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WHERE GREAT PLACES BEGIN
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EPC STORMWATER REVIEW COMMENTS IN ORANGE BOXES WITH BLACK TEXT

Final Drainage Report
Lot 1 The Rock Commerce Center
Subdivision Filing No. 1

Prepared for:

Central Development LLC
1660 S Albion St, Suite 200
Denver, CO 80222
(303) 628-0200 voice

Prepared by:

Redland
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Littleton, Colorado 80120
(720) 283-6783 voice
Mark D. Cevaal, P.E.

Add "PCD File No. PPR2329"

July 28, 2023
Project No. 23009.001

Revise signature blocks accordingly.

Signature Page

<u>**Lot 1 of The Rock Commerce Center Subdivision Filing No. 1**</u>

Engineer's Statement

This report and pla
Filing No. 1 was pr
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County Drainage C
understand that th
designed by other
omissions on my p

Design Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable 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.

______________________________ ______________
[Name, P.E. #_________] Date

SIGNATURE (Affix Seal) : ______________________________ 07/28/23
Colorado P.E. No. 33123 Date

Developer's Statemen

18950 Base Camp Ro
Commerce Center Su
this report. I understa
drainage facilities des
El Paso pursuant to th
Center Subdivision Fil
Camp Road, LLC and/
further understand th
design.

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.

______________________________ ______________
[Name, Title] Date
[Business Name]
[Address]

____
Name of Developer

____
Authorized Signature Date

Add El Paso County signature block

____
Printed Name

____
Title

____
Address

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:

Table of Contents

General Location and Description

Introduction

The purpose of this Final Drainage Report is to identify on-site and off-site drainage patterns, storm sewer, inlet locations, areas tributary to the site, and to safely route the developed flows to the proposed full spectrum pond. Analyses for the proposed drainage patterns and requirements for the proposed Lot 1 of The Rock Commerce Center Subdivision Filing No. 1 development, hereafter referred to as the Site, are presented in the appendices of this Report.

Site Location

The Site is located on unplatted land in the Northwest Quarter of Section 11, Township 11 South, Range 67 West of the 6th Principal Meridian, El Paso County, Colorado. The site is bordered on the west side by Monument Hill Road and I-25, Palmer Ridge High School to the north and west, and 18950 Base Camp Road to the south, see Appendix A. The site will have two connections onto Monument Hill Road and one connection to the southeast to Base Camp Road.

The assesor's site shows the lot as being 10 acres. Please revise or discuss how total was determined.

Description of Property

The site encompasses approximately 11.61 acres and is currently undeveloped. Native grasses and weeds currently cover the site with a few small trees. The site generally falls north to south but has a ridge running diagonally from the northwest corner toward Monument Hill Road splitting the site north and south. The northern section of site slopes at about 12% from west to east. The middle of the site slopes at about 4% from the northeast to the southwest. The southern section of site slopes at about 4% from the west to east.

The property is proposed to include a 163,000 SF commercial warehouse/showroom with associated parking, sidewalks, drive aisles, and landscaping. The building will be located in the middle of the site running north to south parallel to Monument Hill Road. The total disturbed area is 12.30 acres.

Discuss amount of disturbed area as it is higher than lot size.

The Site is located within the Crystal Creek Drainage Basin which outfalls to Monument Lake per the *El Paso County Drainage Basin Map (DBMP), prepared by the Board of Commissioners, El Paso County, dated 2005*.

LOI and TIS state 163,800 sf please revise for consistency.

There are no existing irrigation facilities on the Site.

18" on GEC. Confirm

There is an existing 24” storm sewer located near the northwest corner of the site located in a roadside swale next to Monument Hill Road This storm sewer crosses Monument Hill Road and ties into a 42” storm sewer which flows under I-25 to outfall west of I-25. An existing 24” storm sewer is also located near the southwest corner of the site in a roadside swale next to Monument Hill Road The southwest storm sewer conveys flows under Monument Hill Road and outfalls into the I-25 right of way where it then enters another storm sewer that outfalls to the west of I-25.

"C"

Recent revision date is December 18, 2018. Date does not match FEMA attachment included in the appendix.

The property lies within the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel 08041c0276G dated May 5, 2020. Based on a review of the FIRM panel, the Site is located within Flood Zone X which is designated as an area determined to be outside the 0.2% (500-year) annual chance floodplain (see Appendix A).

The NRCS soil survey indicates that the soil on site is primarily Tomah-Crowfoot loamy sands and Tomah-Crowfoot complex, whose hydrologic soil group is Type B. A soil map has been included in the appendix for reference.

Drainage Basins and Subbasins

Existing Major Basin Description

The Site is located within the Crystal Creek Drainage Basin. The Crystal Creek Basin outfalls to Monument Lake. The Site is included in the *Dirty Woman Creek and Crystal Creek Drainage Basin Planning Study, prepared by Kiowa Engineering Corporation, dated September 1993*. The Final Drainage Report for Palmer ridge High School, prepared by Tetra Tech, dated July 3, 2007 also includes a small portion of the site. Both of these previous drainage reports focus primarily on the flows entering and flowing through Crystal Creek. The flows from the site flow west crossing under I-25 before flowing southwest in an undefined channel towards Crystal Creek and eventually Monument Lake.

Existing Subbasin Description

its shown as 18 on DNG-1

The Site currently is made up of three existing basins that are all part of the Crystal Creek Drainage Basin. Basin A is the north basin that is 2.35 acres and drains east to west to an existing 24" storm sewer at Design Point A that eventually outfalls west of I-25. Basin B is the largest existing basin with 7.40 acres flowing northeast to southwest into an existing 24" storm sewer at Design Point B. This existing storm sewer outfalls on the west side of Monument Hill Road where the flow enters another storm sewer to eventually outfall west of I-25. Both Basin A and B flow in an undefined channel on the west side of I-25 to the southwest until eventually making it to Monument Lake. Basin C is the south basin on the site with 1.86 acres flowing east to southwest. The runoff from this basin currently enters a roadside ditch on the east side of Monument Hill Road where it flows south away from the site to eventually enter Crystal Creek. An Existing Conditions Map is included in Appendix E.

There are three existing off-site basins that currently flow onto the site or into the Monument Hill Road swale adjacent to the Site. Basin OSA1 is a west portion of the Palmer Ridge High School that includes the school's west entrance and a detention pond. Basin OSA1 is 0.70 acres and flows northeast to southwest where it enters the existing 24" storm sewer at Design Point A. Basin OSB1 is a southwest portion of the Palmer Ridge High School that includes field, lawn, and parts of the school's track. Basin OSB1 is 0.74 acres and flows east to west on to the Site. The runoff then flows through Basin B until it reaches the existing 24" storm sewer at Design Point B. The largest existing offsite basin is Basin OSC1 at 1.91 acres. Basin OSC1 is the southwest corner of the Palmer Ridge High School and includes field, lawn, and

Provide the minor and major flows for each existing basin.

parts of the school's track. Basin OSC1 flows northeast to southwest flowing through Basin C until it reaches the roadside ditch next to Monument Hill Road.

at design point c?

Drainage Design Criteria

This Report has been prepared in accordance with the *El Paso County Drainage Criteria Manual Volume 1 & 2 October 2018*. Supplemental information is taken from the *Mile High Flood District Urban Storm Drainage Criteria Manual Volumes 1, 2 and 3*.

"or"

Water Quality is required to be provided on the site and the developed 100-year release rate is 90% of the predeveloped flow from the Site. Existing storm sewers are located in the northwest and southwest corners of the site within drainage easements. The outlet of the proposed full spectrum pond is planned to discharge into the existing roadside ditch and enter the existing 24" storm sewer near the southwest of the Site. The full spectrum pond will be designed so the release of the 100-year runoff will be restricted to a release rate equal of less than the predeveloped runoff. It was estimated that the predeveloped 10-year runoff to be 2.1 CFS and the 100-year runoff to be 11.7 CFS. For the purpose of this Report, the 100-year storm event will be released from the pond at a rate equal to or less than 10.6 CFS.

State why 10.6 cfs was chosen as the max release rate.

The hydrologic design was computed using the Rational Method as defined by El Paso County Drainage Criteria Manual. The 10-year storm was used as the minor storm event, while the 100-year storm was used as the major event. The one-hour point rainfall depth used for the 10-year storm was 1.46 inches and 2.52 inches for the 100-year event. The Rational Method was used to analyze fully developed conditions. Hydraulic grade lines were calculated using Haestead's StormCad and are attached in the appendices. On-site detention includes a full spectrum dentition pond with water quality control volume, excess urban runoff volume, and the 100-year flood volume. The 100-year release is required to be less than 10.6 CFS. Inlets were sized using the UD-Inlet_V4.06 spreadsheet. The full spectrum pond was sized using the MHFD-Detention _v4.03 spreadsheet.

The rainfall depth shall be 1.75 inches per the EPC DCM Vol 1 Chapter 6 Table 6-2 please revise.

Runoff/Proposed Basin Description

Major Basins

The Site in its development condition includes 3 primary Basins described as Basins A, B, and C. The Proposed Drainage Map in included in Appendix E. Basin B is the largest basin with 10.58 acres on-site plus an additional 3.88 acres of an off-site basin tributary to it. Basin A has 0.12 acres on-site plus an additional 0.71 acres of an off-site tributary to it. Basin C has 0.11 acres on-site and no off-site basins.

State that Basin B is broken into sub-basins and provide the total number of sub-basins.

Sub-Basins

Basin A1 (0.12 Acres):

Basin A1 represents the northwest edge of the Site and includes the portion of the roadside ditch along Monument Hill Road that is located on the site. Basin A1 is tributary to the existing 24” storm sewer located in the northwest of the Site and discharges under Monument Hill Road and to the west side of I-25. This Basin has an overall imperviousness of 0%.

Explain in the narrative that WQ is not required because of exclusion I.7.1.B.7 (land disturbance to undeveloped land that will remain undeveloped).

C_{10} = 0.06 C_{100} = 0.43

Q_{10} = 0.0 CFS Q_{100} = 0.3 CFS

Basin OSA1 (0.71 Acres)

Basin OSA1 consists of a portion of the Palmer Ridge High School site and the east half section of Monument Hill Road This basin all flows to the road side ditch and is tributary to the northwest existing storm sewer. This Basin has an overall imperviousness of 63%.

C_{10} = 0.52 C_{100} = 0.72

Q_{10} = 1.2 CFS Q_{100} = 3.4 CFS

The combined Basin A 100-year runoff of 3.7 CFS discharges to the existing 24” storm sewer at Design Point A and will not be routed through the proposed full spectrum pond.

Basin B1 (0.12 Acres)

Basin B1 consists of parking lot, sidewalk, and landscape islands located to the west of proposed Building. It will also receive the water from a portion of the roof in basin B16. The grades of this Basin generally slope at 3% and 4%. Runoff will sheet flow to a 2-foot concrete drainage pan where the concentrated flow will be collected in a Single Type 13 Inlet at Design Point 1 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%. Emergency overflow from this Basin will route to the next downstream Sub-basin, B2.

C_{10} = 0.87 C_{100} = 0.90

Q_{10} = 2.1 CFS Q_{100} = 3.8 CFS

Basin B2 (0.49 Acres)

Basin B2 consists of parking lot, sidewalk, and landscape islands located to the west of proposed Building B. It will also receive the water from a portion of the roof in basins B17 and B18. The grades of this Basin generally slope between 3% to 5%. Runoff will sheet flow to a 2-foot concrete drainage pan where the concentrated flow will be collected in a Single Type 13 Inlet at Design Point 2 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 2.1$ CFS $Q_{100} = 3.7$ CFS

Basin B3 (0.36 Acres)

Basin B3 consists of parking lot, sidewalk, and landscape islands located to the west of the proposed building. This basin also includes the north entrance into the site. It will also receive the water from a portion of the roof in basin B19 and the off-site basin OSB7. The grades of this Basin generally slope between 3% to 5%. Runoff will sheet flow away from the proposed building to the curb and gutter on the west side. The concentrated flow will be then be conveyed through a curb chase at Design Point 3 and conveyed to the next downstream basin, B4. This Basin has an overall imperviousness of 100%.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 1.5$ CFS $Q_{100} = 2.7$ CFS

Basin B4 (0.20 Acres)

Basin B4 consists of parking lot, sidewalk, and landscape islands located to the west of the proposed building. It will also receive the water from a portion of the roof in basin B20. The grades of this Basin generally slope at 3%. Runoff will sheet flow away from the proposed building to the curb and gutter on the west side. The concentrated flow will be then be conveyed to a 10' Type R Inlet at Design Point 4 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 0.9$ CFS $Q_{100} = 1.6$ CFS

Basin B5 (0.39 Acres)

Basin B5 consists of parking lot, sidewalk, and landscape islands located to the west and south of the proposed building. It will also receive the water from a portion of the roof in basin B21. The grades of this Basin generally slope at 3% and 7%. Runoff will sheet flow away from the proposed building to the curb and gutter on the west side. The concentrated flow will be then be conveyed to a Single Type 13 Combo Inlet at Design Point 5 and conveyed to the proposed Full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%. Emergency overflow from this Basin will overtop of curb and enter the proposed full spectrum pond.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 1.7$ CFS $Q_{100} = 3.0$ CFS

Basin B6 (0.35 Acres)

Basin B6 consists of parking lot, sidewalk, landscape islands, and landscape buffer located to the north of proposed Building. The grades of this Basin generally slope between 3% to 5%. Runoff will sheet flow to a 2-foot concrete drainage pan where the concentrated flow will be collected in a Single Type 13 Inlet at Design Point 6 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 1.5$ CFS $Q_{100} = 2.7$ CFS

Basin B7 (0.36 Acres)

Basin B7 consists of parking lot, sidewalk, landscape islands, and landscape buffer located to the north of proposed Building. The grades of this Basin generally slope between 3% to 5%. Runoff will sheet flow to a 2-foot concrete drainage pan where the concentrated flow will be collected in a Single Type 13 Inlet at Design Point 7 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%. Emergency overflow from this Basin will route to the next downstream Basin, B6.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 1.60$ CFS $Q_{100} = 2.8$ CFS

Basin B8 (1.05 Acres)

Basin B8 consists of loading dock and landscape islands located to the east of proposed Building. It will also receive the water from a portion of the roof in basin B22. The grades of this Basin generally slope between 3% to 5%. Runoff will sheet flow to a 10-foot concrete drainage pan where the concentrated flow will be collected in a Triple Type 13 Inlet at Design Point 8 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%.

C_{10} = 0.87 C_{100} = 0.90

Q_{10} = 4.5 CFS Q_{100} = 8.0 CFS

Basin B9 (0.69 Acres)

Basin B9 consists of loading dock and landscape islands located to the east of proposed Building. It will also receive the water from a portion of the roof in basin B23. The grades of this Basin generally slope between 3% to 5%. Runoff will sheet flow to a 10-foot concrete drainage pan where the concentrated flow will be collected in a on grade Single Type 13 Inlet at Design Point 9 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%. Emergency overflow from this Basin will route to the next downstream Basin, B10.

C_{10} = 0.87 C_{100} = 0.90

Q_{10} = 3.0 CFS Q_{100} = 5.3 CFS

Basin B10 (0.54 Acres)

Basin B10 consists of loading dock located to the east of proposed Building. It will also receive the water from the offsite basin OSB1 and a portion of the roof in basin B24. The grades of this Basin generally slope between 3% to 5%. Runoff will sheet flow to a 10-foot concrete drainage pan where the concentrated flow will be collected in a Triple Type 13 Inlet at Design Point 10 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%.

C_{10} = 0.87 C_{100} = 0.90

Q_{10}= 2.3 CFS Q_{100} = 4.2 CFS

Basin B11 (0.35 Acres)

Basin B11 consists of loading dock and landscape islands located to the east of proposed Building. It will also receive the water from the off-site basin OSB2 and a portion of the roof in basin B25. The grades of this Basin generally slope between 3% to 5%. Runoff will sheet flow to a curb and gutter on the west side of the drive aisle where the concentrated flow will be collected in a 5' Type R Inlet at Design Point 11 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 1.5$ CFS $Q_{100} = 2.7$ CFS

Basin B12 (0.80 Acres)

Basin B12 consists of loading dock located to the east of proposed Building. It will also receive the water from the off-site basin OSB3 and a portion of the roof in basin B26. The grades of this Basin generally slope between 3% to 5%. Runoff will sheet flow to a curb and gutter on the east side of the drive aisle where the concentrated flow will be collected in an on-grade Triple Type 13 Combo Inlet at Design Point 12 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%. Emergency overflow from this Basin will route to the next downstream Basin, B13.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 3.4$ CFS $Q_{100} = 6.0$ CFS

Basin B13 (0.44 Acres)

Basin B13 consists of loading dock and landscaping located to the east and south of proposed Building. It will also receive the water from the off-site basin OSB4 and a portion of the roof in basin B27. The grades of this Basin generally slope between 3% to 7%. Runoff will sheet flow to a curb and gutter on the west side of the drive aisle where the concentrated flow will be collected in a 10' Type R Inlet at Design Point 13 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%. Emergency overflow from this Basin will route to the next downstream Basin, B14.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 1.9$ CFS $Q_{100} = 3.4$ CFS

Basin B14 (0.09 Acres)

Basin B14 consists of drive aisle and landscape islands located to the south of proposed Building. The grades of this Basin generally slope between 3% to 7%. Runoff will sheet flow to a curb and gutter where the concentrated flow will be collected in a Single Type 13 Combo Inlet at Design Point 14 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%.

C_{10} = 0.87 C_{100} = 0.90

Q_{10} = 0.4 CFS Q_{100} = 0.7 CFS

Basin B15 (0.16 Acres)

confirm

Basin B15 consists of loading dock and landscape islands located to the east of proposed Building. It will also receive the water from the off-site basin OSB5. The grades of this Basin generally slope between 4% to 8%. Runoff will sheet flow to a curb and gutter on the north side of the entrance drive where the concentrated flow will be collected in a on grade 5’ Type R Inlet at Design Point 15 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 100%.

C_{10} = 0.87 C_{100} = 0.90

Q_{10} = 0.7 CFS Q_{100} = 1.2 CFS

Basin B16 (0.30 Acres)

Basin B16 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to grade through a drainage chase located on the west side of proposed Building into Basin B1. This Basin has an overall imperviousness of 90%.

C_{10} = 0.79 C_{100} = 0.85

Q_{10} = 1.2 CFS Q_{100} = 2.2 CFS

Basin B17 (0.30 Acres)

Basin B17 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to grade through a drainage chase located on the west side of proposed Building into Basin B2. This Basin has an overall imperviousness of 90%.

C_{10} = 0.79 C_{100} = 0.85

Q_{10} = 1.2 CFS Q_{100} = 2.2 CFS

Basin B18 (0.30 Acres)

Basin B18 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to grade through a drainage chase located on the west side of proposed Building into Basin B2. This Basin has an overall imperviousness of 90%.

C_{10} = 0.79 C_{100} = 0.85

Q_{10} = 1.2 CFS Q_{100} = 2.2 CFS

Basin B19 (0.30 Acres)

Basin B19 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to grade through a drainage chase located on the west side of proposed Building into Basin B3. This Basin has an overall imperviousness of 90%.

C_{10} = 0.79 C_{100} = 0.85

Q_{10} = 1.2 CFS Q_{100} = 2.2 CFS

Basin B20 (0.30 Acres)

Basin B20 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to grade through a drainage chase located on the west side of proposed Building into Basin B4. This Basin has an overall imperviousness of 90%.

C_{10} = 0.79 C_{100} = 0.85

Q_{10} = 1.2 CFS Q_{100} = 2.2 CFS

Basin B21 (0.30 Acres)

Basin B21 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to grade through a drainage chase located on the west side of proposed Building into Basin B5. This Basin has an overall imperviousness of 90%.

C_{10} = 0.79 C_{100} = 0.85

Q_{10} = 1.2 CFS Q_{100} = 2.2 CFS

Basin B22 (0.42 Acres)

Basin B22 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to the east side of proposed Building into Basin B8. This Basin has an overall imperviousness of 90%.

$C_{10} = 0.79$ $C_{100} = 0.85$

$Q_{10} = 1.6$ CFS $Q_{100} = 3.0$ CFS

Basin B23 (0.36 Acres)

Basin B23 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to the east side of proposed Building into Basin B9. This Basin has an overall imperviousness of 90%.

$C_{10} = 0.79$ $C_{100} = 0.85$

$Q_{10} = 1.4$ CFS $Q_{100} = 2.6$ CFS

Basin B24 (0.30 Acres)

Basin B24 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to the east side of proposed Building into Basin B10. This Basin has an overall imperviousness of 90%.

$C_{10} = 0.79$ $C_{100} = 0.85$

$Q_{10} = 1.2$ CFS $Q_{100} = 2.2$ CFS

Basin B25 (0.30 Acres)

Basin B25 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to the east side of proposed Building into Basin B11. This Basin has an overall imperviousness of 90%.

$C_{10} = 0.79$ $C_{100} = 0.85$

$Q_{10} = 1.2$ CFS $Q_{100} = 2.2$ CFS

Basin B26 (0.30 Acres)

Basin B26 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to the east side of proposed Building into Basin B12. This Basin has an overall imperviousness of 90%.

C_{10} = 0.79 C_{100} = 0.85

Q_{10} = 1.2 CFS Q_{100} = 2.2 CFS

Basin B27 (0.30 Acres)

Basin B27 consists of a portion of the proposed roof. The slope of the rooftop is 2.5% and runoff will sheet flow to a roof drain. Runoff will then discharge to the east side of proposed Building into Basin B13. This Basin has an overall imperviousness of 90%.

C_{10} = 0.79 C_{100} = 0.85

Q_{10} = 1.2 CFS Q_{100} = 2.2 CFS

Basin B28 (0.06 Acres)

Basin B28 consists of a portion of the roadside ditch next to Monument Hill Road that is on site. The grades of this Basin generally slope between 4% to 15%. Runoff will sheet flow to roadside ditch where the concentrated flow will be conveyed under the north entrance to the south half of the roadside ditch via an 18" culvert at design point RC1. This Basin it not tributary to the proposed full spectrum pond. This Basin has an overall imperviousness of 0%.

Explain in the narrative that WQ is not required because of possible exclusion I.7.1.C.1 (which allows for 20% not to exceed 1 acre of the applicable development site area to not be captured)

C_{10} = 0.06 C_{100} = 0.43

Q_{10} = 0.0 CFS Q_{100} = 0.2 CFS

Basin B29 (0.37 Acres)

Basin B29 consists of a portion of the roadside ditch next to Monument Hill Road and landscaping. The grades of this Basin generally slope between 4% to 33%. Runoff will sheet flow to the Monument Hill Road roadside ditch where the concentrated flow will be collected by the existing southwest 24" storm sewer at design point B. It will then be conveyed to the west side of I-25 via the existing storm sewer. This Basin it not tributary to the proposed full spectrum pond. This Basin has an overall imperviousness of 0%.

Explain in the narrative that WQ is not required because of possible exclusion I.7.1.C.1 (which allows for 20% not to exceed 1 acre of the applicable development site area to not be captured)

C_{10} = 0.06 C_{100} = 0.43

Q_{10} = 0.1 CFS Q_{100} = 1.0 CFS

Basin OSB1 (0.08 Acres)

Basin OSB1 consists of lawn and field on the west edge of the Palmer Ridge School Site. The grades of this Basin generally slope between 6% to 8%. Runoff will sheet flow to the southwest onto the site and enter the curb and gutter in basin B10. Where the concentrated flow will be collected in a Triple Type 13 Inlet at Design Point 10 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 0%.

$C_{10} = 0.06$ $C_{100} = 0.43$

$Q_{10} = 0.0$ CFS $Q_{100} = 0.2$ CFS

Basin OSB2 (0.34 Acres)

Basin OSB2 consists of lawn, field, and a portion of the school's track on the west edge of the Palmer Ridge School Site. The grades of this Basin generally slope between 1% to 12%. Runoff will sheet flow to the west onto the site and enter the curb and gutter in basin B11. Where the concentrated flow will be collected in a 5' Type R Inlet at Design Point 11 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 0%.

