

FINAL DRAINAGE REPORT

for
7315 COLE VIEW

7315 Cole View
El Paso County, Colorado

July 2024

PCD File No: PPR2344

Prepared for:

Black Diamond Cable

7315 Cole View
Colorado Springs, CO 80915
Contact: Ryan Foster
(719) 306-4478

Prepared by:

Drexel, Barrell & Co.

101 S. Sawatch St. #100
Colorado Springs, CO 80903
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1.0 CERTIFICATION STATEMENTS

Engineer's Statement

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

SIGNATURE (Affix Seal):


For and on behalf of Drexel, Barrell & Co.
Tim D. McConnell, P.E. #33797



Date

Developer's Statement

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



7/16/24

Date

Ryan Foster
Black Diamond Cable
7315 Cole View
Colorado Springs, CO 80915

El Paso County

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.

8/1/2024

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

Date

Conditions:

2.0 PURPOSE

This report is prepared by Drexel, Barrell & Co in support of 7315 Cole View. The purpose of this report is to identify onsite and offsite drainage patterns, storm sewer, inlet locations, and areas tributary to the site, and to safely route developed storm water runoff to adequate outfall facilities.

3.0 GENERAL SITE DESCRIPTION

Location

7315 Cole View is located in Colorado Springs, El Paso County, Colorado, within the northeast quarter of Section 8, Township 14 South, Range 65 West of the 6th P.M. The property is bounded by Sand Creek to the west, a commercial lot to the north, a vacant commercial lot to the east and a residential neighborhood to the south.

Site Conditions

The proposed development will be used as a Commercial property. The proposed site is to consist of a permanent 10,000 sf building, parking lot, storage yard and a water quality pond. The property is 1.83 acres, all of which will be disturbed. The existing site is undeveloped and covered with natural vegetation.

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the site is underlain by Ellicott loamy coarse sand (Soil No. 28), a hydrologic type A soil. See appendix for Soils map.

Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 08041CO752G (December 7, 2018), the site does not lie within a designated 100-year floodplain. The site is in Zone X, an area of minimal flood hazard. See Grading & Erosion Control Plan for the approximate location of the 100-yr floodplain to the west of the site. See Appendix for FIRMette map.

4.0 DRAINAGE CRITERIA

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

5.0 HISTORIC CONDITION

The historic site is undeveloped and covered with native vegetation that consists mostly of grasses as well as some shrubs. The site generally follows a 1%-35% grade from northeast to southwest. The flows leave the site to the west and discharge into Sand Creek. A prior FDR was done for the portion of Claremont Business Park that this lot is a part of, "Final Drainage Report for Claremont Business Park Filing No. 2", by Matrix Design Group, Inc., November 2006.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm events. See below for a summary runoff table. See Appendix for Historic Condition Drainage Map.

Rational Method Runoff Summary

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
A	1	1.76	0.8	3.9
B	2	0.07	0.3	0.6

6.0 DEVELOPED CONDITION

The proposed development consists of a 10,000 sf building and associated parking and landscaping at the north end of the site. The south end of the site is to be a gravel storage yard and a water quality pond. The proposed grading will route flows to the southwest where a curb will carry the flows to a water quality pond where they will be slowly released into Sand Creek.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm events. See below for a summary runoff table. See Appendix for Proposed Conditions Drainage Map

Rational Method Runoff Summary

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
A	1	1.76	1.9	5.4
B	2	0.07	0.3	0.6
Pond Release			0.0	1.2

DP-1 is located at the existing curb & gutter at the north end of Basin A, where the flows leave the site and flow north along the curb & gutter to an existing off-site inlet. There is no proposed development for Basin A, the existing and proposed conditions are the same for this basin, therefore the flows will also remain unchanged.

DP-2 is located at the south end of the site at the proposed water quality pond. The pond will capture, treat and release all of the flows from Basin B. The flows leave the pond via an outlet structure and an 18" storm pipe which conveys the flows to the existing storm system, which then discharges into Sand Creek. The release rates are $Q_5=0.0$ cfs and $Q_{100}=1.2$ cfs, which are lower than the historic flows leaving the site and entering Sand Creek. A spillway is located on the west side of the pond for any overflow to reach the creek.

No previous drainage reports could be found for the existing area inlet at the south end of the site or the pipe discharging from the inlet into the creek. Also, no previous drainage reports could be found for the detention facilities located in the lots to the east of our site. Field observation showed that the pond on the adjacent lot (Lot 30, Claremont Business Park Filing No. 2) has no outlet and the pond on Lot 27 of Claremont Business Park has an outlet that daylights to the swale that runs along the south edge of all of the lots leading to the existing area inlet on our project site. Since no reports could be found, it is unknown what flows are being released from each pond. It is also unknown what the actual flows are at the existing area inlet. Rational Method calculations have been performed for the offsite area east of our project site assuming no existing ponds. Therefore, the flows we have calculated to reach the area inlet on our site will be conservative. An exhibit of the offsite area can be found in the Appendix as well as the Rational Method calculations. These flows will be captured by a double Type C area inlet, as determined by the Inlet Capacity chart included in the Appendix. These flows will continue to the west via a 30" RCP pipe, where they will combine with the proposed pond's slow-release flows and continue to the west to discharge into Sand Creek.

7.0 FOUR STEP PROCESS

This project conforms to the El Paso County Four Step Process. The process for this site focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

1. **Employ Runoff Reduction Practices:** Proposed impervious areas on this site (roofs, asphalt/sidewalk) will sheet flow across landscaped area, gravel and natural grasses in an effort to slow runoff and increase time of concentration prior to entering Sand Creek. This will minimize directly connected impervious areas within the project site.
2. **Implement BMP's that provide a Water Quality Capture Volume with slow release:** Runoff from this project will be treated through capture and slow release of the WQCV in the proposed water quality pond designed per current City of Colorado Springs/El Paso County drainage criteria. Per Resolution No. 16-426, all lots within

Claremont Business Park require a permanent water quality pond.

3. **Stabilize Drainage Ways:** Sand Creek will not require any stabilization to occur due to the runoff from this site. An existing outfall into the creek from adjacent lots is already in place and was stabilized at the time of construction. The release rates from the proposed pond will not increase the flows at this point enough to necessitate any further stabilization. The creek is in acceptable condition and is able to convey the developed flow without impact to downstream facilities.
4. **Implement Site Specific and Other Source Control BMP's:** Standard commercial source control will be utilized in order to minimize potential pollutants entering the creek. Example source control measures consist of: indoor storage of chemicals; and trash receptacles in common areas.

8.0 DRAINAGE & BRIDGE FEES

Drainage and bridge fees are not required as the site has been previously platted.

