FINAL DRAINAGE REPORT

for

7315 COLE VIEW

7315 Cole View
El Paso County, Colorado

December 2023

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. Sahwatch St. #100
Colorado Springs, CO 80903
Contact: Tim McConnell, P.E.
(719) 260-0887

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APPENDICES

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. Date
Tim D. McConnell, P.E. #33797

Developer's Statement

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

_____

Authorized Signature Date
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.

_____

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

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.

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. 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 were used to calculate the existing 30" pipe. We will assume that the additional 1.2 cfs in the 100-yr storm event is not significant enough to warrant an increase in pipe size. A spillway is located on the west side of the pond for any overflow to reach the 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:

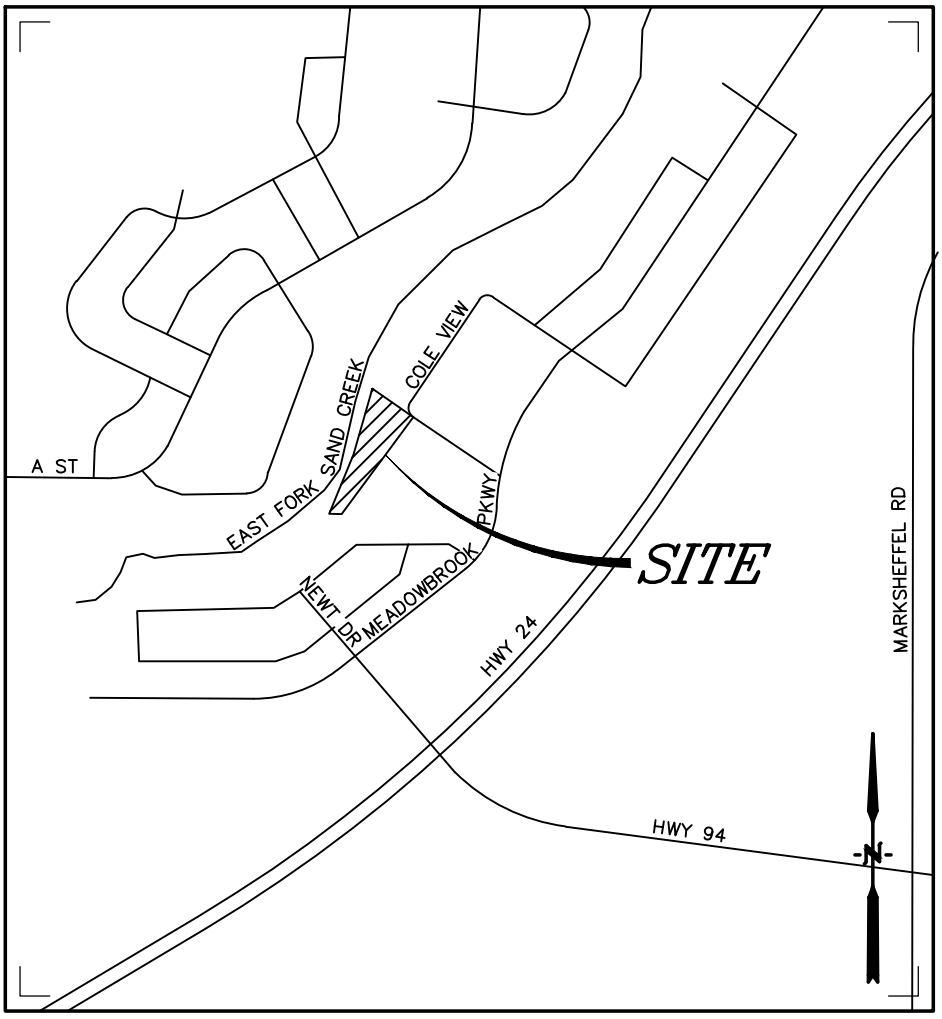
1. El Paso County Drainage Criteria Manual, 10-31-2018.

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:

JOB NO: 21813-00CSCV

DWG. NO. VMAP

SHEET 1 OF 1

Hydrologic Soil Group—El Paso County Area, Colorado

Map Scale: 1:1,060 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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

FEMA

104°41'50"W 38°51'6"N

104°41'12"W 38°50'38"N

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

1:6,000

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
- Area of Undetermined Flood Hazard *Zone D*

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 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

Drexel, Barrell & Co.

