



# FINAL DRAINAGE REPORT FOR COLORADO CENTRE METROPOLITAN DISTRICT ADMINISTRATION BUILDING

PCD FILE # PPR-21-51



## PREPARED BY

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## PREPARED FOR

Colorado Centre Metropolitan District  
4770 Horizonview Drive  
Colorado Springs, CO 80925

April 2023

Project 247.07





## ENGINEER'S STATEMENT

This report and plan for the drainage design of Colorado Centre Metropolitan District Administration Building, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan 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 understand that El Paso County does not, and will not, assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Richard Gallegos, P.E.

Registered Professional Engineer State of Colorado No. 36247

1/3/2023

Date



## OWNER/DEVELOPER'S STATEMENT

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

Jackie McClintock, President  
Colorado Centre Metropolitan District  
4770 Horizonview Drive,  
Colorado Springs, CO 80925

1/4/2023

Date

## EL PASO COUNTY STATEMENT

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

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

Date



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## 1.0 PURPOSE

This drainage report is for the design of the Colorado Centre Metropolitan District Administration Building. The site is located at 9696 Flagstone Street, Colorado Springs, Colorado in central El Paso County. See Vicinity Map in the Appendix below for reference. It is further described as the Northeast One-Quarter of the Southwest One-Quarter of Section 3, Township 15 South, Range 65 West of the 6<sup>th</sup> P.M.

One County-approved Drainage Report was found within the County's files that included the project site:

- *Drainage Report for Colorado Centro Metropolitan District Water Treatment Facility* by JDS-Hydro Consultants Inc. approved in August 2015.

This 7.73-acre site is located within the Jimmy Camp Creek – FOFO2000 basin. Work will include the construction of a 4,542 square foot (sf) administration building, asphalt driveway, and a parking lot. In order to accommodate an area of disturbance greater than 1 acre, a 0.207-acre-foot detention basin will be constructed in the southwest portion of the site to detain all flows directed to the south. No portion of the site is located within a FEMA designated 100-year floodplain per Map No. 08041C0769G that was effective on December 7<sup>th</sup>, 2018.

## 2.0 SOIL CONDITIONS

According to the El Paso County Area Soil Survey, the soil on the site is classified as follows:

SOIL #	SOIL TYPE	HYDROLOGIC CLASSIFICATION	PERCENT OF SITE
28	Ellicot Loamy Coarse Sand, 0 to 5 Percent Slopes	A	0.0%
101	Ustic Torrfluvents, Loamy	B	100.0%

The Ustic Torrfluvents soil can be described as having a high permeability, low surface runoff, and slight hazard of erosion. The Ellicot soils is described as having very high permeability and very low surface runoff. The hydrologic soil classification used for this study is 'B'. See Soils Map in the Appendix for reference.

## 3.0 HYDROLOGIC CRITERIA

The methodology utilized for this report is in accordance with the *El Paso County Drainage Criteria Manual*. All references from the *El Paso County Drainage Criteria Manual* can be found in Appendix C. The Rational Method for computation of runoff was used.



$Q = CIA$

Where

$Q$  = maximum rate of runoff in cubic feet per second

$c$  = runoff coefficient representing drainage area characteristics

$i$  = average rainfall intensity, in inches per hour, for the duration required for the runoff to become established

$a$  = drainage basin size in acres

The storm recurrence intervals used for this study were the 5-year storm and the 100-year storm. The detention discharge for the proposed 0.207-acre-foot Full Spectrum Extended Detention Basin is 0.5 cfs for the 5-year storm and 5.5 cfs for the 100-year storm. The Colorado Urban Hydrograph Procedure (CUHP) was used to route flows through the proposed private detention basin. This procedure is described in more detail in the *Mile High Flood District Urban Storm Drainage Criteria Manual Volume 1*, shown below in Appendix C – Colorado Urban Hydrograph Procedure Summary.

The Mile High Flood District – Detention Version 4.05 (January 2022) spreadsheet was used to determine the required detention basin storage volume and outlet structure design. ManningSolver Version 1.019, also, was used in this analysis to calculate the Manning's normal depth within the pond inlet channel.

## 4.0 EXISTING DRAINAGE CONDITIONS

The overall site consists of 7.73 acres. The site includes an existing 3725 sf water treatment plant and an asphalt driveway. The areas of the site not covered by the water treatment plant or asphalt driveway are covered with nearly bare ground. These undeveloped areas include slopes that range from 0.5% to 19.3%. The overall existing site is 4.6% impervious. See Existing Drainage Map for reference.

Flows from Sub-basin Aex through Sub-basin Dex are tributary to the Jimmy Camp Creek (FOFO2000) basin.

Sub-basin Aex contains 2.05 acres and drains south towards a grated inlet in the southwest corner of the site. This sub-basin produces existing flows of 0.6 cfs for the 5-year storm and 3.4 cfs for the 100-year storm. Flows from Aex are ultimately drained by flowing to an existing graded inlet near Flagstone Street, and discharged to the existing Flagstone Channel located to the east via a 24" CMP pipe. At the 24" CMP discharge point, a riprap pad was installed. Based on site observations, the existing riprap is adequate to protect the outfall point and can be considered scour stable. The scour stable assessment is based upon deposition of sediment at the outfall point, and the establishment of vegetation, both of which would not occur if the discharge point was unstable. A photograph showing the outfall point is included within the appendix of this report. As part of the project, the sediment and any excessive vegetation should be removed.

Sub-basin Bex contains 0.17 acres and drains south along East Anvil Drive. This sub-basin produces existing flows of 0.8 cfs for the 5-year storm and 1.5 cfs for the 100-year storm. These flows move south into and along curb and gutter as channelized flow.



Sub-basin Cex contains 2.87 acres and drains east towards Jimmy Camp Creek. This sub-basin produces existing flows of 1.0 cfs for the 5-year storm and 5.4 cfs for the 100-year storm. These flows sheetflow to the east.

Sub-basin Dex contains 0.71 acres and drains east towards Jimmy Camp Creek. It produces flows of 0.2 cfs for the 5-year storm and 1.5 cfs for the 100-year storm. These flows sheetflow to the east, ultimately ending up in Jimmy Camp Creek.

Sub-basin Eex contains 1.65 acres and drains east towards Jimmy Camp Creek. It produces flows of 0.4 cfs for the 5-year storm and 2.8 cfs for the 100-year storm. These flows sheetflow to the east into Jimmy Camp Creek.

Sub-basin Fex contains 0.09 acres and drains northeast into Jimmy Camp Creek. It produces flows of less than 0.1 cfs for the 5-year storm and 0.3 cfs for the 100-year storm. These flows sheetflow to the east into Jimmy Camp Creek.

Sub-basin Gex contains 0.07 acres and drains south towards Flagstone Street. It produces flows of less than 0.1 cfs for the 5-year storm and 0.2 cfs for the 100-year storm. These flows sheetflow to the south onto Flagstone Street.

Sub-basin OS1 contains 0.50 acres and drains southwest towards Sub-basin Aex. It produces flows of 0.1 cfs for the 5-year storm and 0.9 cfs for the 100-year storm. These flows sheetflow to the southwest into Sub-basin Aex.

Sub-basin OS2 contains 0.37 acres and drains southeast towards Sub-basin Eex. It produces flows of 0.1 cfs for the 5-year storm and 0.8 cfs for the 100-year storm. These flows sheetflow to the southeast into Sub-basin Eex.

Sub-basin OS3 contains 0.01 acres and drains east towards Sub-basin Aex. It produces flows of less than 0.1 cfs for the 5-year storm and less than 0.1 cfs for the 100-year storm. These flows sheetflow to the east into Sub-basin Aex.

The estimated runoff amounts produced for the project under Existing Conditions are shown in Table 1 below.

TABLE 1 – EXISTING CONDITIONS		
Sub-basin	Q <sub>5</sub> (CFS)	Q <sub>100</sub> (CFS)
Aex	0.6	3.4
Bex	0.8	1.5
Cex	1.0	5.4
Dex	0.2	1.5
Eex	0.4	2.8
Fex	<0.1	0.3
Gex	<0.1	0.2
OS1	0.1	0.9
OS2	0.1	0.8
OS3	<0.1	<0.1



## 5.0 DEVELOPED DRAINAGE CONDITIONS

The overall site consists of 7.73 acres, of which 2.65 acres will be disturbed as part of this project. A 4,542 sf administration building and asphalt driveway is proposed on the west side of the site. A 0.20-acre-foot Full Spectrum Extended Detention basin size will accommodate the area of disturbance greater than 1 acre. Proposed Conditions Map is located below in the Back Pocket for reference. Proposed site imperviousness is 19.6%, versus 4.6% in the existing conditions. Proposed flows are tributary to the Jimmy Camp Creek Basin (FOFO2000).

Sub-basin A contains 2.78 acres and south towards a 0.20-acre-foot Full Spectrum Extended Detention Basin located in the southwest corner of the site. It produces flows of 3.7 cfs for the 5-year storm and 9.1 cfs for the 100-year storm. These flows sheetflow to the south into the proposed 0.20-acre-foot Full Spectrum Extended Detention Basin. A portion of these flows drain through an existing 4' wide curb opening located on the along East Anvil Drive. A conservative approach was used in calculating the curb opening capacity and the total 100-year flow of 9.1 cfs was used. The 9.1 cfs accounts for 0.33 feet of depth, with minimum of 0.5' of freeboard. No flows will bypass the existing curb opening. More details on this calculation can be found in Appendix B below.

Sub-basin B contains 0.17 acres and drains south along East Anvil Drive. This sub-basin produces flows of 0.8 cfs for the 5-year storm and 1.5 cfs for the 100-year storm. These flows move south into and along curb and gutter as channelized flow. No water quality control measures are proposed within Sub-basin B per the El Paso County Engineering Criteria Manual (ECM) Section I.7.1.C.1., which allows for the County to exclude up to 20 percent when the County has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. Sub-basin B is to remain the same as existing conditions.

Sub-basin C contains 2.14 acres and drains east towards Jimmy Camp Creek. This sub-basin produces flows of 0.8 cfs for the 5-year storm and 4.2 cfs for the 100-year storm. These flows sheetflow to the east. No water quality control measures are proposed within Sub-basin C because the land is to remain undeveloped. Water quality is not required for this sub-basin per El Paso County ECM Section I.7.1.B.7.

Sub-basin D contains 0.65 acres and drains east towards Jimmy Camp Creek. It produces flows of 0.2 cfs for the 5-year storm and 1.4 cfs for the 100-year storm. These flows sheetflow to the east, draining into Jimmy Camp Creek. No water quality control measures are proposed within Sub-basin D because the land is to remain undeveloped. Water quality is not required for this sub-basin per El Paso County ECM Section I.7.1.B.7.

Sub-basin E contains 1.65 acres and drains east towards Jimmy Camp Creek. It produces flows of 0.4 cfs for the 5-year storm and 2.8 cfs for the 100-year storm. These flows sheetflow to the east into Jimmy Camp Creek. No water quality control measures are proposed within Sub-basin E because the land is to remain undeveloped. Water quality is not required for this sub-basin per El Paso County ECM Section I.7.1.B.7.

Sub-basin F contains 0.09 acres and drains northeast into Jimmy Camp Creek. It produces flows of less than 0.1 cfs for the 5-year storm and 0.3 cfs for the 100-year storm. These flows sheetflow to the



east into Jimmy Camp Creek. No water quality control measures are proposed within Sub-basin F because the land is to remain undeveloped. Water quality is not required for this sub-basin per El Paso County ECM Section I.7.1.B.7.

Sub-basin OS1 contains 0.50 acres and drains southwest towards Sub-basin A. It produces flows of 0.1 cfs for the 5-year storm and 0.9 cfs for the 100-year storm. These flows sheetflow to the southwest into Sub-basin A. Flows combine with flows from Sub-basin A at Design Point 1 (DP1) to produce total flows of 3.3 cfs for the 5-year storm and 8.8 cfs for the 100-year storm. Flows were computed at this point to determine the capacity and freeboard within the proposed swale and trickle channel.

Sub-basin OS2 contains 0.37 acres and drains southeast towards Sub-basin E. It produces flows of 0.1 cfs for the 5-year storm and 0.8 cfs for the 100-year storm. These flows sheetflow to the southeast into Sub-basin E.

Sub-basin OS3 contains 0.01 acres and drains east towards Sub-basin A. It produces flows of less than 0.1 cfs for the 5-year storm and less than 0.1 cfs for the 100-year storm. These flows sheetflow to the east into Sub-basin A.

One existing rock check dam is to be removed to allow for the installation of the concrete forebay. All other existing rock check dams are to remain onsite. The removal of all other rock check dams is deemed unnecessary, and therefore, should remain as to slow runoff.

The estimated runoff amounts produced for the project under Proposed Conditions are shown in Table 2 below. The proposed design point information for the project are shown in Table 3 below.

TABLE 2 – PROPOSED CONDITIONS		
Sub-basin	Q <sub>5</sub> (CFS)	Q <sub>100</sub> (CFS)
A*	3.7	9.1
B	0.8	1.5
C	0.8	4.2
D	0.2	1.4
E	0.4	2.8
F	<0.1	0.3
OS1	0.1	0.9
OS2	0.1	0.8
OS3	<0.1	<0.1

\*Note that detained flows are 0.6 cfs for the 5-year event and 5.0 cfs for the 100-year event

TABLE 3 – DESIGN POINTS		
DESIGN POINT	Q <sub>5</sub> (CFS)	Q <sub>100</sub> (CFS)
DP1 (A + OS1)	3.3	8.8





## 6.0 FOUR STEP PROCESS

The proposed development follows the “Four Step Process” as mandated by the *El Paso County Drainage Criteria Manual* as follows:

Step 1: Reduce runoff by disconnecting impervious area, eliminating “unnecessary” impervious area and encouraging infiltration into soils that are suitable.

Runoff has been reduced by disconnecting impervious areas where possible, eliminating “unnecessary” impervious areas and encouraging infiltration into suitable soils. IRF Spreadsheets utilized for design.

Step 2: Treat and slowly release the WQCV.

- All new developed flows have been routed to the water quality basin with impervious area less than one acre.
- Drain time for the water quality basin is as follows: Full Spectrum Extended Detention Basin (EDB) is 40 hours.

Step 3: Stabilize stream channels.

Although Jimmy Camp Creek drainageway is adjacent to the project, no work will be done in the drainageway.

- Site flows from the project have been directed to the concrete curb and gutters along the roadways and transported to public drainage facilities which direct them into the water quality/detention facility.
- All new and re-developed projects are required to construct or participate in the funding of channel stabilization measures. Drainage basin fees paid at the time of platting go towards channel stabilization within the drainage basin.

Step 4: Implement source controls.

Erosion control measures will be in place during initial construction to provide source control of sediment with landscaping placed within the proposed development and permanent seeding of all disturbed areas. No other potential pollutants are anticipated with this site post construction. The development of this site will have no adverse impact on downstream properties.

## 7.0 DETENTION BASIN

To accommodate the area of disturbance greater than 1 acre, a private 0.20-acre-foot Full Spectrum Detention Basin is proposed on the southwest corner of the site (See Proposed Drainage Plan in the Back Pocket). An proposed ditch beginning in the west end of Sub-basin A will direct flows towards the proposed private detention basin in the southwest corner of the site, as seen in Back Pocket – Proposed Drainage Plan. The detention basin, with a depth of 5.17ft and a volume of 0.20-acre-feet, will detain a flow of 3.3 cfs for the 5-year storm and 8.8 cfs for the 100-year storm in Sub-basin A (according to the CUHP procedure), seen below in Appendix B – Developed Detention for Colorado Centre.



A triangular channel located on the west end of the site discharges flows into the 0.20-acre-foot Full Spectrum Extended Detention Basin. These flows produce a velocity of 3.04 feet per second (fps) and a depth of 0.50 feet for the 5-year storm and a velocity of 3.89 fps and a depth of 0.72 feet for the 100-year storm within the channel. This is 1.95 feet of freeboard for the 5-year storm and 1.73 feet of freeboard for the 100-year storm within the channel. More details on the Manning's normal depth calculation for the inlet channel are provided below in Appendix B.

The detention basin will have post-detention peak flows of 0.6 cfs for the 5-year storm and 5.0 cfs for the 100-year storm. This detention basin will outlet 5-year flows through a series of orifices spaced at 0, 0.71, and 1.41 feet above the bottom of the basin. The detention basin will, conversely, outlet 100-year flows through a proposed Type OS2 outlet structure and tied into an existing 24" diameter CMP outlet pipe with a flow restrictor plate set at 6.0" above the pipe invert. More details can be found in the Appendix B – Outlet Structure Design. Basin drain times and stage versus volume figures are shown below in Appendix B – Developed Detention for Colorado Centre.

## 8.0 WATER QUALITY

Water quality for the site will be achieved through a 0.20-acre-foot proposed private Full Spectrum Extended Detention Basin (FS/EDB). A 2' wide trickle channel located in the detention basin will carry flows towards a private 'Type OS2' Outlet Structure tied into an existing private 24" corrugated metal pipe outlet (See *MHFD Detention Basin Stage-Storage Table Builder* in Appendix B for reference). The existing grated inlet located in Sub-basin Aex will be removed during construction. The outlet pipe to be tied into is in a stable and working condition, flowing and outfalling east into Flagstone Channel (See the Proposed Drainage Plan in the Back Pocket for reference). The outfall is protected with existing riprap and vegetation, which is seen below in a provided photo found in Appendix A. For these reasons, no improvements to the existing pipe are proposed. The private EDB drains an area of 3.28 acres that is 35.4% impervious and will have a volume of 0.20-acre-ft. The Water Quality capture volume will be 0.047 acre- ft. Calculations for the private EDB and outlet structure design are included in Appendix B of this report.

## 9.0 EROSION CONTROL PLAN

The site construction consists of constructing a new administration building and asphalt drive, disturbing 2.65 acres of area. This requires an Erosion and Stormwater Quality Control Permit. The Grading and Erosion Control Plan will be submitted in separate Construction Plans.

## 10.0 FLOODPLAIN STATEMENT

No portion of the developed site is located within a designated FEMA 100-year floodplain according to the information published in the Federal Emergency Management Agency Flood Plain Map No. 08041C0769G dated December 7<sup>th</sup>, 2018.



## 11.0 DRAINAGE BASIN FEES

The proposed development is located within the Jimmy Camp Creek Drainage Basin.

### 2022 Jimmy Camp Creek Drainage Fees

Drainage fees are waived because Colorado Centre Metropolitan District owns and maintains the drainage infrastructure within its boundaries.

### 2022 Jimmy Camp Creek Bridge Fees

Bridge fees are waived because Colorado Centre Metropolitan District owns and maintains the bridges within its boundaries.

## 12.0 CONSTRUCTION COST OPINION

The private, non-reimbursable Control Measures (CM) Financial Assurances costs of construction are as follows:

Description	Quantity	Unit Cost	Amount
OUTLET STRUCTURE	1 EA	\$3,000	\$3,000
CONCRETE FOREBAY	1 LS	\$500	\$500
2' CONC. PAN	120 LF	\$20	\$2,400
FSD/EDB GRADING	1350 CY	\$10	\$13,500
CONCRETE STILLING BASIN	1 EA	\$2,500	\$2,500
RETAINING WALL	90 SF	\$20	\$1,800
		Sub-Total	\$23,700
		Engineering & Contingencies 10%	<u>\$2,370</u>
		Total	\$26,070

## 13.0 CONCLUSIONS

For this 7.73-acre site, work will include constructing a 4,542 sf administration building and asphalt driveway. In order to accommodate an area of disturbance greater than 1 acre, a 0.20-acre-foot Full Spectrum Extended Detention Basin is proposed that detains flows from Sub-basin A and releases 5-year storm and 100-year storm flows through a Type OS2 Outlet Structure that is tied into an existing 24" corrugated metal pipe.

Sediment and vegetation surrounding the existing 24" corrugated metal pipe outfall point in Flagstone Channel will be removed. Riprap pad will be re-established at this outfall point. The outfall point is currently scour stable. All areas disturbed by construction will be repaired, and erosion control measures will be installed during construction of the proposed site per the approved Grading and Erosion Control Plan to be submitted separately for review and approval. Site runoff, storm drains, and appurtenances associated with the development of the Colorado Centre Metropolitan District Administration building will not adversely affect the downstream and surrounding developments.



## 14.0 REFERENCES

*Drainage Report for Colorado Centre Metropolitan District Water Treatment Facility*, prepared by JDS-Hydro Consultants Inc in August 2015.

*Flood Insurance Rate Map Number 08041C0769G*, Federal Emergency Management Agency Floodplain Data, revised December 7, 2018

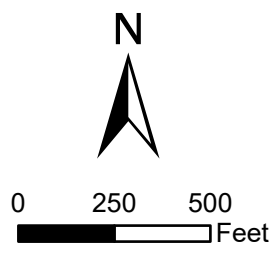
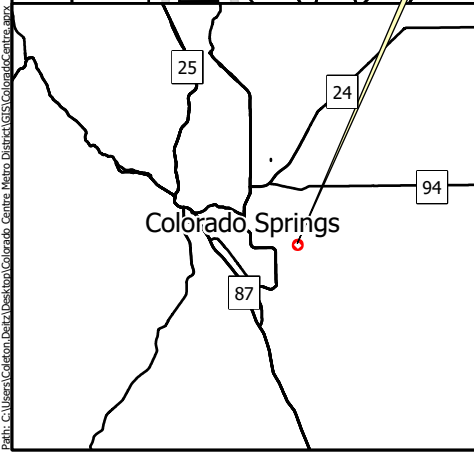
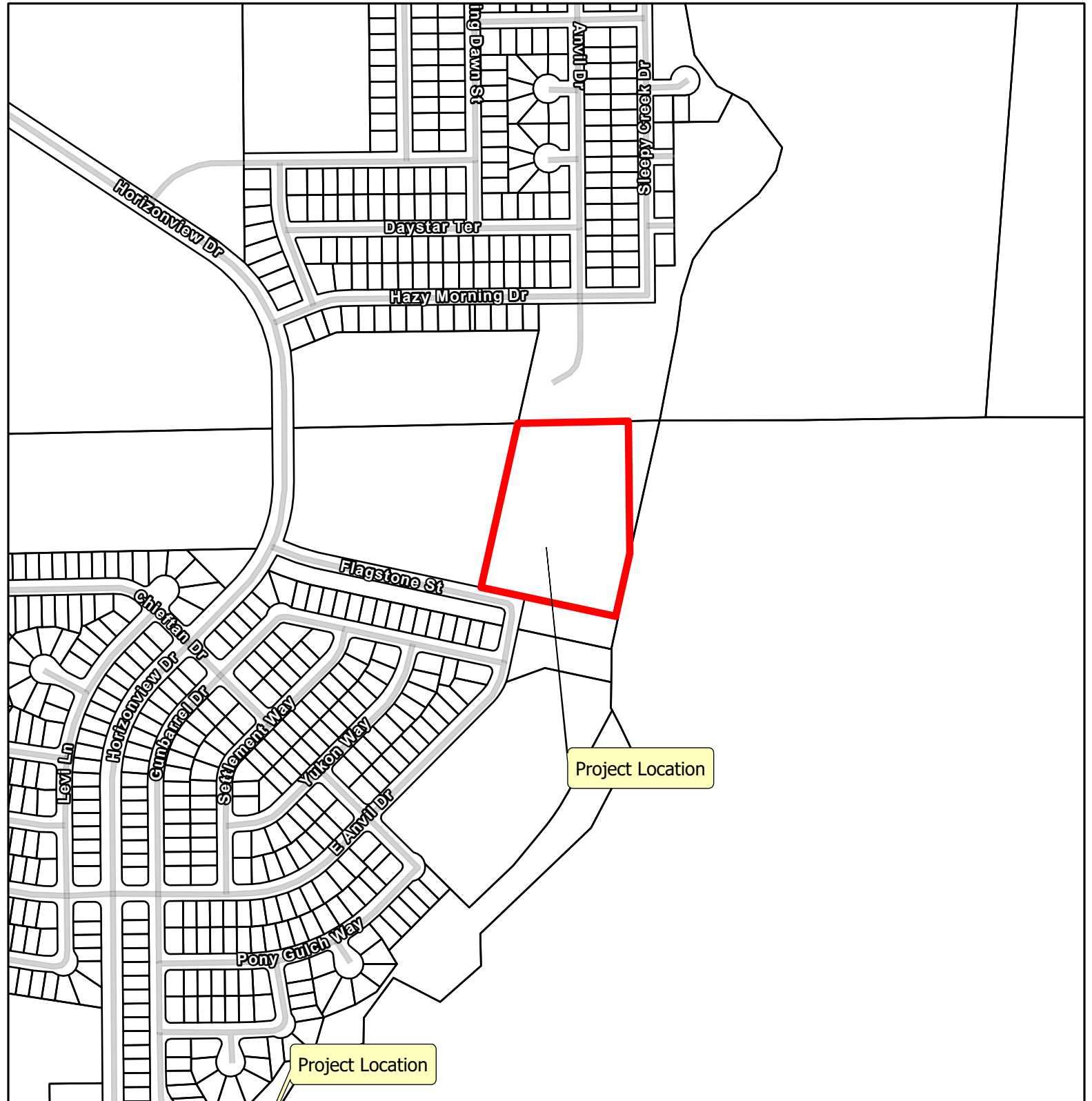
Municipal Code Corporation (2018). *Drainage Criteria Manual of El Paso County, Colorado (DPM)*

Urban Drainage and Flood Control District (June 2017). *Urban Storm Drainage Criteria Manual, Volume 1-3*.


USDA, NRCS. Soil Survey of El Paso County Area, Colorado.