9.0 SUMMARY

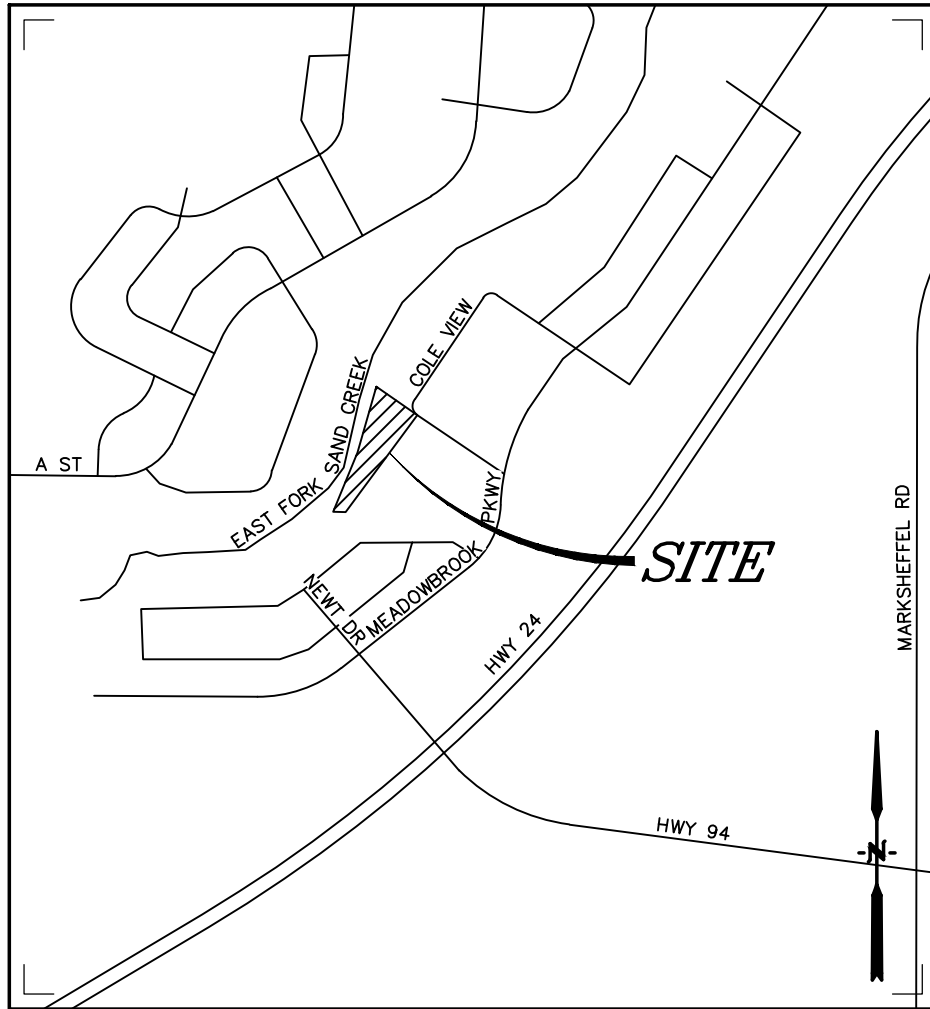
Development of 7315 Cole View will not adversely affect surrounding or downstream developments. The runoff coefficients, percent imperviousness, and therefore the flow rates have decreased from the original design in "Final Drainage Report for Claremont Business Park Filing No. 2", by Matrix Design Group, Inc., November 2006" to this proposed development.

10.0 REFERENCES

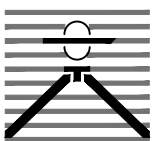
The sources of information used in the development of this study are listed below:

1. El Paso County Drainage Criteria Manual, 10-31-2018.
2. "Final Drainage Report for Claremont Business Park Filing No. 2", by Matrix Design Group, Inc., November 2006.
3. Natural Resources Conservation Service (NRCS) Web Soil Survey
4. Federal Emergency Management Agency, Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Map Number 08041C0752G, Effective Date December 7, 2018

APPENDIX



Vicinity Map
Not to scale



**7315 COLE VIEW
COLORADO SPRINGS, CO
VICINITY MAP**

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:

DWG. NO.

JOB NO:


21813-00CSCV

VMAP

SHEET 1 OF 1









Hydrologic Soil Group—El Paso County Area, Colorado





MAP LEGEND**Area of Interest (AOI)**
 Area of Interest (AOI)
Soils**Soil Rating Polygons**





-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

Soil Rating Lines



-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available


Soil Rating Points

-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available

Water Features
 Streams and Canals
Transportation

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

Background
 Aerial Photography
MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A	1.8	100.0%
Totals for Area of Interest			1.8	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

National Flood Hazard Layer FIRMette



104°41'50"W 38°51'6"N



1:6,000

104°41'12"W 38°50'38"N

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
MAP PANELS		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped



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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/9/2023 at 11:12 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

PROJECT INFORMATION								
PROJECT:	7315 Cole View							
PROJECT NO:	21813-00							
DESIGN BY:	SBN							
REV. BY:	TDM							
AGENCY:	EPC							
REPORT TYPE:	Final							
DATE:	11/28/2023							
Soil Type: A								
				C2*	C5*	C10*	C100*	% IMPERV
Pasture/Meadow/Lawn					0.08		0.35	0
Asphalt/Sidewalk					0.90		0.96	100
Roofs					0.73		0.81	90
*C-Values and Basin Imperviousness based on Table 6-6, City of Colorado Springs and El Paso County "Drainage Criteria Manual"								
EXISTING								
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV	
		ACRE	C2	C5	C10	C100		
A	Pasture/Meadow/Lawn	1.62		0.08		0.35	0	
	Asphalt/Sidewalk	0.14		0.90		0.96	100	
	Roofs	0.00		0.73		0.81	90	
	WEIGHTED AVERAGE			0.15		0.40	8%	
TOTAL A		1.76						
B	Pasture/Meadow/Lawn	0.00		0.08		0.35	0	
	Asphalt/Sidewalk	0.07		0.90		0.96	100	
	Roofs	0.00		0.73		0.81	90	
	WEIGHTED AVERAGE			0.90		0.96	100%	
TOTAL B		0.07						
TOTAL BASIN AREAS		1.83		0.17		0.42	11.5%	

PROJECT INFORMATION

PROJECT: 7315 Cole View
 PROJECT NO: 21813-00
 DESIGN BY: SBN
 REV. BY: TDM
 AGENCY: EPC
 REPORT TYPE: Final
 DATE: 11/28/2023



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t_i)				TRAVEL TIME (t_t)					PIPE TRAVEL TIME (t_p)				TIME OF CONC. t_c		FINAL t_c
BASIN	DESIGN PT:	C_5	C_{100}	AREA	LENGTH	HT	SLOPE	t_i	LENGTH	HT	SLOPE	VEL.	t_t	LENGTH	SLOPE	VEL.	t_t	COMP. t_c	MINIMUM t_c	Min
				Ac	Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t_c	t_c	Min
A	1	0.15	0.40	1.76	100	2	2.0	14.2	550	10	1.8	4.2	2.2					16.4	5	16.4
B	2	0.90	0.96	0.07	30	0.5	1.7	1.7	100	0.5	0.5	4.1	0.4					2.1	5	5.0

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING	RUNOFF		5 YR STORM		P1= 1.50		
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
A	1	1.76	0.15	16.4	0.26	3.32	0.8
B	2	0.07	0.90	5.0	0.06	5.10	0.3

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RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING	RUNOFF		100 YR STORM		P1=		2.52
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
A	1	1.76	0.40	16.4	0.70	5.58	3.9
B	2	0.07	0.96	5.0	0.07	8.58	0.6

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REV. BY:	TDM							
AGENCY:	EPC							
REPORT TYPE:	Final							
DATE:	11/28/2023							
Soil Type: A								
				C2*	C5*	C10*	C100*	% IMPERV
Pasture/Meadow/Lawn					0.08		0.35	0
Asphalt/Sidewalk					0.90		0.96	100
Roof					0.73		0.81	90
*C-Values and Basin Imperviousness based on Table 6-6, City of Colorado Springs and El Paso County "Drainage Criteria Manual"								
PROPOSED								
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV	
		ACRE	C2	C5	C10	C100		
A	Pasture/Meadow/Lawn	1.23		0.08		0.35	0	
	Asphalt/Sidewalk	0.30		0.90		0.96	100	
	Roof	0.23		0.73		0.81	90	
	WEIGHTED AVERAGE			0.30		0.51	29%	
TOTAL A		1.76						
B	Pasture/Meadow/Lawn	0.00		0.08		0.35	0	
	Asphalt/Sidewalk	0.07		0.90		0.96	100	
	Roof	0.00		0.73		0.81	90	
	WEIGHTED AVERAGE			0.90		0.96	100%	
TOTAL B		0.07						
TOTAL SITE		1.83		0.33		0.53	31.5%	



Drexel, Barrell & Co.

