

DRAINAGE COMPLIANCE LETTER

To: Town of Parker

From: Madeleine Reinke, P.E.
Kimley-Horn and Associates, Inc

Date: September 8, 2025

Subject: **7 Brew – Lincoln Professional Park Filing No. 1, Lot 2**

Kimley-Horn and Associates, Inc. (Kimley-Horn) is submitting this Drainage Compliance Letter for the above referenced project as required by the Town of Parker for Construction Development approval. The purpose of this letter is to demonstrate that the proposed improvements for this project will not negatively impact the existing drainage conditions for the site and will conform to all previously approved drainage reports below:

- “Final Drainage Report for Lincoln & Dransfeldt” prepared by Harris Kocher Smith Dated July 30, 2021 (the “Master Drainage Report”)

PROJECT DESCRIPTION

The proposed 7 Brew development on Lincoln Professional Park Filing No. 1, Lot 2 is part of the multi-use development in the southeast corner of the intersection of Lincoln Avenue and Dransfeldt Road in the Town of Parker, Colorado (“the Town”). The project consists of a vacant 1.05 acres parcel and the development includes site grading, utility service installation, new building construction, parking and sidewalk improvements, and landscaping. The site is bordered to the north by the Private Drive leading to the Maverik gas station, to the east by Private Road B and Andy’s Frozen Custard, to the south by Private Road A, and to the west by the Maverik gas station.

EXISTING DRAINAGE INFORMATION

Per the Master Drainage Report, Drainage Basin B contains Lot 2 and Tract C, which includes the Private Drive to Maverik. Lot 2 is fully contained within Drainage Basin B. Drainage Basin B has the following characteristics:

Table 1 – Existing Drainage

Drainage Basin	Area (AC)	Imperviousness
B	1.26	95%

The master drainage report can be found in **Appendix C**.

**COMPLIANCE WITH COLORADO DISCHARGE PERMIT SYSTEM
GENERAL PERMIT COR080000**

This site lies entirely within the Cherry Creek Reservoir Basin and is subject to compliance with the Colorado Discharge Permit System General Permit COR080000 Stormwater Discharges Associated with Municipal Separate Storm Sewer Systems (MS4s). This permit states that applicable developments must implement control measures to meet the effluent requirements of the permit. A map of the Cherry Creek Reservoir Basin highlighting the project location within it is provided in Appendix A.

“Applicable development sites” are those that result in land disturbance of greater than or equal to one acre, including sites less than one acre that are part of a larger common plan of development or sale, unless excluded below. Applicable development sites include all new development and redevelopment sites for which permanent water quality control measures were required in accordance with an MS4 permit. “New Development” means land disturbing activities; structural development, including construction or installation of a building or structure, creation of impervious surfaces; and land subdivision for a site that does not meet the definition of redevelopment.

This project meets the requirements of an applicable development site as a new development.

The control measure for applicable development sites shall meet the following base design standard which was listed in code section XX of the CDPSG:

(A) WQCV Standard: The control measure(s) is designed to provide treatment and/or infiltration of the WQCV and:

- 1) 100% of the applicable development site is captured, except the permittee may exclude up to 20 percent, not to exceed 1 acre, of the applicable development site area when the permittee has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the permittee must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to street).
- 2) Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the control measure implemented. Consideration of drain time shall include maintaining vegetation necessary for operation of the control measure (e.g., wetland vegetation).

The proposed development will meet the WQCV Standard listed above through routing runoff into the existing extended detention basin located to the west of the Site in Tract A. Any area that the on-site capture infrastructure does not account for is accounted for by the overall development. The total on-site area is 1.05 acres.

PROPOSED DRAINAGE INFORMATION

Drainage patterns proposed in the Master Drainage Report are maintained for this site. Proposed storm sewer infrastructure includes area inlets, curb inlets, and storm sewer pipe that ultimately tie into the existing storm drain infrastructure in the southwest corner of the site. Stormwater will then follow the system proposed in the Master Drainage Report to the extended detention basin on the west side of Lincoln Professional Park Filing No. 1, Tract A before ultimately discharging into the existing public storm infrastructure crossing under Dransfeldt Road.

The Proposed Site is contained in four sub drainage basins, three of which are captured on-site, and one of which flows offsite and is captured within the existing infrastructure within the Private Drive north of the site. The Lincoln Professional Park Filing No. 1 – Lot 2 proposed drainage basins and layout of the storm sewer is shown on the Proposed Drainage Map included in **Appendix A** of this Report. Rational calculations are included in **Appendix B** of this Report, these calculations show the site is overall imperviousness 71%, which is well below the 95% proposed for the overall Basin B within the Master Drainage Report.

Please use and reference the latest MHFD recommended imperviousness from the latest version of Table 6-2 and 6-3 of the USDCM_Volume_1.

Sub-Basin 1

Sub-Basin 1 is approximately 0.13 acres and will consist of landscaping, sidewalk, and asphalt paving. Sub-Basin 1 is 100% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.63 and 0.80 for the 5-year and 100-year storm, respectively. The runoff from Sub-Basin 1 will sheet flow into a 5' Type R curb inlet (Design Point 1) and be conveyed via proposed storm pipe to the existing storm manhole in the southwest corner of the site. The runoff will then be conveyed via existing storm pipe to the offsite detention pond in Tract A.

KH Response:

The latest MHFD recommended imperviousness from Table 6-3 was used and the reference was added to the report text.

Sub-Basin 2

Sub-Basin 2 is approximately 0.54 acres and will consist of the proposed building, portions of the drive-thru lanes, landscaping, sidewalk, and asphalt paving. Sub-Basin 2 has been calculated to be 81% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.66 and 0.81 for the 5-year and 100-year storm, respectively. The runoff from Sub-Basin 2 will sheet flow into a 5' Type R curb inlet (Design Point 2) and be conveyed via proposed storm pipe to the existing storm manhole in the southwest corner of the site. The runoff will then be conveyed via existing storm pipe to the offsite detention pond in Tract A.

Sub-Basin 3

Sub-Basin 3 is approximately 0.13 acres and will consist of landscaping and sidewalk. Sub-Basin 3 has been calculated to be 26% impervious at its ultimate build out condition. The

resulting runoff coefficients for this basin are 0.19 and 0.59 for the 5-year and 100-year storm, respectively. The runoff from Sub-Basin 3 will sheet flow into an area drain (Design Point 3) and be conveyed and be conveyed via proposed storm pipe to the existing storm manhole in the southwest corner of the site. The runoff will then be conveyed via existing storm pipe to the offsite detention pond in Tract A.

Sub-Basin O1

Sub-Basin O1 is approximately 0.01 acres and will consist of portions of sidewalk and landscape area. Sub-Basin O1 has been calculated to be 45% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.40 and 0.67 for the 5-year and 100-year storm, respectively. The runoff from Sub-Basin O1 will sheet flow into the Private Drive to the north of the site and be conveyed via existing storm pipe to the existing offsite flood control pond in Tract A.

The entirety of the proposed Sub-Basins lie within Sub Basin B of The Master Drainage Report. These proposed Sub-Basins do not exceed the imperviousness approved in the Master Drainage Report Basin B. Additionally, the approved drainage patterns are maintained by this design.

The Site proposed onsite drainage basins characteristics are summarized in Table 2 below:

Table 2 – Proposed Drainage

Drainage Basin	Area (AC)	Imperviousness
1	0.13	78%
2	0.54	81%
3	0.13	26%
O1	0.01	45%
TOTAL	0.80	71%

INLET HYDRAULICS

Applicable design methods were utilized to size proposed storm sewer inlets, which includes the use of UD-Inlet, v5.02 MHFD spreadsheets for proposed Type R Inlets and the use of UD-Inlet, v5.02 MHFD equations for the proposed yard area drain inlet.

Inlet hydraulic analysis consist of design intervals as outlined by the following design storm events:

- Minor Storm: 5-year Storm Event
- Major Storm: 100-year Storm Event

Allowable Flow Depths and Spread Widths:

- Minor Storm: 6-inches deep, ½ the adjacent lane/drive width
- Major Storm: 6-inches deep, ½ the adjacent lane/drive width

Inlet Hydraulic Calculations are provided in **Appendix D**.

COMPLIANCE

Discharge compliance is based on the Master Drainage Report. The site maintains the drainage patterns and impervious values established in the Master Drainage Report. The site's storm drain system will capture and route stormwater runoff from the Project Site to the onsite flood control ponds as intended.

The site proposes an impervious cover less than the allowable impervious value for Sub Basin B in the Master Drainage Report and therefore is in compliance with the discharge rates required by the Master Drainage Report. Site impervious calculations from the Master Drainage Report as well as for the proposed development of this site can be found in **Appendices B and C**, respectively, and a summary of the Master Drainage plan impervious and the impervious cover proposed for the site is provided below.

Table 3 – Sub-Basin B Impervious Cover

Allowable	95%
Proposed	71%

CONCLUSION

The development proposes to maintain or reduce the impervious surface ratio for the Site anticipated in the Master Drainage Report. This compliance letter demonstrates that the proposed development on Lot 2, Lincoln Professional Park Filling No 1. project does not deviate from the assumptions made in the approved Master Drainage Report.

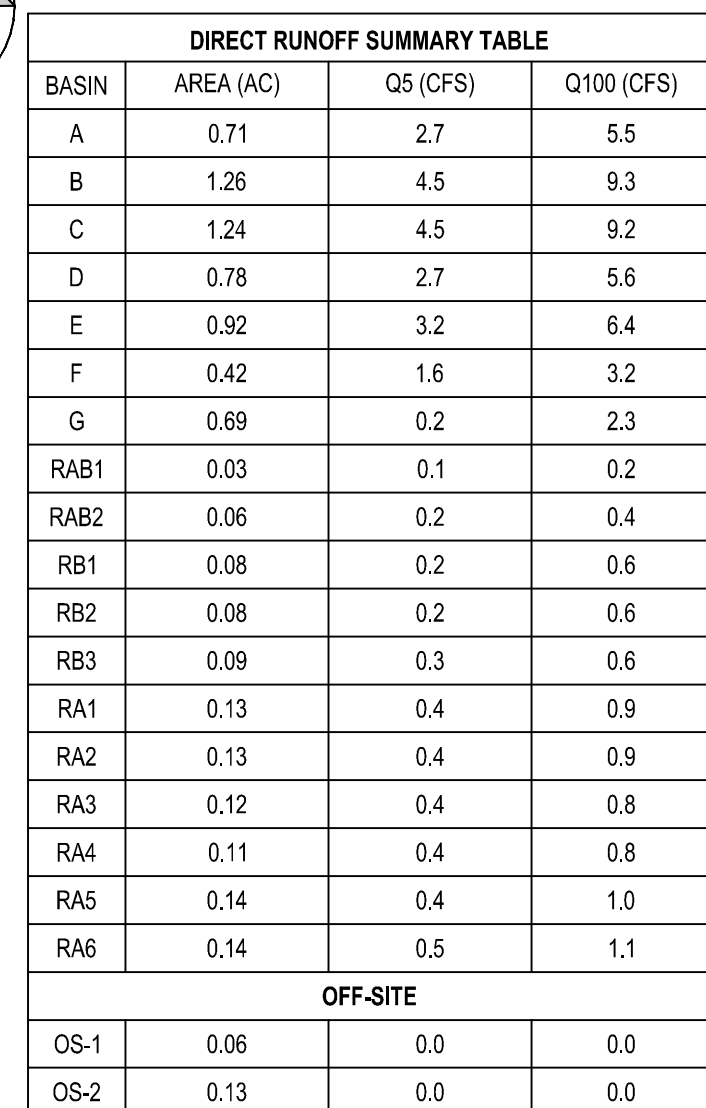
By: Madeleine Reinke
 Licensed Professional Engineer
 State of Colorado No. 66256

Appendices:

- Appendix A: Drainage Map
- Appendix B: Runoff Calculations
- Appendix C: Master Drainage Report
- Appendix D: Inlet Calculations

APPENDIX A –DRAINAGE MAPS





MATCHLINE - SHEET 2

DRANSFELDT RD
(VARIABLE-WIDTH ROW)

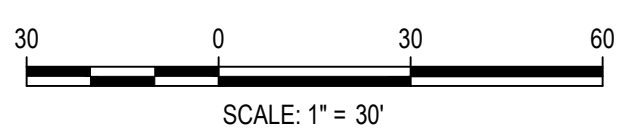
BASIN
EX-RD

AREA	C MINOR ROAD
0.58	0.86
AC	0.89

Professional Engineer



Know what's below.
Call before you dig.



DESIGNED BY: ORM
CHECKED BY: RCP
DRAWN BY: ORM

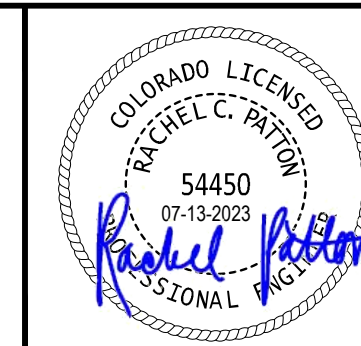
ISSUE DATE: 07-30-2021

DATE	REVISION COMMENTS
11-19-2021	PER TOWN OF PARKER COMMENTS
04-08-2022	PER TOWN OF PARKER COMMENTS
07-21-2022	PER TOWN OF PARKER COMMENTS
10-20-2022	PER TOWN OF PARKER COMMENTS
01-18-2023	PER TOWN OF PARKER COMMENTS
04-03-2023	PER TOWN OF PARKER COMMENTS
07-12-2023	PERMIT SET



1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

PLAZA STREET PARTNERS

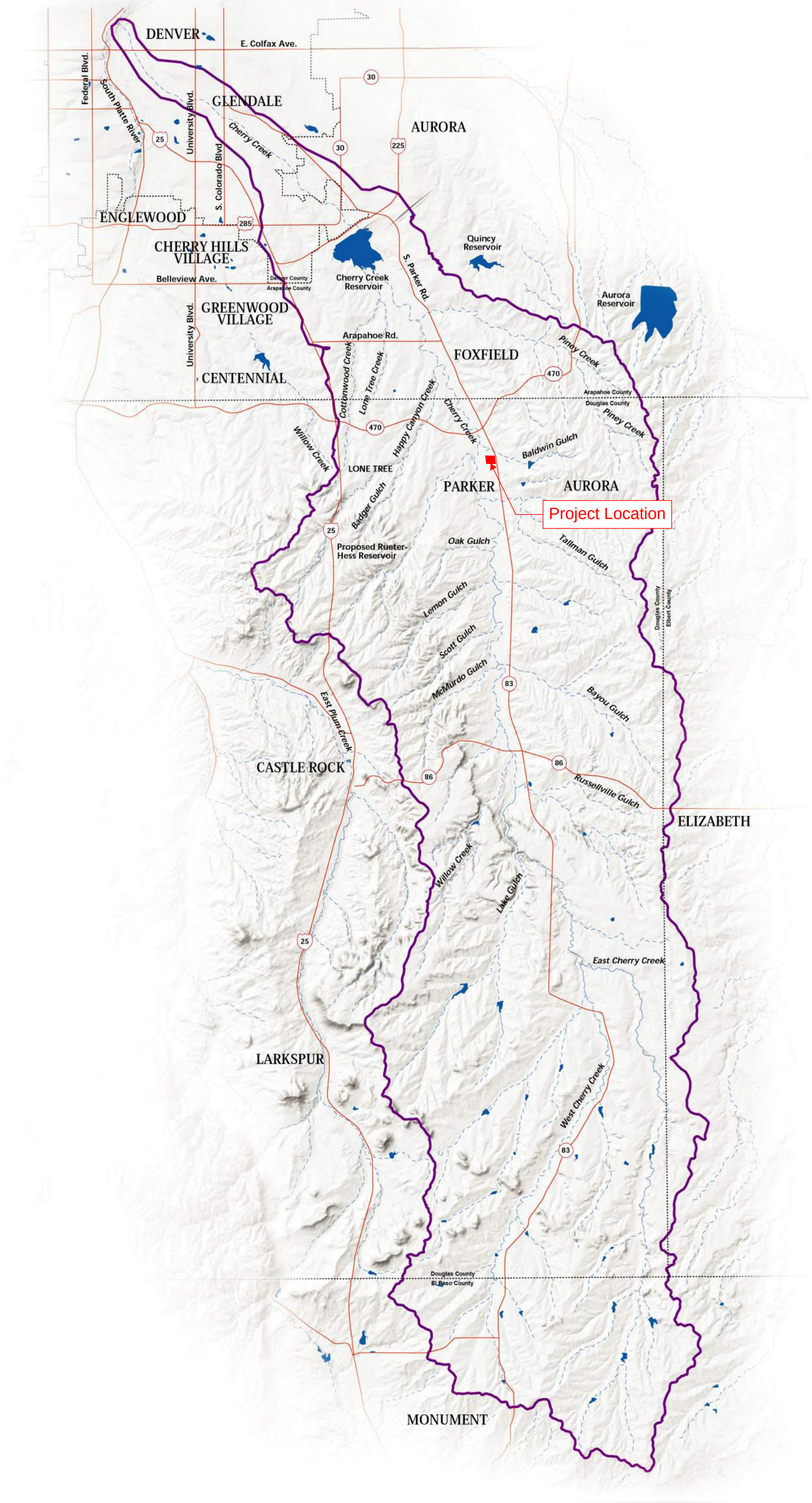
LINCOLN & DRANSFELDT
DRAINAGE MAP

PROJECT #: 200829
SHEET NUMBER

1

1 OF 2

CHERRY CREEK BASIN DRAINAGE MAP



The site plan for Lincoln Professional Park Filing No. 1, Tract C, shows Lot 5 (0.01 acres) and Lot 3 (0.13 acres) outlined in red. The plan includes a private drive, private road A, and private road B. It also shows a 25' drainage easement (typ.) (rec. no. 2023025447) and various utility lines (gas, water, sewer). The plan is dated 01/01/2023 and includes a north arrow.

Lincoln Professional Park Filing No. 1 Tract C

Lincoln Professional Park Filing No. 1 Lot 5

Private Drive

Private Road A

Private Road B

25' DRAINAGE EASEMENT (TYP.) (REC. NO. 2023025447)

Gas

Water

Sewer

STOP

ENTER

EXIT

01 0.01 45%

3 0.13 26%

2 0.53 81%

1 0.13 78%

02 0.24 55%

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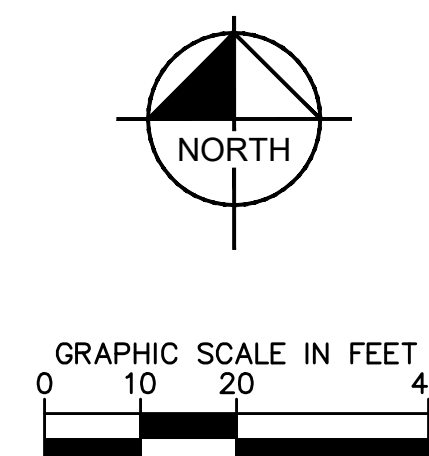
1. ALL STORM INFRASTRUCTURE NOT WITHIN THE ROW IS PRIVATELY OWNED AND MAINTAINED.

RATIONAL CALCULATIONS SUMMARY					
DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	IMPERVIOUSNESS %	PEAK FLOWS (CFS)	
				Q5	Q100
On-Site Basins					
1	1	0.13	78%	0.31	0.81
2	2	0.53	81%	1.25	3.21
3	3	0.13	26%	0.02	0.08
OI	OI	0.01	45%	0.00	0.00
TOTAL		0.79	71%	1.58	4.10

KH Response:
Inlet capacity calculations provided in Appendix D of the Drainage Compliance Letter. Updated calculations per the latest design changes have been included in the same location.

Please include hydraulic calculations for pipe sizing and HGL's for the minor and major storm events. (See Section 6.3.3.4 of the SDECM for Hydraulic Design Requirements)

KH Response:
Hydraulic calculations for pipe sizing and the HGL's for the minor and major storm events has been included in the Drainage Compliance Letter.



Kimley»Horn

© 2025 KIMLEY-HORN AND ASSOCIATES, INC.
6200 South Syracuse Way, Suite 300
Greenwood, Colorado 80111 (303) 228-2300

DESIGNED BY: MMR
DRAWN BY: KNP
CHECKED BY: KEW
DATE: 8/4/25

LINCOLN PROFESSIONAL PARK FILING NO. 1
LOT 2, PARKER, CO
7 BREW - CONSTRUCTION DOCUMENTS
DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR
CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
296237001

SHEET
296237001_DM

C7.0

APPENDIX B – RUNOFF CALCULATIONS



STANDARD FORM SF-1

RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION - PROPOSED

PROJECT NAME: 7 Brew Parker
PROJECT NUMBER: 296237001
CALCULATED BY: KNP
CHECKED BY: MMR

9/9/2025

SOIL:

LAND USE:	PAVEMENT AREA	ROOF AREA	LAWN AREA	GRAVEL AREA
2-YEAR COEFF.	0.78	0.78	0.14	0.30
5-YEAR COEFF.	0.81	0.81	0.20	0.36
100-YEAR COEFF.	0.87	0.87	0.57	0.64
IMPERVIOUS %	95%	95%	20%	40%

DESIGN BASIN	DESIGN POINT	PAVEMENT AREA (AC)	ROOF AREA (AC)	LAWN AREA (AC)	GRAVEL AREA (AC)	TOTAL AREA (AC)	C(2)	C(5)	C(100)	Imp %
On-Site Basins										
1	1	0.10	0.00	0.03	0.00	0.13	0.63	0.67	0.80	78%
2	2	0.42	0.01	0.10	0.00	0.53	0.66	0.69	0.81	81%
3	3	0.01	0.00	0.12	0.00	0.13	0.19	0.25	0.59	26%
O1	O1	0.00	0.00	0.01	0.00	0.01	0.35	0.40	0.67	45%
BASIN SUBTOTAL		0.53	0.01	0.26	0.00	0.80	0.57	0.61	0.77	71%
		67%	1%	32%	0%	100%				

STANDARD FORM SF-2
Time of Concentration

PROJECT NAME: 7 Brew Parker
PROJECT NUMBER: 296237001
CALCULATED BY: KNP
CHECKED BY: MMR

DATE: 9/9/2025

SUB-BASIN DATA			INITIAL TIME (T _i)			TRAVEL TIME (T _t)					T _c CHECK (URBANIZED BASINS)					FINAL T _c
DESIGN BASIN (1)	AREA Ac (2)	C5 (3)	LENGTH Ft (4)	SLOPE % (5)	T _i Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	C _v (9)	VEL fps (11)	T _t Min. (12)	COMP. t _c (13)	TOTAL LENGTH (14)	TOTAL SLOPE (15)	TOTAL IMP. (16)	T _c Min. (17)	Min.
On-Site Basins																
1	0.130	0.669	64	3.6%	4.1	52	0.5%	20.0	1.5	0.6	4.7	116	2.2%	78%	13.4	5.0
2	0.530	0.695	97	2.8%	5.2	134	2.9%	20.0	3.4	0.7	5.8	231	2.8%	81%	12.9	5.8
3	0.130	0.247	47	3.2%	7.2	52	2.2%	7.0	1.0	0.8	8.0	99	2.7%	26%	22.1	8.0
O1	0.011	0.400	12	5.0%	2.6			7.0			2.6	12	5.0%	45%		
$t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_o^{0.33}}$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$																



STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 5 YEAR EVENT

PROJECT NAME: 7 Brew Parker
PROJECT NUMBER: 2.96E+08
CALCULATED BY: KNP
CHECKED BY: MMR

DATE: 9/9/2025

P₁ (1-Hour Rainfall) = 1.1

[illegible]



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

PROJECT NAME: 7 Brew Parker
PROJECT NUMBER: 2.96E+08
CALCULATED BY: KNP
CHECKED BY: MMR

DATE: 9/9/2025

$$P_1 \text{ (1-Hour Rainfall)} = 2.29$$
[illegible]



PROJECT NAME: 7 Brew Parker

DATE: 9/9/2025

PROJECT NUMBER: 296237001

CALCULATED BY: KNP

CHECKED BY: MMR

RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	IMPERVIOUSNESS %	PEAK FLOWS (CFS)	
				Q5	Q100
On-Site Basins					
1	1	0.13	78%	0.31	0.81
2	2	0.53	81%	1.25	3.21
3	3	0.13	26%	0.02	0.08
O1	O1	0.01	45%	0.00	0.00
TOTAL		0.79	71%	1.58	4.10



NOAA Atlas 14, Volume 8, Version 2
Location name: Parker, Colorado, USA*
Latitude: 39.536°, Longitude: -104.7697°
Elevation: 5833 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, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerals](#)

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	0.224 (0.181-0.279)	0.280 (0.227-0.350)	0.377 (0.303-0.471)	0.461 (0.369-0.579)	0.582 (0.452-0.763)	0.681 (0.515-0.903)	0.784 (0.572-1.06)	0.892 (0.623-1.24)	1.04 (0.699-1.49)	1.16 (0.756-1.68)
10-min	0.328 (0.265-0.409)	0.411 (0.332-0.512)	0.552 (0.444-0.690)	0.675 (0.540-0.847)	0.853 (0.662-1.12)	0.997 (0.754-1.32)	1.15 (0.837-1.56)	1.31 (0.912-1.82)	1.52 (1.02-2.19)	1.70 (1.11-2.46)
15-min	0.400 (0.324-0.498)	0.501 (0.405-0.624)	0.673 (0.542-0.841)	0.823 (0.659-1.03)	1.04 (0.807-1.36)	1.22 (0.919-1.61)	1.40 (1.02-1.90)	1.59 (1.11-2.22)	1.86 (1.25-2.67)	2.07 (1.35-3.00)
30-min	0.529 (0.428-0.659)	0.663 (0.536-0.827)	0.892 (0.718-1.12)	1.09 (0.873-1.37)	1.38 (1.07-1.81)	1.61 (1.22-2.14)	1.85 (1.35-2.52)	2.11 (1.47-2.94)	2.46 (1.65-3.53)	2.74 (1.79-3.98)
60-min	0.670 (0.542-0.834)	0.824 (0.666-1.03)	1.09 (0.881-1.37)	1.33 (1.07-1.68)	1.69 (1.31-2.22)	1.98 (1.50-2.63)	2.29 (1.67-3.12)	2.62 (1.83-3.67)	3.08 (2.07-4.43)	3.46 (2.25-5.01)
2-hr	0.810 (0.659-1.00)	0.985 (0.801-1.22)	1.30 (1.05-1.61)	1.58 (1.27-1.96)	2.00 (1.57-2.61)	2.35 (1.80-3.11)	2.73 (2.01-3.69)	3.13 (2.21-4.35)	3.71 (2.51-5.28)	4.17 (2.74-5.99)
3-hr	0.911 (0.744-1.12)	1.09 (0.892-1.35)	1.42 (1.16-1.76)	1.72 (1.39-2.14)	2.18 (1.72-2.85)	2.57 (1.98-3.39)	2.99 (2.22-4.03)	3.45 (2.45-4.77)	4.10 (2.79-5.82)	4.63 (3.05-6.61)
6-hr	1.11 (0.914-1.36)	1.32 (1.09-1.62)	1.70 (1.39-2.08)	2.05 (1.67-2.52)	2.58 (2.05-3.34)	3.03 (2.34-3.95)	3.52 (2.62-4.69)	4.04 (2.89-5.53)	4.79 (3.29-6.73)	5.40 (3.59-7.64)
12-hr	1.36 (1.12-1.64)	1.62 (1.34-1.96)	2.08 (1.72-2.53)	2.49 (2.04-3.04)	3.10 (2.47-3.95)	3.60 (2.80-4.64)	4.13 (3.10-5.45)	4.70 (3.38-6.35)	5.50 (3.80-7.62)	6.13 (4.12-8.58)
24-hr	1.65 (1.38-1.98)	1.96 (1.63-2.35)	2.48 (2.06-2.99)	2.93 (2.42-3.55)	3.60 (2.88-4.52)	4.13 (3.23-5.26)	4.70 (3.54-6.11)	5.29 (3.83-7.06)	6.11 (4.25-8.37)	6.76 (4.57-9.36)
2-day	1.97 (1.66-2.35)	2.29 (1.92-2.73)	2.84 (2.37-3.39)	3.31 (2.75-3.98)	4.00 (3.23-4.99)	4.56 (3.59-5.75)	5.15 (3.92-6.64)	5.77 (4.21-7.63)	6.63 (4.65-8.99)	7.31 (4.99-10.0)
3-day	2.13 (1.79-2.52)	2.48 (2.09-2.94)	3.08 (2.58-3.66)	3.59 (2.99-4.29)	4.33 (3.50-5.35)	4.92 (3.88-6.16)	5.53 (4.22-7.08)	6.18 (4.52-8.10)	7.06 (4.97-9.50)	7.75 (5.31-10.6)
4-day	2.24 (1.89-2.65)	2.63 (2.21-3.11)	3.27 (2.75-3.88)	3.82 (3.19-4.54)	4.60 (3.72-5.65)	5.22 (4.12-6.49)	5.85 (4.47-7.45)	6.52 (4.78-8.50)	7.42 (5.24-9.93)	8.12 (5.58-11.0)
7-day	2.56 (2.17-3.01)	2.98 (2.53-3.51)	3.69 (3.12-4.35)	4.30 (3.61-5.08)	5.15 (4.19-6.29)	5.83 (4.64-7.20)	6.52 (5.02-8.24)	7.24 (5.34-9.37)	8.21 (5.84-10.9)	8.97 (6.21-12.1)
10-day	2.86 (2.44-3.35)	3.30 (2.81-3.86)	4.04 (3.42-4.74)	4.67 (3.93-5.49)	5.56 (4.54-6.75)	6.26 (5.00-7.70)	6.99 (5.40-8.79)	7.75 (5.74-9.98)	8.78 (6.26-11.6)	9.57 (6.66-12.8)
20-day	3.77 (3.23-4.37)	4.24 (3.63-4.92)	5.04 (4.30-5.86)	5.71 (4.85-6.67)	6.68 (5.50-8.03)	7.44 (5.99-9.06)	8.23 (6.41-10.2)	9.05 (6.77-11.5)	10.2 (7.32-13.3)	11.0 (7.74-14.6)
30-day	4.52 (3.89-5.22)	5.07 (4.36-5.86)	5.98 (5.12-6.92)	6.74 (5.75-7.84)	7.81 (6.45-9.32)	8.65 (6.98-10.4)	9.50 (7.42-11.7)	10.4 (7.78-13.1)	11.5 (8.34-14.9)	12.4 (8.76-16.3)
45-day	5.45 (4.71-6.26)	6.17 (5.32-7.09)	7.32 (6.30-8.43)	8.26 (7.07-9.55)	9.53 (7.88-11.3)	10.5 (8.49-12.6)	11.4 (8.96-14.0)	12.4 (9.32-15.5)	13.6 (9.87-17.5)	14.5 (10.3-19.0)
60-day	6.22 (5.39-7.12)	7.13 (6.17-8.17)	8.57 (7.39-9.83)	9.71 (8.33-11.2)	11.2 (9.26-13.2)	12.3 (9.97-14.6)	13.4 (10.5-16.2)	14.4 (10.8-17.9)	15.7 (11.4-20.0)	16.6 (11.8-21.5)