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.	MINIMUM	
				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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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING **RUNOFF** **100 YR STORM** **P1=** **2.52**

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
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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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%**

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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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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**

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RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

PROPOSED **RUNOFF** **100 YR STORM** **P1=** **2.52**

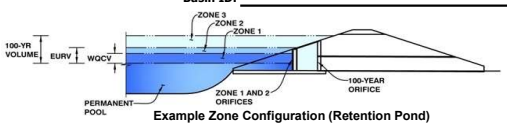
			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
A	1	1.76	0.51	14.0	0.90	6.00	**5.4**
B	2	0.07	0.96	5.0	0.07	8.58	**0.6**

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Cole View

Basin ID:



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	1.83	acres
Watershed Length =	625	ft
Watershed Length to Centroid =	300	ft
Watershed Slope =	0.015	ft/ft
Watershed Imperviousness =	31.50%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.024	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.058	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.041	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.056	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.069	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.099	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.128	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.166	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.49 in.) =	0.299	acre-feet	3.49	inches
Approximate 2-yr Detention Volume =	0.037	acre-feet		
Approximate 5-yr Detention Volume =	0.049	acre-feet		
Approximate 10-yr Detention Volume =	0.061	acre-feet		
Approximate 25-yr Detention Volume =	0.077	acre-feet		
Approximate 50-yr Detention Volume =	0.089	acre-feet		
Approximate 100-yr Detention Volume =	0.107	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.024	acre-feet
Zone 2 Volume (100-year - Zone 1) =	0.083	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.107	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

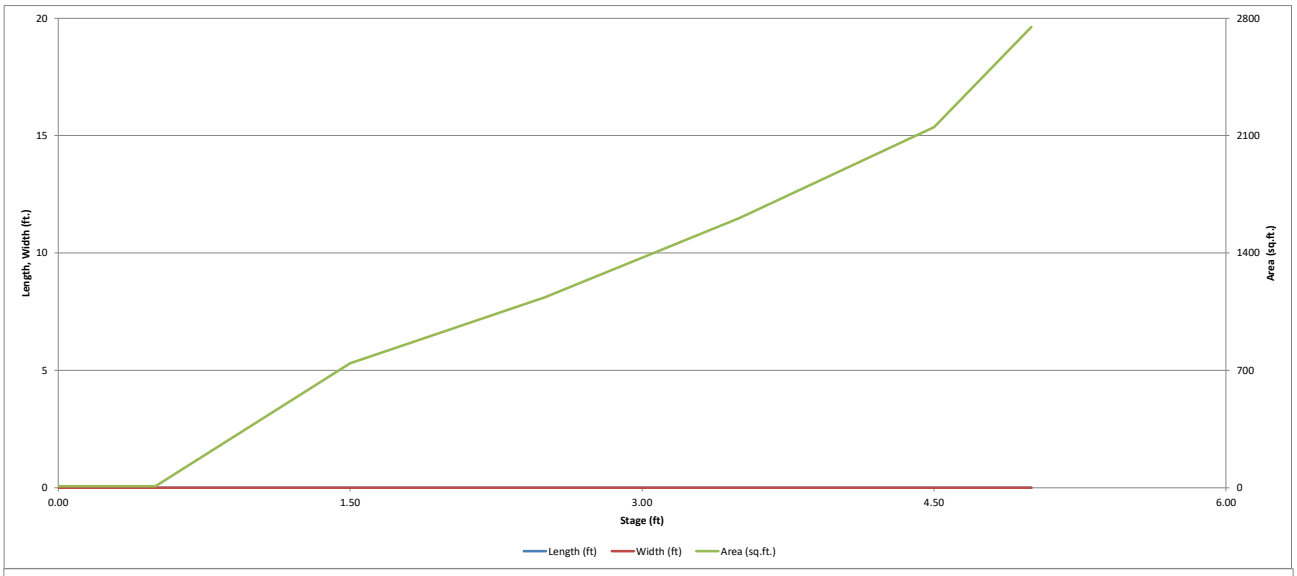
Provide rundown and spillway riprap sizing calcs