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AGENCY: EPC
REPORT TYPE: Final
DATE: 11/28/2023



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF
PROPOSED TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t _i)				TRAVEL TIME (t _t)					PIPE TRAVEL TIME (t _p)				TIME OF CONC. t _c		FINAL t _c
BASIN	DESIGN PT:	C ₅	C ₁₀₀	AREA	LENGTH	HT	SLOPE	t _i	LENGTH	HT	SLOPE	VEL.	t _t	LENGTH	SLOPE	VEL.	t _t	COMP.	MINIMUM	
				Ac	Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t _c	t _c	Min
A	1	0.30	0.51	1.76	100	2	2.0	11.8	550	10	1.8	4.2	2.2					14.0	5	14.0
B	2	0.90	0.96	0.07	30	1	1.7	1.7	100	1	0.5	4.1	0.4					2.1	5	5.0

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AGENCY: EPC
REPORT TYPE: Final
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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

PROPOSED	RUNOFF 5 YR STORM				P1=	1.50
			DIRECT RUNOFF			
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR) Q (CFS)
A	1	1.76	0.30	14.0	0.54	3.57 1.9
B	2	0.07	0.90	5.0	0.06	5.10 0.3

PROJECT INFORMATION

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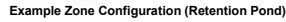
Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

PROPOSED		RUNOFF 100 YR STORM			P1=		
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
A	1	1.76	0.51	14.0	0.90	6.00	5.4
B	2	0.07	0.96	5.0	0.07	8.58	0.6

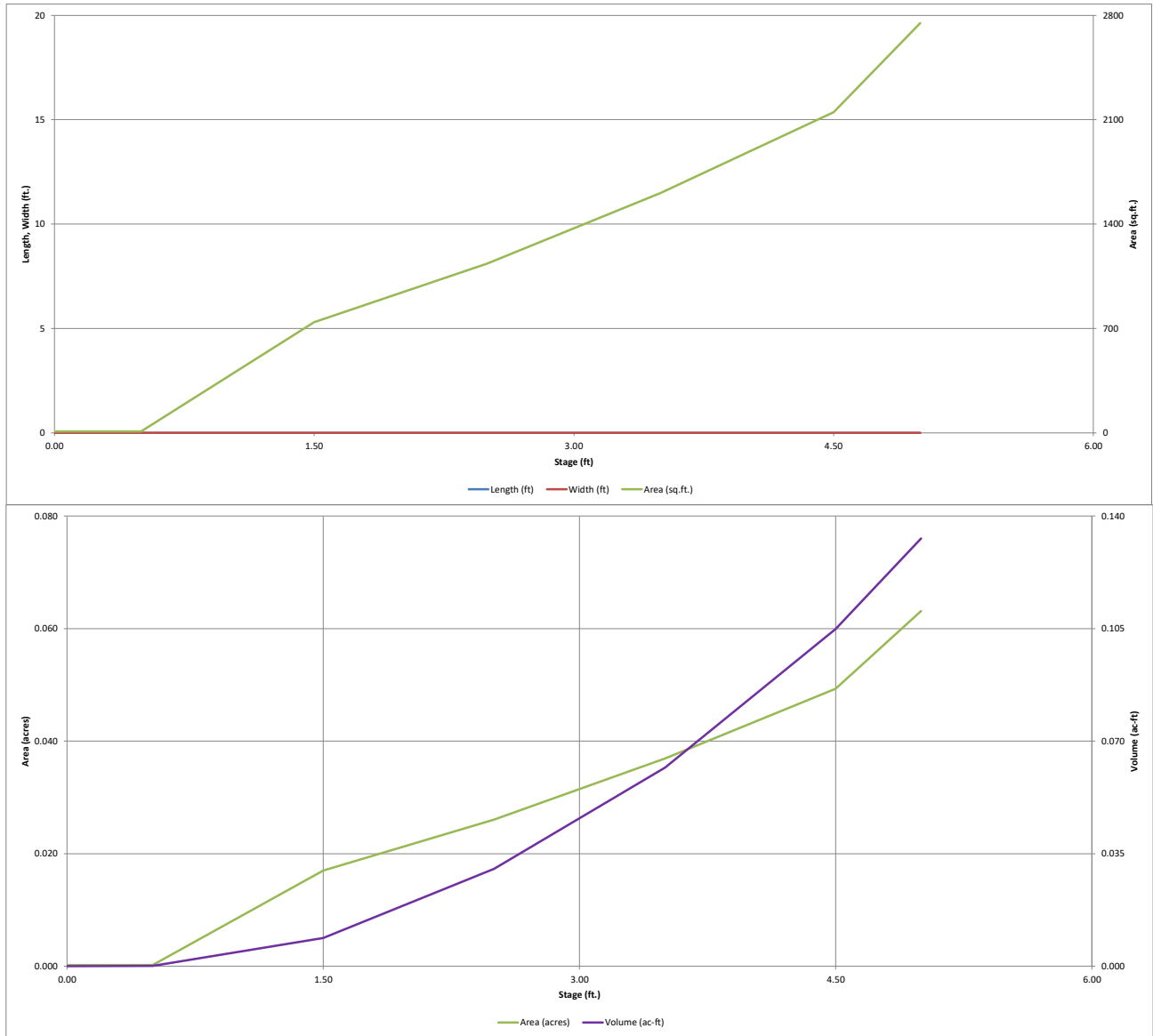
MHFD-Detention, Version 4.06 (July 2022)

Basin ID:



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

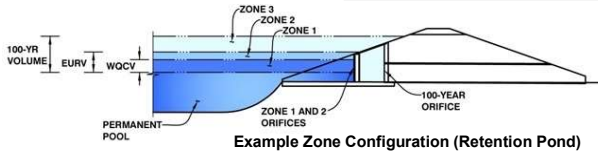


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Cole View**

Basin ID: _____



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.24	0.024	Orifice Plate
Zone 2 (100-year)	4.55	0.083	Weir&Pipe (Circular)
Zone 3			
Total (all zones)		0.107	

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 = ft²
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

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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)	<input type="text" value="0.00"/>							
Orifice Area (sq. inches)	<input type="text" value="0.18"/>							

	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)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = 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