$C_{10} = 0.06$ $C_{100} = 0.43$

$Q_{10} = 0.1$ CFS $Q_{100} = 0.9$ CFS

Basin OSB3 (0.78 Acres)

Basin OSB3 consists of lawn, field, and a portion of the school's track on the west edge of the Palmer Ridge School Site. The grades of this Basin generally slope between 1% to 25%. Runoff will sheet flow to the west onto the site and enter the curb and gutter in basin B12. Where the concentrated flow will be collected in a Triple Type 13 Combo Inlet at Design Point 12 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 0%.

$C_{10} = 0.06$ $C_{100} = 0.43$

$Q_{10} = 0.2$ CFS $Q_{100} = 2.1$ CFS

Basin OSB4 (1.88 Acres)

Basin OSB4 consists of lawn, field, and a portion of the school's track on the west edge of the Palmer Ridge School Site. The grades of this Basin generally slope between 1% to 25%. Runoff will sheet flow to the west onto the site and enter the curb and gutter in basin B13. Where the concentrated flow will be collected in a 10' Type R Inlet at Design Point 13 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 0%.

C_{10} = 0.06 C_{100} = 0.43

Q_{10} = 0.3 CFS Q_{100} = 3.7 CFS

Basin OSB5 (0.07 Acres)

Basin OSB5 consists of landscaping, parking lot, and drive aisle between the site and Case Camp Road to the southeast. The grades of this Basin generally slope between 3% to 7%. Runoff will sheet flow to the northwest onto the site and enter the curb and gutter in basin B15. Where the concentrated flow will be collected in a 5' Type R Inlet at Design Point 15 and conveyed to the proposed full spectrum pond via storm sewer. This Basin has an overall imperviousness of 0%.

C_{10} = 0.50 C_{100} = 0.71

Q_{10} = 0.1 CFS Q_{100} = 0.4 CFS

Basin OSB6 (0.21 Acres)

Basin OSB6 consists of a half section of Monument Hill Road and a portion of the roadside ditch to the west of the site. The grades of this Basin generally slope between 2% to 20%. Runoff will sheet flow to the southeast and enter the roadside ditch. Where the concentrated flow will be conveyed under the north entrance of the site to the south half of the roadside ditch, via an 18" culvert at Design Point RC1. This Basin it not tributary to the proposed full spectrum pond. This Basin has an overall imperviousness of 49%.

Explain in the narrative that WQ is not required because of possible exclusion I.7.1.C.1 (which allows for 20% not to exceed 1 acre of the applicable development site area to not be captured)

C_{10} = 0.40 C_{100} = 0.66

Q_{10} = 0.3 CFS Q_{100} = 1.0 CFS

Basin OSB7 (0.05 Acres)

Basin OSB7 consists of a half section of Monument Hill Road and the north connection to the site. The grades of this Basin generally slope between 2% to 4%. Runoff will sheet flow to the southeast enter the site through the north entrance. The sheet flow will be collected in the curb and gutter in Basin B3. This Basin has an overall imperviousness of 100%.

Explain in the narrative that WQ is not required because of possible exclusion I.7.1.C.1 (which allows for 20% not to exceed 1 acre of the applicable development site area to not be captured)

$C_{10} = 0.86$ $C_{100} = 0.90$

$Q_{10} = 0.2$ CFS $Q_{100} = 0.4$ CFS

Basin OSB8 (0.47 Acres)

Basin OSB8 consists of a half section of Monument Hill Road and a portion of the roadside ditch to the west of the site. The grades of this Basin generally slope between 2% to 33%. Runoff will sheet flow to the southeast and enter the roadside ditch. Where the concentrated flow will be collected by the existing southwest 24" storm sewer at design point B. It will then be conveyed to the west side of I-25 via the existing storm sewer. This Basin it not tributary to the proposed full spectrum pond. This Basin has an overall imperviousness of 49%.

Explain in the narrative that WQ is not required because of possible exclusion I.7.1.C.1 (which allows for 20% not to exceed 1 acre of the applicable development site area to not be captured)

$C_{10} = 0.54$ $C_{100} = 0.73$

$Q_{10} = 0.9$ CFS $Q_{100} = 2.5$ CFS

The combined Basin B 100-year runoff of 76.18 CFS discharges to the proposed full spectrum pond at Design Point O-1 and O-2. Basins B28 and B29 combine with Basins OSB6 and OSB8 in the roadside ditch adjacent to Monument Hill Road to discharge into the existing 24" storm sewer at Design Point B. The previously mentioned basins have a combined 100-year runoff of 3.5 CFS that enters the roadside ditch without being routed through the full spectrum pond. This flow of 3.5 CFS then combines with the 100-year release from the full spectrum pond of 10.5 CFS and enters the 24" existing storm sewer at Design Point B. Since, the full spectrum pond delays the release on the 100-year event, the peak flow at Design Point B is 10.5 CFS.

Basin C1 (0.11 Acres):

Basin C1 represents the southwest edge of the site and includes the south entrance road. Basin C1 will sheet flow south to enter the Monument Hill Road roadside ditch that runs south from the site. This Basin has an overall imperviousness of 100%.

$C_{10} = 0.87$ $C_{100} = 0.90$

$Q_{10} = 0.5$ CFS $Q_{100} = 0.9$ CFS

Explain in the narrative that WQ is not required because of possible exclusion I.7.1.C.1 (which allows for 20% not to exceed 1 acre of the applicable development site area to not be captured)

by this point you are over the 1 acre maximum allowable area for this exclusion. consider splitting the existing roadway out as offsite non disturbance (no WQ needed) and only count the disturbed areas for each basin as part of the exclusion. if this doesn't work, we can look at using runoff reduction and considering the swales separate pervious areas (SPAs). Please feel free to reach out if you have any questions.

The combined Basin C 100-year runoff of 0.9 CFS discharges to the existing roadside ditch next to Monument Hill Road without being routed through the proposed full spectrum pond.

The proposed drainage design will decrease 100-year flows going to the existing storm sewer at Design Point A from 8.3 CFS to 3.7 CFS. It will decrease the 100-year flows entering the roadside ditch next to Monument Hill Road at Design Point C from 7.3 CFS to 0.9 CFS. With the restriction of the outflows from the proposed full spectrum pond, the 100-year flows at Design Point B will decrease from 15.1 CFS to 10.5 CFS. These values and calculations can be found in Appendix B in the Existing and Developed SF Form Tables. The proposed Site will not have an adverse impact on existing downstream conveyance systems.

confirm suitable outfall at I-25. is outlet protection required?

Stormwater Detention and Water Quality Design

will review with next submittal following revisions to the pond calculations

Runoff from the Site will surface flow and be piped to a full spectrum pond located near the southwest corner of the Site. The full spectrum pond has been sized using the MHFD-Detention _v4.03 spreadsheet to meet the El Paso County Drainage Criteria Manual Standards. The full spectrum pond has been sized to provide Water Quality Control Volume (WQCV), Excess Urban Runoff Volume (EURV) and 100-year flood protection for the developed Site. The full spectrum pond has been sized for 11.4 acres with a watershed imperviousness of 85%. The full spectrum pond is approximately 95 feet by 225 feet in size. Runoff enters the full spectrum pond via a forebay at the east end of the pond, Forebay O-1, and an 18" FES at about the midpoint of the south side of the pond. Forebay O-1 notch was calculated at 5.3 inches wide to release at 0.71 CFS. The calculation for Forebay O-1 were made using the UD-BMP v3.07 from Mile High Flood District. The required WQCV is 0.343 ac-ft. The micropool water surface elevation and outlet pipe are at a water surface elevation of 7134.23. The WQCV provided is 0.343 ac-ft at an elevation of 7137.77. The WQCV is drained through an orifice plate that has four 1-3/8" diameter openings spaced 25" apart. The 99% drain time for the WQCV is 40 hours. The EURV storage provided by the full spectrum pond is 0.735 ac-ft at an elevation of 7140.46. The EURV will be drained from the full spectrum pond through the same orifice plate as the WQCV. In the 100-year storm event, runoff overtops the outlet structure and is released through an 18" storm sewer that has a restrictor plate. The restrictor plate will be 8.5 inches above the invert of the 18" pipe. An additional 0.538 ac-ft volume is provided in the full spectrum pond for the release of the 100-year runoff. The 100-year runoff will pond to an elevation of 7141.98 and will discharge a maximum 10.5 CFS into the roadside ditch next to Monument Hill Road The 99% drain time of the 100-year volume is 77 hours. A concrete emergency spillway is provided on the west side of the full spectrum pond. The spillway crest length is 26 feet with an invert elevation of 7142.00. The spillway end slopes are 5H:1V. The emergency spillway discharges into the roadside ditch next to Monument Hill Road The spillway was over sized to allow the flows from offsite to be bypassed over the spillway in the 100-year event. The full spectrum pond calculations are included in Appendix C.

A 10' wide maintenance access road is provided to the outlet structure of the proposed full spectrum pond.

Please revise maintenance access road width. The minimum width is 15 feet.

The County of El Paso requires the UDFCD Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the WQCV, stabilizing drainageways, and implementing long-term source controls. The four steps and how they are implemented into the proposed design is below:

1) Step one is Employ Runoff Reduction Practices.
   - The existing roadside ditch on the west side of the site are being conserved and landscaping islands are being used. With the grades on site, there are no more opportunities to implement Runoff Reduction Practices.

2) Step two is Stabilize Drainage Ways.
   - No stream is located within the vicinity of this project so step three does not apply. Stormwater runoff from the Site is being provided water quality treatment and discharged into a storm sewer system rather than flowing directly into the Monument Hill Road roadside ditch. The Monument Hill Road roadside ditch is located on the west property line. This project will benefit the Monument Hill Road roadside ditch by reducing the amount of sediment tributary to the ditch from the Site and by improving the embankment and running slope of the ditch.

3) Step three is Provide a Water Quality Capture Volume.
   - Water Quality Capture Volume is provided in the full spectrum pond and is released over a period of 40 hours. Which lowers the peak flow at the existing storm sewer in the Monument Hill Road roadside ditch.

4) Step four is Identify Best Management Practices to be used to control industrial and commercial pollutants.
   - All parking, driving aisle, and loading docks drain to the proposed storm sewer system and are discharged into the full spectrum pond. This will remove pollutants from the commercial runoff.

Drainage Fees

The Site will require $23,078 per Impervious Acre for the 2023 Drainage Fee and an additional $1,262 per Impervious Acre for the 2023 Bridge Fee. With 9.6 acres of impervious area, the Site will require a Drainage Fee of $233,664.

Provide a breakdown of fee calculations.

Erosion Control Plan

A Grading and Erosion Control Plan will be submitted to the County for review and approval prior to construction.

Construction Cost Estimate

Storm sewer and water quality are required for the Site. All drainage and detention facilities are private and non-reimbursable. The storm infrastructure includes RCP storm sewer, inlets and manholes. The full spectrum pond includes an outlet structure and spillway. Below is a cost estimate for the private storm facilities and the full spectrum pond.

				UNIT	TOTAL
Strom Sewer		QUANTITY	UNIT	PRICE	COST
	18" RCP (0-8' depth)	1,140	LF	$50.00	$57,017
	24" RCP (0-8' depth)	1,223	LF	$65.00	$79,509
	36" RCP (0-8' depth)	667	LF	$100.00	$66,713
	5' Dia. Manhole	19	EA	$4,500.00	$85,500
	5' Type 'R' Inlet	2	EA	$4,750.00	$9,500
	6' Dia. Manhole	2	EA	$6,000.00	$12,000
	10' Type 'R' Inlet	2	EA	$6,500.00	$13,000
	18" Flared End Section	1	EA	$1,350.00	$1,350
	24" Flared End Section	2	EA	$1,600.00	$3,200
	Type '13' Combination Inlet (Double)	1	EA	$4,750.00	$4,750
	Type '13' Combination Inlet (Triple)	9	EA	$6,500.00	$58,500
	Pond Outlet Structure	1	EA	$15,000.00	$15,000
	Forebay (36" Inlet)	1	EA	$15,000.00	$15,000
				Subtotal	**$421,039**
				15% Contingency	**$63,156**
				TOTAL COST	**$484,195**

Include a cost estimate for Pond with line items for all components (ex: riprap, road base, forebay, trickle channel, outlet structure, outlet pipe, spillway, etc). Input the total value into the FAE form under “Permanent Pond/BMP (provide engineer’s estimate)” in Section 1. The total should not include grading, which is a separate line item in Section 1: “Earthwork.”

Other Government Agency Requirements

The proposed drainage improvements on the Lot 1 of The Rock Commerce Center Sub Filing No. 1 will not require any other agency approval. It is not with the FEMA floodplain so will not require further review or floodplain map revisions. The full spectrum pond’s spillway will not need review by the State Engineer’s office since it is less than 10’ in height at the centerline of the spillway

Conclusion

The proposed drainage improvements on the Lot 1 of The Rock Commerce Center Sub Filing No. 1 will have no adverse effects to the surrounding properties, downstream storm conveyance system, or regional drainage facilities. The Site was designed in compliance with the El Paso County Stormwater Criteria. The Site development proposed is in conformance with the approved land use and zoning. This Report and its findings are in conformance with all pertinent studies related to this site.

Discuss existing conditions of the roadside ditches and existing culverts underneath Monument Hill Road. Provide culvert calculations to verify flow capacity.

References

REFERENCES

1. Drainage Criteria Manual Volumes 1 & 2, El Paso County. October 2018.

2. Mile High and Flood District, Denver, Colorado, Urban Storm Drainage Criteria Manual, Volume 1-3, latest online addition.

3. The El Paso County Drainage Basin Map (DBMP), El Paso County Board of Commissioners, 2005

4. Final Drainage Report for Palmer Ridge High School, Monument, Colorado, Tetra Tech, July 3, 2007

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Appendix A - Vicinity Map, FIRM Map, Soils Map

Provide culvert calculations for proposed culverts.

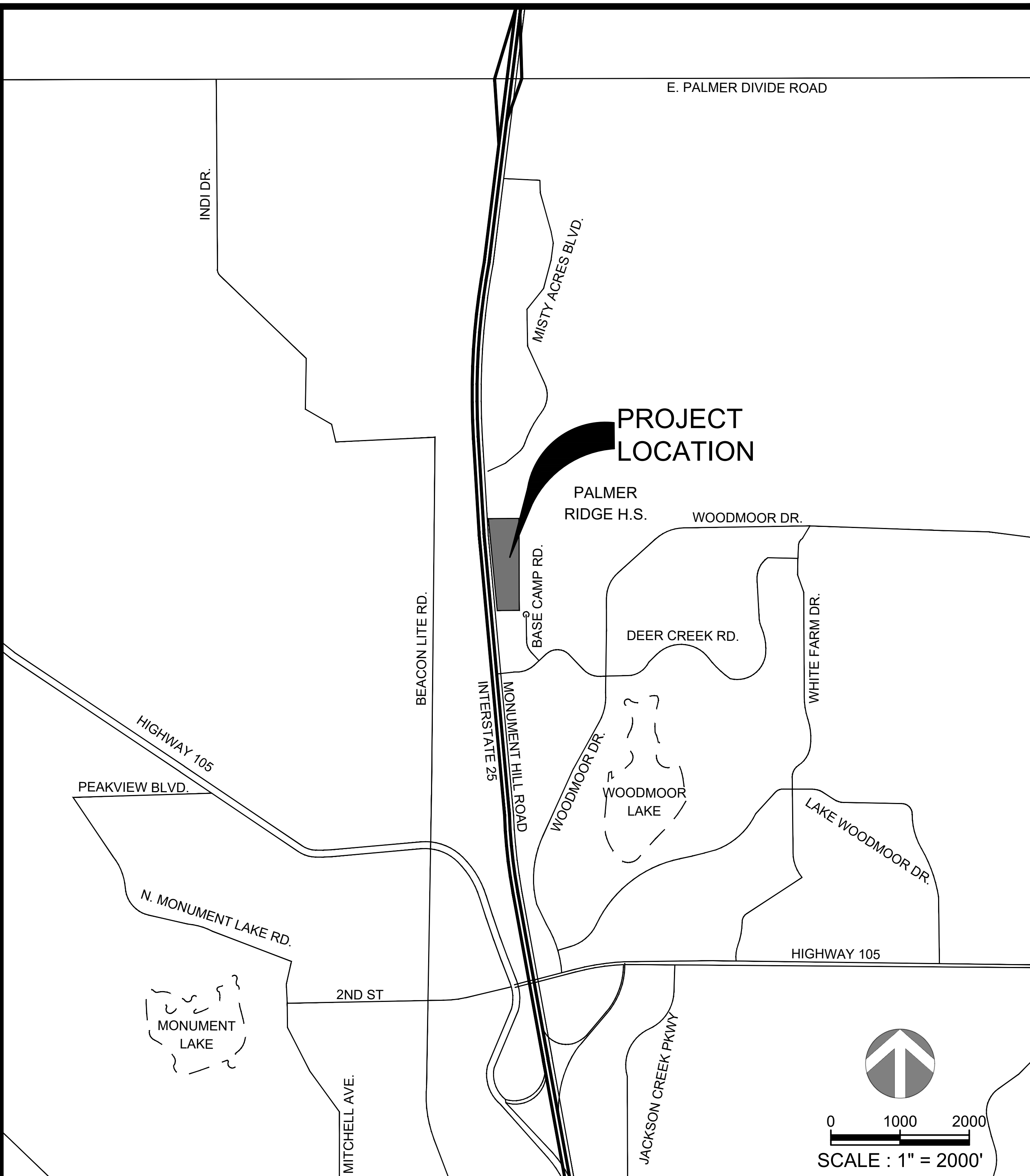
provide inlet/outlet riprap protection calculations for exiting and proposed culverts.

provide spillway riprap sizing. See page 12-33 of MHFD USDCMv2 for riprap sizing chart. And see page 12-23 for design considerations.

Include forebay/riprap outlet protection (and calcs) at DP O-2

provide swale calculations and any necessary protection

provide trickle channel calculations (see MHFD BMP Spreadsheet)



THE ROCK LOT 1 FILING NO. 1

VICINITY MAP
EXHIBIT

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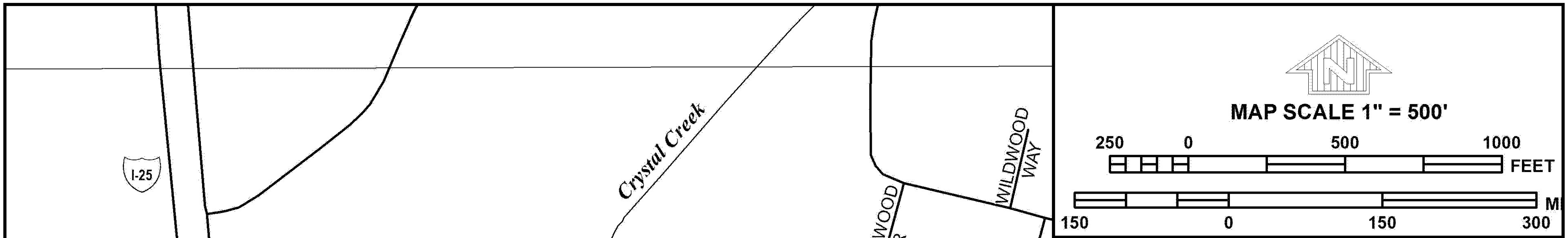
- Civil Engineering
- Landscape Architecture
- Construction Management

PROJECT NO: 23009.001
DATE: 07/28/2023
DRAWING NO: 1 OF 1



NFIP

PANEL 0276G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 276 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0276	G
MONUMENT, TOWN OF	080064	0276	G
PALMER LAKE, TOWN OF	080065	0276	G

Notice: This map was reissued on 05/15/2020 to make a correction.This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

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

MAP NUMBER
08041C0276G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at https://msc.fema.gov.

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 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	13.6	93.8%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	B	0.9	6.2%
Totals for Area of Interest			**14.5**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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Appendix B - Hydrologic Calculation

Peak flows do not add up flows shown on the existing conditions drainage map or pg 34 of 113. Please revise.

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PROJECT NAME: The Rock Commerce Cent DATE: 7/28/2023
PROJECT NUMBER: 23009.000 JURISDICTION: El Paso
CALCULATED BY: CJS
CHECKED BY: MDC

Basin Summary Table - UNDEVELOPED						
		Runoff Coefficients			Peak Flows (cfs)	
Basin	Area (AC)	C_{10}	C_{100}	I (%)	Q_{10}	Q_{100}
A1	2.35	0.06	0.43	0%	0.4	5.1
OSA1	0.75	0.48	0.67	53%	1.3	3.2
B1	7.40	0.00	0.43	0%	0.0	13.4
OSB1	0.74	0.00	0.43	0%	0.0	1.7
C1	1.86	0.00	0.43	0%	0.0	3.8
OSC1	1.91	0.00	0.43	0%	0.0	3.5

Please revise runoff coefficients. The coefficients shown do not match the EPC DCM Vol. 1 Chapter 6 Table 6-6 Runoff Coefficients for B soils in the 10-year storm and 100-year storm.

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STANDARD FORM SF-1 - UNDEVELOPED RUNOFF COEFFICIENTS

PROJECT NAME: The Rock Commerce Center
PROJECT NUMBER: 23009
CALCULATED BY: CJS
CHECKED BY: MDC

DATE: 7/28/2023
JURISDICTION: El Paso

LAND USE:	Drive/Walk	Roof	Lawn			
IMPERVIOUSNESS	100%	90%	0%			

NRCS SOIL TYPE: TYPE B

OVERALL SITE STUDY AREA

DESIGN BASIN	DESIGN POINT	Drive/Walk (AC)	Roof (AC)	Lawn (AC)	(AC)	(AC)	(AC)	TOTAL AREA (AC)	$C_d(2)$	$C_d(5)$	$C_d(10)$	$C_d(100)$	Imp (%)
A1	A	0.00	0.00	2.35				2.35	0.00	0.00	0.06	0.43	0%
OSA1	A	0.40	0.00	0.35				0.75	0.40	0.43	0.48	0.67	53%
BASIN A		0.40		2.71				3.10	0.08	0.09	0.16	0.49	13%
		12.7%		87.3%				100.0%					
B1	B	0.00	0.00	7.40				7.40	0.00	0.00	0.06	0.43	0%
OSB1	B	0.00	0.00	0.74				0.74	0.00	0.00	0.06	0.43	0%
BASIN B				8.14				8.14	0.00	0.00	0.06	0.43	0%
				100.0%				100.0%					
C1	C	0.00	0.00	1.86				1.86	0.00	0.00	0.06	0.43	0%
OSC1	C	0.00	0.00	1.91				1.91	0.00	0.00	0.06	0.43	0%
BASIN C				3.77				3.77	0.00	0.00	0.06	0.43	0%
				100.0%				100.0%					

STANDARD FORM SF-2 - UNDEVELOPED
TIME OF CONCENTRATION

PROJECT NAME: The Rock Commerce Center
PROJECT NUMBER: 23009
CALCULATED BY: CJS
CHECKED BY: MDC

DATE: 7/28/2023
JURISDICTION: El Paso

SUB-BASIN DATA			INITIAL TIME (T_i)			TRAVEL TIME (T_t)						tc CHECK (URBANIZED BASINS)			FINAL Tc	RUNOFF COEFFICIENT	
DESIGN BASIN (1)	AREA (AC) (2)	C_5 (3)	LENGTH* (FT) (4)	SLOPE (%) (5)	T_i (MINUTES) (6)	LENGTH (FT) (7)	SLOPE (%) (8)	C_v (9)	Land Surface (10)	VEL (FPS) (11)	T_t (MINUTES) (12)	COMP. t_c (13)	TOTAL LENGTH (14)	REGIONAL tc (15)	Min. t_c	C_5	C_{100}
A1	2.35		110	5.0%	12	445	5.0%	5.0	Tillage/Field	1.1	6.6	19.0	555	26.3	19.0		0.43
OSA1	0.75	0.43	128	3.5%	9.2	192	4.3%	5.0	Tillage/Field	1.0	3.1	12.3	320	17.2	12.3	0.43	0.67
B1	7.40		197	4.0%	17.8	962	4.4%	5.0	Tillage/Field	1.0	15.3	33.1	1159	26.6	26.6		0.43
OSB1	0.74		100	2.0%	16.0	100	11.0%	5.0	Tillage/Field	1.7	1.0	17.0	200	26.0	17.0		0.43
C1	1.86		155	5.0%	14.7	385	3.3%	5.0	Tillage/Field	0.9	7.1	21.7	540	26.3	21.7		0.43
OSC1	1.91		165	1.0%	25.9	245	7.0%	5.0	Tillage/Field	1.3	3.1	29.0	410	26.1	26.1		0.43

Missing C(5) values

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STANDARD FORM SF-3 - UNDEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 10 YEAR EVENT

PROJECT NAME: The Rock Commerce Center
PROJECT NUMBER: 23009
CALCULATED BY: CJS
CHECKED BY: MDC

P_1 (1-Hour Rainfall) = 1.46

DATE: 7/28/2023
JURISDICTION: El Paso

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF C_{10}	t_c (minutes)	C*A(ac)	I (in/hr)	Q (cfs)	t_c(minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t_t (minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	A	A1	2.4	0.06	19.0	0.1	2.95	0.4													
	A	OSA1	0.8	0.48	12.3	0.4	3.63	1.3													
	B	B1	7.4	0.06	26.6	0.4	2.46	1.0													
	B	OSB1	0.7	0.06	17.0	0.0	3.12	0.1													
	C	C1	1.9	0.06	21.7	0.1	2.75	0.3													
	C	OSC1	1.9	0.06	26.1	0.1	2.48	0.3													

Redland

STANDARD FORM SF-3 - UNDEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: The Rock Commerce Center

PROJECT NUMBER: 23009

CALCULATED BY: CJS

CHECKED BY: MDC

P_1 (1-Hour Rainfall) = 2.52

DATE: 7/28/2023

JURISDICTION: El Paso

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
STORM LINE	DESIGN POINT	DESIGN BASIN	AREA (AC)	RUNOFF COEFF C_{100}	t_c (minutes)	C*A(ac)	I (in/hr)	Q (cfs)	t_c(minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t_t (minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	A	A1	2.4	0.43	19.0	1.0	5.09	5.1													
	A	OSA1	0.8	0.67	12.3	0.5	6.26	3.2													
	B	B1	7.4	0.43	26.6	3.2	4.24	13.4													
	B	OSB1	0.7	0.43	17.0	0.3	5.38	1.7													
	C	C1	1.9	0.43	21.7	0.8	4.74	3.8													
	C	OSC1	1.9	0.43	26.1	0.8	4.28	3.5													

Label as developed conditions.