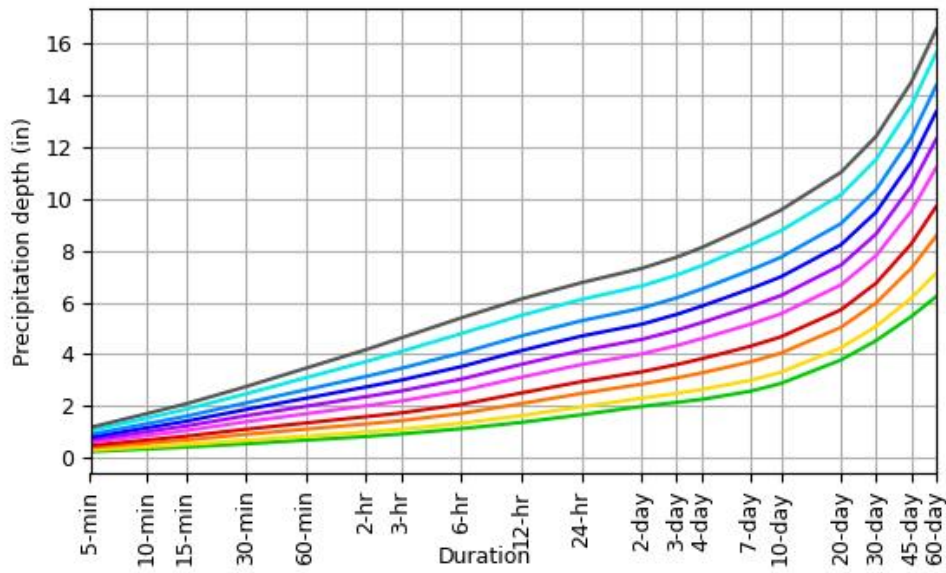
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average 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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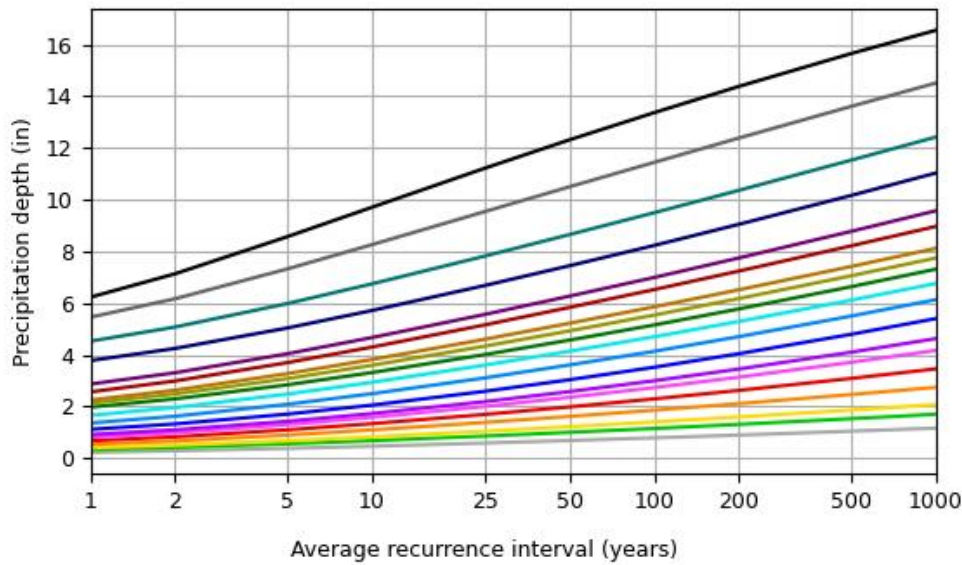
PF graphical

PDS-based depth-duration-frequency (DDF) curves

Latitude: 39.5360°, Longitude: -104.7697°



Average recurrence interval (years)	
1	
2	
5	
10	
25	
50	
100	
200	
500	
1000	

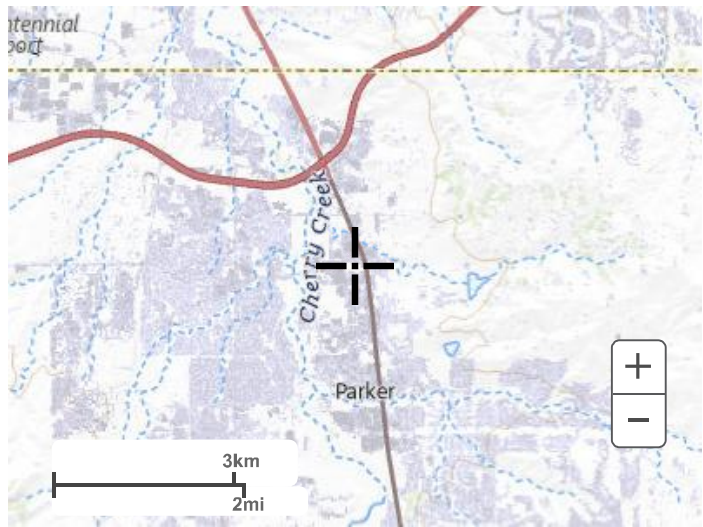


Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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[US Department of Commerce](#)
[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)

APPENDIX C – MASTER DRAINAGE REPORT



FINAL DRAINAGE REPORT

FOR

LINCOLN & DRANSFELDT

July 30, 2021

Revised July 12, 2023

Prepared for:

Plaza Street Partners
2400 W 75th St, Suite 220
Prairie Village, KS 66208

Prepared by:



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Denver, CO 80203
Ph: 303-623-6300

Town of Parker Project Number: SUB21-055
HKS Project No. 200829

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ENGINEER CERTIFICATION

This report for the final drainage design of Lincoln & Dransfeldt was prepared by me or under my direct supervision in accordance with the provisions of the Town of Parker Storm Drainage and Environmental Criteria Manual. I understand that the Town of Parker and its designated town authority do not and will not assume liability for drainage facilities designed by others.

By: Rachel C. Patton
On behalf of Harris Kocher Smith



1. GENERAL LOCATION AND DESCRIPTION

A. Location

The Lincoln & Dransfeldt development (herein referred to as “Site”) lies within the Town of Parker and County of Douglas. The Site is bounded by existing commercial developments to the east and south, Lincoln Avenue to the north and Dransfeldt Road to the west.

The Site is more particularly situated in the Southwest $\frac{1}{4}$ of Section 15, Township 6 South, Range 66 West of the 6th Principal Meridian, County of Douglas, State of Colorado.

A Vicinity Map is included in Appendix A.

B. Description of Property

The planned Lincoln & Dransfeldt development is a proposed commercial development. For the purposes of this Master Report, all end users have been assumed to be commercial with an assumed imperviousness of 95%.

The Site is approximately 7.76 acres, which includes the existing water quality pond in the northeast corner of the Site. The entire Site will be disturbed by demolition, excavation, grading, utility installation and other construction activities.

Currently, the Site contains two single-family homes and garages and driveways with an existing drainage ditch that runs east to west along the northern property line. The existing grades on Site slope generally from east to west, at approximately 2.5%.

There is an existing drainage ditch that runs along the northern property line that will be rerouted via proposed storm infrastructure. There are no existing major irrigation facilities such as ditches or canals located on the Site.

There is no known contamination on-Site. The contractor will be responsible for monitoring for contamination throughout the construction and any required remediation will occur immediately.

The hydrologic soil group for the Site consists of Natural Resources Conservation Service (NRCS) Type B and C soil. Type C/D was used for conservative design purposes. The NCRS Soil Study can be found in Appendix A.

2. MAJOR DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

The Site is located within the Cherry Creek 4600 basin, an area of minimal flood hazard as defined by MHFD. The Site is shown to be in a Zone X (unshaded) Flood Area according to FIRM Map 08035C0067G County of Douglas, Colorado dated March 16, 2016 (See FIRM map in Appendix A). Zone X (unshaded), as depicted on the aforementioned Map, is described by FEMA as “Areas determined to be outside the 0.2% annual change floodplain”. A copy of the FIRM Map is included in Appendix A for reference.

B. Sub-basin Description

Existing runoff from the Site flows overland to an existing drainage ditch along the north side of the property that follows Lincoln Avenue where it is captured by an existing 36-inch x 24-inch elliptical storm culvert at the northwest corner of the property. The culvert conveys flows to the west, under Dransfeldt Road and discharges into an existing storm sewer infrastructure. The proposed on-Site drainage follows the existing patterns and outfall to the existing storm sewer crossing under Dransfeldt Road. The proposed widening improvements along Dransfeldt Road will maintain the existing drainage patterns and will be routed to the existing storm infrastructure and ultimately routed to the existing downstream drainage facility.

The Site is comprised of 20 drainage basins, 18 on-Site and 2 off-Site. The following section describes in detail the on-site drainage basins.

Basin A (0.71 acres) consists of future commercial area, with an assumed impervious of 95%. Runoff from Basin A will be swaled to a grated manhole in the interim/overlot condition at DP 1 and will be routed to the proposed detention basin via the proposed storm infrastructure. In the final condition, the future development will connect to the proposed storm stub. The runoff will be connected to the proposed storm system at Design Point 1.

Basin B (1.26 acres) consists of future commercial area, with an assumed impervious of 95%. Runoff from Basin B will be swaled to a grated manhole in the interim/overlot condition at DP 11 and will be routed to the proposed detention basin via the proposed storm infrastructure. In the final condition, the future development will connect to the proposed storm stub. The runoff will be connected to the proposed storm system at Design Point 11.

Basin C (1.24 acres) consists of future commercial area, with an assumed impervious of 95%. Runoff from Basin C will runoff to the proposed curb and gutter in interim/overlot condition and will be routed to the proposed detention basin via the proposed storm infrastructure. In the final condition, the future development will connect to the proposed storm stub. The runoff will be connected to the proposed storm system at Design Point 15.

Basin D (0.78 acres) consists of future commercial area, with an assumed impervious of 95%. Runoff from Basin D will be swaled to a grated manhole in the interim/overlot condition at DP 16 and will be routed to the proposed detention basin via the proposed storm infrastructure. In the final condition, the future development will connect to the proposed storm stub. The runoff will be connected to the proposed storm system at Design Point 16.

Basin E (0.92 acres) consists of future commercial area, with a calculated impervious of 95%. Runoff from Basin will be swaled to a grated manhole in the interim/overlot condition at DP 12 and will be routed to the proposed detention basin via the proposed storm infrastructure. infrastructure In the final condition, the future development will connect to the proposed storm stub. The runoff will be connected to the proposed storm system at Design Point 12.

Basin F (0.42 acres) consists of future commercial area, with an assumed impervious of 95%. Runoff from Basin F will be swaled to a grated manhole in the interim/overlot condition at DP 4 and will be routed to the proposed detention basin via the proposed storm infrastructure. infrastructure In the final condition, the future development will connect to the proposed storm stub. The runoff will be connected to the proposed storm system at Design Point 4.

Basin G (0.69 acres) consists of the proposed extended detention basin, with an assumed impervious of 7%. Runoff from this basin will be routed from the outlet structure to the existing storm infrastructure.

Basin RAB1 (0.03 acres) consists of portions of proposed Roads A & B, with a calculated impervious of 97%. Runoff from Basin RAB1 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet A6 at Design Point 10.

Basin RAB2 (0.06 acres) consists of portions of proposed Road B, with a calculated impervious of 82%. Runoff from Basin RAB2 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet D3 at Design Point 5.

Basin RB1 (0.08 acres) consists of a portion of proposed Road B, with a calculated impervious of 78%. Runoff from Basin RB1 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet F2 at Design Point 2.

Basin RB2 (0.08 acres) consists of a portion of proposed Road B, with a calculated impervious of 78%. Runoff from Basin RB2 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet F1 at Design Point 3.

Basin RB3 (0.09 acres) consists of a portion of proposed Roads A & B, with a calculated impervious of 76%. Runoff from Basin RB3 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet D2 at Design Point 6.

Basin RA1 (0.13 acres) consists of a portion of proposed Road A, with a calculated impervious of 78%. Runoff from Basin RA1 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet J2 at Design Point 7.

Basin RA2 (0.13 acres) consists of a portion proposed Road A, with a calculated impervious of 78%. Runoff from Basin RA2 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet J1 at Design Point 8.

Basin RA3 (0.12 acres) consists of a portion of proposed Road A, with a calculated impervious of 75%. Runoff from Basin RA3 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet C1 at Design Point 13.

Basin RA4 (0.11 acres) consists of a portion of proposed Road A, with a calculated impervious of 81%. Runoff from Basin RA4 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet A3 at Design Point 14.

Basin RA5 (0.14 acres) consists of a portion of proposed Road A, with a calculated impervious of 79%. Runoff from Basin RA5 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet B1 at Design Point 17.

Basin RA6 (0.14 acres) consists of a portion of proposed Road A, with a calculated impervious of 92%. Runoff from Basin RA6 will runoff to the proposed curb and gutter and will be routed to the proposed detention basin via the proposed storm infrastructure. Runoff from this basin will be captured by Inlet A1 at Design Point 18.

The following section describes the off-Site basins:

Basin OS-1 (0.06 acres) consists of a portion of proposed Road B, which flows off-site, with a calculated impervious of 77%. Runoff from Basin OS-1 will runoff to the north to the existing access road and will be captured by existing storm infrastructure in Lincoln Avenue.

Basin OS-2 (0.13 acres) consists of a portion of proposed Road A, which flows off-site, with a calculated impervious of 84%. Runoff from Basin OS-2 will runoff to the west to Dransfeldt and will be captured by the same existing storm infrastructure that the Site outfall is tied into, via storm infrastructure on Dransfeldt Road.

Storage for these in the proposed extended detention basin as compensatory storage as in accordance with Section 7.2.4 of the Town of Parker Storm Drainage and Environmental Criteria Manual and is further described in the Drainage Facility Design section of this Report.

Calculations for Storm Line E along the northern property boundary have been included in the Rational Calculations in Appendix B. This proposed storm line picks up flows that, in the existing condition, discharge from an existing water quality pond in Tract B to the existing drainage ditch. The 24-inch pipe was sized using an estimation of the existing area going to the pond. These areas are shown in the rational calculations and on drainage map as EX-1 and EX-2, which can be found in Appendix B and Appendix D, respectively.

Due to the widening of east side of Dransfeldt Road, the existing inlet is being removed and replaced. The proposed inlet was analyzed due to the additional impervious area being captured. Based on the "Final Drainage Report for Dransfeldt Road Improvements Phase IV" prepared by Tetra Tech RMC, INC on February 2003, the existing inlet captured 0.40 acres (Basin 131 in the original report). Due to the proposed widening of Dransfeldt by the development, Basin EX-RD (0.58 acres total, 0.18 acres from the widening) and Basin OS-2 (0.12 acres) will need to be captured by the relocated inlet. Both basins are shown on the proposed drainage plan in Appendix D. The proposed inlet is a 15-ft Type R Inlet (Inlet I1) at DP 23 and has capacity to accept the additional flows. Refer to the Inlet Calculations in Appendix C.

The Existing Basin EX-RD was also included in the Rational Calculations in order to confirm the capacity of the outfall pipe at DP 22 for the entire Site. Since the existing drainage patterns for Lincoln Avenue are not being affected by the proposed improvements, the area and flow information was pulled from the Final Drainage Report for the Lincoln Avenue Extension Project (Basin L11 in the original report). It is HKS' understanding that the Town is currently designing the widening of Lincoln and it will their

responsibility to analyze the addition of any additional flows from the widening to the overall storm system.

3. DRAINAGE DESIGN CRITERIA

A. Regulations

The principal design criteria used was the Town of Parker Storm Drainage and Environmental Criteria Manual revised February 2014 (hereinafter referred to as “Parker Criteria”).

In addition, the Urban Storm Drainage Criteria Manual, Volumes 1-3 for Mile High Flood District (MHFD) was also consulted.

B. Town of Parker Stream Protection Standards

Compliance with the Town of Parker’s Stream Protection Standards is not applicable because there are no “natural drainage systems”, as defined by the Parker Criteria.

C. Development Criteria References and Constraints

The principal design guidelines sourced for this Site development are the Parker Criteria and the Urban Storm Drainage Criteria Manual, January 2016 (Volume 1&2) and November 2010 (Volume 3) (hereinafter referred to as “District Manual”).

D. Hydrologic Criteria

The following formula, from the District Manual, was used to determine rainfall intensities:

$$I = \frac{28.5P_1}{(10 + T_C)^{0.786}}$$

One-hour rainfall P_1 values were taken from Table 5.1 in Parker Criteria. The P_1 values for the 5-year and 100-year storms are 0.99 inches and 2.60 inches, respectively.

As previously mentioned, the hydrologic soil group of the Site is assumed to be comprised of NRCS Type C and D soil for conservative design purposes.

The Rational Method, as presented in the District Manual, was used to calculate the maximum rate of runoff for the minor and major storm events. “C” coefficients were taken from Table 6-4 of the District Manual. Rational Method calculation results, including composite C-values, time of concentration, and flow rates can be found in Appendix C.

The 5-year and 100-year storm events have been analyzed, from Table 3-1 of the District Manual. The 5-year storm is considered the minor event and the 100-year storm is considered the major event.

The maximum allowable unit flow release rates (cfs/acre) for on-site detention facilities were obtained from Equation 12-5 from Volume 2, Chapter 12 of the District Manual. The maximum allowable unit release rate is equal to 90 percent of the predevelopment discharge for the upstream watershed. The WQCV will be released via an orifice designed to release the storm using a 40-hour drain time. Calculations are in Appendix D.

Other criteria or calculation methods outside of Parker Criteria or the District Manual were not used in the hydrologic design for the Site.

E. Hydraulic Criteria

Hydraulic capacity for proposed storm sewer system was designed in accordance with the Parker Criteria and the Streets/Inlets/Storm Sewers chapter of the District Manual.

The routing method for the proposed storm sewer system was designed in accordance with the Parker Criteria and the Streets/Inlets/Storm Sewers chapter of the District Manual. StormCAD software will be used to calculate storm sewer capacity and hydraulic grade lines.

Hydraulic grade lines were designed in accordance with the Parker Criteria. During the initial storm event, the hydraulic grade line must be located below the crown of the pipe. For the major storm event, the hydraulic grade must be located 12 inches below finished grade as a maximum condition.

Other criteria or calculation methods outside of Parker Criteria or the District Manual was not used in the drainage facility design for the Site.

F. Variance from Criteria

A variance from the retaining wall criteria listed in Parker Criteria Section 7.3.13 is requested in order to meet other design criteria. A copy of the variance letter has been included in Appendix A.

4. DRAINAGE FACILITY DESIGN

A. General Concept

The general drainage concept for the Site is to capture runoff and route the runoff through proposed curb and gutter and storm sewer infrastructure to an extended detention basin where runoff will be treated and detained. The Extended Detention facility overflows to the public roadway.

B. Specific Details

There is an existing 36"x24" HERCP storm sewer conveyance system underneath Dransfeldt Road that flows from east to west. The proposed system includes street drainage, inlets, storm pipe, manholes, and the associated pond infrastructure. There is an existing water quality treatment pond located on the Site within Tract B.

Once captured, runoff (Basins A-F, RA1-RA6, RB1-RB3, & RAB1-RAB2) will be routed into the extended detention basin. Runoff will then be treated, detained and released to the public storm infrastructure per Town of Parker standards. See Appendix C for calculations.

An assumed imperviousness of 95% for commercial areas was used in the design of the drainage infrastructure based on Table 6-3 in Volume 1 Chapter 6 of the District Criteria. The total required volume is provided based on the UD-Detention Design Spreadsheet.

The acreage of the entire Site, including the existing water quality pond, 7.76 acres, was used as a conservative design. Additional volume was provided to allow for construction tolerance in the field.

EXTENDED DETENTION BASIN SUMMARY TABLE		
STAGE – STORAGE DESCRIPTION	VOLUME REQUIRED	VOLUME PROVIDED
	[AC-FT]	[AC-FT]
WQCV	0.289	0.289
EURV	0.445	0.445
100-YEAR	0.304	0.713
TOTAL	1.038	1.882

The Water Quality Control Volume (WQCV) treatment system and release rate was designed in accordance with Volume 3 of the District Manual. WQCV calculations for the Site can be found in Appendix C.

Compensatory flows for basins OS-1 and OS-2 have been provided and were accounted for in storage and release rate calculations, per Section 7.2.4 of the Parker Criteria. The original outflow of the pond was 8.26 cfs. Per Parker Criteria, the release rate should be decreased by the sum of the undetained flows for the off-site basins. Thus, the outlet structure of the extended detention basin has been reduced by the 100-year flow of 0.40 cfs and 0.70 cfs for basins OS-1 and OS-2, respectively, so the design outflow is 7.03 cfs. Please see the rational calculations and UD detention calculations in Appendices B and C, respectively.

This Site is categorized as a tier three development based on the Cherry Creek tiered water quality requirements because the total disturbed area is over one acre. Based on Town of Parker standards (section 8.3), “Tier three new development and redevelopment must install and operate PBMPs that provide WQCV designed and constructed to capture and treat, at a minimum, the 80th percentile runoff event, in accordance with this SDECM and the MANUAL Volume 3”.

C. Storm Sewer System

Storm sewer pipes were modeled in StormCAD using both Parker Criteria and District Manual standards to ensure the 5-year and 100-year storm criteria were met. Improvements will not impact receiving structures or downstream properties to any greater extents than allowed by regulation or consistent with prior study. Inlets were modeled using the latest version of the MHFD Inlet Spreadsheet. All inlets will capture all flows within their respective basins and no carryover flows are anticipated.

5. Environmental Protection Criteria

A. General

There are no wetland areas or waters of the U.S. situated within the Site. There are no anticipated impacts on threatened and endangered species or presence of Habitat Protection Areas and Stream Restoration Areas.

A Stormwater discharge permit will be acquired through the Colorado Discharge Permit System (CDPS) in addition to a grading permit granted by the Town of Parker.

B. Construction BMP Plan

CBMPs are required to be constructed for use before, during and immediately after the phases of construction. All initial phase CBMPs must be approved and installed prior to the issuance of a grading permit from the Town of Parker. The primary purpose of the CBMPs to be implemented is erosion and sediment control and to contain land disturbing activities onsite. Example of some of the CBMPs to be

utilized are silt fencing, sediment basins, vehicle tracking control, seeding and mulching, etc. CBMP Plans will be submitted and approved by the Town of Parker prior to land disturbance.

C. Permanent BMP Plan

A permanent BMP Plan will be required for the Site since there is an on-site detention basin.

6. CONCLUSIONS

A. Compliance with Standards

Drainage design for the Site was performed in accordance with Parker Criteria, except for when instructed to by said Standard. There is a requested variance from the retaining wall criteria.

Major Drainageway Planning Studies did not implicate specific design requirements to the Site.

B. Drainage Concept

The proposed development will have no negative drainage impacts on upstream and downstream properties.

The proposed development will not influence any master drainage plan recommendations.

C. Sediment and Erosion Control Concept

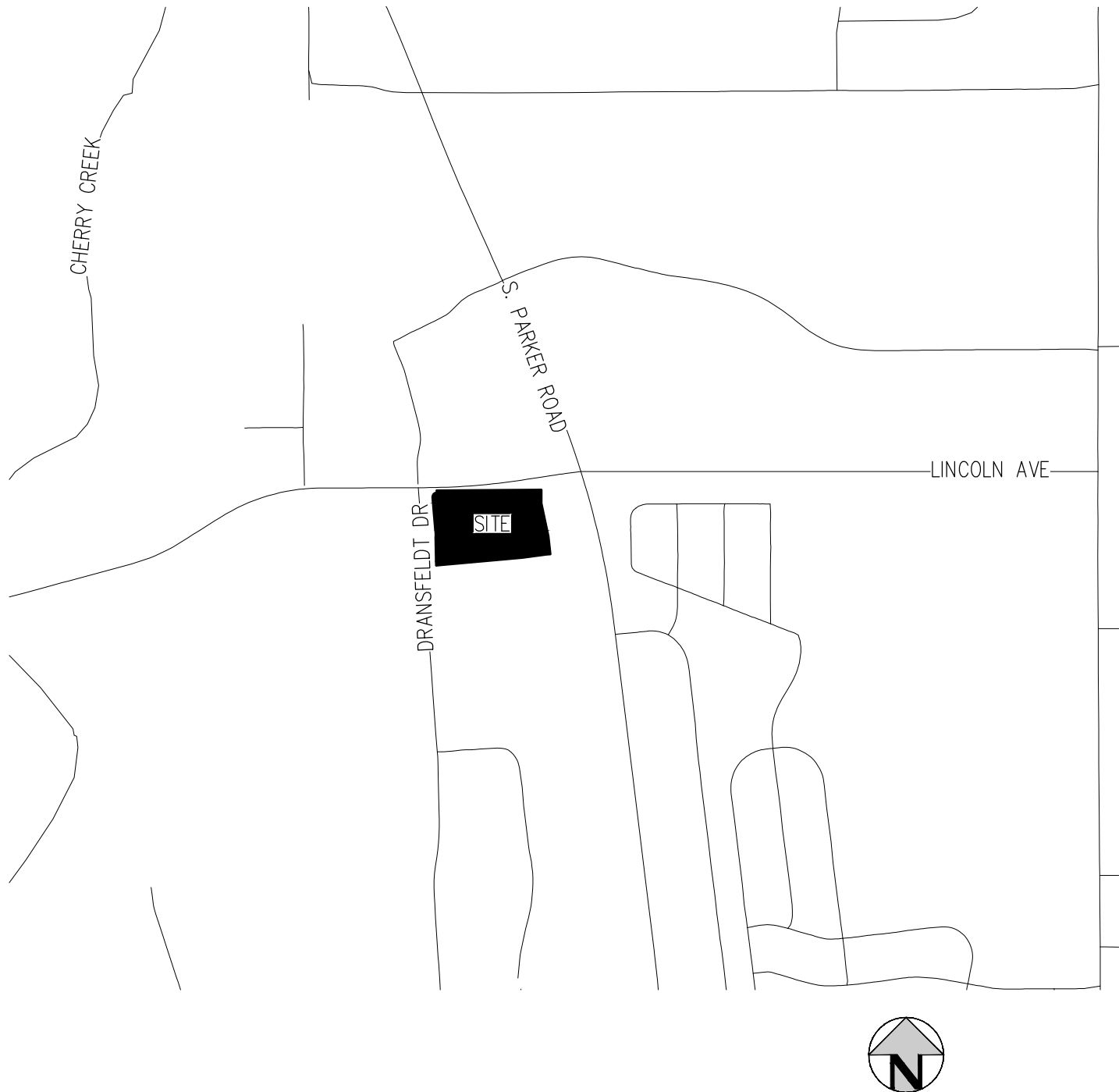
As designed, the proposed CBMP plan satisfies all requirements to obtain a stormwater discharge permit from the CDPS. The CBMP plan also satisfies, at a minimum, all requirements set forth by the Town of Parker and MHFD. All stormwater runoff generated by the Site during construction will be treated by CBMPs. The effect of land disturbing activities on adjacent development and right-of-ways is minimized through the use of various CBMPs.

7. LIST OF REFERENCES

1. Storm Drainage and Environmental Criteria Manual, Town of Parker, Colorado; revised February 2014.
2. Urban Storm Drainage Criteria Manual, Vol. 1 & 2, Urban Drainage and Flood Control District, January 2016.
3. Urban Storm Drainage Criteria Manual, Vol. 3, Urban Drainage and Flood Control District, November 2010.
4. Flood Insurance Rate Map, City and County of Denver, Colorado, Map #0800460201G, FEMA, revised November 17th, 2005.
5. Final Drainage Report for Dransfeldt Road Improvements Phase IV, prepared by Tetra Tech RMC, Inc, February 2003.
6. Final Drainage Report for Lincoln Avenue Extension Project, prepared by Carter Burgess, January 2001.