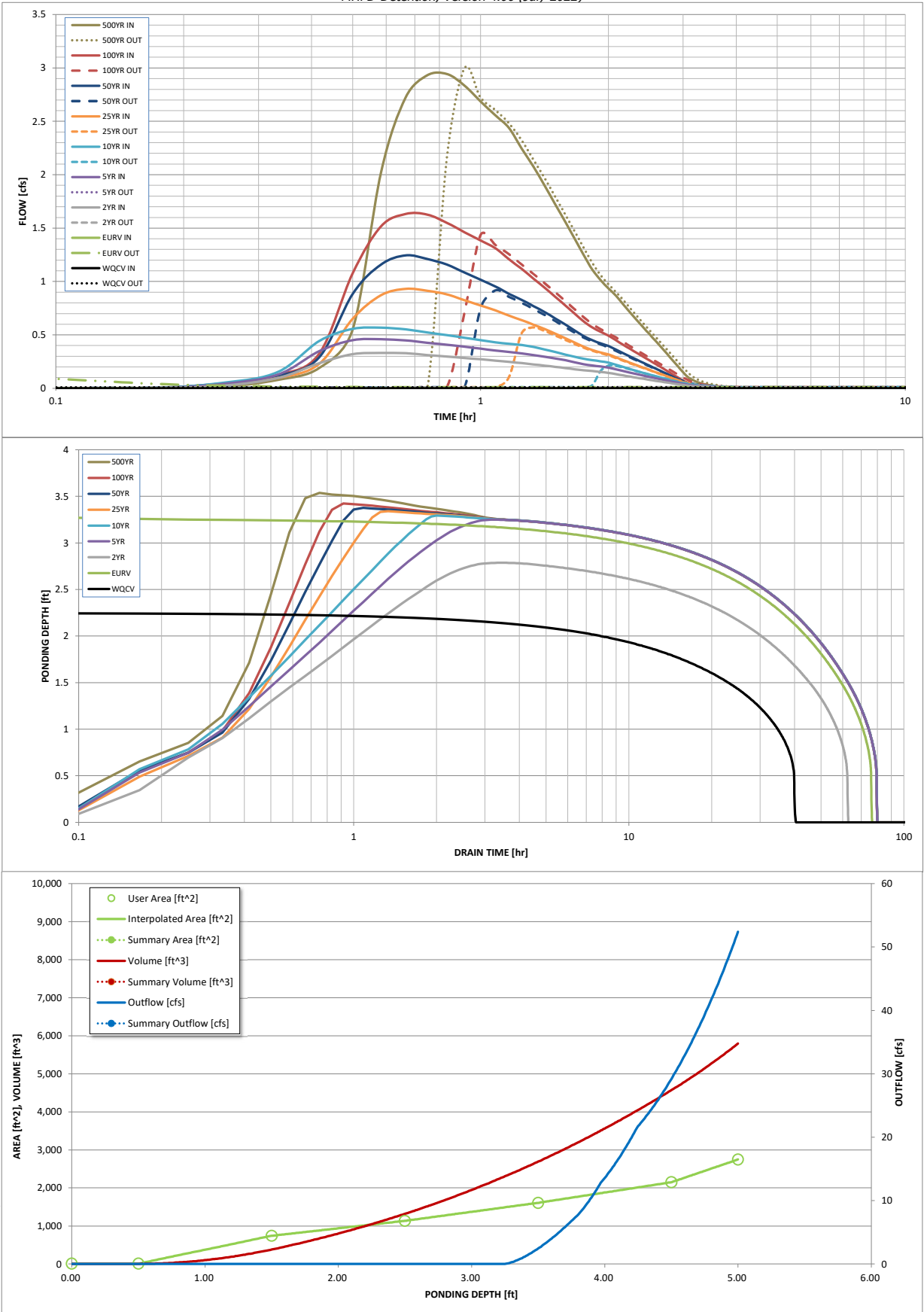
Routed Hydrograph Results

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	3.49
One-Hour Rainfall Depth (in) =	0.024	0.058	0.041	0.056	0.069	0.099	0.128	0.166	0.299
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.041	0.056	0.069	0.099	0.128	0.166	0.299
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.0	0.0	0.2	0.5	0.8	1.8
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.12	0.25	0.41	0.97
Peak Inflow Q (cfs) =	N/A	N/A	0.3	0.5	0.6	0.9	1.2	1.6	2.9
Peak Outflow Q (cfs) =	0.0	0.6	0.0	0.0	0.2	0.6	0.9	1.4	3.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	8.6	2.5	2.0	1.9	1.7
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	0.20	N/A	0.0	0.0	0.1	0.2	0.2	0.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	72	60	76	75	73	72	69	62
Time to Drain 99% of Inflow Volume (hours) =	40	75	62	78	78	77	77	76	73
Maximum Ponding Depth (ft) =	2.25	3.40	2.79	3.25	3.29	3.34	3.38	3.42	3.54
Area at Maximum Ponding Depth (acres) =	0.02	0.04	0.03	0.03	0.03	0.04	0.04	0.04	0.04
Maximum Volume Stored (acre-ft) =	0.024	0.058	0.038	0.053	0.054	0.056	0.057	0.059	0.063

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	0:15:00	0.00	0.00	0.03	0.04	0.05	0.04	0.05	0.05	0.08
	0:20:00	0.00	0.00	0.10	0.13	0.15	0.10	0.12	0.12	0.19
	0:25:00	0.00	0.00	0.23	0.35	0.44	0.23	0.29	0.32	0.55
	0:30:00	0.00	0.00	0.32	0.45	0.56	0.65	0.88	1.08	2.03
	0:35:00	0.00	0.00	0.33	0.46	0.57	0.87	1.16	1.52	2.72
	0:40:00	0.00	0.00	0.33	0.45	0.55	0.93	1.24	1.63	2.93
	0:45:00	0.00	0.00	0.31	0.43	0.52	0.91	1.21	1.63	2.94
	0:50:00	0.00	0.00	0.30	0.41	0.50	0.88	1.16	1.55	2.83
	0:55:00	0.00	0.00	0.28	0.39	0.47	0.82	1.08	1.46	2.69
	1:00:00	0.00	0.00	0.27	0.37	0.45	0.78	1.02	1.38	2.56
	1:05:00	0.00	0.00	0.26	0.35	0.43	0.73	0.95	1.31	2.44
	1:10:00	0.00	0.00	0.25	0.34	0.42	0.68	0.88	1.21	2.24
	1:15:00	0.00	0.00	0.24	0.33	0.40	0.64	0.83	1.12	2.07
	1:20:00	0.00	0.00	0.22	0.31	0.39	0.60	0.77	1.03	1.89
	1:25:00	0.00	0.00	0.21	0.29	0.36	0.55	0.71	0.94	1.72
	1:30:00	0.00	0.00	0.20	0.28	0.34	0.51	0.65	0.86	1.56
	1:35:00	0.00	0.00	0.19	0.26	0.32	0.47	0.60	0.78	1.40
	1:40:00	0.00	0.00	0.18	0.24	0.29	0.43	0.54	0.70	1.25
	1:45:00	0.00	0.00	0.17	0.23	0.28	0.39	0.49	0.63	1.11
	1:50:00	0.00	0.00	0.16	0.21	0.26	0.36	0.45	0.57	1.01
	1:55:00	0.00	0.00	0.15	0.20	0.25	0.34	0.42	0.53	0.94
	2:00:00	0.00	0.00	0.14	0.19	0.24	0.32	0.40	0.49	0.87
	2:05:00	0.00	0.00	0.13	0.18	0.22	0.29	0.36	0.45	0.79
	2:10:00	0.00	0.00	0.12	0.16	0.20	0.26	0.33	0.41	0.71
	2:15:00	0.00	0.00	0.11	0.15	0.18	0.24	0.30	0.37	0.64
	2:20:00	0.00	0.00	0.10	0.13	0.16	0.22	0.27	0.33	0.57
	2:25:00	0.00	0.00	0.09	0.12	0.14	0.19	0.24	0.30	0.51
	2:30:00	0.00	0.00	0.08	0.11	0.13	0.17	0.21	0.26	0.44
	2:35:00	0.00	0.00	0.07	0.09	0.11	0.15	0.19	0.23	0.38
	2:40:00	0.00	0.00	0.06	0.08	0.10	0.13	0.16	0.20	0.32
	2:45:00	0.00	0.00	0.05	0.07	0.08	0.11	0.13	0.16	0.26
	2:50:00	0.00	0.00	0.05	0.06	0.07	0.09	0.11	0.13	0.21
	2:55:00	0.00	0.00	0.04	0.05	0.06	0.07	0.09	0.10	0.15
	3:00:00	0.00	0.00	0.03	0.04	0.05	0.06	0.06	0.07	0.10
	3:05:00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.05	0.08
	3:10:00	0.00	0.00	0.02	0.03	0.03	0.03	0.04	0.04	0.06
	3:15:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	3:20:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:25:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:30:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.01	0.02
	3:35:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:40:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:45:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:50:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:55:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.01
	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