**APPENDIX A**  
**MAPS**



Prepared by:



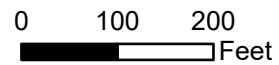
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COLORADO CENTRE METROPOLITAN DISTRICT  
 ADMINISTRATION BUILDING

**VICINITY MAP**

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Path: C:\Users\Colson\Desktop\Colorado\_Centre\_Metro\_District\GIS\Colorado\_Centre.aprx



Map Unit Symbol	Map Unit Name	Rating	Percent of Site, %
28	Ellicot loamy coarse sand, 0 to 5 percent slopes	A	0
101	Ustic Torrfluvents, loamy	B	100.0

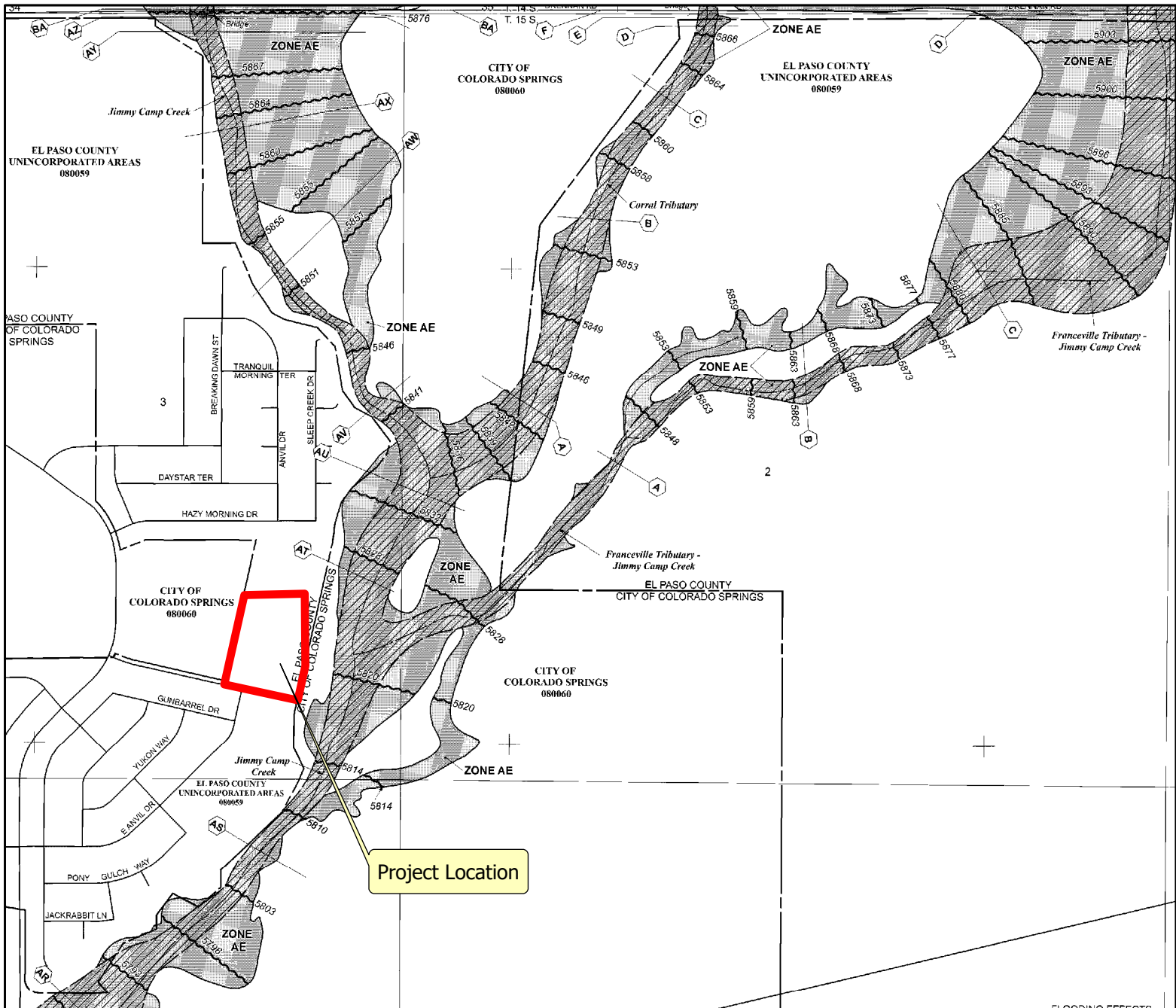
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COLORADO CENTRE METROPOLITAN DISTRICT  
 ADMINISTRATION BUILDING

**SOILS MAP**



Project Location

FLOODING EFFECTS FROM JIMMY CAMP CREEK - EAST TRIBUTARY



0 500 1,000 Feet

**NFP**

**PANEL 0769G**

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

PANEL 769 OF 1300  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:


COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0769	G
EL PASO COUNTY	080059	0769	G

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

**MAP NUMBER**  
08041C0769G

**MAP REVISED**  
DECEMBER 7, 2018

Federal Emergency Management Agency



Prepared by:



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COLORADO CENTRE METROPOLITAN DISTRICT  
ADMINISTRATION BUILDING

**FIRM MAP**

Esri Community Maps Contributors, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Esri, NASA, NGA, USGS, FEMA, Maxar





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# APPENDIX B

## CALCULATIONS

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Colorado Centre Metropolitan District Administration Building									
PROJ.247.07									
C FACTOR CALCULATION SHEET									
EXISTING CONDITIONS									
RUNOFF COEFICIENT									
TYPE A/B SOILS									
LAND USE		Imperv %	5 YR	100 YR					
UNDEV		0	0.08	0.35					
GRAVEL ROAD		80	0.59	0.7					
ASPHALT ROAD		100	0.9	0.96					
ROOFS		90	0.73	0.81					
EXISTING CONDITIONS									
	TOTAL	SURFACE CONDITION AREAS				CALCULATED C			
AREA	AREA	UNDEV	GRAVEL	ASPHALT	ROOFS	5	100	% IMPERVIOUS	
DESIG.	(acre)		ROAD	ROAD		YR	YR		
Aex	2.05	2.01	0.00	0.04	0.00	0.09	0.36		1.8
Bex	0.17	0.00	0.00	0.17	0.00	0.90	0.96		100.0
Cex	2.87	2.72	0.00	0.07	0.08	0.12	0.38		4.9
Dex	0.71	0.71	0.00	0.00	0.00	0.08	0.35		0.0
Eex	1.65	1.65	0.00	0.00	0.00	0.08	0.35		0.0
Fex	0.09	0.09	0.00	0.00	0.00	0.08	0.35		0.0
Gex	0.07	0.07	0.00	0.00	0.00	0.08	0.35		0.0
OS1	0.50	0.50	0.00	0.00	0.00	0.08	0.35		0.0
OS2	0.37	0.37	0.00	0.00	0.00	0.08	0.35		0.0
OS3	0.01	0.01	0.00	0.00	0.00	0.08	0.35		0.0
Site Percent Impervious, %		4.6							

PROPOSED CONDITIONS									
RUNOFF COEFFICIENT									
TYPE A/B SOILS									
LAND USE		Imperv %	5 YR	100 YR					
UNDEV		0	0.08	0.35					
GRAVEL ROAD		80	0.59	0.7					
ASPHALT ROAD		100	0.9	0.96					
ROOFS		90	0.73	0.81					

**PROPOSED CONDITIONS**

	TOTAL	SURFACE CONDITION AREAS				CALCULATED C			
AREA	AREA	UNDEV	GRAVEL	ASPHALT	ROOFS	5	100	% IMPERVIOUS	
DESIG.	(acre)		ROAD	ROAD		YR	YR		
A	2.78	1.61	0.00	1.05	0.12	0.42	0.60		41.8
B	0.17	0.00	0.00	0.17	0.00	0.90	0.96		100.0
C	2.14	1.99	0.00	0.07	0.08	0.13	0.39		6.9
D	0.65	0.65	0.00	0.00	0.00	0.08	0.35		0.0
E	1.65	1.65	0.00	0.00	0.00	0.08	0.35		0.0
F	0.09	0.09	0.00	0.00	0.00	0.08	0.35		0.0
G	0.07	0.07	0.00	0.00	0.00	0.08	0.35		0.0
OS1	0.50	0.50	0.00	0.00	0.00	0.08	0.35		0.0
OS2	0.37	0.37	0.00	0.00	0.00	0.08	0.35		0.0
OS3	0.01	0.01	0.00	0.00	0.00	0.08	0.35		0.0
Site Percent Impervious, %		19.6							



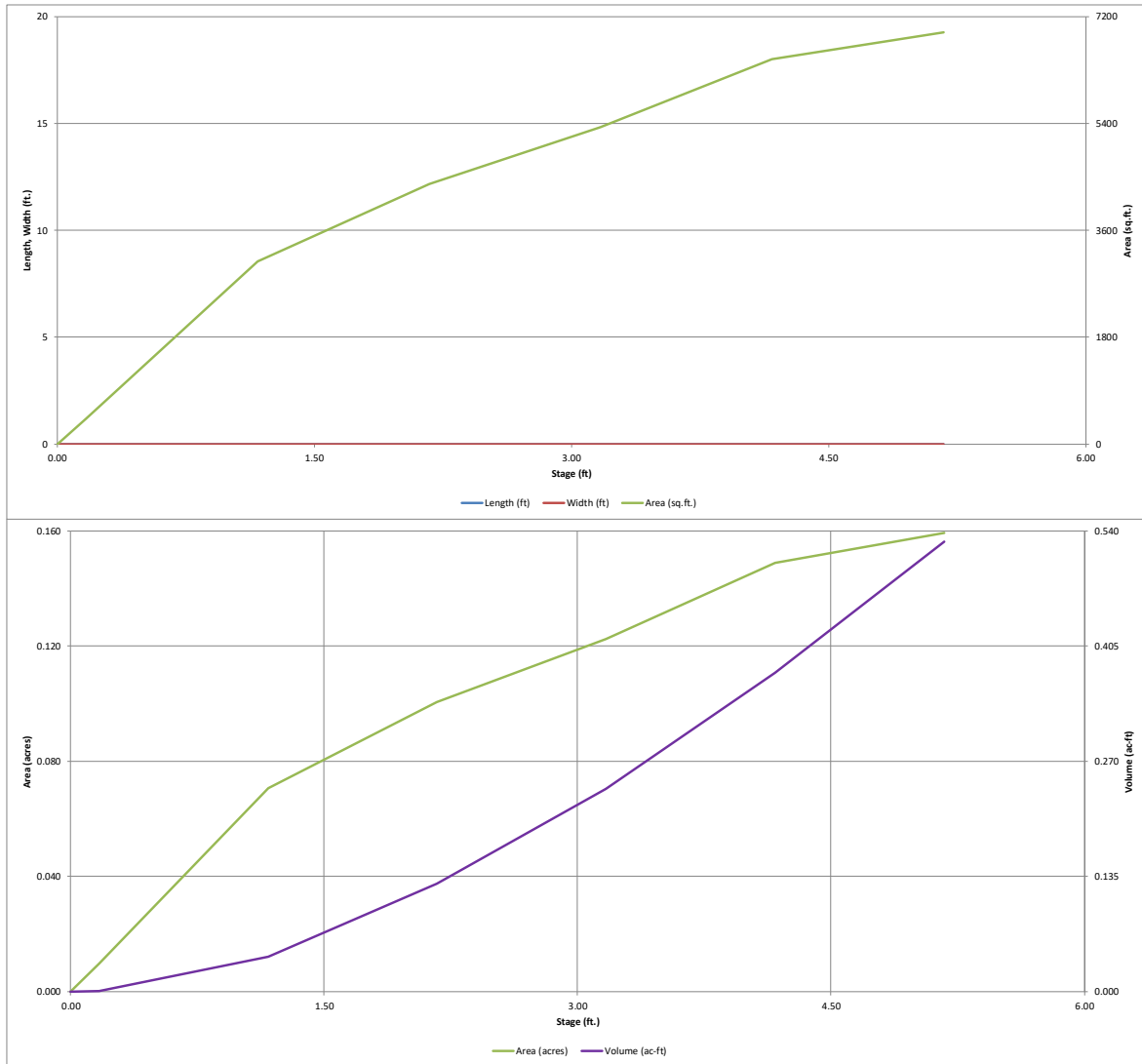
**Colorado Centre Metropolitan District  
Proposed Full Spectrum Detention Basin  
Stage-Area Curve**

<b>Elevation (ft)</b>	<b>Depth (ft)</b>	<b>Area (sf)</b>	<b>Area (ac)</b>	<b>Inc. Vol. (ac-ft)</b>	<b>Total Vol. (ac-ft)</b>
5818.83	0	0	0	0.00	0.00
5819	5819	419	0.01	0.00	0.00
5820	5820	3075	0.07	0.04	0.04
5821	5821	4378	0.10	0.09	0.13
5822	5822	5338	0.12	0.11	0.24
5823	5823	6484	0.15	0.14	0.37
5824	5824	6940	0.16	0.15	0.53



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.05 (January 2022)*

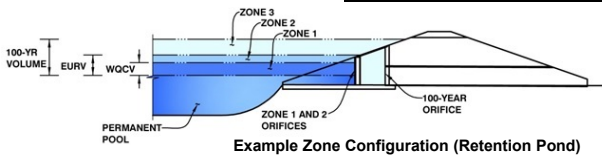


# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

**Project:** Colorado Centre Metro District Admin Building

**Basin ID:** D1



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.24	0.046	Orifice Plate
Zone 2 (EURV)	2.12	0.075	Orifice Plate
Zone 3 (100-year)	3.21	0.121	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>0.242</b>	

**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<sup>2</sup>  
 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)

Centroid of Lowest Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Orifice Plate =  ft (relative to basin bottom at Stage = 0 ft)  
 Orifice Plate: Orifice Vertical Spacing =  inches  
 Orifice Plate: Orifice Area per Row =  sq. inches (diameter = 11/16 inch)

**Calculated Parameters for Plate**  
 WQ Orifice Area per Row =  ft<sup>2</sup>  
 Elliptical Half-Width =  feet  
 Elliptical Slot Centroid =  feet  
 Elliptical Slot Area =  ft<sup>2</sup>

**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	0.71	1.41					
Orifice Area (sq. inches)	0.38	0.38	0.38					
	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

**User Input:** Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
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 <sup>2</sup>
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 =	2.15	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	0.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

**Calculated Parameters for Overflow Weir**

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H <sub>u</sub> =	2.15	N/A	feet
Overflow Weir Slope Length =	0.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	0.00	N/A	
Overflow Grate Open Area w/o Debris =	0.00	N/A	ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	0.00	N/A	ft <sup>2</sup>

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	6.00		inches

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate**

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.61	N/A	ft <sup>2</sup>
Outlet Orifice Centroid =	0.29	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.05	N/A	radians

**User Input:** Emergency Spillway (Rectangular or Trapezoidal)

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

**Calculated Parameters for Spillway**

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

## Routed Hydrograph Results

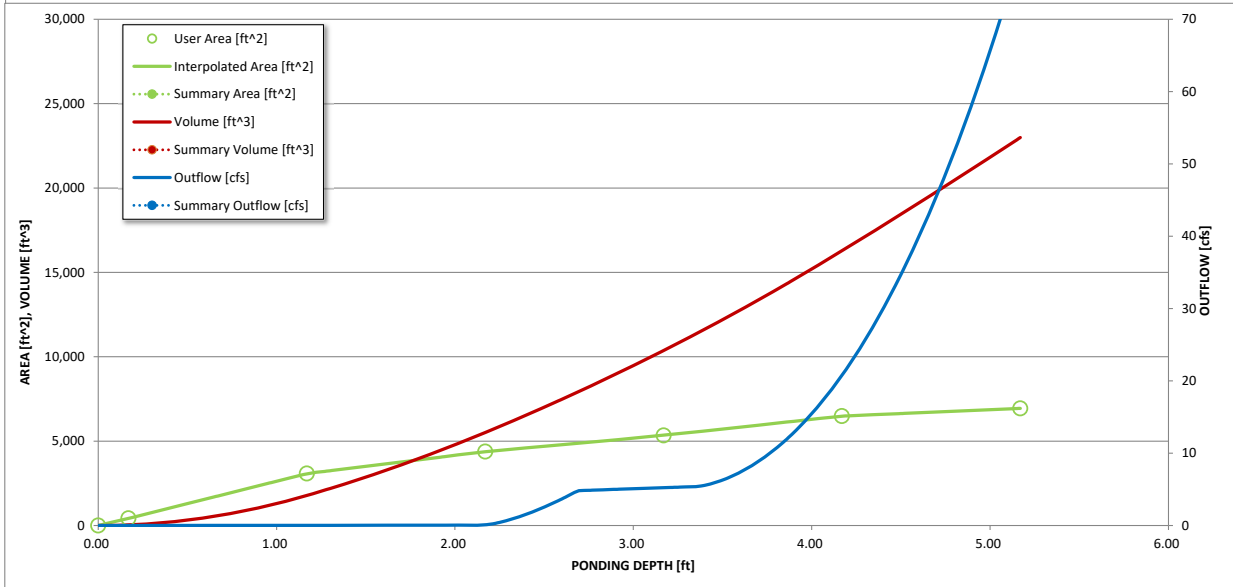
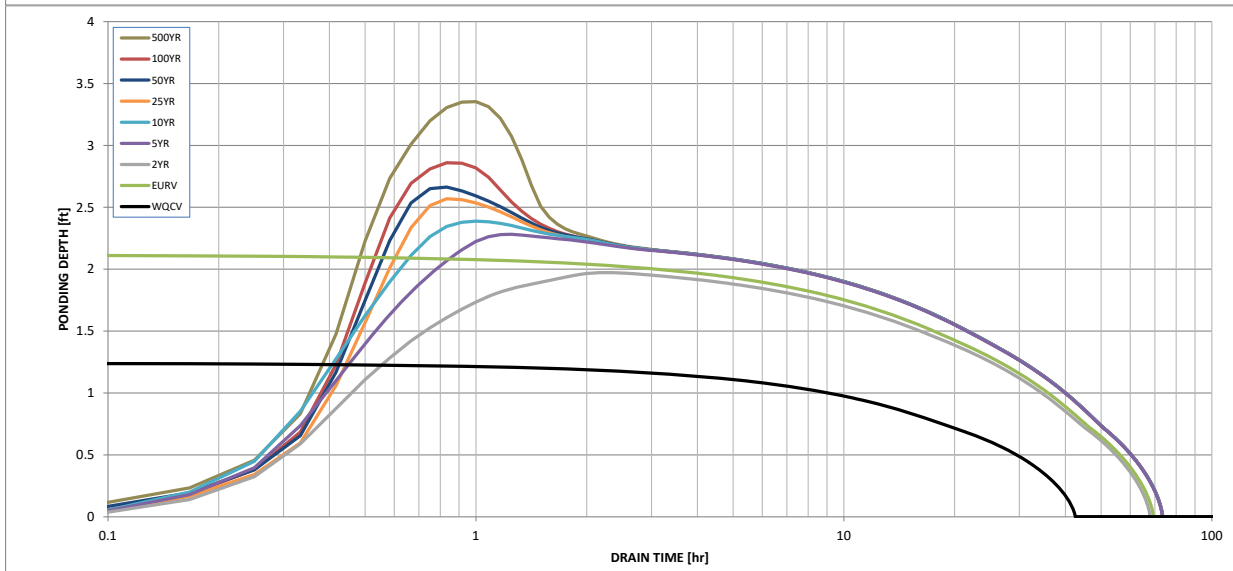
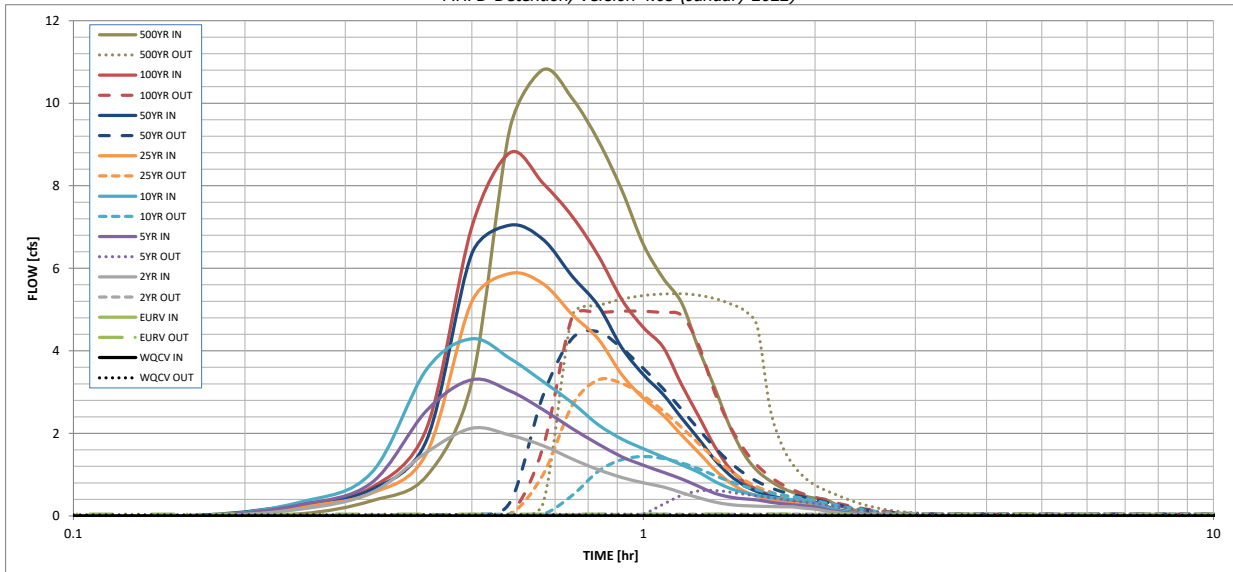
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.01
One-Hour Rainfall Depth (in) =	0.046	0.121	0.114	0.175	0.232	0.314	0.378	0.461	0.590
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.114	0.175	0.232	0.314	0.378	0.461	0.590
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.5	1.4	2.1	3.6	4.5	5.6	7.3
OPTIONAL CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.16	0.42	0.64	1.10	1.37	1.72	2.24
Peak Inflow Q (cfs) =	N/A	N/A	2.1	3.3	4.3	5.9	7.0	8.8	10.8
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.6	1.4	3.3	4.5	5.0	5.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.7	0.9	1.0	0.9	0.7
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Gate 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	62	61	63	61	58	55	52	49
Time to Drain 99% of Inflow Volume (hours) =	<b>41</b>	66	65	69	68	67	66	64	63
Maximum Ponding Depth (ft) =	1.25	2.12	1.97	2.28	2.39	2.57	2.66	2.86	3.35
Area at Maximum Ponding Depth (acres) =	0.07	0.10	0.09	0.10	0.11	0.11	0.11	0.12	0.13
Maximum Volume Stored (acre-ft) =	0.047	0.121	0.107	0.138	0.148	0.167	0.178	0.200	0.260



# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.05 (January 2022)*



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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*Outflow Hydrograph Workbook Filename:*

## Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.05
	0:15:00	0.00	0.00	0.16	0.27	0.33	0.22	0.28	0.28	0.37
	0:20:00	0.00	0.00	0.56	0.80	1.04	0.55	0.63	0.68	0.97
	0:25:00	0.00	0.00	1.54	2.56	3.55	1.53	1.84	2.13	3.25
	0:30:00	0.00	0.00	2.12	3.30	4.29	5.20	6.35	7.00	9.39
	0:35:00	0.00	0.00	1.96	3.03	3.82	5.87	7.04	8.80	10.81
	0:40:00	0.00	0.00	1.70	2.57	3.25	5.63	6.70	8.06	10.12
	0:45:00	0.00	0.00	1.38	2.12	2.74	4.88	5.81	7.26	9.09
	0:50:00	0.00	0.00	1.12	1.74	2.21	4.29	5.09	6.31	7.89
	0:55:00	0.00	0.00	0.93	1.43	1.86	3.42	4.07	5.24	6.58
	1:00:00	0.00	0.00	0.80	1.23	1.63	2.85	3.42	4.56	5.76
	1:05:00	0.00	0.00	0.70	1.06	1.43	2.44	2.94	4.08	5.16
	1:10:00	0.00	0.00	0.56	0.90	1.24	1.96	2.37	3.18	4.05
	1:15:00	0.00	0.00	0.44	0.72	1.06	1.54	1.87	2.42	3.11
	1:20:00	0.00	0.00	0.34	0.55	0.84	1.13	1.36	1.69	2.18
	1:25:00	0.00	0.00	0.28	0.46	0.67	0.81	0.99	1.15	1.51
	1:30:00	0.00	0.00	0.25	0.41	0.57	0.61	0.74	0.83	1.10
	1:35:00	0.00	0.00	0.23	0.39	0.50	0.48	0.59	0.64	0.85
	1:40:00	0.00	0.00	0.23	0.33	0.45	0.40	0.49	0.51	0.68
	1:45:00	0.00	0.00	0.22	0.30	0.42	0.34	0.42	0.42	0.56
	1:50:00	0.00	0.00	0.22	0.27	0.39	0.31	0.38	0.36	0.48
	1:55:00	0.00	0.00	0.19	0.25	0.36	0.28	0.35	0.32	0.43
	2:00:00	0.00	0.00	0.16	0.22	0.31	0.27	0.33	0.30	0.40
	2:05:00	0.00	0.00	0.12	0.16	0.22	0.19	0.24	0.22	0.29
	2:10:00	0.00	0.00	0.09	0.12	0.16	0.14	0.17	0.15	0.21
	2:15:00	0.00	0.00	0.06	0.08	0.11	0.10	0.12	0.11	0.15
	2:20:00	0.00	0.00	0.04	0.06	0.08	0.07	0.08	0.08	0.10
	2:25:00	0.00	0.00	0.03	0.04	0.05	0.05	0.06	0.05	0.07
	2:30:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.04	0.05
	2:35:00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.02	0.03
	2:40:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	2:45:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	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

# Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

**Project:** Colorado Centre Admin Building  
**Designer:** CTD  
**Date:** December 1, 2022

**County:** El Paso, Colorado  
**Checked by:** RGG  
**Date:** \_\_\_\_\_

**Input Geometry:**

Upstream Channel	Chute	Downstream Channel
Bw = 4.0 ft.	Bw = 2.0 ft.	Bw = 2.0 ft.
Side slopes = 0.0 (m:1)	Factor of safety = 1.20 (F <sub>s</sub> ) <b>1.2 Min</b>	Side slopes = 0.0 (m:1)
Velocity n-value = 0.013	Side slopes = 4.0 (m:1) → <b>2.0:1 max.</b>	Velocity n-value = 0.013
Bed slope = 0.0200 ft./ft.	Bed slope (3:1) = 0.333 ft./ft → <b>3.0:1 max.</b>	Bed slope = 0.0050 ft./ft.
	Freeboard = 0.5 ft. →	
	Outlet apron depth, d = 1.0 ft.	Base flow = 0.0 cfs

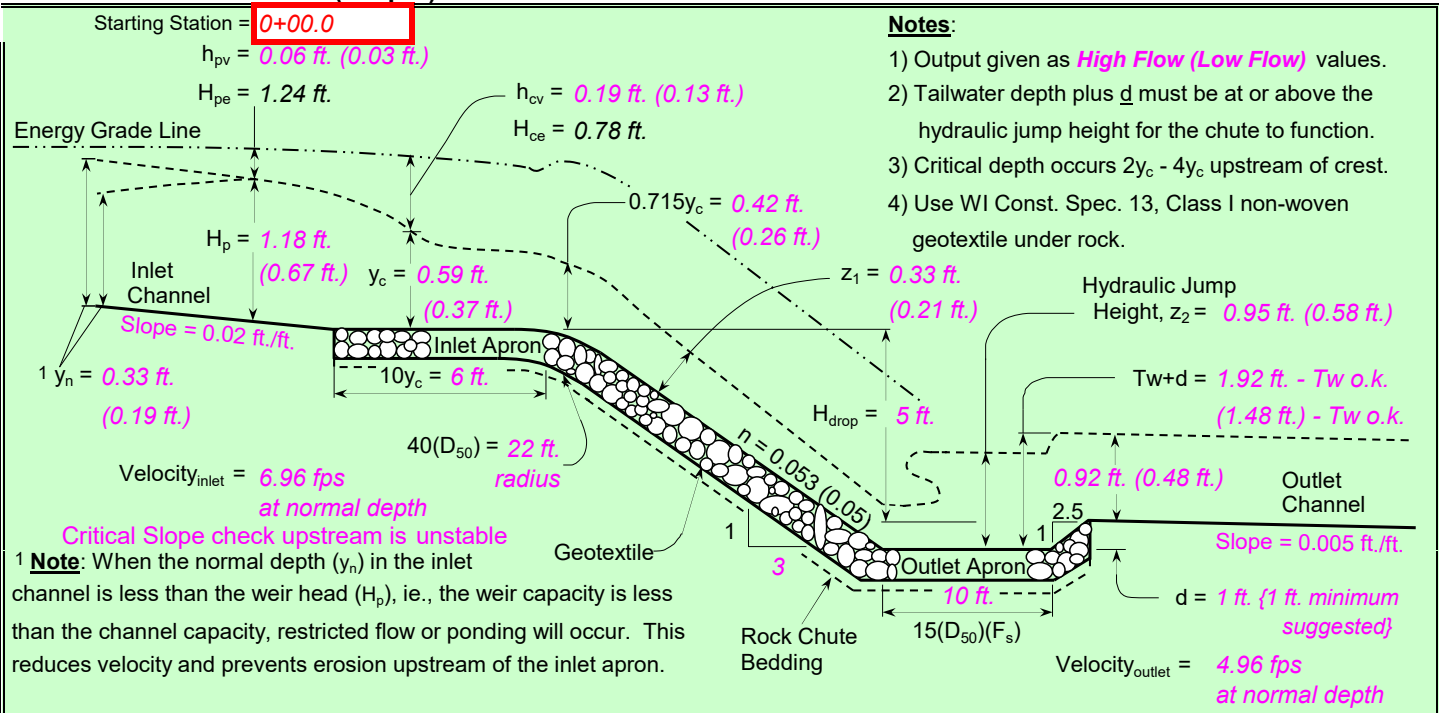
*Note: n value = a) velocity n from waterway program or b) computed manning's n for channel*

**Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):**

Apron elev. --- Inlet = <b>5826.0</b> ft. ----- Outlet <b>5820.0</b> ft. --- (H <sub>drop</sub> = 5 ft.)		<b>Note:</b> The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.
Q <sub>high</sub> = Runoff from design storm capacity from Table 2, FOTG Standard 410	Q <sub>5</sub> = Runoff from a 5-year, 24-hour storm.	
Q <sub>high</sub> = <b>9.1</b> cfs	High flow storm <b>through chute</b>	Tw (ft.) = <b>Program</b>
Q <sub>5</sub> = <b>3.7</b> cfs	Low flow storm <b>through chute</b>	Tw (ft.) = <b>Program</b>

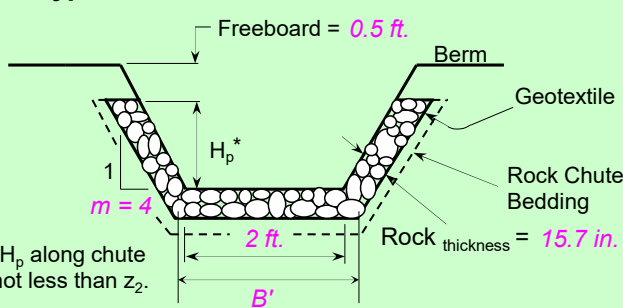
**Input tailwater (Tw):**      0.33      1.20

**Profile and Cross Section (Output):**



**Profile Along Centerline of Chute**

**Typical Cross Section**



F <sub>s</sub> = <b>1.20</b>	Factor of safety (multiplier)
z <sub>1</sub> = <b>0.33 ft.</b>	Normal depth in chute
n-value = <b>0.053</b>	Manning's roughness coefficient
D <sub>50</sub> (F <sub>s</sub> ) = <b>7.9 in.</b>	Minimum Design D50*
2(D <sub>50</sub> )(F <sub>s</sub> ) = <b>15.7 in.</b>	Rock chute thickness
Tw + d = <b>1.92 ft.</b>	Tailwater above outlet apron
z <sub>2</sub> = <b>0.95 ft.</b>	Hydraulic jump height
<b>*** The outlet will function adequately</b>	

**High Flow Storm Information**

Equivalent unit discharge	<b>2.59 cfs/ft.</b>
---------------------------	---------------------

Project: Colorado Centre Admin Building



Water Quality Capture Volume (WQCV) Calculator

Drain Time (hrs)	40
Coefficient, a	1.0
Imperviousness, I	35.4%
WQCV (watershed inches)	0.17
WQCV (ft)	0.01
Watershed Area (ac)	3.3
WQCV (ac-ft)	0.046



Forebay Calculator

WQCV (ac-ft)	0.046
2% of WQCV (ac-ft)	0.0009
2% of WQCV (cf)	40
Depth (ft)	1.00
Width (ft)	6
Length (ft)	8
Volume (cf)	48
Is Volume greater than 2% of WQCV?	YES



Forebay Notch Calculator

Q <sub>100</sub> (cfs)	8.8
2% of Q <sub>100</sub> (cfs)	0.18
D (ft)	1
<b>W (ft)</b>	<b>0.06</b>

$$W = \frac{2\% \text{ of } Q}{D^{1.5} * C}$$



### Trickle Channel Calculator

Q <sub>100</sub> (cfs)	8.8
2% of Q <sub>100</sub> (cfs)	0.18
Slope (ft/ft)	0.005
<b>Bottom Width (ft)</b>	<b>2</b>
Side Slopes (Vertical)	0
<b>Depth of Trickle Channel (ft)</b>	<b>0.5</b>
Depth of 2% of 100-Year (ft)	0.07
Velocity (ft/s)	1.3
Froude Number	0.9
Type of Flow (Subcritical/Supercritical)	Subcritical

**Project: Colorado Centre Admin Building**



**Proposed Detention Basin Spillway**

Slope (ft/ft)	0.1
Cf	2
Q <sub>100</sub> (cfs)	8.8
Width (ft)	4.0
q (cfs/ft)	2.20
Calculated D <sub>50</sub> (in)	5.3
D <sub>50</sub> used (in)	6.0



**Detention Basin Outlet**

100-Year Peak Outflow (cfs)	5.6
Y <sub>t</sub> (ft)	0.59
D <sub>c</sub> (ft)	2.0
D <sub>50</sub> (ft)	0.2
D <sub>50</sub> Used (ft)	6.0

## Manning Formula:

Trickle Channel - 2% of 100 Year Flow

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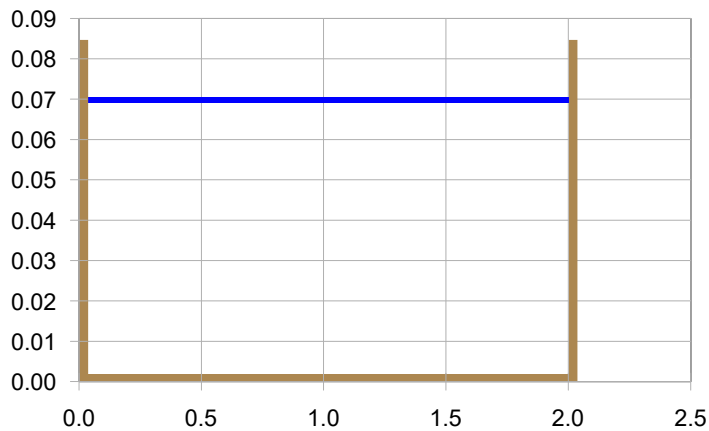
### Rectangular Channel

#### Input

Flow	0.18 cfs
Slope	0.005 ft/ft
Manning's n	0.013
Base Width	2 ft
Right Side Slope	0:1
Left Side Slope	0:1

#### Output

Depth	0.069 ft
Flow Area	0.138 sf
Velocity	1.30 fps
Velocity Head	0.0263 ft
Top Width	2.00 ft
Froude Number	0.873
Critical Depth	0.063 ft
Critical Slope	0.00671 ft/ft



**Manning Formula:** Curb Opening - 100 Year Flow

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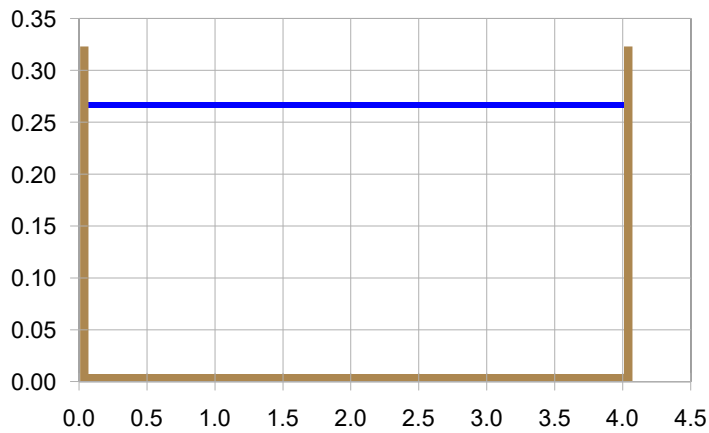
**Rectangular Channel**

**Input**

Flow	9.1 cfs
Slope	0.04 ft/ft
Manning's n	0.013
Base Width	4 ft
Right Side Slope	0:1
Left Side Slope	0:1

**Output**

Depth	0.263 ft
Flow Area	1.05 sf
Velocity	8.65 fps
Velocity Head	1.16 ft
Top Width	4.00 ft
Froude Number	2.97
Critical Depth	0.544 ft
Critical Slope	0.00416 ft/ft





Pond Inlet Channel - 5 Year Flow

**Manning Formula:**

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**Irregular Section**

**Input**

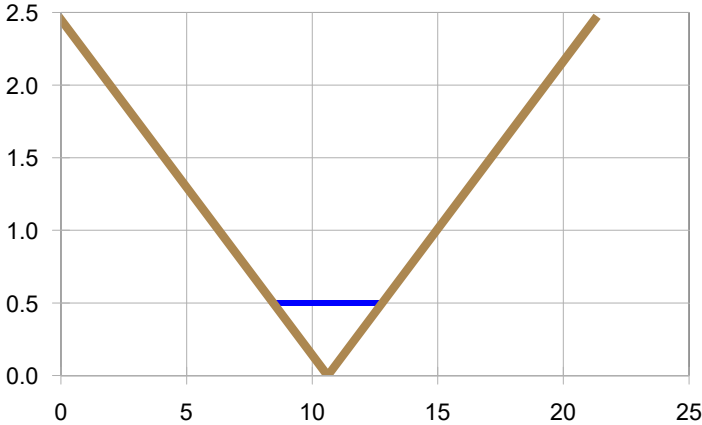
Flow 3.3 cfs  
Slope 0.044 ft/ft

Sta	Elev	n	Sta	Elev	n	Sta	Elev	n	Sta	Elev	n
0	2.45	0.04	10.62	0	0.04	21.24	2.45	0.04			

**Output**

WSElev 0.500 ft  
Flow Area 1.09 sf  
Velocity 3.04 fps  
Velocity Head 0.144 ft  
Top Width 4.34 ft  
Froude Number 1.07  
Critical WSElev 0.514 ft  
Critical Slope ft/ft

Note: 1.95' of Freeboard.



Pond Inlet Channel - 100 Year Flow

**Manning Formula:**

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**Irregular Section**

**Input**

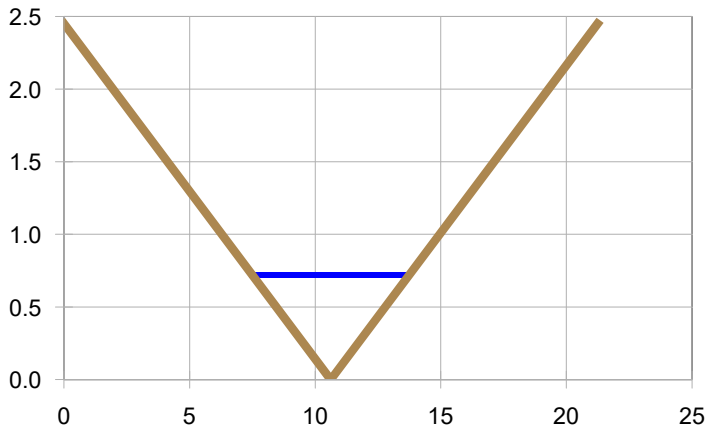
Flow 8.8 cfs  
Slope 0.044 ft/ft

Sta	Elev	n	Sta	Elev	n	Sta	Elev	n	Sta	Elev	n
0	2.45	0.04	10.62	0	0.04	21.24	2.45	0.04			

**Output**

WSElev 0.723 ft  
Flow Area 2.26 sf  
Velocity 3.89 fps  
Velocity Head 0.235 ft  
Top Width 6.27 ft  
Froude Number 1.14  
Critical WSElev 0.762 ft  
Critical Slope ft/ft

Note: 1.73' of Freeboard.





**Image taken looking southeast at the existing outfall configuration of the 24" CMP storm sewer line beginning onsite and terminating in Flagstone Channel.**



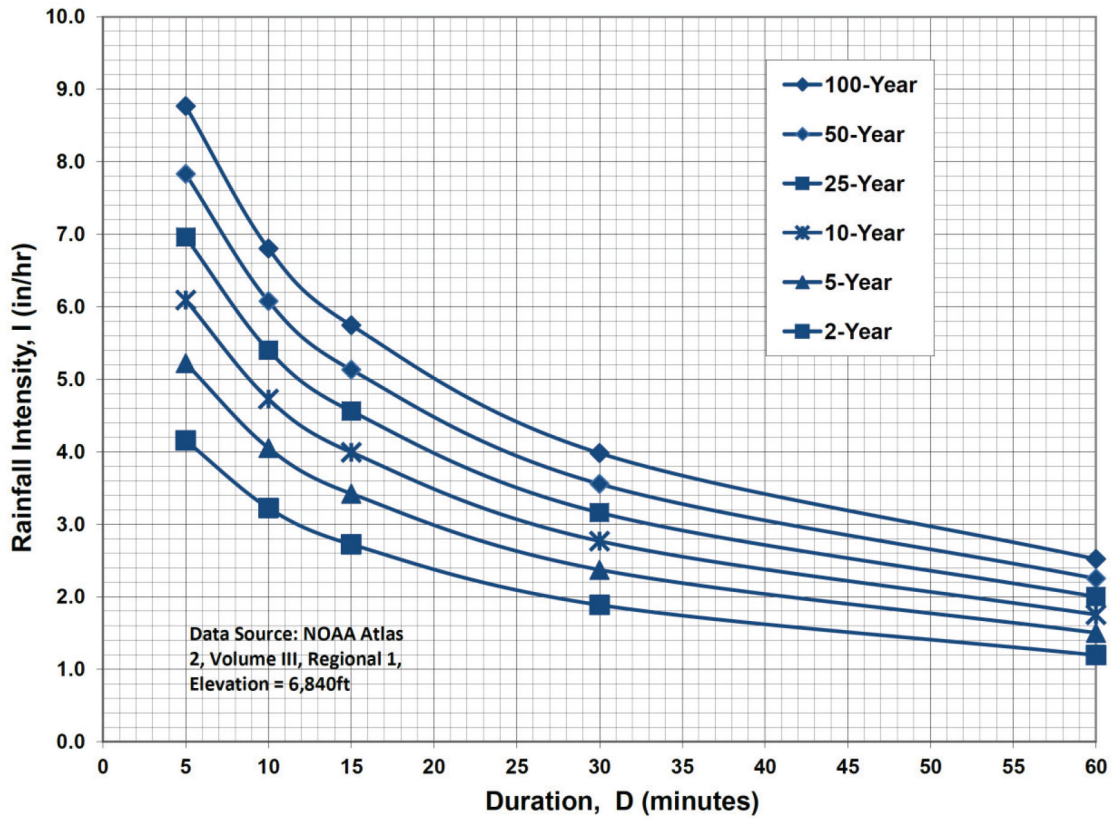
**APPENDIX C**  
**DESIGN CHARTS**





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

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



**IDF Equations**

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

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

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

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

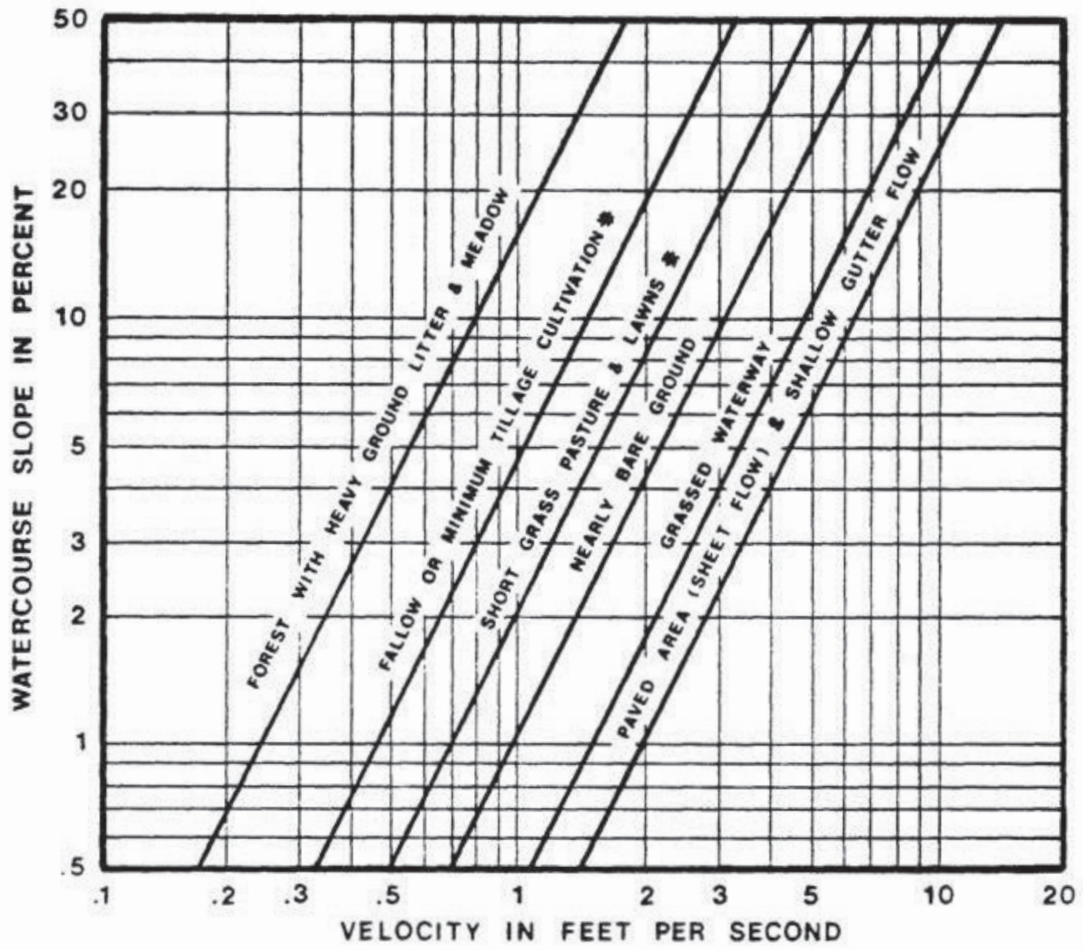
$$I_5 = -1.50 \ln(D) + 7.583$$

$$I_2 = -1.19 \ln(D) + 6.035$$

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



Figure 6-25. Estimate of Average Concentrated Shallow Flow



## 3.0 Colorado Urban Hydrograph Procedure

### 3.1 Background

The Colorado Urban Hydrograph Procedure (CUHP) is a method of hydrologic analysis based upon the unit hydrograph principle. A unit hydrograph is defined as the hydrograph of one inch of direct runoff from the tributary area resulting from a storm of a given duration. The unit hydrograph thus represents the integrated effects of factors such as tributary area, shape, street pattern, channel capacities, and street and land slopes. The basic premise of the unit hydrograph is that individual hydrographs resulting from the successive increments of excess rainfall that occur throughout a storm period will be proportional in discharge throughout their runoff period. Thus, the hydrograph of total storm discharge is obtained by summing the ordinates of the individual sub-hydrographs.

CUHP has been developed and calibrated using rainfall-runoff data collected in Colorado (mostly in the Denver/Boulder metropolitan area). This section provides a general background in the use of the computer version of CUHP to perform stormwater runoff calculations. A detailed description of the CUHP method and the assumptions and equations used, including a hand calculation example, are provided in the CUHP User Manual. The latest version of the CUHP 2005 macro-enabled Excel workbook and User Manual are available for download from [www.udfed.org](http://www.udfed.org).

### 3.2 Effective Rainfall for CUHP

Effective rainfall is that portion of precipitation during a storm event that runs off the land to streams. Those portions of precipitation that do not reach a stream are called abstractions and include interception by vegetation, evaporation, infiltration, storage in all surface depressions, and extended duration surface retention. The total design rainfall depth for use with CUHP should be obtained from the *Rainfall* chapter of the USDCM. This chapter illustrates a method for estimating the amount of rainfall that actually becomes surface runoff whenever a design rainstorm is used.

#### 3.2.1 Pervious-Impervious Areas

As described in Section 2.5.1, the urban landscape is comprised of pervious and impervious surfaces. The degree of imperviousness is the primary variable that affects the volumes and rates of runoff calculated using CUHP. When analyzing a watershed for design purposes, the probable future percent of impervious area must first be estimated. A complete tabulation of recommended values of total percentage imperviousness is provided in Table 6-3 and Figures 6-1 through 6-3. References to impervious area and all calculations in this chapter are based on the input of total impervious areas. The pervious-impervious area relationship can be further refined for use in CUHP as follows:

- **DCIA:** Impervious area portion directly connected to the drainage system.
- **UIA:** Impervious area portion that drains onto or across pervious surfaces.
- **RPA:** The portion of pervious area receiving runoff from impervious portions.
- **SPA:** The separate pervious area portion not receiving runoff from impervious surfaces.

This further refinement is explained in more detail in the CUHP User Manual and in Chapter 3 of the USDCM Volume 3.



