NO. 3
COMPOSITE RUNOFF COEFFICIENTS

DEVELOPED CONDITIONS

5-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
A	2.84	1.80	BUILDINGS/IMPERVIOUS	0.9	1.04	LANDSCAPED	0.08				0.600
B	2.58	2.58	MEADOW	0.08							0.080

100-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
A	2.84	1.80	BUILDINGS/IMPERVIOUS	0.96	1.04	LANDSCAPED	0.35				0.737
B	2.58	2.58	MEADOW	0.35							0.350

IMPERVIOUS AREAS

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
A	2.84	1.80	BUILDINGS/IMPERVIOUS	100	1.04	LANDSCAPED	0				63.380
B	2.58	2.58	MEADOW	0.00							0.000

FALCON FIRE STATION NO. 3
RATIONAL METHOD

EXISTING CONDITIONS

					Overland Flow			Channel flow									
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco [1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS [2] VELOCITY (FT/S)	Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
A	1	5.42	0.171	0.418	100	0.010	17.0	500	15	0.018	2.01	4.1	21.1	21.1	3.01	5.05	2.79	11.43

DEVELOPED CONDITIONS

					Overland Flow			Channel flow									
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco [1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS [2] VELOCITY (FT/S)	Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
A	A	2.84	0.600	0.737	100	0.010	9.2	570	20	0.014	2.37	4.0	13.2	13.2	3.72	6.24	6.33	13.06
B	B	2.58	0.080	0.350	100	0.050	10.9	160	15	0.025	2.37	1.1	12.0	12.0	3.85	6.46	0.79	5.84
A,B	1	5.42	0.352	0.553									13.2	13.2	3.72	6.24	7.10	18.69

1) OVERLAND FLOW Tco = (0.395*(1.1-RUNOFF COEFFICIENT)*(OVERLAND FLOW LENGTH^(0.5)/(SLOPE^(0.333))
2) SCS VELOCITY = C * ((SLOPE(FT/FT)^0.5)
C = 2.5 FOR HEAVY MEADOW
C = 5 FOR TILLAGE/FIELD
C = 7 FOR SHORT PASTURE AND LAWNS
C = 10 FOR NEARLY BARE GROUND
C = 15 FOR GRASSED WATERWAY
C = 20 FOR PAVED AREAS AND SHALLOW PAVED SWALES

3) MANNING'S CHANNEL TRAVEL TIME = L/V (WHEN CHANNEL VELOCITY IS KNOWN)
4) Tc = Tco + Tt
*** IF TOTAL TIME OF CONCENTRATION IS LESS THAN 5 MINUTES, THEN 5 MINUTES IS USED
5) INTENSITY BASED ON I-D-F EQUATIONS IN CITY OF COLORADO SPRINGS DRAINAGE CRITERIA MANUAL
I_5 = -1.5 * ln(Tc) + 7.583
I_{100} = -2.52 * ln(Tc) + 12.735
6) Q = CiA

APPENDIX B

HYDRAULIC CALCULATIONS

FALCON FIRE STATION NO. 3
STORM INLET SIZING SUMMARY

	BASIN FLOW			INLET FLOW					
INLET	DP	Q5 FLOW (CFS)	Q100 FLOW (CFS)	INLET FLOW % OF BASIN	Q5 FLOW (CFS)	Q100 FLOW (CFS)	INLET CONDITION / TYPE	INLET SIZE	INLET CAPACITY (CFS)
A1	1	6.3	13.1	60	3.8	7.9	SUMP TYPE R	5'	8.9
A2	1	6.3	13.1	20	1.3	2.6	SUMP TYPE R	5'	8.9
A3	1	6.3	13.1	20	1.3	2.6	SUMP TYPE R	5'	8.9

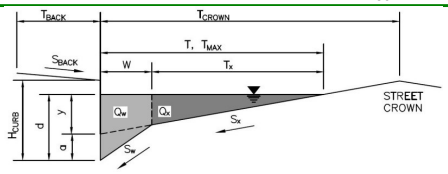
Version 4.05 Released March 2017

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

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

Project: FALCON FIRE STATION NO. 3 - INLET A1

Inlet ID: Inlet A1



Gutter Geometry (Enter data in the blue cells)

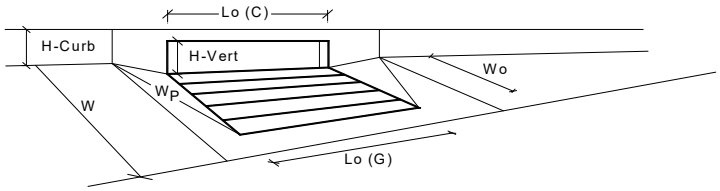
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	50.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	50.0	50.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	7.8	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.77	0.99	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**5.4**	**8.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	3.8	7.9	cfs

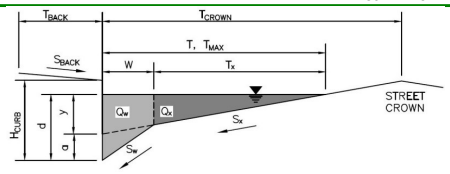
Version 4.05 Released March 2017

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

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

Project: FALCON FIRE STATION NO. 3 - INLET A2 & A3

Inlet ID: Inlet A2-A3



Gutter Geometry (Enter data in the blue cells)

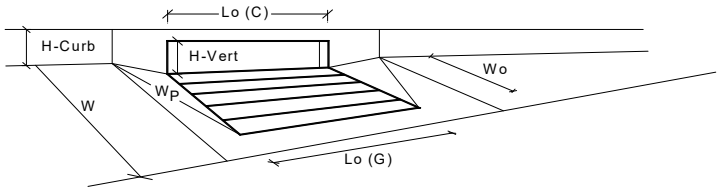
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	50.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	50.0	50.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	7.8	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.77	0.99	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**5.4**	**8.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	1.3	2.6	cfs

FALCON FIRE STATION NO. 3
STORM SEWER SIZING SUMMARY

	PIPE FLOW				PIPE CAPACITY		
PIPE	BASINS	Q5 FLOW (CFS)	Q100 FLOW (CFS)		SELECTED PIPE SIZE (IN)	MIN. PIPE SLOPE	FULL PIPE CAPACITY (CFS)
A1	A1	3.8	7.9		18	1.0%	10.5
A2	A1,A2	5.0	10.5		18	1.0%	10.5
A3	A3	1.3	2.6		12	1.0%	3.6