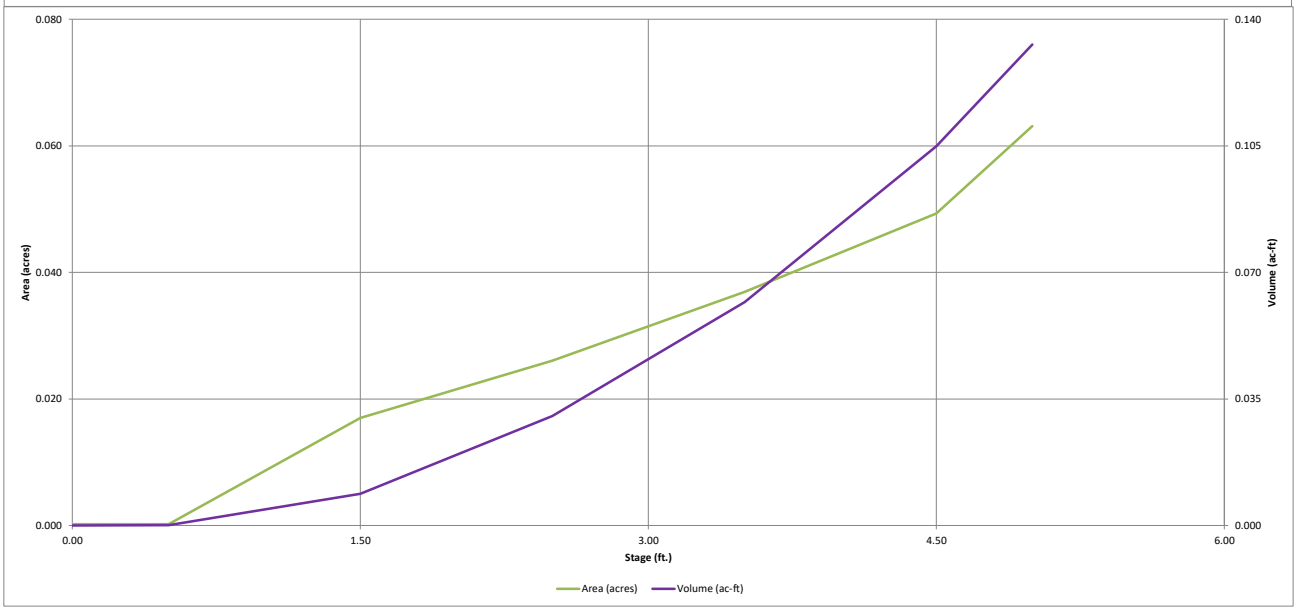
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
6319	--	0.50	--	--	--	10	0.000	5	0.000
6320	--	1.50	--	--	--	742	0.017	381	0.009
6321	--	2.50	--	--	--	1,135	0.026	1,319	0.030
6322	--	3.50	--	--	--	1,609	0.037	2,691	0.062
6323	--	4.50	--	--	--	2,150	0.049	4,571	0.105
6324	--	5.00	--	--	--	2,749	0.063	5,796	0.133

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



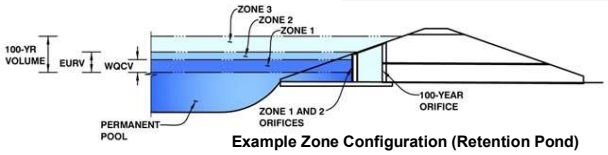


DETENTION BASIN OUTLET STRUCTURE DESIGN

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 =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	2.48	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

3.24 ft per the CDs. Verify

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							
Orifice Area (sq. inches)	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)

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

Calculated Parameters for Vertical Orifice

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

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.24		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.24		feet
Overflow Weir Front Edge Length =	2.92		feet	Overflow Weir Slope Length =	2.92		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	3.36		
Horiz. Length of Weir Sides =	2.92		feet	Overflow Grate Open Area w/o Debris =	5.93		ft²
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	2.97		ft²
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