FOREBAY VOLUME

$$V = 3\% \times WQCV$$

$$WQCV = 0.024 \text{ ac-ft}$$

$$V = 0.0007 \text{ ac-ft}$$

FOREBAY RELEASE NOTCH WIDTH

$$Q = CLH^{2/3}$$

$$Q_{100} = 5.4 \text{ cfs}$$

$$2\% \text{ of } Q = 0.11 \text{ cfs}$$

$$C = 2.6$$

$$H \text{ (height of forebay wall)} = 1 \text{ ft}$$

$$L = \begin{matrix} 0 \text{ in} \\ 3 \text{ in minimum} \end{matrix}$$

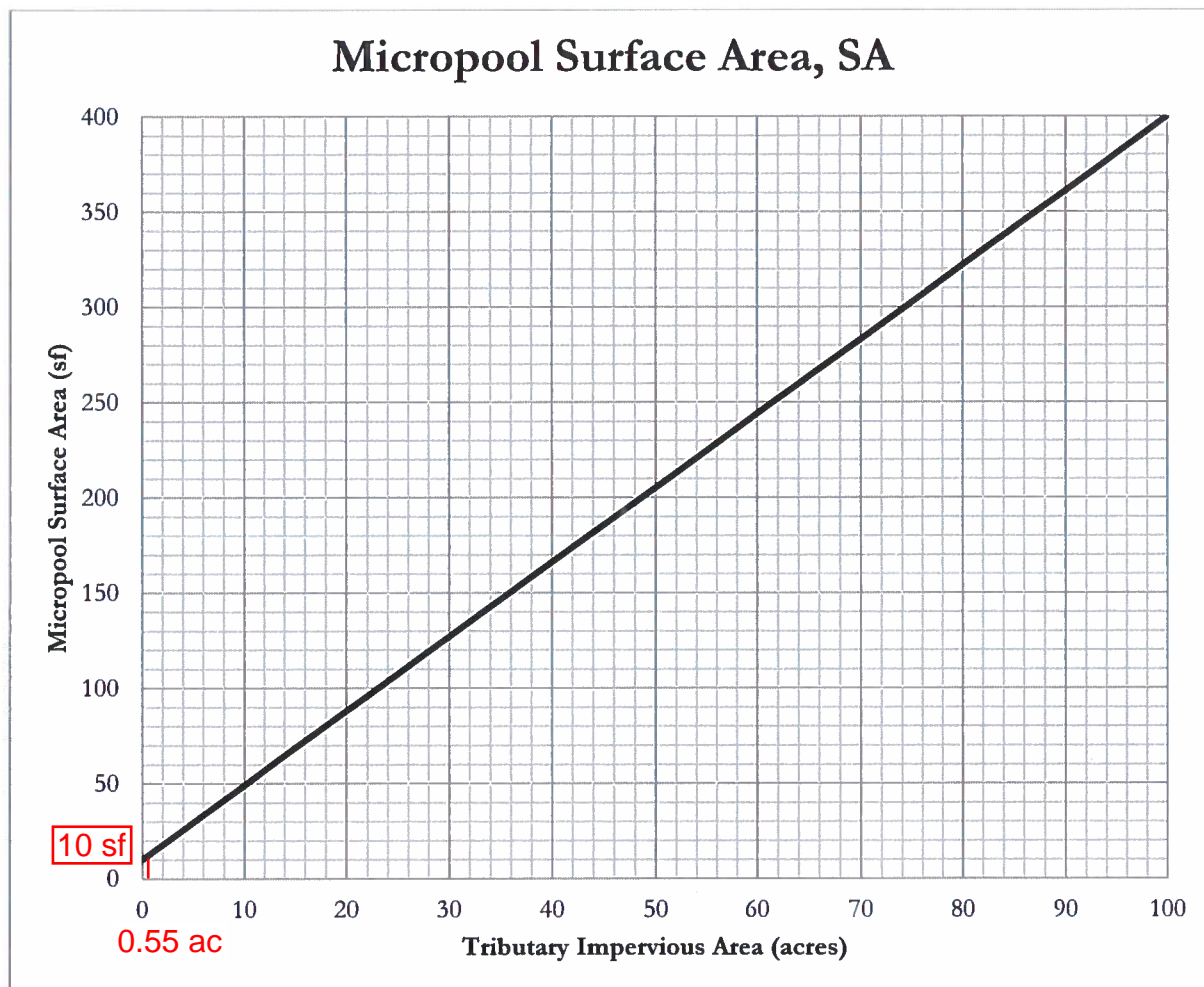


Figure 1 – Micropool surface area (SA) determination chart

The tributary impervious area is the effective number of impervious acres that will be treated by the extended detention basin (EDB). It is calculated by multiplying the tributary area to be treated by the impervious fraction of that area.