ASSUMPTIONS:
1. STORM DRAIN PIPE ASSUMED TO BE RCP OR HDPE

Hydraulic Analysis Report

Project Data

Project Title: Project - Falcon Fire Station No. 3

Designer: JPS

Project Date: Friday, July 17, 2020

Project Units: U.S. Customary Units

Notes:

Channel Analysis: SD-A1-A2

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0130

Depth: 1.5000 ft

Result Parameters

Flow: 10.5043 cfs

Area of Flow: 1.7671 ft^2

Wetted Perimeter: 4.7124 ft

Hydraulic Radius: 0.3750 ft

Average Velocity: 5.9442 ft/s

Top Width: 0.0000 ft

Froude Number: 0.0000

Critical Depth: 1.2451 ft

Critical Velocity: 6.6989 ft/s

Critical Slope: 0.0098 ft/ft

Critical Top Width: 1.13 ft

Calculated Max Shear Stress: 0.9360 lb/ft^2

Calculated Avg Shear Stress: 0.2340 lb/ft^2

Channel Analysis: SD-A3

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.0000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0130

Depth: 1.0000 ft

Result Parameters

Flow: 3.5628 cfs

Area of Flow: 0.7854 ft^2

Wetted Perimeter: 3.1416 ft

Hydraulic Radius: 0.2500 ft

Average Velocity: 4.5363 ft/s

Top Width: 0.0000 ft

Froude Number: 0.0000

Critical Depth: 0.8057 ft

Critical Velocity: 5.2542 ft/s

Critical Slope: 0.0103 ft/ft

Critical Top Width: 0.79 ft

Calculated Max Shear Stress: 0.6240 lb/ft^2

Calculated Avg Shear Stress: 0.1560 lb/ft^2

APPENDIX C

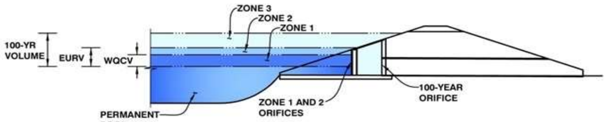
DETENTION POND CALCULATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: FALCON FIRE STATION NO. 3

Basin ID: A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	2.84	acres
Watershed Length =	670	ft
Watershed Length to Centroid =	300	ft
Watershed Slope =	0.013	ft/ft
Watershed Imperviousness =	63.40%	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) =	0.059	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.222	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.160	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.210	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.250	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.303	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.356	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.419	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	0.559	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	0.144	acre-feet		
Approximate 5-yr Detention Volume =	0.189	acre-feet		
Approximate 10-yr Detention Volume =	0.228	acre-feet		
Approximate 25-yr Detention Volume =	0.274	acre-feet		
Approximate 50-yr Detention Volume =	0.303	acre-feet		
Approximate 100-yr Detention Volume =	0.333	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.059	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.163	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.111	acre-feet
Total Detention Basin Volume =	0.333	acre-feet

Depth Increment = | | ft

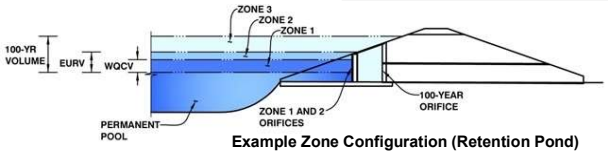
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
Bot EL=6828.0	--	1.00	--	--	--	3,766	0.086	1,888	0.043
	--	3.00	--	--	--	5,462	0.125	11,116	0.255
Spillway=6831.0	--	4.00	--	--	--	6,397	0.147	17,045	0.391
Top EL=6833.0	--	6.00	--	--	--	8,300	0.191	31,742	0.729
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: FALCON FIRE STATION NO. 3

Basin ID: A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.18	0.059	Orifice Plate
Zone 2 (EURV)	2.73	0.163	Orifice Plate
Zone 3 (100-year)	3.59	0.111	Weir&Pipe (Restrict)
Total (all zones)		0.333	

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 =	4.028E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.73	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	10.90	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.58	sq. inches (diameter = 7/8 inch)	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	0.91	1.82					
Orifice Area (sq. inches)	0.58	0.58	0.58					

	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 =	3.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.50	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	2.50	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	78.25	N/A	
Horiz. Length of Weir Sides =	2.50	N/A	feet	Overflow Grate Open Area w/o Debris =	8.75	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	4.38	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 Restrictor	Not Selected			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 Orifice Area =	0.11	N/A	ft^2
Outlet Pipe Diameter =	12.00	N/A	inches	Outlet Orifice Centroid =	0.12	N/A	feet
Restrictor Plate Height Above Pipe Invert =	2.40		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.93	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.63	feet
Spillway Crest Length =	2.00	feet	Stage at Top of Freeboard =	5.63	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.18	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.66	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

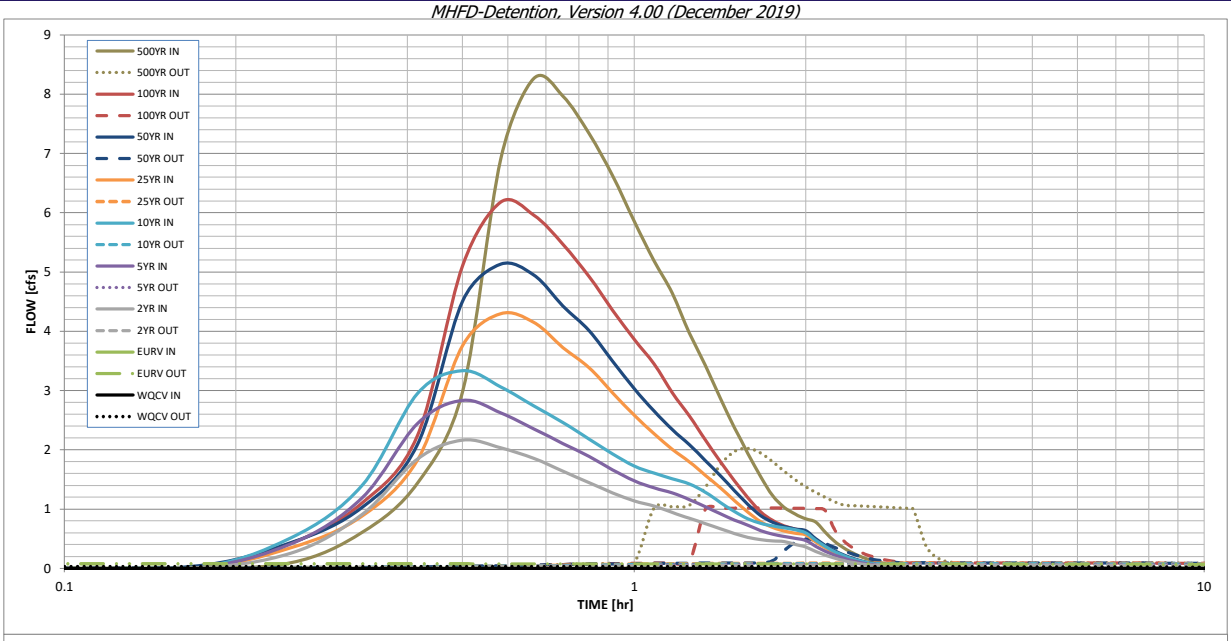
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