Redland

PROJECT NAME: The Rock Commerce Cent DATE: 7/26/2023
PROJECT NUMBER: 23009.000 JURISDICTION: El Paso
CALCULATED BY: CJS
CHECKED BY: MDC

Basin Summary Table						
		Runoff Coefficients			Peak Flows (cfs)	
Basin	Area (AC)	C10	C_{100}	I (%)	Q10	Q_{100}
B16	0.30	0.79	0.85	90%	1.2	2.2
B1	0.49	0.87	0.90	100%	2.1	3.8
B17	0.30	0.79	0.85	90%	1.2	2.2
B18	0.30	0.79	0.85	90%	1.2	2.2
B2	0.49	0.87	0.90	100%	2.1	3.7
B19	0.30	0.79	0.85	90%	1.2	2.2
B3	0.36	0.87	0.90	100%	1.5	2.7
B20	0.30	0.79	0.85	90%	1.2	2.2
B4	0.20	0.87	0.90	100%	0.9	1.6
B21	0.30	0.79	0.85	90%	1.2	2.2
B5	0.39	0.87	0.90	100%	1.7	3.0
B27	0.30	0.79	0.85	90%	1.2	2.2
B7	0.36	0.87	0.90	100%	1.6	2.8
B6	0.35	0.87	0.90	100%	1.5	2.7
B8	1.05	0.87	0.90	100%	4.5	8.0
B22	0.42	0.79	0.85	90%	1.6	3.0
B9	0.69	0.87	0.90	100%	3.0	5.3
B23	0.36	0.79	0.85	90%	1.4	2.6
B24	0.30	0.79	0.85	90%	1.2	2.2
B10	0.54	0.87	0.90	100%	2.3	4.2
B25	0.30	0.79	0.85	90%	1.2	2.2
B26	0.30	0.79	0.85	90%	1.2	2.2
B11	0.35	0.87	0.90	100%	1.5	2.7
B12	0.80	0.87	0.90	100%	3.4	6.0
B13	0.44	0.87	0.90	100%	1.9	3.4
B14	0.09	0.87	0.90	100%	0.4	0.7
B15	0.16	0.87	0.90	100%	0.7	1.2
C1	0.11	0.87	0.90	100%	0.5	0.9
A1	0.12	0.06	0.43	0%	0.0	0.3
B28	0.06	0.06	0.43	0%	0.0	0.2
B29	0.37	0.06	0.43	0%	0.1	1.0
OSB1	0.08	0.06	0.43	0%	0.0	0.2
OSB2	0.34	0.06	0.43	0%	0.1	0.9
OSB3	0.78	0.06	0.43	0%	0.2	2.1
OSB4	1.88	0.06	0.43	0%	0.3	3.7
OSA1	0.71	0.52	0.72	63%	1.2	3.4
OSB6	0.21	0.40	0.66	49%	0.3	1.0
OSB7	0.05	0.86	0.90	100%	0.2	0.4
OSB8	0.47	0.54	0.73	65%	0.9	2.5
OSB5	0.07	0.50	0.71	61%	0.1	0.4

Redland

STANDARD FORM SF-1 - DEVELOPED RUNOFF COEFFICIENTS

PROJECT NAME: The Rock Commerce Center
PROJECT NUMBER: 23009
CALCULATED BY: CJS
CHECKED BY: MDC

DATE: 7/26/2023
JURISDICTION: El Paso

Please runoff coefficients from DCM Vol 1. Chapter 6 Table 6-6. Please revise.

LAND USE:	Drive/Walk	Roof	Lawn		
IMPERVIOUSNESS	100%	90%	0%		

NRCS SOIL TYPE: TYPE B

OVERALL SITE STUDY AREA

DESIGN BASIN	DESIGN POINT	Drive/Walk (AC)	Roof (AC)	Lawn (AC)	(AC)	(AC)	TOTAL AREA (AC)	$C_d(2)$	$C_d(5)$	$C_d(10)$	$C_d(100)$	Imp (%)
B16	1	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B1	1	0.49	0.00	0.00			0.49	0.84	0.86	0.87	0.90	100%
B17	2	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B18	2	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B2	2	0.49	0.00	0.00			0.49	0.84	0.86	0.87	0.90	100%
B19	3	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B3	3	0.36	0.00	0.00			0.36	0.84	0.86	0.87	0.90	100%
B20	4	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B4	4	0.20	0.00	0.00			0.20	0.84	0.86	0.87	0.90	100%
B21	5	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B5	5	0.39	0.00	0.00			0.39	0.84	0.86	0.87	0.90	100%
B27	13	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B7	7	0.36	0.00	0.00			0.36	0.84	0.86	0.87	0.90	100%
B6	6	0.35	0.00	0.00			0.35	0.84	0.86	0.87	0.90	100%

Redland

STANDARD FORM SF-1 - DEVELOPED
RUNOFF COEFFICIENTS

PROJECT NAME: The Rock Commerce Center
PROJECT NUMBER: 23009
CALCULATED BY: CJS
CHECKED BY: MDC

DATE: 7/26/2023
JURISDICTION: El Paso

B8	8	1.05	0.00	0.00			1.05	0.84	0.86	0.87	0.90	100%
B22	8	0.00	0.42	0.00			0.42	0.74	0.77	0.79	0.85	90%
B9	9	0.69	0.00	0.00			0.69	0.84	0.86	0.87	0.90	100%
B23	9	0.00	0.36	0.00			0.36	0.74	0.77	0.79	0.85	90%
B24	10	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B10	10	0.54	0.00	0.00			0.54	0.84	0.86	0.87	0.90	100%
B25	11	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B26	12	0.00	0.30	0.00			0.30	0.74	0.77	0.79	0.85	90%
B11	11	0.35	0.00	0.00			0.35	0.84	0.86	0.87	0.90	100%
B12	12	0.80	0.00	0.00			0.80	0.84	0.86	0.87	0.90	100%
B13	13	0.44	0.00	0.00			0.44	0.84	0.86	0.87	0.90	100%
B14	14	0.09	0.00	0.00			0.09	0.84	0.86	0.87	0.90	100%
B15	15	0.16	0.00	0.00			0.16	0.84	0.86	0.87	0.90	100%
C1	C	0.11	0.00	0.00			0.11	0.84	0.86	0.87	0.90	100%
A1	A	0.00	0.00	0.12			0.12	0.00	0.00	0.06	0.43	0%
B28	RC1	0.00	0.00	0.06			0.06	0.00	0.00	0.06	0.43	0%
B29	B	0.00	0.00	0.37			0.37	0.00	0.00	0.06	0.43	0%
OSB1	10	0.00	0.00	0.08			0.08	0.00	0.00	0.06	0.43	0%
OSB2	11	0.00	0.00	0.34			0.34	0.00	0.00	0.06	0.43	0%
OSB3	12	0.00	0.00	0.78			0.78	0.00	0.00	0.06	0.43	0%
OSB4	13	0.00	0.00	1.88			1.88	0.00	0.00	0.06	0.43	0%
OSA1	A	0.45	0.00	0.26			0.71	0.49	0.52	0.57	0.72	63%
OSB6	RC1	0.10	0.00	0.11			0.21	0.37	0.40	0.45	0.66	49%
OSB7	3	0.05	0.00	0.00			0.05	0.84	0.86	0.87	0.90	100%
OSB8	B	0.31	0.00	0.16			0.47	0.51	0.54	0.59	0.73	65%
OSB5	15	0.04	0.00	0.03			0.07	0.47	0.50	0.55	0.71	61%

STANDARD FORM SF-2 - DEVELOPED
TIME OF CONCENTRATION

PROJECT NAME: The Rock Commerce Center
PROJECT NUMBER: 23009
CALCULATED BY: CJS
CHECKED BY: MDC

DATE: 7/26/2023
JURISDICTION: El Paso

SUB-BASIN DATA			INITIAL TIME (T_i)			TRAVEL TIME (T_t)						tc CHECK (URBANIZED BASINS)			FINAL Tc	RUNOFF COEFFICIENT	
DESIGN BASIN (1)	AREA (AC) (2)	C_5 (3)	LENGTH* (FT) (4)	SLOPE (%) (5)	T_i (MINUTES) (6)	LENGTH (FT) (7)	SLOPE (%) (8)	C_v (9)	Land Surface (10)	VEL (FPS) (11)	T_t (MINUTES) (12)	COMP. t_c (13)	TOTAL LENGTH (14)	REGIONAL tc (15)	Min. t_c	C_5	C_{100}
B16	0.30	0.77	50	2.5%	3	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B1	0.49	0.86	77	30.0%	1.2	228	0.8%	20.0	Paved Areas	1.7	2.2	3.4	305	9.3	5.0	0.86	0.90
B17	0.30	0.77	50	2.5%	3.2	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B18	0.30	0.77	50	2.5%	3.2	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B2	0.49	0.86	70	5.0%	2.2	189	75.0%	20.0	Paved Areas	17.3	0.2	2.3	259	9.0	5.0	0.86	0.90
B19	0.30	0.77	50	2.5%	3.2	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B3	0.36	0.86	123	4.0%	3.1	220	1.0%	20.0	Paved Areas	2.0	1.8	4.9	343	9.3	5.0	0.86	0.90
B20	0.30	0.77	50	2.5%	3.2	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B4	0.20	0.86	65	3.0%	2.5	115	1.0%	20.0	Paved Areas	2.0	1.0	3.4	180	9.1	5.0	0.86	0.90
B21	0.30	0.77	50	2.5%	3.2	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B5	0.39	0.86	60	3.0%	2.4	275	3.5%	20.0	Paved Areas	3.7	1.2	3.6	335	9.2	5.0	0.86	0.90
B27	0.30	0.77	50	2.5%	3.2	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B7	0.36	0.86	90	30.0%	1.3	45	1.0%	20.0	Paved Areas	2.0	0.4	1.7	135	9.1	5.0	0.86	0.90
B6	0.35	0.86	90	25.0%	1.4	66	1.0%	20.0	Paved Areas	2.0	0.6	2.0	156	9.1	5.0	0.86	0.90
B8	1.05	0.86	65	33.0%	1.1	324	2.5%	20.0	Paved Areas	3.2	1.7	2.8	389	9.2	5.0	0.86	0.90
B22	0.42	0.77	75	2.0%	4.2	60	2.0%	20.0	Paved Areas	2.8	0.4	4.6	135	10.8	5.0	0.77	0.85
B9	0.69	0.86	150	18.0%	2.1	123	1.2%	20.0	Paved Areas	2.2	0.9	3.0	273	9.1	5.0	0.86	0.90
B23	0.36	0.77	50	2.5%	3.2	90	2.5%	20.0	Paved Areas	3.2	0.5	3.7	140	10.8	5.0	0.77	0.85
B24	0.30	0.77	50	2.5%	3.2	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B10	0.54	0.86	150	18.0%	2.1	150	0.5%	20.0	Paved Areas	1.4	1.8	3.8	300	9.3	5.0	0.86	0.90

Maximum overland length is 100 ft for urban land uses per DCM Vol. 1 Chapter 6 Section 3.2.1. Please revise initial time calculations.

Redland

STANDARD FORM SF-2 - DEVELOPED
TIME OF CONCENTRATION

PROJECT NAME: The Rock Commerce Center
PROJECT NUMBER: 23009
CALCULATED BY: CJS
CHECKED BY: MDC

DATE: 7/26/2023
JURISDICTION: El Paso

SUB-BASIN DATA			INITIAL TIME (T_i)			TRAVEL TIME (T_t)						tc CHECK (URBANIZED BASINS)			FINAL Tc	RUNOFF COEFFICIENT	
DESIGN BASIN (1)	AREA (AC) (2)	C_5 (3)	LENGTH* (FT) (4)	SLOPE (%) (5)	T_i (MINUTES) (6)	LENGTH (FT) (7)	SLOPE (%) (8)	C_v (9)	Land Surface (10)	VEL (FPS) (11)	T_t (MINUTES) (12)	COMP. t_c (13)	TOTAL LENGTH (14)	REGIONAL tc (15)	Min. t_c	C_5	C_{100}
B25	0.30	0.77	50	2.5%	3.2	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B26	0.30	0.77	50	2.5%	3.2	64	2.5%	20.0	Paved Areas	3.2	0.3	3.5	114	10.7	5.0	0.77	0.85
B11	0.35	0.86	110	6.5%	2.5	0	1.0%	20.0	Paved Areas	2.0	0.0	2.5	110	9.0	5.0	0.86	0.90
B12	0.80	0.86	150	3.0%	3.7	240	1.7%	20.0	Paved Areas	2.6	1.5	5.3	390	9.2	5.3	0.86	0.90
B13	0.44	0.86	125	3.0%	3.4	150	4.0%	20.0	Paved Areas	4.0	0.6	4.0	275	9.1	5.0	0.86	0.90
B14	0.09	0.86	85	7.0%	2.1	47	4.2%	20.0	Paved Areas	4.1	0.2	2.3	132	9.0	5.0	0.86	0.90
B15	0.16	0.86	150	650.0%	0.6	55	4.0%	20.0	Paved Areas	4.0	0.2	0.9	205	9.0	5.0	0.86	0.90
C1	0.11	0.86	50	2.5%	2.3	125	2.0%	20.0	Paved Areas	2.8	0.7	3.0	175	9.1	5.0	0.86	0.90
A1	0.12		60	3.3%	10.5	215	3.0%	7.0	Short Pasture/Lawn	1.2	3.0	13.4	275	26.2	13.4		0.43
B28	0.06		40	5.0%	7.5	200	7.5%	7.0	Short Pasture/Lawn	1.9	1.7	9.2	240	26.1	9.2		0.43
B29	0.37		40	5.0%	7.5	470	4.0%	7.0	Short Pasture/Lawn	1.4	5.6	13.1	510	26.3	13.1		0.43
OSB1	0.08		135	7.4%	12.0	30	6.7%	7.0	Short Pasture/Lawn	1.8	0.3	12.3	165	26.0	12.3		0.43
OSB2	0.34		102	3.9%	12.9	60	5.0%	7.0	Short Pasture/Lawn	1.6	0.6	13.6	162	26.0	13.6		0.43
OSB3	0.78		110	7.2%	11.0	55	10.9%	7.0	Short Pasture/Lawn	2.3	0.4	11.4	165	26.0	11.4		0.43
OSB4	1.88		214	2.3%	22.4	70	14.3%	7.0	Short Pasture/Lawn	2.6	0.4	22.8	284	26.0	22.8		0.43
OSA1	0.71	0.52	150	2.5%	9.5	200	3.5%	20.0	Paved Areas	3.7	0.9	10.4	350	15.3	10.4	0.52	0.72
OSB6	0.21	0.40	75	2.5%	8.2	200	7.5%	20.0	Paved Areas	5.5	0.6	8.8	275	17.7	8.8	0.40	0.66
OSB7	0.05	0.86	84	4.0%	2.5	0	1.0%	20.0	Paved Areas	2.0	0.0	2.5	84	9.0	5.0	0.86	0.90
OSB8	0.47	0.54	90	2.5%	7.2	470	4.0%	20.0	Paved Areas	4.0	2.0	9.1	560	15.2	9.1	0.54	0.73
OSB5	0.07	0.50	80	7.0%	5.1	0	1.0%	20.0	Paved Areas	2.0	0.0	5.1	80	15.6	5.1	0.50	0.71

Maximum overland length is 100 ft for urban land uses per DCM Vol. 1 Chapter 6 Section 3.2.1. Please revise initial time calculations.

Redland

STANDARD FORM SF-3 - DEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 10 YEAR EVENT

PROJECT NAME: The Rock Commerce Center
PROJECT NUMBER: 23009
CALCULATED BY: CJS
CHECKED BY: MDC

P_1 (1-Hour Rainfall) = 1.46

DATE: 7/26/2023
JURISDICTION: El Paso

Provide flows for each design point

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF C_{10}	t_c (minutes)	C*A(ac)	I (in/hr)	Q (cfs)	t_c(minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t_t (minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	1	B16	0.3	0.79	5.0	0.2	4.95	1.2													
	1	B1	0.5	0.87	5.0	0.4	4.95	2.1													
	2	B17	0.3	0.79	5.0	0.2	4.95	1.2													
	2	B18	0.3	0.79	5.0	0.2	4.95	1.2													
	2	B2	0.5	0.87	5.0	0.4	4.95	2.1													
	3	B19	0.3	0.79	5.0	0.2	4.95	1.2													
	3	B3	0.4	0.87	5.0	0.3	4.95	1.5													
	4	B20	0.3	0.79	5.0	0.2	4.95	1.2													
	4	B4	0.2	0.87	5.0	0.2	4.95	0.9													
	5	B21	0.3	0.79	5.0	0.2	4.95	1.2													
	5	B5	0.4	0.87	5.0	0.3	4.95	1.7													
	13	B27	0.3	0.79	5.0	0.2	4.95	1.2													
	7	B7	0.4	0.87	5.0	0.3	4.95	1.6													
	6	B6	0.3	0.87	5.0	0.3	4.95	1.5													
	8	B8	1.0	0.87	5.0	0.9	4.95	4.5													
	8	B22	0.4	0.79	5.0	0.3	4.95	1.6													
	9	B9	0.7	0.87	5.0	0.6	4.95	3.0													
	9	B23	0.4	0.79	5.0	0.3	4.95	1.4													
	10	B24	0.3	0.79	5.0	0.2	4.95	1.2													
	10	B10	0.5	0.87	5.0	0.5	4.95	2.3													

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STANDARD FORM SF-3 - DEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 10 YEAR EVENT

PROJECT NAME: The Rock Commerce Center

DATE: 7/26/2023

PROJECT NUMBER: 23009

P_1 (1-Hour Rainfall) = 1.46

JURISDICTION: El Paso

CALCULATED BY: CJS

CHECKED BY: MDC

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF C_{10}	t_c (minutes)	C*A(ac)	I (in/hr)	Q (cfs)	t_c(minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t_t (minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	11	B25	0.3	0.79	5.0	0.2	4.95	1.2													
	12	B26	0.3	0.79	5.0	0.2	4.95	1.2													
	11	B11	0.3	0.87	5.0	0.3	4.95	1.5													
	12	B12	0.8	0.87	5.3	0.7	4.88	3.4													
	13	B13	0.4	0.87	5.0	0.4	4.95	1.9													
	14	B14	0.1	0.87	5.0	0.1	4.95	0.4													
	15	B15	0.2	0.87	5.0	0.1	4.95	0.7													
	C	C1	0.1	0.87	5.0	0.1	4.95	0.5													
	A	A1	0.1	0.06	13.4	0.0	3.49	0.0													
	RC1	B28	0.1	0.06	9.2	0.0	4.08	0.0													
	B	B29	0.4	0.06	13.1	0.0	3.53	0.1													
	10	OSB1	0.1	0.06	12.3	0.0	3.63	0.0													
	11	OSB2	0.3	0.06	13.6	0.0	3.47	0.1													
	12	OSB3	0.8	0.06	11.4	0.0	3.75	0.2													
	13	OSB4	1.9	0.06	22.8	0.1	2.68	0.3													
	A	OSA1	0.7	0.57	10.4	0.4	3.89	1.6													
	RC1	OSB6	0.2	0.45	8.8	0.1	4.14	0.4													
	3	OSB7	0.0	0.87	5.0	0.0	4.95	0.2													
	B	OSB8	0.5	0.59	9.1	0.3	4.09	1.1													
	15	OSB5	0.1	0.55	5.1	0.0	4.93	0.2													

STANDARD FORM SF-3 - DEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

Redland

PROJECT NAME: The Rock Commerce Center

PROJECT NUMBER: 23009

CALCULATED BY: CJS

CHECKED BY: MDC

DATE: 7/26/2023

JURISDICTION: El Paso

P_1 (1-Hour Rainfall) = 2.52

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF C_{100}	t_c (minutes)	C*A(ac)	I (in/hr)	Q (cfs)	t_c(minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t_t (minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	1	B16	0.3	0.85	5.0	0.3	8.55	2.2													
	1	B1	0.5	0.90	5.0	0.4	8.55	3.8													
	2	B17	0.3	0.85	5.0	0.3	8.55	2.2													
	2	B18	0.3	0.85	5.0	0.3	8.55	2.2													
	2	B2	0.5	0.90	5.0	0.4	8.55	3.7													
	3	B19	0.3	0.85	5.0	0.3	8.55	2.2													
	3	B3	0.4	0.90	5.0	0.3	8.55	2.7													
	4	B20	0.3	0.85	5.0	0.3	8.55	2.2													
	4	B4	0.2	0.90	5.0	0.2	8.55	1.6													
	5	B21	0.3	0.85	5.0	0.3	8.55	2.2													
	5	B5	0.4	0.90	5.0	0.3	8.55	3.0													
	13	B27	0.3	0.85	5.0	0.3	8.55	2.2													
	7	B7	0.4	0.90	5.0	0.3	8.55	2.8													
	6	B6	0.3	0.90	5.0	0.3	8.55	2.7													
	8	B8	1.0	0.90	5.0	0.9	8.55	8.0													
	8	B22	0.4	0.85	5.0	0.4	8.55	3.0													
	9	B9	0.7	0.90	5.0	0.6	8.55	5.3													
	9	B23	0.4	0.85	5.0	0.3	8.55	2.6													
	10	B24	0.3	0.85	5.0	0.3	8.55	2.2													
	10	B10	0.5	0.90	5.0	0.5	8.55	4.2													

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STANDARD FORM SF-3 - DEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: The Rock Commerce Center

DATE: 7/26/2023

PROJECT NUMBER: 23009

P_1 (1-Hour Rainfall) = 2.52

JURISDICTION: El Paso

CALCULATED BY: CJS

CHECKED BY: MDC

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF C_{100}	t_c (minutes)	C*A(ac)	I (in/hr)	Q (cfs)	t_c(minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t_t (minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	11	B25	0.3	0.85	5.0	0.3	8.55	2.2													
	12	B26	0.3	0.85	5.0	0.3	8.55	2.2													
	11	B11	0.3	0.90	5.0	0.3	8.55	2.7													
	12	B12	0.8	0.90	5.3	0.7	8.42	6.0													
	13	B13	0.4	0.90	5.0	0.4	8.55	3.4													
	14	B14	0.1	0.90	5.0	0.1	8.55	0.7													
	15	B15	0.2	0.90	5.0	0.1	8.55	1.2													
	C	C1	0.1	0.90	5.0	0.1	8.55	0.9													
	A	A1	0.1	0.43	13.4	0.1	6.02	0.3													
	RC1	B28	0.1	0.43	9.2	0.0	7.04	0.2													
	B	B29	0.4	0.43	13.1	0.2	6.10	1.0													
	10	OSB1	0.1	0.43	12.3	0.0	6.26	0.2													
	11	OSB2	0.3	0.43	13.6	0.1	5.99	0.9													
	12	OSB3	0.8	0.43	11.4	0.3	6.48	2.1													
	13	OSB4	1.9	0.43	22.8	0.8	4.62	3.7													
	A	OSA1	0.7	0.72	10.4	0.5	6.71	3.4													
	RC1	OSB6	0.2	0.66	8.8	0.1	7.15	1.0													
	3	OSB7	0.0	0.90	5.0	0.0	8.55	0.4													
	B	OSB8	0.5	0.73	9.1	0.3	7.06	2.5													
	15	OSB5	0.1	0.71	5.1	0.1	8.50	0.4													

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720.283.6783 Office
1500 West Canal Court
Littleton, Colorado 80120
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Appendix C - Hydraulic Calculations

- Provide calculations sizing cross pans

- Provide calculations for sizing of forebays

- Provide calculations for sizing of riprap in pond spillway

- Provide calculations for sizing of riprap outlet protection for pond outlet pipe

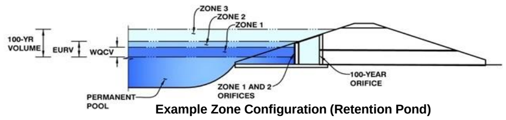
- Provide calculation for sizing of trickle channel in pond

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **23009 - The Rock Lot 1 Filing No. 1**

Basin ID: **Basin B**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	11.38	acres
Watershed Length =	1,550	ft
Watershed Length to Centroid =	775	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	85.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	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.