**APPENDIX D**  
**GEC PLANSET**



**EROSION CONTROL NOTES:**

- STORMWATER DISCHARGES FROM CONSTRUCTION SITES SHALL NOT CAUSE OR THREATEN TO CAUSE POLLUTION, CONTAMINATION, OR DEGRADATION OF STATE WATERS. ALL WORK AND EARTH DISTURBANCE SHALL BE DONE IN A MANNER THAT MINIMIZES POLLUTION OF ANY ON-SITE OR OFF-SITE WATERS, INCLUDING WETLANDS.
- NOTWITHSTANDING ANYTHING DEPICTED IN THESE PLANS IN WORDS OR GRAPHIC REPRESENTATION, ALL DESIGN AND CONSTRUCTION RELATED TO ROADS, STORM DRAINAGE, AND EROSION CONTROL SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS OF THE MOST RECENT VERSION OF THE RELEVANT ADOPTED EL PASO COUNTY STANDARDS, INCLUDING THE LAND DEVELOPMENT CODE, THE ENGINEERING CRITERIA MANUAL, THE DRAINAGE CRITERIA MANUAL, AND THE DRAINAGE CRITERIA MANUAL VOLUME 2. ANY DEVIATIONS FROM REGULATIONS AND STANDARDS MUST BE REQUESTED, AND APPROVED, IN WRITING.
- A SEPARATE STORMWATER MANAGEMENT PLAN (SWMP) FOR THIS PROJECT SHALL BE COMPLETED AND AN EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP) ISSUED PRIOR TO COMMENCING CONSTRUCTION. MANAGEMENT OF THE SWMP DURING CONSTRUCTION IS THE RESPONSIBILITY OF THE DESIGNATED QUALIFIED STORMWATER MANAGER OR CERTIFIED EROSION CONTROL INSPECTOR. THE SWMP SHALL BE LOCATED ON SITE AT ALL TIMES DURING CONSTRUCTION AND SHALL BE KEPT UP TO DATE WITH WORK PROGRESS AND CHANGES IN THE FIELD.
- ONCE THE ESQCP IS APPROVED AND A "NOTICE TO PROCEED" HAS BEEN ISSUED, THE CONTRACTOR MAY INSTALL THE INITIAL STAGE EROSION AND SEDIMENT CONTROL MEASURES AS INDICATED ON THE APPROVED GEC. A PRECONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, AND EL PASO COUNTY WILL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE APPLICANT TO COORDINATE THE MEETING TIME AND PLACE WITH COUNTY STAFF.
- CONTROL MEASURES MUST BE INSTALLED PRIOR TO COMMENCEMENT OF ACTIVITIES THAT COULD CONTRIBUTE POLLUTANTS TO STORMWATER. CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES, AND DISTURBED LAND AREAS SHALL BE INSTALLED IMMEDIATELY UPON COMPLETION OF THE DISTURBANCE.
- ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE MAINTAINED AND REMAIN IN EFFECTIVE OPERATING CONDITION UNTIL PERMANENT SOIL EROSION CONTROL MEASURES ARE IMPLEMENTED AND FINAL STABILIZATION IS ESTABLISHED. ALL PERSONS ENGAGED IN LAND DISTURBANCE ACTIVITIES SHALL ASSESS THE ADEQUACY OF CONTROL MEASURES AT THE SITE AND IDENTIFY IF CHANGES TO THOSE CONTROL MEASURES ARE NEEDED TO ENSURE THE CONTINUED EFFECTIVE PERFORMANCE OF THE CONTROL MEASURES. ALL CHANGES TO TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES MUST BE INCORPORATED INTO THE STORMWATER MANAGEMENT PLAN.
- TEMPORARY STABILIZATION SHALL BE IMPLEMENTED ON DISTURBED AREAS AND STOCKPILES WHERE GROUND-DISTURBING CONSTRUCTION ACTIVITY HAS PERMANENTLY CEASED OR TEMPORARILY CEASED FOR LONGER THAN 14 DAYS.
- FINAL STABILIZATION MUST BE IMPLEMENTED AT ALL APPLICABLE CONSTRUCTION SITES. FINAL STABILIZATION IS ACHIEVED WHEN ALL GROUND-DISTURBING ACTIVITIES ARE COMPLETE AND ALL DISTURBED AREAS EITHER HAVE A UNIFORM VEGETATIVE COVER WITH INDIVIDUAL PLANT DENSITY OF 70 PERCENT OF PRE-DISTURBANCE LEVELS ESTABLISHED OR EQUIVALENT PERMANENT ALTERNATIVE STABILIZATION METHOD IS IMPLEMENTED. ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED UPON FINAL STABILIZATION AND BEFORE PERMIT CLOSURE.
- ALL PERMANENT STORMWATER MANAGEMENT FACILITIES SHALL BE INSTALLED AS DESIGNED IN THE APPROVED PLANS. ANY PROPOSED CHANGES THAT EFFECT THE DESIGN OR FUNCTION OF PERMANENT STORMWATER MANAGEMENT STRUCTURES MUST BE APPROVED BY THE ECM ADMINISTRATOR PRIOR TO IMPLEMENTATION.
- EARTH DISTURBANCES SHALL BE CONDUCTED IN SUCH A MANNER SO AS TO EFFECTIVELY MINIMIZE ACCELERATED SOIL EROSION AND RESULTING SEDIMENTATION. ALL DISTURBANCES SHALL BE DESIGNED, CONSTRUCTED, AND COMPLETED SO THAT THE EXPOSED AREA OF ANY DISTURBED LAND SHALL BE LIMITED TO THE SHORTEST PRACTICAL PERIOD OF TIME. PRE-EXISTING VEGETATION SHALL BE PROTECTED AND MAINTAINED WITHIN 50 HORIZONTAL FEET OF A WATERS OF THE STATE UNLESS SHOWN TO BE INFEASIBLE AND SPECIFICALLY REQUESTED AND APPROVED.
- COMPACTION OF SOIL MUST BE PREVENTED IN AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES OR WHERE FINAL STABILIZATION WILL BE ACHIEVED BY VEGETATIVE COVER. AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES SHALL ALSO BE PROTECTED FROM SEDIMENTATION DURING CONSTRUCTION UNTIL FINAL STABILIZATION IS ACHIEVED. IF COMPACTION PREVENTION IS NOT FEASIBLE DUE TO SITE CONSTRAINTS, ALL AREAS DESIGNATED FOR INFILTRATION AND VEGETATION CONTROL MEASURES MUST BE LOOSENEED PRIOR TO INSTALLATION OF THE CONTROL MEASURE(S).
- ANY TEMPORARY OR PERMANENT FACILITY DESIGNED AND CONSTRUCTED FOR THE CONVEYANCE OF STORMWATER AROUND, THROUGH, OR FROM THE EARTH DISTURBANCE AREA SHALL BE A STABILIZED CONVEYANCE DESIGNED TO MINIMIZE EROSION AND THE DISCHARGE OF SEDIMENT OFF SITE.
- CONCRETE WASH WATER SHALL BE CONTAINED AND DISPOSED OF IN ACCORDANCE WITH THE SWMP. NO WASH WATER SHALL BE DISCHARGE TO OR ALLOWED TO ENTER STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES. CONCRETE WASHOUTS SHALL NOT BE LOCATED IN AN AREA WHERE SHALLOW GROUNDWATER MAY BE PRESENT, OR WITHIN 50 FEET OF A SURFACE WATER BODY, CREEK, OR STREAM.
- DURING DEWATERING OPERATIONS OF UNCONTAMINATED GROUND WATER MAY BE DISCHARGED ON SITE, BUT SHALL NOT LEAVE THE SITE IN THE FORM OF SURFACE RUNOFF UNLESS AN APPROVED STATE DEWATERING PERMIT IS IN PLACE.
- EROSION CONTROL BLANKETING OR OTHER PROTECTIVE COVERING SHALL BE USED ON SLOPES 3:1 AND STEEPER.
- CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL WASTES FROM THE CONSTRUCTION SITE FOR DISPOSAL IN ACCORDANCE WITH LOCAL AND STATE REGULATORY REQUIREMENTS. NO CONSTRUCTION DEBRIS, TREE SLASH, BUILDING MATERIAL WASTES, OR UNUSED BUILDING MATERIALS SHALL BE BURIED, DUMPED, OR DISCHARGED AT THE SITE.
- WASTE MATERIALS SHALL NOT BE TEMPORARILY PLACED OR STORED IN THE STREET, ALLEY, OR OTHER PUBLIC WAY, UNLESS IN ACCORDANCE WITH AN APPROVED TRAFFIC CONTROL PLAN. CONTROL MEASURES MAY BE REQUIRED BY EL PASO COUNTY ENGINEERING IF DEEMED NECESSARY, BASED ON SPECIFIC CONDITIONS AND CIRCUMSTANCES.
- TRACKING OF SOILS AND CONSTRUCTION DEBRIS OFF SITE SHALL BE MINIMIZED. MATERIALS TRACKED OFF SITE SHALL BE CLEANED UP AND PROPERLY DISPOSED OF IMMEDIATELY.
- THE OWNER/DEVELOPER SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL CONSTRUCTION DEBRIS, DIRT, TRASH, ROCK, SEDIMENT, SOIL, AND SAND THAT MAY ACCUMULATE IN ROADS, STORM DRAINS, AND OTHER DRAINAGE CONVEYANCE SYSTEMS AND STORMWATER APPURTENANCES AS A RESULT OF SITE DEVELOPMENT.
- THE QUANTITY OF MATERIALS STORED ON THE PROJECT SITE SHALL BE LIMITED, AS MUCH AS PRACTICAL, TO THAT QUANTITY REQUIRED TO PERFORM THE WORK IN AN ORDERLY SEQUENCE. ALL MATERIALS STORED ON SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER, IN THEIR ORIGINAL CONTAINERS, AND WITH ORIGINAL MANUFACTURER'S LABELS.
- NO CHEMICAL(S) HAVING THE POTENTIAL TO BE RELEASED IN STORMWATER ARE TO BE STORED OR USED ON SITE UNLESS PERMISSION FOR THE USE OF SUCH CHEMICAL(S) IS GRANTED IN WRITING BY THE ECM ADMINISTRATOR. IN GRANTING APPROVAL FOR THE USE OF SUCH CHEMICAL(S), SPECIAL CONDITIONS AND MONITORING MAY BE REQUIRED.
- BULK STORAGE OF ALLOWED PETROLEUM PRODUCTS OR OTHER ALLOWED LIQUID CHEMICALS IN EXCESS OF 55 GALLONS SHALL REQUIRE ADEQUATE SECONDARY CONTAINMENT PROTECTION TO CONTAIN ALL SPILLS ON SITE AND TO PREVENT ANY SPILLED MATERIALS FROM ENTERING STATE WATERS, ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM, OR OTHER FACILITIES.
- NO PERSON SHALL CAUSE THE IMPEDIMENT OF STORMWATER FLOW IN THE CURB AND GUTTER OR DITCH EXCEPT WITH APPROVED SEDIMENT CONTROL MEASURES.
- OWNER/DEVELOPER AND THEIR AGENTS SHALL COMPLY WITH THE "COLORADO WATER QUALITY CONTROL ACT" (TITLE 25, ARTICLE 8, CRS) AND THE "CLEAN WATER ACT" (33 USC 1344), IN ADDITION TO THE REQUIREMENTS OF THE LAND DEVELOPMENT CODE, DCM VOLUME II AND THE ECM APPENDIX I. ALL APPROPRIATE PERMITS MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION (1041, NPDES, FLOODPLAIN, 404, FUGITIVE DUST, ETC.). IN THE EVENT OF CONFLICTS BETWEEN THESE REQUIREMENTS AND OTHER LAWS, RULES, OR REGULATIONS OF OTHER FEDERAL, STATE, LOCAL, OR COUNTY AGENCIES, THE MOST RESTRICTIVE LAWS, RULES, OR REGULATIONS SHALL APPLY.
- ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE ONLY AT APPROVED CONSTRUCTION ACCESS POINTS.
- PRIOR TO CONSTRUCTION, THE PERMITTEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.
- A WATER SOURCE SHALL BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND SHALL BE UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.
- THE SOILS REPORT FOR THIS SITE WAS PREPARED BY EARTH ENGINEERING CONSULTANTS, LLC (DATED 09/08/14) AND SHALL BE CONSIDERED A PART OF THESE PLANS.
- AT LEAST TEN (10) DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB ONE (1) ACRE OR MORE, THE OWNER OR OPERATOR OF CONSTRUCTION ACTIVITY SHALL SUBMIT A PERMIT APPLICATION FOR STORMWATER DISCHARGE TO THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY DIVISION. THE APPLICATION CONTAINS CERTIFICATION OF COMPLETION OF A STORMWATER MANAGEMENT PLAN (SWMP), OF WHICH THIS GRADING AND EROSION CONTROL PLAN MAY BE A PART. FOR INFORMATION OR APPLICATIONS MATERIALS, CONTACT:

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
 WATER QUALITY CONTROL DIVISION  
 WQCD - PERMITS  
 4300 CHERRY CREEK DRIVE SOUTH  
 DENVER, CO 80246-1530  
 ATTN: PERMITS UNIT

**EROSION CONTROL NOTES (CONT'D):**

- SEED AND MULCH ALL DISTURBED AREAS THAT WILL NOT HAVE IMPROVEMENTS (I.E. PAVED ROADS, RIPRAP, ETC.).
- NO BATCH PLANTS ARE PROPOSED AS A PART OF THIS PROJECT.
- THERE ARE NO STREAM CROSSINGS WITHIN THE LIMITS OF THIS PROJECT.
- BMPs MUST BE INSTALLED PRIOR TO LAND DISTURBANCE. SEE LEGEND FOR PHASED BMPs (INITIAL/INTERIM/FINAL) FOR THIS PROJECT.
- PROPOSED BUILDING SITE/LANDSCAPING IS LOCATED OUTSIDE OF FLOODPLAIN.
- J-HOOKS TO BE INSTALLED WHEREVER SILT FENCE IS INSTALLED PERPENDICULAR TO CONTOURS.
- THE PARTIES RESPONSIBLE FOR THIS PLAN HAVE FAMILIARIZED THEMSELVES WITH ALL CURRENT ACCESSIBILITY CRITERIA AND SPECIFICATIONS AND THE PROPOSED PLAN REFLECTS ALL SITE ELEMENTS REQUIRED BY THE APPLICABLE ADA DESIGN STANDARDS AND GUIDELINES AS PUBLISHED BY THE UNITED STATES DEPARTMENT OF JUSTICE. APPROVAL OF THIS PLAN BY EL PASO COUNTY DOES NOT ASSURE COMPLIANCE WITH THE ADA OR ANY REGULATIONS OR GUIDELINES ENACTED OR PROMULGATED UNDER OR WITH RESPECT TO SUCH LAWS.
- EXISTING VEGETATION CONSISTS OF NATIVE GRASSES/WEEDS WITH APPROXIMATELY 75% GROUND COVER.

**TIMING, CONSTRUCTION STAGING, AND SEQUENCING:**

EXPECTED START DATE: FALL 2022  
 INSTALL TEMPORARY EROSION CONTROL: 2-4 DAYS  
 - PERIMETER SILT FENCING  
 - VEHICLE TRACKING CONTROL PAD  
 - CONCRETE WASHOUT  
 - CURB SOCK

ROUGH GRADING - 5 DAYS  
 INSTALL FINAL SITE IMPROVEMENTS - 10 MONTHS  
 REMOVE TEMPORARY EROSION CONTROL - 5 DAYS

**EARTHWORK SUMMARY:**

PROPOSED SITE:  
 CUT - 3,855.2 CY  
 FILL - 1,688.6 (\*1.15) = 1,941.9 CY  
 NET - 1,913.3 CY CUT

DISTURBED AREA - 152,246 SF, 3.50 AC

**EROSION CONTROL FACILITIES:**

SILT FENCE - 1337 LF  
 VEHICLE TRACKING PAD (VT) - 1  
 CURB SOCK LOCATIONS - 1  
 ROCK CHECK DAMS - 4  
 CONCRETE WASHOUT - 1  
 EROSION CONTROL BLANKET - 884 SY  
 TEMPORARY SEDIMENT BASIN - 1

OVERALL LOT COVERAGE	
AREA OF TRACT	336,719
AREA OF BUILDING (EXISTING TREATMENT FACILITY)	3,727±
AREA OF BUILDING (PROPOSED ADMIN. BLDG.)	4,542
% TRACT COVERAGE WITH IMPROVEMENTS (INCLUDING PROPOSED ADMIN. BLDG.)	15%
TOTAL IMPERVIOUS AREA (PROPOSED IMPROVEMENTS)	36,376

**GENERAL GRASS SEEDING NOTES:**

- AN ESTABLISHED STAND OF GRASS IN THIS COLORADO CLIMATE IS DEFINED AS 2 TO 3 PLANTS IN A SQUARE FOOT AREA.
- GRASSES MUST BE PLANTED IN A FIRM, WEED-FREE SEEDBED, PRIMARILY BECAUSE SUCCESS DEPENDS UPON GOOD SOIL-TO-SEED CONTACT. IF YOU ARE BROADCASTING SEED, IT MUST BE RAKED INTO THE SOIL. NATIVE GRASS SEED IS PLANTED ONLY 1/4 TO 1/2 INCHES DEEP. LOOSE SOIL DRIES OUT QUICKLY AT THE SURFACE COMPARED TO FIRM SOIL.
- MOST GRASSES SHOULD BE PLANTED WITH A GRASS DRILL, BUT BROADCASTING CAN ALSO BE USED. A DOUBLE DISC DRILL WITH AN AGITATOR IS RECOMMENDED FOR SEEDING. IF USING A GRASS DRILL, THE AMOUNT OF SEED NEEDED WILL BE CUT IN HALF SINCE THE METHOD OF PLANTING IS MORE EFFICIENT.
- IN MOST CASES, A GRASS SEEDLING NEEDS NO FERTILIZER DURING ESTABLISHMENT. HOWEVER, ON DISTURBED SITES, SUCH AS AREAS AROUND A NEW HOUSE, WATER LINES, TRENCHING, ETC., SOIL AMENDMENTS MAY BE REQUIRED TO MAINTAIN THE VIGOR OF THE GRASSES.
- RECOMMENDED SEEDING DATES FOR COLORADO ARE NOVEMBER 1 TO MAY 1, WHEN THE SOIL IS NOT FROZEN. GRASSES SHOULD BE SEEDED WHEN SOIL MOISTURE AND TEMPERATURE ARE OPTIMUM FOR GERMINATION. GRASSES ARE DESIGNATED EITHER 'COOL' OR 'WARM' SEASON BASED ON THEIR GROWTH CYCLE. COOL-SEASON GRASSES CAN BE PLANTED WHEN TEMPERATURES ARE COOLER AND DAY LENGTHS ARE SHORT. WARM-SEASON GRASSES NEED WARMER TEMPERATURES AND LONGER DAY LENGTHS TO GROW.
- A PROPER SEEDBED IS FIRM AND FREE OF COMPETING VEGETATION. CORRECT FIRMNESS IS WHEN AN ADULT FOOTPRINT IS ONLY SLIGHTLY VISIBLE ON THE PREPARED BED PRIOR TO THE SEEDING OPERATION. THE SEEDBED CAN BE FIRMED, IF NEEDED, BY PULLING A COMMERCIAL OR HOMEMADE PACKER OR ROLLER. A FIRM SEEDBED IS ESSENTIAL FOR PROPER SEEDING DEPTH. A LOOSE, FLUFFY BED WILL PLACE SEEDS TOO DEEP FOR PROPER GERMINATION.
- SEEDING NATIVE GRASSES IN A SUITABLE COVER CROP IS RECOMMENDED. A SUITABLE COVER CROP DECREASES EVAPORATION TO RETAIN SOIL MOISTURE, AND KEEPS SOIL TEMPERATURES LOWER BECAUSE OF SHADING. IT PROTECTS YOUNG GRASS SEEDLINGS FROM STRONG WINDS, COLLECTS SNOW DURING WINTER, AND MINIMIZES THE WEED PROBLEM. THE COVER CROP SHOULD BE PLANTED IN THE SPRING MAY 15 THROUGH JULY 15 BUT PREFERABLY BEFORE JUNE 15. GRASS IS SEEDED DIRECTLY INTO THE STANDING STUBBLE IN THE FALL. IF YOU ARE HAYING THE COVER CROP, LEAVE 18 INCHES ON SANDY SOIL AND 12 INCHES ON LOAMY OR HEAVIER SOILS. RECOMMENDED COVER CROPS ARE STERILE FORAGE SORGHUM, LONG-SEASON MILO, MILLET, OATS, SUDAN GRASS, ETC.
- MOST GROWERS OF NATIVE GRASSES ARE CONVINCED THEY HAVE A FAILURE THE FIRST YEAR. MOST OF THE TIME THEY ACTUALLY HAVE A GOOD STAND. NATIVE GRASSES GROW DOWN, NOT UP, DURING THE ESTABLISHMENT YEAR. THE TOP GROWTH NORMALLY AMOUNTS TO A NARROW, STRAIGHT LEAF UNTIL LATE SUMMER. THESE SEEDLINGS CAN BE HARD TO SEE, EVEN FOR THE EXPERIENCED GROWER. BE PATIENT. DO NOT GRAZE FOR AT LEAST 2 TO 3 GROWING SEASONS AND AFTER THE GRASS IS ESTABLISHED.

**MINIMUM BEST MANAGEMENT PRACTICES ELEMENTS:**

- STEP 1- EROSION AND SEDIMENT CONTROL  
 INSTALL SEDIMENT TRAPPING DEVICES (PERIMETER CONTROLS) PRIOR TO THE START OF CONSTRUCTION.
- STEP 2- SPILL PREVENTION AND RESPONSE
- STEP 3- MATERIAL MANAGEMENT  
 MATERIAL AND EQUIPMENT STORAGE AREAS SHALL BE SECURE AND CONTAINED TO PREVENT DISCHARGE OF ANY MATERIAL IN RUNOFF. WASTE SHALL BE CONTAINED AND DISPOSED OF PROPERLY. MAINTAIN BMP'S DURING BUILDING AND UTILITY CONSTRUCTION.
- STEP 4- INSPECTION AND MAINTENANCE (SEE EROSION CONTROL NOTES)
- STEP 5- INSTALL FINAL STABILIZATION - PAVEMENT, LANDSCAPING, EROSION CONTROL BLANKETS, AND SEEDING.
- STEP 6- REMOVE TEMPORARY CONTROLS - SILT FENCING, CURB SOCK AFTER PERMANENT FEATURES ARE INSTALLED.

**FINAL STABILIZATION AND LONG-TERM STORMWATER MANAGEMENT:**

FINAL STABILIZATION MEASURES INCLUDE PAVEMENT, PARTIAL LANDSCAPE, AND REVEGETATION.

ALL AREAS DISTURBED BY EARTHWORK SHALL BE PERMANENTLY REVEGETATED WITH GRASS MIX BY DRILL SEEDING. SEED MIX FOR THIS PROJECT SHALL BE AS FOLLOWS (SEE BELOW):

TYPE: SHOTGUN MIX	RECOMMENDED VARIETY	% OF SEED MIX	PLS RATE PER ACRE, DOUBLE IF BROADCAST
BLUESTEM, BIG	KAW, BISON, CHAMP	20.0%	1.08
GRAMA, BLUE	LOVINGTON, HACHITA, ALMA	10.0%	0.12
GREEN NEEDLEGRASS	LODORM	10.0%	0.48
WHEATGRASS, WESTERN	ARRIBA, BARTON	20.0%	1.60
GRAMA, SIDEOATS	VAUGHN, BUTTE, EL RENO, NINER	10.0%	0.46
SWITCHGRASS	BLACKWELL, GREENVILLE	10.0%	0.20
PRAIRIE SANDREED	GOSHEN, PRONGHORN	10.0%	0.32
YELLOW INDIANGRASS	CHEYENNE, HOLT, LLANO	10.0%	0.51



COLORADO CENTRE METROPOLITAN DISTRICT  
 ADMINISTRATIVE BUILDING - SITE DEVELOPMENT PLAN  
 GRADING & EROSION CONTROL NOTES

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Project No.: 247.07  
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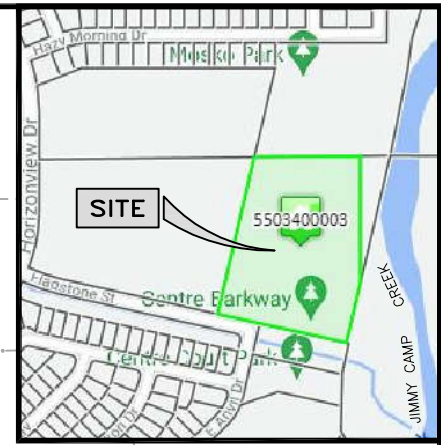
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 SHEET 1 OF 15

**PCD File No. PPR-21-51**

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ADJACENT PROPERTY  
SCHEDULE: 5503400001  
OWNER: BLH NO 2 LLC  
AREA: 427,324 SF (9.81 AC)  
LOCATION: HORIZONVIEW DR  
ZONING: R1-6/CR AO  
LAND USE: VACANT LAND

ADJACENT PROPERTY  
SCHEDULE: 550000189  
OWNER: BLH NO 2 LLC  
AREA: 3,787,542 SF (86.95 AC)  
LOCATION: S MARKSHEFFEL RD  
ZONING: R1-6/CR  
PBC/CR AO AP  
LAND USE: VACANT LAND



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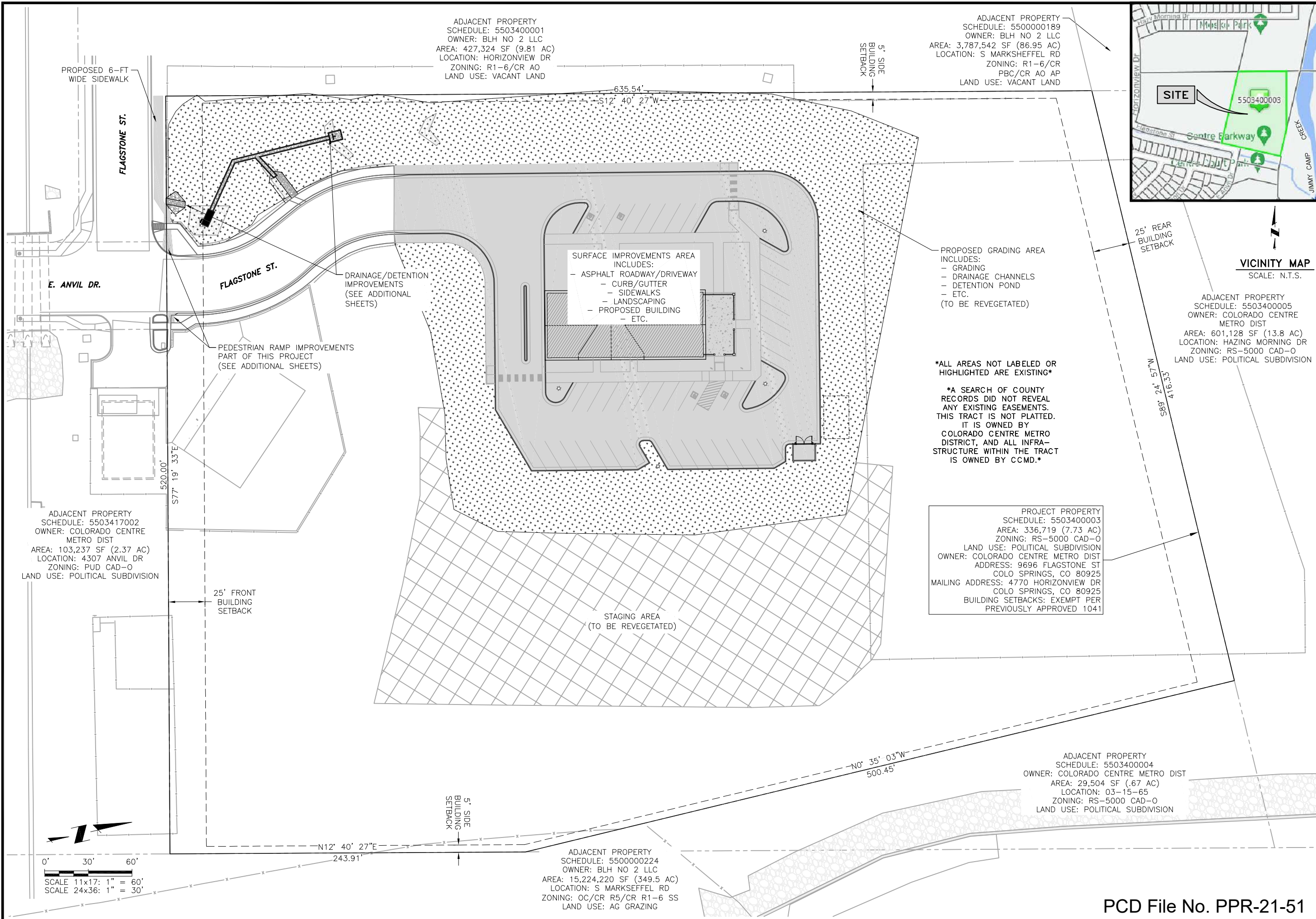
**COLORADO CENTRE METROPOLITAN DISTRICT**  
**ADMINISTRATIVE BUILDING - SITE DEVELOPMENT PLAN**  
**ADJACENT PROPERTY OWNERSHIP & PROPOSED IMPROVEMENTS EXHIBIT**

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SHEET 2 OF 15



**SURFACE IMPROVEMENTS AREA INCLUDES:**  
- ASPHALT ROADWAY/DRIVEWAY  
- CURB/GUTTER  
- SIDEWALKS  
- LANDSCAPING  
- PROPOSED BUILDING  
- ETC.