APPENDIX A – Vicinity Map, FIRM, NCRS Soils Report, Variance Request Letter

Plotted: FRI 07/30/21 4:54:02P By: Olivia McCracken Filepath: k:\200829\engineering\ref\vic map.dwg Layout: layout1



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LINCOLN & DRANSFELDT	
VICINITY MAP	

PROJECT #: 200829
SHEET NUMBER
1
1 OF 1



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Castle Rock Area, Colorado**



June 1, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

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 1:20,000.

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: Castle Rock Area, Colorado
Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Jun 10, 2014—Dec 4, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	7.8	89.4%
Lo	Loamy alluvial land	0.4	5.0%
Sa	Sampson loam	0.5	5.6%
Totals for Area of Interest		8.8	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the

Custom Soil Resource Report

development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Castle Rock Area, Colorado

BrB—Bresser sandy loam, cool, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tlpj

Elevation: 5,500 to 6,500 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 100 to 130 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Bresser, cool, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bresser, Cool

Setting

Landform: Hillslopes, terraces

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope, tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Tertiary aged alluvium derived from arkose

Typical profile

Ap - 0 to 5 inches: sandy loam

Bt1 - 5 to 8 inches: sandy loam

Bt2 - 8 to 27 inches: sandy clay loam

Bt3 - 27 to 36 inches: sandy loam

C - 36 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)

Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: B

Ecological site: R049XB210CO - Sandy Foothill

Hydric soil rating: No

Minor Components

Sampson

Percent of map unit: 5 percent
Landform: Terraces, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XC202CO - Loamy Foothill 14-19 P.Z.
Hydric soil rating: No

Truckton

Percent of map unit: 5 percent
Landform: Hillslopes, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Lo—Loamy alluvial land

Map Unit Setting

National map unit symbol: jqzb
Elevation: 7,000 to 8,000 feet
Mean annual precipitation: 17 to 19 inches
Mean annual air temperature: 44 to 46 degrees F
Frost-free period: 115 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Loamy alluvial land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loamy Alluvial Land

Setting

Landform: Flood plains, swales
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

H1 - 0 to 20 inches: sandy loam
H2 - 20 to 40 inches: stratified loamy sand to clay loam
H3 - 40 to 60 inches: sand and gravel

Properties and qualities

Slope: 1 to 5 percent

Drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 6.00 in/hr)

Depth to water table: About 48 to 72 inches

Frequency of flooding: FrequentNone

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

Available water capacity: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: C

Ecological site: R049XY036CO - Overflow

Hydric soil rating: No

Minor Components

Bresser

Percent of map unit: 7 percent

Hydric soil rating: No

Sampson

Percent of map unit: 7 percent

Hydric soil rating: No

Sandy alluvial land

Percent of map unit: 5 percent

Fluvaquentic haplustolls

Percent of map unit: 1 percent

Landform: Terraces

Hydric soil rating: Yes

Sa—Sampson loam

Map Unit Setting

National map unit symbol: jr02

Elevation: 5,500 to 6,600 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 135 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Sampson and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sampson

Setting

Landform: Stream terraces on drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Weathered alluvium derived from arkose

Typical profile

H1 - 0 to 9 inches: loam
H2 - 9 to 28 inches: clay loam
H3 - 28 to 38 inches: loam
H4 - 38 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R049XC202CO - Loamy Foothill 14-19 P.Z.
Hydric soil rating: No

Minor Components

Englewood

Percent of map unit: 8 percent
Hydric soil rating: No

Bresser

Percent of map unit: 7 percent
Hydric soil rating: No

Loamy alluvial land

Percent of map unit: 4 percent
Hydric soil rating: No

Aquic haplustolls

Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Erosion Factors

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

Wind Erodibility Index

The wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Custom Soil Resource Report Map—Wind Erodibility Index



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MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

	0
	38
	48
	56
	86
	134
	160
	180
	220
	250
	310
	Not rated or not available

Soil Rating Lines

	0
	38
	48
	56
	86
	134
	160
	180
	220

 250

 310

 Not rated or not available

Soil Rating Points

	0
	38
	48
	56
	86
	134
	160
	180
	220
	250
	310
	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 1:20,000.

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.

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Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Jun 10, 2014—Dec 4, 2018

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

Table—Wind Erodibility Index

Map unit symbol	Map unit name	Rating (tons per acre per year)	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	86	7.8	89.4%
Lo	Loamy alluvial land	86	0.4	5.0%
Sa	Sampson loam	48	0.5	5.6%
Totals for Area of Interest			8.8	100.0%

Rating Options—Wind Erodibility Index

Units of Measure: tons per acre per year

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

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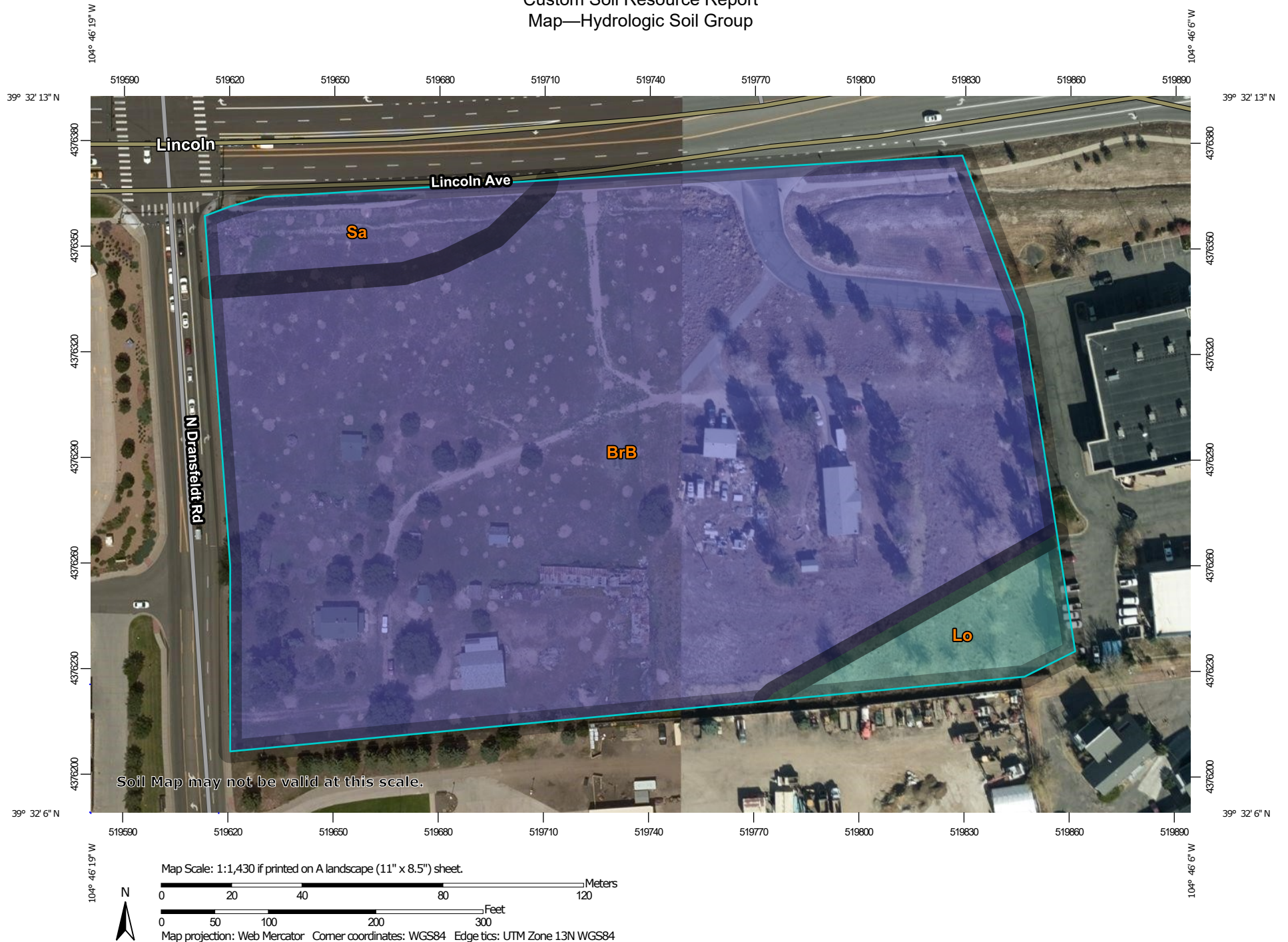
soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report Map—Hydrologic Soil Group



Custom Soil Resource Report

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 1:20,000.

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: Castle Rock Area, Colorado
Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Jun 10, 2014—Dec 4, 2018

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	B	7.8	89.4%
Lo	Loamy alluvial land	C	0.4	5.0%
Sa	Sampson loam	B	0.5	5.6%
Totals for Area of Interest			8.8	100.0%

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

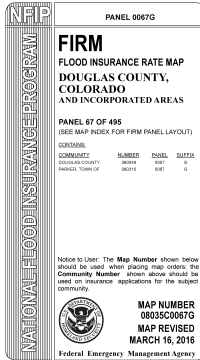
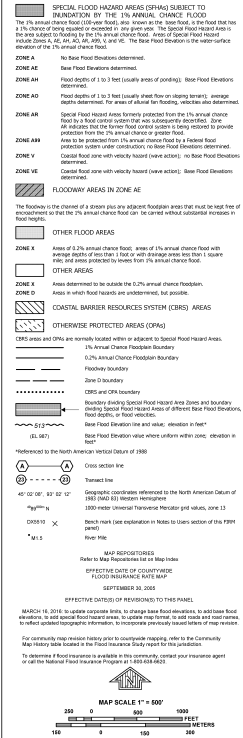
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Custom Soil Resource Report

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DENVER • DALLAS/FORT WORTH

April 13, 2023

Attention: Michael Walton
Senior Review Engineer
Town of Parker
20120 E. Mainstreet
Parker, CO 80138

RE: Lincoln Professional Park – SUB21-055 - Retaining Wall Variance Request
HKS Project No. 200829

Dear Mr. Walton,

This letter serves as a formal request for a variance to the Town of Parker Drainage Criteria Manual, specifically Section 7.3.13 regarding retaining walls. This request is specific for the Lincoln Professional Park, a Master Development which creates 6 commercial lots and 3 tracts.

The Applicant is requesting the following variance to allow retaining walls for more than 50 percent of the circumference of the proposed detention pond:

- The increase in retaining walls around the pond is driven by the space constraints and the proposed CORE utility easement along the western side of the pond. Where feasible, the walls are limited to 30-inches in height, but any sections greater than 30-inches and adjacent to pedestrian use will have appropriate railings and fall protection.
- The proposed pond design provides adequate maintenance per Town Criteria and is not susceptible to failure. The increase in allowable wall extents accommodates the Town Criteria for keeping the EURV Water Surface Elevation below the wall footing and ensures a more manageable long-term structure with a lower likelihood of failure.
- The proposed design of the pond was reviewed with Town staff to incorporate elements that meet the design criteria.
- The proposed pond design is fully functional and can detain the required volume for the 100-yr storm. The pond also does not negatively impact the downstream developments.

If you should have any questions or require additional information, please do not hesitate to contact me at 303-623-6300 or rpatton@hkseng.com.

Sincerely,

HARRIS KOCHER SMITH

A handwritten signature in blue ink that reads 'Rachel Patton'.

Rachel Patton, PE
Project Manager

APPENDIX B – Hydrologic Computations

Project Name:	Lincoln & Dransfeldt
	Composite C-Value Computations
	Post-Development
Project No:	200829
Date:	07/30/21
Revised:	10/19/22
Design by:	ORM
Checked by:	RCP
NRCS Soil Group	C/D

BASIN	TOTAL AREA (ACRES)	ROOFS (90%)	CONCRETE DRIVES & WALKS (90%)	STREETS (100%)	LANDSCAPE AREA (2%)	PERCENT IMPERVIOUS	C ₅ =	C ₁₀₀ =
A	0.71					95%	0.81	0.87
B	1.26					95%	0.81	0.87
C	1.24					95%	0.81	0.87
D	0.78					95%	0.81	0.87
E	0.92					95%	0.81	0.87
F	0.42					95%	0.81	0.87
G	0.69	0.00	0.04	0.00	0.65	7%	0.09	0.51
RAB1	0.03	0.00	0.01	0.02	0.00	97%	0.83	0.88
RAB2	0.06	0.00	0.01	0.04	0.01	82%	0.71	0.82
RB1	0.08	0.00	0.01	0.05	0.02	75%	0.65	0.79
RB2	0.08	0.00	0.01	0.05	0.02	75%	0.65	0.79
RB3	0.09	0.00	0.01	0.06	0.02	76%	0.66	0.80
RA1	0.13	0.00	0.02	0.08	0.03	78%	0.67	0.80
RA2	0.13	0.00	0.02	0.08	0.03	78%	0.67	0.80
RA3	0.12	0.00	0.02	0.07	0.03	75%	0.65	0.79
RA4	0.11	0.00	0.02	0.07	0.02	81%	0.70	0.82
RA5	0.14	0.00	0.02	0.09	0.03	79%	0.68	0.81
RA6	0.14	0.00	0.02	0.11	0.01	92%	0.79	0.86
Total Treated	7.13					81%	0.70	0.82
OFF-SITE TO EX POND								
EX-1	0.43	0.00	0.00	0.17	0.26	41%	0.37	0.65
EX-2	2.38					100%	0.86	0.89
OFF-SITE RUNOFF								
OS-1	0.06	0.00	0.00	0.04	0.02	65%	0.57	0.75
OS-2	0.13	0.00	0.01	0.09	0.03	78%	0.67	0.80
TOTAL FOR POND DESIGN	7.32							
	PS PS							
Total Runoff Off-Site	0.19							
EX-RD	0.58	0.00	0.00	0.58	0.00	100%	0.86	0.89
L11	1.91					100%	0.88*	0.93*

*Percent Impervious for Basins A-F
determined from USDCM Vol 1 Table 6-3

*C Values from Final Drainage Report for
Lincoln Avenue Extension Project

Runoff Coefficient Equations (from USDCM Vol. 1)		
	NRCS Soil Group	C/D
5-year		0.82(i)+0.035
100-year		0.41(i)+0.484

Project Name: Lincoln & Dransfeldt
 Project No: 200829
 Date: 07/30/21
 Revised: 10/19/22

STANDARD FORM SF-2
TIME OF CONCENTRATION
Post-Development

Designed By: ORM
 Checked By: RCP

SUB-BASIN DATA			INITIAL/OVERLAND TIME (Ti)			TRAVEL TIME (Ti)					Tc CHECK (URBANIZED BASINS)			FINAL	REMARKS
BASIN	AREA (AC)	C _s	LENGTH (FT)	SLOPE %	Ti (MIN)	LENGTH (FT)	SLOPE %	C _v	VELOCITY (FPS)	Tt (MIN)	COMPOS. Tc (MIN)	TOTAL LENGTH	Tc = (L/180) + 10 (MIN)	Tc (MIN)	
A	0.71	0.81	62.5	2.00	3.29	219.9	2.00	20	2.83	1.30	5.00	282	11.57	5.00	
B	1.26	0.81	150	2.00	5.10	142.81	2.00	20	2.83	0.84	5.94	293	11.63	5.94	
C	1.24	0.81	102.6	2.00	4.22	241	2.00	20	2.83	1.42	5.64	344	11.91	5.64	
D	0.78	0.81	150	2.00	5.10	238.9	2.00	20	2.83	1.41	6.50	389	12.16	6.50	
E	0.92	0.81	150	2.00	5.10	318.9	2.00	20	2.83	1.88	6.98	469	12.61	6.98	
F	0.42	0.81	25	2.00	2.08	76	2.00	20	2.83	0.45	5.00	101	10.56	5.00	
G	0.69	0.09	87	2.00	13.66	244	2.00	7	0.99	4.11	17.77	331	11.84	11.84	
RAB1	0.03	0.83	20.5	2.00	1.79	75	1.00	20	2.00	0.63	5.00	96	10.53	5.00	
RAB2	0.06	0.71	20.5	2.00	2.59	210	2.50	20	3.16	1.11	5.00	231	11.28	5.00	
RB1	0.08	0.65	15	2.00	2.54	89	1.00	20	2.00	0.74	5.00	104	10.58	5.00	
RB2	0.08	0.65	15	2.00	2.54	89	1.00	20	2.00	0.74	5.00	104	10.58	5.00	
RB3	0.09	0.66	15	2.00	2.49	244	2.50	20	3.16	1.29	5.00	259	11.44	5.00	
RA1	0.13	0.67	15	2.00	2.41	105	1.00	20	2.00	0.88	5.00	120	10.67	5.00	
RA2	0.13	0.67	15	2.00	2.40	40	2.30	20	3.03	0.22	5.00	55	10.31	5.00	
RA3	0.12	0.65	15	2.00	2.56	180	2.30	20	3.03	0.99	5.00	195	11.08	5.00	
RA4	0.11	0.70	15	2.00	2.26	180	2.30	20	3.03	0.99	5.00	195	11.08	5.00	
RA5	0.14	0.68	15	2.00	2.35	200	2.30	20	3.03	1.10	5.00	215	11.19	5.00	
RA6	0.14	0.79	15	2.00	1.75	200	2.30	20	3.03	1.10	5.00	215	11.19	5.00	
OFF-SITE TO EX POND															
EX-1	0.43	0.37	40	2.00	6.73	240	2.30	20	3.03	1.32	8.05	280	11.56	8.05	
EX-2	0.14	0.86	60	2.00	2.76	450	2.30	20	3.03	2.47	5.23	510	12.83	5.23	
OFF-SITE RUNOFF															
OS-1	0.05	0.57	22	2.00	3.65	37	1.00	20	2.00	0.31	5.00	59	10.33	5.00	
OS-2	0.05	0.67	35	2.00	3.69	70	4.00	20	4.00	0.29	5.00	105	10.58	5.00	
EX-RD	0.05	0.00	38	2.00	9.87	620	4.00	20	4.00	2.58	12.45	658	13.66	12.45	

1-HR Rainfall

<u>Return Interval (YR)</u>	<u>1-hour Rainfall</u>
2	0.99
5	1.37
10	1.64
100	2.6

Project Name:Lincoln & Dransfeldt

Project No:200829

Date:07/30/21

Revised:10/19/22

STANDARD FORM SF-2

Post-Development

Rational Method Procedure

Designed By:ORM

Checked By:RCP

Design Storm:5YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				STREET/INLET					STORM SEWER PIPE				TRAVEL TIME			CARRYOVER FLOWS					REMARKS	
		AREA (AC)	RUNOFF COEFF	Tc (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	Tc (min)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	DESIGN FLOW (CFS)	PIPE SLOPE (%)	PIPE SIZE (IN)	Q _{FULL} (CFS)	LENGTH (FT)	VELOCITY (FPS)	Tt (min)	Σ(C x A) BYPASS (AC)	LENGTH (FT)	SLOPE (%)	VELOCITY (FPS)	Tt (min)		
A	1	0.71	0.81	5.00	0.58	4.65	2.7									2.7	0.5	18	9.7	29.3	1.1	0.46							Runoff for Lot 3	
B	11	1.26	0.81	5.94	1.03	4.43	4.5									4.5	2.0	18	19.3	15.7	2.1	0.12							Runoff for Lot 2	
C		1.24	0.81	5.64	1.01	4.50	4.5																							Runoff for Lot 1
D	16	0.78	0.81	6.50	0.63	4.31	2.7									2.7	0.5	18	9.7	46.7	1.1	0.73							Runoff for Lot 4	
E	12	0.92	0.81	6.98	0.75	4.22	3.2									3.2	1.0	18	13.7	36.9	1.5	0.41							Runoff for Lot 5	
F	4	0.42	0.81	5.00	0.34	4.65	1.6									1.6	0.5	18	9.7	26.9	1.1	0.42							Runoff of Lot 6	
G		0.69	0.09	11.84	0.06	3.46	0.2																							Detention Pond
RAB1		0.03	0.83	5.00	0.02	4.65	0.1																							Portions of Roads A & B captured by Inlet A6
RAB2		0.06	0.71	5.00	0.04	4.65	0.2																							Portions of Road B captured by Inlet D3
RB1		0.08	0.65	5.00	0.05	4.65	0.2																							Portion of Road B captured by Inlet F2
RB2		0.08	0.65	5.00	0.05	4.65	0.2																							Portion of Road B captured by Inlet F1
RB3		0.09	0.66	5.00	0.06	4.65	0.3																							Portion of Road B captured by Inlet D2
RA1	7	0.13	0.67	5.00	0.09	4.65	0.4									0.4	1.0	18	13.7	31.3	1.5	0.35							Portion of Road B captured by Inlet J2	
RA2		0.13	0.67	5.00	0.09	4.65	0.4																							Portion of Road A captured by Inlet J1
RA3		0.12	0.65	5.00	0.08	4.65	0.4																							Portion of Road A captured by Inlet C1
RA4		0.11	0.70	5.00	0.08	4.65	0.4																							Portion of Road A captured by Inlet A3
RA5		0.14	0.68	5.00	0.10	4.65	0.4																							Portion of Road A captured by Inlet B1
RA6		0.14	0.79	5.00	0.11	4.65	0.5																							Portion of Road A captured by Inlet A1
ΣDP1 + BASIN RB1	2							5.46	0.63	4.54	2.9						2.9	0.5	18	9.7	31.3	1.1	0.49							
ΣDP2 + BASIN RB2	3							5.95	0.68	4.43	3.0						3.0	2.4	18	21.2	113.6	2.3	0.81							
ΣDP4 + BASIN RAB2	5							5.42	0.38	4.55	1.7						1.7	0.5	18	9.7	31.4	1.1	0.49							
ΣDP5 + BASIN RB3	6							5.92	0.44	4.44	2.0						2.0	0.5	18	9.7	84.9	1.1	1.33							
ΣDP7 + BASIN RA2	8							5.35	0.18	4.56	0.8						0.8	2.7	18	22.4	100.0	2.5	0.68							
ΣDP6 + DP8	9							7.25	0.62	4.16	2.6						2.6	0.5	18	9.7	42.2	1.1	0.66							
ΣDP3 + DP9 + RAB1	10							7.91	1.33	4.04	5.4						5.4	0.6	18	10.6	194.2	1.2	2.78							
ΣDP12 + BASIN RA3	13							7.40	0.83	4.14	3.4						3.4	1.0	18	13.7	31.3	1.5	0.35							
ΣDP10 + DP11 +DP13 + RA4	14							10.70	3.25	3.61	11.7						11.7	0.5	24	20.8	107.2	1.1	1.68							
ΣDP14 + BASIN C	15							12.38	4.26	3.39	14.5						14.5	0.5	24	20.8	68.2	1.1	1.07							
ΣDP16 + BASIN RA5	17							7.24	0.73	4.17	3.0						3.0	0.5	18	9.7	40.5	1.1	0.64							
ΣDP17 + DP15 + BASIN RA6	18							13.45	5.10	3.27	16.7						16.7	0.5	24	20.8	58.1	1.1	0.91							
TOTAL OUTFLOW TO POND	19							14.37	5.17	3.17	16.4																			
OFFSITE AREA GOING TO EX POND																	0.0	3.0	24	50.9	521.4	2.6	3.34							
EX-1		0.43	0.37	8.05	0.16	4.02	0.6																							
EX-2		2.38	0.86	5.23	2.03	4.59	9.3																							
ΣBASIN EX-1 + BASIN EX-2	20							8.05	2.19	4.02	8.8																			
OUTFLOW FROM POND							0.2										0.2	0.5	24	20.8	35.6	1.1	0.56							Outflow from UD_Detention Spreadsheet
ΣOUTFLOW FROM POND + DP20	21										9.0						9.0	0.5	24	20.8	27.0	1.1	0.42							Combined Flows from Proposed Detention Pond and Existing Basins Conservatively Summed
ΣDP21 + EX-RD2	22							8.47	#####	3.95	#VALUE!																			
OS-1		0.06	0.57	5.00	0.03	4.65	0.2																							
OS-2		0.13	0.67	12.45	0.09	3.38	0.3					0.67	0.3	0.0	0.0	0.3					265.0	1.2	3.60							
EX-RD		0.58	0.86	12.45	0.50	3.38	1.7																							
L11		1.91	0.88*	5.00	#####		8.3										8.3	2.0	18	19.3	27.7	2.1	0.22							Flow from Final Drainage Report for Lincoln Avenue Extension Project
ΣBASIN EX-RD + BASIN OS-2	23							16.05	0.58	3.01	1.8																			Flows Captured by Inlet I1 in Dransfeldt

Project Name: Lincoln & Dransfeldt

Project No: 200829

Date: 07/30/21

Revised: 10/19/22

STANDARD FORM SF-2

Post-Development

Rational Method Procedure

Designed By: ORM

Checked By: RCP

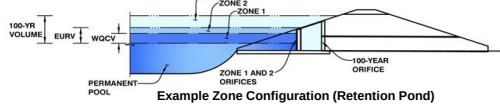
Design Storm: 100 YR

BASIN (s)	DESIGN POINT	DIRECT RUNOFF						TOTAL RUNOFF				STREET/INLET					STORM SEWER PIPE				TRAVEL TIME			CARRYOVER FLOWS					REMARKS	
		AREA (AC)	RUNOFF COEFF	Tc (min)	C x A (AC)	I (IN/HR)	DIRECT RUNOFF, Q (CFS)	Tc (min)	Σ(C x A) (AC)	I (IN/HR)	TOTAL RUNOFF, Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	INLET DESIGN FLOW (CFS)	STREET OR INLET INTERCEPTION (CFS)	CARRYOVER (CFS)	DESIGN FLOW (CFS)	PIPE SLOPE (%)	PIPE SIZE (IN)	Q _{FULL} (CFS)	LENGTH (FT)	VELOCITY (FPS)	Tt (min)	Σ(C x A) BYPASS (AC)	LENGTH (FT)	SLOPE (%)	VELOCITY (FPS)	Tt (min)		
A	1	0.71	0.87	5.00	0.62	8.82	5.5									5.5	0.5	18	9.7	29.3	1.1	0.46							Runoff for Lot 3	
B	11	1.26	0.87	5.94	1.10	8.41	9.3									9.3	2.0	18	19.3	15.7	2.1	0.12							Runoff for Lot 2	
C	15	1.24	0.87	5.64	1.08	8.54	9.2																							Runoff for Lot 1
D	16	0.78	0.87	6.50	0.68	8.18	5.6									5.6	0.5	18	9.7	46.7	1.1	0.73							Runoff for Lot 4	
E	12	0.92	0.87	6.98	0.80	8.00	6.4									6.4	1.0	18	13.7	36.9	1.5	0.41							Runoff for Lot 5	
F	4	0.42	0.87	5.00	0.37	8.82	3.2									3.2	0.5	18	9.7	26.9	1.1	0.42							Runoff of Lot 6	
G		0.69	0.51	11.84	0.35	6.56	2.3																							Detention Pond
RAB1		0.03	0.88	5.00	0.03	8.82	0.2																							Portions of Roads A & B captured by Inlet A6
RAB2		0.06	0.82	5.00	0.05	8.82	0.4																							Portions of Road B captured by Inlet D3
RB1		0.08	0.79	5.00	0.06	8.82	0.6																							Portion of Road B captured by Inlet F2
RB2		0.08	0.79	5.00	0.06	8.82	0.6																							Portion of Road B captured by Inlet F1
RB3		0.09	0.80	5.00	0.07	8.82	0.6																							Portion of Road B captured by Inlet D2
RA1	7	0.13	0.80	5.00	0.10	8.82	0.9									0.9	1.0	18	13.7	31.3	1.5	0.35							Portion of Road A captured by Inlet J2	
RA2		0.13	0.80	5.00	0.10	8.82	0.9																							Portion of Road A captured by Inlet J1
RA3		0.12	0.79	5.00	0.09	8.82	0.8																							Portion of Road A captured by Inlet C1
RA4		0.11	0.82	5.00	0.09	8.82	0.8																							Portion of Road A captured by Inlet A3
RA5		0.14	0.81	5.00	0.11	8.82	1.0																							Portion of Road A captured by Inlet B1
RA6		0.14	0.86	5.00	0.12	8.82	1.1																							Portion of Road A captured by Inlet A1
ΣDP1 + BASIN RB1	2							5.46	0.68	8.61	5.9					5.9	0.5	18	9.7	31.3	1.1	0.49								
ΣDP2 + BASIN RB2	3							5.95	0.75	8.40	6.3					6.3	2.4	18	21.2	113.6	2.3	0.81								
ΣDP4 + BASIN RAB2	5							5.42	0.42	8.63	3.6					3.6	0.5	18	9.7	31.4	1.1	0.49								
ΣDP5 + BASIN RB3	6							5.92	0.49	8.42	4.1					4.1	0.5	18	9.7	84.9	1.1	1.33								
ΣDP7 + BASIN RA2	8							5.35	0.21	8.66	1.8					1.8	2.7	18	22.4	100.0	2.5	0.68								
ΣDP6 + DP8	9							7.25	0.70	7.90	5.5					5.5	0.5	18	9.7	42.2	1.1	0.66								
ΣDP3 + DP9	10							7.91	1.47	7.67	11.3					11.3	0.6	18	10.6	194.2	1.2	2.78								
ΣDP12 + BASIN RA3	13							7.40	0.90	7.85	7.1					7.1	1.0	18	13.7	31.3	1.5	0.35								
ΣDP10 + DP11 +DP13	14							10.70	3.56	6.85	24.4					24.4	0.5	24	20.8	107.2	1.1	1.68								
ΣDP14 + BASIN C	15							12.38	4.64	6.44	29.9					29.9	0.5	24	20.8	68.2	1.1	1.07								
ΣDP16 + BASIN RA5	17							7.24	0.79	7.91	6.3					6.3	0.5	18	9.7	40.5	1.1	0.64								
ΣDP17 + DP15 + BASIN RA6	18							13.45	5.56	6.21	34.5					34.5	0.5	24	20.8	58.1	1.1	0.91								
TOTAL OUTFLOW TO POND	19							14.37	5.91	6.02	35.6																			
OFFSITE AREA GOING TO EX POND																0.0	3.0	24	50.9	521.4	2.6	3.34								
EX-1		0.43	0.65	8.05	0.28	7.63	2.1																							
EX-2		2.38	0.89	5.23	2.13	8.71	18.5																							
ΣBASIN EX-1 + BASIN EX-2	20							8.05	2.41	7.63	18.4																			
OUTFLOW FROM POND							7.4									7.4	0.5	24	20.8	35.6	1.1	0.56								Outflow from UD_Detention Spreadsheet
ΣOUTFLOW FROM POND + DP16	21										25.7					25.7	0.5	24	20.8	27.0	1.1	0.42								Combined Flows from Proposed Detention Pond and Existing Basins Conservatively Summed
ΣDP21 + EX-RD2	22							8.47	#####	7.49	#VALUE!																			
OS-1		0.06	0.75	5.00	0.04	8.82	0.4																							
OS-2		0.13	0.80	12.45	0.10	6.42	0.7					0.67	0.7	0.0	0.0	0.7					265.0	1.2	3.60							
EX-RD L11		0.58 1.91	0.89 0.93*	12.45 5.00	0.52 #####	6.42 16.1	3.3																							Flow from Final Drainage Report for Llincoln Avenue Extension Project
ΣBASIN EX-RD + BASIN OS-2	23							16.05	0.62	5.72	3.6																			Flows Captured by Inlet I1 in Dransfeldt