Provide table listing basins contributing to pond along with % impervious and avg % impervious for site

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.343	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.079	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.9 in.) =	0.685	acre-feet	0.90	inches
5-yr Runoff Volume (P1 = 1.2 in.) =	0.960	acre-feet	1.20	inches
10-yr Runoff Volume (P1 = 1.46 in.) =	1.208	acre-feet	1.46	inches
25-yr Runoff Volume (P1 = 1.85 in.) =	1.608	acre-feet	1.85	inches
50-yr Runoff Volume (P1 = 2.17 in.) =	1.927	acre-feet	2.17	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.288	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.39 in.) =	3.166	acre-feet	3.39	inches
Approximate 2-yr Detention Volume =	0.648	acre-feet		
Approximate 5-yr Detention Volume =	0.902	acre-feet		
Approximate 10-yr Detention Volume =	1.160	acre-feet		
Approximate 25-yr Detention Volume =	1.377	acre-feet		
Approximate 50-yr Detention Volume =	1.491	acre-feet		
Approximate 100-yr Detention Volume =	1.617	acre-feet		

Please use rainfall depths from Table 6-2.

Table 6-2. Rainfall Depths for Colorado Springs

Return Period	1-Hour Depth	6-Hour Depth	24-Hour Depth
2	1.19	1.70	2.10
5	1.50	2.10	2.70
10	1.75	2.40	3.20
25	2.00	2.90	3.60
50	2.25	3.20	4.20
100	2.52	3.50	4.60

Where Z= 6,840 ft/100

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.343	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.735	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.538	acre-feet
Total Detention Basin Volume =	1.617	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 1.00 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	--	--	--	0	0.000		
7134	--	1.00	--	--	--	747	0.017	374	0.009
7135	--	2.00	--	--	--	4,659	0.107	3,077	0.071
		3.00	--	--	--	9,002	0.207	9,907	0.227
		4.00	--	--	--	10,517	0.241	19,667	0.451
		5.00	--	--	--	12,089	0.278	30,970	0.711
		6.00	--	--	--	13,719	0.315	43,875	1.007
		7.00	--	--	--	15,407	0.354	58,438	1.342
		8.00	--	--	--	17,156	0.394	74,720	1.715
7142	--	9.00	--	--	--	18,969	0.435	92,782	2.130
7143	--	10.00	--	--	--	20,803	0.478	112,668	2.586
7144	--		--	--	--				
7145	--		--	--	--				
7146	--		--	--	--				
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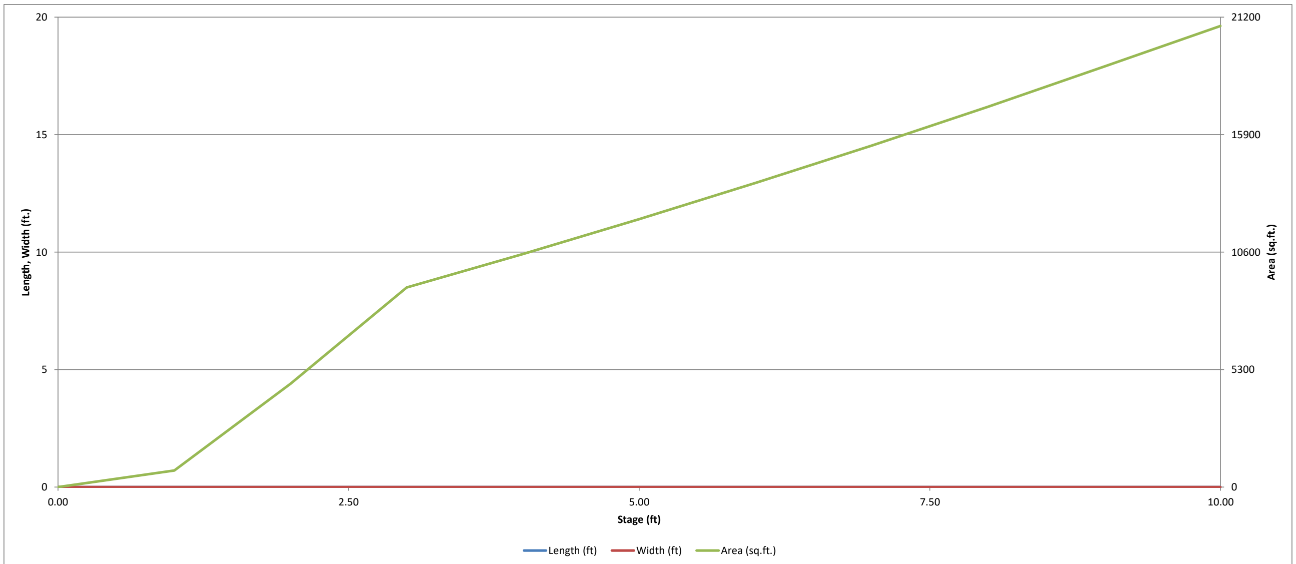
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5300
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0.00
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5.00
7.50
10.00
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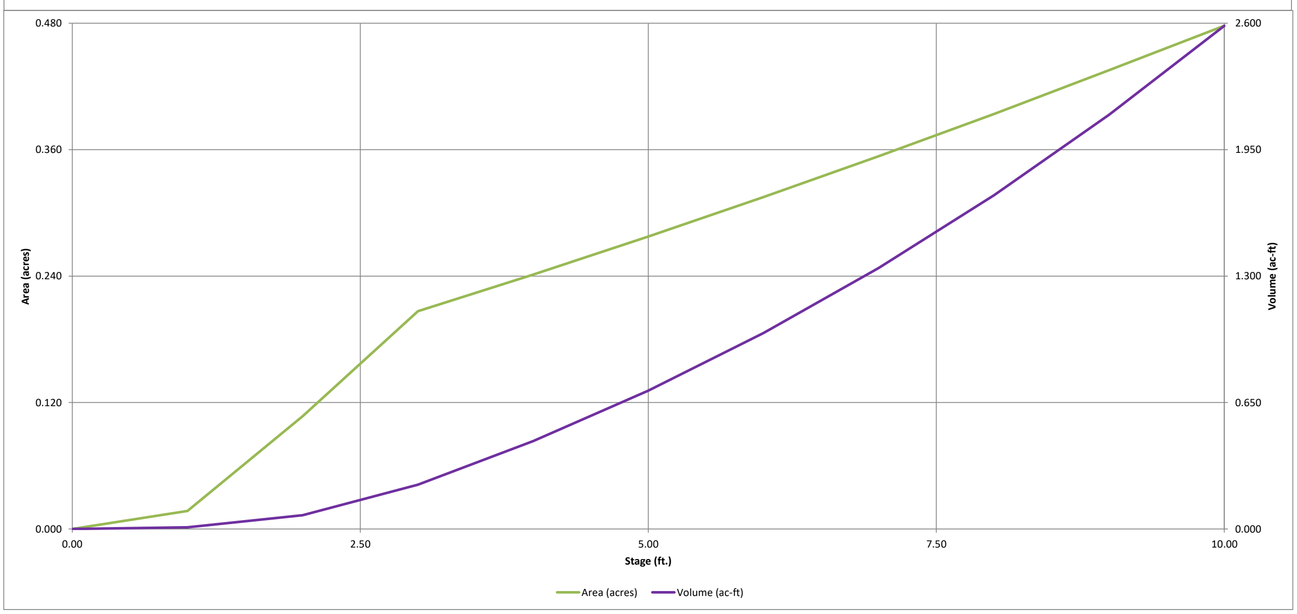
Length, Width (ft.)
Area (sq.ft.)
Length (ft)
Width (ft)
Area (sq.ft.)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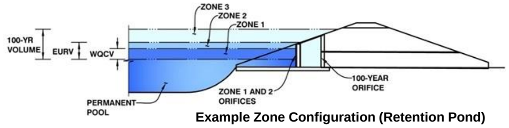
1.950
1.300
0.650
0.000
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: 23009 - The Rock Lot 1 Filing No. 1

Basin ID: Basin B



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.54	0.343	Orifice Plate
Zone 2 (EURV)	6.23	0.735	Orifice Plate
Zone 3 (100-year)	7.75	0.538	Weir&Pipe (Restrict)
Total (all zones)		1.617	

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 Area =		ft^2
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		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)

Calculated Parameters for Plate

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.049E-02	ft^2
Depth at top of Zone using Orifice Plate =	6.23	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 =	1.51	sq. inches (diameter = 1-3/8 inches)	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.08	4.15	5.15				
Orifice Area (sq. inches)	1.51	1.51	1.51	1.51				

	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)

Calculated Parameters for Vertical Orifice

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

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

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	7.00	N/A	feet
Overflow Weir Front Edge Length =	8.00	N/A	feet	Overflow Weir Slope Length =	3.09	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	20.97	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	17.22	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	17.22	N/A	ft^2
Debris Clogging % =	0%	N/A	%				

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.82	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.41	N/A	feet
Restrictor Plate Height Above Pipe Invert =	8.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.52	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.55	feet
Spillway Crest Length =	26.00	feet	Stage at Top of Freeboard =	9.55	feet
Spillway End Slopes =	5.00	H:V	Basin Area at Top of Freeboard =	0.46	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.38	acre-ft

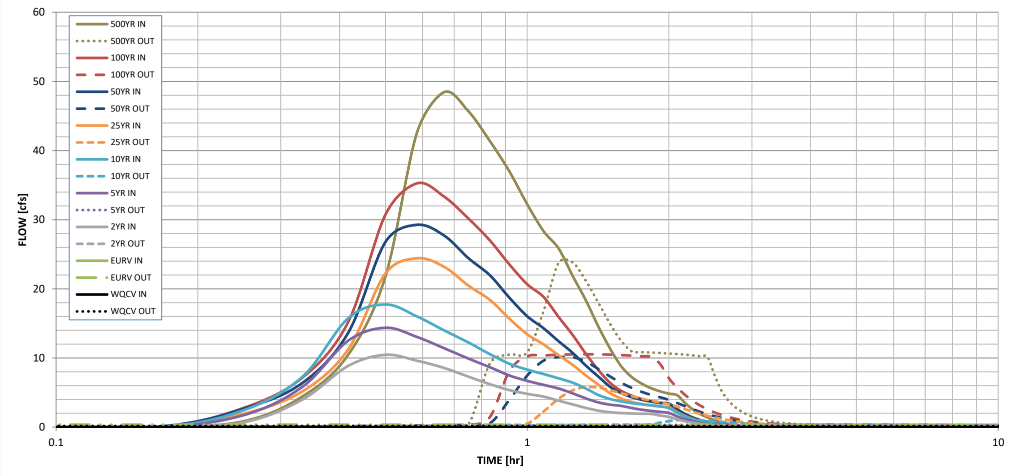
Routed Hydrograph Results

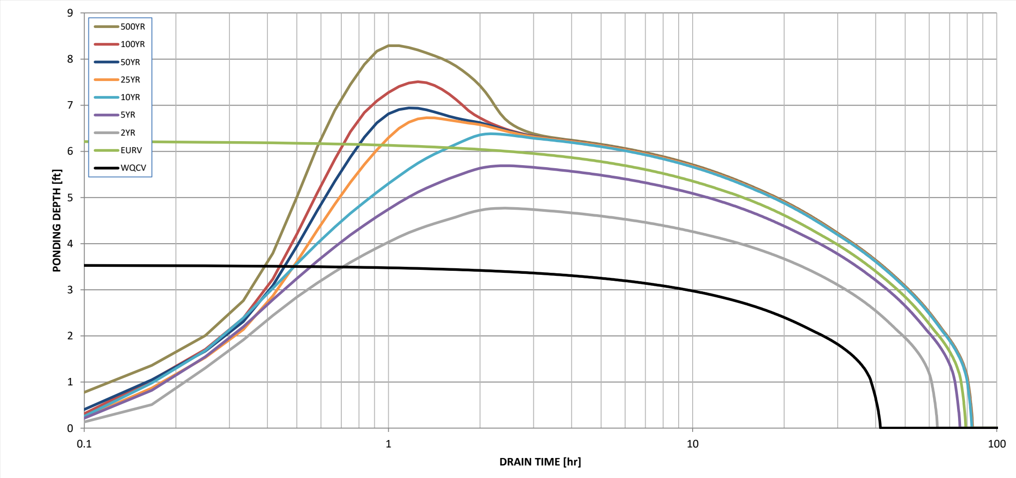
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

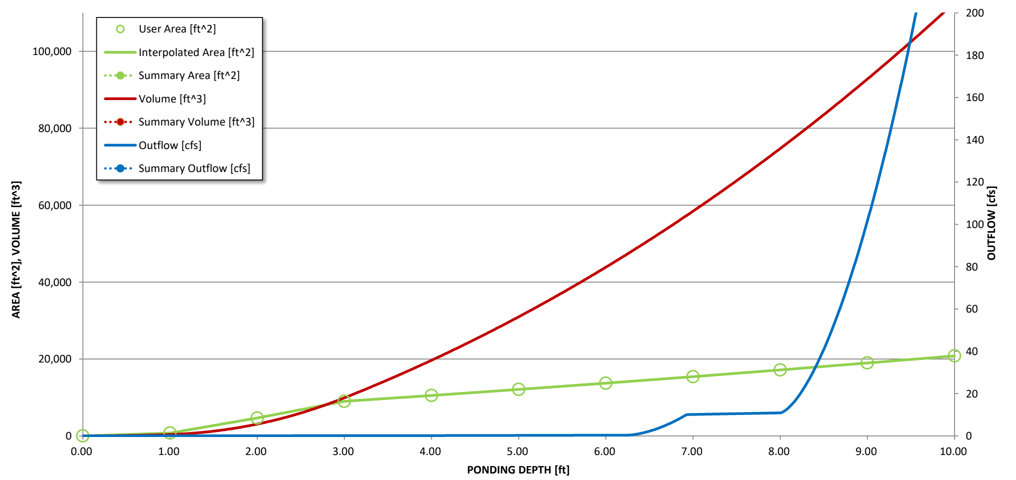
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.90	1.20	1.46	1.85	2.17	2.52	3.39
CUHP Runoff Volume (acre-ft) =	0.343	1.079	0.685	0.960	1.208	1.608	1.927	2.288	3.166
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.685	0.960	1.208	1.608	1.927	2.288	3.166
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.7	2.1	6.2	8.6	11.7	18.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.06	0.19	0.54	0.75	1.03	1.61
Peak Inflow Q (cfs) =	N/A	N/A	10.4	14.4	17.7	24.4	29.3	35.3	48.5
Peak Outflow Q (cfs) =	0.2	0.4	0.2	0.3	1.0	5.8	10.1	10.5	23.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.5	0.9	1.2	0.9	1.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.3	0.6	0.6	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	71	59	69	74	72	71	69	65
Time to Drain 99% of Inflow Volume (hours) =	**40**	76	62	73	79	79	78	77	76
Maximum Ponding Depth (ft) =	3.54	6.23	4.77	5.69	6.38	6.73	6.94	7.51	8.29
Area at Maximum Ponding Depth (acres) =	0.23	0.32	0.27	0.30	0.33	0.34	0.35	0.37	0.41
Maximum Volume Stored (acre-ft) =	0.344	1.081	0.645	0.908	1.130	1.244	1.320	1.523	1.827

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

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	SD IN1	SD IN2	SD IN3
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT/Denver 13 Valley Grate	CDOT/Denver 13 Valley Grate	CDOT Type R Curb Opening

Inlets will be reviewed with next submittal when flows are provided at each design point

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	3.3	4.5	5.0
Major Q_{Known} (cfs)	6.0	8.1	9.1

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	2.4	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**3.3**	**4.5**	**5.0**
Major Total Design Peak Flow, Q (cfs)	**6.0**	**10.5**	**9.1**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	SD IN4	SD IN5	SD IN6
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT/Denver 13 Combination	CDOT/Denver 13 Valley Grate	CDOT/Denver 13 Valley Grate

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.9	1.5	1.6
Major Q_{Known} (cfs)	5.2	2.7	2.8

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.2	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**2.9**	**1.5**	**1.6**
Major Total Design Peak Flow, Q (cfs)	**5.2**	**2.9**	**2.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	SD IN7	SD IN8	SD IN9
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	In Sump
Inlet Type	CDOT/Denver 13 Valley Grate	CDOT/Denver 13 Valley Grate	CDOT/Denver 13 Valley Grate

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	6.1	4.4	3.5
Major Q_{Known} (cfs)	11.1	7.9	6.5

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	User-Defined
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	2.3
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	4.8

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**6.1**	**4.4**	**5.8**
Major Total Design Peak Flow, Q (cfs)	**11.1**	**7.9**	**11.3**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	2.3	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	4.8	N/A

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	SD IN10	SD IN11	SD IN12
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT/Denver 13 Combination	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.8	4.8	3.4
Major Q_{Known} (cfs)	5.8	10.3	9.3

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	User-Defined
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.2
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	1.6

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**2.8**	**4.8**	**3.6**
Major Total Design Peak Flow, Q (cfs)	**5.8**	**10.3**	**10.9**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.2	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	1.6	N/A

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	SD IN13	SD IN14
Site Type (Urban or Rural)	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	On Grade
Inlet Type	CDOT/Denver 13 Combination	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.4	0.9
Major Q_{Known} (cfs)	0.7	1.5

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	User-Defined	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	1.5	0.0

Watershed Characteristics

Subcatchment Area (acres)		
Percent Impervious		
NRCS Soil Type		

Watershed Profile

Overland Slope (ft/ft)		
Overland Length (ft)		
Channel Slope (ft/ft)		
Channel Length (ft)		

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		

CALCULATED OUTPUT

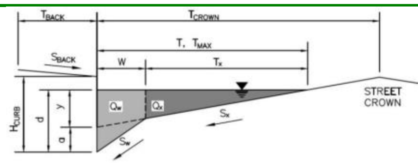
Minor Total Design Peak Flow, Q (cfs)	**0.4**	**0.9**
Major Total Design Peak Flow, Q (cfs)	**2.2**	**1.5**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0

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

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

Project:

Inlet ID: **SD IN1**



Gutter Geometry:

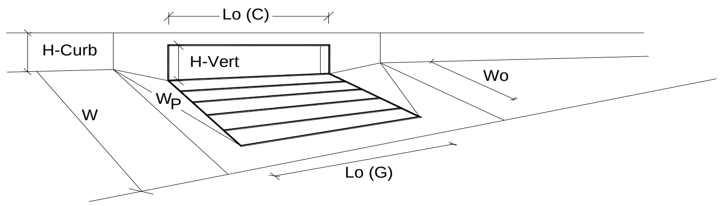
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.050	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	14.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.035	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	14.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



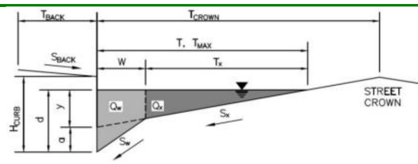
		MINOR	MAJOR	
Design Information (Input) CDOT/Denver 13 Valley Grate				
Type of Inlet	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.52	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	0.71	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.6**	**3.6**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	3.3	6.0	cfs

Inlet does not appear to capture all of flow. Increase inlet size or route flow-by to next downstream inlet. Comment is for all inlets with this warning message.