**PROPOSED GRADING AREA INCLUDES:**  
- GRADING  
- DRAINAGE CHANNELS  
- DETENTION POND  
- ETC.  
(TO BE REVEGETATED)

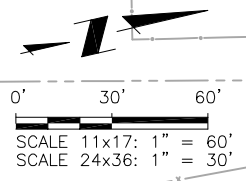
**\*ALL AREAS NOT LABELED OR HIGHLIGHTED ARE EXISTING\***

**\*A SEARCH OF COUNTY RECORDS DID NOT REVEAL ANY EXISTING EASEMENTS. THIS TRACT IS NOT PLATTED. IT IS OWNED BY COLORADO CENTRE METRO DISTRICT, AND ALL INFRA-STRUCTURE WITHIN THE TRACT IS OWNED BY CCMD.\***

**PROJECT PROPERTY**  
SCHEDULE: 5503400003  
AREA: 336,719 (7.73 AC)  
ZONING: RS-5000 CAD-0  
LAND USE: POLITICAL SUBDIVISION  
OWNER: COLORADO CENTRE METRO DIST  
ADDRESS: 9696 FLAGSTONE ST  
COLO SPRINGS, CO 80925  
MAILING ADDRESS: 4770 HORIZONVIEW DR  
COLO SPRINGS, CO 80925  
BUILDING SETBACKS: EXEMPT PER PREVIOUSLY APPROVED 1041

ADJACENT PROPERTY  
SCHEDULE: 550000224  
OWNER: BLH NO 2 LLC  
AREA: 15,224,220 SF (349.5 AC)  
LOCATION: S MARKSHEFFEL RD  
ZONING: OC/CR R5/CR R1-6 SS  
LAND USE: AG GRAZING

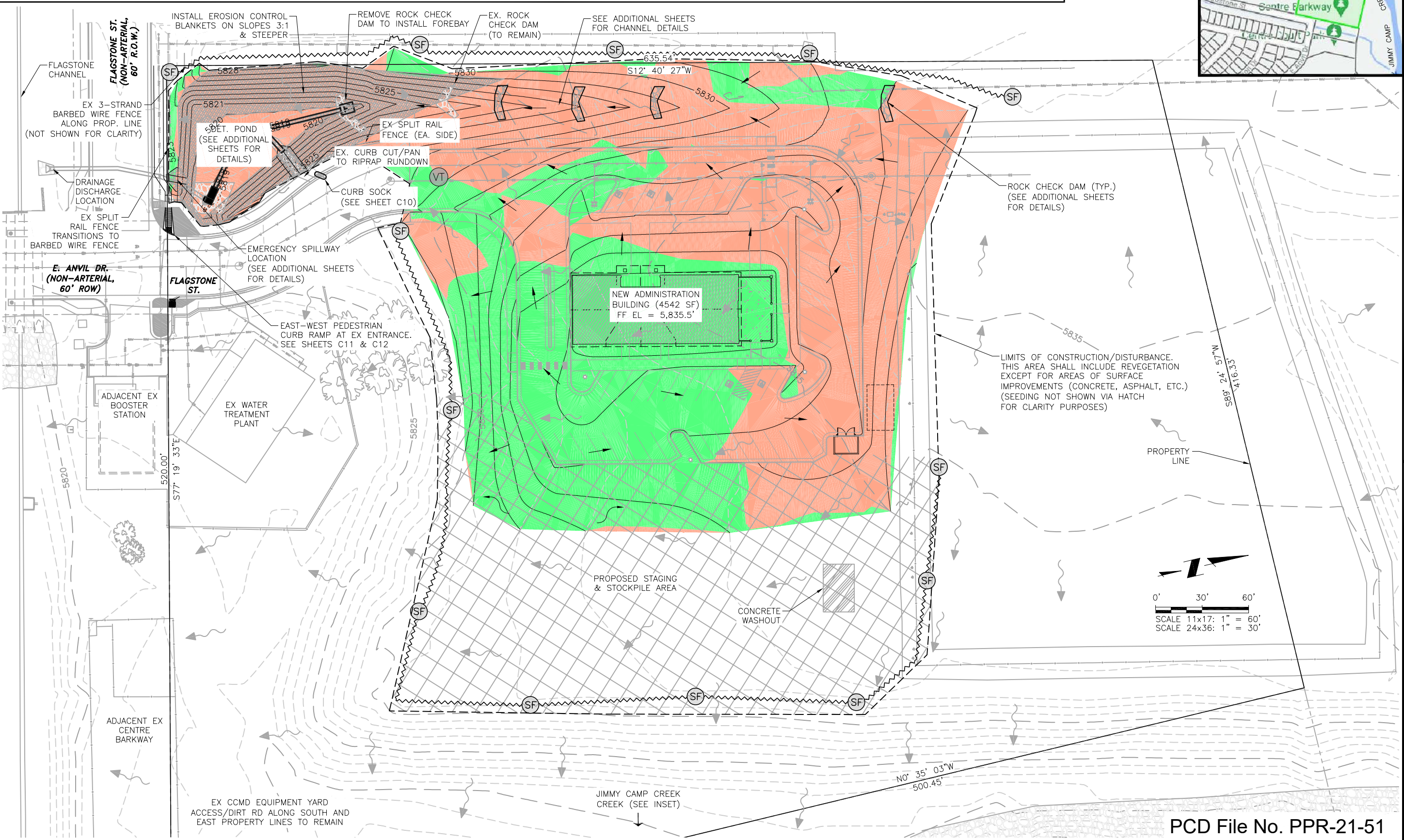
ADJACENT PROPERTY  
SCHEDULE: 5503400004  
OWNER: COLORADO CENTRE METRO DIST  
AREA: 29,504 SF (.67 AC)  
LOCATION: 03-15-65  
ZONING: RS-5000 CAD-0  
LAND USE: POLITICAL SUBDIVISION



PCD File No. PPR-21-51

**LEGEND**

	EX PROPERTY LINE		EX FIRE HYDRANT		STAGING AREA (INITIAL/INTERIM)
	EX RIGHT-OF-WAY		EX WATER LINE		CONCRETE WASHOUT (INITIAL/INTERIM)
	EX BARBED WIRE FENCE		EX SANITARY SEWER LINE		RIPRAP (FINAL)
	EX SPLIT RAIL FENCE		EX FIRE HYDRANT		AREA OF CUT
	EX CHAIN LINK FENCE		CONTOURS-MAJOR		AREA OF FILL
	EX CONTOURS-MAJOR		CONTOURS-MINOR		PRE-DEVELOPED FLOW DIRECTION
	EX CONTOURS-MINOR		SILT FENCE (INITIAL/INTERIM)		DEVELOPED FLOW DIRECTION
			EX VEGETATION (SIZE VARIES)		
			PARKING LOT ISLAND LIGHT POLE		
			VEHICLE TRACKING PAD (INITIAL/INTERIM)		
			CHECK DAM (FINAL)		
			EROSION CONTROL BLANKET (FINAL)		
			CURB SOCK (INTERIM)		



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**COLORADO CENTRE METROPOLITAN DISTRICT**  
**ADMINISTRATIVE BUILDING - SITE DEVELOPMENT PLAN**  
**GRADING & EROSION CONTROL PLAN**

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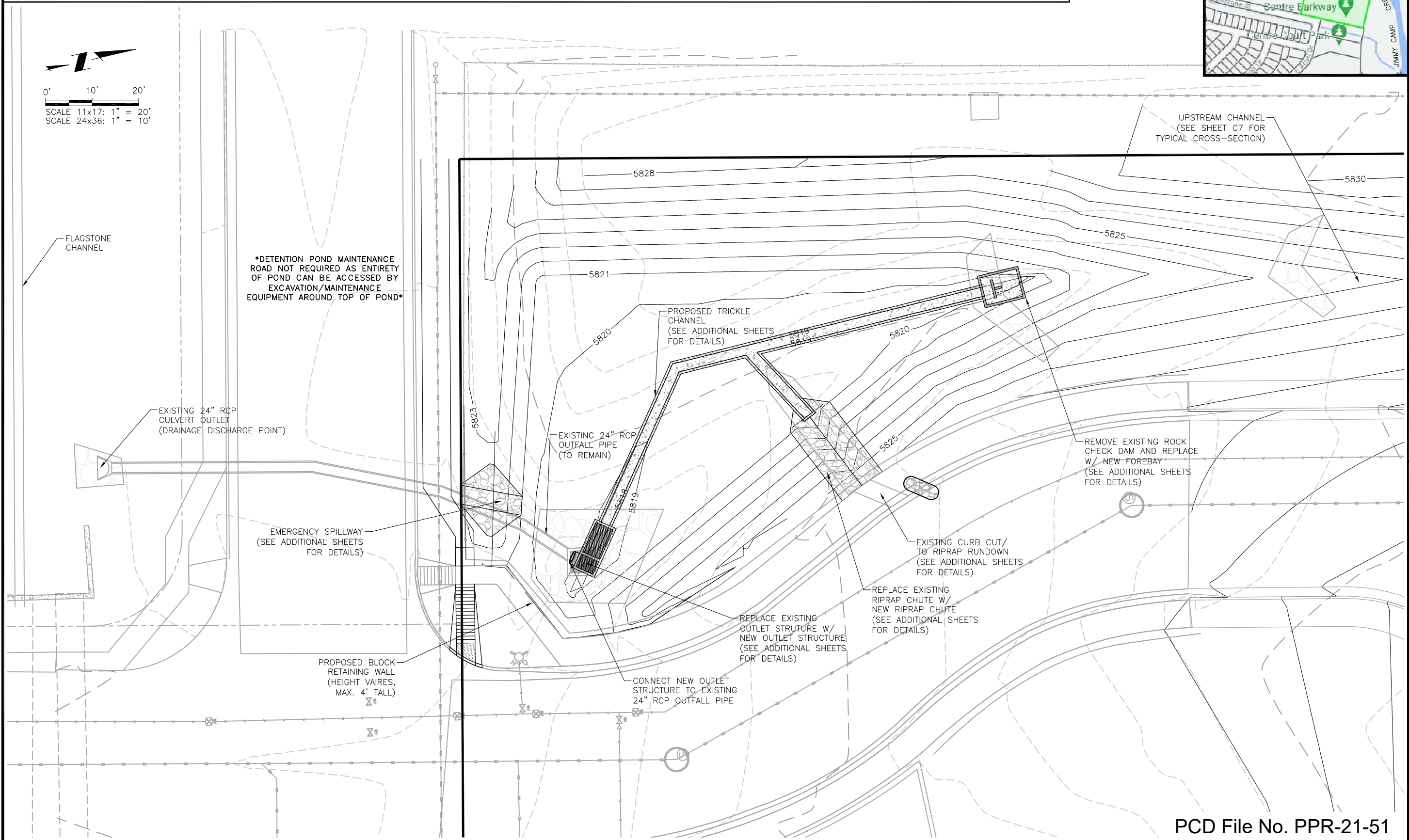
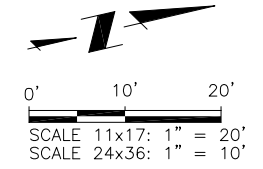
# LEGEND

	EX PROPERTY LINE		EX FIRE HYDRANT		STAGING AREA (INITIAL/INTERIM)
	EX RIGHT-OF-WAY		EX WATER LINE		CONCRETE WASHOUT (INITIAL/INTERIM)
	EX BARBED WIRE FENCE		EX SANITARY SEWER LINE		RIPRAP (FINAL)
	EX SPLIT RAIL FENCE		EX FIRE HYDRANT		AREA OF CUT
	EX CHAIN LINK FENCE		CONTOURS-MAJOR		AREA OF FILL
	EX CONTOURS-MAJOR		CONTOURS-MINOR		PRE-DEVELOPED FLOW DIRECTION
	EX CONTOURS-MINOR		SILT FENCE (INITIAL/INTERIM)		DEVELOPED FLOW DIRECTION
			EX VEGETATION (SIZE VARIES)		
			PARKING LOT ISLAND LIGHT POLE		
			VEHICLE TRACKING PAD (INITIAL/INTERIM)		
			CHECK DAM (FINAL)		
			EROSION CONTROL BLANKET (FINAL)		
			CURB SOCK (INTERIM)		



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**COLORADO CENTRE METROPOLITAN DISTRICT**  
**ADMINISTRATIVE BUILDING - SITE DEVELOPMENT PLAN**  
**DETENTION POND PLAN**

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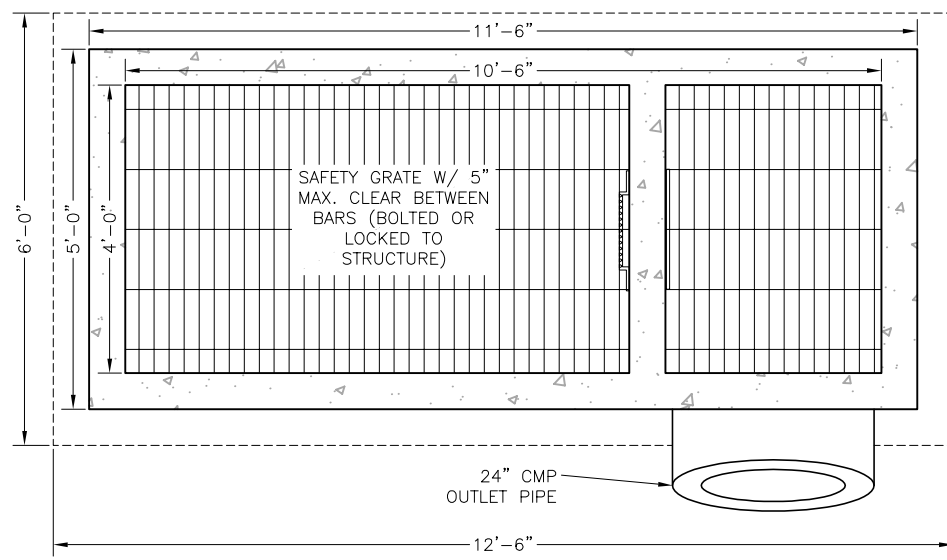
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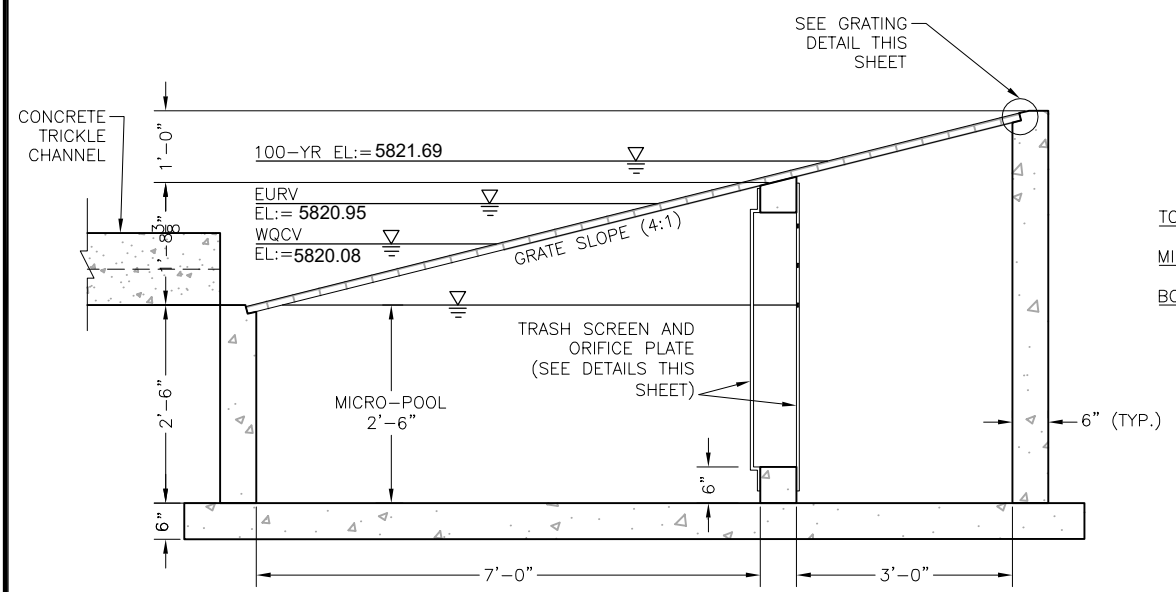
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**OUTLET STRUCTURE - TOP VIEW**  
 11x17 SCALE: 3/8"=1'-0"  
 24x36 SCALE: 3/4"=1'-0"



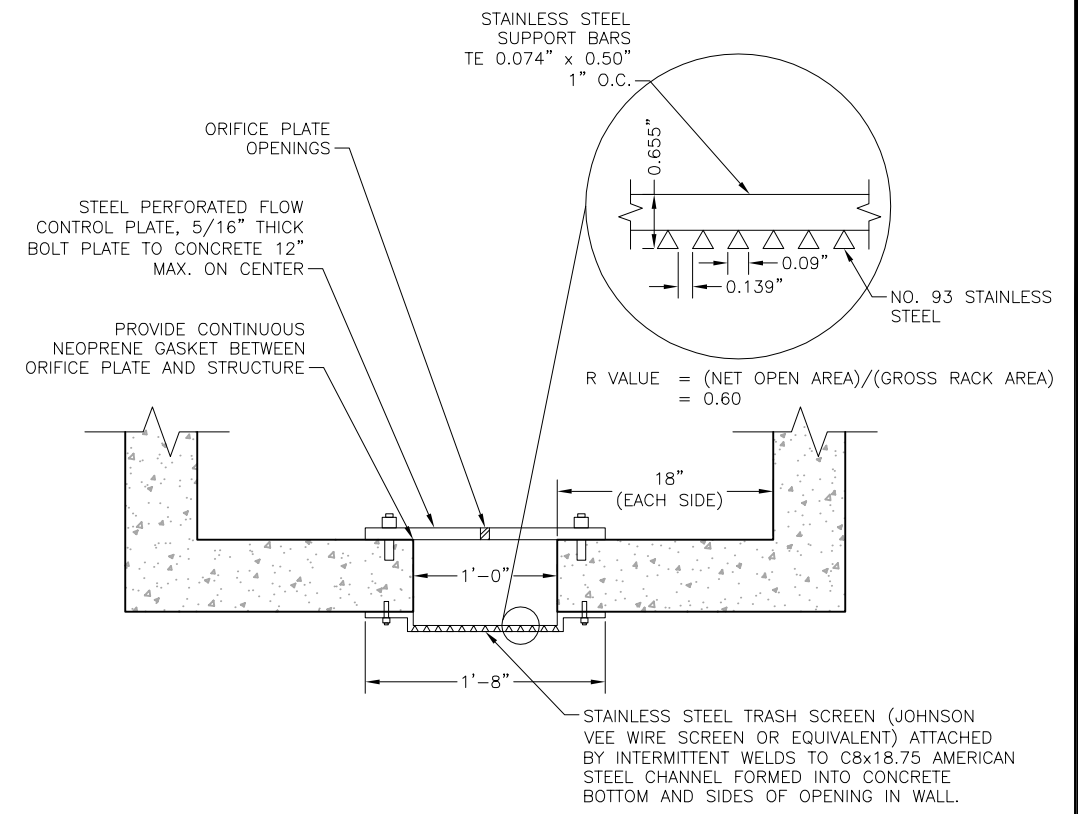
**OUTLET STRUCTURE - SECTION A**  
 11x17 SCALE: 3/8"=1'-0"  
 24x36 SCALE: 3/4"=1'-0"

**EURV AND WQCV TRASH RACK NOTES:**

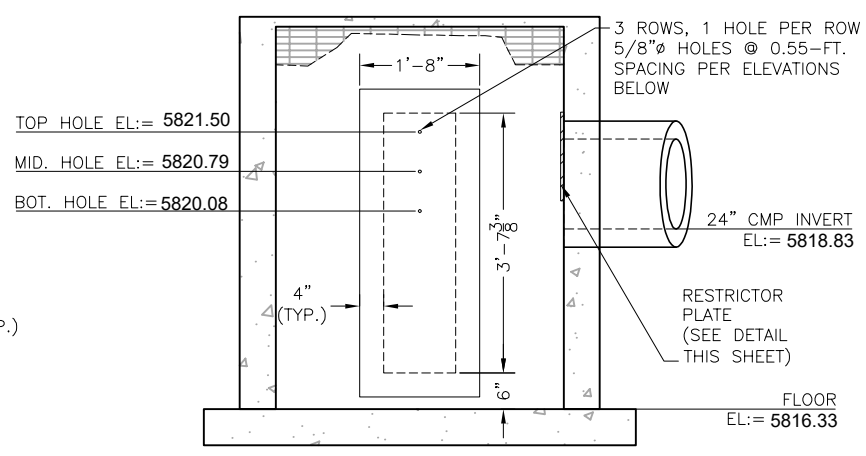
1. WELL-SCREEN TRASH RACKS SHALL BE STAINLESS STEEL AND SHALL BE ATTACHED BY INTERMITTENT WELDS ALONG THE EDGE OF THE MOUNTING FRAME.
2. BAR GATE TRASH RACKS SHALL BE ALUMINUM AND SHALL BE BOLTED USING STAINLESS STEEL HARDWARE.
3. TRASH RACK OPEN AREAS ARE FOR SPECIFIED TRASH RACK MATERIALS. TOTAL TRASH RACK SIZE MAY NEED TO BE ADJUSTED FOR MATERIALS HAVING DIFFERENT OPEN AREA/GROSS AREA RATIO (R VALUE).
4. STRUCTURAL DESIGN OF TRASH RACKS SHALL BE BASED ON FULL HYDROSTATIC HEAD WITH ZERO HEAD DOWNSTREAM OF THE RACK.

**OVERFLOW SAFETY GRATE NOTES:**

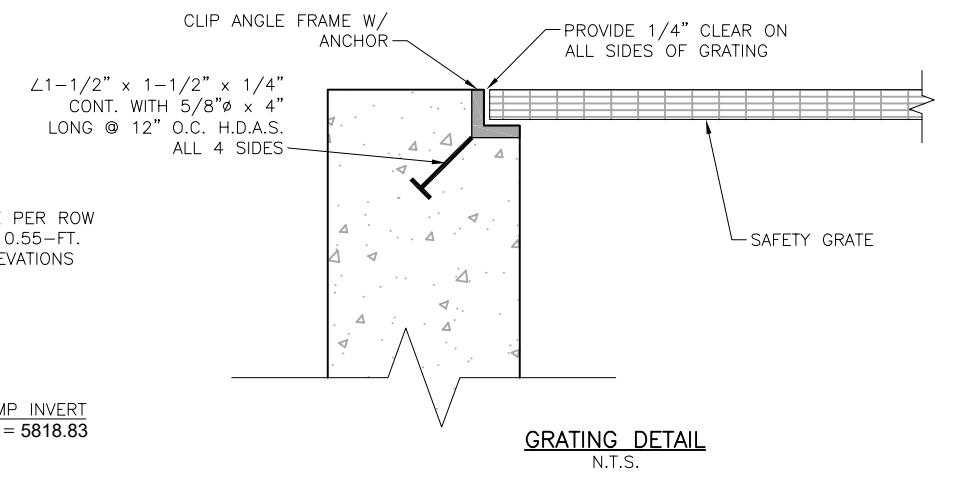
1. ALL SAFETY GRATES SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH HINGED AND LOCKABLE OR BOLTABLE ACCESS PANELS.
2. SAFETY GRATES SHALL BE STAINLESS STEEL, ALUMINUM, OR STEEL. STEEL GRATES SHALL BE HOT DIP GALVANIZED AND MAY BE HOT POWDER COATED AFTER GALVANIZING.
3. SAFETY GRATES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



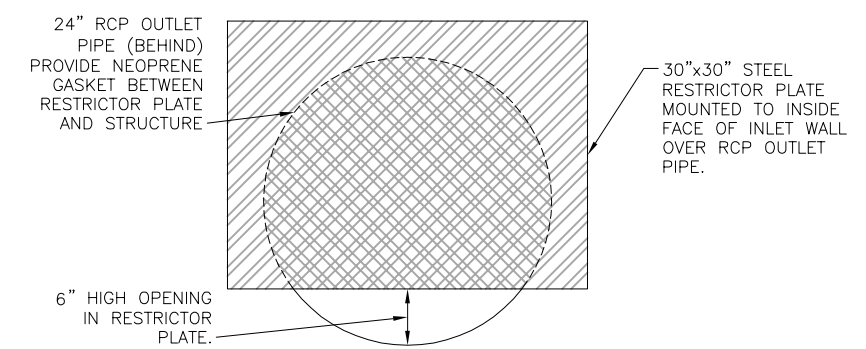
**TRASH SCREEN & ORIFICE PLATE PLAN VIEW**  
 N.T.S.



**OUTLET STRUCTURE - SECTION B**  
 11x17 SCALE: 3/8"=1'-0"  
 24x36 SCALE: 3/4"=1'-0"



**GRATING DETAIL**  
 N.T.S.



**RESTRICTOR PLATE DETAIL**  
 N.T.S.

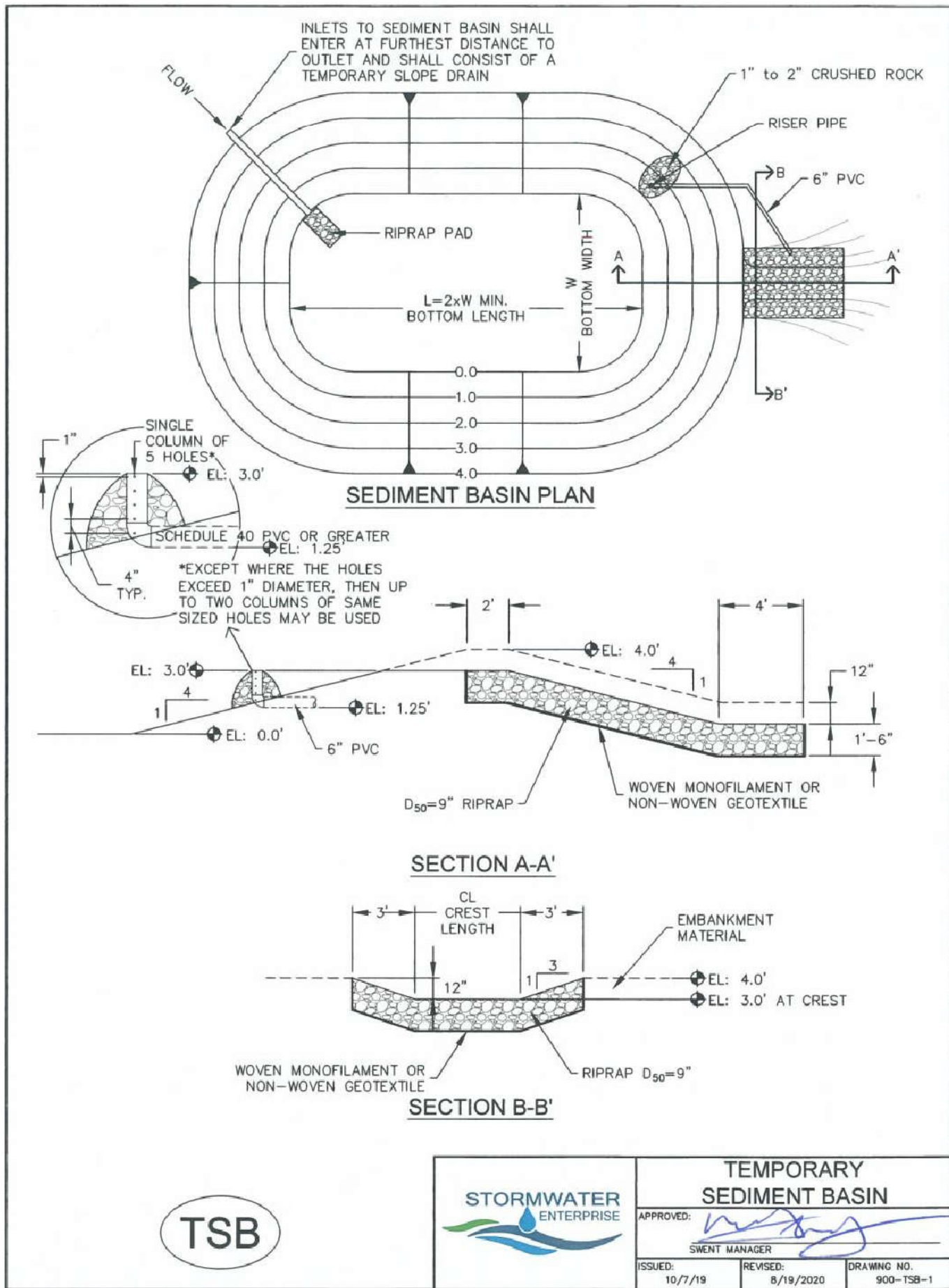
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TSB

**STORMWATER ENTERPRISE**

**TEMPORARY SEDIMENT BASIN**

APPROVED: *[Signature]*

SWENT MANAGER

ISSUED: 10/7/19

REVISED: 8/19/2020

DRAWING NO. 900-TSB-1

TSB

**STORMWATER ENTERPRISE**

**TEMPORARY SEDIMENT BASIN**

APPROVED: *[Signature]*

SWENT MANAGER

ISSUED: 10/7/19

REVISED: 8/19/2020

DRAWING NO. 900-TSB-2

**TABLE SB-1, SIZING INFORMATION FOR STANDARD SEDIMENT BASIN**

UPSTREAM DRAINAGE AREA (ROUNDED TO NEAREST ACRE), (AC)	BASIN BOTTOM WIDTH (W), (FT)	SPILLWAY CREST LENGTH (CL), (FT)	HOLE DIAMETER (HD), (IN)
1	12½"	2	9/32
2	21	3	13/16
3	28	5	½
4	33½	6	9/16
5	38½	8	21/32
6	43	9	21/32
7	47¼	11	25/32
8	51	12	27/32
9	55	13	7/8
10	58¼	15	15/16
11	61	16	31/32
12	64	18	1
13	67½	19	1 1/16
14	70½	21	1 1/8
15	73¼	22	1 1/4

**INSTALLATION NOTES**

- FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.
- EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES, AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE No. 200 SIEVE
- EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D-698.
- PIPE SCHEDULE 40 OR GREATER SHALL BE USED.
- THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES. DESIGN CALCULATIONS MUST BE APPROVED PRIOR TO IMPLEMENTATION.

**MAINTENANCE NOTES**

- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- SEDIMENT ACCUMULATED IN BASIN SHALL BE REMOVED AS NEEDED TO MAINTAIN CONTROL MEASURE EFFECTIVENESS, TYPICALLY WHEN SEDIMENT DEPTH REACHES ONE FOOT (I.E. TWO FEET BELOW SPILLWAY CREST).
- SEDIMENT BASINS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS PERMANENTLY STABILIZED.
- PERMANENTLY STABILIZE AREA AFTER SEDIMENT BASIN REMOVAL.