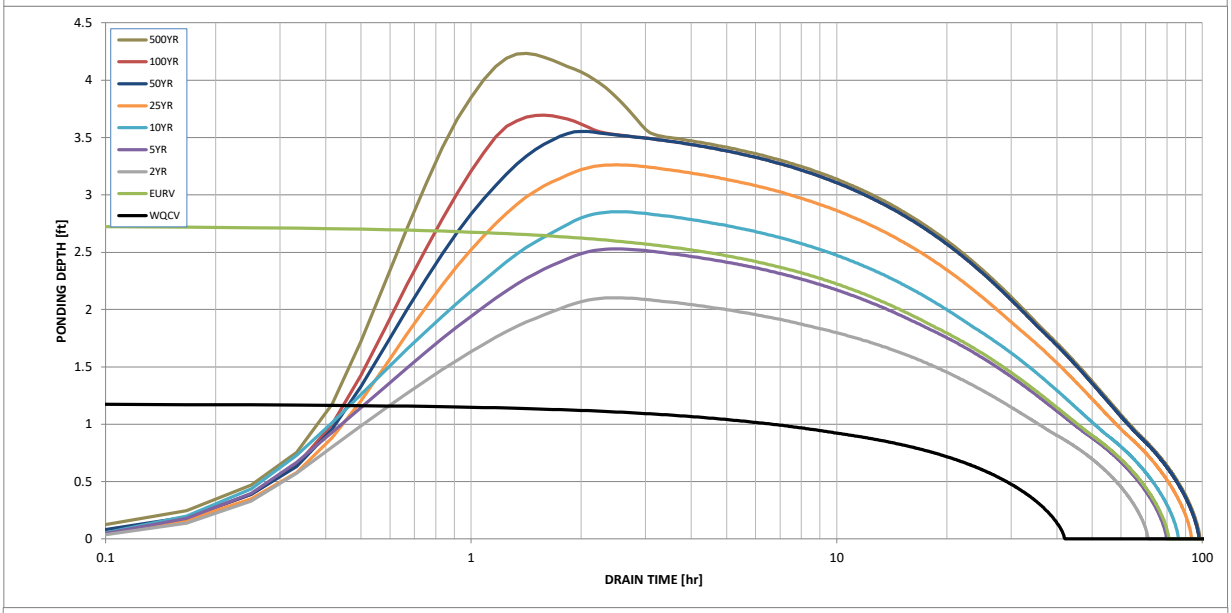
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.059	0.222	0.160	0.210	0.250	0.303	0.356	0.419	0.559
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.160	0.210	0.250	0.303	0.356	0.419	0.559
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.4	0.8	1.3	2.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.14	0.28	0.46	0.85
Peak Inflow Q (cfs) =	N/A	N/A	2.2	2.8	3.3	4.3	5.1	6.2	8.3
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.1	0.1	0.5	1.0	2.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.3	1.8	0.2	0.6	0.8	0.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.0	0.1	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	72	64	71	76	82	85	84	81
Time to Drain 99% of Inflow Volume (hours) =	**41**	77	68	76	82	89	92	92	91
Maximum Ponding Depth (ft) =	1.18	2.73	2.10	2.53	2.85	3.26	3.55	3.70	4.23
Area at Maximum Ponding Depth (acres) =	0.09	0.12	0.11	0.12	0.12	0.13	0.14	0.14	0.15
Maximum Volume Stored (acre-ft) =	0.059	0.222	0.150	0.197	0.237	0.289	0.327	0.347	0.426

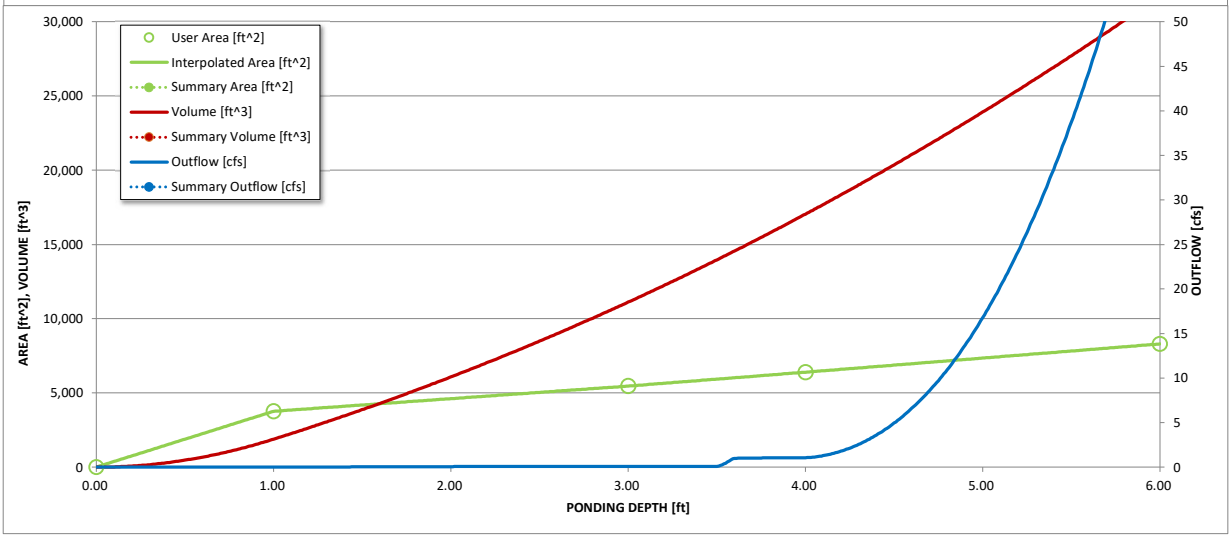
Note: While some ratios of Outflow to Predevelopment Q are higher than standard; the actual Outflows are negligible (0.1 cfs).