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

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

Project:
Inlet ID: **SD IN2**



<u>Gutter Geometry:</u>

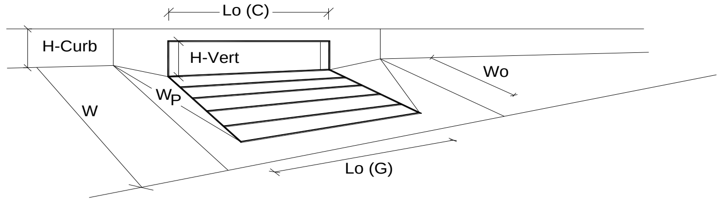
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	14.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.030	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLEt IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT/Denver 13 Valley Grate	MINOR	MAJOR	
Type of Inlet	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.5	8.7	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	

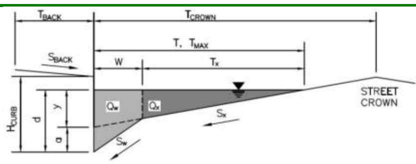
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.56	0.75	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.61	0.82	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.3**	**10.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	4.5	10.5	cfs

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

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

Project:
Inlet ID: **SD IN3**



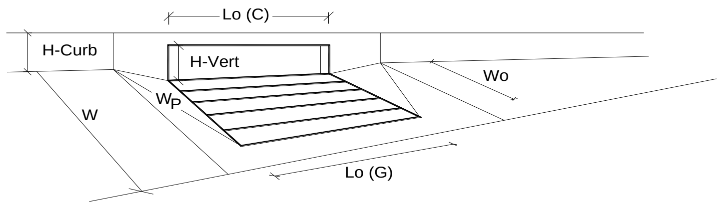
Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	4.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.010		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.040		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.3	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.3	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

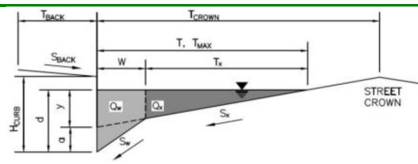
		MINOR	MAJOR	
Low Head Performance Reduction (Calculated)				
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.35	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.95	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**9.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	5.0	9.1	cfs

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

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

Project:
Inlet ID: **SD IN4**



Gutter Geometry:

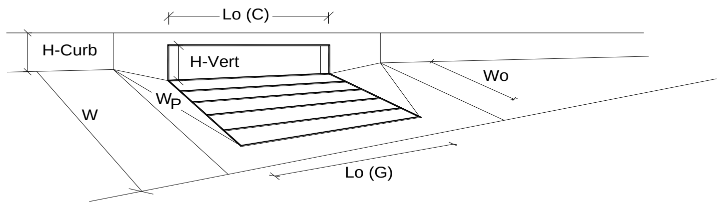
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.030	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)

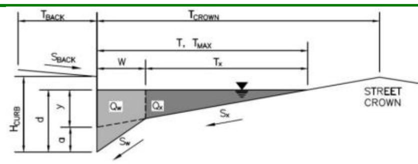


		MINOR	MAJOR	
Design Information (Input) — CDOT/Denver 13 Combination		MINOR	MAJOR	
Type of Inlet	Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.52	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	0.94	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.1**	**5.1**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	2.9	5.2	cfs

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

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

Project:
Inlet ID: **SD IN5**



Gutter Geometry:

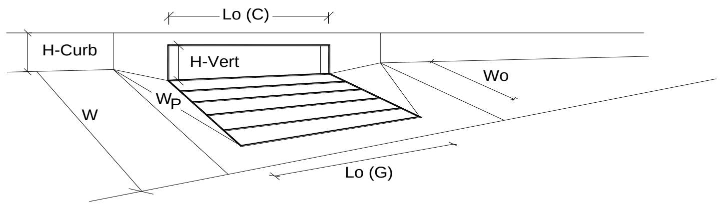
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	12.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.040	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	7.9	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT/Denver 13 Valley Grate		MINOR	MAJOR	
Type of Inlet		Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	7.9	7.9	inches
Grate Information			MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	3.00	3.00	feet
Width of a Unit Grate		W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.60	0.60	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A	

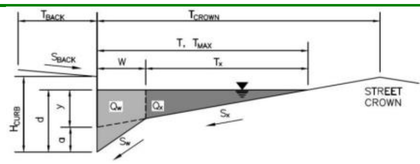
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.68	0.68	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	1.00	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.0**	**4.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.5	2.9	cfs

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

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

Project:
Inlet ID: **SD IN6**



Gutter Geometry:

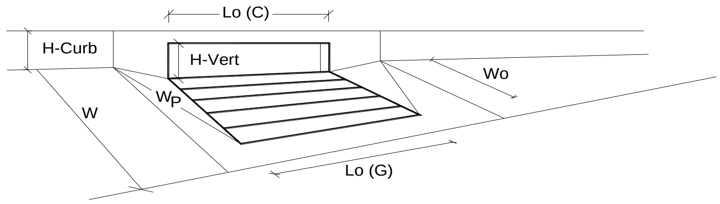
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	12.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.040	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)

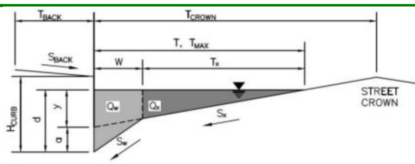


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT/Denver 13 Valley Grate)	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.52	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	$\mathbf{Q_a}$ =	**2.6**	**2.6**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	1.6	2.8	cfs

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

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

Project:
Inlet ID: **SD IN7**



Gutter Geometry:

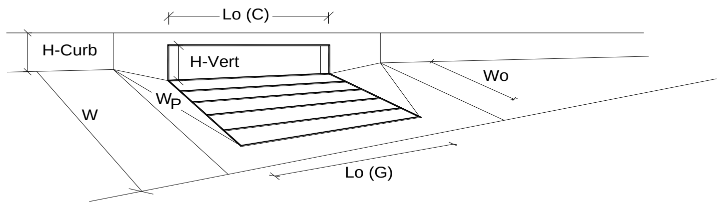
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	11.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0		ft
Gutter Width	W =	5.00		ft
Street Transverse Slope	S_X =	0.040		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.5	12.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	10.0	10.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLEET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT/Denver 13 Valley Grate		MINOR	MAJOR	
Type of Inlet		Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	3	3	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	8.6	8.6	inches
Grate Information			MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	3.00	3.00	feet
Width of a Unit Grate		W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.60	0.60	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A	

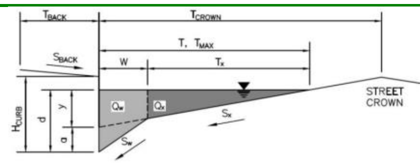
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.78	0.78	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.81	0.81	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**11.4**	**11.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	6.1	11.1	cfs

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

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

Project:
Inlet ID: SD IN8



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	11.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	5.00	ft
Street Transverse Slope	S_X =	0.040	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.005	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

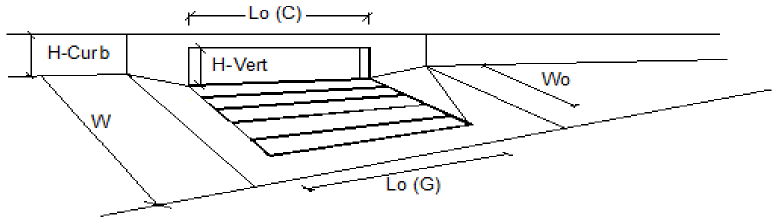
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.5	12.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	8.0	8.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**8.7**	**8.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.37 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.92 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



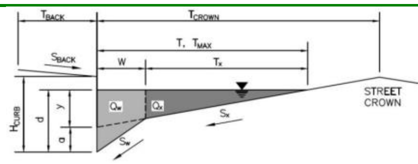
Design Information (Input)	CDOT/Denver 13 Valley Grate		MINOR	MAJOR	
Type of Inlet		Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	N/A	N/A	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.1**	**3.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.3**	**4.8**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**48**	**40**	**%**

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

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

Project:
Inlet ID: **SD IN9**



Gutter Geometry:

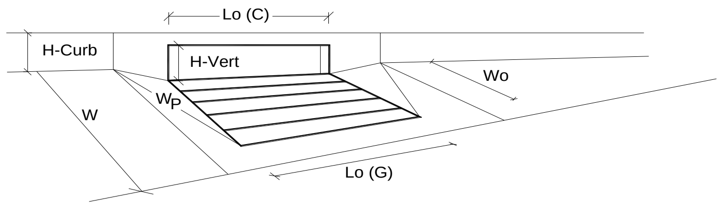
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.000	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	11.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	5.00	ft
Street Transverse Slope	S_X =	0.040	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.5	12.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	10.0	10.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)

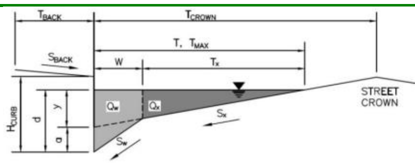


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT/Denver 13 Valley Grate)	Type =	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	8.6	8.6	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.78	0.78	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.81	0.81	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**11.4**	**11.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	5.8	11.3	cfs

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

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

Project:
Inlet ID: **SD IN10**



Gutter Geometry:

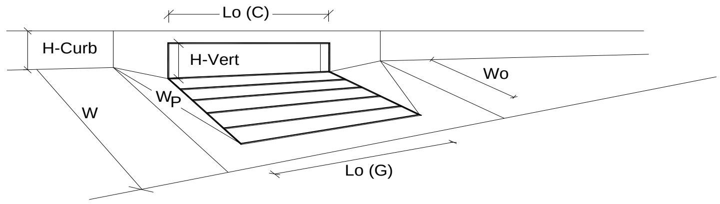
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.070	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.040	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLEТ IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**6.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.8	5.8	cfs

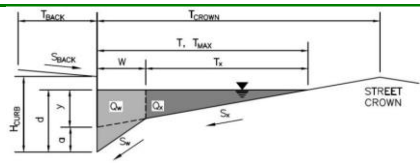
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project:

Inlet ID: **SD IN11**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.1	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.100	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	54.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.040	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.014	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

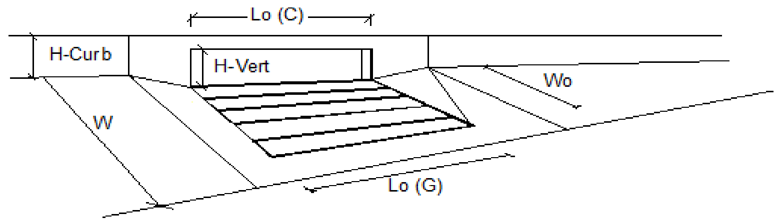
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**8.5**	**8.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.80 cfs on sheet 'Inlet Management'

WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 10.27 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT/Denver 13 Combination		MINOR	MAJOR	
Type of Inlet		Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**4.6**	**8.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.2**	**1.6**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**95**	**84**	**%**

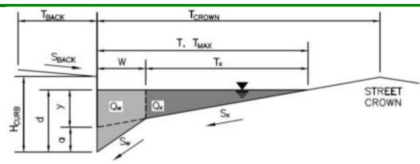
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project:

Inlet ID: **SD IN12**



Gutter Geometry:

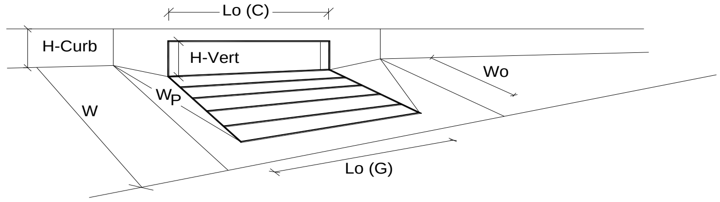
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.040	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLEET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)

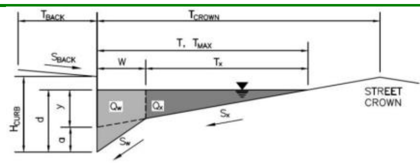


		MINOR	MAJOR	
Design Information (Input)	CDOT Type R Curb Opening			
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.3	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.36	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.95	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**9.4**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	3.6	10.9	cfs

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

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

Project:
Inlet ID: **SD IN13**



Gutter Geometry:

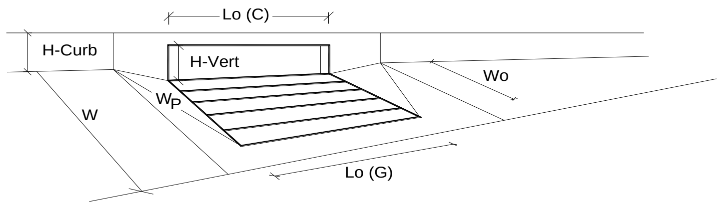
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.1	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.100	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT/Denver 13 Combination	Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.52	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	0.94	

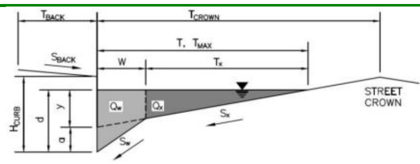
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.1**	**5.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.4	2.2	cfs

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

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

Project:

Inlet ID: **SD IN14**



Gutter Geometry:

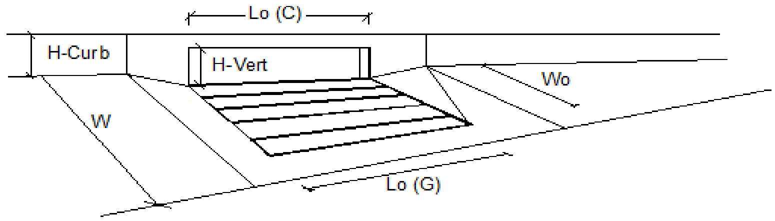
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.1		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.100		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.040		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**13.0**	**13.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.90 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 1.50 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.9**	**1.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**98**	**%**

Channel Report

EXISITNG 24" STORM SEWER AT DESIGN POINT B

Circular
Diameter (ft) = 2.00

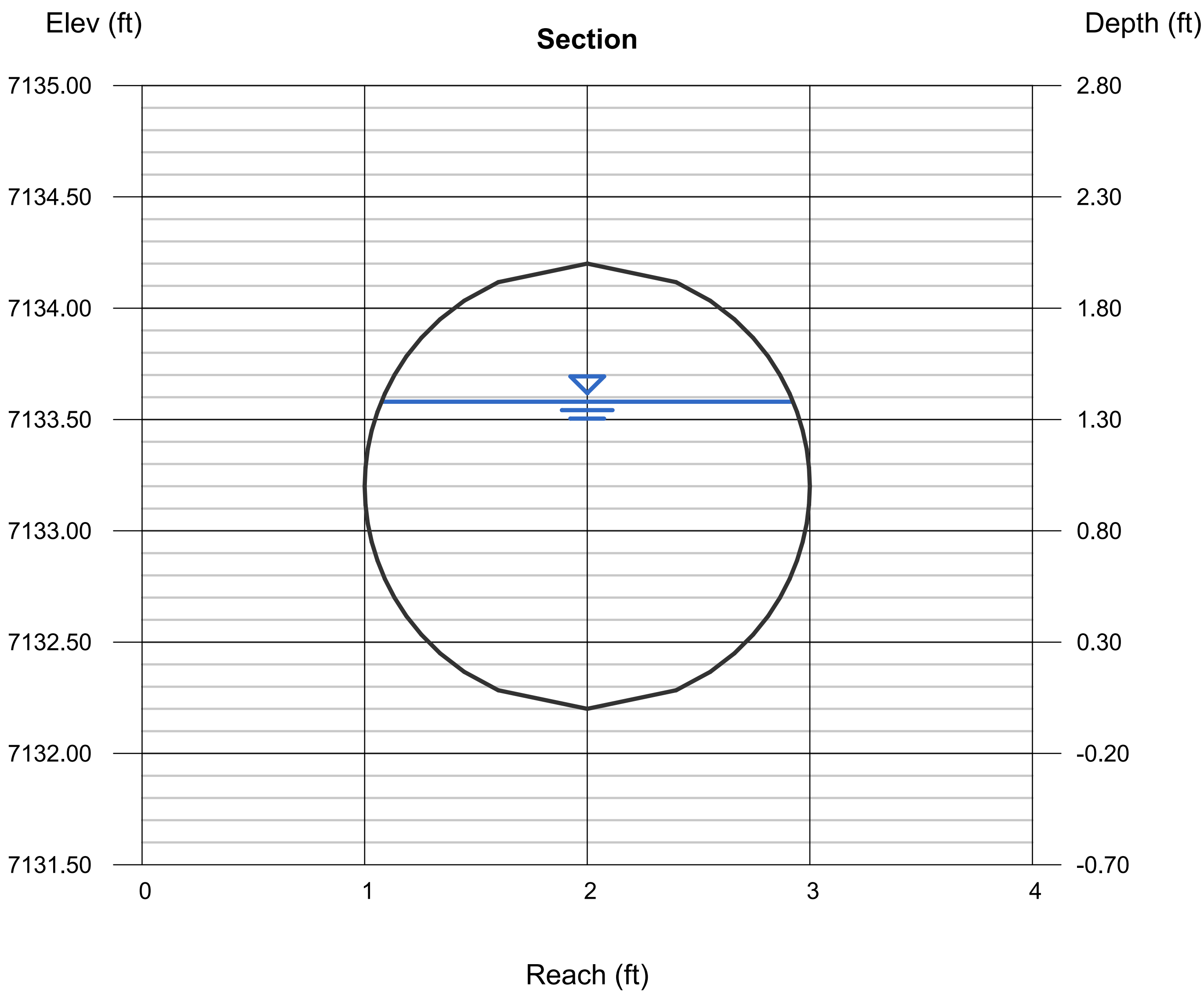
Invert Elev (ft) = 7132.20
Slope (%) = 1.00
N-Value = 0.013

Calculations
Compute by: Known Q
Known Q (cfs) = 18.51

THIS FLOW WAS CALCULATED BY THE FULL 100-YEAR RELEASE FOR THE DETENTION POND PLUS THE FLOWS FROM BASINS B28, B29, OSB6, AND OSB8

Highlighted
Depth (ft) = 1.38
Q (cfs) = 18.51
Area (sqft) = 2.32
Velocity (ft/s) = 7.98
Wetted Perim (ft) = 3.93
Crit Depth, Yc (ft) = 1.55
Top Width (ft) = 1.85
EGL (ft) = 2.37

This should then be the flow at design point B.



Channel Report

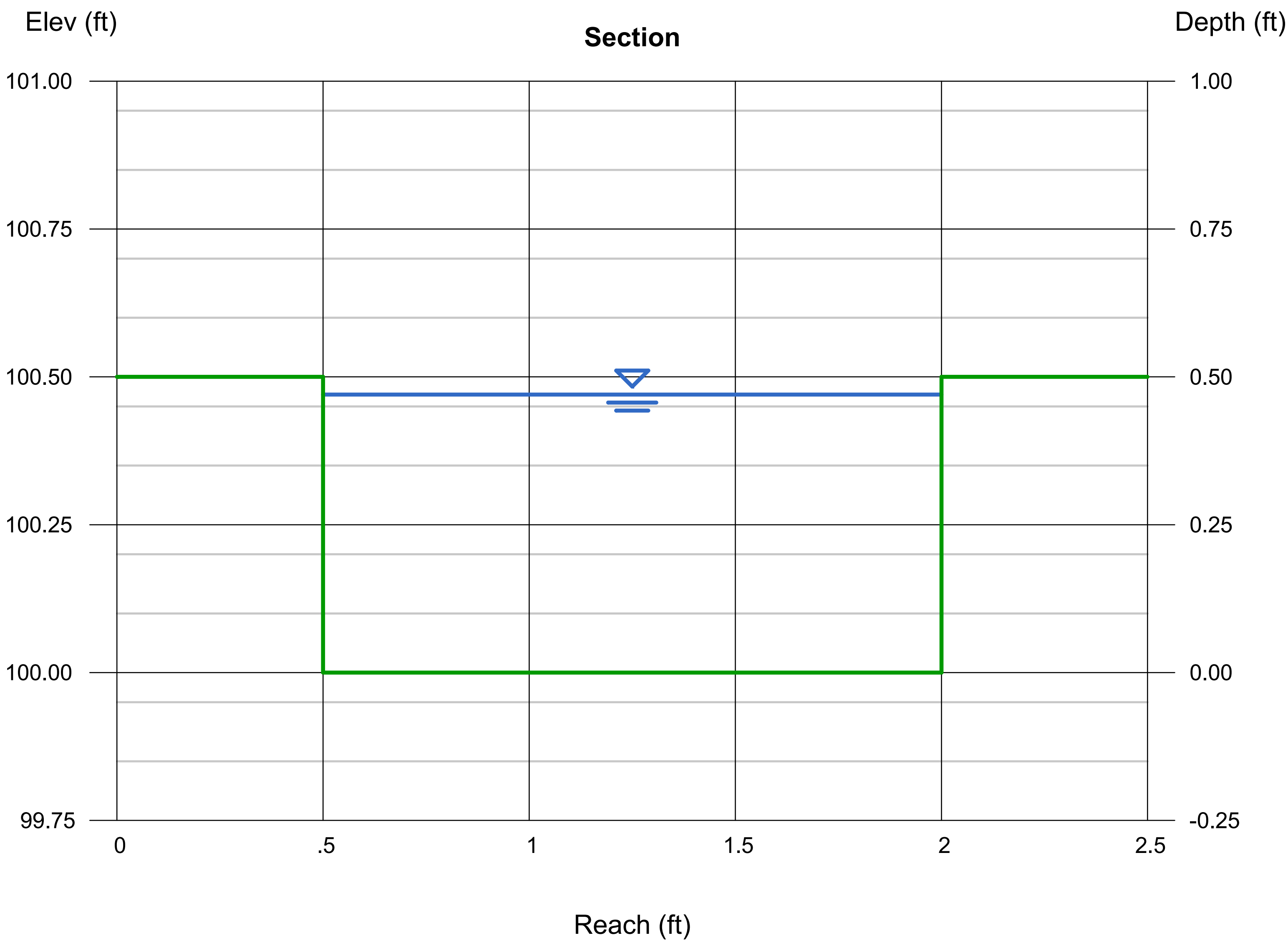
Basin B3, B19, & OSB7 Drainage Chase

Show and label drainage chase on plans

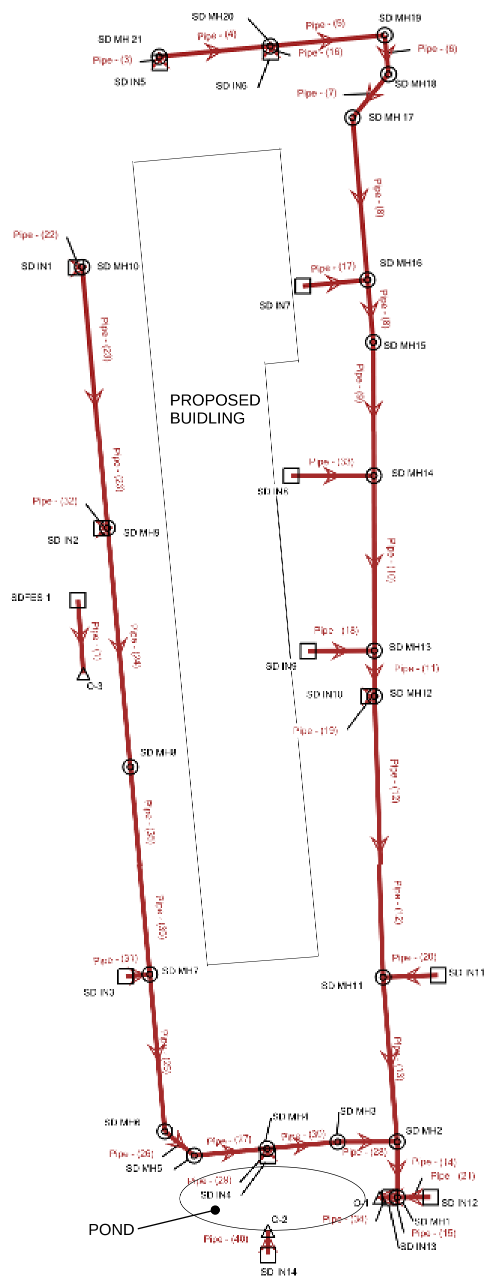
Rectangular			**Highlighted**		
Bottom Width (ft)	=	1.50	Depth (ft)	=	0.47
Total Depth (ft)	=	0.50	Q (cfs)	=	3.500
			Area (sqft)	=	0.70
Invert Elev (ft)	=	100.00	Velocity (ft/s)	=	4.96
Slope (%)	=	1.00	Wetted Perim (ft)	=	2.44
N-Value	=	0.013	Crit Depth, Yc (ft)	=	0.50
			Top Width (ft)	=	1.50
Calculations			EGL (ft)	=	0.85
Compute by:		Known Q			
Known Q (cfs)	=	3.50			

KNOWN Q IS EQUAL TO THE 10-YEAR BASIN FLOW FOR EACH OF THE ABOVE BASINS FOUND IN APPENDIX B, STANDARD SF FORM 3. IN THE 100-YEAR EVENT THE CURB IS OVER TOPPED AND THE OVERFLOW REACHES THE DOWNSTREAM BASIN WITH NO ADVERSE EFFECTS.

Show overtopping route of flow on proposed drainage map



STORMCAD NETWORK PREVEIW
THE ROCK LOT 1 FILING NO. 1



Labels are hard to read for pipes.