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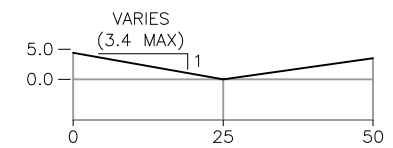
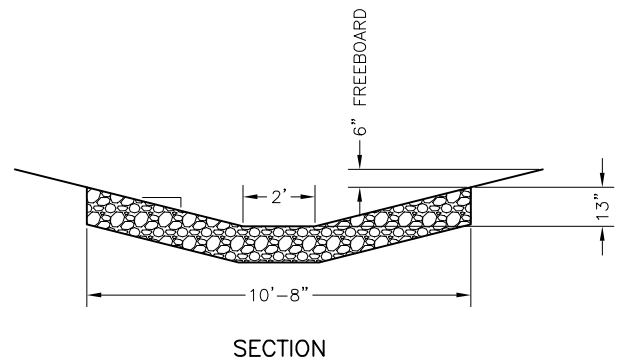
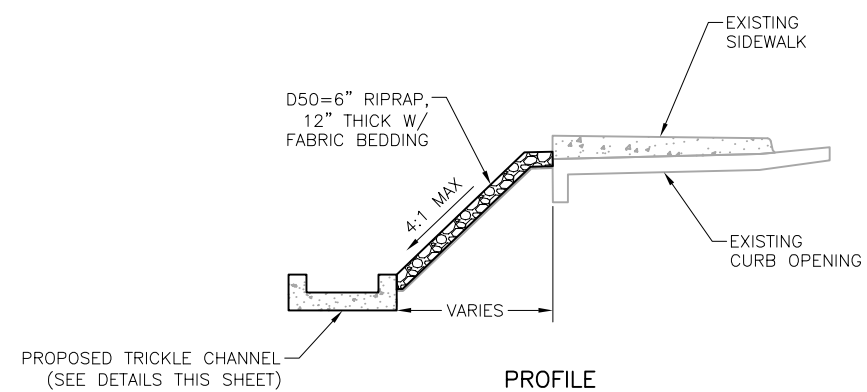
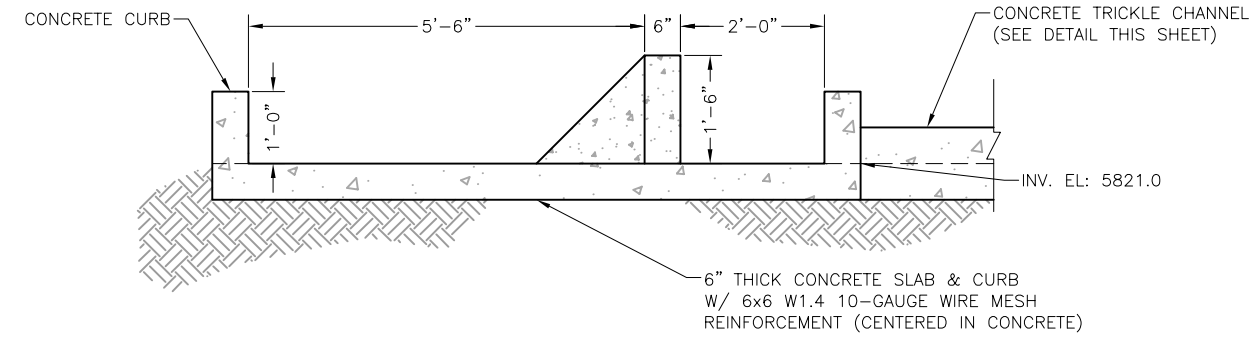
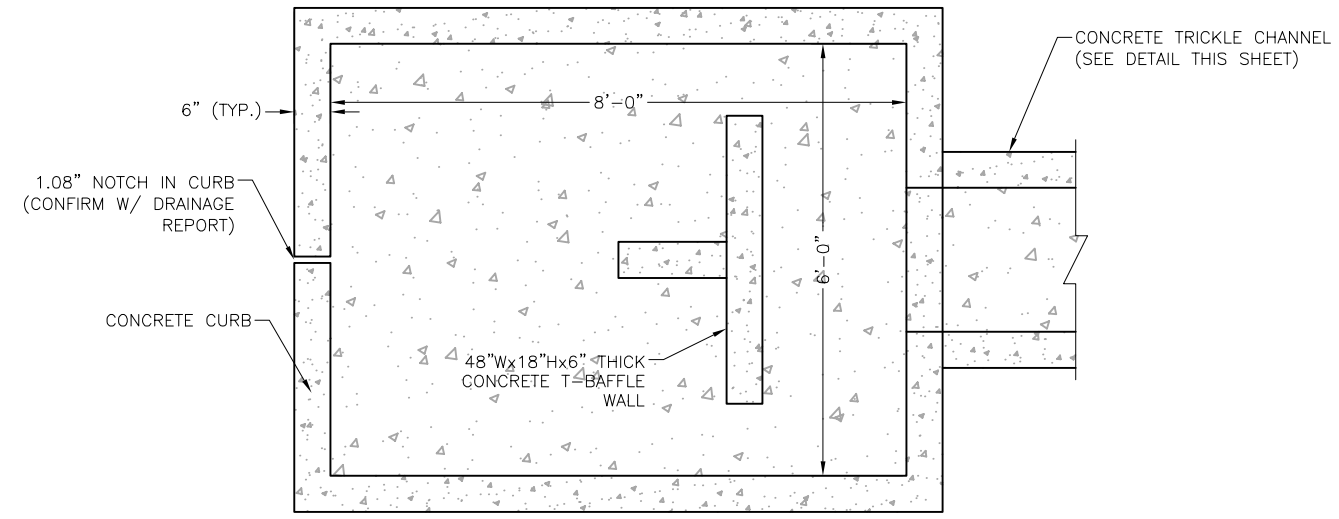
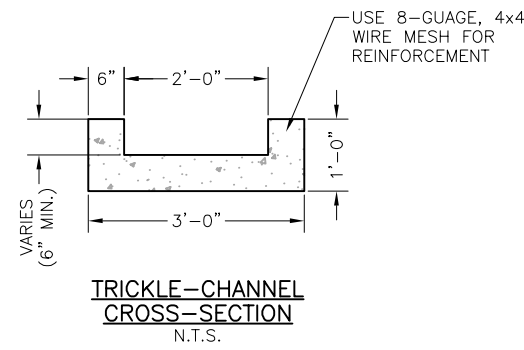
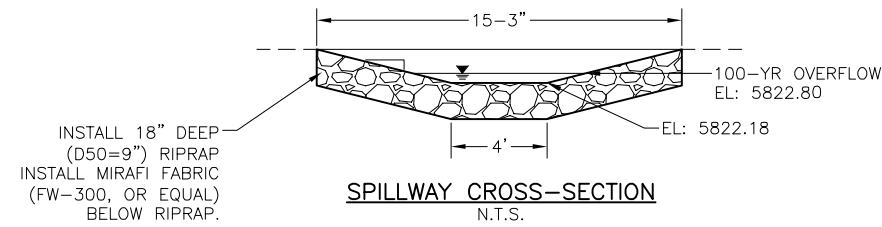
**COLORADO CENTRE METROPOLITAN DISTRICT**  
 ADMINISTRATIVE BUILDING - SITE DEVELOPMENT PLAN  
 TEMPORARY SEDIMENTATION BASIN DETAILS

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**COLORADO CENTRE METROPOLITAN DISTRICT**  
**ADMINISTRATIVE BUILDING - SITE DEVELOPMENT PLAN**  
**DRAINAGE DETAILS**

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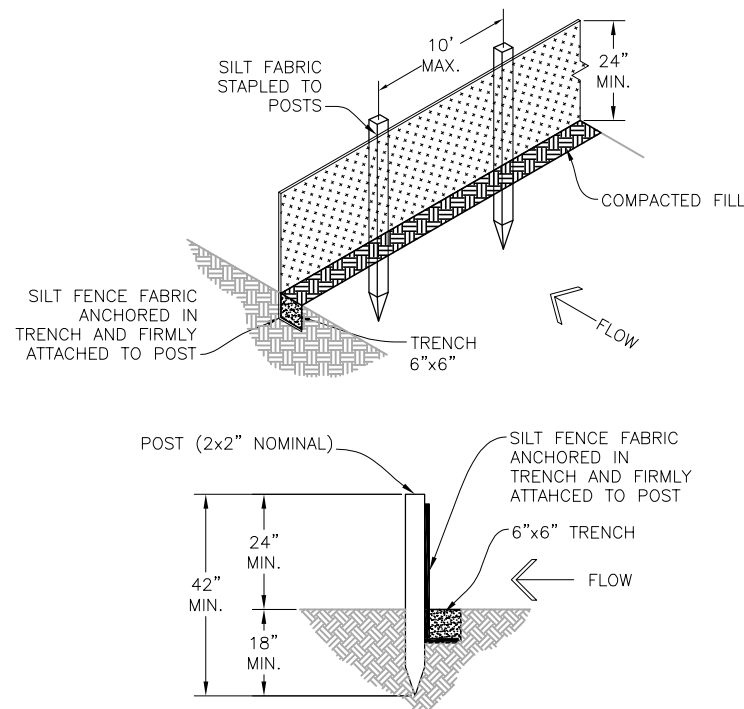
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**SILT FENCE DETAIL**

**INSTALLATION REQUIREMENTS:**

- SILT FENCES SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
- WHEN JOINTS ARE NECESSARY, SILT FENCE GEOTEXTILE SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POST AND SECURELY SEALED.
- METAL POSTS SHALL BE "STUDDED TEE" OR "U" TYPE WITH MINIMUM WEIGHT OF 1.33 POUNDS PER LINEAR FOOT. WOOD POSTS SHALL HAVE A MINIMUM DIAMETER OR CROSS SECTION DIMENSION OF 2 INCHES.
- THE FILTER MATERIAL SHALL BE FASTENED SECURELY TO METAL POSTS USING WIRE TIES, OR TO WOOD POSTS WITH 3/4" LONG #9 HEAVY-DUTY STAPLES. THE SILT FENCE GEOTEXTILE SHALL NOT BE STAPLED TO EXISTING TREES.
- WHILE NOT REQUIRED, WIRE MESH FENCE MAY BE USED TO SUPPORT THE GEOTEXTILE. WIRE FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 3/4" LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 6 INCHES AND SHALL NOT EXTEND MORE THAN 3 FEET ABOVE THE ORIGINAL GROUND SURFACE.

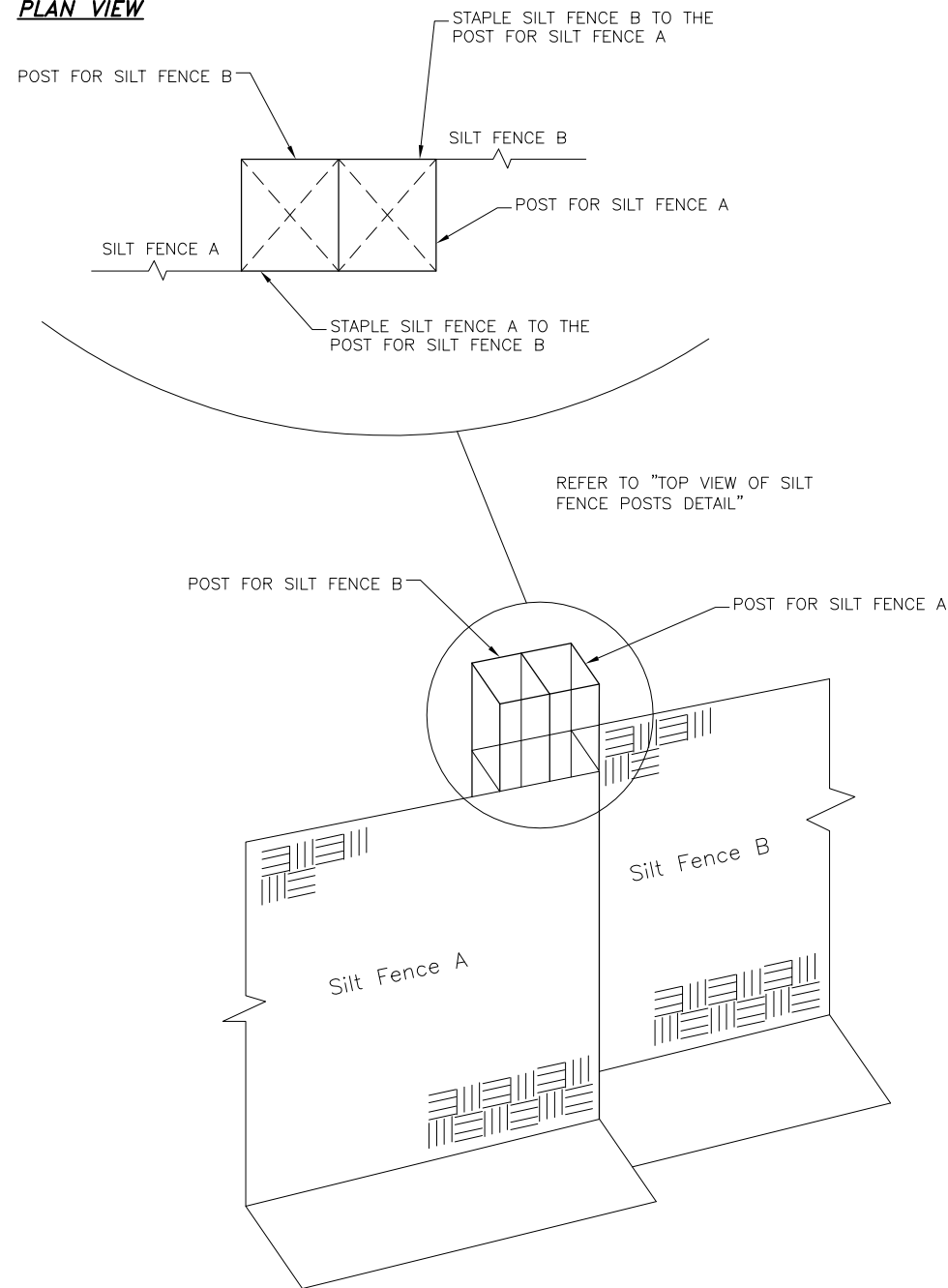
- ALONG THE TOE OF FILLS, INSTALL THE SILT FENCE ALONG A LEVEL CONTOUR AND PROVIDE AN AREA BEHIND THE FENCE FOR RUNOFF TO POND AND SEDIMENT TO SETTLE. A MINIMUM DISTANCE OF 5 FEET FROM THE TOE OF THE FILL IS RECOMMENDED.
- THE HEIGHT OF THE SILT FENCE FROM THE GROUND SURFACE SHALL BE MINIMUM OF 24 INCHES AND SHALL NOT EXCEED 36 INCHES. HIGHER FENCES MAY IMPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE.

**MAINTENANCE REQUIREMENTS:**

- CONTRACTOR SHALL INSPECT SILT FENCES IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS OF NO RAINFALL. DAMAGED, COLLAPSED, UNENTRENCHED OR INEFFECTIVE SILT FENCES SHALL BE PROMPTLY REPAIRED OR REPLACED.
- SEDIMENT SHALL BE REMOVED FROM BEHIND SILT FENCE WHEN IT ACCUMULATES TO HALF THE EXPOSED GEOTEXTILE HEIGHT.
- SILT FENCES SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED.

**A**  
**C8** **SILT FENCE DETAIL**  
SCALE: N.T.S.

**PLAN VIEW**



**B**  
**C8** **SILT FENCE POSTS DETAIL**  
SCALE: N.T.S.

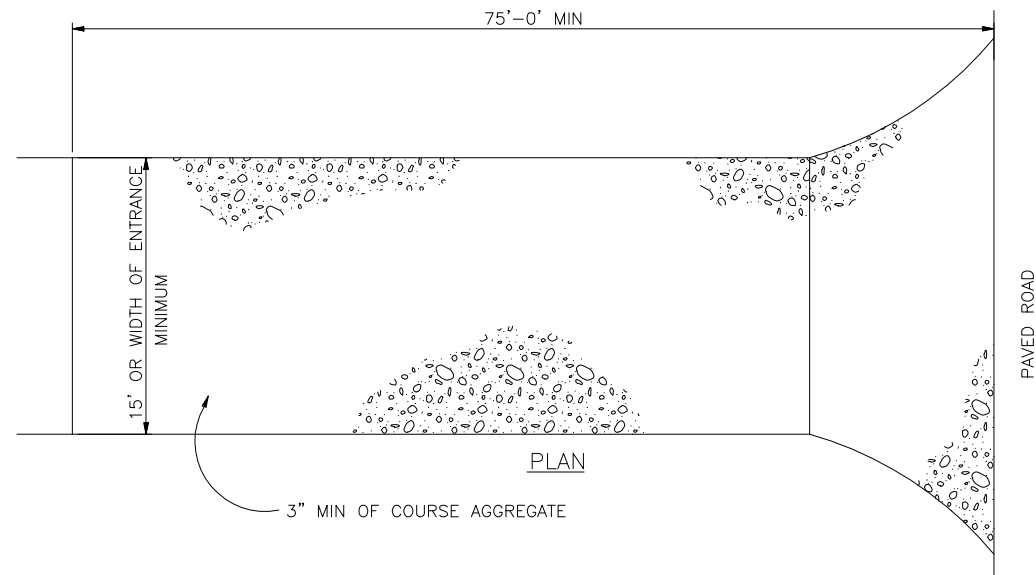
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Date: 01/03/23  
Design: RMM  
Drawn: GGM  
Check: RMM

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**VEHICLE TRACKING PAD DETAIL**

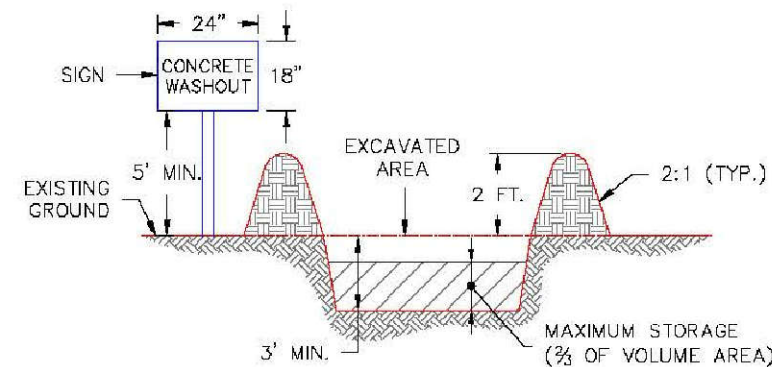
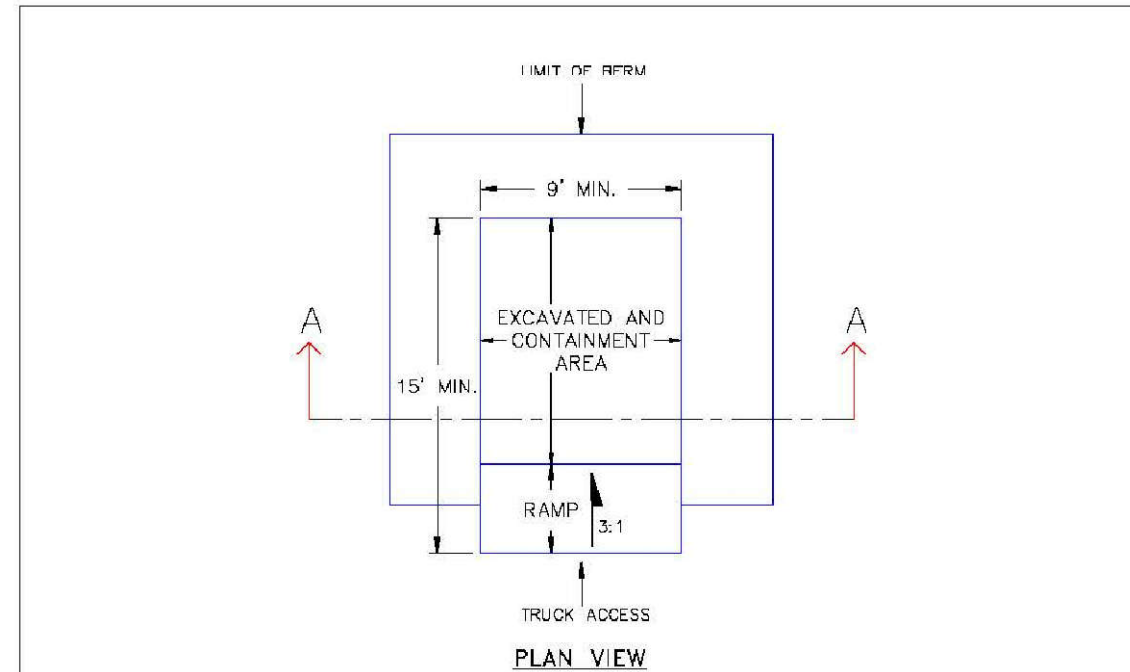
**INSTALLATION REQUIREMENTS:**

1. ALL ENTRANCES TO THE CONSTRUCTION SITE ARE TO BE STABILIZED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. CONSTRUCTION ENTRANCES ARE TO BE BUILT WITH AN APRON TO ALLOW FOR TURNING TRAFFIC, BUT SHOULD NOT BE BUILT OVER EXISTING PAVEMENT EXCEPT FOR A SLIGHT OVERLAP.
3. AREAS TO BE STABILIZED ARE TO BE PROPERLY GRADED AND COMPACTED.
4. CONSTRUCTION ROADS, PARKING AREAS, LOADING/UNLOADING ZONES, STORAGE AREAS, AND STAGING AREAS ARE TO BE STABILIZED.
5. CONSTRUCTION ROADS ARE TO BE BUILT TO CONFORM TO SITE GRADES, BUT SHOULD NOT HAVE SIDE SLOPES OR ROAD GRADES THAT ARE EXCESSIVELY STEEP.

**MAINTENANCE REQUIREMENTS**

1. REGULAR INSPECTIONS ARE TO BE MADE OF ALL STABILIZED AREAS, ESPECIALLY AFTER STORM EVENTS.
2. STONES ARE TO BE REAPPLIED PERIODICALLY AND WHEN REPAIR IS NECESSARY.
3. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED DAILY BY SHOVELING OR SWEEPING. SEDIMENT IS NOT TO BE WASHED DOWN STORM SEWER DRAINS.
4. OTHER ASSOCIATED SEDIMENT CONTROL MEASURES ARE TO BE INSPECTED TO ENSURE GOOD WORKING CONDITION.
5. TO BE REMOVED JUST PRIOR TO FINAL SURFACING AND STABILIZATION.

**A**  
**C9** VEHICLE TRACKING PAD DETAIL  
SCALE: N.T.S.



**SECTION A-A**

**NOTES:**

1. SIGN MATERIAL, EXCAVATION, AND RESTORATION ARE INCLUDED IN THE COST OF THE CONCRETE WASHOUT STRUCTURE.
2. EROSION BALES MAY BE USED AS AN ALTERNATIVE FOR THE BERM.

DATE APPROVED: 1/1/08 John A. McCarty DEPARTMENT OF TRANSPORTATION	Concrete Washout Structure Standard Drawing REVISION DATE: 7/17/07 FILE NAME: SD_3-84	
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**B**  
**C9** CONCRETE WASHOUT STRUCTURE DETAIL  
SCALE: N.T.S.

**JDS-HYDRO** a Division of **RESPEC**  
5540 TECH CENTER DR SUITE 100  
COLORADO SPRINGS, COLORADO 80919  
(719) 227-0072  
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**COLORADO CENTRE METROPOLITAN DISTRICT**  
**ADMINISTRATIVE BUILDING - SITE DEVELOPMENT PLAN**  
**GRADING & EROSION CONTROL DETAILS 2**

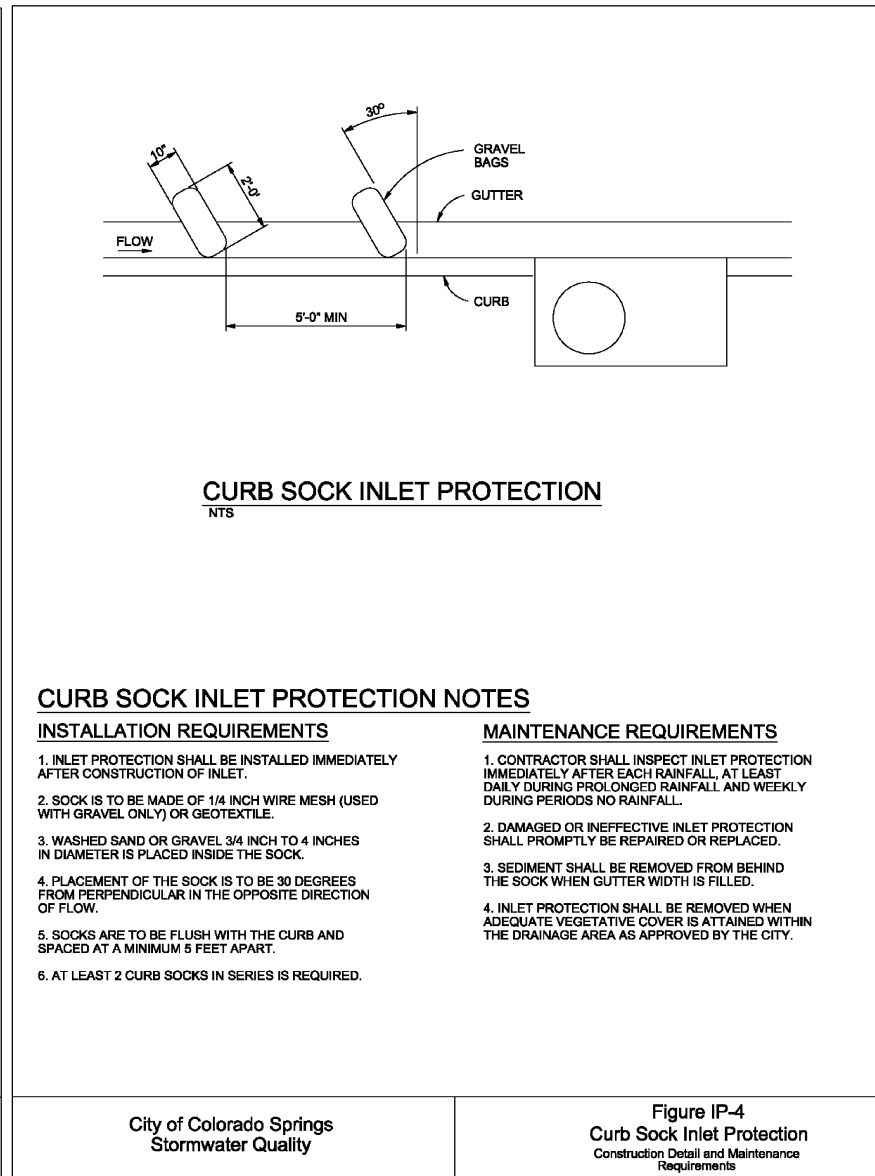
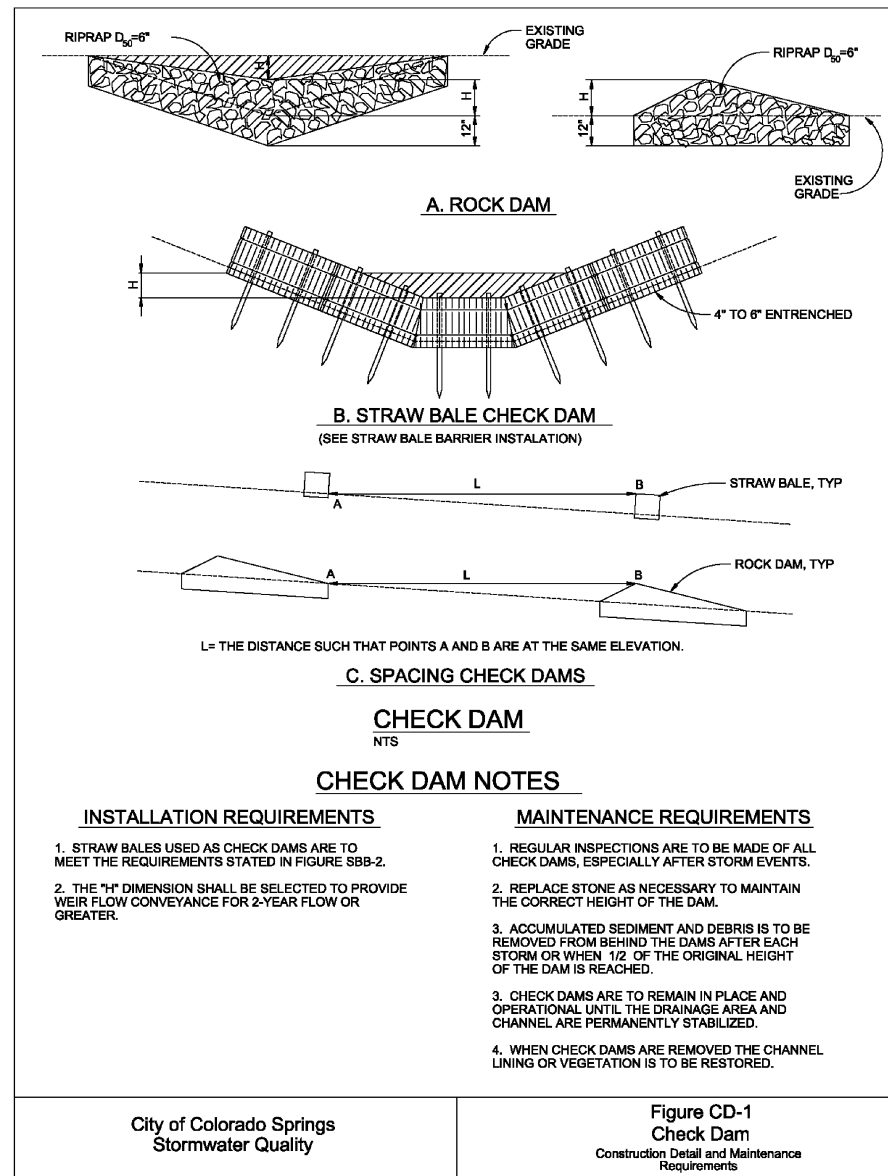
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Date: 01/03/23  
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Drawn: GGM  
Check: RMM