DIRECT RUNOFF SUMMARY TABLE			
BASIN	AREA (AC)	Q ₅ (CFS)	Q ₁₀₀ (CFS)
A	0.71	2.7	5.5
B	1.26	4.5	9.3
C	1.24	4.5	9.2
D	0.78	2.7	5.6
E	0.92	3.2	6.4
F	0.42	1.6	3.2
G	0.69	0.2	2.3
RAB1	0.03	0.1	0.2
RAB2	0.06	0.2	0.4
RB1	0.08	0.2	0.6
RB2	0.08	0.2	0.6
RB3	0.09	0.3	0.6
RA1	0.13	0.4	0.9
RA2	0.13	0.4	0.9
RA3	0.12	0.4	0.8
RA4	0.11	0.4	0.8
RA5	0.14	0.4	1.0
RA6	0.14	0.5	1.1
OFF-SITE			
OS-1	0.06	0.0	0.0
OS-2	0.13	0.0	0.0

APPENDIX C – Hydraulic Computations

MHFD-Detention, Version 4.05 (January 2022)

Basin ID: BASINS A - RA6

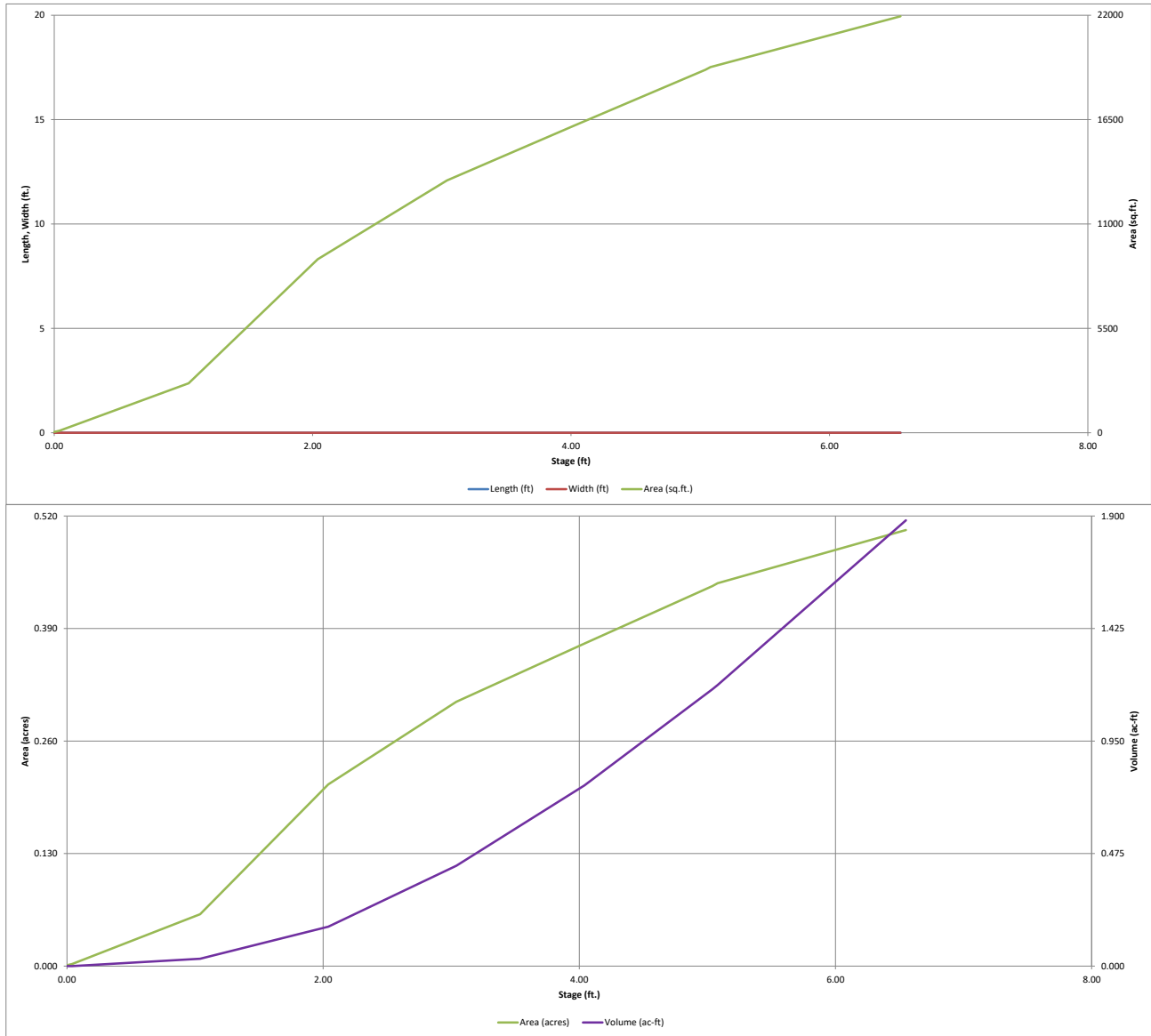
Optional User Overrides

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

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

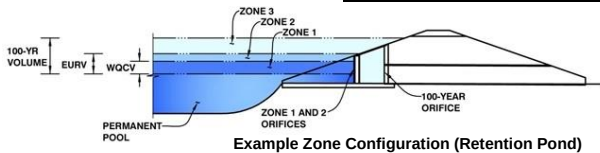


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: Lincoln & Dransfeldt

Basin ID: BASINS A - RA6



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.57	0.289	Orifice Plate
Zone 2 (EURV)	3.97	0.445	Orifice Plate
Zone 3 (100-year)	4.74	0.304	Weir&Pipe (Restrict)
Total (all zones)		1.038	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = N/A ft (distance below the filtration media surface)
Underdrain Orifice Diameter = N/A inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = N/A ft²
Underdrain Orifice Centroid = N/A feet

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

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 3.97 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = N/A inches
Orifice Plate: Orifice Area per Row = 1.45 sq. inches (diameter = 1-3/8 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = 1.007E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.25	2.50					
Orifice Area (sq. inches)	1.45	1.45	1.45					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = N/A ft²
Vertical Orifice Centroid = N/A feet

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

Overflow Weir Front Edge Height, H_o = 4.00 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 13.90 feet
Overflow Weir Grate Slope = 4.00 H:V
Horiz. Length of Weir Sides = 2.92 feet
Overflow Grate Type = Close Mesh Grate
Debris Clogging % = 50%

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = 4.73 feet
Overflow Weir Slope Length = 3.01 feet
Grate Open Area / 100-yr Orifice Area = 58.08
Overflow Grate Open Area w/o Debris = 33.06 ft²
Overflow Grate Open Area w/ Debris = 16.53 ft²

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

Depth to Invert of Outlet Pipe = 2.92 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 18.00 inches
Restrictor Plate Height Above Pipe Invert = 6.45 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 0.57 ft²
Outlet Orifice Centroid = 0.31 feet
Half-Central Angle of Restrictor Plate on Pipe = 1.28 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 5.08 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 25.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.47 feet
Stage at Top of Freeboard = 6.55 feet
Basin Area at Top of Freeboard = 0.50 acres
Basin Volume at Top of Freeboard = 1.88 acre-ft

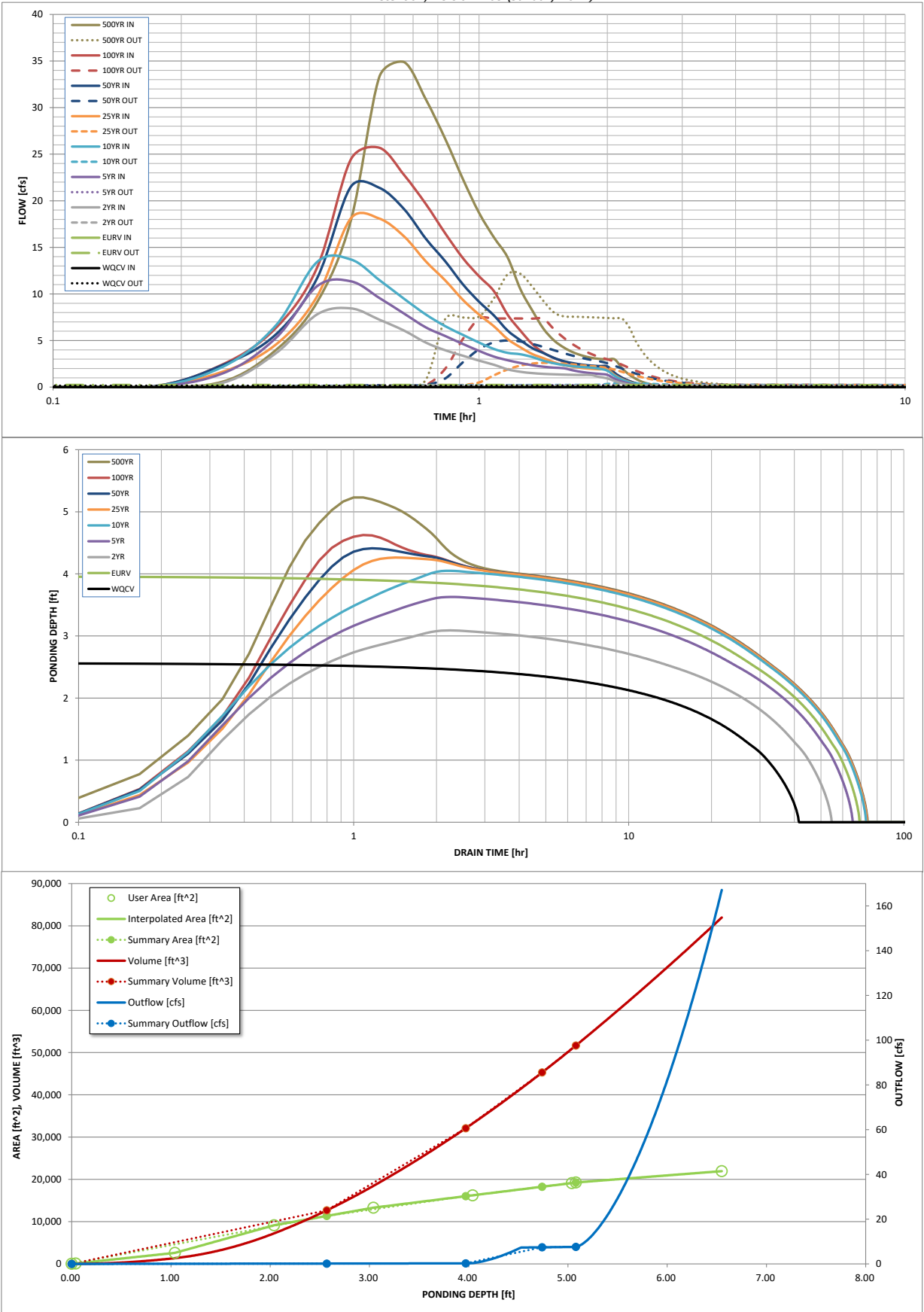
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.82	1.10	1.34	1.69	1.98	2.29	3.08
One-Hour Rainfall Depth (in) =	0.289	0.734	0.467	0.649	0.808	1.043	1.238	1.447	1.978
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.467	0.649	0.808	1.043	1.238	1.447	1.978
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.1	0.7	1.9	4.9	6.7	9.1	14.1
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.09	0.25	0.63	0.86	1.17	1.82
Peak Inflow Q (cfs) =	N/A	N/A	8.5	11.4	13.7	18.1	21.5	25.7	34.9
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.4	2.6	5.0	7.37	12.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.2	0.5	0.8	0.8	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.1	0.1	0.2	0.2
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	61	49	58	65	63	62	61	58
Time to Drain 99% of Inflow Volume (hours) =	40	66	52	62	69	69	69	68	67
Maximum Ponding Depth (ft) =	2.57	3.97	3.09	3.63	4.05	4.26	4.41	4.63	5.23
Area at Maximum Ponding Depth (acres) =	0.26	0.37	0.31	0.34	0.37	0.39	0.40	0.41	0.45
Maximum Volume Stored (acre-ft) =	0.291	0.737	0.436	0.612	0.763	0.846	0.905	0.990	1.253

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58
	0:15:00	0.00	0.00	0.46	1.47	2.17	1.65	2.36	2.44	3.97
	0:20:00	0.00	0.00	3.63	5.26	6.61	4.56	5.65	6.34	9.11
	0:25:00	0.00	0.00	7.80	10.83	13.42	9.74	11.68	12.82	17.85
	0:30:00	0.00	0.00	8.45	11.36	13.70	18.11	21.50	24.42	33.29
	0:35:00	0.00	0.00	7.24	9.57	11.49	18.09	21.39	25.69	34.88
	0:40:00	0.00	0.00	6.07	7.89	9.48	16.18	19.11	22.77	30.88
	0:45:00	0.00	0.00	4.78	6.41	7.79	13.49	15.93	19.65	26.62
	0:50:00	0.00	0.00	3.95	5.48	6.54	11.44	13.49	16.49	22.32
	0:55:00	0.00	0.00	3.37	4.63	5.61	9.36	11.02	13.84	18.71
	1:00:00	0.00	0.00	2.84	3.89	4.78	7.78	9.16	11.90	16.08
	1:05:00	0.00	0.00	2.40	3.28	4.10	6.54	7.70	10.31	13.93
	1:10:00	0.00	0.00	1.91	2.89	3.68	5.16	6.07	7.78	10.52
	1:15:00	0.00	0.00	1.64	2.59	3.53	4.27	5.04	6.07	8.23
	1:20:00	0.00	0.00	1.50	2.35	3.23	3.55	4.18	4.62	6.26
	1:25:00	0.00	0.00	1.42	2.19	2.83	3.10	3.65	3.69	5.00
	1:30:00	0.00	0.00	1.37	2.09	2.55	2.66	3.13	3.12	4.24
	1:35:00	0.00	0.00	1.34	2.02	2.36	2.36	2.78	2.74	3.71
	1:40:00	0.00	0.00	1.32	1.78	2.24	2.17	2.56	2.49	3.38
	1:45:00	0.00	0.00	1.30	1.61	2.15	2.04	2.41	2.32	3.15
	1:50:00	0.00	0.00	1.29	1.50	2.09	1.96	2.31	2.23	3.03
	1:55:00	0.00	0.00	1.09	1.42	1.98	1.92	2.26	2.20	2.98
	2:00:00	0.00	0.00	0.94	1.32	1.77	1.89	2.22	2.18	2.96
	2:05:00	0.00	0.00	0.64	0.89	1.20	1.28	1.51	1.49	2.02
	2:10:00	0.00	0.00	0.42	0.59	0.80	0.85	1.00	1.00	1.35
	2:15:00	0.00	0.00	0.27	0.38	0.52	0.56	0.66	0.66	0.89
	2:20:00	0.00	0.00	0.17	0.23	0.33	0.35	0.42	0.41	0.56
	2:25:00	0.00	0.00	0.10	0.15	0.20	0.23	0.27	0.26	0.36
	2:30:00	0.00	0.00	0.05	0.08	0.11	0.13	0.15	0.15	0.20
	2:35:00	0.00	0.00	0.02	0.04	0.05	0.06	0.07	0.07	0.09
	2:40:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.03
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MHFD-Detention, Version 4.05 (January 2022)

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

St	St	Stage	Area	Area	Volume	Volume	Total
----	----	-------	------	------	--------	--------	-------

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Channel Report

Emergency Spillway Anaysis

Trapezoidal

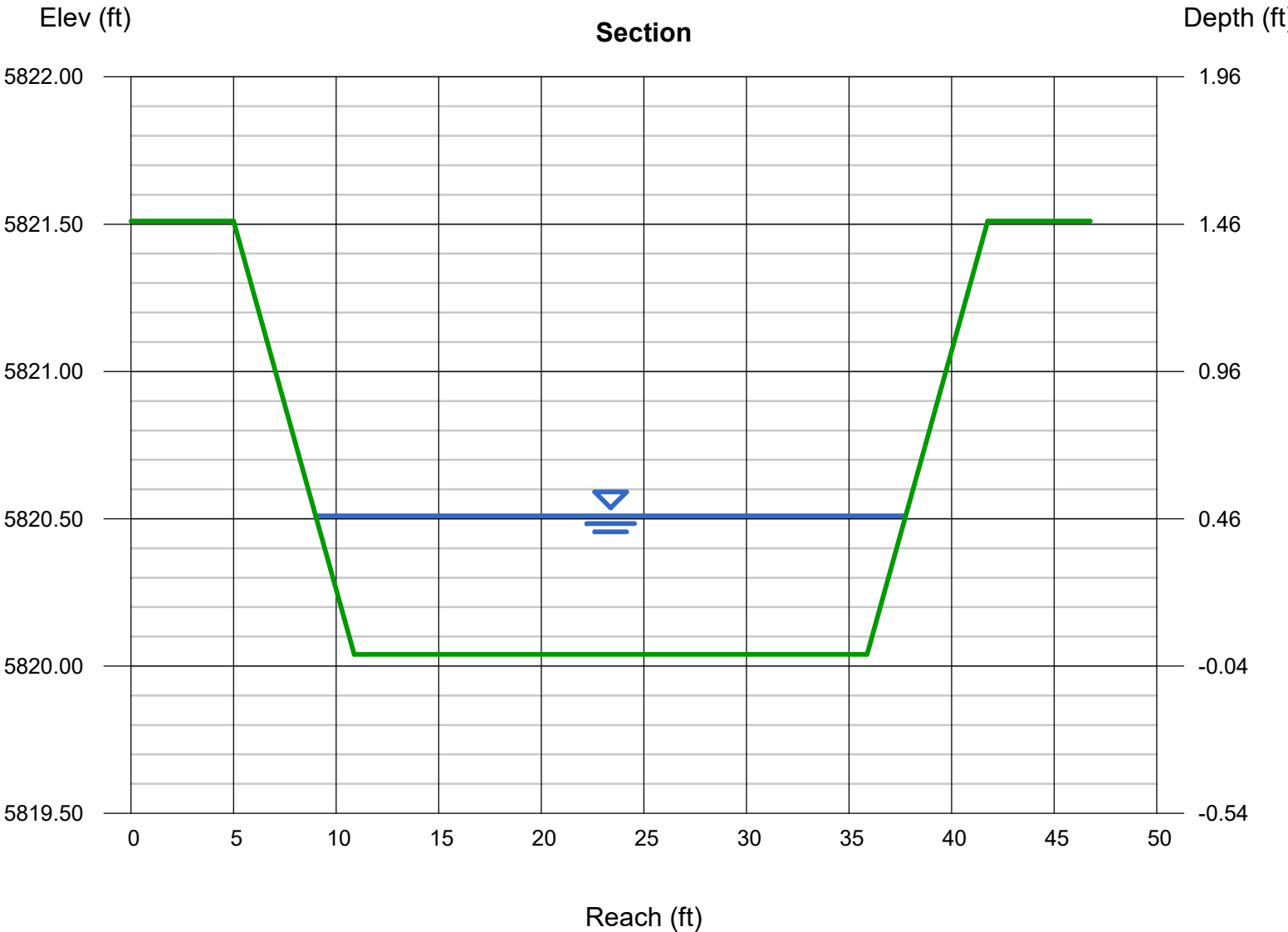
Bottom Width (ft)	= 25.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.47
Invert Elev (ft)	= 5820.04
Slope (%)	= 2.50
N-Value	= 0.020

Highlighted

Depth (ft)	= 0.47
Q (cfs)	= 85.51
Area (sqft)	= 12.63
Velocity (ft/s)	= 6.77
Wetted Perim (ft)	= 28.88
Crit Depth, Yc (ft)	= 0.69
Top Width (ft)	= 28.76
EGL (ft)	= 1.18

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.47



Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

Designer: Brad Weaverling
Company: Harris Kocher Smith
Date: October 20, 2022
Project: Lincoln & Dransfeldt
Location: Tower of Parker Colorado

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * \text{Area})$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV \text{ OTHER}} = (d_e * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- 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
- 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: $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume
(Only if a different EURV Design Volume is desired)

$I_a = 95.0$ %

$i = 0.950$

Area = 7.760 ac

$d_e =$ in

Choose One

- ☐ Water Quality Capture Volume (WQCV)
☒ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 0.289$ ac-ft

$V_{DESIGN \text{ OTHER}} =$ ac-ft

$V_{DESIGN \text{ USER}} =$ ac-ft

HSG A = 0 %

HSG B = 0 %

HSG C/D = 100 %

$EURV_{DESIGN} = 0.734$ ac-ft

$EURV_{DESIGN \text{ USER}} =$ ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.5 : 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 4.00 ft / ft

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)

$V_{FMIN} = 0.009$ ac-ft

- B) Actual Forebay Volume

$V_F = 0.011$ ac-ft

- C) Forebay Depth
($D_F = 18$ inch maximum)

$D_F = 18.0$ in

- D) Forebay Discharge

- i) Undetained 100-year Peak Discharge

$Q_{100} = 25.70$ cfs

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

$Q_F = 0.51$ 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 $W_N = 4.6$ in

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer: Brad Weaverling
 Company: Harris Kocher Smith
 Date: October 20, 2022
 Project: Lincoln & Dransfeldt
 Location: Tower of Parker Colorado

6. Trickle Channel

A) Type of Trickle Channel

F) Slope of Trickle Channel

Choose One
☒ Concrete
☐ Soft Bottom

S = 0.0050 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-foot minimum)

B) Surface Area of Micropool (10 ft² minimum)

C) Outlet Type

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)

E) Total Outlet Area

D_M = 2.5 ft

A_M = 41 sq ft

Choose One
☒ Orifice Plate
☐ Other (Describe):

D_{orifice} = 1.19 inches

A_{or} = 3.39 square inches

8. Initial Surge Volume

A) Depth of Initial Surge Volume (Minimum recommended depth is 4 inches)

B) Minimum Initial Surge Volume (Minimum volume of 0.3% of the WQCV)

C) Initial Surge Provided Above Micropool

D_{IS} = 4 in

V_{IS} = 38 cu ft

V_s = 13.6 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{or} * 38.5 * (e^{-0.095D})$

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open area to the total screen area for the material specified.)

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other')

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H_{TR})

G) Width of Water Quality Screen Opening (W_{opening}) (Minimum of 12 inches is recommended)

A_t = 117 square inches

S.S. Well Screen with 60% Open Area

User Ratio =

A_{total} = 194 sq. in.

H = 5.06 feet

H_{TR} = 89.08 inches

W_{opening} = 12.0 inches

VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 3

Designer: Brad Weaverling
 Company: Harris Kocher Smith
 Date: October 20, 2022
 Project: Lincoln & Dransfeldt
 Location: Tower of Parker Colorado

10. Overflow Embankment

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

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

Ze = ft / ft

11. Vegetation

Choose One
☐ Irrigated
☒ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

Notes:

INLET MANAGEMENT

Worksheet Protected

INLET NAME	<u>INLET F2 (BASIN RB1)</u>	<u>INLET A3 (BASIN RA4)</u>	<u>INLET B2 (BASIN RA5)</u>
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 Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	0.20	0.40	0.40
Major Q_{Known} (cfs)	0.60	0.80	1.00

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	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	0.0	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)	0.2	0.4	0.4
Major Total Design Peak Flow, Q (cfs)	0.6	0.8	1.0
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	INLET C1 (BASIN RA3)	INLET A1 (BASIN RA6)	INLET F1 (BASIN RB2)
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	0.30	0.50	0.20
Major Q_{Known} (cfs)	0.80	1.10	0.60

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	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	0.0	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)	0.3	0.5	0.2
Major Total Design Peak Flow, Q (cfs)	0.8	1.1	0.6
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	INLET A6 (BASIN RAB1)	INLET D2 (BASIN RB3)	INLET J2 (BASIN RA1)
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	0.10	0.30	0.40
Major Q_{Known} (cfs)	0.20	0.60	0.90

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	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	0.0	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)	0.1	0.3	0.4
Major Total Design Peak Flow, Q (cfs)	0.2	0.6	0.9
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	INLET J1 (BASIN RA2)	INLET D4 (BASIN RAB2)	INLET I1 (DP 23)
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 Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	0.40	0.20	1.80
Major Q_{Known} (cfs)	0.90	0.40	3.60

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	
Major Bypass Flow Received, Q_b (cfs)	0.0	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

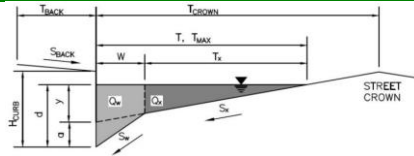
Minor Total Design Peak Flow, Q (cfs)	0.4	0.2	1.8
Major Total Design Peak Flow, Q (cfs)	0.9	0.4	3.6
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET F2 (BASIN RB1)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.015	ft/ft
$n_{BACK} =$	0.013	

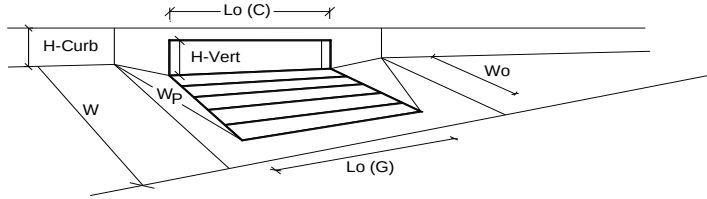
$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	15.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.016	

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



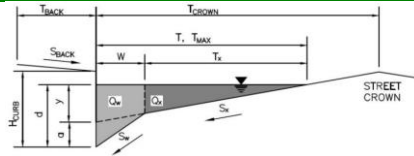
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	5.1	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _o =	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} =	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	3.69	3.69	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	0.20	0.60	cfs

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET A3 (BASIN RA4)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.015	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	15.0	ft
$W =$	2.00	ft
$S_X =$	0.020	ft/ft
$S_W =$	0.083	ft/ft
$S_0 =$	0.010	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Spread Criterion

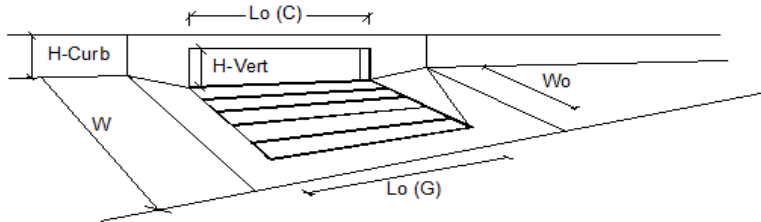
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	8.0	8.0	cfs

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



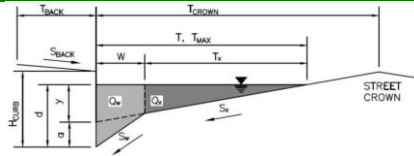
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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 _{r-G} =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _{-C} =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity			MINOR	MAJOR	
Total Inlet Interception Capacity		Q =	0.40	0.80	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _b =	0.0	0.0	cfs
Capture Percentage = Q _i /Q _a =		C% =	100	100	%

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET B2 (BASIN RA5)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.015	ft/ft
n_{BACK}	=	0.013	