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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

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	0.03	0.00	0.09
	0:15:00	0.00	0.00	0.26	0.42	0.52	0.35	0.43	0.42	0.61
	0:20:00	0.00	0.00	0.91	1.19	1.40	0.88	1.03	1.10	1.44
	0:25:00	0.00	0.00	1.85	2.45	2.95	1.83	2.09	2.25	2.99
	0:30:00	0.00	0.00	2.16	2.84	3.33	3.76	4.51	5.11	6.91
	0:35:00	0.00	0.00	2.03	2.62	3.06	4.30	5.13	6.18	8.27
	0:40:00	0.00	0.00	1.86	2.36	2.74	4.15	4.95	5.96	7.97
	0:45:00	0.00	0.00	1.64	2.10	2.46	3.73	4.43	5.47	7.33
	0:50:00	0.00	0.00	1.44	1.89	2.18	3.38	4.01	4.92	6.63
	0:55:00	0.00	0.00	1.27	1.66	1.93	2.96	3.50	4.36	5.86
	1:00:00	0.00	0.00	1.14	1.48	1.73	2.58	3.03	3.86	5.19
	1:05:00	0.00	0.00	1.05	1.36	1.60	2.27	2.65	3.45	4.64
	1:10:00	0.00	0.00	0.94	1.27	1.51	2.01	2.34	2.96	3.97
	1:15:00	0.00	0.00	0.84	1.16	1.42	1.80	2.09	2.57	3.42
	1:20:00	0.00	0.00	0.75	1.04	1.29	1.57	1.82	2.17	2.87
	1:25:00	0.00	0.00	0.67	0.92	1.11	1.36	1.57	1.80	2.38
	1:30:00	0.00	0.00	0.59	0.81	0.96	1.14	1.31	1.48	1.94
	1:35:00	0.00	0.00	0.52	0.73	0.84	0.95	1.08	1.19	1.55
	1:40:00	0.00	0.00	0.48	0.64	0.76	0.79	0.89	0.95	1.22
	1:45:00	0.00	0.00	0.46	0.58	0.71	0.69	0.78	0.81	1.03
	1:50:00	0.00	0.00	0.45	0.54	0.68	0.63	0.71	0.72	0.91
	1:55:00	0.00	0.00	0.40	0.51	0.65	0.59	0.66	0.66	0.83
	2:00:00	0.00	0.00	0.36	0.47	0.60	0.56	0.63	0.62	0.78
	2:05:00	0.00	0.00	0.28	0.37	0.47	0.44	0.50	0.48	0.60
	2:10:00	0.00	0.00	0.22	0.29	0.37	0.34	0.38	0.36	0.45
	2:15:00	0.00	0.00	0.17	0.22	0.28	0.26	0.29	0.28	0.34
	2:20:00	0.00	0.00	0.13	0.17	0.21	0.20	0.22	0.21	0.26
	2:25:00	0.00	0.00	0.10	0.13	0.16	0.15	0.17	0.16	0.20
	2:30:00	0.00	0.00	0.08	0.10	0.12	0.11	0.13	0.12	0.15
	2:35:00	0.00	0.00	0.06	0.07	0.09	0.08	0.09	0.09	0.11
	2:40:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.07	0.08
	2:45:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.06
	2:50:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	2:55:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	3:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	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

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: JPS
Company: JPS
Date: September 14, 2020
Project: Falcon Fire Station No. 3
Location: Detention Basin A

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 63.4 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.634

C) Contributing Watershed Area — Area = 2.840 ac

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

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

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

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$) — V_{DESIGN} = 0.059 ac-ft

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

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

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

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
— $EURV_{DESIGN}$ = 0.222 ac-f t

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

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

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred) — Z = 3.00 ft / ft
DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

4. Inlet

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

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 1% of the WQCV) — V_{FMIN} = 0.001 ac-ft

B) Actual Forebay Volume — V_F = 0.001 ac-ft

C) Forebay Depth (D_F = 12 inch maximum) — D_F = 12.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 13.10 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 0.26 cfs

E) Forebay Discharge Design

Choose One
- ○ Berm With Pipe
- ◉ Wall with Rect. Notch
- ○ Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches) — Calculated D_P = in

G) Rectangular Notch Width — Calculated W_N = 3.3 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: JPS
Company: JPS
Date: September 14, 2020
Project: Falcon Fire Station No. 3
Location: Detention Basin A

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0050 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 10 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 0.88 inches
E) Total Outlet Area	A_{ot} = 1.74 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 6 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 5.0 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 62 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*S.S. Well Screen with 60% Open Area*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 103 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 2.73 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 60.76 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: JPS
Company: JPS
Date: September 14, 2020
Project: Falcon Fire Station No. 3
Location: Detention Basin A

10. Overflow Embankment

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

Buried Riprap Spillway

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

Ze = 3.00 ft / ft
DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

11. Vegetation

Choose One
- ○ Irrigated
- ◉ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

Periodic inspection and maintenance by property owner as required;
Ramp provided for skid-loader access to pond bottom

Notes:

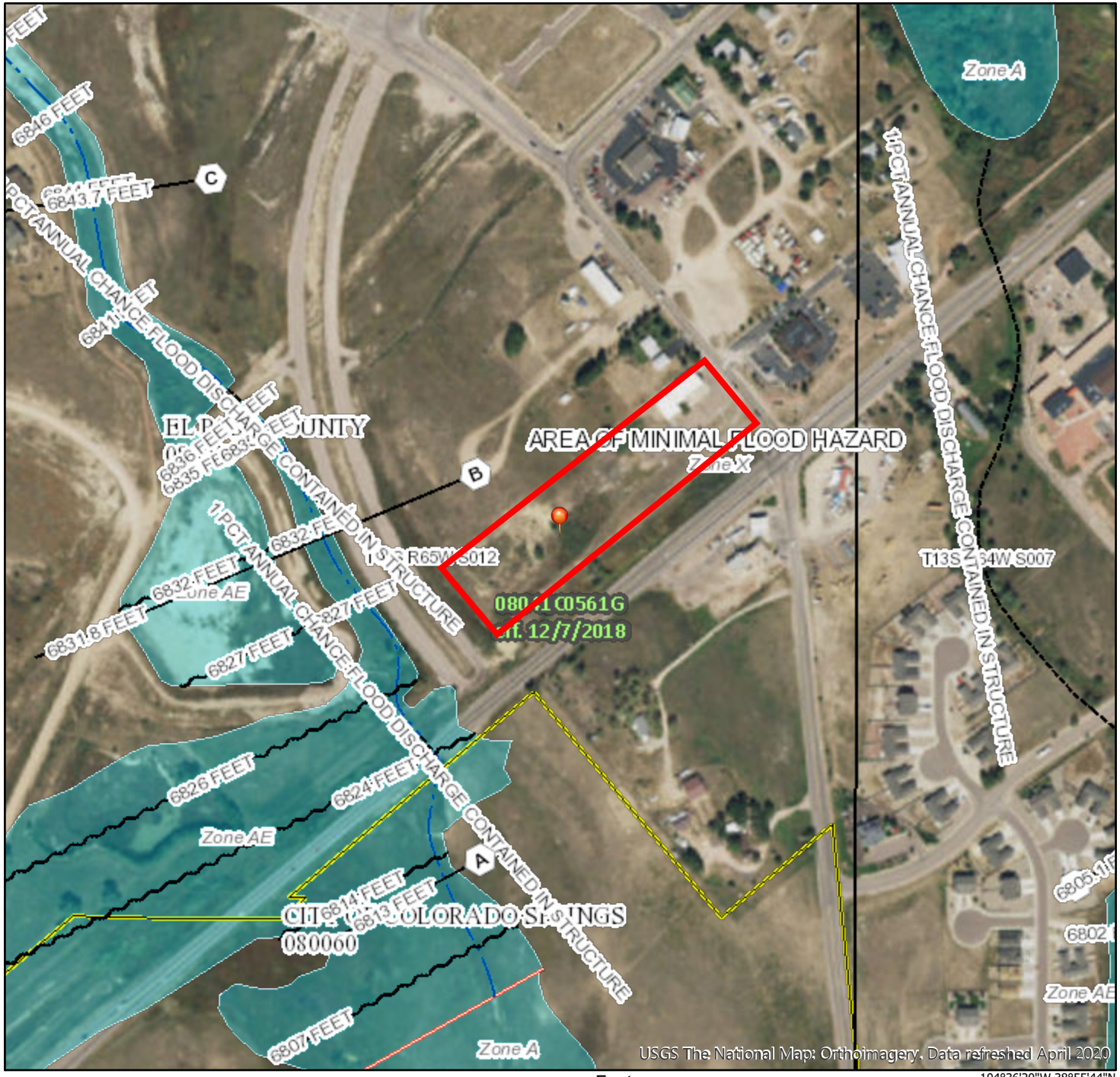
APPENDIX D

FIGURES

National Flood Hazard Layer FIRMette

FEMA

104°36'57"W 38°56'12"N



104°36'20"W 38°55'44"N

Feet

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

1:6,000

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

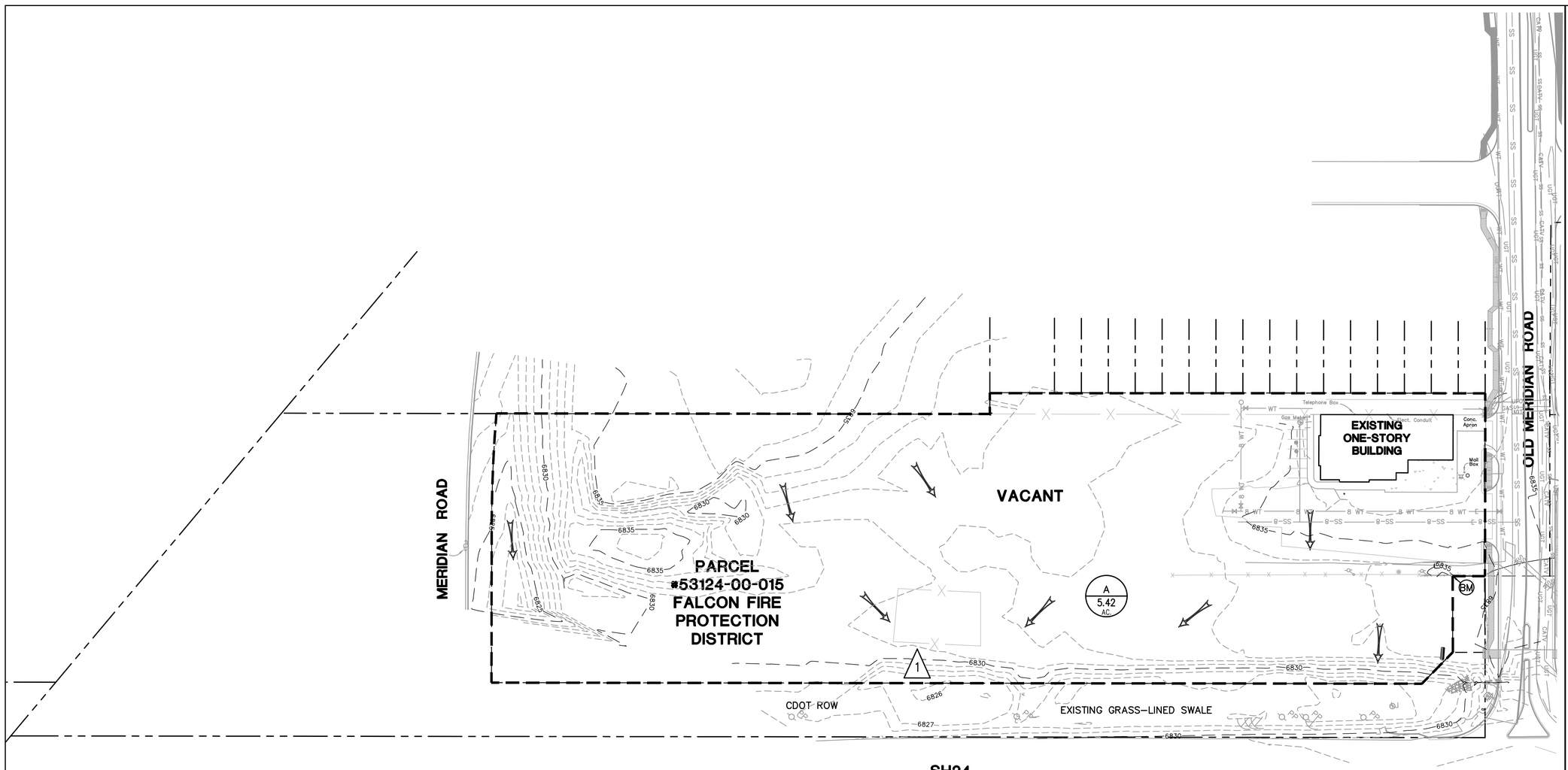
N

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 7/17/2020 at 4:15 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.



DRAINAGE LEGEND

- RIPRAP
- FLOW DIRECTION ARROW
- FLOWLINE
- MAJOR DRAINAGE BASIN BOUNDARY
- 5 — DESIGN POINT
- C14 / 23.21 ac — DEVELOPED BASIN DESIGNATION / DEVELOPED BASIN AREA (ACRES)
- 6910 — FEMA 100-YR WATER SURFACE ELEVATION (CONVERTED TO NGVD 29 DATUM)

BENCHMARK:
1.5" ALUM. CAP
POLARIS PLS 27605
EL=6835.03
(NAVD 88)

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