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

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77		ft²
Circular Orifice Diameter =	18.00		inches	Outlet Orifice Centroid =	0.75		feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.80	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.20 feet
Spillway Crest Length =	5.00	feet	Stage at Top of Freeboard =	5.00 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.06 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.13 acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

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

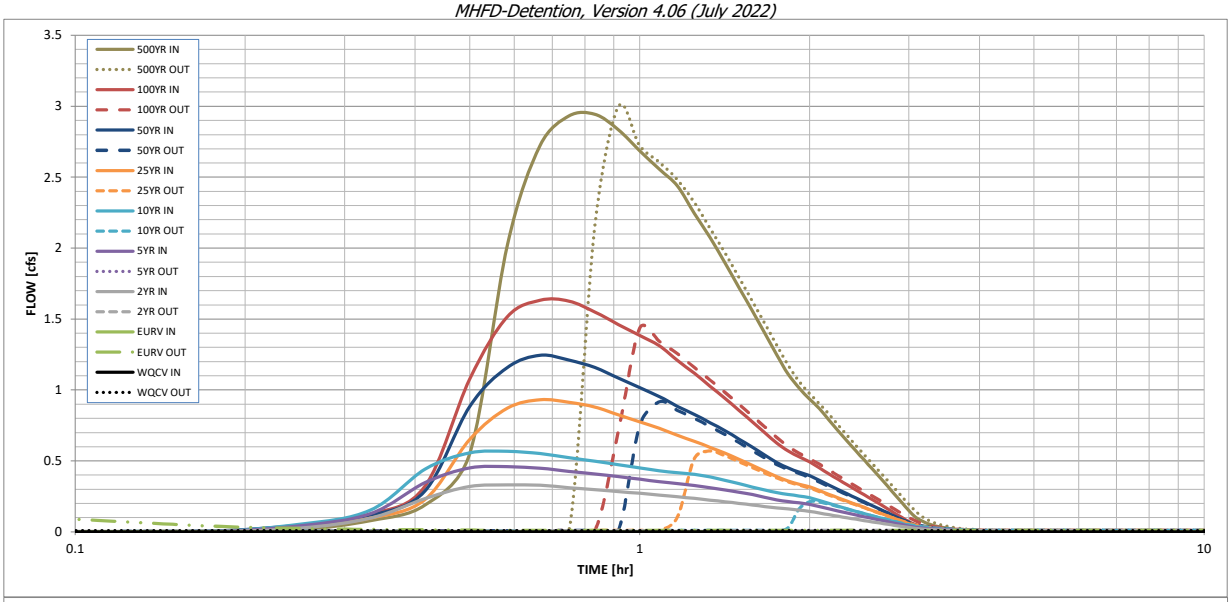
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.024	0.058	0.041	0.056	0.069	0.099	0.128	0.166	0.299
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.041	0.056	0.069	0.099	0.128	0.166	0.299
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.2	0.5	0.8	1.8
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