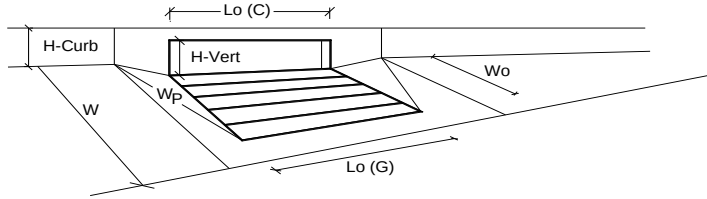
H_{CURB}	=	6.00	inches
T_{CROWN}	=	18.5	ft
W	=	2.00	ft
S_x	=	0.020	ft/ft
S_w	=	0.083	ft/ft
S_o	=	0.000	ft/ft
n_{STREET}	=	0.016	

	Minor Storm	Major Storm	
T_{MAX}	=	18.5	ft
d_{MAX}	=	6.0	inches

	Minor Storm	Major Storm	
Q_{allow}	=	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



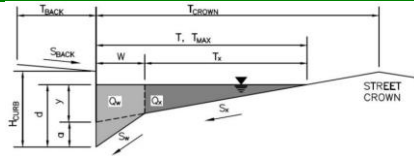
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _o =	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	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.76	0.76	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _s =	5.3	5.3	cfs
		Q _{PEAK REQUIRED} =	0.4	1.0	cfs

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET C1 (BASIN RA3)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.015	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	15.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.010	ft/ft
$n_{STREET} =$	0.013	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Spread Criterion

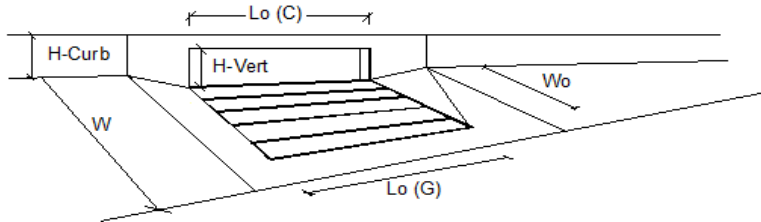
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	9.8	9.8	cfs

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



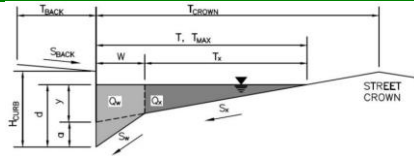
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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_{r-G} =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_{r-C} =	0.10	0.10	
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$					
Total Inlet Interception Capacity		Q =	0.3	0.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	0.0	0.0	cfs
Capture Percentage = Q_r/Q_o =		$C\%$ =	100	100	%

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET A1 (BASIN RA6)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

$$T_{BACK} = 5.0 \text{ ft}$$

$$S_{BACK} = 0.015 \text{ ft/ft}$$

$$n_{BACK} = 0.013$$

$$H_{CURB} = 6.00 \text{ inches}$$

$$T_{CROWN} = 18.5 \text{ ft}$$

$$W = 2.00 \text{ ft}$$

$$S_X = 0.020 \text{ ft/ft}$$

$$S_W = 0.083 \text{ ft/ft}$$

$$S_O = 0.000 \text{ ft/ft}$$

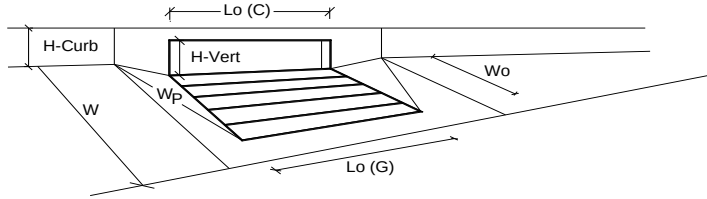
$$n_{STREET} = 0.016$$

	Minor Storm	Major Storm	
$T_{MAX} =$	18.5	18.5	ft
$d_{MAX} =$	6.0	12.0	inches

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



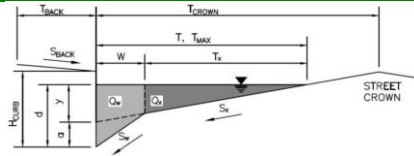
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _o =	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	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.76	0.76	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	5.3	5.3	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	0.5	1.1	cfs

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET F1 (BASIN RB2)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.015	ft/ft
$n_{BACK} =$	0.013	

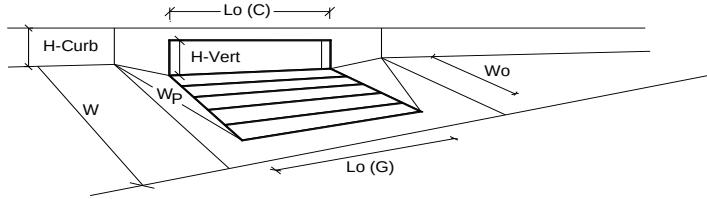
$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	15.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.016	

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



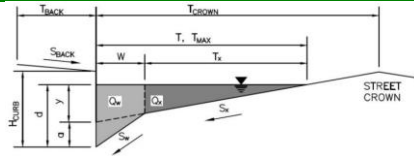
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	5.1	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _o =	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} =	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _s =	3.7	3.7	cfs
		Q _{PEAK REQUIRED} =	0.2	0.6	cfs

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET A6 (BASIN RAB1)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.015	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	15.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.023	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Spread Criterion

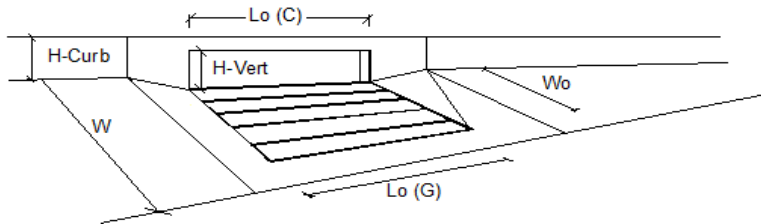
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	12.1	12.1	cfs

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



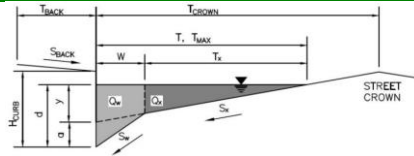
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit 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 _{r-G} =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C _{r-C} =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity					
Total Inlet Interception Capacity		Q =	0.1	0.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q _b =	0.0	0.0	cfs
Capture Percentage = Q _i /Q _a =		C% =	100	100	%

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET D2 (BASIN RB3)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.015	ft/ft
$n_{BACK} =$	0.013	

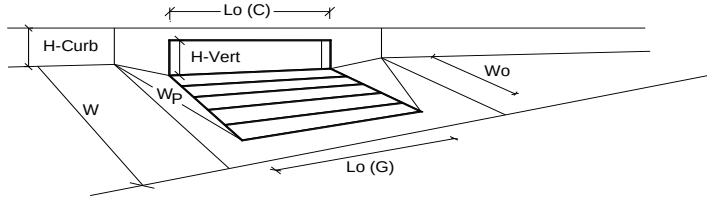
$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	15.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.016	

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



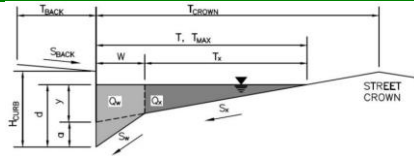
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	5.1	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _o =	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} =	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _s =	3.7	3.7	cfs
		Q _{PEAK REQUIRED} =	0.3	0.6	cfs

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET J2 (BASIN RA1)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.015	ft/ft
$n_{BACK} =$	0.013	

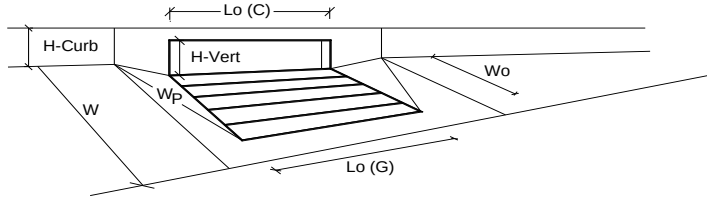
$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	15.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.016	

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



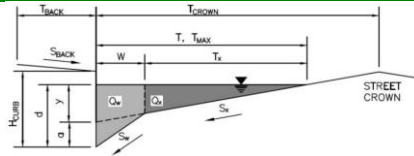
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	5.1	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _o =	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} =	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	3.7	3.7	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	0.4	0.9	cfs

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET J1 (BASIN RA2)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.015	ft/ft
$n_{BACK} =$	0.013	

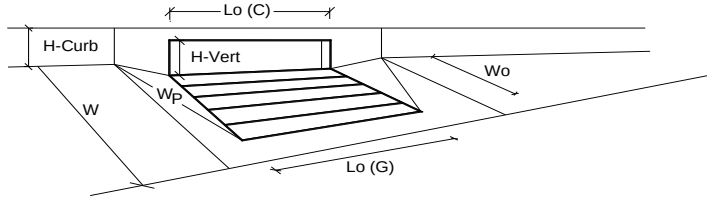
$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	15.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.016	

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



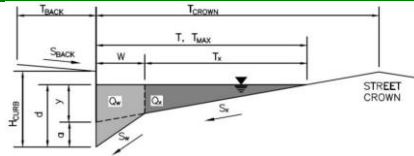
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	5.1	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _o =	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} =	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	3.7	3.7	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	0.4	0.9	cfs

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

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

Project: LINCOLN & DRANSFELDT

Inlet ID: INLET D4 (BASIN RAB2)

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.015	ft/ft
$n_{BACK} =$	0.013	

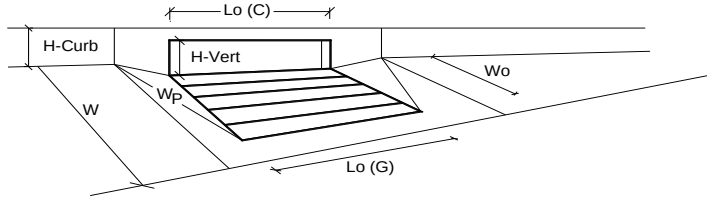
$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	15.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.016	

	Minor Storm	Major Storm	
$T_{MAX} =$	15.0	15.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

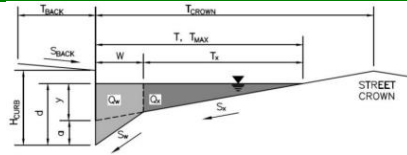
MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	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 =	5.1	5.1	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _o =	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} =	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	3.7	3.7	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _{PEAK REQUIRED} =	0.2	0.4	cfs

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

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

Project: **LINCOLN & DRANSFELDT**Inlet ID: **INLET I1 (DP 23)****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} = 5.0$ ft
 $S_{BACK} =$ ft/ft
 $n_{BACK} =$

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 38.8$ ft
 $W = 2.00$ ft
 $S_x = 0.040$ ft/ft
 $S_w = 0.083$ ft/ft
 $S_o = 0.000$ ft/ft
 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	10.5	38.0	ft
$d_{MAX} =$	6.0	12.0	inches

☐ ☐

MINOR STORM Allowable Capacity is based on Depth Criterion

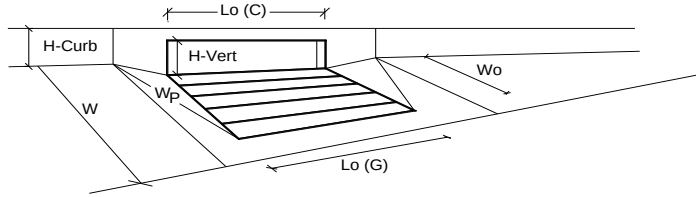
MAJOR STORM Allowable Capacity is based on Depth Criterion

$Q_{allow} =$

Minor Storm	Major Storm	
SUMP	SUMP	cfs

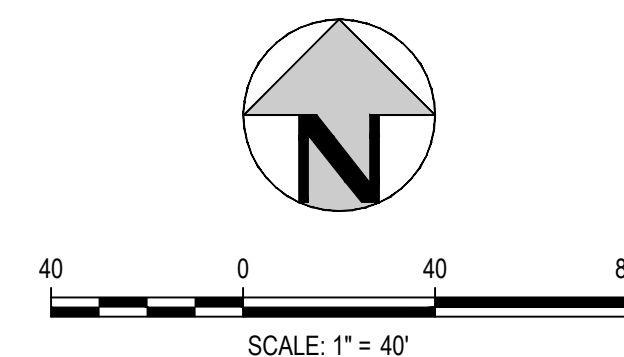
INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	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	12.0	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	15.00	15.00	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 _o =	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	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	0.57	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{curb} =	0.79	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q _a =	9.7	39.1	cfs
		Q _{PEAK REQUIRED} =	1.8	3.6	cfs

Filepath: K:\2008\29\ENGINEERING\DRAINAGE\STORMCADC PLAN.DWG Layout: 19 OVERALL UTILITY PLAN
XREF's: e-base, e-legal, e-util, p-base, p-legal, p-util
Plotted: THU 03/09/23 10:49:25A By: Olivia McCracken



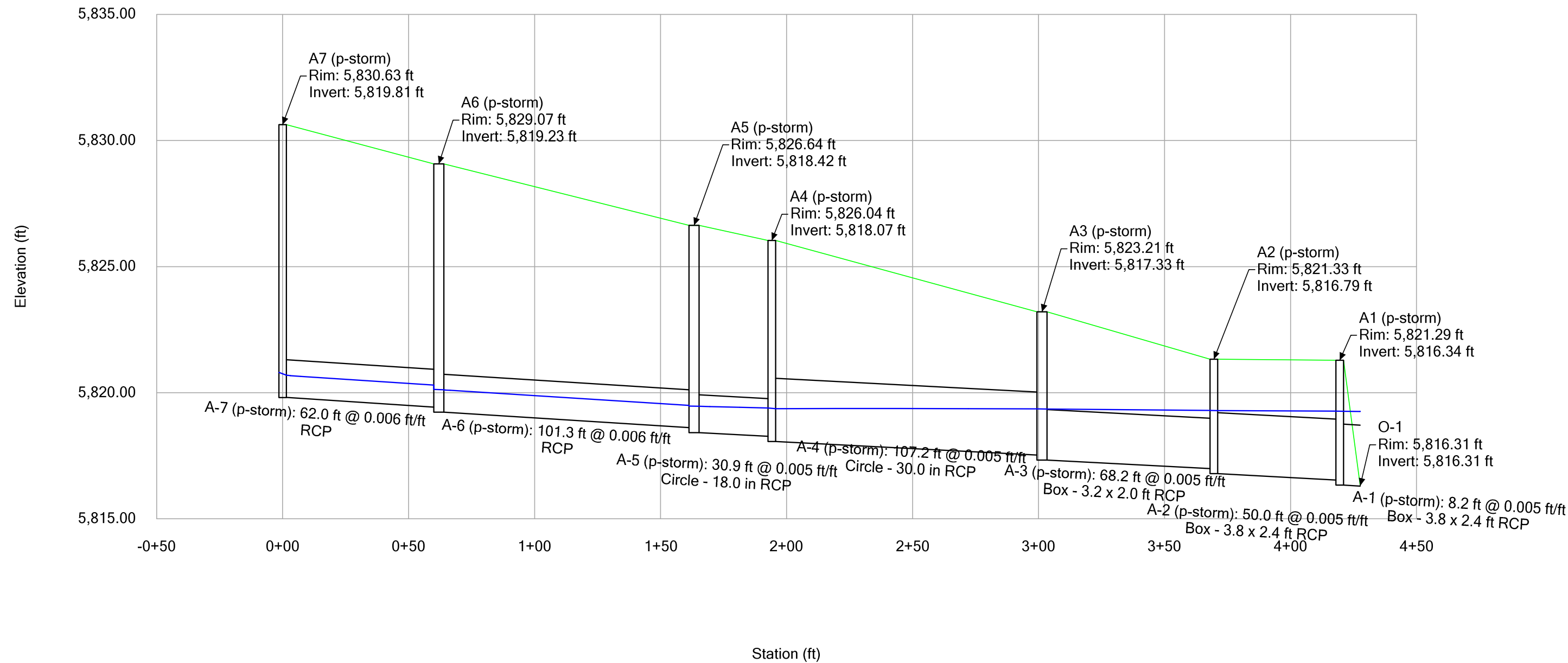
FlexTable: Conduit Table
Active Scenario: 5 YR

Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Notes
F-3 (p-storm)	F3 (p-storm)	5,823.27	F2 (p-storm)	5,823.12	29.3	0.005	18.0	0.013	2.79	3.90	0.92	7.43	37.6	18" RCP
D-1 (p-storm)	D1 (p-storm)	5,820.22	A7 (p-storm)	5,820.01	42.2	0.005	18.0	0.013	2.50	3.79	0.81	7.43	33.7	18" RCP
A-7 (p-storm)	A7 (p-storm)	5,819.81	A6 (p-storm)	5,819.43	62.0	0.006	18.0	0.013	5.30	4.95	0.87	8.24	64.3	18" RCP
F-1 (p-storm)	F1 (p-storm)	5,822.75	A7 (p-storm)	5,820.01	113.6	0.024	18.0	0.013	3.04	7.06	0.79	16.30	18.6	18" RCP
F-2 (p-storm)	F2 (p-storm)	5,822.92	F1 (p-storm)	5,822.76	31.3	0.005	18.0	0.013	2.92	3.95	1.23	7.43	39.3	18" RCP
D-2 (p-storm)	D2 (p-storm)	5,820.85	D1 (p-storm)	5,820.42	84.9	0.005	18.0	0.013	2.01	3.57	0.53	7.43	27.1	18" RCP
J-1 (p-storm)	J1 (p-storm)	5,823.12	D1 (p-storm)	5,820.42	100.1	0.027	18.0	0.013	0.67	4.72	0.42	17.25	3.9	18" RCP
A-6 (p-storm)	A6 (p-storm)	5,819.23	A5 (p-storm)	5,818.62	101.3	0.006	18.0	0.013	5.30	4.91	0.88	8.15	65.0	18" RCP
J-2 (p-storm)	J2 (p-storm)	5,823.64	J1 (p-storm)	5,823.32	31.3	0.010	18.0	0.013	0.34	2.73	0.18	10.50	3.2	18" RCP
D-4 (p-storm)	D4 (p-storm)	5,821.54	D3 (p-storm)	5,821.40	26.9	0.005	18.0	0.013	1.73	3.43	0.49	7.43	23.3	18" RCP
D-3 (p-storm)	D3 (p-storm)	5,821.20	D2 (p-storm)	5,821.04	31.4	0.005	18.0	0.013	1.83	3.48	0.73	7.43	24.6	18" RCP
A-5 (p-storm)	A5 (p-storm)	5,818.42	A4 (p-storm)	5,818.27	30.9	0.005	18.0	0.013	5.30	4.52	1.13	7.32	72.4	18" RCP
E-3 (p-storm)	E4 (p-storm)	5,824.01	E4	5,815.73	175.2	0.047	24.0	0.013	8.81	11.85	0.57	49.18	17.9	24" RCP
A-4 (p-storm)	A4 (p-storm)	5,818.07	A3 (p-storm)	5,817.53	107.2	0.005	30.0	0.013	11.86	5.63	1.83	29.11	40.7	24" RCP
C-1 (p-storm)	C1 (p-storm)	5,818.88	A4 (p-storm)	5,818.57	31.3	0.010	18.0	0.013	3.49	5.32	0.83	10.45	33.4	18" RCP
H-1 (p-storm)	H1 (p-storm)	5,818.88	A4 (p-storm)	5,818.57	15.7	0.020	18.0	0.013	4.73	7.43	0.87	14.76	32.1	18" RCP
C-2 (p-storm)	C2 (p-storm)	5,819.45	C1 (p-storm)	5,819.08	36.9	0.010	18.0	0.013	3.30	5.26	0.73	10.52	31.4	18" RCP
E-2 (p-storm)	E4	5,815.53	E3	5,811.86	323.4	0.011	24.0	0.013	8.81	7.08	1.25	24.10	36.6	24" RCP
A-3 (p-storm)	A3 (p-storm)	5,817.33	A2 (p-storm)	5,816.99	68.2	0.005		0.013	14.61	2.31	2.31	36.88	39.6	38"x24" HECRP CLASS IV
B-2 (p-storm)	B2 (p-storm)	5,817.62	B1 (p-storm)	5,817.39	46.7	0.005		0.013	2.84	0.72	1.91	19.60	14.5	30"x19" HECRP CLASS IV
B-1 (p-storm)	B1 (p-storm)	5,817.19	A2 (p-storm)	5,816.99	40.5	0.005		0.013	3.08	0.49	2.31	36.70	8.4	38"x24" HECRP CLASS IV
G-1 (p-storm)	G1 (p-storm)	5,812.04	E3	5,811.86	29.5	0.006	24.0	0.013	0.20	1.88	1.25	17.68	1.1	24" RCP
A-2 (p-storm)	A2 (p-storm)	5,816.79	A1 (p-storm)	5,816.54	50.0	0.005		0.013	16.85	1.86	2.73	59.66	28.2	45"x29" HECRP CLASS IV
A-1 (p-storm)	A1 (p-storm)	5,816.34	O-1	5,816.30	8.2	0.005		0.013	16.85	1.86	2.96	59.09	28.5	45"x29" HECRP CLASS IV
I-1	I1	5,811.68	O-2	5,811.39	57.4	0.005	24.0	0.013	1.97	3.47	0.47	16.08	12.2	
E-1 (p-storm)(1)	E3	5,811.68	E2	5,811.55	27.0	0.005	24.0	0.013	9.01	5.17	1.53	15.70	57.4	24" RCP
E-1 (p-storm)(2)	E2	5,811.55	O-2	5,811.38	34.4	0.005	24.0	0.013	15.29	5.76	1.41	15.90	96.1	24" RCP
K-1	EX-1	5,812.30	E2	5,811.78	27.7	0.019	18.0	0.013	8.30	8.43	1.30	14.39	57.7	

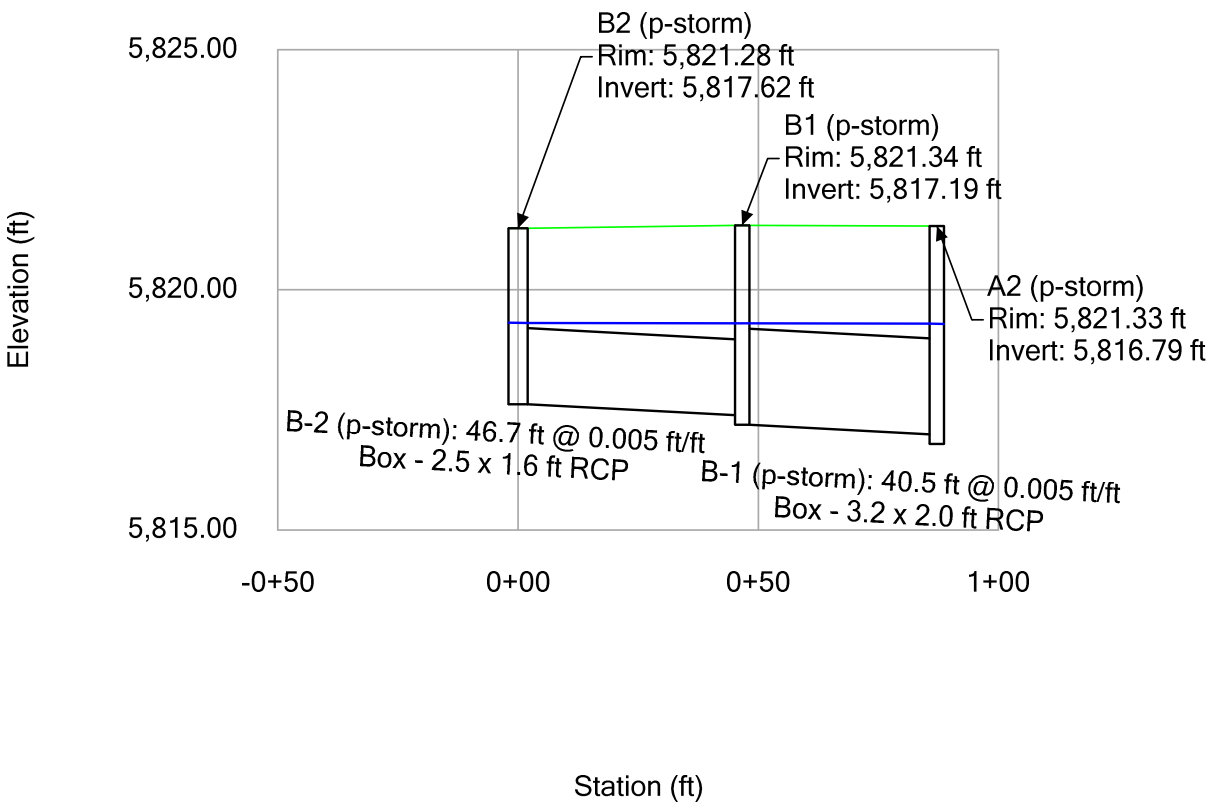
FlexTable: Manhole Table
Active Scenario: 5 YR

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Notes
F3 (p-storm)	5,830.85	5,830.85	(N/A)	2.79	0.78	5,824.05	Standard	5,824.22	4'Ø Flat-Top Manhole
A7 (p-storm)	5,830.63	5,830.63	5,820.01	5.30	0.89	5,820.70	HEC-22 Energy (Second Edition)	5,820.81	Inlet Type R 5'
F1 (p-storm)	5,830.26	5,830.26	5,822.76	3.04	0.66	5,823.41	HEC-22 Energy (Second Edition)	5,823.99	Inlet Type R 5'
F2 (p-storm)	5,830.05	5,830.05	5,823.12	2.92	1.09	5,824.01	HEC-22 Energy (Second Edition)	5,824.04	Inlet Type R 5'
D1 (p-storm)	5,829.72	5,829.72	5,820.42	2.50	0.61	5,820.83	HEC-22 Energy (Second Edition)	5,820.84	4'Ø Manhole
A6 (p-storm)	5,829.07	5,829.07	5,819.43	5.30	0.89	5,820.12	HEC-22 Energy (Second Edition)	5,820.13	4'Ø Manhole
J2 (p-storm)	5,828.92	5,828.92	(N/A)	0.34	0.22	5,823.85	Standard	5,823.94	Inlet Type R 5'
J1 (p-storm)	5,828.92	5,828.92	5,823.32	0.67	0.30	5,823.43	HEC-22 Energy (Second Edition)	5,823.53	Inlet Type R 5'
D4 (p-storm)	5,828.19	5,828.19	(N/A)	1.73	0.49	5,822.03	Standard	5,822.26	4'Ø Flat-Top Manhole
D2 (p-storm)	5,828.16	5,828.16	5,821.04	2.01	0.53	5,821.38	HEC-22 Energy (Second Edition)	5,821.77	Inlet Type R 5'
D3 (p-storm)	5,828.14	5,828.14	5,821.40	1.83	0.58	5,821.78	HEC-22 Energy (Second Edition)	5,821.85	Inlet Type R 5'
A5 (p-storm)	5,826.64	5,826.64	5,818.62	5.30	1.04	5,819.46	HEC-22 Energy (Second Edition)	5,819.47	4'Ø Manhole
A4 (p-storm)	5,826.04	5,826.04	5,818.27	11.86	1.29	5,819.36	HEC-22 Energy (Second Edition)	5,819.40	Inlet Type R 5'
C1 (p-storm)	5,826.02	5,826.02	5,819.08	3.49	0.88	5,819.59	HEC-22 Energy (Second Edition)	5,819.81	Inlet Type R 5'
E4	5,825.36	5,825.36	5,815.73	8.81	1.06	5,816.59	HEC-22 Energy (Second Edition)	5,816.60	4'Ø Manhole
H1 (p-storm)	5,825.11	5,825.11	(N/A)	4.73	0.84	5,819.72	Standard	5,820.14	4'Ø Flat-Top ManholeW/ GRATED LID
C2 (p-storm)	5,823.93	5,823.93	(N/A)	3.30	0.86	5,820.14	Standard	5,820.48	4'Ø Flat-Top ManholeW/ GRATED LID
A3 (p-storm)	5,823.21	5,823.21	5,817.53	14.61	2.02	5,819.35	HEC-22 Energy (Second Edition)	5,819.36	4'Ø Manhole
B1 (p-storm)	5,821.34	5,821.34	5,817.39	3.08	2.11	5,819.30	HEC-22 Energy (Second Edition)	5,819.30	Inlet Type R 5'
B2 (p-storm)	5,821.28	5,821.28	(N/A)	2.84	1.69	5,819.31	Standard	5,819.32	4'Ø Flat-Top ManholeW/ GRATED LID
A2 (p-storm)	5,821.33	5,821.33	5,816.99	16.85	2.50	5,819.29	HEC-22 Energy (Second Edition)	5,819.30	Inlet Type R 5'
E3	5,818.77	5,818.77	5,811.86	9.01	1.45	5,813.11	HEC-22 Energy (Second Edition)	5,813.11	6'Ø Manhole
G1 (p-storm)	5,818.36	5,820.60	(N/A)	0.20	1.07	5,813.11	Standard	5,813.11	Inlet Type D
E4 (p-storm)	5,826.26	5,826.26	(N/A)	8.81	1.06	5,825.07	Standard	5,825.60	24" FES
A1 (p-storm)	5,821.29	5,821.29	5,816.54	16.85	2.92	5,819.26	HEC-22 Energy (Second Edition)	5,819.27	
I1	5,816.34	5,816.34	(N/A)	1.97	0.49	5,812.17	Standard	5,812.38	
E2	5,817.57	5,817.57	5,811.55	15.29	1.56	5,813.08	Absolute	5,813.08	
EX-1	5,818.34	5,818.34	(N/A)	8.30	1.12	5,813.42	Standard	5,814.09	