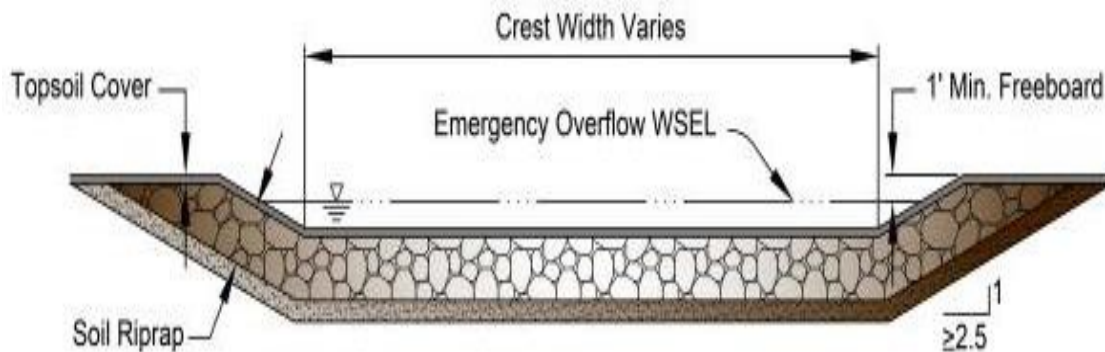
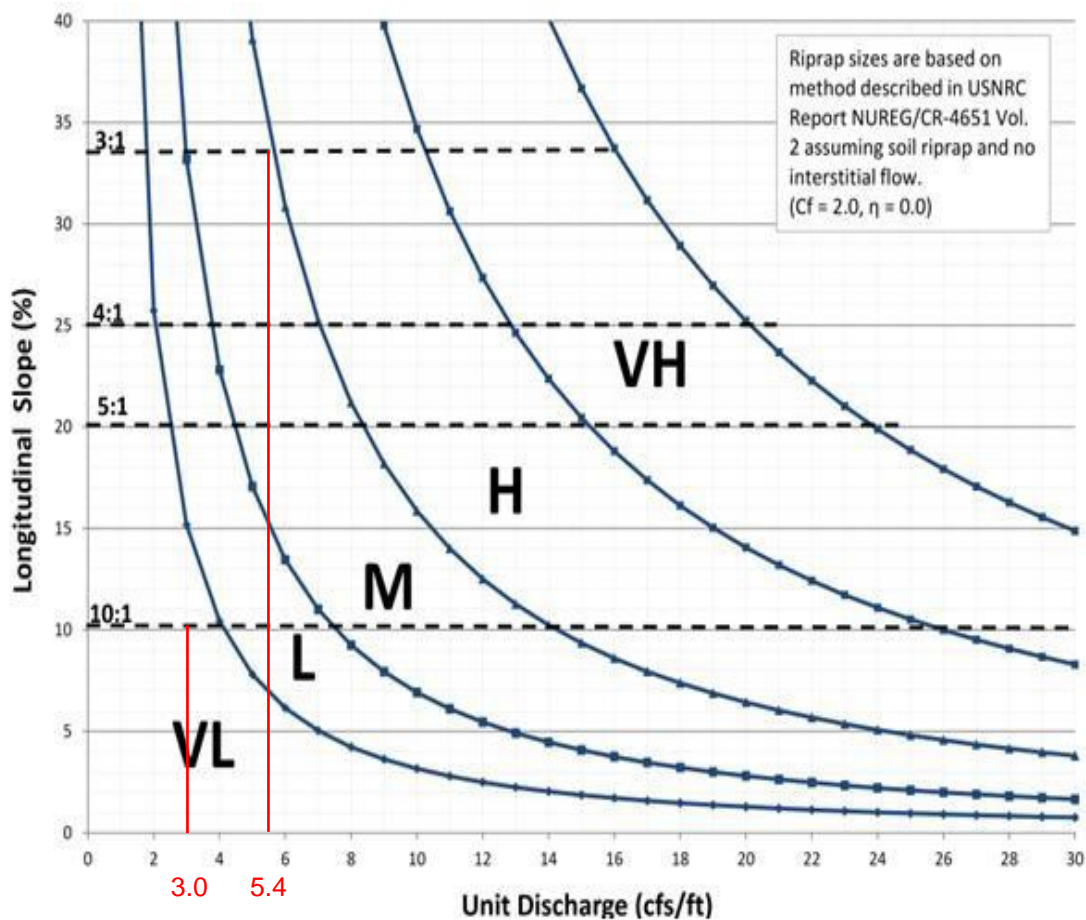
$$TIA = I \times A = (31.5/100) \times 1.76 \text{ ac} = 0.55 \text{ ac}$$

TIA = Tributary impervious area (acres)
 I = Imperviousness (fraction)
 A = Tributary catchment area upstream (acres)

For EDBs with tributary impervious areas greater than 100 acres, the micropool surface area is 400 sf. The initial surcharge depth (ISD) is defined as the depth of the initial surcharge volume (ISV). The surface area determined using Figure 1 assumes an ISD of 4 inches. The initial surcharge volume is thus calculated by multiplying the micropool surface area by 4 inches.

$$ISV = SA \times 4 \text{ inches}$$

ISV = Initial surcharge volume (cf)
 SA = Surface area (from Figure 1, sf)

Figure 13-12c. Emergency Spillway Protection**Figure 13-12d. Riprap Types for Emergency Spillway Protection**

Rundown: 5.4 cfs
Spillway: 3.0 cfs

PROJECT INFORMATION								
PROJECT:	7315 Cole View							
PROJECT NO:	21813-00							
DESIGN BY:	SBN							
REV. BY:	TDM							
AGENCY:	EPC							
REPORT TYPE:	Final							
DATE:	7/16/2024							
Soil Type: A								
				C2*	C5*	C10*	C100*	% IMPERV
Pasture/Meadow/Lawn					0.08		0.35	0
Gravel					0.59		0.70	80
Asphalt/Sidewalk					0.90		0.96	100
Roof					0.73		0.81	90
*C-Values and Basin Imperviousness based on Table 6-6, City of Colorado Springs and El Paso County "Drainage Criteria Manual"								
EXIST. OFFSITE TO AREA INLET								
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV	
		ACRE	C2	C5	C10	C100		
OS1	Pasture/Meadow/Lawn	1.31		0.08		0.35	0	
	Gravel	2.13		0.59		0.70	80	
	Asphalt/Sidewalk	0.83		0.90		0.96	100	
	Roof	0.48		0.73		0.81	90	
	WEIGHTED AVERAGE			0.52		0.66	62%	
TOTAL OS1		4.75						
TOTAL SITE		4.75		0.52		0.66	62.4%	

PROJECT INFORMATION

PROJECT: 7315 Cole View
PROJECT NO: 21813-00
DESIGN BY: SBN
REV. BY: TDM
AGENCY: EPC
REPORT TYPE: Final
DATE: 7/16/2024



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF
OFFSITE TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t _i)				TRAVEL TIME (t _t)					PIPE TRAVEL TIME (t _p)				TIME OF CONC. t _c		FINAL t _c
BASIN	DESIGN PT:	C ₅	C ₁₀₀	AREA	LENGTH	HT	SLOPE	t _i	LENGTH	HT	SLOPE	VEL.	t _t	LENGTH	SLOPE	VEL.	t _p	COMP.	MINIMUM	
				Ac	Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t _c	t _c	Min
OS-1	Area Inlet	0.52	0.66	4.75	100	2	2.0	8.6	745	15	2.0	4.4	2.8					11.5	5	11.5

PROJECT INFORMATION

PROJECT: 7315 Cole View
 PROJECT NO: 21813-00
 DESIGN BY: SBN
 REV. BY: TDM
 AGENCY: EPC
 REPORT TYPE: Final
 DATE: 7/16/2024



Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

OFFSITE		RUNOFF 5 YR STORM			P1=		1.50
		DIRECT RUNOFF					
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1	Inlet	4.75	0.52	11.5	2.46	3.89	9.6

PROJECT INFORMATION

PROJECT: 7315 Cole View
 PROJECT NO: 21813-00
 DESIGN BY: SBN
 REV. BY: TDM
 AGENCY: EPC
 REPORT TYPE: Final
 DATE: 7/16/2024