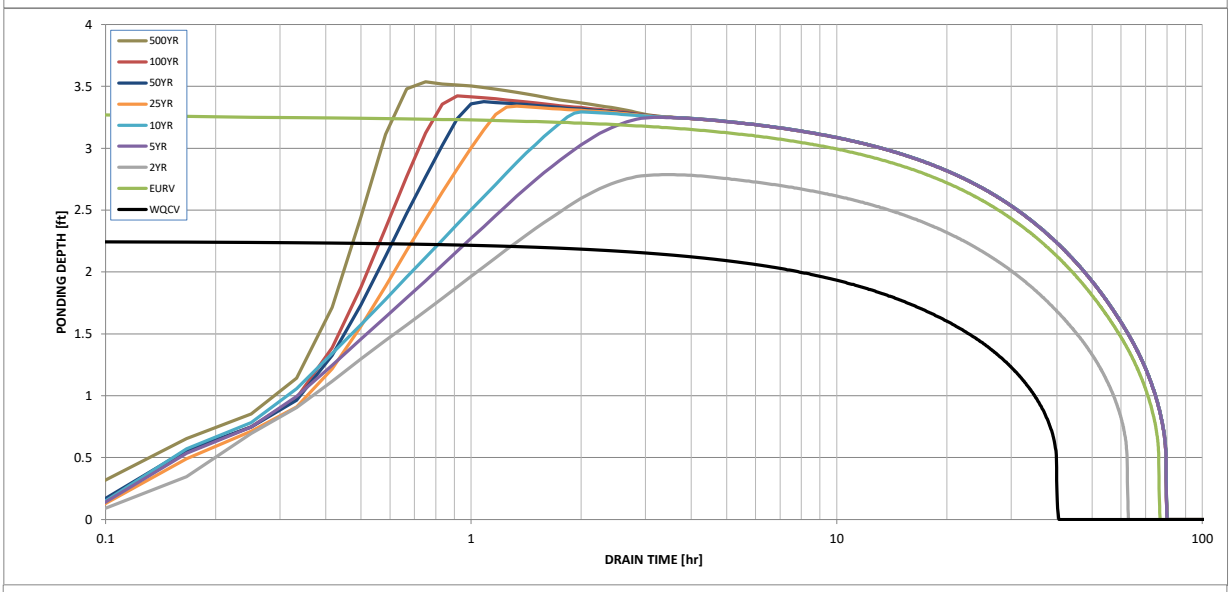
why are these all N/A

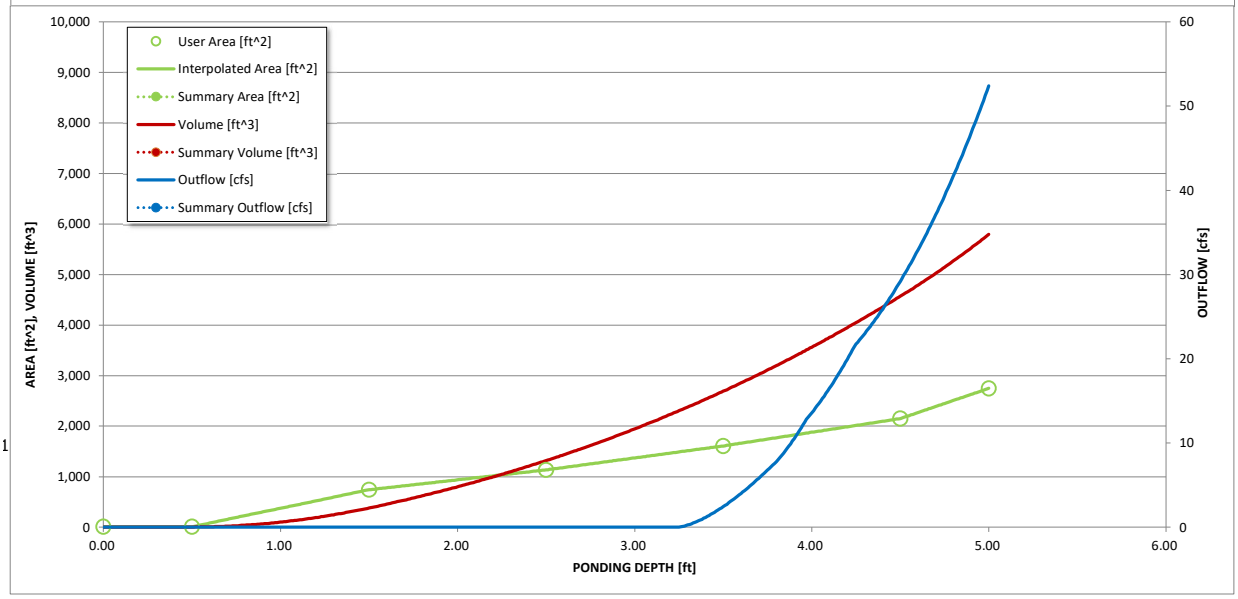
Ratios should be 1.0 except ratio for 100-yr event should be less than or equal to 0.9, per MHFD DCMv2 Chap 12

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% x WQCV

WQCV=	0.024	ac-ft
V=	0.0007	ac-ft

FOREBAY RELEASE NOTCH WIDTH

$Q=CLH^{2/3}$

Q_{100}=	5.4	cfs
2% of Q=	0.11	cfs
C=	2.6	
H (height of forebay wall)=	1	ft
L=	0	in
	3	in minimum