Include profiles for all lateral pipes

FlexTable: Conduit Table - 10 Year Event

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Manning's n	Flow (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Froude Number (Normal)
Pipe - (1)	24.0	0.068	6.92	7,159.33	7,154.29	0.013	0.92	7,159.66	7,155.30	7,159.77	7,155.31	3.553
Pipe - (3)	18.0	0.010	4.21	7,157.00	7,156.94	0.013	1.50	7,157.46	7,157.34	7,157.63	7,157.58	1.425
Pipe - (4)	18.0	0.007	3.80	7,156.34	7,155.51	0.013	1.50	7,156.80	7,156.40	7,156.96	7,156.42	1.235
Pipe - (5)	18.0	0.008	4.59	7,155.31	7,154.45	0.013	2.92	7,155.96	7,155.21	7,156.21	7,155.38	1.227
Pipe - (6)	18.0	0.007	4.54	7,154.25	7,153.96	0.013	2.86	7,154.89	7,154.54	7,155.14	7,154.86	1.219
Pipe - (7)	18.0	0.008	4.55	7,153.76	7,153.34	0.013	2.84	7,154.40	7,153.92	7,154.64	7,154.24	1.226
Pipe - (8)	18.0	0.008	4.54	7,153.14	7,151.92	0.013	2.81	7,153.78	7,153.15	7,154.02	7,153.20	1.228
Pipe - (8)	24.0	0.015	7.64	7,151.42	7,150.50	0.013	8.19	7,152.44	7,151.26	7,152.84	7,152.13	1.809
Pipe - (9)	24.0	0.015	7.66	7,150.30	7,148.26	0.013	8.14	7,151.32	7,150.00	7,151.72	7,150.12	1.821
Pipe - (10)	24.0	0.007	6.25	7,148.06	7,146.76	0.013	9.93	7,149.19	7,149.07	7,149.65	7,149.22	1.236
Pipe - (11)	24.0	0.007	6.85	7,146.56	7,146.22	0.013	14.84	7,147.95	7,147.52	7,148.58	7,148.25	1.133
Pipe - (12)	36.0	0.007	7.08	7,145.22	7,143.00	0.013	16.94	7,146.54	7,145.17	7,147.04	7,145.32	1.375
Pipe - (13)	36.0	0.007	7.46	7,142.80	7,141.57	0.013	20.36	7,144.51	7,144.56	7,144.88	7,144.69	1.367
Pipe - (14)	36.0	0.010	9.29	7,141.37	7,140.82	0.013	31.69	7,143.20	7,142.34	7,143.96	7,143.55	1.537
Pipe - (15)	36.0	0.030	14.28	7,136.82	7,136.61	0.013	34.57	7,139.84	7,139.83	7,140.22	7,140.20	2.757
Pipe - (16)	18.0	0.010	4.21	7,155.80	7,155.74	0.013	1.50	7,156.38	7,156.40	7,156.47	7,156.46	1.425
Pipe - (17)	18.0	0.019	7.81	7,153.15	7,151.92	0.013	5.99	7,154.10	7,153.15	7,154.50	7,153.38	1.921
Pipe - (18)	18.0	0.019	7.74	7,148.31	7,147.06	0.013	5.85	7,149.24	7,149.07	7,149.64	7,149.24	1.918
Pipe - (19)	18.0	0.025	6.73	7,146.87	7,146.72	0.013	2.50	7,147.47	7,147.42	7,147.69	7,147.57	2.241
Pipe - (20)	18.0	0.030	8.55	7,145.92	7,144.30	0.013	4.56	7,146.74	7,145.17	7,147.07	7,145.46	2.464
Pipe - (21)	18.0	0.030	8.03	7,142.96	7,141.97	0.013	3.63	7,143.69	7,142.44	7,143.97	7,143.35	2.473
Pipe - (22)	18.0	0.007	4.42	7,155.32	7,155.28	0.013	3.00	7,156.06	7,156.07	7,156.24	7,156.23	1.150
Pipe - (23)	18.0	0.011	5.30	7,155.08	7,152.18	0.013	2.99	7,155.74	7,153.22	7,155.99	7,153.30	1.490
Pipe - (24)	24.0	0.007	5.64	7,151.68	7,149.89	0.013	6.69	7,152.60	7,150.70	7,152.95	7,151.19	1.279
Pipe - (25)	24.0	0.008	6.32	7,147.80	7,146.62	0.013	10.30	7,148.95	7,147.65	7,149.42	7,148.27	1.234
Pipe - (26)	24.0	0.007	6.26	7,146.42	7,146.14	0.013	10.11	7,147.56	7,147.17	7,148.02	7,147.77	1.228
Pipe - (27)	24.0	0.026	9.90	7,145.94	7,144.06	0.013	10.06	7,147.08	7,144.79	7,147.54	7,146.24	2.398
Pipe - (28)	36.0	0.010	7.18	7,142.16	7,141.57	0.013	12.09	7,144.56	7,144.56	7,144.62	7,144.60	1.608
Pipe - (29)	18.0	0.030	7.22	7,144.37	7,144.16	0.013	2.50	7,144.97	7,144.86	7,145.19	7,145.01	2.466
Pipe - (30)	36.0	0.010	7.16	7,143.06	7,142.36	0.013	12.18	7,144.49	7,144.57	7,144.70	7,144.65	1.596
Pipe - (31)	18.0	0.030	8.53	7,149.02	7,148.30	0.013	4.49	7,149.83	7,149.78	7,150.16	7,149.89	2.468
Pipe - (32)	18.0	0.008	5.18	7,152.23	7,152.18	0.013	3.99	7,153.22	7,153.22	7,153.38	7,153.37	1.270
Pipe - (33)	18.0	0.008	4.20	7,149.18	7,148.56	0.013	2.12	7,150.00	7,150.00	7,150.07	7,150.02	1.239
Pipe - (34)	36.0	0.030	14.39	7,136.41	7,136.00	0.013	34.97	7,139.79	7,139.75	7,140.17	7,140.13	2.773
Pipe - (35)	24.0	0.008	5.60	7,149.69	7,148.00	0.013	6.47	7,150.59	7,149.78	7,150.94	7,149.86	1.284
Pipe - (40)	18.0	0.013	3.31	7,136.30	7,136.00	0.013	0.50	7,139.75	7,139.75	7,139.75	7,139.75	1.533

FlexTable: Catch Basin Table - 10 Year Event

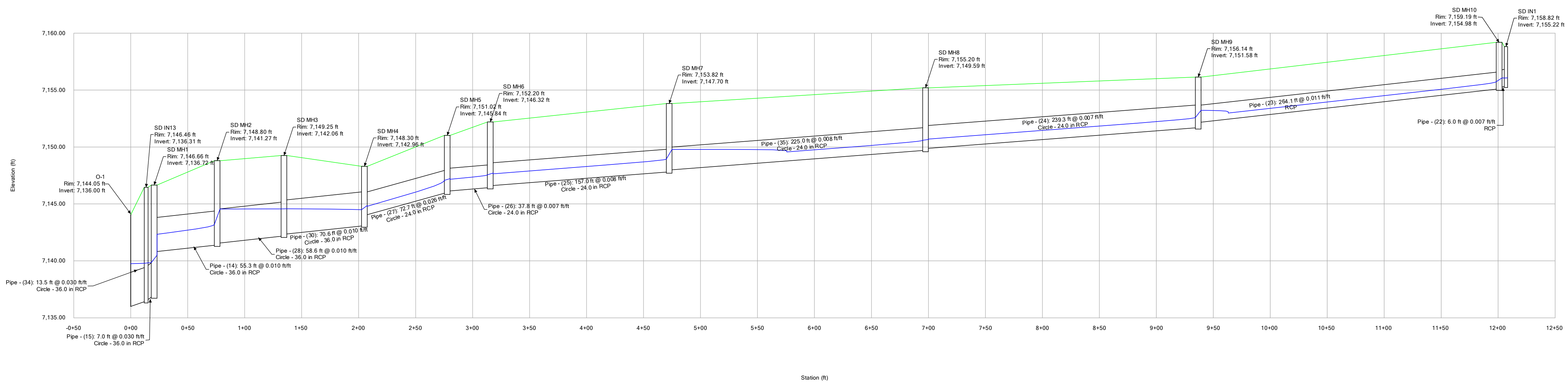
Label	Notes	Elevation (Ground) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)
SD IN1	CDOT Type 13	7,158.82	Standard	0.100	0.02
SD IN2	CDOT Type 13	7,155.73	Standard	0.100	0.02
SD IN3	CDOT Type R	7,153.13	Standard	0.100	0.03
SD IN4	CDOT Type 13 Combo	7,148.04	Standard	0.100	0.02
SD IN5	CDOT Type 13	7,160.08	Standard	0.100	0.02
SD IN6	CDOT Type 13	7,160.43	Standard	0.100	0.01
SD IN7	CDOT Type 13	7,156.65	Standard	0.100	0.04
SD IN8	CDOT Type 13	7,152.68	Standard	0.100	0.01
SD IN9	CDOT Type 13	7,151.81	Standard	0.100	0.04
SD IN10	CDOT Type R	7,153.71	Standard	0.100	0.02
SD IN11	CDOT Type 13 Combo	7,152.33	Standard	0.100	0.03
SD IN12	CDOT Type R	7,146.46	Standard	0.100	0.03
SD IN13	CDOT Type 13 Combo	7,146.46	Standard	0.100	0.04
SD IN14	CDOT Type 13 Combo	7,141.13	Standard	0.100	0.00
SDFES 1	24" FES	7,161.72	Standard	0.100	0.01

FlexTable: Manhole Table - 10 Year Event

Label	Notes	Elevation (Rim) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)
SD MH19	5' DIA MH	7,162.57	Standard	1.320	0.32
SD MH18	5' DIA MH	7,161.52	Standard	0.320	0.08
SD MH20	5' DIA MH	7,160.89	Standard	1.770	0.44
SD MH 21	5' DIA MH	7,160.46	Standard	1.770	0.29
SD MH 17	5' DIA MH	7,159.30	Standard	0.320	0.08
SD MH10	5' DIA MH	7,159.19	Standard	1.320	0.33
SD MH16	5' DIA MH	7,158.42	Standard	1.770	0.71
SD MH15	5' DIA MH	7,157.65	Standard	0.200	0.08
SD MH9	5' DIA MH	7,156.14	Standard	1.770	0.62
SD MH14	5' DIA MH	7,156.09	Standard	1.770	0.81
SD MH8	5' DIA MH	7,155.20	Standard	0.200	0.07
SD MH13	5' DIA MH	7,154.56	Standard	1.770	1.12
SD MH11	5' DIA MH	7,154.40	Standard	1.770	0.66
SD MH12	5' DIA MH	7,154.00	Standard	1.770	0.89
SD MH7	5' DIA MH	7,153.82	Standard	1.770	0.84
SD MH6	5' DIA MH	7,152.20	Standard	0.320	0.15
SD MH5	5' DIA MH	7,151.02	Standard	0.320	0.15
SD MH3	5' DIA MH	7,149.25	Standard	0.200	0.01
SD MH2	6' DIA MH	7,148.80	Standard	1.770	1.36
SD MH4	5' DIA MH	7,148.30	Standard	1.770	0.37
SD MH1	6' DIA MH	7,146.66	Standard	1.770	0.66

Profile Report

Engineering Profile - O-1 to SD IN1 - 10 Year Event

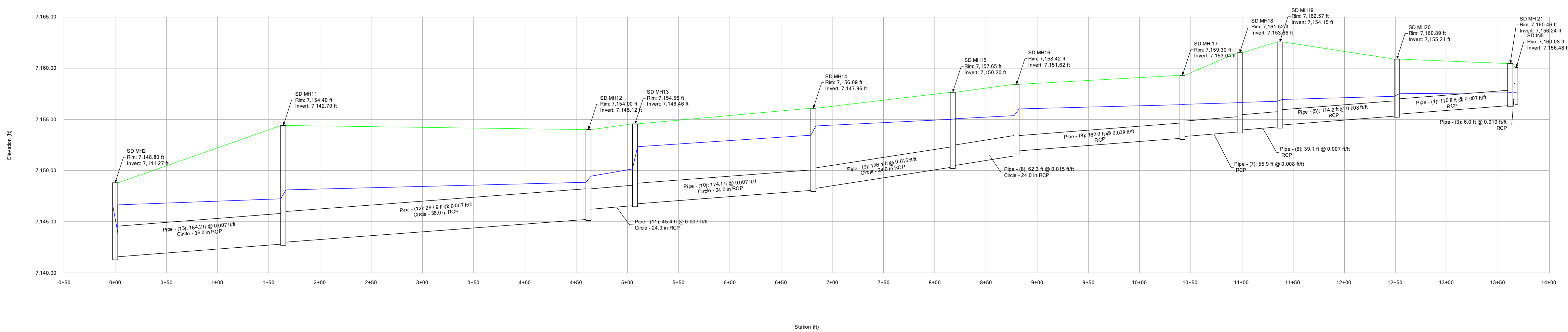


Profile Report

Please provide 10-year event profile

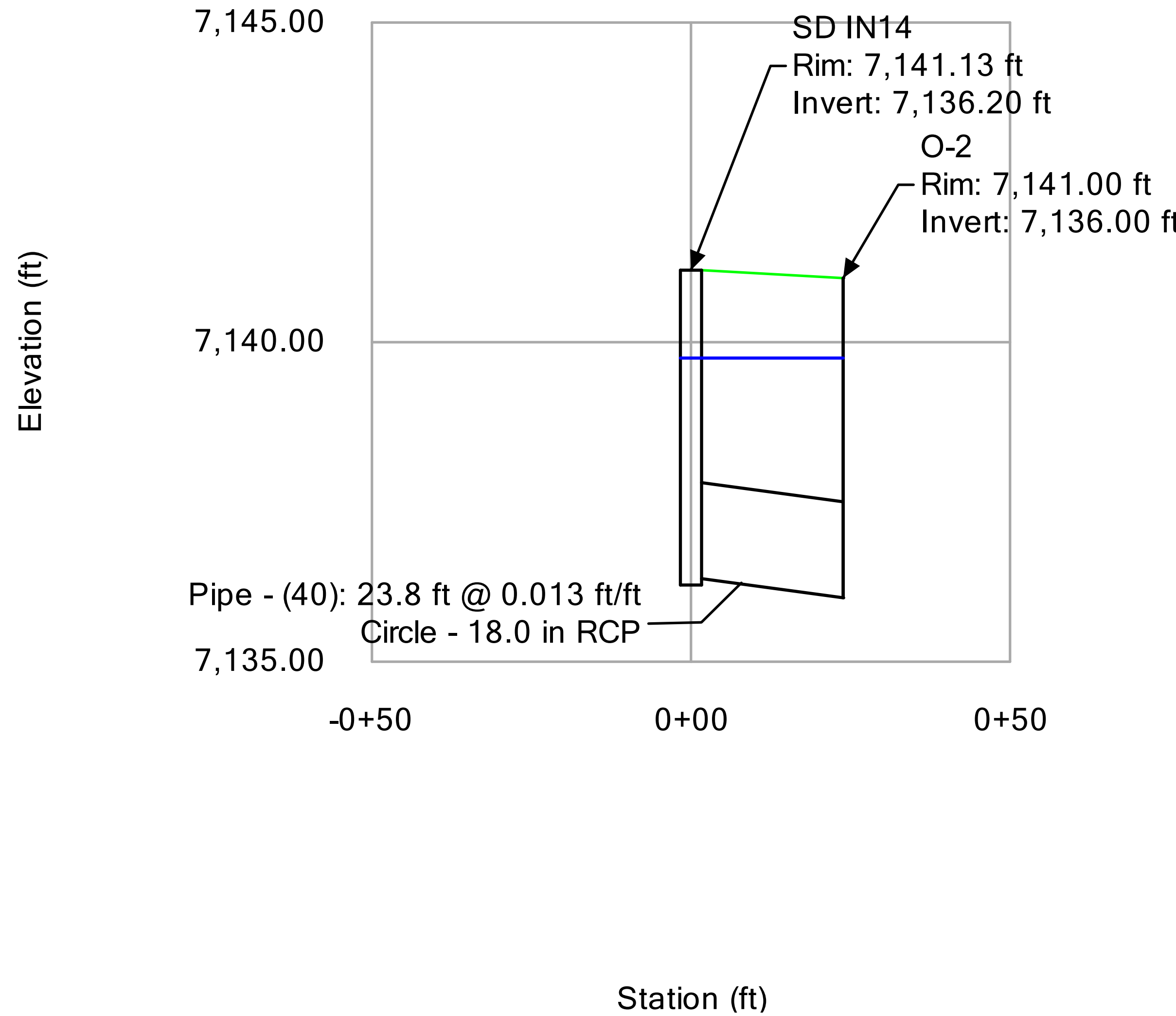
Engineering Profile - SD MH2 to SD IN5 - 100 Year Event

Per ECM Section 3.3.1.D pipes shall be designed to flow full and free of pressure head, except for short runs. Please revise design to eliminate pressure head.



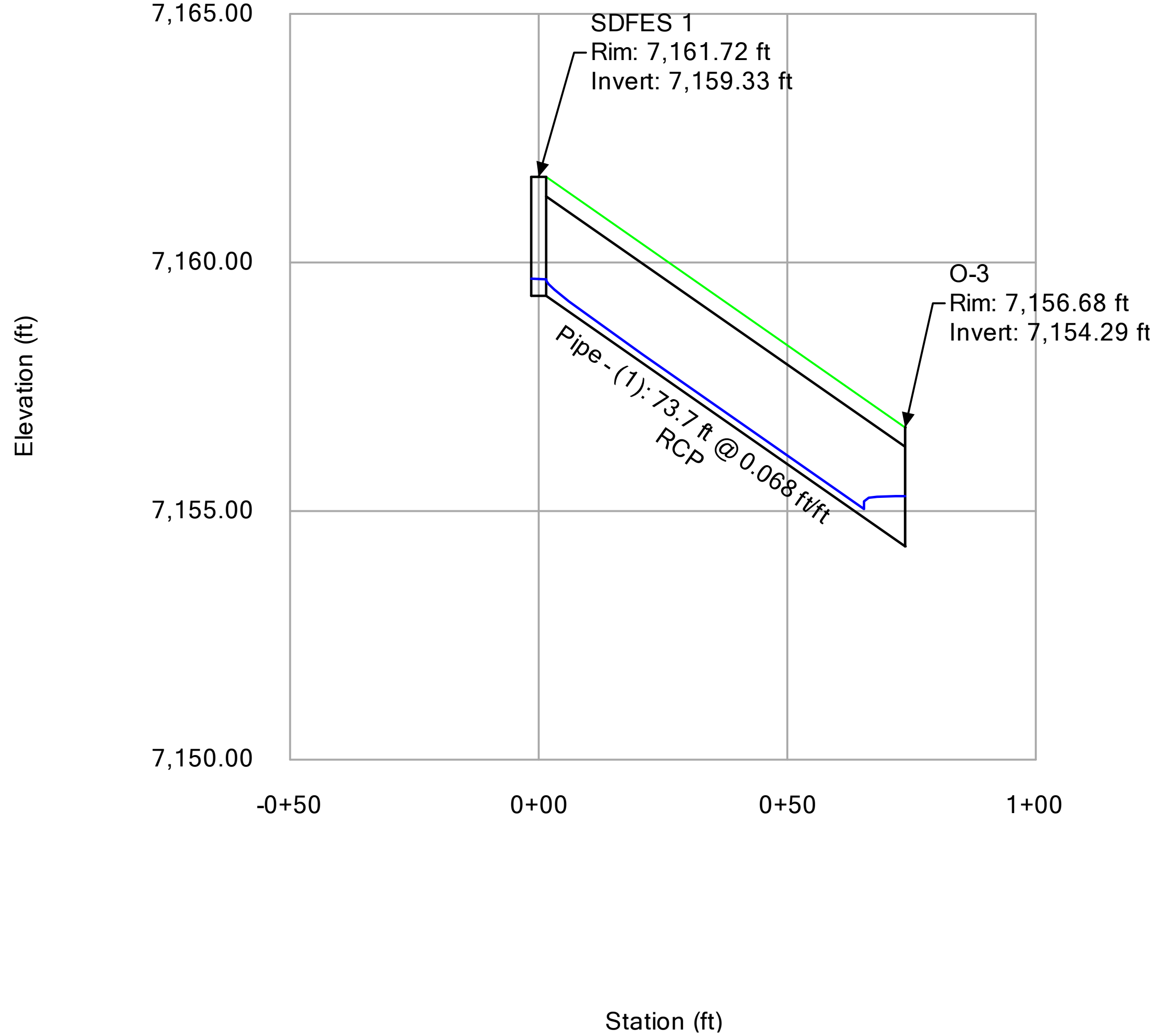
Profile Report

Engineering Profile - O-2 to SD IN14 - 10 Year Event



Profile Report

Engineering Profile - O-3 to SDFES 1 - 10 Year Event



FlexTable: Conduit Table - 100 Year Event

Label	Diameter (in)	Slope (Calculated) (ft/ft)	Velocity (ft/s)	Invert (Start) (ft)	Invert (Stop) (ft)	Manning's n	Flow (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Froude Number (Normal)
Pipe - (1)	24.0	0.068	10.02	7,159.33	7,154.29	0.013	3.18	7,159.95	7,155.30	7,160.18	7,155.36	3.788
Pipe - (3)	18.0	0.010	5.09	7,157.00	7,156.94	0.013	2.92	7,157.65	7,157.68	7,157.90	7,157.86	1.421
Pipe - (4)	18.0	0.007	4.58	7,156.34	7,155.51	0.013	2.92	7,157.59	7,157.51	7,157.64	7,157.56	1.224
Pipe - (5)	18.0	0.008	5.38	7,155.31	7,154.45	0.013	5.42	7,157.26	7,156.95	7,157.40	7,157.10	1.154
Pipe - (6)	18.0	0.007	5.33	7,154.25	7,153.96	0.013	5.33	7,156.76	7,156.66	7,156.91	7,156.81	1.148
Pipe - (7)	18.0	0.008	5.35	7,153.76	7,153.34	0.013	5.29	7,156.62	7,156.48	7,156.76	7,156.62	1.157
Pipe - (8)	18.0	0.008	5.34	7,153.14	7,151.92	0.013	5.25	7,156.43	7,156.03	7,156.57	7,156.17	1.161
Pipe - (8)	24.0	0.015	9.01	7,151.42	7,150.50	0.013	15.48	7,155.36	7,155.07	7,155.74	7,155.45	1.712
Pipe - (9)	24.0	0.015	9.05	7,150.30	7,148.26	0.013	15.39	7,155.00	7,154.37	7,155.37	7,154.74	1.728
Pipe - (10)	24.0	0.007	7.07	7,148.06	7,146.76	0.013	18.14	7,153.45	7,152.33	7,153.97	7,152.85	1.015
Pipe - (11)	24.0	0.007	8.90	7,146.56	7,146.22	0.013	27.96	7,150.15	7,149.46	7,151.38	7,150.69	1.109
Pipe - (12)	36.0	0.007	8.44	7,145.22	7,143.00	0.013	33.21	7,148.85	7,148.11	7,149.19	7,148.45	1.296
Pipe - (13)	36.0	0.007	8.81	7,142.80	7,141.57	0.013	39.85	7,147.23	7,146.65	7,147.73	7,147.14	1.249
Pipe - (14)	36.0	0.010	10.71	7,141.37	7,140.82	0.013	63.96	7,143.94	7,143.21	7,145.47	7,144.95	1.212
Pipe - (15)	36.0	0.030	17.38	7,136.82	7,136.61	0.013	74.72	7,140.20	7,140.11	7,141.94	7,141.85	2.540
Pipe - (16)	18.0	0.010	4.94	7,155.80	7,155.74	0.013	2.62	7,157.52	7,157.51	7,157.55	7,157.55	1.425
Pipe - (17)	18.0	0.019	9.05	7,153.15	7,151.92	0.013	11.20	7,156.76	7,156.03	7,157.39	7,156.65	1.711
Pipe - (18)	18.0	0.019	9.06	7,148.31	7,147.06	0.013	11.39	7,153.10	7,152.33	7,153.75	7,152.97	1.693
Pipe - (19)	18.0	0.025	8.61	7,146.87	7,146.72	0.013	6.03	7,149.48	7,149.46	7,149.66	7,149.64	2.208
Pipe - (20)	18.0	0.030	10.12	7,145.92	7,144.30	0.013	8.52	7,148.47	7,148.11	7,148.83	7,148.47	2.380
Pipe - (21)	18.0	0.030	11.17	7,142.96	7,141.97	0.013	12.92	7,144.31	7,142.98	7,145.23	7,144.59	2.208
Pipe - (22)	18.0	0.007	4.65	7,155.32	7,155.28	0.013	3.63	7,156.18	7,156.18	7,156.36	7,156.35	1.134
Pipe - (23)	18.0	0.011	5.58	7,155.08	7,152.18	0.013	3.62	7,155.81	7,154.05	7,156.09	7,154.11	1.480
Pipe - (24)	24.0	0.007	6.73	7,151.68	7,149.89	0.013	13.63	7,153.01	7,152.10	7,153.60	7,152.40	1.163
Pipe - (25)	24.0	0.008	6.85	7,147.80	7,146.62	0.013	21.50	7,149.99	7,148.59	7,150.72	7,149.32	0.853
Pipe - (26)	24.0	0.007	6.73	7,146.42	7,146.14	0.013	21.13	7,148.36	7,148.06	7,149.07	7,148.78	0.838
Pipe - (27)	24.0	0.026	12.00	7,145.94	7,144.06	0.013	21.04	7,147.83	7,147.24	7,148.56	7,147.93	2.255
Pipe - (28)	36.0	0.010	8.81	7,142.16	7,141.57	0.013	25.37	7,146.73	7,146.65	7,146.93	7,146.85	1.577
Pipe - (29)	18.0	0.030	8.87	7,144.37	7,144.16	0.013	5.17	7,147.25	7,147.24	7,147.39	7,147.37	2.460
Pipe - (30)	36.0	0.010	8.78	7,143.06	7,142.36	0.013	25.52	7,146.88	7,146.77	7,147.08	7,146.98	1.565
Pipe - (31)	18.0	0.030	10.40	7,149.02	7,148.30	0.013	9.48	7,151.47	7,151.28	7,151.92	7,151.73	2.352
Pipe - (32)	18.0	0.008	5.99	7,152.23	7,152.18	0.013	10.58	7,154.11	7,154.05	7,154.67	7,154.61	0.862
Pipe - (33)	18.0	0.008	4.72	7,149.18	7,148.56	0.013	3.22	7,154.44	7,154.37	7,154.49	7,154.42	1.222
Pipe - (34)	36.0	0.030	17.56	7,136.41	7,136.00	0.013	76.58	7,139.93	7,139.75	7,141.75	7,141.57	2.544
Pipe - (35)	24.0	0.008	6.70	7,149.69	7,148.00	0.013	13.24	7,152.05	7,151.28	7,152.33	7,151.55	1.175
Pipe - (40)	18.0	0.013	4.54	7,136.30	7,136.00	0.013	1.46	7,139.75	7,139.75	7,139.77	7,139.76	1.593