1	2.8	11.4

50' 0 50' 100'
ORIGINAL SCALE: 1"=50' (24"x36" SHEET)
CONTOUR INTERVAL=1'

FALCON FIRE STATION NO. 3

EXISTING CONDITIONS DRAINAGE PLAN

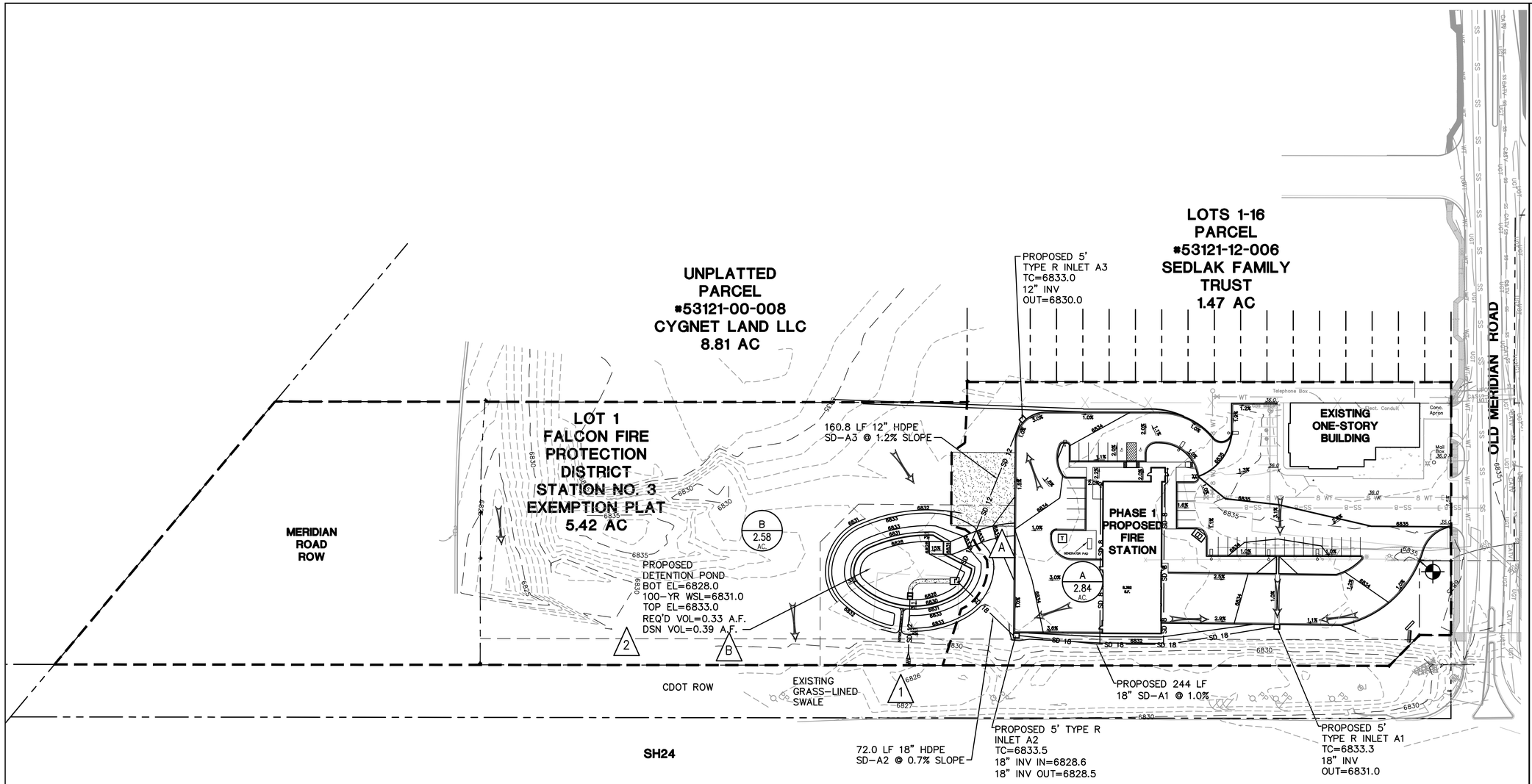
JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO
80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 48 HOURS (2 BUSINESS DAYS) IN ADVANCE BEFORE YOU DIG, GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	BY	DATE

HORZ. SCALE:	1"=50'	DRAWN:	BJJ
VERT. SCALE:	N/A	DESIGNED:	JPS
SURVEYED:	LDC	CHECKED:	JPS
CREATED:	7/14/20	LAST MODIFIED:	9/18/20
PROJECT NO:	042001	MODIFIED BY:	BJJ

SHEET: EX1



BENCHMARK:

1.5" ALUM. CAP
POLARIS PLS 27605
EL=6835.03
(NAVD 88)

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q_5 (CFS)	Q_{100} (CFS)
A	6.3	13.1
B	0.8	5.8
1	7.1	18.7

BASIN A AREA = 2.84 AC.