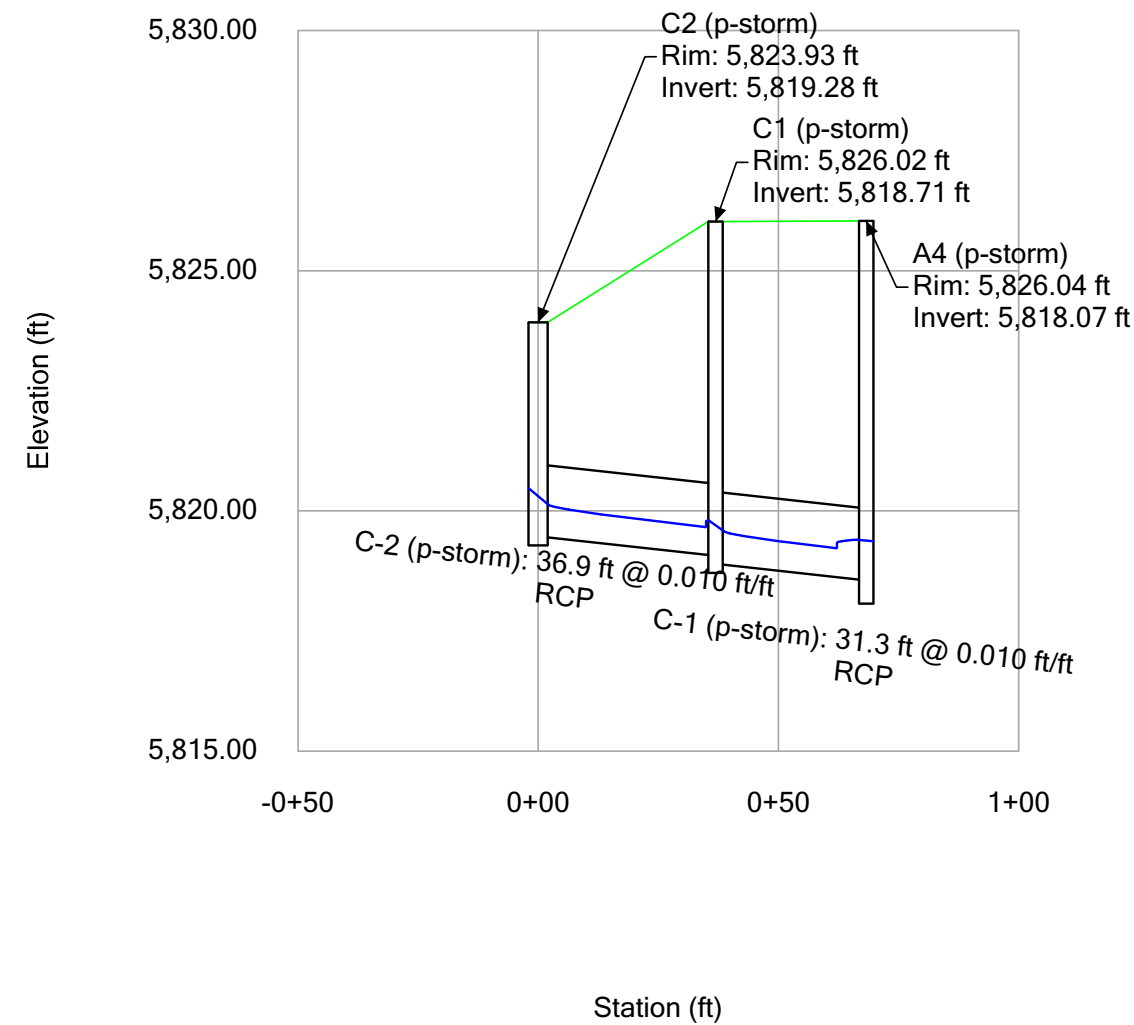
Profile Report
Engineering Profile - Storm Line A (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



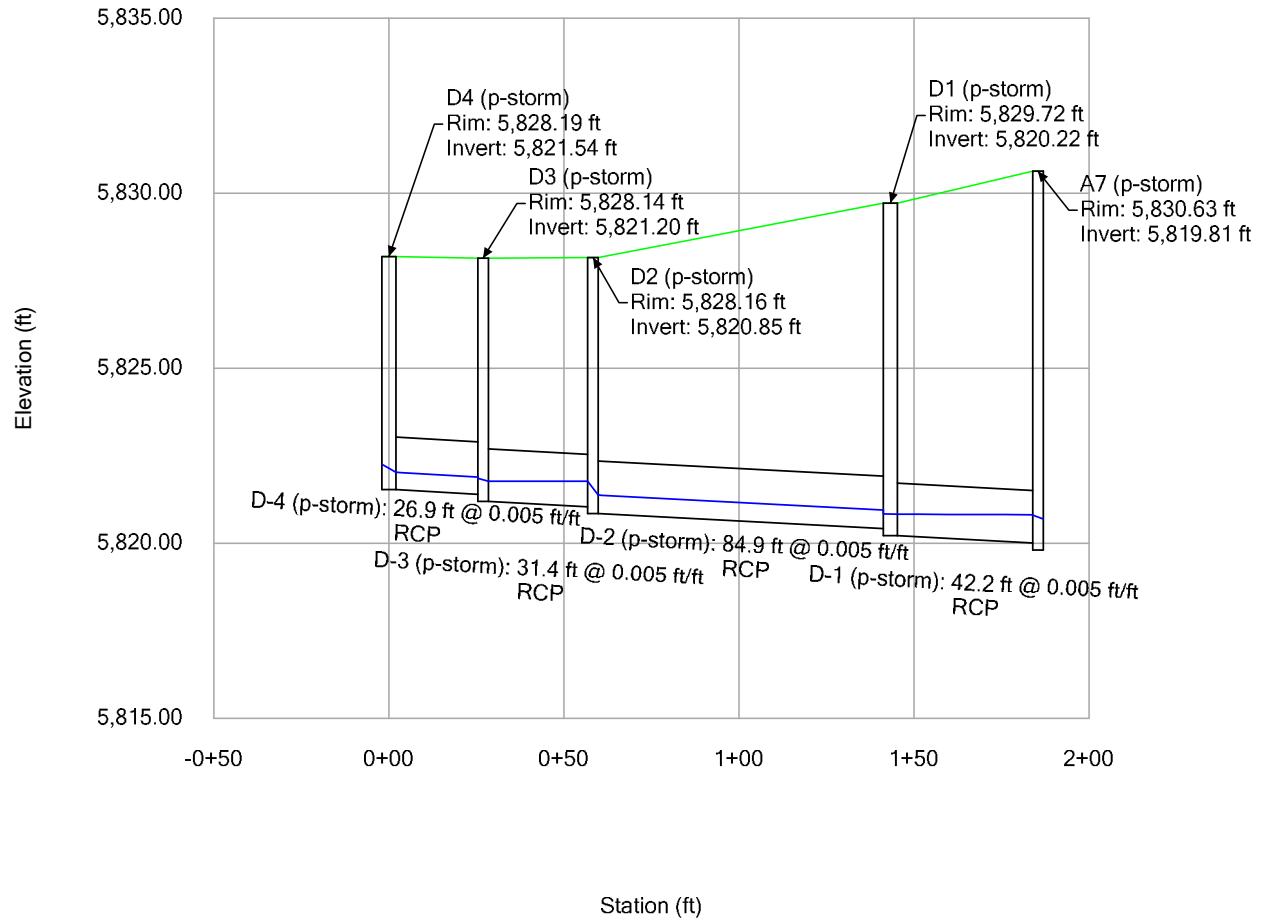
Profile Report
Engineering Profile - Storm Line B (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



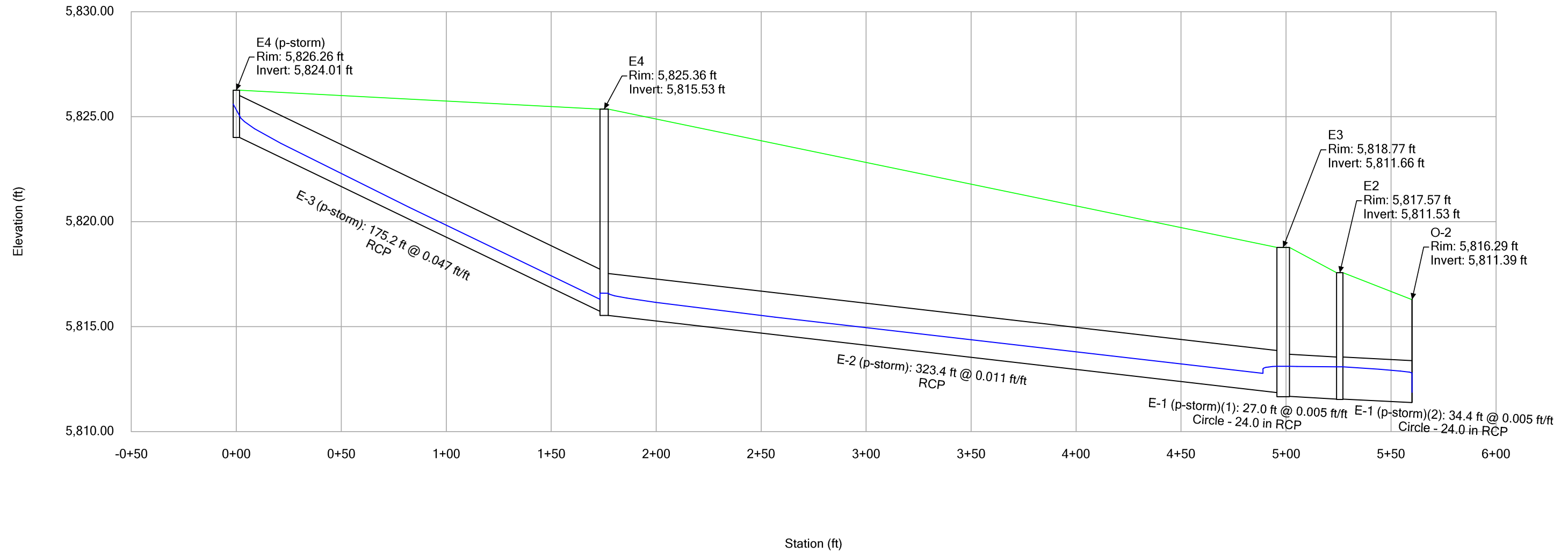
Profile Report
Engineering Profile - Storm Line C (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



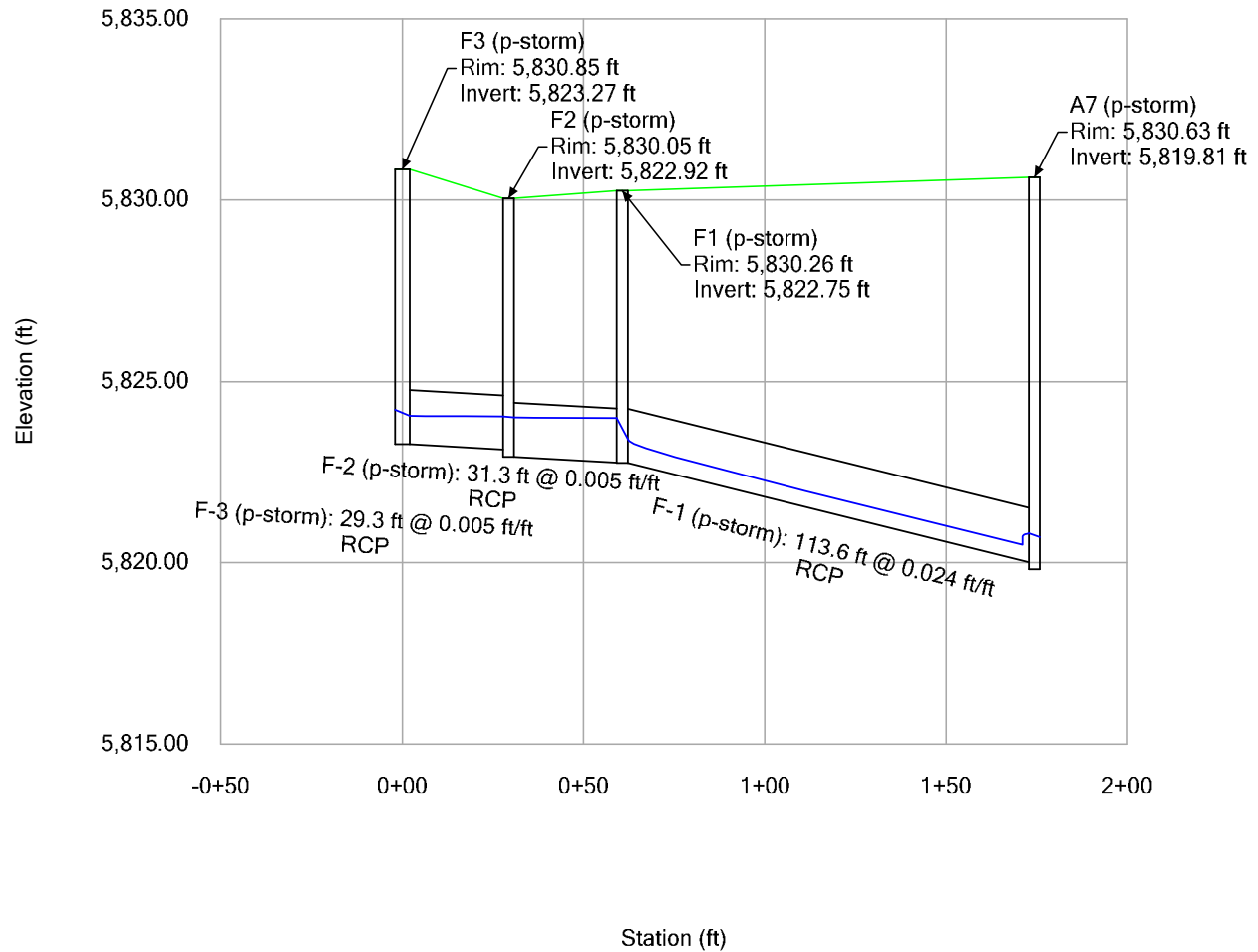
Profile Report **Engineering Profile - Storm Line D (StormCAD-10-6-2022.stsw)** **Active Scenario: 5 YR**



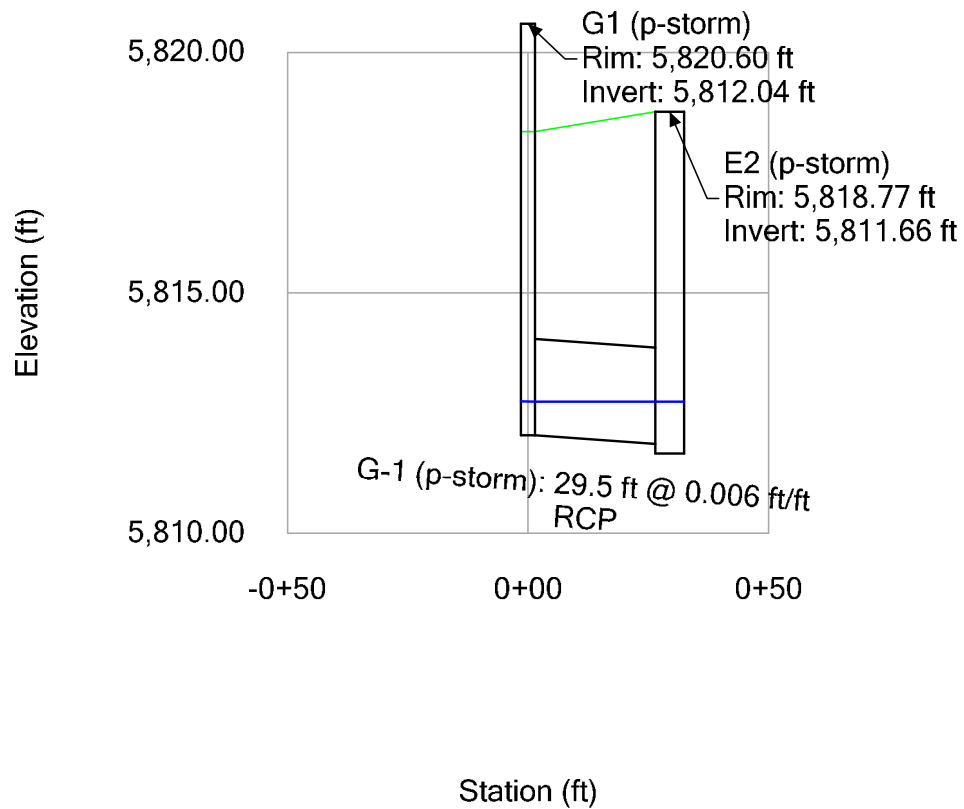
Profile Report
Engineering Profile - Storm Line E (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



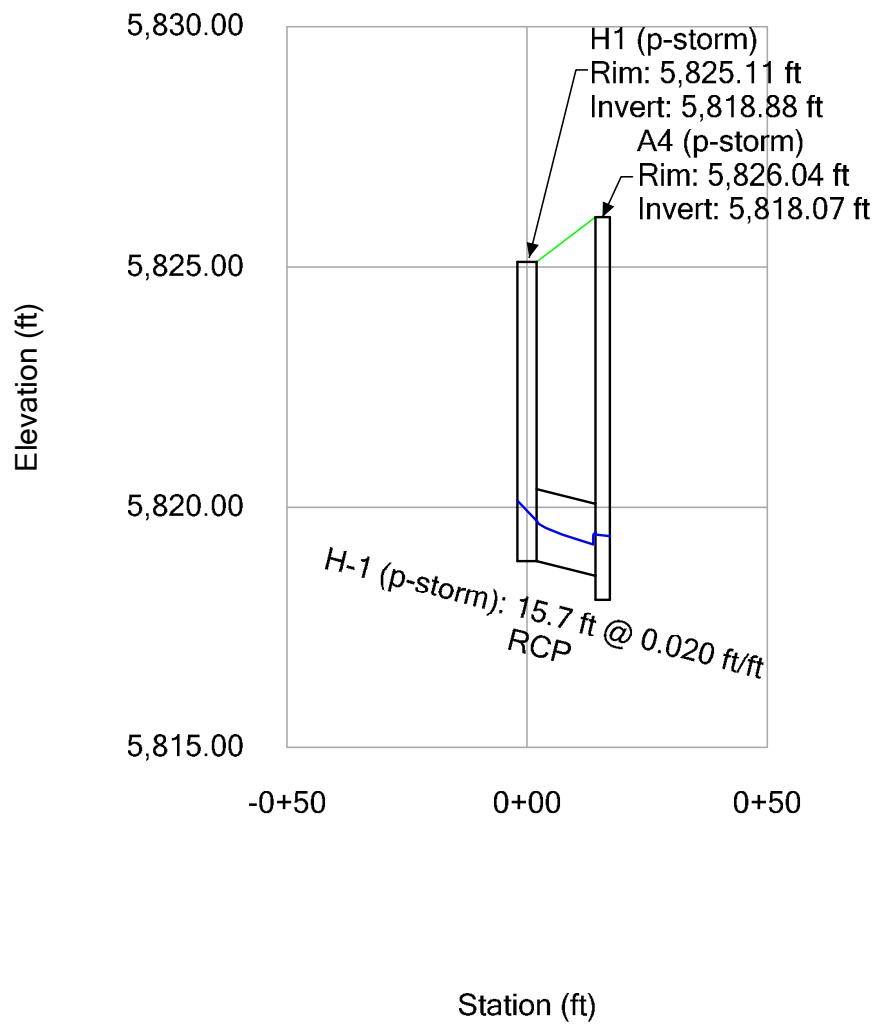
Profile Report **Engineering Profile - Storm Line F (StormCAD-10-6-2022.stsw)** **Active Scenario: 5 YR**



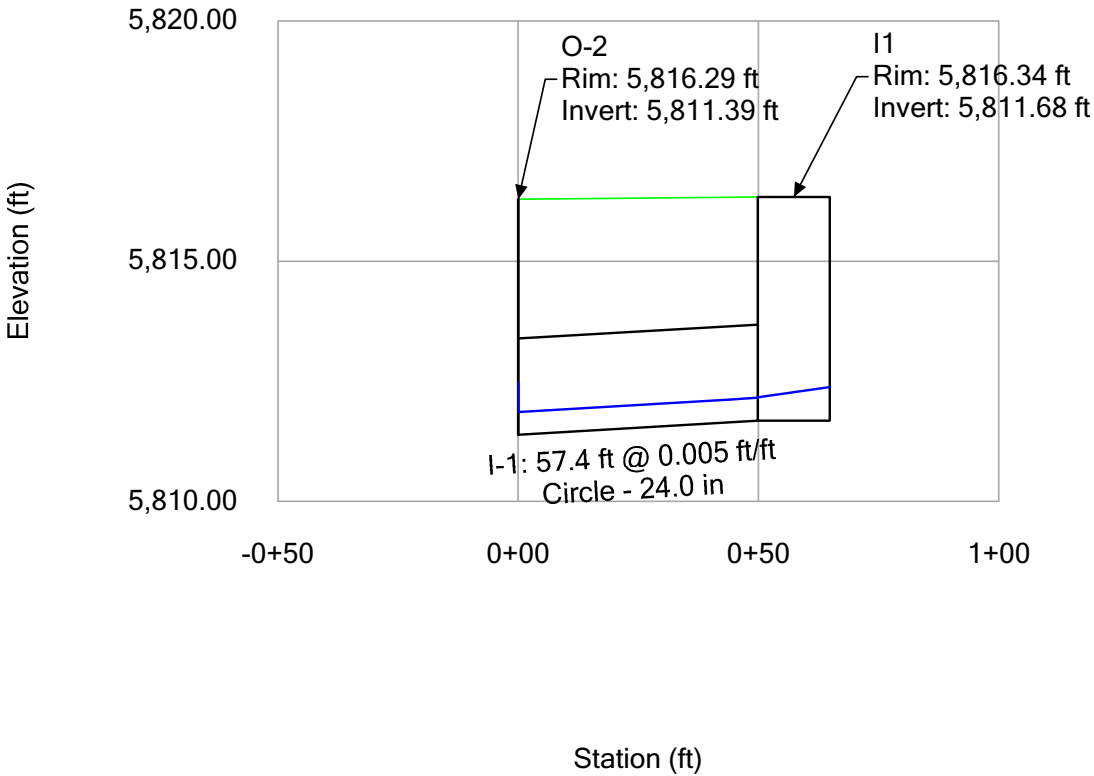
Profile Report
Engineering Profile - Storm Line G (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



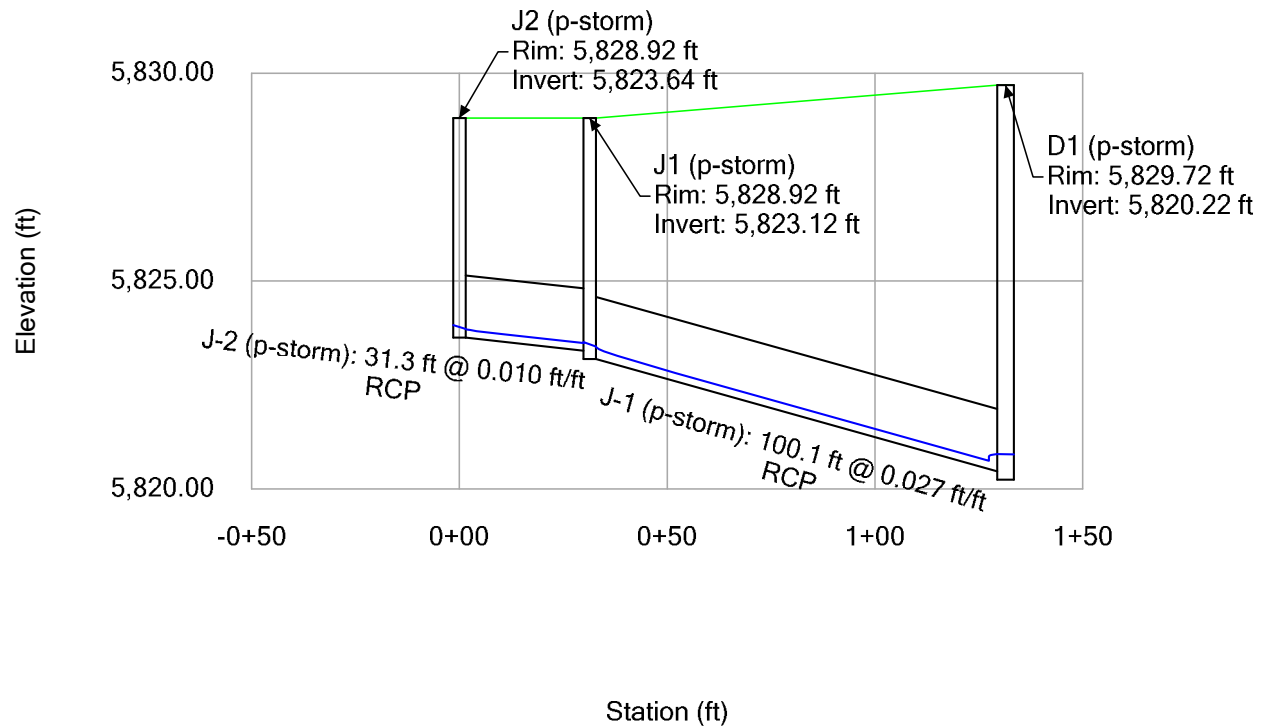
Profile Report
Engineering Profile - Storm Line H (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



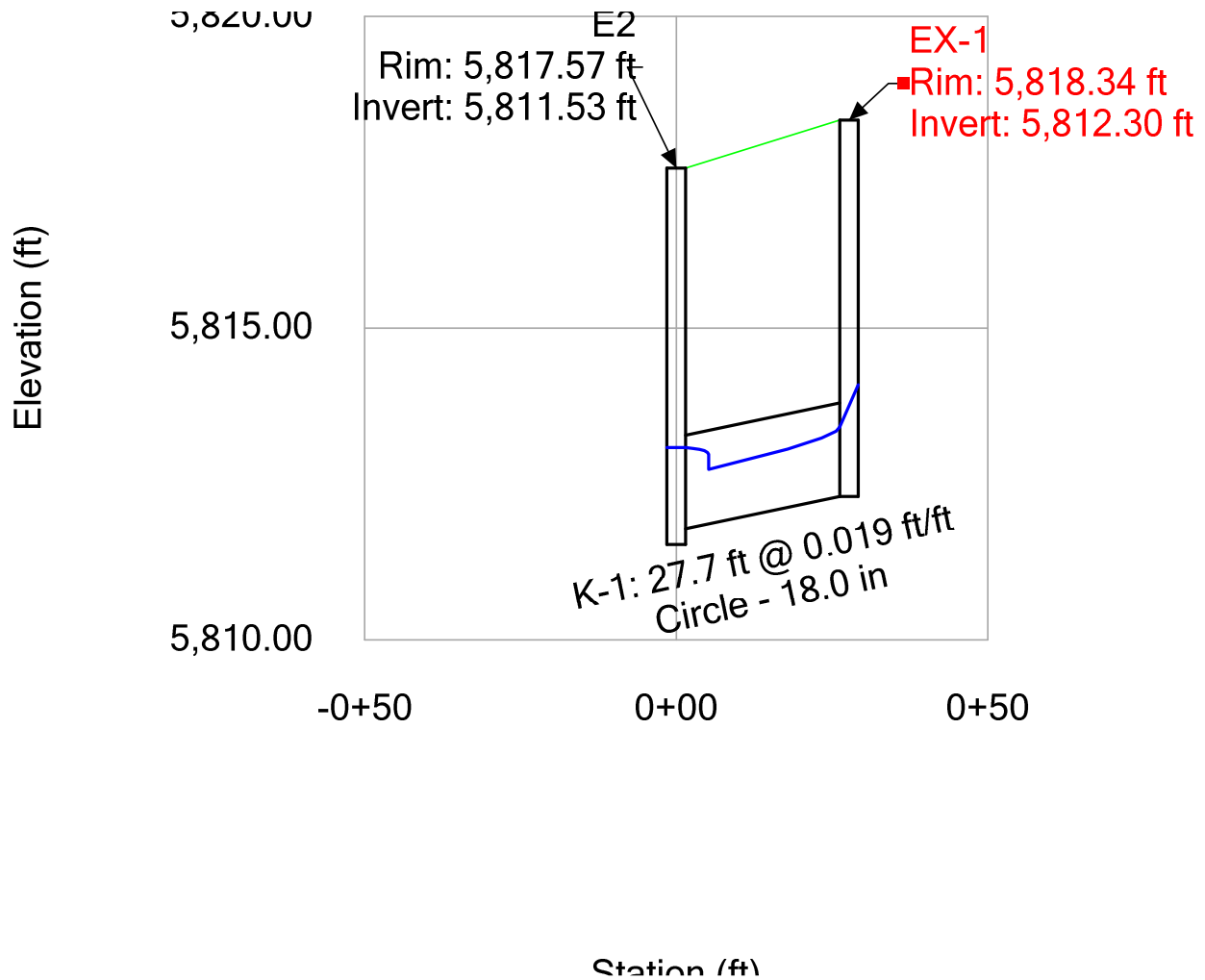
Profile Report
Engineering Profile - Storm Line I (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