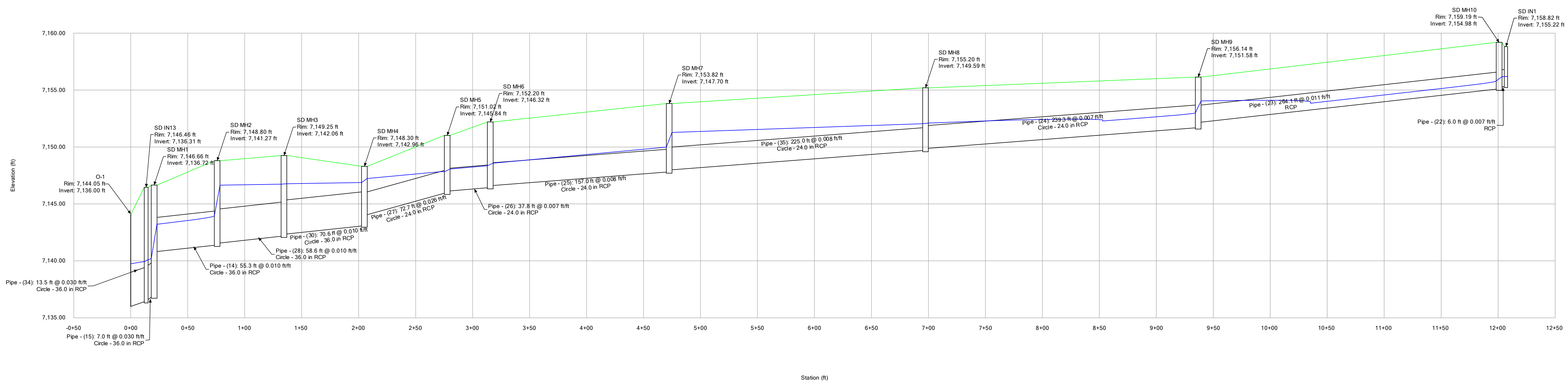
FlexTable: Catch Basin Table - 100 Year Event

Label	Notes	Elevation (Ground) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)
SD IN1	CDOT Type 13	7,158.82	Standard	0.100	0.02
SD IN2	CDOT Type 13	7,155.73	Standard	0.100	0.06
SD IN3	CDOT Type R	7,153.13	Standard	0.100	0.04
SD IN4	CDOT Type 13 Combo	7,148.04	Standard	0.100	0.01
SD IN5	CDOT Type 13	7,160.08	Standard	0.100	0.02
SD IN6	CDOT Type 13	7,160.43	Standard	0.100	0.00
SD IN7	CDOT Type 13	7,156.65	Standard	0.100	0.06
SD IN8	CDOT Type 13	7,152.68	Standard	0.100	0.01
SD IN9	CDOT Type 13	7,151.81	Standard	0.100	0.06
SD IN10	CDOT Type R	7,153.71	Standard	0.100	0.02
SD IN11	CDOT Type 13 Combo	7,152.33	Standard	0.100	0.04
SD IN12	CDOT Type R	7,146.46	Standard	0.100	0.09
SD IN13	CDOT Type 13 Combo	7,146.46	Standard	0.100	0.18
SD IN14	CDOT Type 13 Combo	7,141.13	Standard	0.100	0.00
SDFES 1	24" FES	7,161.72	Standard	0.100	0.02

FlexTable: Manhole Table - 100 Year Event

Label	Notes	Elevation (Rim) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)
SD MH19	5' DIA MH	7,162.57	Standard	1.320	0.19
SD MH18	5' DIA MH	7,161.52	Standard	0.320	0.04
SD MH20	5' DIA MH	7,160.89	Standard	1.770	0.26
SD MH 21	5' DIA MH	7,160.46	Standard	1.770	0.10
SD MH 17	5' DIA MH	7,159.30	Standard	0.320	0.04
SD MH10	5' DIA MH	7,159.19	Standard	1.320	0.37
SD MH16	5' DIA MH	7,158.42	Standard	1.770	0.67
SD MH15	5' DIA MH	7,157.65	Standard	0.200	0.07
SD MH9	5' DIA MH	7,156.14	Standard	1.770	1.04
SD MH14	5' DIA MH	7,156.09	Standard	1.770	0.92
SD MH8	5' DIA MH	7,155.20	Standard	0.200	0.06
SD MH13	5' DIA MH	7,154.56	Standard	1.770	2.18
SD MH11	5' DIA MH	7,154.40	Standard	1.770	0.87
SD MH12	5' DIA MH	7,154.00	Standard	1.770	0.61
SD MH7	5' DIA MH	7,153.82	Standard	1.770	1.29
SD MH6	5' DIA MH	7,152.20	Standard	0.320	0.23
SD MH5	5' DIA MH	7,151.02	Standard	0.320	0.23
SD MH3	5' DIA MH	7,149.25	Standard	0.200	0.04
SD MH2	6' DIA MH	7,148.80	Standard	1.770	2.71
SD MH4	5' DIA MH	7,148.30	Standard	1.770	0.36
SD MH1	6' DIA MH	7,146.66	Standard	1.770	3.07

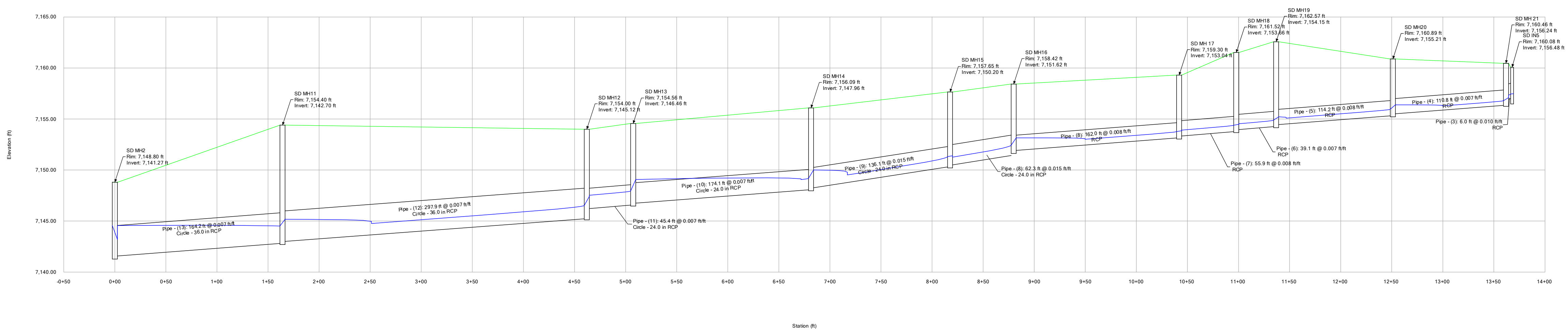
Profile Report
Engineering Profile - O-1 to SD IN1 - 100 Year Event



Profile Report

Engineering Profile - SD MH2 to SD IN5 - 10 Year Event

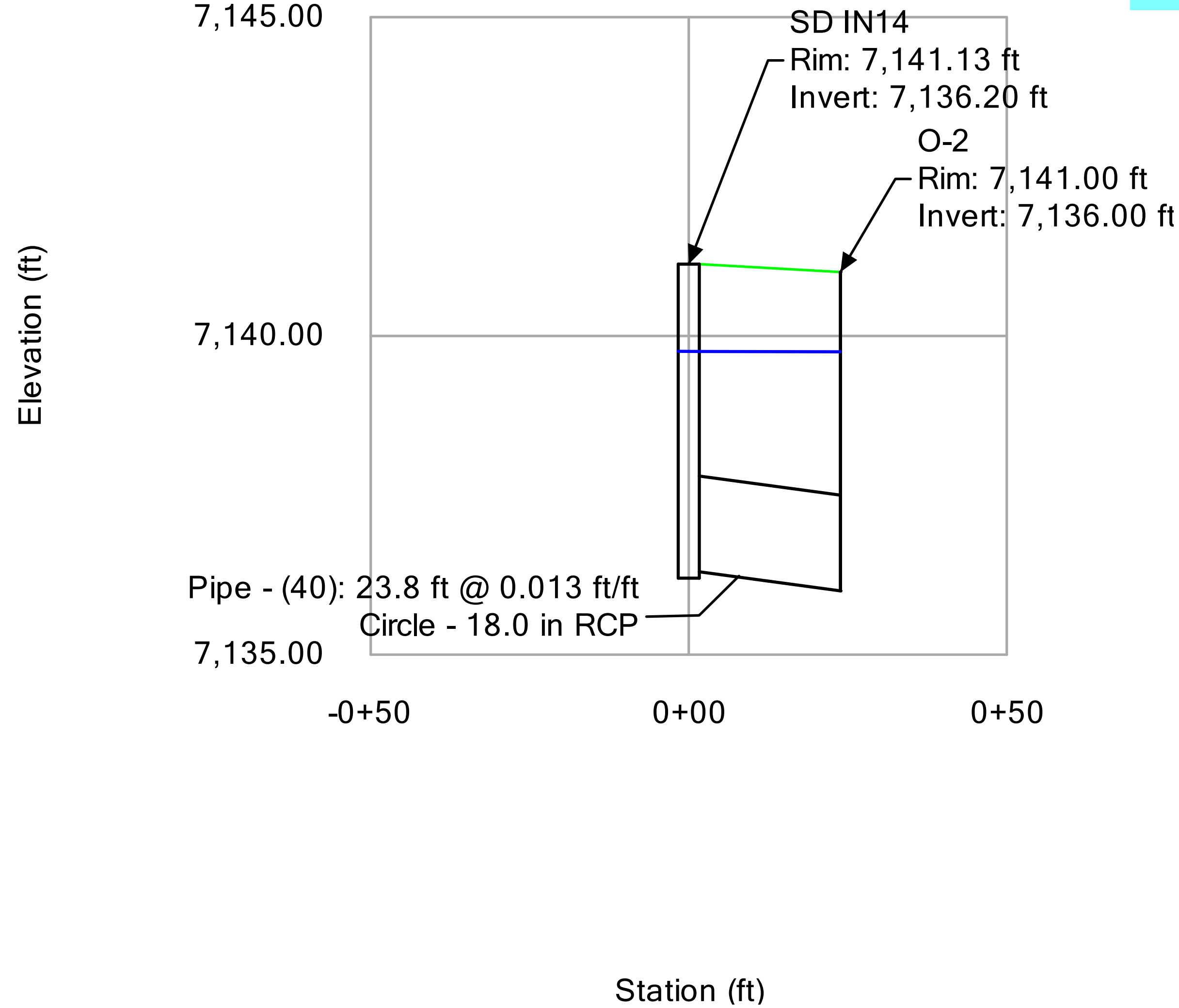
10-year and 100-year profiles were switched. Please place in correct spots



Profile Report

Engineering Profile - O-2 to SD IN14 - 100 Year Event

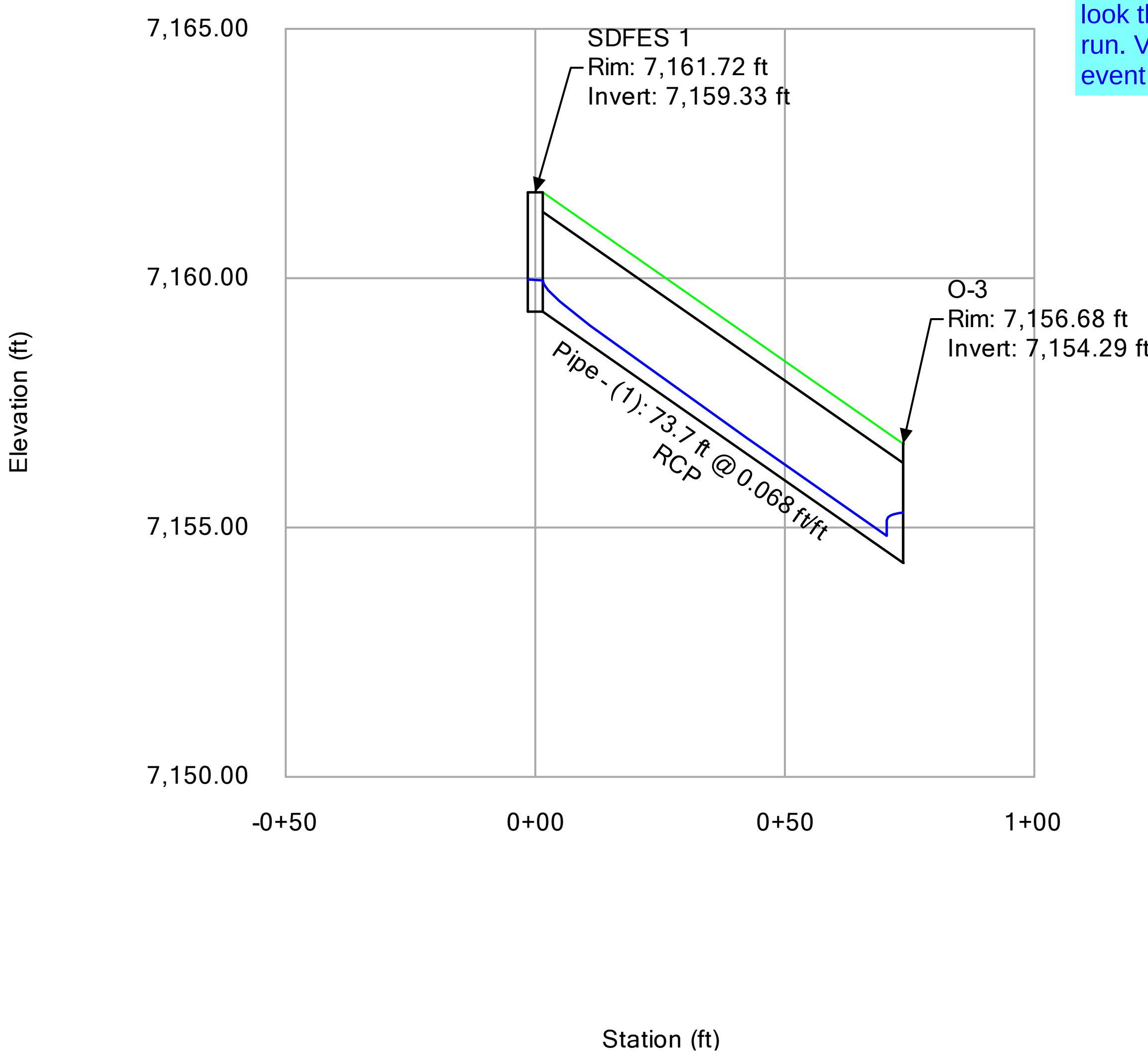
10 and 100-year profiles look the same for this pipe run. Verify each profile event.



Profile Report

Engineering Profile - O-3 to SDFES 1 - 100 Year Event

10 and 100-year profiles look the same for this pipe run. Verify each profile event.



Appendix D - Reference Documents

2.1. - Rainfall Depths

Rainfall depths must be determined based on the duration and return period of the design storm and the size of the drainage basin being evaluated. Depths can be derived by the methods described in the NOAA Atlas. The depths reported in the NOAA Atlas represent probable total depths for each duration and return period at a point on the ground. An extensive evaluation of available rain gage data was completed with the Carlton Study. While some increase in recorded depths was noted from the airport gage data, the other long-term gage locations showed that depths consistent with the NOAA Atlas can be expected. Since the NOAA Atlas is in the process of being updated, it was determined that the published atlas should continue to be used as the source of rainfall depths until this publication is revised or replaced.

The methods described in this Manual require only that the 1-hour, 6-hour and 24-hours depths be used as input. The storm return periods required for the application of methods in this Manual are the 2-, 5-, 10-, 25-, 50- and 100-year events. The 6-hour and 24-hour depths for these return periods can be read directly from Figures 6-6 through 6-17 at the end of this chapter. The1-hour depth for return periods can be calculated for all design return periods following this procedure:

Step 1: Calculate 2-year, 1-hour rainfall based on 2-year, 6-hour and 24-hour values.

$$Y_2 = 0.218 + 0.709 \cdot (X_1 \cdot X_1 / X_2) \qquad \text{(Eq. 6-1)}$$

Where:

Y_2 = 2-year, 1-hour rainfall (in)

X_1 = 2-year, 6-hour rainfall (in) from Figure 6-6

X_2 = 2-year, 24-hour rainfall (in) from Figure 6-12

Step 2: Calculate 100-year, 1-hour rainfall based on 2-year 6-hour and 24-hour values

$$Y_{100} = 1.897 + 0.439 \cdot (X_3 \cdot X_3 / X_4) - 0.008Z \qquad \text{(Eq. 6-2)}$$

Where:

Y_{100} = 100-year, 1-hour rainfall (in)

X_3 = 100-year, 6-hour rainfall (in) from Figure 6-11

X_4 = 100-year, 24-hour rainfall (in) from Figure 6-17

Z = Elevation in hundreds of feet above sea level

3.0. - RATIONAL METHOD

The Rational Method is used to determine runoff peak discharges for drainage basins up to and including 130 acres in size and when hydrologic routing is relatively simple. However, the drainage area should be divided into sub-basins that represent homogeneous land uses, soil types or land cover. The Rational Method is most typically applied for inlet and storm drain sizing.

The Rational Method is based on the direct relationship between rainfall and runoff, and is expressed by the following equation:

$Q = C \cdot I \cdot A$ (Eq. 6-5)

In which:

Q = the maximum rate of runoff (cubic feet per second [cfs])

C = the runoff coefficient that is the ratio between the runoff volume from an area and the average rainfall depth over a given duration for that area

I = the average intensity of rainfall for a duration equal to the time of concentration (in/hr)

A = drainage basin area (acres)

The assumptions and limitations of the Rational Method are described in the UDFCD Manual, Volume 1, Runoff chapter. Standard Form 1 (SF-1) and Standard Form 2 (SF-2) are provided at the end of this chapter as Figure 6-23 and Figure 6-24, respectively to provide a standard format for Rational Method calculations. The SF-1 Form is used for calculating the time of concentration, and the SF-2 form is used to estimate accumulated peak discharges from multiple basins as storm runoff flows downstream in a channel or pipe. Results from the Rational Method calculations shall be included with the drainage report submittal. As an alternative to SF-1 and SF-2, the UD-Rational spreadsheet can be used to document basin parameters and calculations or other spreadsheets or programs can be used as long as the information and format is the similar to that shown in these standard forms.

3.1. - Rational Method Runoff Coefficient (C)

The runoff coefficient represents the integrated effects of infiltration, detention storage, evaporation, retention, flow routing, and interception, all of which affect the time distribution and peak rate of runoff. Runoff coefficients are based on the imperviousness of a particular land use and the hydrologic soil type of the area and are to be selected in accordance with Table 6-6.

The procedure for determining the runoff coefficient includes these steps:

1. Categorize the site area into one or more similar land uses, each with a representative imperviousness, according to the information in Table 6-6.
2. Based on the dominant hydrologic soil type in the area, use Table 6-6 to estimate the runoff coefficient for the particular land use category for the design storms of interest.
3. Calculate an area-weighted average runoff coefficient for the site based on the runoff coefficients from individual land use areas of the site.

When analyzing an area for design purposes, urbanization of the full watershed, including both on-site and off-site areas, shall be assumed.

Gravel parking areas, storage areas, and access drives proposed on Site Improvement Plans shall be analyzed based on an imperviousness of 80%. This is due to the potential for gravel areas being paved over time by property owners and the resulting adverse impacts on the stormwater management facilities and adjacent properties.

There are some circumstances where the selection of impervious percentage values may require additional investigation due to unique land characteristics (e.g., recent burn areas). When these circumstances arise, it is the designer's responsibility to verify that the correct land use assumptions are made.

When multiple sub-basins are delineated, the composite C value calculation is:

$C_c = (C_1 A_1 + C_2 A_2 + C_3 A_3 + \ldots C_i A_i)/A_t$ (Eq. 6-6)

Where:

C_c = composite runoff coefficient for total area

C_i = runoff coefficient for subarea corresponding to surface type or land use

A_i = area of surface type corresponding to Ci (units must be the same as those used for total area)

A_t = total area of all subareas for which composite runoff coefficient applies

i = number of surface types in the drainage area

Table 6-6. Runoff Coefficients for Rational Method

(Source: UDFCD 2001)

Land Use or Surface Characteristics	**Percent Impervious**	**Runoff Coefficients**											
		2-year		**5-year**		**10-year**		**25-year**		**50-year**		**100-year**	
		HSG A&B	**HSG C&D**	**HSG A&B**	**HSG C&D**	**HSG A&B**	**HSG C&D**	**HSG A&B**	**HSG C&D**	**HSG A&B**	**HSG C&D**	**HSG A&B**	**HSG C&D**
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
⅛ Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
¼ Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
⅓ Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57

½ Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis—Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96

Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2. - Time of Concentration

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

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

$t_c = t_i + t_t$ (Eq. 6-7)

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min) ;0h5; 3.2.1.\Overland (Initial) Flow Time

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

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

Where:

t_i = overland (initial) flow time (min)

C_5 = runoff coefficient for 5-year frequency (see Table 6-6)

L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)

S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize. ;0h5; 3.2.2.\Travel Time

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

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

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried) *	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20
* For buried riprap, select C_v value based on type of vegetative cover.	

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

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7. ;0h5; 3.2.3.\First Design Point Time of Concentration in Urban Catchments

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

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

2.1. - DESIGN STORM WATER RUNOFF DETERMINATION

The City/County drainage policy permits the Rational Method and the Soil Conservation Service (SCS) Hydrograph Method as models to be used by designers in estimating storm water runoff for project purposes. The Rational Method is required for drainage basins of 100 acres or less. The SCS Hydrograph Method is required for drainage basins greater than 100 acres. For large complex Drainage Basin Planning Studies, computer models may be utilized following approval by City/County. Necessary data requirements, assumptions and detailed procedures for using models are discussed Section II. All drainage systems must be planned, designed and constructed to handle runoff from both the initial and major design storms. The initial design storm shall be the 10 year event. The major design storm shall be the 100-year event.

Normally in a roadway section, the initial drainage system should convey a substantial portion of the minor storm flows with the more intense or major storm flows conveyed by the available street capacity. Out of roadway sections, storm drain systems combined with overflow swales or drainageway or channel sections must be of adequate capacity to convey both design storms and protect adjacent properties.