IMPERVIOUS AREAS
(EXISTING & PROPOSED):

SURFACE TYPE	AREA
BUILDINGS	15,085 SF
SIDEWALK	2,122 SF
CONCRETE	3,138 SF
PAVEMENT	53,856 SF
CRUSHED ASPHALT @ 80%	4,200 SF 3,360 SF
TOTAL	77,561 SF

= 1.8 AC
= 63.4% IMPERVIOUS

DRAINAGE LEGEND

- RIPRAP
- FLOW DIRECTION ARROW
- FLOWLINE
- MAJOR DRAINAGE BASIN BOUNDARY
- 5 — DESIGN POINT
- C14 / 23.21 Ac. — DEVELOPED BASIN DESIGNATION / DEVELOPED BASIN AREA (ACRES)
- 6910 — FEMA 100-YR WATER SURFACE ELEVATION (CONVERTED TO NGVD 29 DATUM)

50' 0 50' 100'
ORIGINAL SCALE: 1"=50' (24"x36" SHEET)
CONTOUR INTERVAL=1'

FALCON FIRE STATION NO. 3

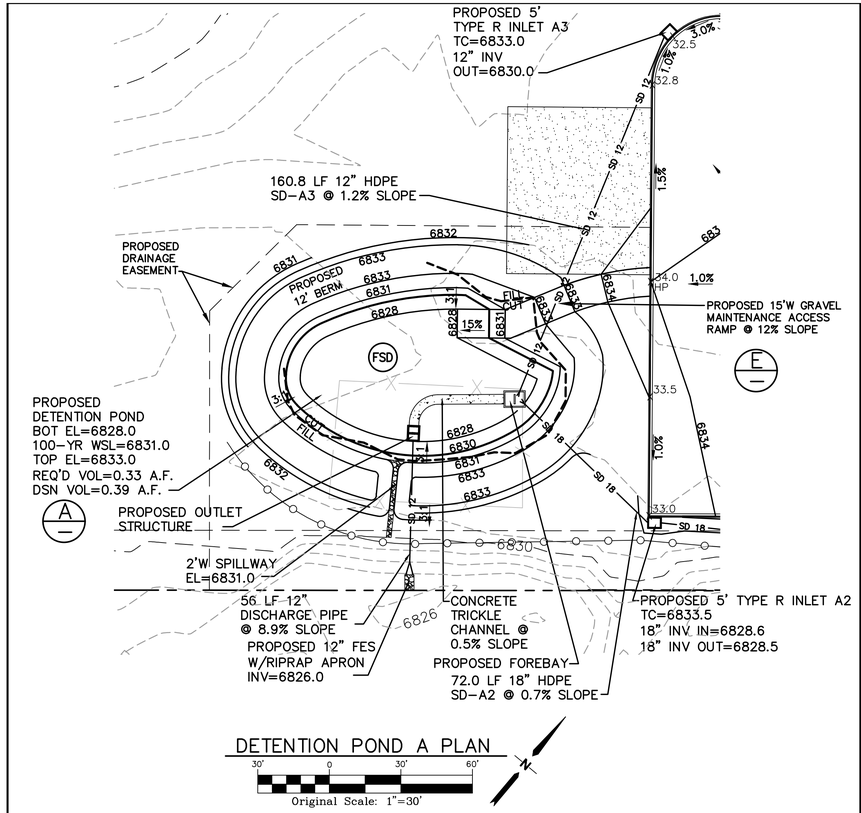
DEVELOPED DRAINAGE PLAN

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO
80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 48 HOURS (2 BUSINESS DAYS) IN ADVANCE BEFORE YOU DIG, GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	BY	DATE

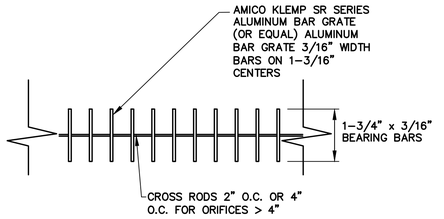
HORZ. SCALE:	1"=50'	DRAWN:	BJJ
VERT. SCALE:	N/A	DESIGNED:	JPS
SURVEYED:	LDC	CHECKED:	JPS
CREATED:	5/26/20	LAST MODIFIED:	9/18/20
PROJECT NO:	042001	MODIFIED BY:	BJJ
SHEET:	D1		



DETENTION POND A PLAN

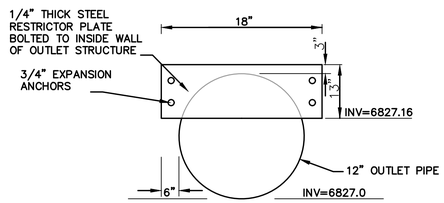
30' 0 30' 60'

Original Scale: 1"=30'



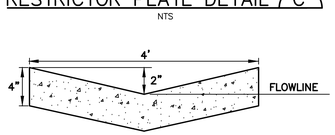
TRASH GRATE SECTION (2)