**C9**  
SHEET 9 OF 15

PCD File No. PPR-21-51



**A**  
**C10** CHECK DAM AND CURB SOCK INLET PROTECTION  
SCALE: N.T.S.

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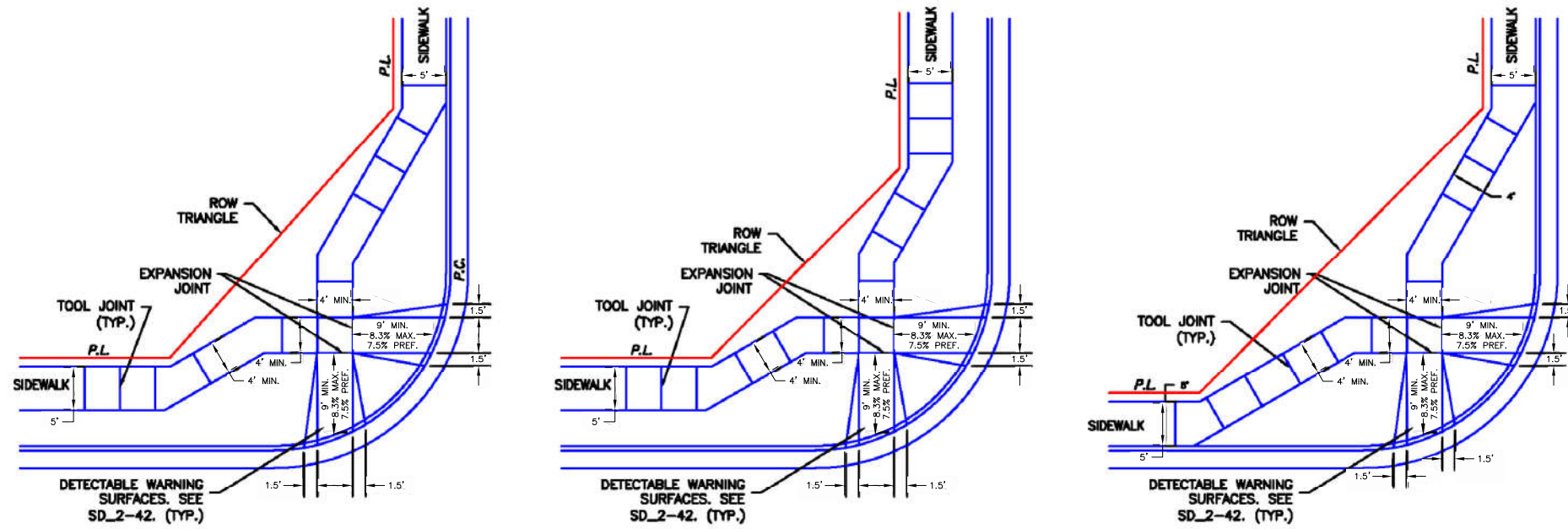
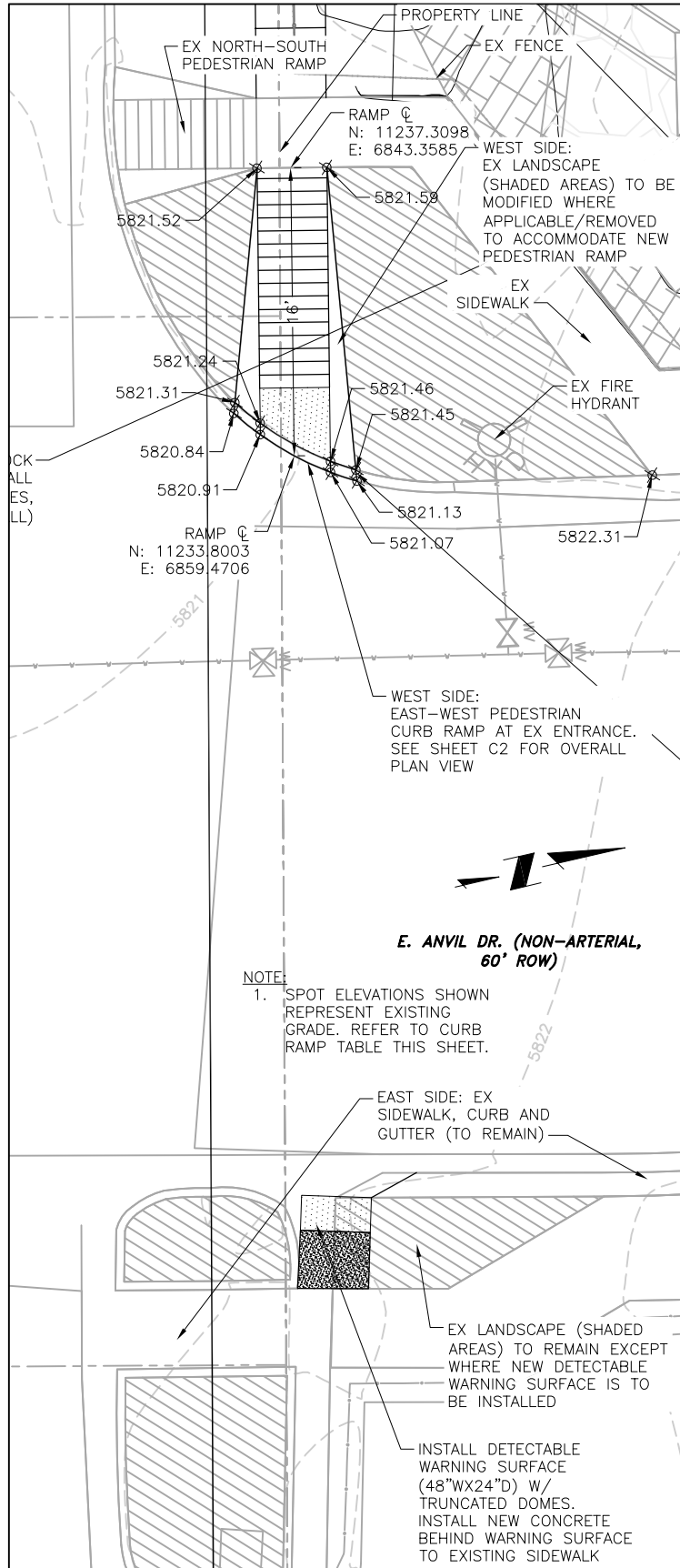
**C10**  
SHEET 10 OF 15

0' 5' 10'  
 SCALE 11x17: 1" = 10'  
 SCALE 24x36: 1" = 5'


- NOTES:  
 1. ALL UTILITIES NOT SHOWN FOR CLARITY. SEE SHEET C3 FOR ADDITIONAL UTILITIES.  
 2. RAMP JOINTS AND GRADE BREAKS SHALL BE FLUSH (1/8"). THE JOINT BETWEEN ROADWAY SURFACE AND GUTTER PAN SHALL BE FLUSH.

**A** PEDESTRIAN CURB RAMP  
**C11** AT E. ANVIL DR.  
 SCALE:

EAST-WEST PEDESTRIAN CURB RAMP	
EXISTING EL	PROPOSED EL
5821.59	
5821.46	5821.04
5821.45	5821.40
5821.13	5821.40
5821.07	
5820.91	
5820.84	5821.24
5821.31	5821.24
5821.24	5821.04
5821.52	



SCALE: NOT TO SCALE

DATE APPROVED: <b>6/23/20</b> Jennifer E. Irvine DEPARTMENT OF PUBLIC WORKS	Pedestrian Curb Ramp Detail Standard Drawing REVISION DATE: <b>6/23/20</b>	FILE NAME: <b>SD_2-40</b>	
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**B** PEDESTRIAN CURB RAMP STANDARD  
**C11** SCALE: N.T.S.

PCD File No. PPR-21-51

JDS-HYDRO a Division of RESPEC  
 5540 TECH CENTER DR. SUITE 100  
 COLORADO SPRINGS, COLORADO 80919  
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COLORADO CENTRE METROPOLITAN DISTRICT  
 ADMINISTRATIVE BUILDING - SITE DEVELOPMENT PLAN  
 GRADING & EROSION CONTROL DETAILS 4

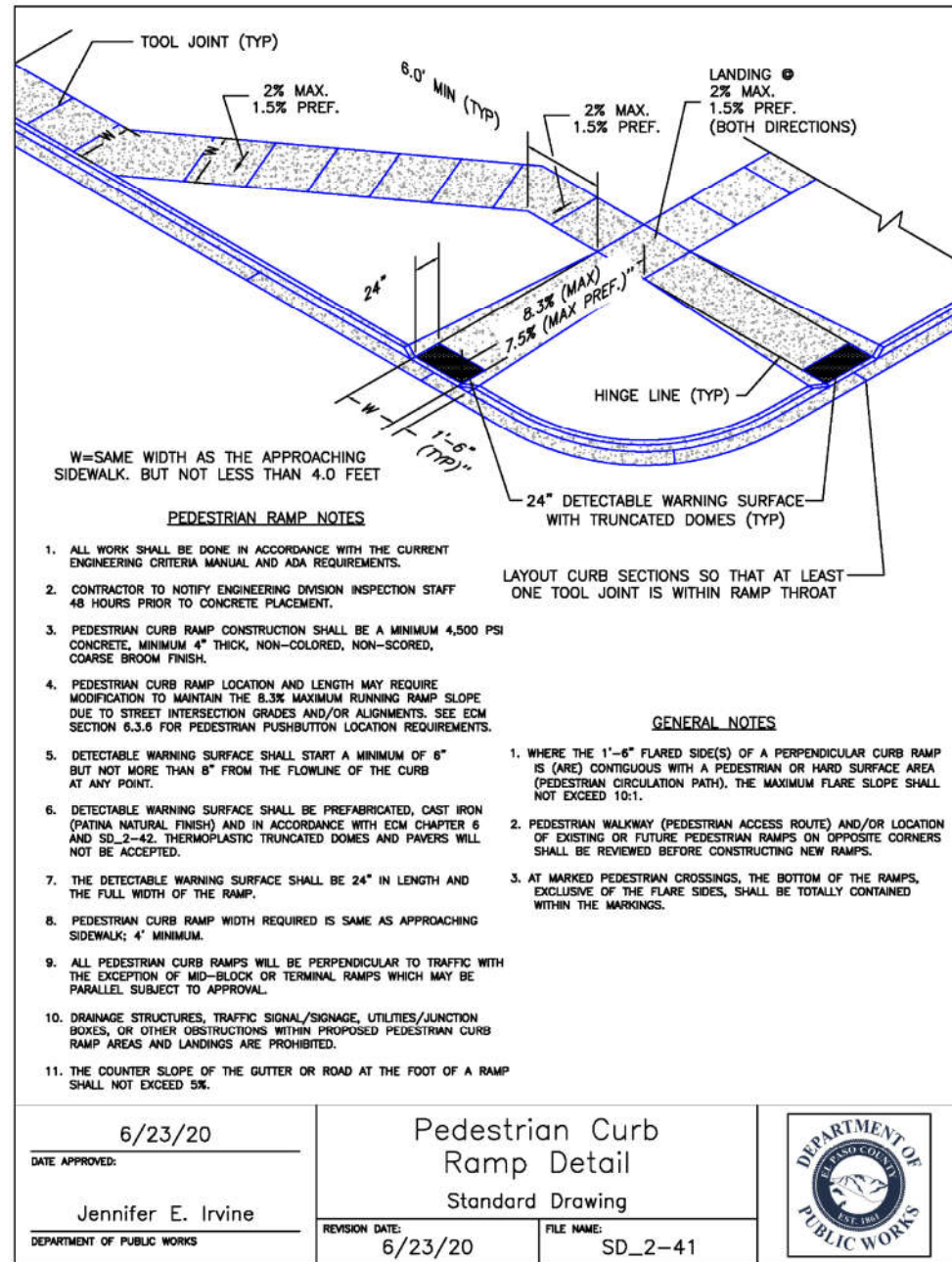
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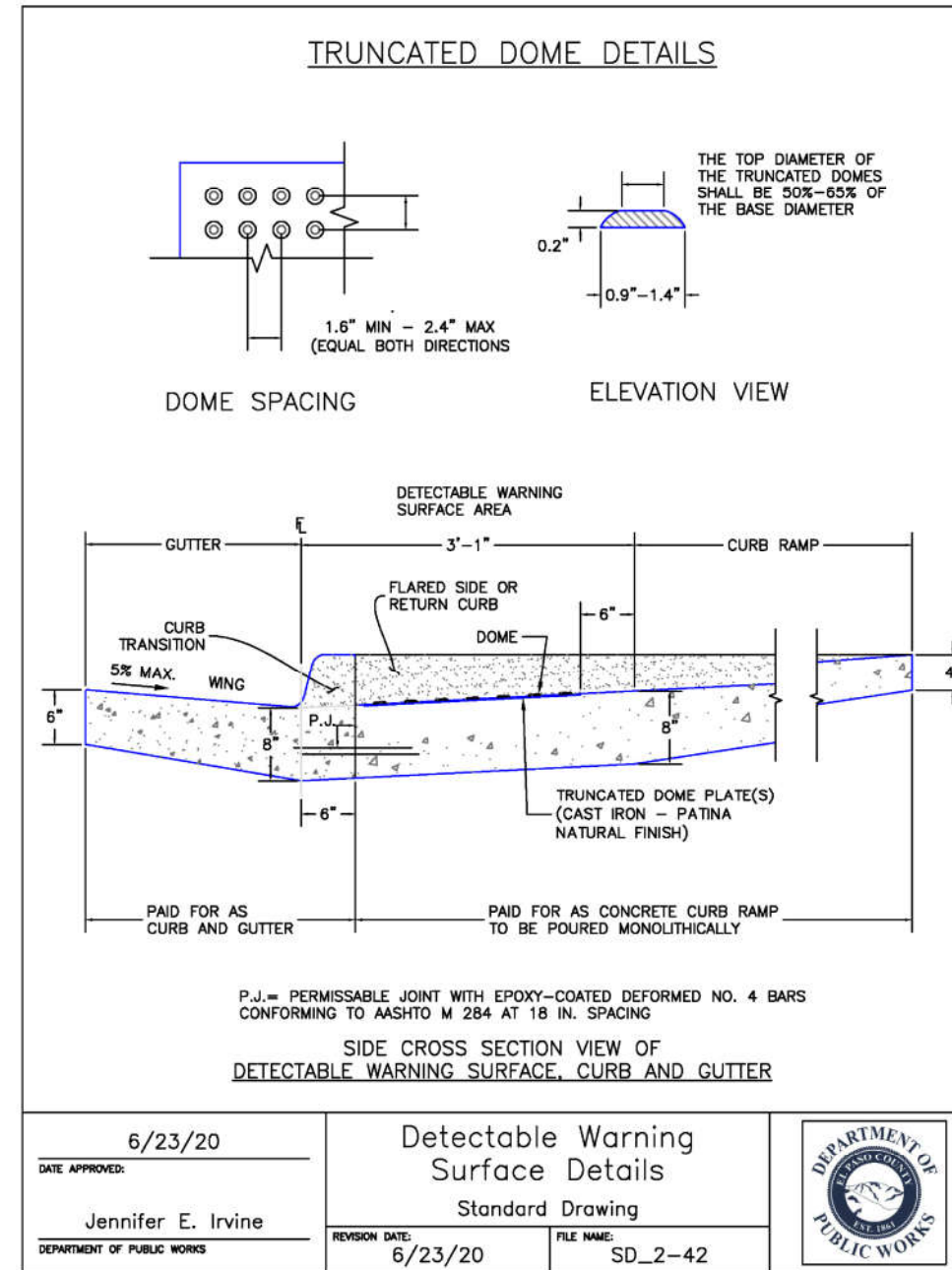
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 Drawn: GGM  
 Check: RMM

**C11**  
 SHEET 11 OF 15

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**A**  
**C12** PEDESTRIAN CURB RAMP  
 SCALE: N.T.S.



**B**  
**C12** DETECTABLE WARNING SURFACE  
 SCALE: N.T.S.

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**Temporary and Permanent Seeding (TS/PS) EC-2**

**Description**

Temporary seeding can be used to stabilize disturbed areas that will be inactive for an extended period. Permanent seeding should be used to stabilize areas at final grade that will not be otherwise stabilized. Effective seeding includes preparation of a seedbed, selection of an appropriate seed mixture, proper planting techniques, and protection of the seeded area with mulch, geotextiles, or other appropriate measures.



Photograph TS/PS-1. Equipment used to drill seed. Photo courtesy of Douglas County.

**Appropriate Uses**

When the soil surface is disturbed and will remain inactive for an extended period (typically 30 days or longer), proactive stabilization measures should be implemented. If the inactive period is short-lived (on the order of two weeks), techniques such as surface roughening may be appropriate. For longer periods of inactivity, temporary seeding and mulching can provide effective erosion control. Permanent seeding should be used on finished areas that have not been otherwise stabilized.

Typically, local governments have their own seed mixes and timelines for seeding. Check jurisdictional requirements for seeding and temporary stabilization.

**Design and Installation**

Effective seeding requires proper seedbed preparation, selection of an appropriate seed mixture, use of appropriate seeding equipment to ensure proper coverage and density, and protection with mulch or fabric until plants are established.

The USDCM Volume 2 *Revegetation* Chapter contains detailed seed mix, soil preparations, and seeding and mulching recommendations that may be referenced to supplement this Fact Sheet.

Drill seeding is the preferred seeding method. Hydroseeding is not recommended except in areas where steep slopes prevent use of drill seeding equipment, and even in these instances it is preferable to hand seed and mulch. Some jurisdictions do not allow hydroseeding or hydromulching.

**Seedbed Preparation**

Prior to seeding, ensure that areas to be revegetated have soil conditions capable of supporting vegetation. Overlot grading can result in loss of topsoil, resulting in poor quality subsoils at the ground surface that have low nutrient value, little organic matter content, few soil microorganisms, rooting restrictions, and conditions less conducive to infiltration of precipitation. As a result, it is typically necessary to provide stockpiled topsoil, compost, or other

Temporary and Permanent Seeding	
Functions	
Erosion Control	Yes
Sediment Control	No
Site/Material Management	No

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**EC-2 Temporary and Permanent Seeding (TS/PS)**

soil amendments and rototill them into the soil to a depth of 6 inches or more.

Topsoil should be salvaged during grading operations for use and spread on areas to be revegetated later. Topsoil should be viewed as an important resource to be utilized for vegetation establishment, due to its water-holding capacity, structure, texture, organic matter content, biological activity, and nutrient content. The rooting depth of most native grasses in the semi-arid Denver metropolitan area is 6 to 18 inches. At a minimum, the upper 6 inches of topsoil should be stripped, stockpiled, and ultimately respread across areas that will be revegetated.

Where topsoil is not available, subsoils should be amended to provide an appropriate plant-growth medium. Organic matter, such as well digested compost, can be added to improve soil characteristics conducive to plant growth. Other treatments can be used to adjust soil pH conditions when needed. Soil testing, which is typically inexpensive, should be completed to determine and optimize the types and amounts of amendments that are required.

If the disturbed ground surface is compacted, rip or rototill the surface prior to placing topsoil. If adding compost to the existing soil surface, rototilling is necessary. Surface roughening will assist in placement of a stable topsoil layer on steeper slopes, and allow infiltration and root penetration to greater depth.

Prior to seeding, the soil surface should be rough and the seedbed should be firm, but neither too loose nor compacted. The upper layer of soil should be in a condition suitable for seeding at the proper depth and conducive to plant growth. Seed-to-soil contact is the key to good germination.

**Seed Mix for Temporary Vegetation**

To provide temporary vegetative cover on disturbed areas which will not be paved, built upon, or fully landscaped or worked for an extended period (typically 30 days or more), plant an annual grass appropriate for the time of planting and mulch the planted areas. Annual grasses suitable for the Denver metropolitan area are listed in Table TS/PS-1. These are to be considered only as general recommendations when specific design guidance for a particular site is not available. Local governments typically specify seed mixes appropriate for their jurisdiction.

**Seed Mix for Permanent Revegetation**

To provide vegetative cover on disturbed areas that have reached final grade, a perennial grass mix should be established. Permanent seeding should be performed promptly (typically within 14 days) after reaching final grade. Each site will have different characteristics and a landscape professional or the local jurisdiction should be contacted to determine the most suitable seed mix for a specific site. In lieu of a specific recommendation, one of the perennial grass mixes appropriate for site conditions and growth season listed in Table TS/PS-2 can be used. The pure live seed (PLS) rates of application recommended in these tables are considered to be absolute minimum rates for seed applied using proper drill-seeding equipment.

If desired for wildlife habitat or landscape diversity, shrubs such as rubber rabbitbrush (*Chrysothamnus nauseosus*), fourwing saltbush (*Atriplex canescens*) and skunkbrush sumac (*Rhus trilobata*) could be added to the upland seedmixes at 0.25, 0.5 and 1 pound PLS/acre, respectively. In riparian zones, planting root stock of such species as American plum (*Prunus americana*), woods rose (*Rosa woodsii*), plains cottonwood (*Populus sargentii*), and willow (*Populus spp.*) may be considered. On non-topsoiled upland sites, a legume such as Ladak alfalfa at 1 pound PLS/acre can be included as a source of nitrogen for perennial grasses.

TS/PS-2 Urban Drainage and Flood Control District June 2012  
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**Temporary and Permanent Seeding (TS/PS) EC-2**

Seeding dates for the highest success probability of perennial species along the Front Range are generally in the spring from April through early May and in the fall after the first of September until the ground freezes. If the area is irrigated, seeding may occur in summer months, as well. See Table TS/PS-3 for appropriate seeding dates.

Table TS/PS-1. Minimum Drill Seeding Rates for Various Temporary Annual Grasses

Species <sup>a</sup> (Common name)	Growth Season <sup>b</sup>	Pounds of Pure Live Seed (PLS)/acre <sup>c</sup>	Planting Depth (inches)
1. Oats	Cool	35 - 50	1 - 2
2. Spring wheat	Cool	25 - 35	1 - 2
3. Spring barley	Cool	25 - 35	1 - 2
4. Annual ryegrass	Cool	10 - 15	½
5. Millet	Warm	3 - 15	¾ - ¾
6. Sudangrass	Warm	5-10	¾ - ¾
7. Sorghum	Warm	5-10	¾ - ¾
8. Winter wheat	Cool	20-35	1 - 2
9. Winter barley	Cool	20-35	1 - 2
10. Winter rye	Cool	20-35	1 - 2
11. Triticale	Cool	25-40	1 - 2

<sup>a</sup> Successful seeding of annual grass resulting in adequate plant growth will usually produce enough dead-plant residue to provide protection from wind and water erosion for an additional year. This assumes that the cover is not disturbed or mowed closer than 8 inches.

Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist. When hydraulic seeding is used, hydraulic mulching should be applied as a separate operation, when practical, to prevent the seeds from being encapsulated in the mulch.

<sup>b</sup> See Table TS/PS-3 for seeding dates. Irrigation, if consistently applied, may extend the use of cool season species during the summer months.

<sup>c</sup> Seeding rates should be doubled if seed is broadcast, or increased by 50 percent if done using a Brillion Drill or by hydraulic seeding.

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**EC-2 Temporary and Permanent Seeding (TS/PS)**

Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses

Common Name	Botanical Name	Growth Season <sup>b</sup>	Growth Form	Seeds/Pound	Pounds of PLS/acre
<b>Alkali Soil Seed Mix</b>					
Alkali sacaton	<i>Sporobolus airoides</i>	Cool	Bunch	1,750,000	0.25
Basin wildrye	<i>Elymus elmeris</i>	Cool	Bunch	165,000	2.5
Sodar streambank wheatgrass	<i>Agropyron riparium 'Sodar'</i>	Cool	Sod	170,000	2.5
Jose tall wheatgrass	<i>Agropyron elongatum 'Jose'</i>	Cool	Bunch	79,000	7.0
Arriba western wheatgrass	<i>Agropyron smithii 'Arriba'</i>	Cool	Sod	110,000	5.5
<b>Total</b>					<b>17.75</b>
<b>Fertile Loamy Soil Seed Mix</b>					
Ephriam crested wheatgrass	<i>Agropyron cristatum 'Ephriam'</i>	Cool	Sod	175,000	2.0
Dural hard fescue	<i>Festuca ovina 'duriuscula'</i>	Cool	Bunch	565,000	1.0
Lincoln smooth brome	<i>Bromus inermis leysii 'Lincoln'</i>	Cool	Sod	130,000	3.0
Sodar streambank wheatgrass	<i>Agropyron riparium 'Sodar'</i>	Cool	Sod	170,000	2.5
Arriba western wheatgrass	<i>Agropyron smithii 'Arriba'</i>	Cool	Sod	110,000	7.0
<b>Total</b>					<b>15.5</b>
<b>High Water Table Soil Seed Mix</b>					
Meadow foxtail	<i>Alopecurus pratensis</i>	Cool	Sod	900,000	0.5
Redtop	<i>Agrostis alba</i>	Warm	Open sod	5,000,000	0.25
Reed canarygrass	<i>Phalaris arundinacea</i>	Cool	Sod	68,000	0.5
Lincoln smooth brome	<i>Bromus inermis leysii 'Lincoln'</i>	Cool	Sod	130,000	3.0
Pathfinder switchgrass	<i>Panicum virgatum 'Pathfinder'</i>	Warm	Sod	388,000	1.0
Alkar tall wheatgrass	<i>Agropyron elongatum 'Alkar'</i>	Cool	Bunch	79,000	5.5
<b>Total</b>					<b>10.75</b>
<b>Transition Turf Seed Mix<sup>c</sup></b>					
Ruebens Canadian bluegrass	<i>Poa compressa 'Ruebens'</i>	Cool	Sod	2,500,000	0.5
Dural hard fescue	<i>Festuca ovina 'duriuscula'</i>	Cool	Bunch	565,000	1.0
Citation perennial ryegrass	<i>Lolium perenne 'Citation'</i>	Cool	Sod	247,000	3.0
Lincoln smooth brome	<i>Bromus inermis leysii 'Lincoln'</i>	Cool	Sod	130,000	3.0
<b>Total</b>					<b>7.5</b>

TS/PS-4 Urban Drainage and Flood Control District June 2012  
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**Temporary and Permanent Seeding (TS/PS) EC-2**

Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses (cont.)