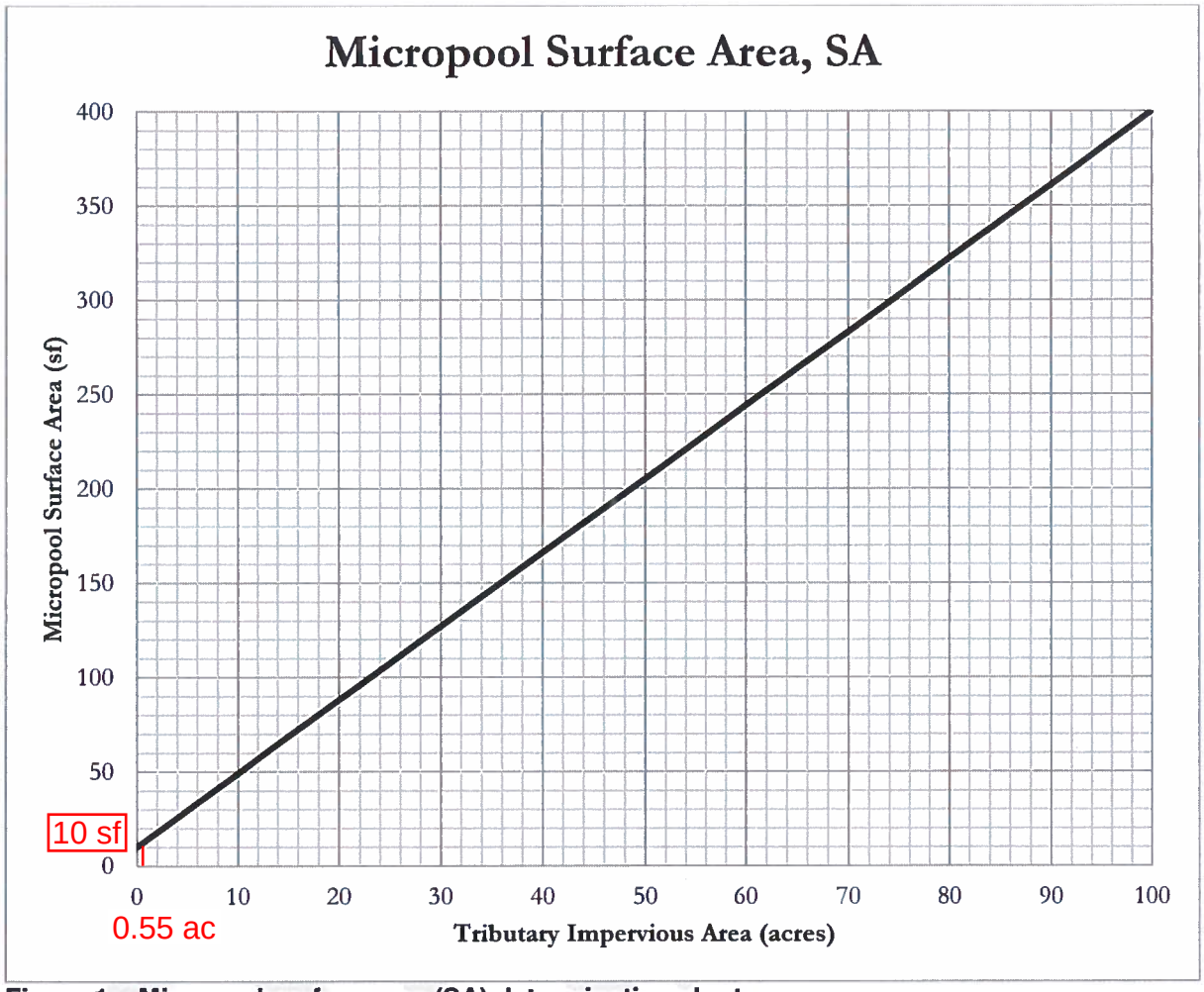


Figure 1 – Micropool surface area (SA) determination chart

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.