NTS

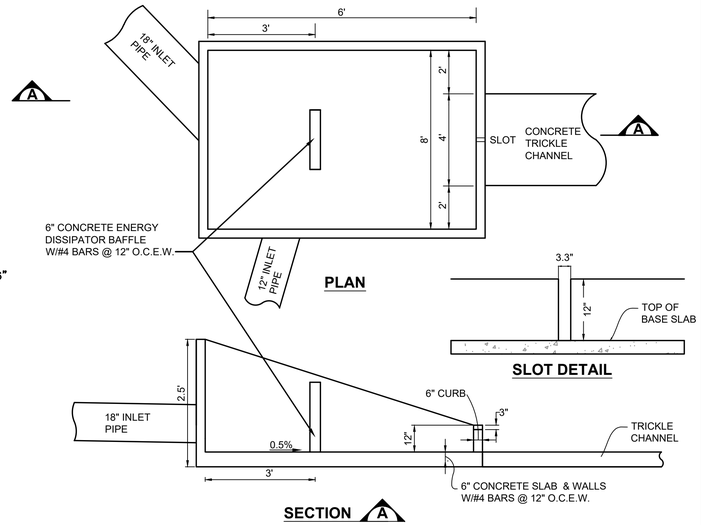


RESTRICTOR PLATE DETAIL (C)

NTS

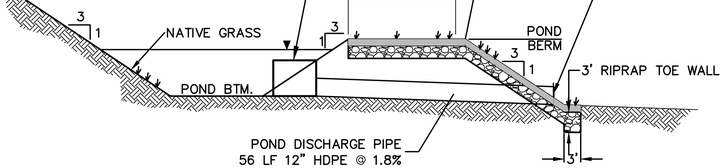


TYPICAL CONCRETE TRICKLE CHANNEL (D)



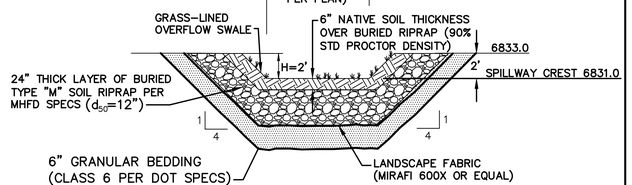
INTEGRAL FOREBAY DETAIL (E)

SCALE: NTS



TYPICAL SECTION DETENTION POND A (F)

SCALE: NTS

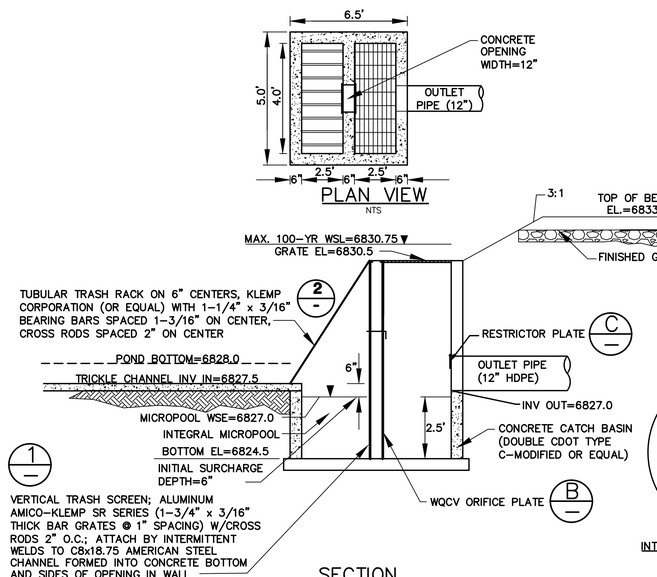


RIPRAP NOTES:

1. RIPRAP SHALL HAVE A MINIMUM SPECIFIC GRAVITY OF 2.6.
2. CONTRACTOR SHALL SUBMIT RIPRAP GRADATION TO ENGINEER FOR APPROVAL PRIOR TO DELIVERY.

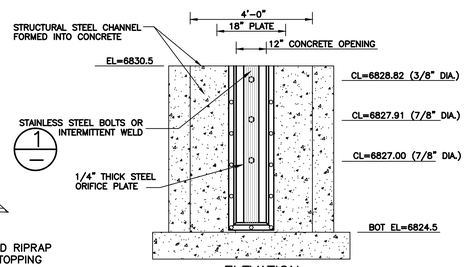
PROPOSED SPILLWAY DETAIL (G)

SCALE: NTS



TYPICAL DETENTION POND OUTLET STRUCTURE (A)

SCALE: NTS



ORIFICE PLATE NOTES:

1. PROVIDE RUBBER GASKET MATERIAL BETWEEN THE ORIFICE PLATE AND CONCRETE.
2. BOLT PLATE TO CONCRETE 12" MAX. ON CENTER.

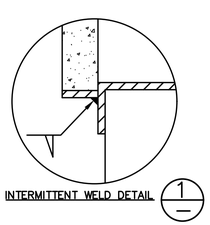
EURV AND WQCV TRASH RACKS:

1. WELL-SCREEN TRASH RACKS (FOR CIRCULAR ORIFICES) SHALL BE STAINLESS STEEL AND SHALL BE ATTACHED BY INTERMITTENT WELDS ALONG THE EDGE OF THE MOUNTING FRAME. (REFER TO DCM VOL 1; FIGURE 6-a)

OVERFLOW TRASH RACKS:

1. ALL TRASH RACKS SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH HINGED AND LOCKABLE OR BOLTABLE ACCESS PANELS.
2. TRASH RACKS SHALL BE STAINLESS STEEL, ALUMINUM, OR STEEL. STEEL TRASH RACKS SHALL BE HOT DIP GALVANIZED AND MAY BE HOT POWDER COATED AFTER GALVANIZING.

NOTE: ORIFICE PLATE WILL NEED TO BE REPLACED FOR FUTURE COMMERCIAL DEVELOPMENT PHASE (PER DRAINAGE REPORT)



ORIFICE PLATE AND TRASH RACK DETAILS AND NOTES (B)

NTS

PCD PROJECT NO. XX-20-XXX

FALCON FIRE STATION NO. 3
7030 OLD MERIDIAN ROAD, FALCON, CO 80831

DETENTION POND A PLAN & DETAILS

No.	REVISION	BY	DATE
1	EPC SUBMITTAL	JPS	7/17/20
2	COUNTY COMMENTS	JPS	9/16/20

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

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

HORZ. SCALE: N/A	DRAWN: BJJ
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: LDC	CHECKED: JPS
CREATED: 7/14/20	LAST MODIFIED: 9/16/20
PROJECT NO: 042001	MODIFIED BY: BJJ

SHEET: C3.1

C:\Users\Owner\Dropbox\jpsprojects\042001_falcon_fire_sta_3\dwg\civil\C3.1.dwg Sep 16, 2020 - 2:10pm