Profile Report **Engineering Profile - Storm Line J (StormCAD-10-6-2022.stsw)** **Active Scenario: 5 YR**



Profile Report
Engineering Profile - Storm Line K (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



FlexTable: Conduit Table
Active Scenario: 100 YR

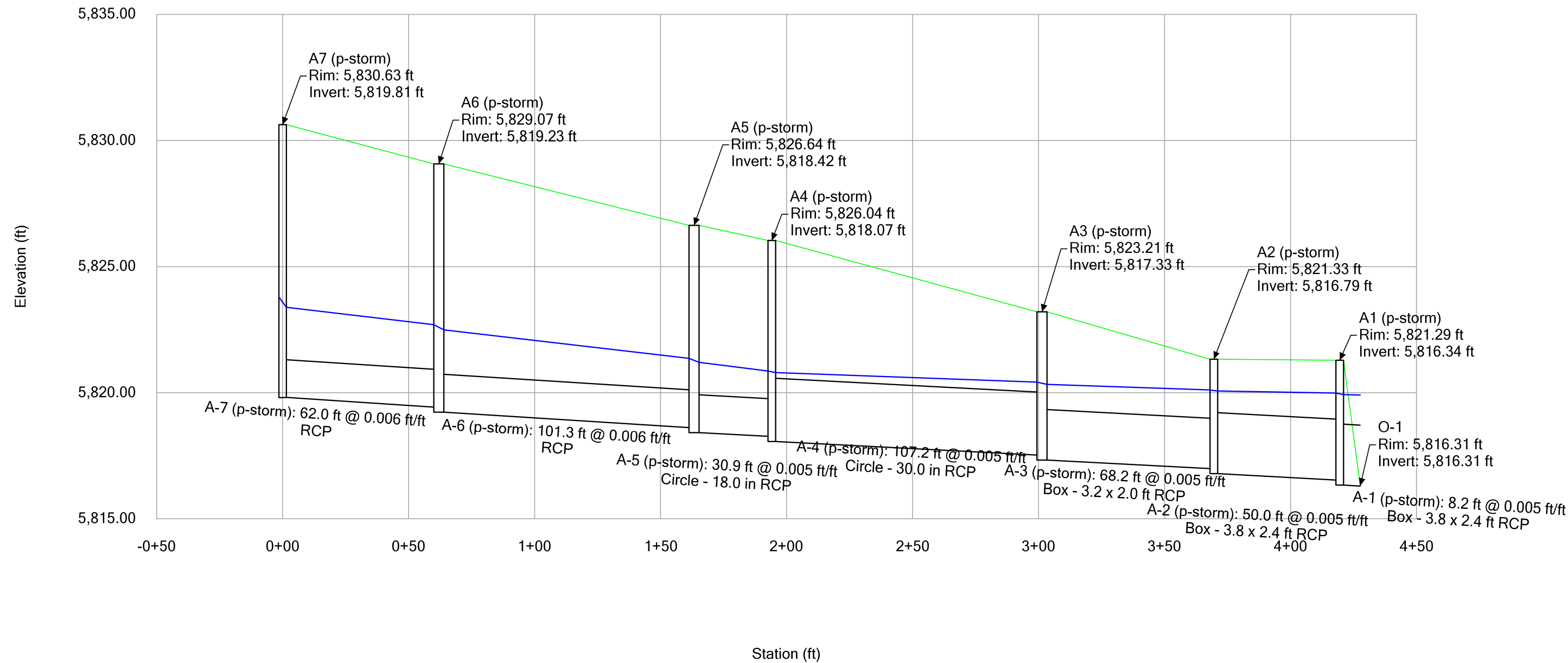
Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Notes
F-3 (p-storm)	F3 (p-storm)	5,823.27	F2 (p-storm)	5,823.12	29.3	0.005	18.0	0.013	5.67	3.21	1.96	7.43	76.3	18" RCP
D-1 (p-storm)	D1 (p-storm)	5,820.22	A7 (p-storm)	5,820.01	42.2	0.005	18.0	0.013	5.30	3.00	3.83	7.43	71.4	18" RCP
A-7 (p-storm)	A7 (p-storm)	5,819.81	A6 (p-storm)	5,819.43	62.0	0.006	18.0	0.013	11.09	6.28	3.27	8.24	134.5	18" RCP
F-1 (p-storm)	F1 (p-storm)	5,822.75	A7 (p-storm)	5,820.01	113.6	0.024	18.0	0.013	6.30	8.63	3.78	16.30	38.6	18" RCP
F-2 (p-storm)	F2 (p-storm)	5,822.92	F1 (p-storm)	5,822.76	31.3	0.005	18.0	0.013	6.00	3.40	2.11	7.43	80.8	18" RCP
D-2 (p-storm)	D2 (p-storm)	5,820.85	D1 (p-storm)	5,820.42	84.9	0.005	18.0	0.013	4.18	2.37	3.61	7.43	56.3	18" RCP
J-1 (p-storm)	J1 (p-storm)	5,823.12	D1 (p-storm)	5,820.42	100.1	0.027	18.0	0.013	1.50	5.99	3.59	17.25	8.7	18" RCP
A-6 (p-storm)	A6 (p-storm)	5,819.23	A5 (p-storm)	5,818.62	101.3	0.006	18.0	0.013	11.09	6.28	2.74	8.15	136.1	18" RCP
J-2 (p-storm)	J2 (p-storm)	5,823.64	J1 (p-storm)	5,823.32	31.3	0.010	18.0	0.013	0.76	3.46	0.74	10.50	7.2	18" RCP
D-4 (p-storm)	D4 (p-storm)	5,821.54	D3 (p-storm)	5,821.40	26.9	0.005	18.0	0.013	3.52	1.99	3.21	7.43	47.4	18" RCP
D-3 (p-storm)	D3 (p-storm)	5,821.20	D2 (p-storm)	5,821.04	31.4	0.005	18.0	0.013	3.75	2.12	3.46	7.43	50.5	18" RCP
A-5 (p-storm)	A5 (p-storm)	5,818.42	A4 (p-storm)	5,818.27	30.9	0.005	18.0	0.013	11.09	6.28	2.59	7.32	151.4	18" RCP
E-3 (p-storm)	E4 (p-storm)	5,824.01	E4	5,815.73	175.2	0.047	24.0	0.013	18.36	14.52	0.85	49.18	37.3	24" RCP
A-4 (p-storm)	A4 (p-storm)	5,818.07	A3 (p-storm)	5,817.53	107.2	0.005	30.0	0.013	24.52	5.00	2.89	29.11	84.2	24" RCP
C-1 (p-storm)	C1 (p-storm)	5,818.88	A4 (p-storm)	5,818.57	31.3	0.010	18.0	0.013	7.18	4.06	2.30	10.45	68.7	18" RCP
H-1 (p-storm)	H1 (p-storm)	5,818.88	A4 (p-storm)	5,818.57	15.7	0.020	18.0	0.013	9.64	5.46	2.36	14.76	65.3	18" RCP
C-2 (p-storm)	C2 (p-storm)	5,819.45	C1 (p-storm)	5,819.08	36.9	0.010	18.0	0.013	6.72	3.80	2.25	10.52	63.9	18" RCP
E-2 (p-storm)	E4	5,815.53	E3	5,811.86	323.4	0.011	24.0	0.013	18.36	8.44	2.56	24.10	76.2	24" RCP
A-3 (p-storm)	A3 (p-storm)	5,817.33	A2 (p-storm)	5,816.99	68.2	0.005		0.013	30.12	4.76	3.12	36.88	81.7	38"x24" HECRP CLASS IV
B-2 (p-storm)	B2 (p-storm)	5,817.62	B1 (p-storm)	5,817.39	46.7	0.005		0.013	5.79	1.46	2.73	19.60	29.5	30"x19" HECRP CLASS IV
B-1 (p-storm)	B1 (p-storm)	5,817.19	A2 (p-storm)	5,816.99	40.5	0.005		0.013	6.34	1.00	3.11	36.70	17.3	38"x24" HECRP CLASS IV
G-1 (p-storm)	G1 (p-storm)	5,812.04	E3	5,811.86	29.5	0.006	24.0	0.013	7.03	2.24	2.55	17.68	39.8	24" RCP
A-2 (p-storm)	A2 (p-storm)	5,816.79	A1 (p-storm)	5,816.54	50.0	0.005		0.013	34.69	3.83	3.45	59.66	58.1	45"x29" HECRP CLASS IV
A-1 (p-storm)	A1 (p-storm)	5,816.34	O-1	5,816.30	8.2	0.005		0.013	34.69	3.83	3.61	59.09	58.7	45"x29" HECRP CLASS IV
I-1	I1	5,811.68	O-2	5,811.39	57.4	0.005	24.0	0.013	3.97	4.24	0.68	16.08	24.7	
E-1 (p-storm)(1)	E3	5,811.68	E2	5,811.55	27.0	0.005	24.0	0.013	25.39	8.08	2.44	15.70	161.7	24" RCP
E-1 (p-storm)(2)	E2	5,811.55	O-2	5,811.38	34.4	0.005	24.0	0.013	31.33	9.97	1.88	15.90	197.0	24" RCP
K-1	EX-1	5,812.30	E2	5,811.78	27.7	0.019	18.0	0.013	16.10	9.11	2.21	14.39	111.9	

FlexTable: Manhole Table

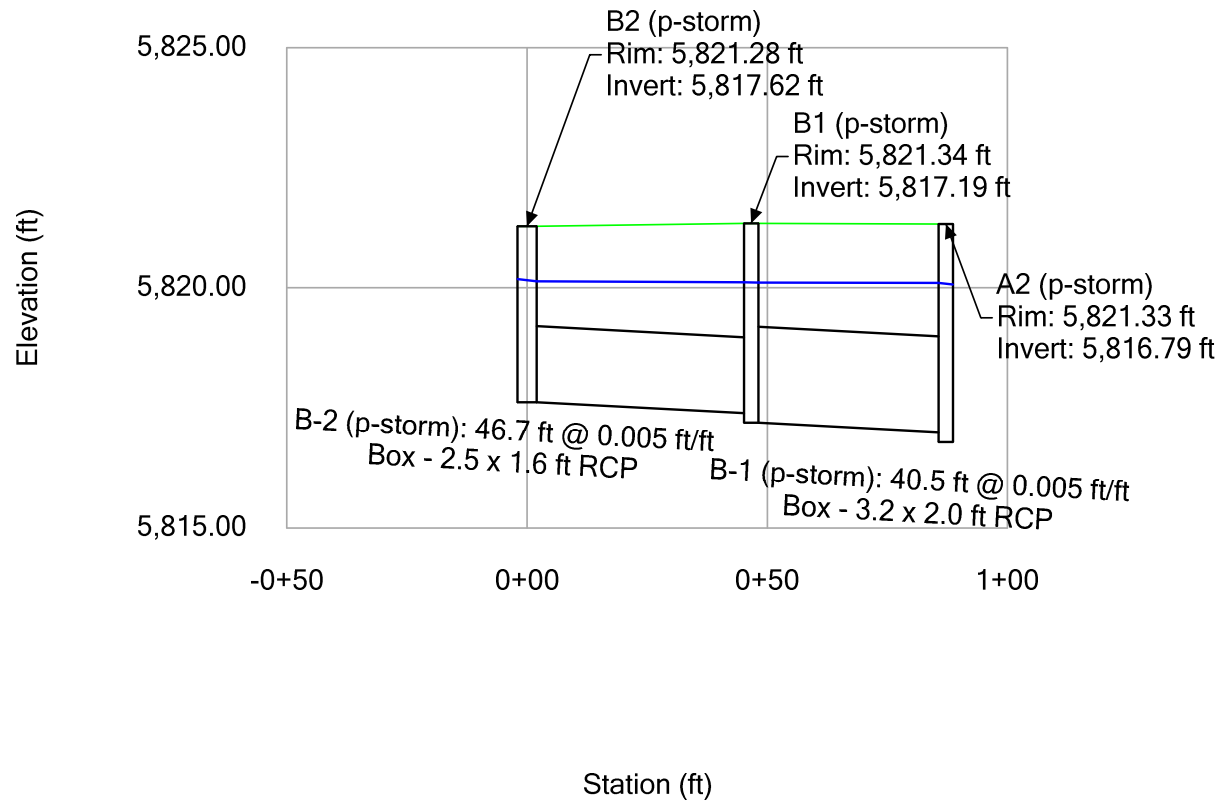
Active Scenario: 100 YR

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss Method	Hydraulic Grade Line (In) (ft)	Notes
F3 (p-storm)	5,830.85	5,830.85	(N/A)	5.67	1.89	5,825.16	Standard	5,825.36	4'Ø Flat-Top Manhole
A7 (p-storm)	5,830.63	5,830.63	5,820.01	11.09	3.58	5,823.39	HEC-22 Energy (Second Edition)	5,823.80	Inlet Type R 5'
F1 (p-storm)	5,830.26	5,830.26	5,822.76	6.30	1.45	5,824.20	HEC-22 Energy (Second Edition)	5,824.87	Inlet Type R 5'
F2 (p-storm)	5,830.05	5,830.05	5,823.12	6.00	2.05	5,824.97	HEC-22 Energy (Second Edition)	5,825.08	Inlet Type R 5'
D1 (p-storm)	5,829.72	5,829.72	5,820.42	5.30	3.73	5,823.95	HEC-22 Energy (Second Edition)	5,824.01	4'Ø Manhole
A6 (p-storm)	5,829.07	5,829.07	5,819.43	11.09	3.26	5,822.49	HEC-22 Energy (Second Edition)	5,822.70	4'Ø Manhole
J2 (p-storm)	5,828.92	5,828.92	(N/A)	0.76	0.40	5,824.04	Standard	5,824.12	Inlet Type R 5'
J1 (p-storm)	5,828.92	5,828.92	5,823.32	1.50	0.89	5,824.02	HEC-22 Energy (Second Edition)	5,824.07	Inlet Type R 5'
D4 (p-storm)	5,828.19	5,828.19	(N/A)	3.52	3.11	5,824.65	Standard	5,824.72	4'Ø Flat-Top Manhole
D2 (p-storm)	5,828.16	5,828.16	5,821.04	4.18	3.32	5,824.17	HEC-22 Energy (Second Edition)	5,824.50	Inlet Type R 5'
D3 (p-storm)	5,828.14	5,828.14	5,821.40	3.75	3.34	5,824.54	HEC-22 Energy (Second Edition)	5,824.62	Inlet Type R 5'
A5 (p-storm)	5,826.64	5,826.64	5,818.62	11.09	2.78	5,821.20	HEC-22 Energy (Second Edition)	5,821.36	4'Ø Manhole
A4 (p-storm)	5,826.04	5,826.04	5,818.27	24.52	2.73	5,820.80	HEC-22 Energy (Second Edition)	5,820.86	Inlet Type R 5'
C1 (p-storm)	5,826.02	5,826.02	5,819.08	7.18	2.30	5,821.02	HEC-22 Energy (Second Edition)	5,821.33	Inlet Type R 5'
E4	5,825.36	5,825.36	5,815.73	18.36	1.54	5,817.08	HEC-22 Energy (Second Edition)	5,817.09	4'Ø Manhole
H1 (p-storm)	5,825.11	5,825.11	(N/A)	9.64	2.18	5,821.06	Standard	5,821.64	4'Ø Flat-Top ManholeW/ GRATED LID
C2 (p-storm)	5,823.93	5,823.93	(N/A)	6.72	2.20	5,821.48	Standard	5,821.76	4'Ø Flat-Top ManholeW/ GRATED LID
A3 (p-storm)	5,823.21	5,823.21	5,817.53	30.12	3.00	5,820.33	HEC-22 Energy (Second Edition)	5,820.42	4'Ø Manhole
B1 (p-storm)	5,821.34	5,821.34	5,817.39	6.34	2.92	5,820.11	HEC-22 Energy (Second Edition)	5,820.12	Inlet Type R 5'
B2 (p-storm)	5,821.28	5,821.28	(N/A)	5.79	2.52	5,820.14	Standard	5,820.18	4'Ø Flat-Top ManholeW/ GRATED LID
A2 (p-storm)	5,821.33	5,821.33	5,816.99	34.69	3.28	5,820.07	HEC-22 Energy (Second Edition)	5,820.10	Inlet Type R 5'
E3	5,818.77	5,818.77	5,811.86	25.39	2.67	5,814.33	HEC-22 Energy (Second Edition)	5,814.41	6'Ø Manhole
G1 (p-storm)	5,818.36	5,820.60	(N/A)	7.03	2.40	5,814.44	Standard	5,814.54	Inlet Type D
E4 (p-storm)	5,826.26	5,826.26	(N/A)	18.36	1.54	5,825.56	Standard	5,826.52	24" FES
A1 (p-storm)	5,821.29	5,821.29	5,816.54	34.69	3.58	5,819.92	HEC-22 Energy (Second Edition)	5,819.99	
I1	5,816.34	5,816.34	(N/A)	3.97	0.70	5,812.38	Standard	5,812.70	
E2	5,817.57	5,817.57	5,811.55	31.33	2.46	5,813.99	Absolute	5,813.99	
EX-1	5,818.34	5,818.34	(N/A)	16.10	2.34	5,814.64	Standard	5,816.26	

Profile Report
Engineering Profile - Storm Line A (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR

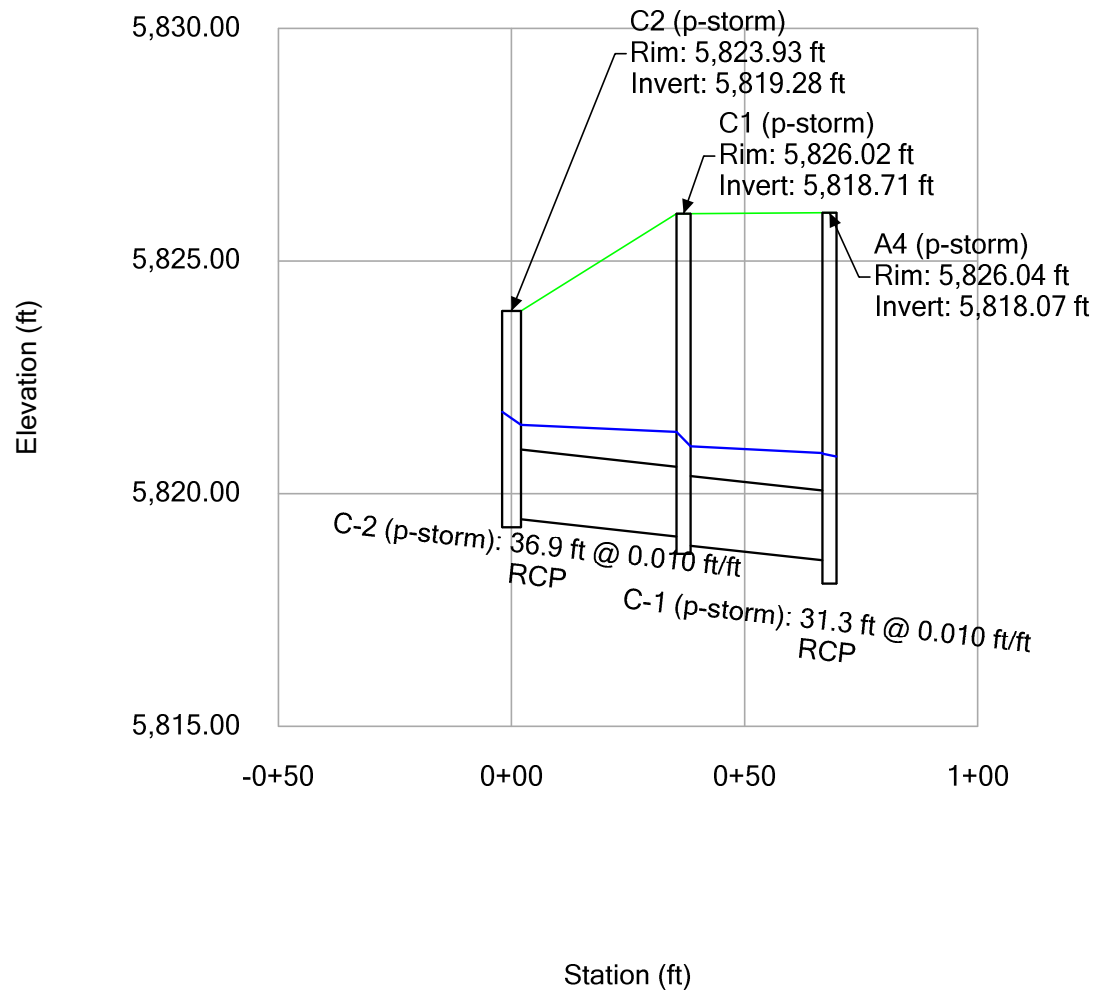


Profile Report **Engineering Profile - Storm Line B (StormCAD-10-6-2022.stsw)** **Active Scenario: 100 YR**

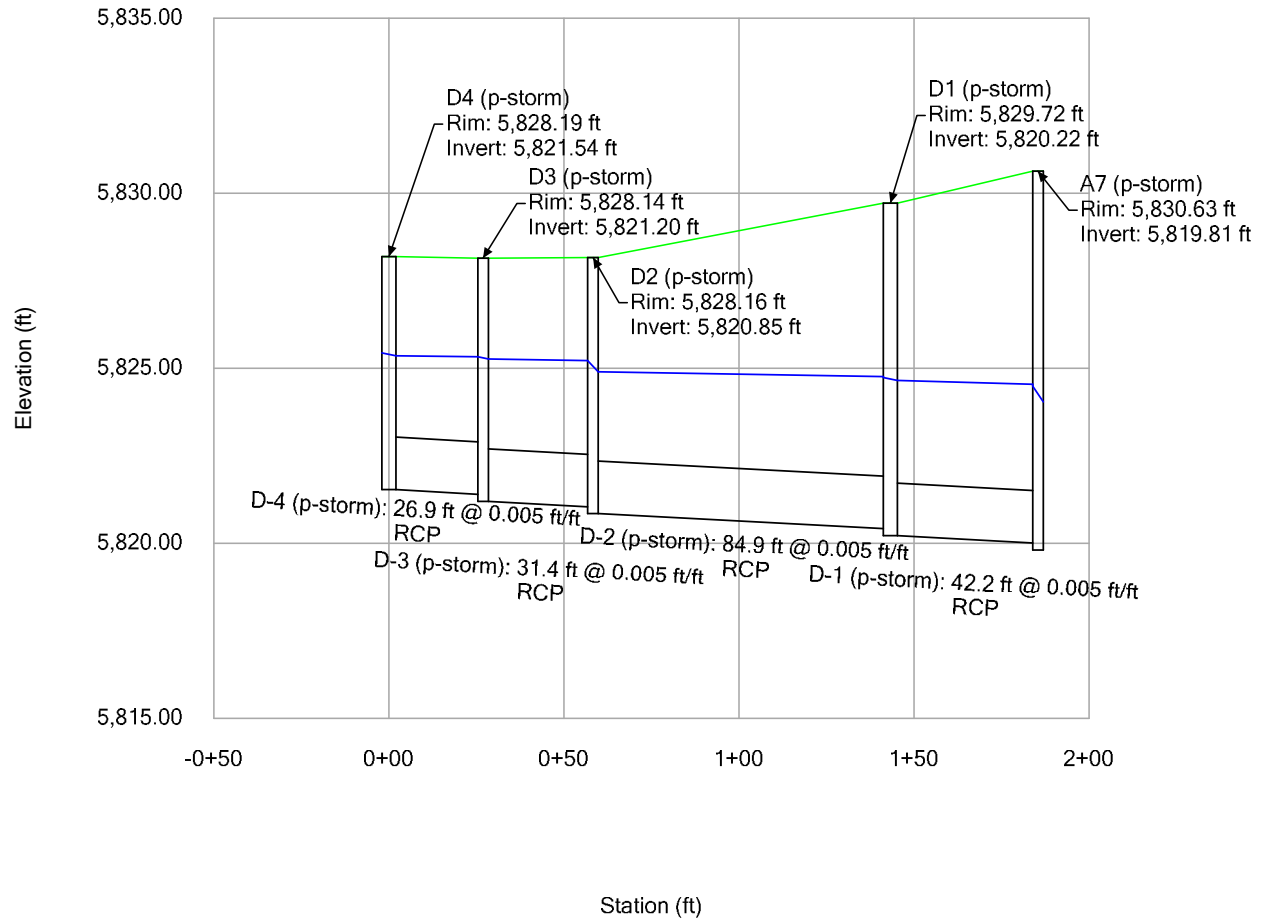


Profile Report **Engineering Profile - Storm Line C (StormCAD-10-6-2022.stsw)**

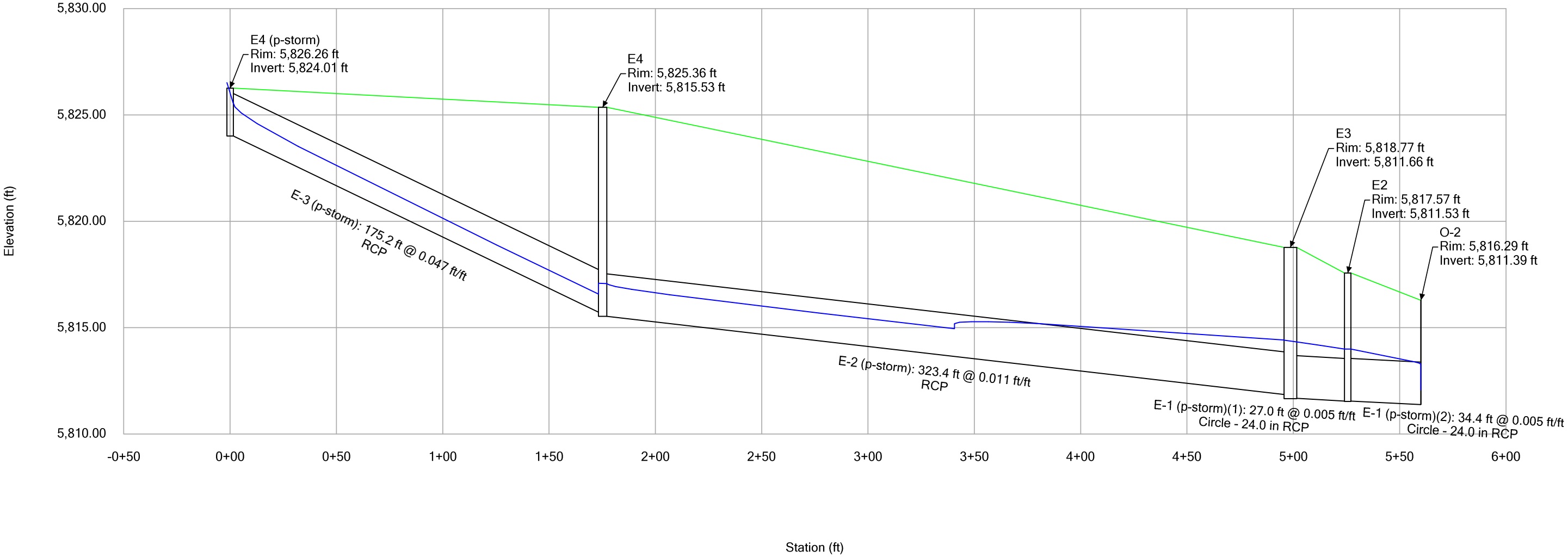
Active Scenario: 100 YR



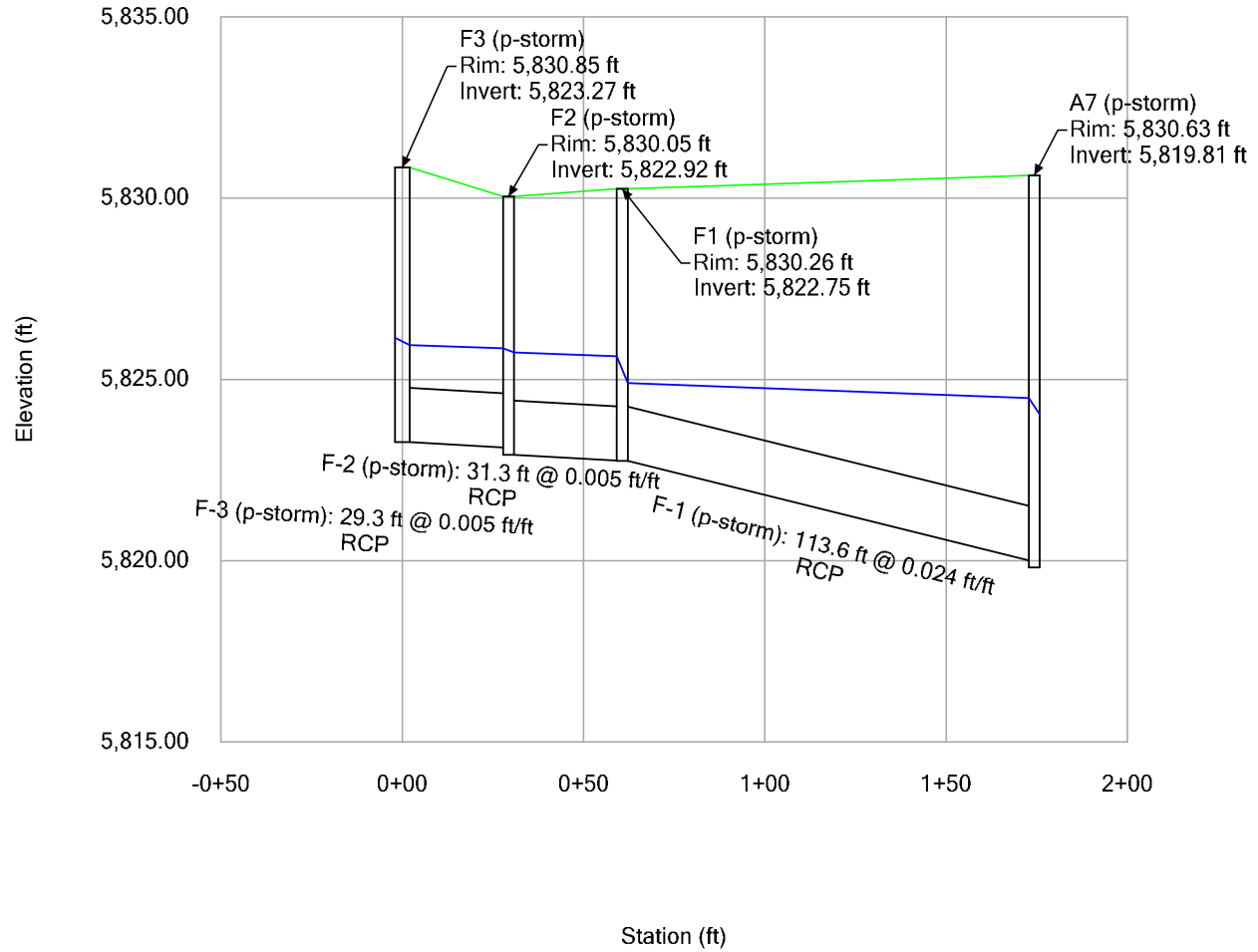
Profile Report **Engineering Profile - Storm Line D (StormCAD-10-6-2022.stsw)** **Active Scenario: 100 YR**