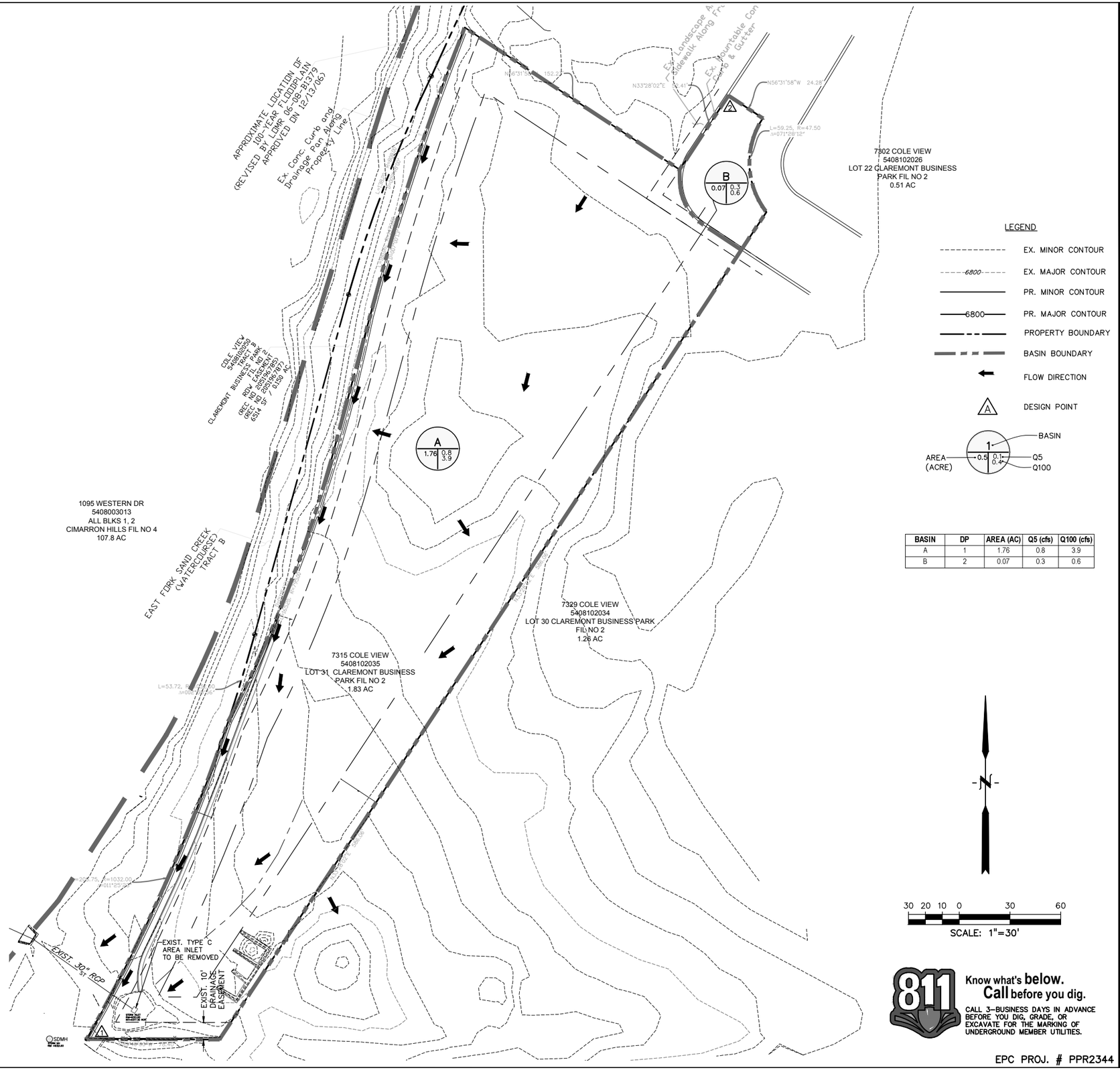
$$TIA = I \times A$$ = (31.5/100) x 1.76 ac = 0.55 ac

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.

$$ISV = SA \times 4\ inches$$

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



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

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

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
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	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. 21813–00CSCV

DRAWING NO.