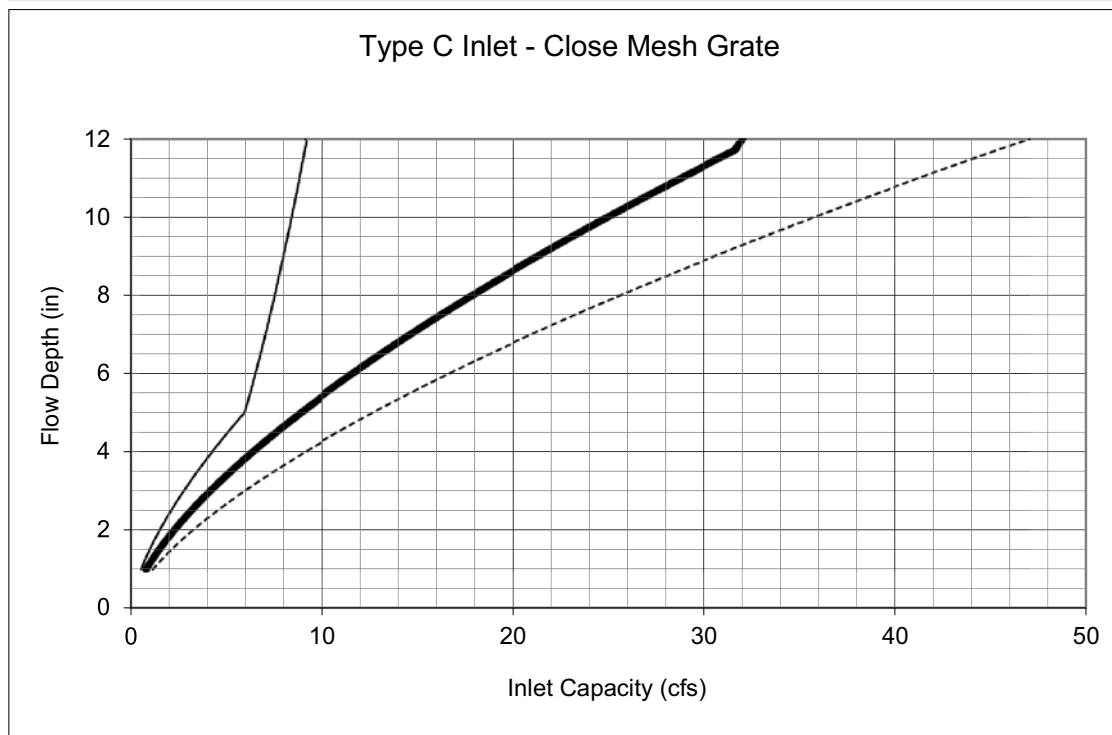
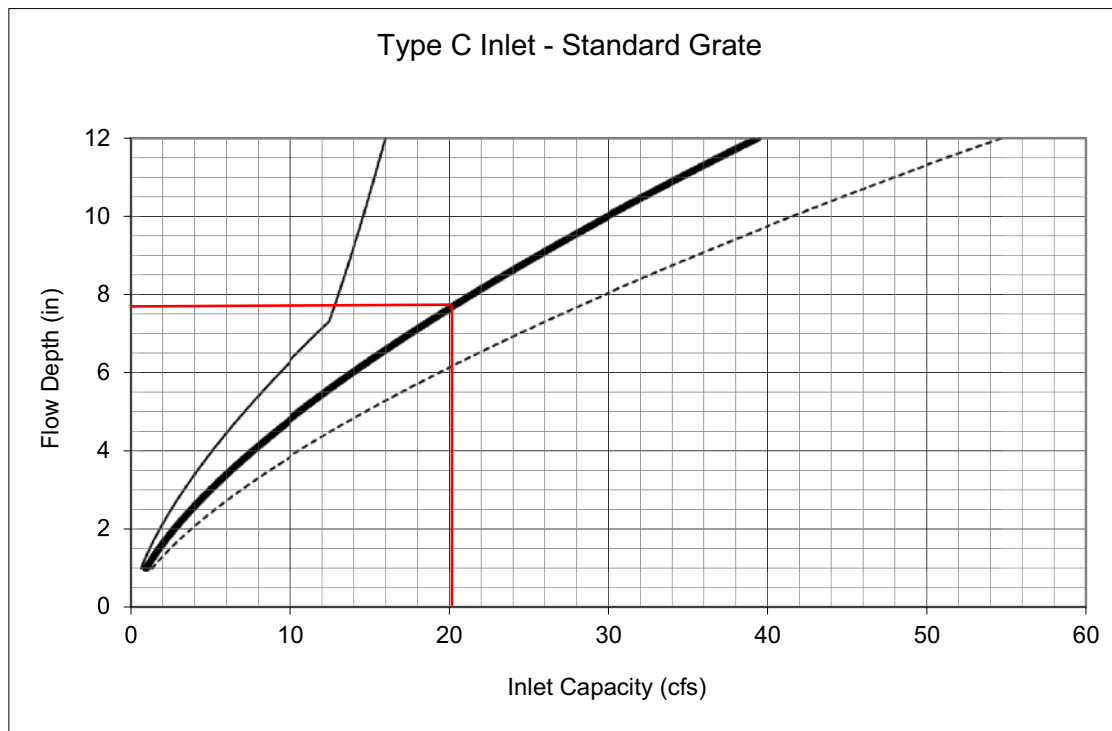
Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

OFFSITE		RUNOFF 100 YR STORM			P1=		
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1	Inlet	4.75	0.66	11.5	3.14	6.53	20.5

Figure 8-10. Inlet Capacity Chart Sump Conditions, Area (Type C) Inlet

Offsite flows to
area inlet:
Q100=20.5 cfs



One Grate
 Two Grates
 Three Grates

Notes:

1. The standard inlet parameters must apply to use these charts.



PREPARED BY:

DREXEL, BARRELL & CO.
Engineers & Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
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BOULDER • COLORADO SPRINGS • GREELEY

CLIENT:

BLACK DIAMOND CABLE

7315 COLE VIEW
COLORADO SPRINGS, CO 80915
CONTACT: RYAN FOSTER
(719) 306-4478

SITE DEVELOPMENT PLAN FOR:
7315 COLE VIEW
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	10/16/23
LATEST ISSUE	7/16/24
DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	21813-000SDR1

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

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

OFFSITE EXHIBIT
TO PROPOSED
AREA INLET

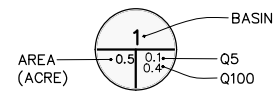
PROJECT NO. 21813-000SCV
DRAWING NO.

EXBT

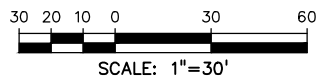
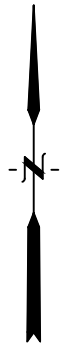
SHEET: 1 OF 1

LEGEND

- EX. MINOR CONTOUR
- EX. MAJOR CONTOUR
- PR. MINOR CONTOUR
- PR. MAJOR CONTOUR
- PROPERTY BOUNDARY
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT



BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1	Area Inlet	4.75	9.6	20.5

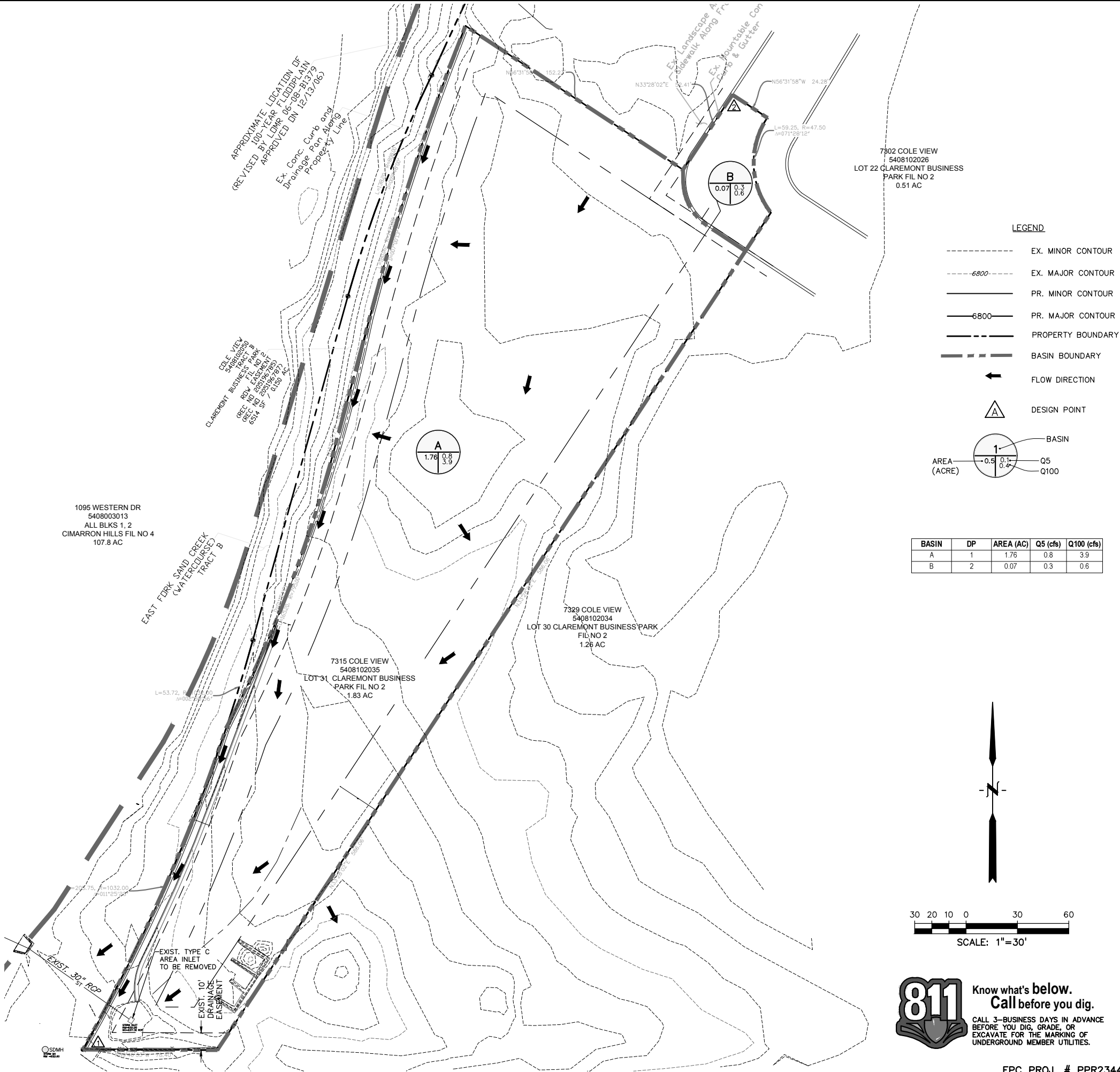


Know what's below.
Call before you dig.

CALL 3-BUSINESS DAYS IN ADVANCE
BEFORE YOU DIG, GRADE, OR
EXCAVATE FOR THE MARKING OF
UNDERGROUND MEMBER UTILITIES.

EPC PROJ. # PPR2344

H:\21813-00\SCV\Reports\Drainage\21813-00EXDR.dwg, 11/28/2023 1:55:44 PM



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CLIENT:

BLACK DIAMOND CABLE

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SITE DEVELOPMENT PLAN FOR:

7315 COLE VIEW

EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	10/16/23
LATEST ISSUE	11/28/23

DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	21813-00EXDR

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

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

HISTORIC CONDITIONS DRAINAGE MAP

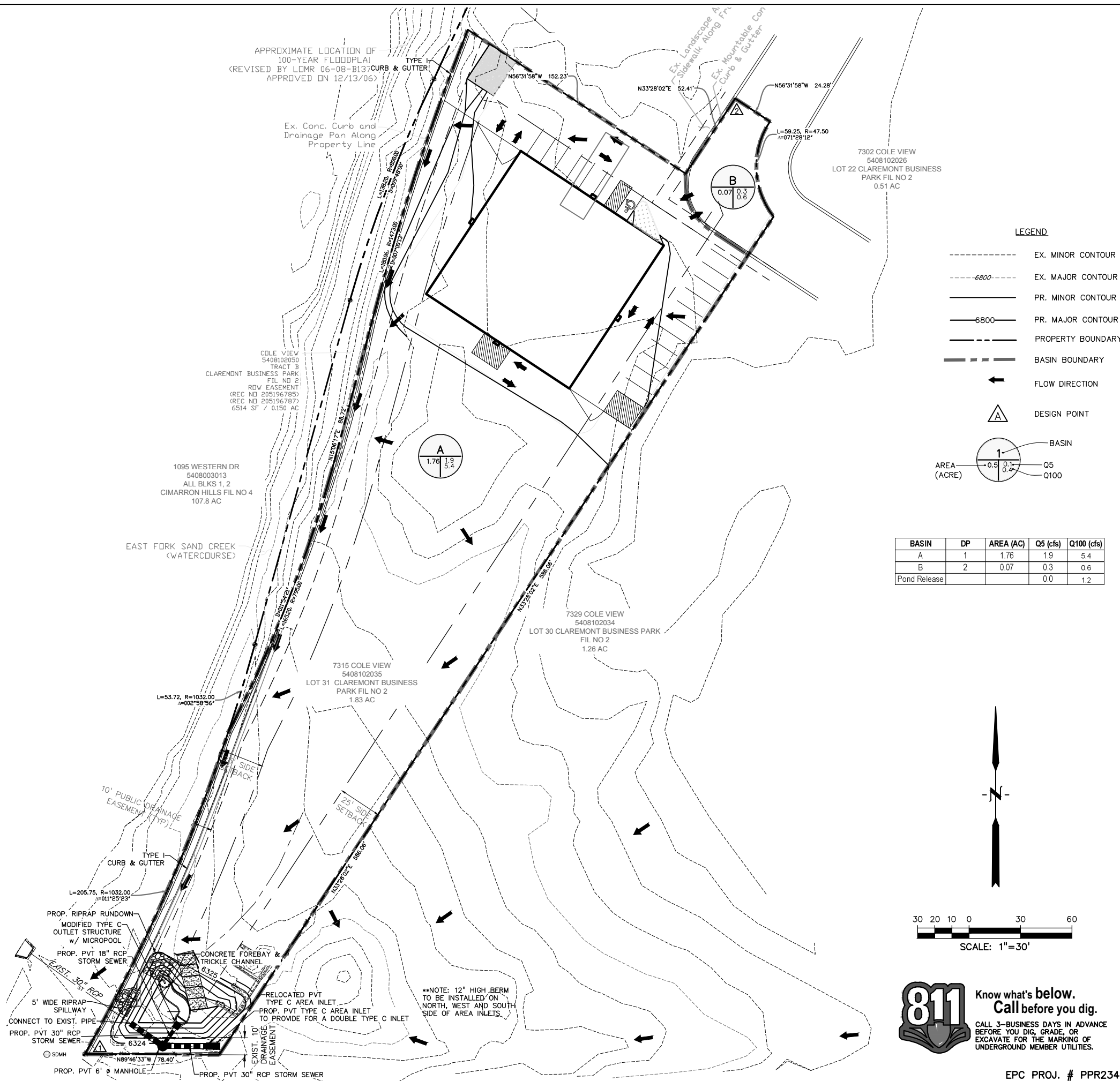
PROJECT NO. 21813-00SCV
DRAWING NO.

DR1

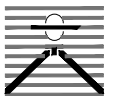
EPC PROJ. # PPR2344

SHEET: 1 OF 2

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SITE DEVELOPMENT PLAN FOR:

7315 COLE VIEW

EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	10/16/23
LATEST ISSUE	7/16/24
DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	21813-00PRDR

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

PROPOSED CONDITIONS DRAINAGE MAP

PROJECT NO. 21813-00CSCV
DRAWING NO.

DR2

EPC PROJ. # PPR2344

SHEET: 2 OF 2