Common Name	Botanical Name	Growth Season <sup>b</sup>	Growth Form	Seeds/Pound	Pounds of PLS/acre
<b>Sandy Soil Seed Mix</b>					
Blue grama	<i>Bouteloua gracilis</i>	Warm	Sod-forming bunchgrass	825,000	0.5
Camper little bluestem	<i>Schizachyrium scoparium 'Camper'</i>	Warm	Bunch	240,000	1.0
Prairie sandreed	<i>Calamovilfa longifolia</i>	Warm	Open sod	274,000	1.0
Sand dropseed	<i>Sporobolus cryptandrus</i>	Cool	Bunch	5,298,000	0.25
Vaughn sidecoats grama	<i>Bouteloua curtipendula 'Vaughn'</i>	Warm	Sod	191,000	2.0
Arriba western wheatgrass	<i>Agropyron smithii 'Arriba'</i>	Cool	Sod	110,000	5.5
<b>Total</b>					<b>10.25</b>
<b>Heavy Clay, Rocky Foothill Seed Mix</b>					
Ephriam crested wheatgrass <sup>d</sup>	<i>Agropyron cristatum 'Ephriam'</i>	Cool	Sod	175,000	1.5
Osage intermediate wheatgrass	<i>Agropyron intermedium 'Osage'</i>	Cool	Sod	115,000	5.5
Vaughn sidecoats grama <sup>e</sup>	<i>Bouteloua curtipendula 'Vaughn'</i>	Warm	Sod	191,000	2.0
Lincoln smooth brome	<i>Bromus inermis leysii 'Lincoln'</i>	Cool	Sod	130,000	3.0
Arriba western wheatgrass	<i>Agropyron smithii 'Arriba'</i>	Cool	Sod	110,000	5.5
<b>Total</b>					<b>17.5</b>

<sup>a</sup> All of the above seeding mixes and rates are based on drill seeding followed by crimped straw mulch. These rates should be doubled if seed is broadcast and should be increased by 50 percent if the seeding is done using a Brillion Drill or is applied through hydraulic seeding. Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1. If hydraulic seeding is used, hydraulic mulching should be done as a separate operation.

<sup>b</sup> See Table TS/PS-3 for seeding dates.

<sup>c</sup> If site is to be irrigated, the transition turf seed rates should be doubled.

<sup>d</sup> Crested wheatgrass should not be used on slopes steeper than 6H to 1V.

<sup>e</sup> Can substitute 0.5 lbs PLS of blue grama for the 2.0 lbs PLS of Vaughn sidecoats grama.

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**EC-2 Temporary and Permanent Seeding (TS/PS)**

Table TS/PS-3. Seeding Dates for Annual and Perennial Grasses

Seeding Dates	Annual Grasses (Numbers in table reference species in Table TS/PS-1)		Perennial Grasses	
	Warm	Cool	Warm	Cool
January 1–March 15			✓	✓
March 16–April 30	4	1,2,3	✓	✓
May 1–May 15	4		✓	
May 16–June 30	4,5,6,7			
July 1–July 15	5,6,7			
July 16–August 31				
September 1–September 30		8,9,10,11		
October 1–December 31			✓	✓

**Mulch**

Cover seeded areas with mulch or an appropriate rolled erosion control product to promote establishment of vegetation. Anchor mulch by crimping, netting or use of a non-toxic tackifier. See the Mulching BMP Fact Sheet for additional guidance.

**Maintenance and Removal**

Monitor and observe seeded areas to identify areas of poor growth or areas that fail to germinate. Reseed and mulch these areas, as needed.

An area that has been permanently seeded should have a good stand of vegetation within one growing season if irrigated and within three growing seasons without irrigation in Colorado. Reseed portions of the site that fail to germinate or remain bare after the first growing season.

Seeded areas may require irrigation, particularly during extended dry periods. Targeted weed control may also be necessary.

Protect seeded areas from construction equipment and vehicle access.

TS/PS-6 Urban Drainage and Flood Control District June 2012  
Urban Storm Drainage Criteria Manual Volume 3

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**100% DESIGN**

Project No.: 247.07  
 Date: 01/03/23  
 Design: RMM  
 Drawn: GGM  
 Check: RMM

2023/03/13 11:53 AM By: Ryan Mangino N:\Projects\247 Colorado Centre MD\247.07 Admin Building Support\Drawings\Working\24707\_Civil.dwg

## Mulching (MU)

EC-4

### Description

Mulching consists of evenly applying straw, hay, shredded wood mulch, rock, bark or compost to disturbed soils and securing the mulch by crimping, tackifiers, netting or other measures. Mulching helps reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff. Although often applied in conjunction with temporary or permanent seeding, it can also be used for temporary stabilization of areas that cannot be reseeded due to seasonal constraints.



Photograph MU-1. An area that was recently seeded, mulched, and crimped.

Mulch can be applied either using standard mechanical dry application methods or using hydromulching equipment that hydraulically applies a slurry of water, wood fiber mulch, and often a tackifier.

### Appropriate Uses

Use mulch in conjunction with seeding to help protect the seedbed and stabilize the soil. Mulch can also be used as a temporary cover on low to mild slopes to help temporarily stabilize disturbed areas where growing season constraints prevent effective reseeding. Disturbed areas should be properly mulched and tacked, or seeded, mulched and tacked promptly after final grade is reached (typically within no longer than 14 days) on portions of the site not otherwise permanently stabilized.

Standard dry mulching is encouraged in most jurisdictions; however, hydromulching may not be allowed in certain jurisdictions or may not be allowed near waterways.

Do not apply mulch during windy conditions.

### Design and Installation

Prior to mulching, surface-roughen areas by rolling with a crimping or punching type roller or by track walking. Track walking should only be used where other methods are impractical because track walking with heavy equipment typically compacts the soil.

A variety of mulches can be used effectively at construction sites. Consider the following:

Mulch	
Functions	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material Management	No

June 2012

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MU-1

EC-4

## Mulching (MU)

- Clean, weed-free and seed-free cereal grain straw should be applied evenly at a rate of 2 tons per acre and must be tacked or fastened by a method suitable for the condition of the site. Straw mulch must be anchored (and not merely placed) on the surface. This can be accomplished mechanically by crimping or with the aid of tackifiers or nets. Anchoring with a crimping implement is preferred, and is the recommended method for areas flatter than 3:1. Mechanical crimpers must be capable of tucking the long mulch fibers into the soil to a depth of 3 inches without cutting them. An agricultural disk, while not an ideal substitute, may work if the disk blades are dull or blunted and set vertically; however, the frame may have to be weighted to afford proper soil penetration.
- Grass hay may be used in place of straw; however, because hay is comprised of the entire plant including seed, mulching with hay may seed the site with non-native grass species which might in turn out-compete the native seed. Alternatively, native species of grass hay may be purchased, but can be difficult to find and are more expensive than straw. Purchasing and utilizing a certified weed-free straw is an easier and less costly mulching method. When using grass hay, follow the same guidelines as for straw (provided above).
- On small areas sheltered from the wind and heavy runoff, spraying a tackifier on the mulch is satisfactory for holding it in place. For steep slopes and special situations where greater control is needed, erosion control blankets anchored with stakes should be used instead of mulch.
- Hydraulic mulching consists of wood cellulose fibers mixed with water and a tackifying agent and should be applied at a rate of no less than 1,500 pounds per acre (1,425 lbs of fibers mixed with at least 75 lbs of tackifier) with a hydraulic mulcher. For steeper slopes, up to 2000 pounds per acre may be required for effective hydroseeding. Hydromulch typically requires up to 24 hours to dry; therefore, it should not be applied immediately prior to inclement weather. Application to roads, waterways and existing vegetation should be avoided.
- Erosion control mats, blankets, or nets are recommended to help stabilize steep slopes (generally 3:1 and steeper) and waterways. Depending on the product, these may be used alone or in conjunction with grass or straw mulch. Normally, use of these products will be restricted to relatively small areas. Biodegradable mats made of straw and jute, straw-coconut, coconut fiber, or excelsior can be used instead of mulch. (See the ECM/TRM BMP for more information.)
- Some tackifiers or binders may be used to anchor mulch. Check with the local jurisdiction for allowed tackifiers. Manufacturer's recommendations should be followed at all times. (See the Soil Binder BMP for more information on general types of tackifiers.)
- Rock can also be used as mulch. It provides protection of exposed soils to wind and water erosion and allows infiltration of precipitation. An aggregate base course can be spread on disturbed areas for temporary or permanent stabilization. The rock mulch layer should be thick enough to provide full coverage of exposed soil on the area it is applied.

### Maintenance and Removal

After mulching, the bare ground surface should not be more than 10 percent exposed. Reapply mulch, as needed, to cover bare areas.

MU-2

Urban Drainage and Flood Control District  
Urban Storm Drainage Criteria Manual Volume 3

June 2012

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100% DESIGN

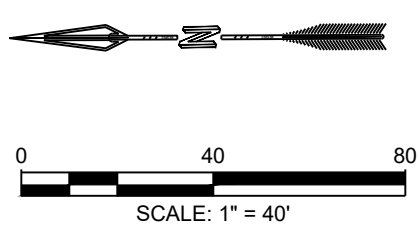
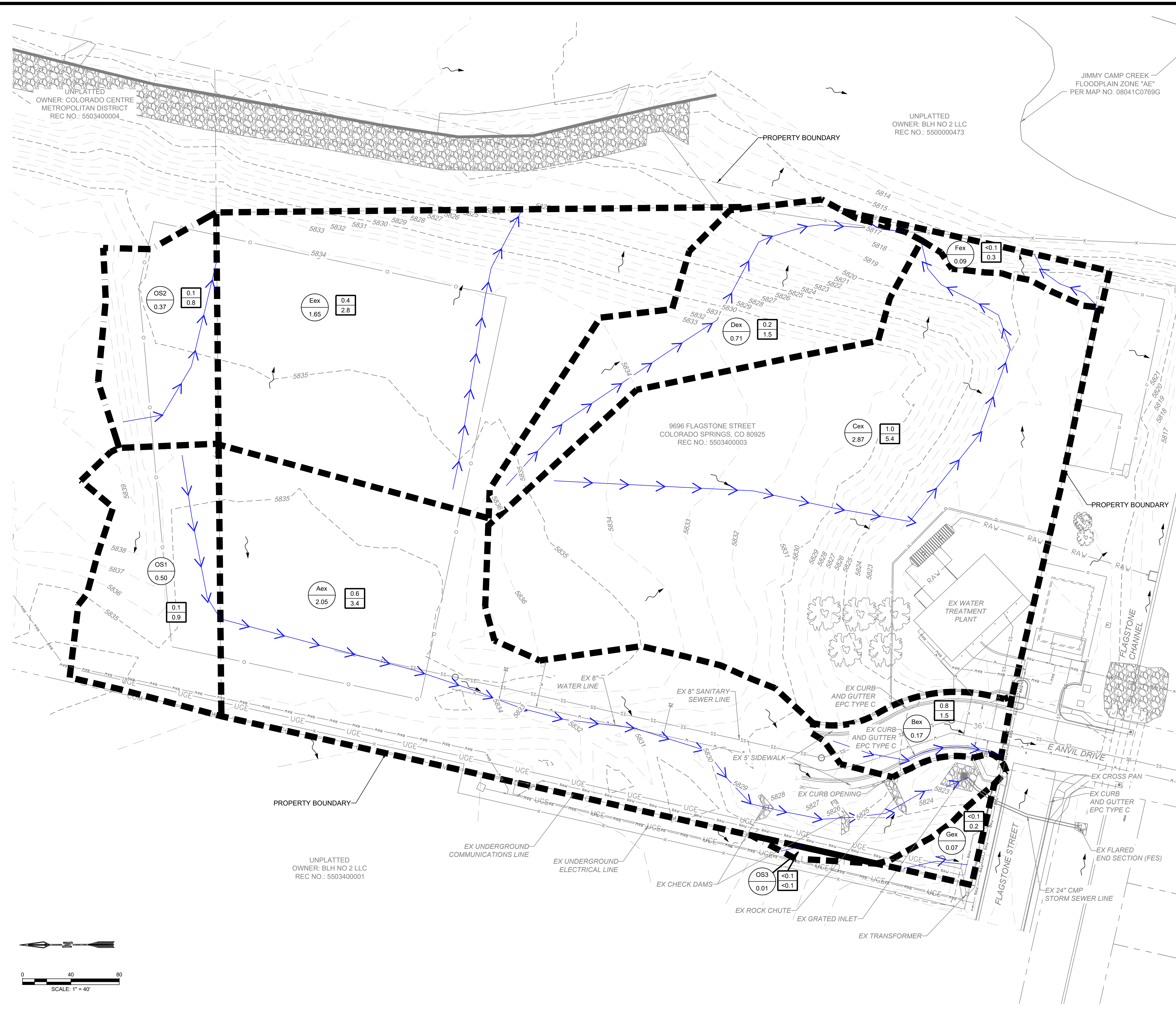
Project No.: 247.07  
 Date: 01/03/23  
 Design: RMM  
 Drawn: GGM  
 Check: RMM

**C15**  
 SHEET 15 OF 15



# BACK POCKET

2023/04/11 4:29 PM By: Rebecca McConnell\N\Projects\247 Colorado Centre MD\247.07 Admin: Building Support\Drawings\Working\Drawings\DWG\Existing Drainage Planning



- BENCHMARKS**
- SURVEY CONTROL POINT AS SHOWN HERON. ELEVATIONS ARE BASED UPON CITY OF COLORADO SPRINGS "FIMS" VERTICAL DATUM. FIMS MONUMENT "TM\_5" ELEVATION = 5824.02 (NGVD 29). "FIMS" ALUMINUM CAP STAMPED "TM-5" IN A ROAD BOX ON THE EAST SIDE OF MARKSHEFFEL ROAD, ABOUT 1/2 MILE SOUTH OF DRENNAN ROAD.
  - SURVEY CONTROL POINT AS SHOWN HERON. ELEVATIONS ARE BASED UPON CITY OF COLORADO SPRINGS "FIMS" VERTICAL DATUM. FIMS MONUMENT "TM\_4" ELEVATION = 5856.50 (NGVD 29). "FIMS" ALUMINUM CAP STAMPED "TM-4" IN A ROAD BOX 26 FEET NORTH OF A FENCE CORNER AT THE SOUTHEAST CORNER OF MARKSHEFFEL ROAD AND DRENNAN ROAD.

- LEGEND**
- (A1A) EXIST BASIN DESIGNATION
  - (XX) EXIST BASIN AREA, ACRES
  - XX EXIST 5 YEAR STORM, CFS
  - XX EXIST 100 YEAR STORM, CFS
  - XX EXIST DESIGN POINT
  - XX.X EXIST 5 YEAR ACCUMULATED FLOW, CFS
  - XX.X EXIST 100 YEAR ACCUMULATED FLOW, CFS
  - EXISTING DIRECTION OF DRAINAGE FLOW
  - EXISTING SUB-BASIN BOUNDARY
  - 7290- EXISTING MAJOR CONTOUR
  - 7291- EXISTING MINOR CONTOUR
  - EXISTING TIME OF CONCENTRATION PATH
  - EXISTING WATER MAIN
  - SS EXISTING SANITARY MAIN SEWER
  - RAW EXISTING NON-POTABLE WATERLINE
  - UGE EXISTING UNDERGROUND ELECTRIC
  - COM EXISTING TELECOMMUNICATION LINE
  - EXISTING FENCE
  - EXISTING PROPERTY BOUNDARY

**NOTE:**  
 1. THERE IS NO FEMA FLOODPLAIN WITHIN THE PROPOSED SITE. FEMA MAP: 08041C0769G EFFECTIVE: 12/7/2018

EXISTING CONDITIONS			
SUB-BASIN	ACRES	Q5(CFS)	Q100(CFS)
Aex	2.05	0.6	3.4
Bex	0.17	0.8	1.5
Cex	2.87	1.0	5.4
Dex	0.71	0.2	1.5
Eex	1.65	0.4	2.8
Fex	0.09	<0.1	0.3
Gex	0.07	<0.1	0.2
OS1	0.50	0.1	0.9
OS2	0.37	0.1	0.8
OS3	0.01	<0.1	<0.1

**JDS-HYDRO** a Division of **RESPEC**  
 5540 TECH CENTER DR., SUITE 100  
 COLORADO SPRINGS, COLORADO 80919  
 (719) 227-0072

UNLESS THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ANY ERRORS OR OMISSIONS SHALL BE REPORTED TO JDS-HYDRO, A DIVISION OF RESPEC. JDS-HYDRO ASSUMES NO LIABILITY FOR UNAUTHORIZED CHANGES AND/OR REVISIONS MADE TO PLANS.

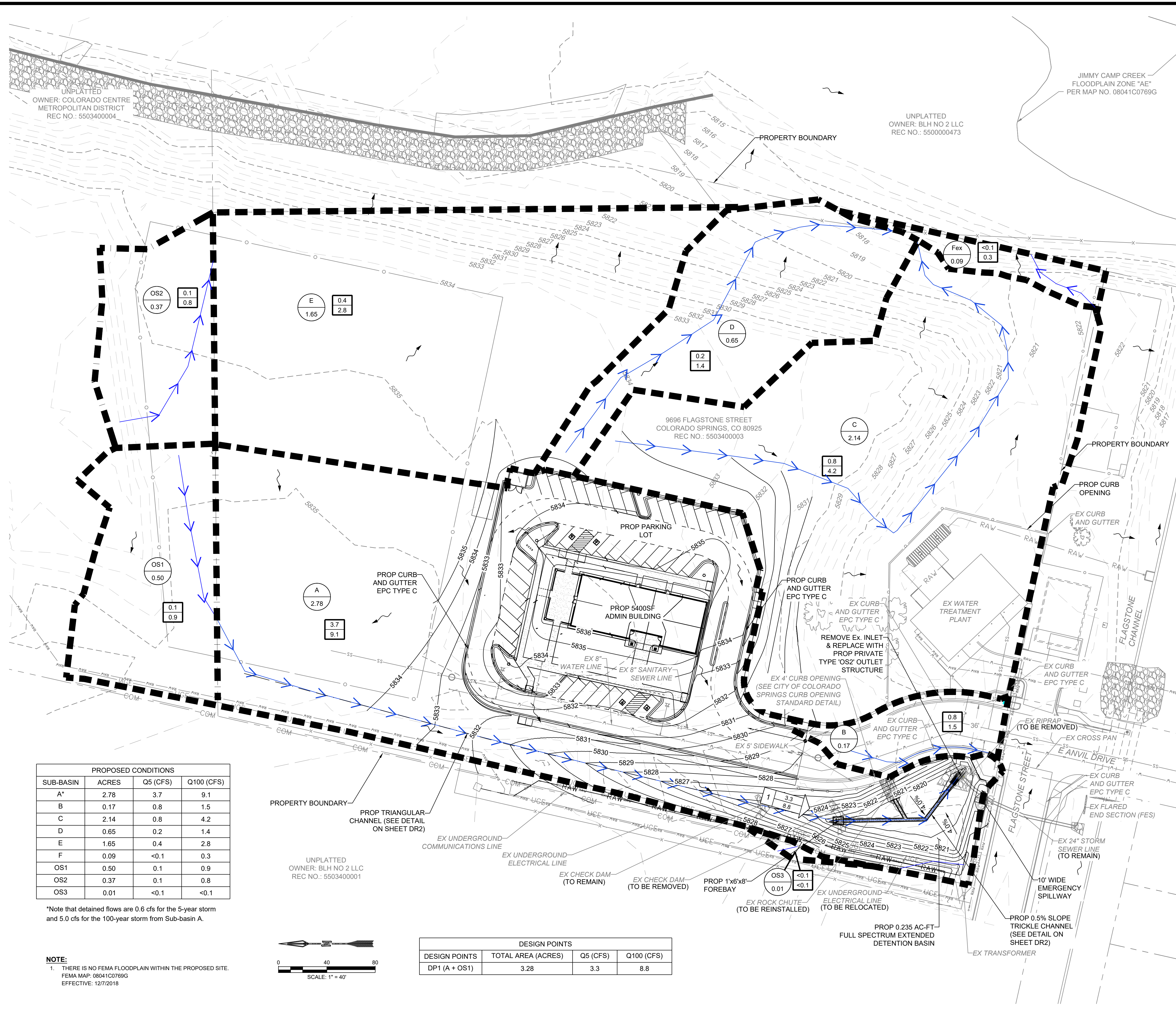
COLORADO CENTRE METROPOLITAN DISTRICT  
 ADMINISTRATION BUILDING  
 EXISTING DRAINAGE PLAN

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Project No.: 247.07  
 Date: 09/2022  
 Design: CTD  
 Drawn: CTD  
 Check: RGG

**DR1**  
 SHEET 1 OF 2

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VICINITY MAP  
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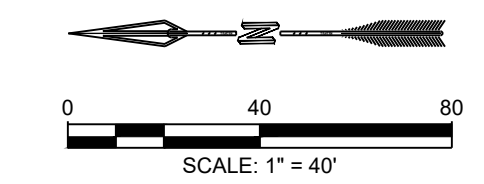
- BENCHMARKS**
- SURVEY CONTROL POINT AS SHOWN HEREON. ELEVATIONS ARE BASED UPON CITY OF COLORADO SPRINGS "FIMS" VERTICAL DATUM. FIMS MONUMENT "TM\_5" ELEVATION = 5824.02' (NGVD 29).  
"FIMS" ALUMINUM CAP STAMPED "TM-5" IN A ROAD BOX ON THE EAST SIDE OF MARKSHEFFEL ROAD, ABOUT 1/2 MILE SOUTH OF DRENNAN ROAD.
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"FIMS" ALUMINUM CAP STAMPED "TM-4" IN A ROAD BOX 26 FEET NORTH OF A FENCE CORNER AT THE SOUTHEAST CORNER OF MARKSHEFFEL ROAD AND DRENNAN ROAD.

- LEGEND**
- (A1A) PROPOSED BASIN DESIGNATION
  - (XX) PROPOSED BASIN AREA, ACRES
  - XX PROPOSED 5 YEAR STORM, CFS
  - XX PROPOSED 100 YEAR STORM, CFS
  - XX XX.X PROPOSED 5 YEAR ACCUMULATED FLOW, CFS
  - XX.X XX.X PROPOSED 100 YEAR ACCUMULATED FLOW, CFS
  - PROPOSED DESIGN POINT
  - PROPOSED DIRECTION OF DRAINAGE FLOW
  - PROPOSED SUB-BASIN BOUNDARY
  - 7290 PROPOSED MAJOR CONTOUR
  - 7291 PROPOSED MINOR CONTOUR
  - 7290 EXISTING MAJOR CONTOUR
  - 7291 EXISTING MINOR CONTOUR
  - PROPOSED TIME OF CONCENTRATION PATH
  - PROPOSED CHANNEL FLOWLINE
  - RAW PROPOSED NON-POTABLE WATERLINE
  - W-W EXISTING WATER MAIN
  - SS-SS EXISTING SANITARY MAIN SEWER
  - RAW-RAW EXISTING NON-POTABLE WATERLINE
  - UGE EXISTING UNDERGROUND ELECTRIC
  - COM EXISTING TELECOMMUNICATION LINE
  - EXISTING FENCE
  - EXISTING PROPERTY BOUNDARY

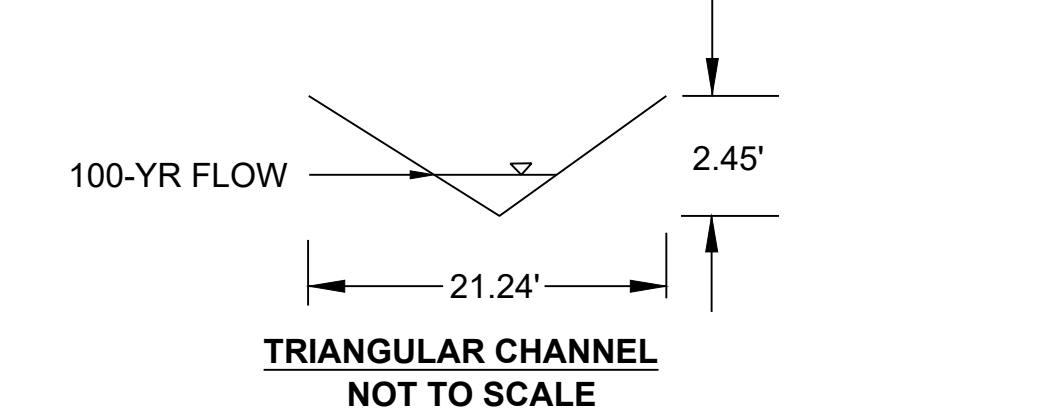
PROPOSED CONDITIONS			
SUB-BASIN	ACRES	Q5 (CFS)	Q100 (CFS)
A*	2.78	3.7	9.1
B	0.17	0.8	1.5
C	2.14	0.8	4.2
D	0.65	0.2	1.4
E	1.65	0.4	2.8
F	0.09	<0.1	0.3
OS1	0.50	0.1	0.9
OS2	0.37	0.1	0.8
OS3	0.01	<0.1	<0.1

\*Note that detained flows are 0.6 cfs for the 5-year storm and 5.0 cfs for the 100-year storm from Sub-basin A.

**NOTE:**  
1. THERE IS NO FEMA FLOODPLAIN WITHIN THE PROPOSED SITE.  
FEMA MAP: 08041C0769G  
EFFECTIVE: 12/7/2016



DESIGN POINTS			
DESIGN POINTS	TOTAL AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
DP1 (A + OS1)	3.28	3.3	8.8



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5540 TECH CENTER DR., SUITE 100  
COLORADO SPRINGS, COLORADO 80919  
(719) 227-0072

DESIGNER SHALL VERIFY ALL DIMENSIONS, ANY ERRORS, AND OMISSIONS SHALL BE REPORTED TO JDS-HYDRO, A DIVISION OF RESPEC. JDS-HYDRO ASSUMES NO LIABILITY FOR UNAUTHORIZED CHANGES AND/OR REVISIONS MADE TO PLANS.

COLORADO CENTRE METROPOLITAN DISTRICT  
ADMINISTRATION BUILDING  
PROPOSED DRAINAGE PLAN

NO.	DESCRIPTION	BY	APP.	DATE
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Project No.: 247.07  
Date: 09/2022  
Design: CTD  
Drawn: CTD  
Check: RGG

**DR2**  
SHEET 2 OF 2