DR1

SHEET: 1 OF 2

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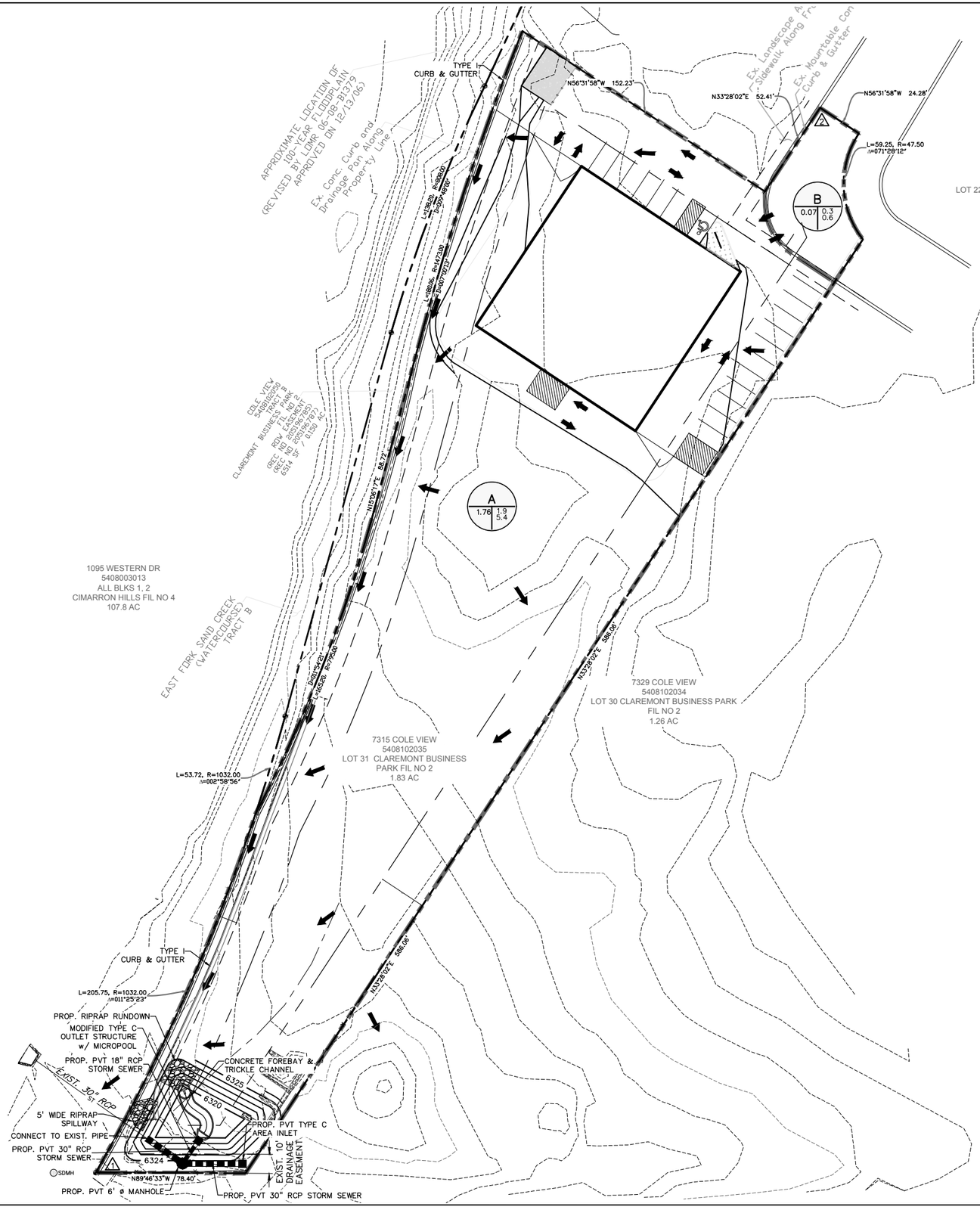

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
A	1	1.76	1.9	5.4
B	2	0.07	0.3	0.6
Pond Release			0.0	1.2

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

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
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	10/12/23

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

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

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

PROPOSED CONDITIONS DRAINAGE MAP

PROJECT NO. 21813-00CSCV

DRAWING NO.

DR2

SHEET: 2 OF 2

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