NOAA Atlas 14, Volume 8, Version 2
Location name: Monument, Colorado, USA*
Latitude: 39.1092°, Longitude: -104.864°
Elevation: 7156 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.244 (0.200-0.297)	0.312 (0.256-0.379)	0.426 (0.348-0.518)	0.523 (0.424-0.638)	0.659 (0.517-0.830)	0.768 (0.587-0.974)	0.878 (0.648-1.14)	0.993 (0.702-1.31)	1.15 (0.780-1.55)	1.27 (0.839-1.73)
10-min	0.358 (0.293-0.434)	0.457 (0.375-0.555)	0.624 (0.509-0.759)	0.765 (0.621-0.934)	0.966 (0.757-1.22)	1.12 (0.859-1.43)	1.29 (0.949-1.66)	1.45 (1.03-1.92)	1.68 (1.14-2.27)	1.86 (1.23-2.53)
15-min	0.436 (0.358-0.530)	0.558 (0.457-0.677)	0.761 (0.621-0.926)	0.933 (0.757-1.14)	1.18 (0.923-1.48)	1.37 (1.05-1.74)	1.57 (1.16-2.03)	1.77 (1.25-2.34)	2.05 (1.39-2.76)	2.27 (1.50-3.09)
30-min	0.575 (0.471-0.698)	0.736 (0.603-0.894)	1.00 (0.820-1.22)	1.23 (1.00-1.51)	1.56 (1.22-1.96)	1.81 (1.38-2.30)	2.07 (1.53-2.68)	2.34 (1.65-3.09)	2.70 (1.84-3.64)	2.99 (1.97-4.06)
60-min	0.727 (0.596-0.882)	0.897 (0.735-1.09)	1.20 (0.975-1.45)	1.46 (1.18-1.78)	1.85 (1.46-2.35)	2.17 (1.67-2.78)	2.52 (1.86-3.27)	2.88 (2.04-3.82)	3.39 (2.31-4.59)	3.80 (2.51-5.17)
2-hr	0.878 (0.725-1.06)	1.06 (0.872-1.27)	1.38 (1.14-1.67)	1.69 (1.38-2.04)	2.15 (1.71-2.72)	2.54 (1.97-3.23)	2.96 (2.21-3.84)	3.42 (2.45-4.52)	4.08 (2.80-5.50)	4.61 (3.07-6.24)
3-hr	0.987 (0.818-1.18)	1.16 (0.958-1.39)	1.48 (1.22-1.78)	1.80 (1.48-2.17)	2.30 (1.85-2.92)	2.74 (2.14-3.49)	3.22 (2.42-4.18)	3.76 (2.71-4.97)	4.54 (3.14-6.12)	5.19 (3.46-6.99)
6-hr	1.20 (1.00-1.42)	1.39 (1.16-1.65)	1.76 (1.46-2.09)	2.13 (1.75-2.54)	2.72 (2.21-3.43)	3.24 (2.55-4.10)	3.83 (2.90-4.93)	4.48 (3.25-5.89)	5.44 (3.78-7.29)	6.24 (4.19-8.35)
12-hr	1.46 (1.22-1.71)	1.72 (1.44-2.02)	2.20 (1.84-2.60)	2.66 (2.21-3.15)	3.37 (2.74-4.19)	3.98 (3.14-4.98)	4.65 (3.54-5.92)	5.39 (3.92-7.00)	6.44 (4.50-8.55)	7.31 (4.94-9.72)
24-hr	1.76 (1.48-2.05)	2.09 (1.76-2.44)	2.68 (2.25-3.13)	3.22 (2.69-3.77)	4.02 (3.28-4.93)	4.70 (3.73-5.80)	5.43 (4.15-6.83)	6.22 (4.55-8.00)	7.33 (5.15-9.64)	8.23 (5.61-10.9)
2-day	2.09 (1.77-2.41)	2.44 (2.07-2.82)	3.08 (2.60-3.56)	3.65 (3.07-4.24)	4.51 (3.69-5.47)	5.23 (4.17-6.39)	6.00 (4.61-7.48)	6.82 (5.02-8.70)	8.00 (5.65-10.4)	8.94 (6.13-11.7)
3-day	2.26 (1.92-2.59)	2.65 (2.26-3.05)	3.34 (2.83-3.85)	3.95 (3.33-4.57)	4.86 (3.99-5.85)	5.61 (4.49-6.82)	6.41 (4.94-7.95)	7.26 (5.36-9.21)	8.46 (6.00-11.0)	9.42 (6.48-12.3)
4-day	2.39 (2.05-2.74)	2.81 (2.40-3.22)	3.54 (3.01-4.06)	4.18 (3.54-4.82)	5.13 (4.22-6.14)	5.91 (4.74-7.15)	6.73 (5.20-8.31)	7.61 (5.63-9.61)	8.83 (6.28-11.4)	9.81 (6.77-12.8)
7-day	2.79 (2.40-3.17)	3.23 (2.77-3.67)	4.00 (3.42-4.56)	4.68 (3.98-5.36)	5.70 (4.71-6.77)	6.53 (5.26-7.84)	7.42 (5.76-9.10)	8.36 (6.22-10.5)	9.68 (6.92-12.5)	10.7 (7.45-13.9)
10-day	3.15 (2.72-3.56)	3.62 (3.11-4.09)	4.43 (3.80-5.02)	5.15 (4.40-5.87)	6.23 (5.17-7.37)	7.11 (5.75-8.50)	8.05 (6.28-9.83)	9.05 (6.76-11.3)	10.5 (7.50-13.4)	11.6 (8.06-15.0)
20-day	4.17 (3.62-4.67)	4.77 (4.14-5.35)	5.80 (5.01-6.52)	6.69 (5.74-7.55)	7.97 (6.63-9.30)	8.99 (7.30-10.6)	10.1 (7.88-12.1)	11.2 (8.39-13.8)	12.7 (9.17-16.1)	13.9 (9.76-17.9)
30-day	5.00 (4.35-5.57)	5.73 (4.99-6.39)	6.95 (6.03-7.77)	7.98 (6.88-8.96)	9.42 (7.85-10.9)	10.5 (8.58-12.3)	11.7 (9.18-14.0)	12.9 (9.68-15.8)	14.4 (10.4-18.2)	15.7 (11.0-20.0)
45-day	6.03 (5.28-6.68)	6.92 (6.05-7.68)	8.36 (7.28-9.30)	9.55 (8.27-10.7)	11.2 (9.31-12.8)	12.4 (10.1-14.4)	13.6 (10.7-16.2)	14.8 (11.2-18.0)	16.4 (11.9-20.5)	17.6 (12.4-22.4)
60-day	6.90 (6.06-7.62)	7.92 (6.94-8.75)	9.54 (8.33-10.6)	10.8 (9.41-12.1)	12.6 (10.5-14.3)	13.9 (11.3-16.0)	15.1 (11.9-17.8)	16.3 (12.3-19.8)	17.9 (13.0-22.2)	19.0 (13.5-24.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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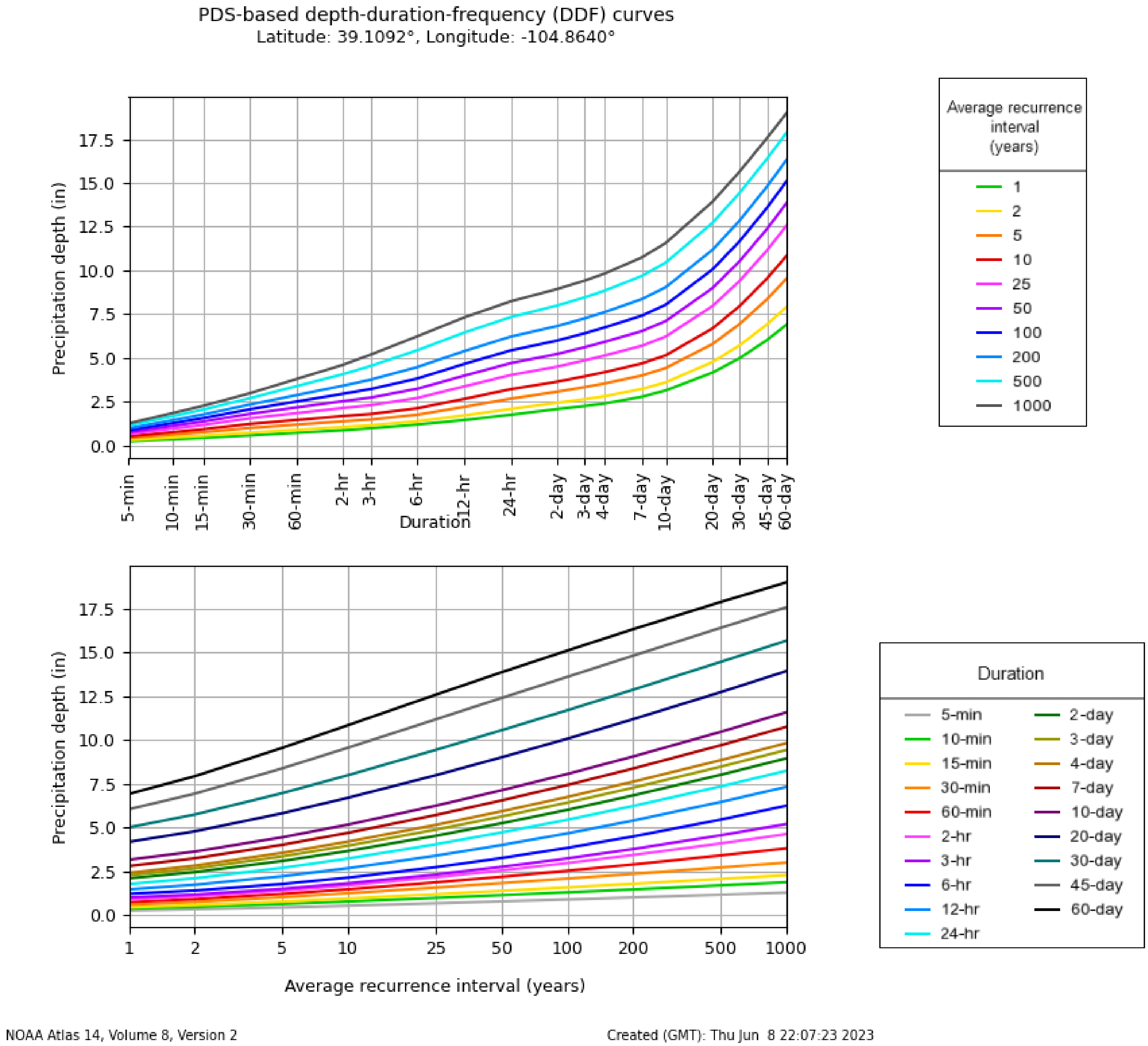
PF graphical



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Maps & aerials

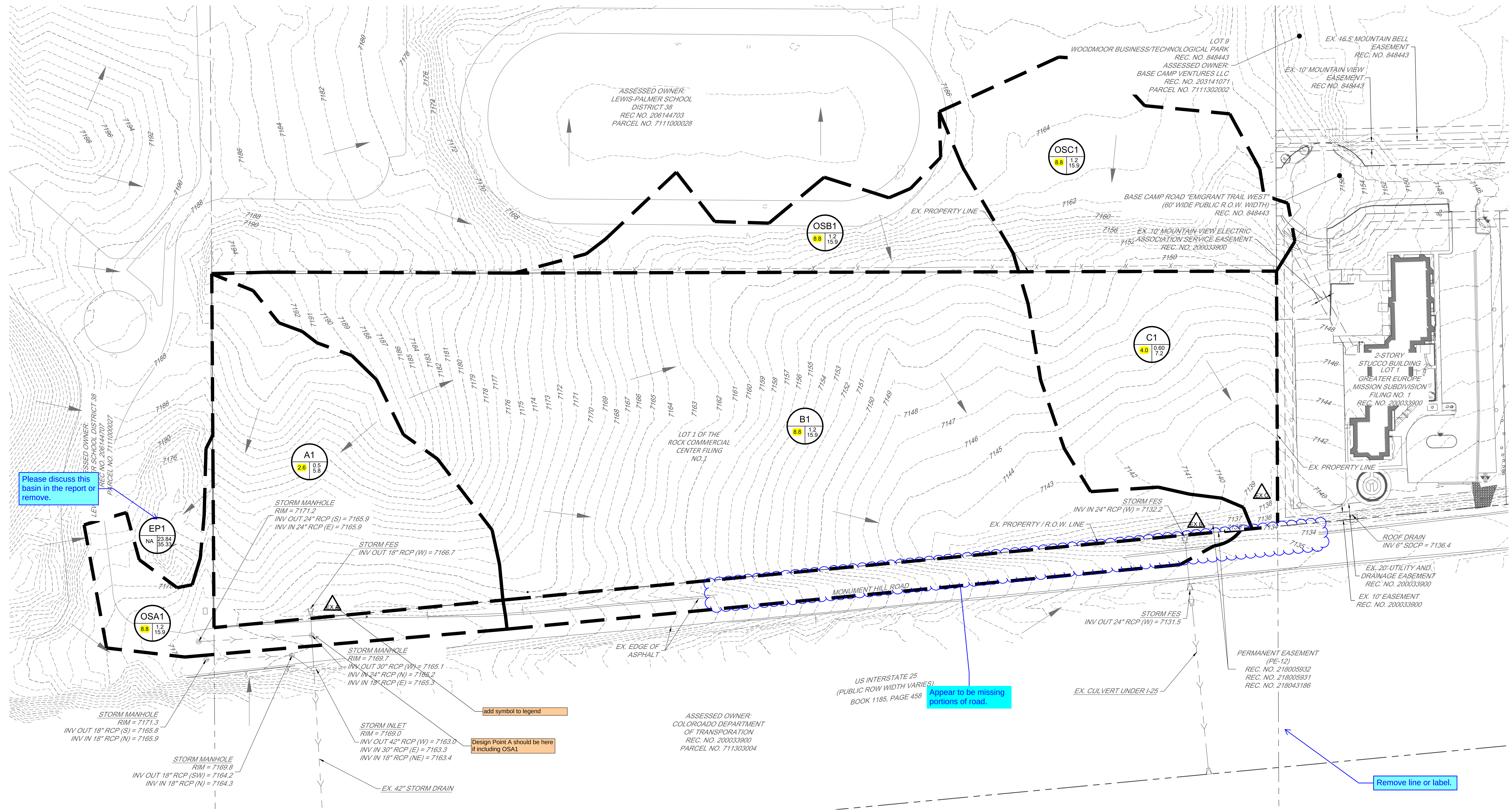
Small scale terrain

Design Procedure Form: Extended Detention Basin (EDB)

Designer: Cameron Salz
Company: Redland
Date: July 28, 2023
Project: The Rock Lot 1 Ffiling No. 1
Location: El Paso County, CO

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 85.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.850
C) Contributing Watershed Area	Area = 10.580 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 1.46 in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ◉ Water Quality Capture Volume (WQCV) ○ Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN}= ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$)	$V_{DESIGN\ OTHER}$= ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= 0.343 ac-ft
I) NRCS Hydrologic Soil Groups of Tributary Watershed i) Percentage of Watershed consisting of Type A Soils ii) Percentage of Watershed consisting of Type B Soils iii) Percentage of Watershed consisting of Type C/D Soils	HSG_A = % HSG_B = % $HSG_{C/D}$ = %
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	$EURV_{DESIGN}$ = ac-f t
K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)	$EURV_{DESIGN\ USER}$= ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.4 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 3.00 ft / ft **DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE**
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	
5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.010 ac-ft
B) Actual Forebay Volume	V_F = 0.010 ac-ft
C) Forebay Depth (D_F = 18 inch maximum)	D_F = 10.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 35.30 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 0.71 cfs
E) Forebay Discharge Design	Choose One: ○ Berm With Pipe ◉ Wall with Rect. Notch ○ Wall with V-Notch Weir — **Flow too small for berm w/ pipe**
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = in
G) Rectangular Notch Width	Calculated W_N = 5.3 in

Appendix E - Drainage Maps



Please revise Basin ID symbols as the acreage shown does not match with the report's narrative or tables.

Also, per legend, other information in basin labels is runoff coefficients. Do not match with runoff coefficients shown in spreadsheet

Include design points in the legend.

DRAINAGE LEGEND

- 5281 EXISTING MINOR CONTOUR
- 5280 EXISTING MAJOR CONTOUR
- EXISTING STORM SEWER LINE
- FEMA FEMA 100-YEAR FLOOD PLAIN
- FEMA ZONE X
- BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- PROPERTY LINE
- A1 EXISTING BASIN ID
- 0.00 EXISTING 10 YEAR RUNOFF COEFFICIENT
- 0.00 EXISTING 100 YEAR RUNOFF COEFFICIENT
- BASIN AREA (ACRES)
- EXISTING GRADE FLOW ARROW

Basin Peak Flows Summary

Basin	Q10	Q100
A1	0.4	5.1
OSA1	0.1	1.5
B1	1.0	13.4
OSB1	0.1	1.7
C1	0.3	3.8
OSC1	0.3	3.5

Flows shown do not match spreadsheet

Design Points Flow Smmary

Design Points	Q10	Q100
A	0.5	6.6
B	1.1	14.1
C	0.6	7.3

Add "PCD File No. PPR2329"

SCALE: 1" = 60'

15 YEARS Redland WHERE GREAT PLACES BEGIN
• Land Planning • Landscape Architecture • Civil Engineering • Construction Management
720.283.6783 REDLAND.COM

NOT FOR CONSTRUCTION

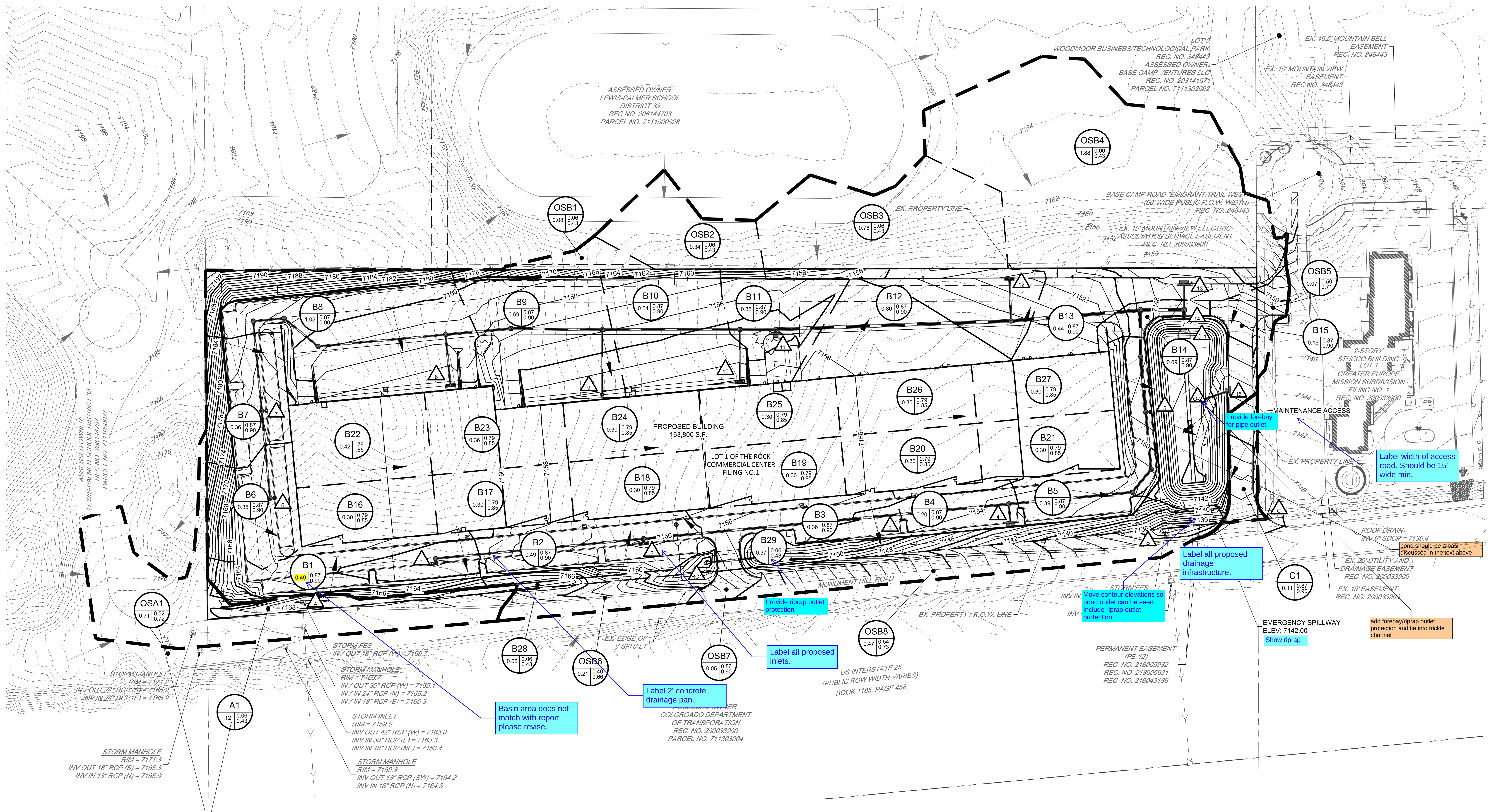
DATE	NO.	NOTES
07/28/23	1	1ST SUBMITTAL

PROJECT NO. 23009

LOT 1 OF THE ROCK COMMERCE CENTER FILING NO. 1

DRAINAGE MAPS
EXISTING DRAINAGE MAP

SHEET DNG-1



DRAINAGE LEGEND

- EXISTING MINOR CONTOUR (5282)
- EXISTING MAJOR CONTOUR (5280)
- PROPOSED MINOR CONTOUR (5281)
- PROPOSED MAJOR CONTOUR (5280)
- PHASE 2 CONSTRUCTION BOUNDARY
- EXISTING STORM SEWER LINE
- PROPOSED STORM SEWER LINE
- PROPOSED MANHOLE
- EXISTING INLET
- PROPOSED INLET
- PROPOSED FLARED END SECTION
- SUB-BASIN BOUNDARY
- MAJOR BASIN BOUNDARY
- PROPERTY LINE
- A1 — BASIN ID; 0.00 — 10 YEAR RUNOFF COEFFICIENT; 0.00 — 100 YEAR RUNOFF COEFFICIENT; 0.000 — BASIN AREA (ACRES)
- 00 — PROPOSED DESIGN POINT
- EX-1 — EXISTING BASIN ID; 0.00 — EXISTING 10 YEAR RUNOFF COEFFICIENT; 0.00 — EXISTING 100 YEAR RUNOFF COEFFICIENT; 0.00 — BASIN AREA (ACRES)
- 00 — EXISTING DESIGN POINT
- EXISTING GRADE FLOW ARROW
- PROPOSED GRADE FLOW ARROW

Basin Peak Flows Summary		
Basin	Q10	Q100
B16	1.2	2.2
B1	2.1	3.8
B17	1.2	2.2
B18	1.2	2.2
B2	2.1	3.7
B19	1.2	2.2
B3	1.5	2.7
B20	1.2	2.2
B4	0.9	1.6
B21	1.2	2.2
B5	1.7	3.0
B27	1.2	2.2
B7	1.6	2.8
B6	1.5	2.7
B8	4.5	8.0
B22	1.6	3.0
B9	3.0	5.3
B23	1.4	2.6
B24	1.2	2.2
B10	2.3	4.2

Basin Peak Flows Summary		
Basin	Q10	Q100
B25	1.2	2.2
B26	1.2	2.2
B11	1.5	2.7
B12	3.4	6.0
B13	1.9	3.4
B14	0.4	0.7
B15	0.7	1.2
C1	0.5	0.9
A1	0.0	0.3
B28	0.0	0.2
B29	0.1	1.0
OSB1	0.0	0.2
OSB2	0.1	0.9
OSB3	0.2	2.1
OSB4	0.3	3.7
OSA1	1.2	3.4
OSB6	0.3	1.0
OSB7	0.2	0.4
OSB8	0.9	2.5
OSB5	0.1	0.4

Include all design points

Design Points Flow Smmary		
Design Points	Q10	Q100
A	1.2	3.7
B	1.3	4.7
C	0.5	0.9
O-1	45	87.1

FULL SPECTRUM POND SUMMARY		
ZONE	VOLUME (AC-FT)	WATER ELEV.
WQCV	0.343	7137.77
EURV	0.735	7140.46
100-YEAR	0.538	7141.98

Water surface elevations do not match with information from MHFD Detention spreadsheet

Add "PCD File No. PPR2329"

SCALE: 1" = 60'

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DRAINAGE MAPS
PROPOSED DRAINAGE MAP

SHEET DNG-2