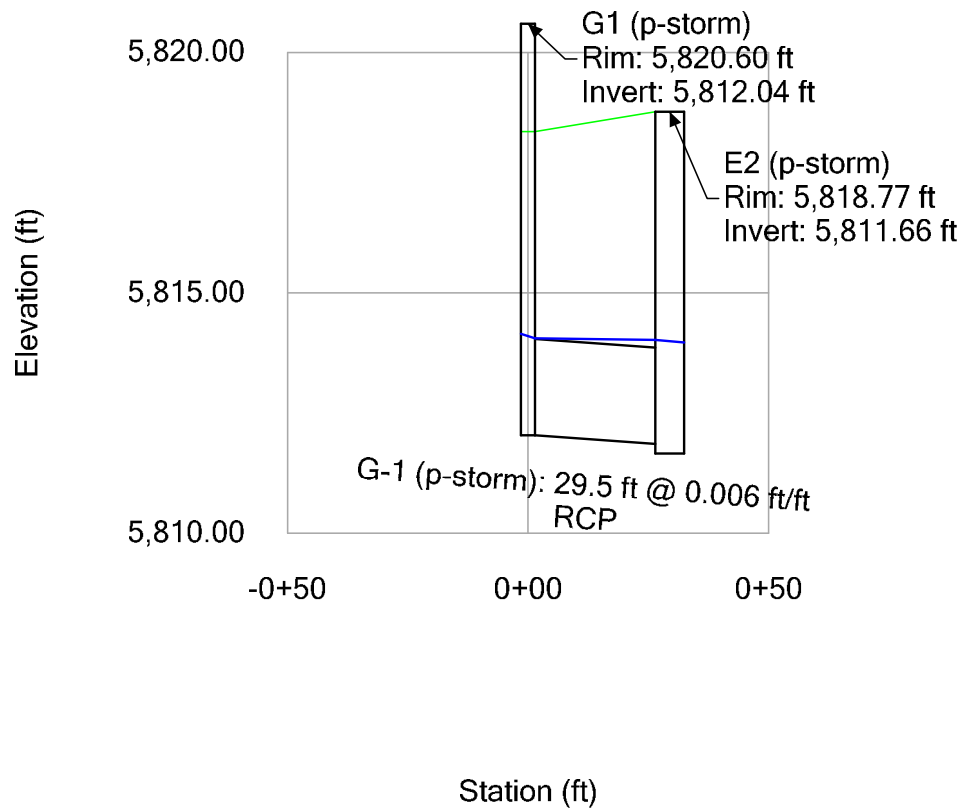
Profile Report
Engineering Profile - Storm Line E (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



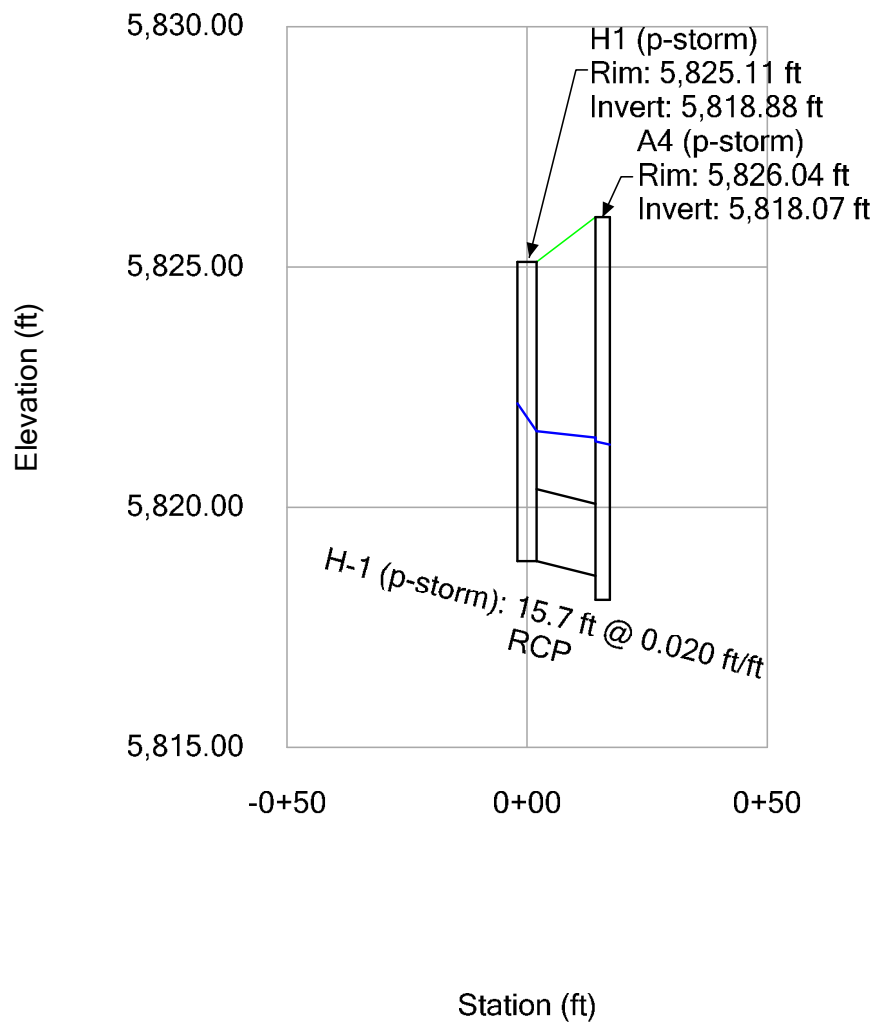
Profile Report **Engineering Profile - Storm Line F (StormCAD-10-6-2022.stsw)** **Active Scenario: 100 YR**



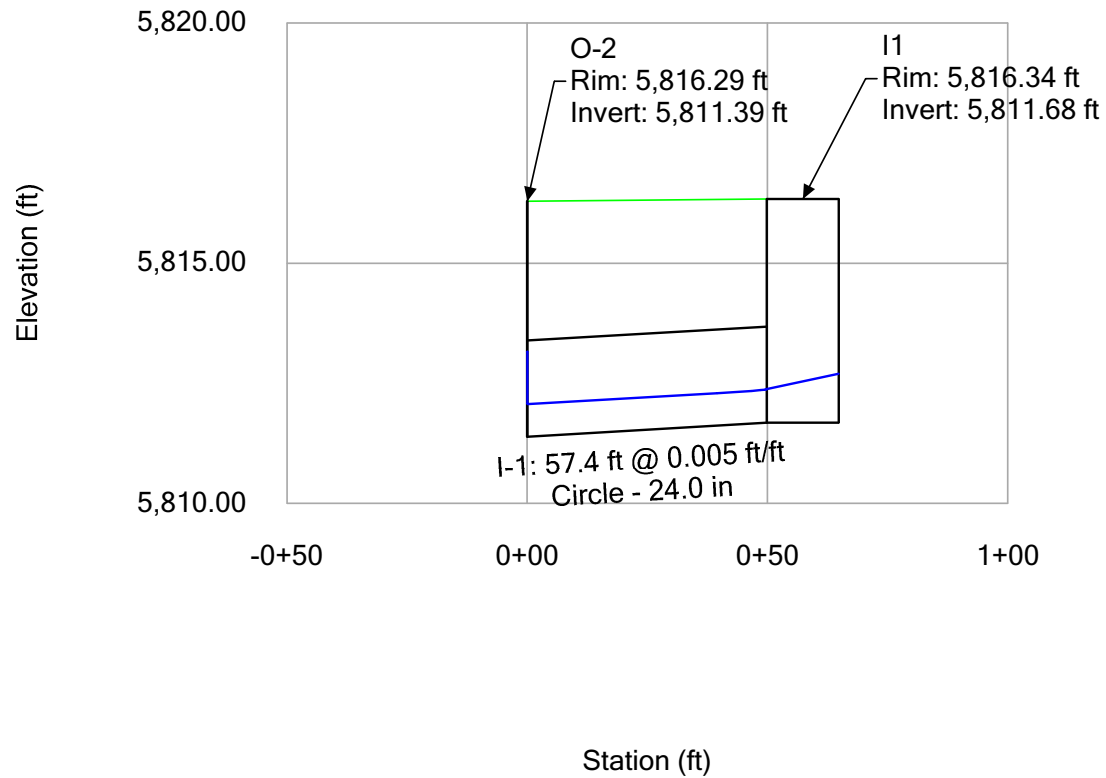
Profile Report
Engineering Profile - Storm Line G (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



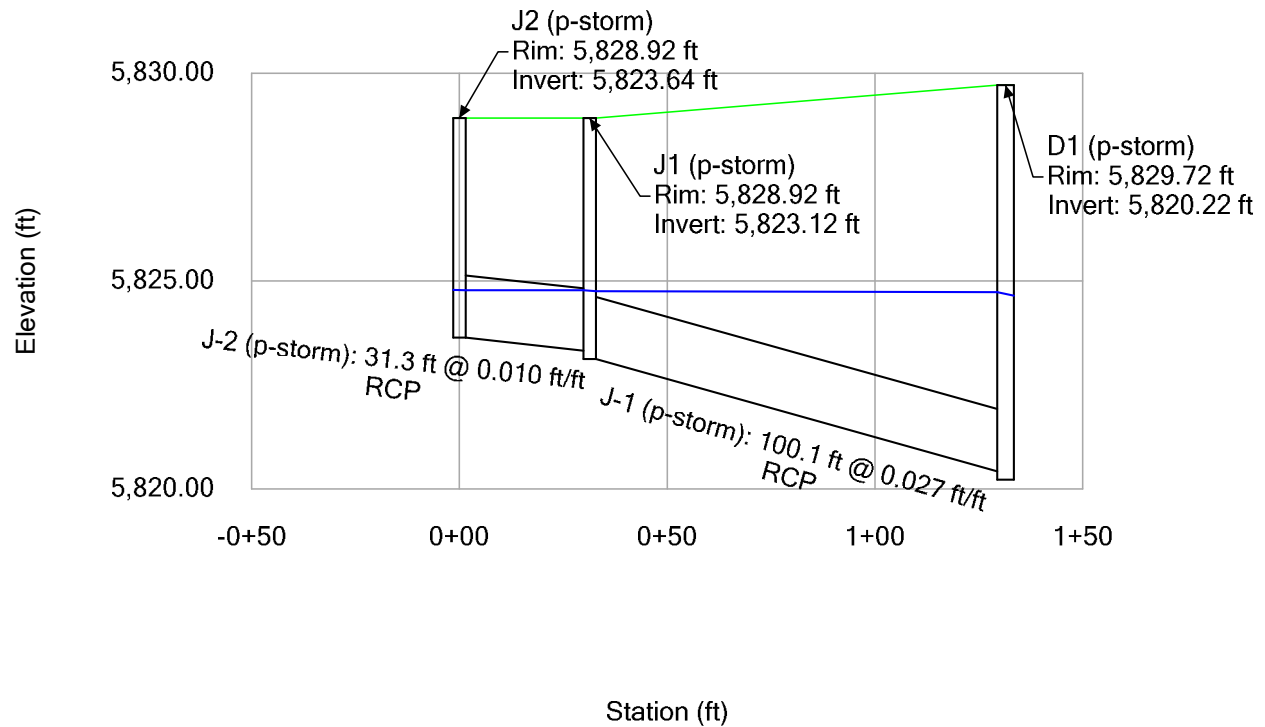
Profile Report
Engineering Profile - Storm Line H (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



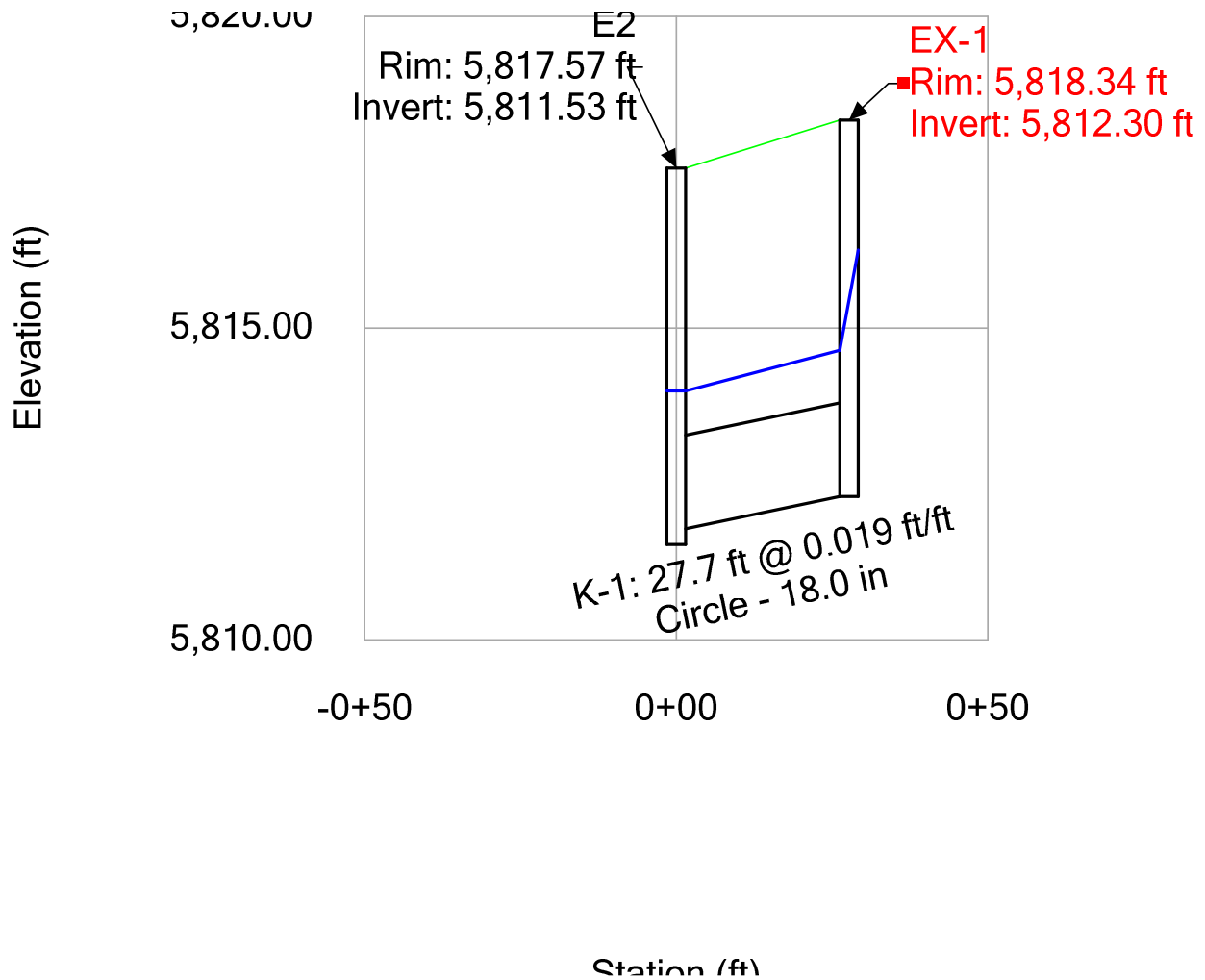
Profile Report
Engineering Profile - Storm Line I (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



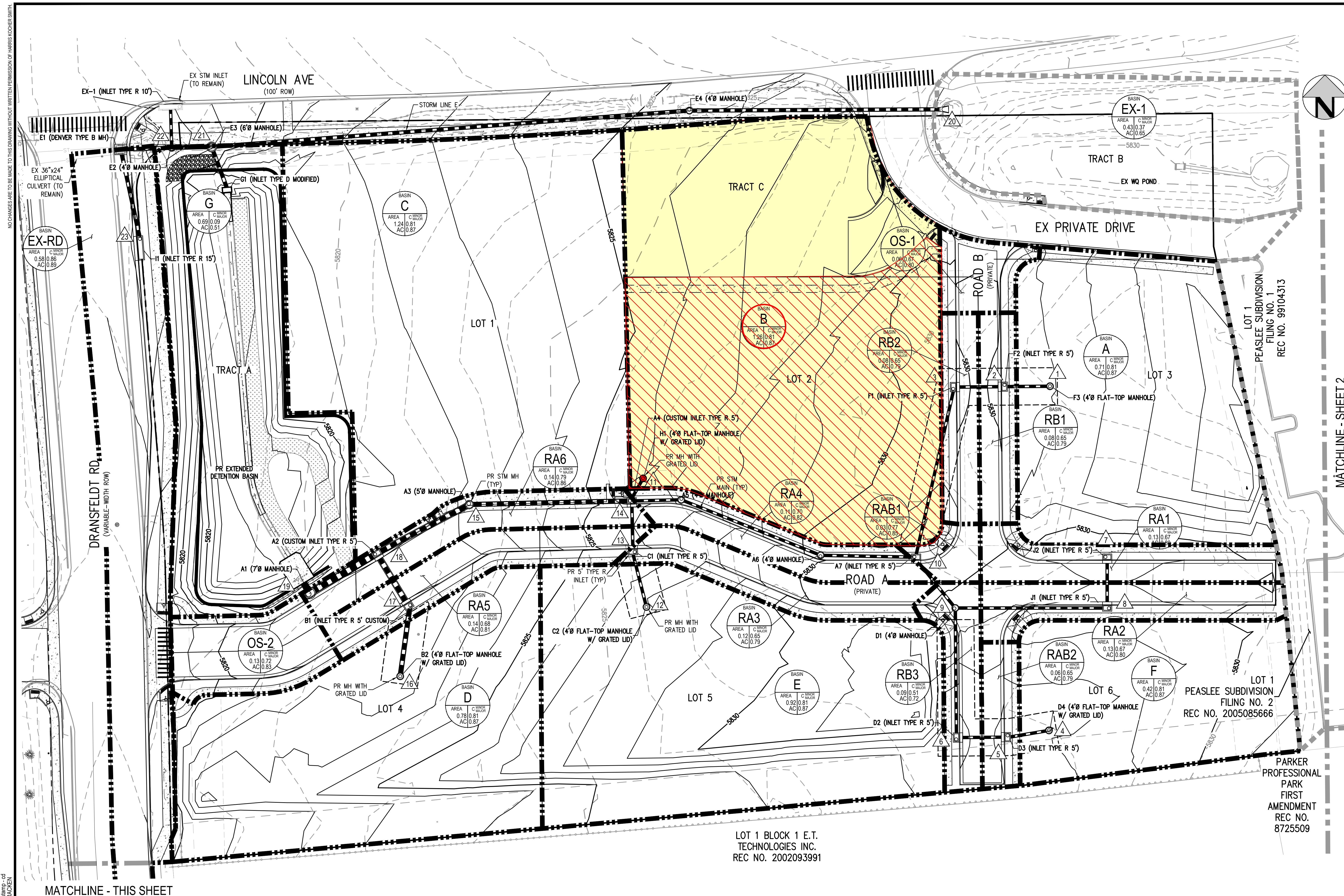
Profile Report **Engineering Profile - Storm Line J (StormCAD-10-6-2022.stsw)** **Active Scenario: 100 YR**



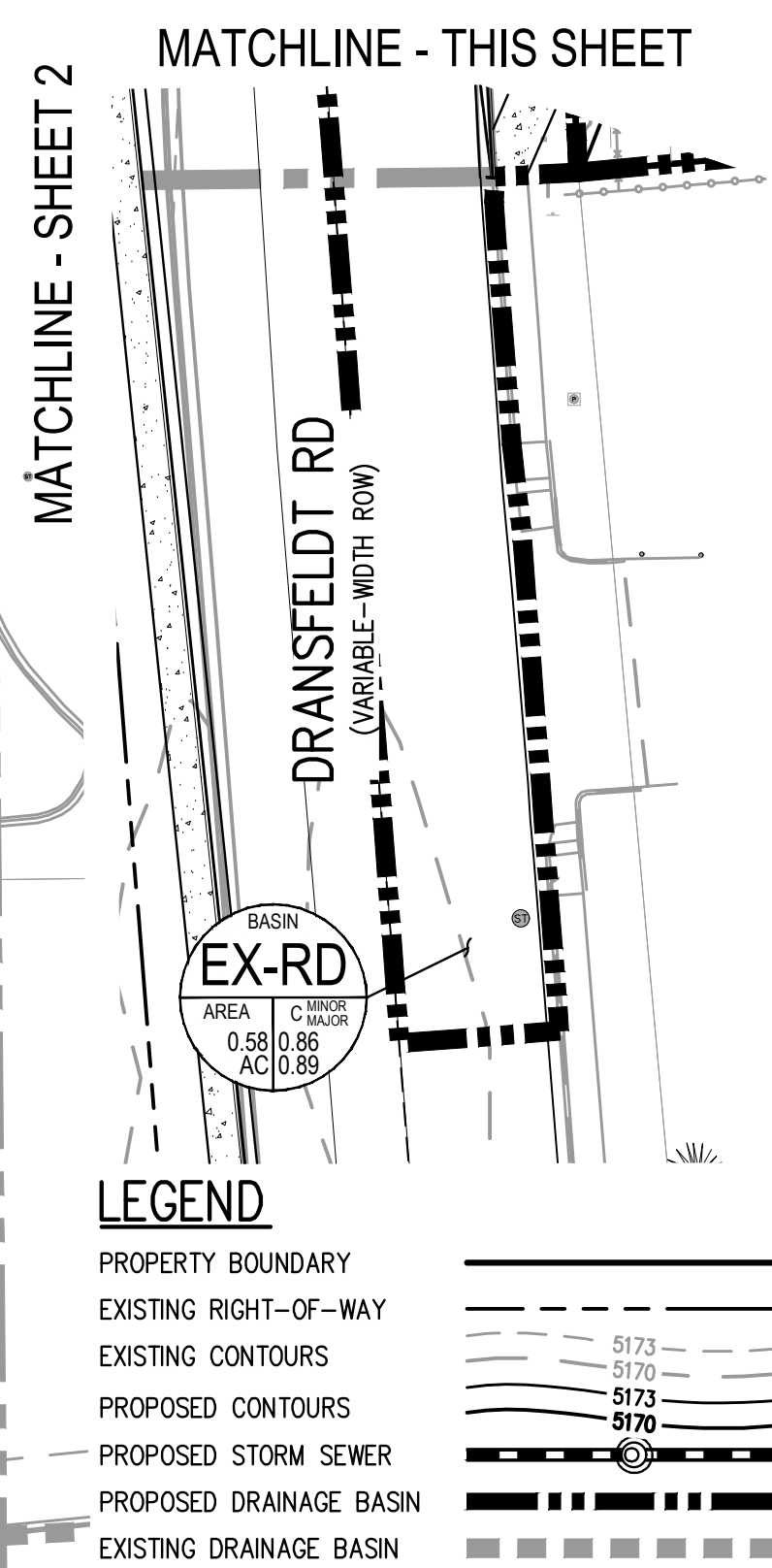
Profile Report
Engineering Profile - Storm Line K (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



APPENDIX D – Final Drainage Plan

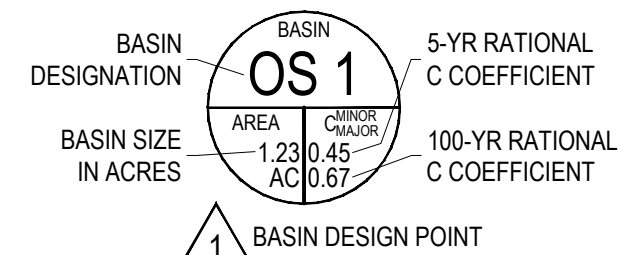


DIRECT RUNOFF SUMMARY TABLE			
BASIN	AREA (AC)	Q5 (CFS)	Q100 (CFS)
A	0.71	2.7	5.5
B	1.26	4.5	9.3
C	1.24	4.5	9.2
D	0.78	2.7	5.6
E	0.92	3.2	6.4
F	0.42	1.6	3.2
G	0.69	0.2	2.3
RAB1	0.03	0.1	0.2
RAB2	0.06	0.2	0.4
RB1	0.08	0.2	0.6
RB2	0.08	0.2	0.6
RB3	0.09	0.3	0.6
RA1	0.13	0.4	0.9
RA2	0.13	0.4	0.9
RA3	0.12	0.4	0.8
RA4	0.11	0.4	0.8
RA5	0.14	0.4	1.0
RA6	0.14	0.5	1.1
OFF-SITE			
OS-1	0.06	0.0	0.0
OS-2	0.13	0.0	0.0



LEGEND

- PROPERTY BOUNDARY
EXISTING RIGHT-OF-WAY
EXISTING CONTOURS
PROPOSED CONTOURS
PROPOSED STORM SEWER
PROPOSED DRAINAGE BASIN
EXISTING DRAINAGE BASIN

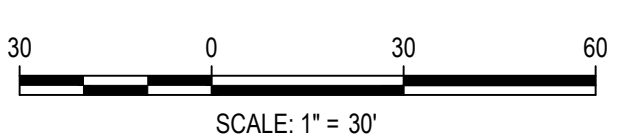


**PARKER
PROFESSIONAL
PARK
FIRST
AMENDMENT
REC NO.
8725509**

LOT 1 BLOCK 1 E.T.
TECHNOLOGIES INC.
REC NO. 2002093991



Know what's below.
Call before you dig.



DESIGNED BY: ORM
CHECKED BY: RCP
DRAWN BY: ORM

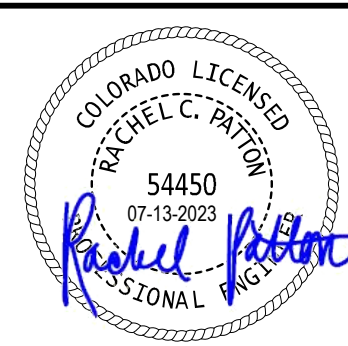
ISSUE DATE: 07-30-2021	
DATE	REVISION COMMENTS
11-19-2021	PER TOWN OF PARKER COMMENTS
04-08-2022	PER TOWN OF PARKER COMMENTS
07-21-2022	PER TOWN OF PARKER COMMENTS
10-20-2022	PER TOWN OF PARKER COMMENTS
01-18-2023	PER TOWN OF PARKER COMMENTS
04-03-2023	PER TOWN OF PARKER COMMENTS
07-12-2023	PERMIT SET



1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
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HarrisKocherSmith.com

PLAZA STREET PARTNERS

LINCOLN & DRANSFELDT
DRAINAGE MAP



PROJECT #: 200829
SHEET NUMBER

1

1 OF 2

APPENDIX D – INLET CALCULATIONS

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet 1	Inlet 2
Site Type (Urban or Rural)	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows		
Minor Q_{known} (cfs)	0.3	1.3
Major Q_{known} (cfs)	0.8	3.3

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

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	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)		

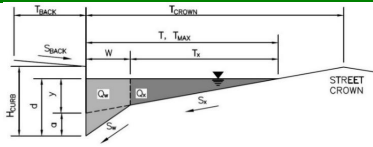
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.3	1.3
Major Total Design Peak Flow, Q (cfs)	0.8	3.3
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A

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

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

Project:

Inlet ID: **Inlet 1****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} = 3.0$ ft
 $S_{BACK} = 0.014$ ft/ft
 $n_{BACK} = 0.020$

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 21.0$ ft
 $W = 1.00$ ft
 $S_X = 0.045$ ft/ft
 $S_W = 0.083$ ft/ft
 $S_0 = 0.000$ ft/ft
 $n_{STREET} = 0.013$

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	5.0	10.0	ft
$d_{MAX} =$	4.0	6.0	inches

MINOR STORM Allowable Capacity is not applicable to Sump Condition

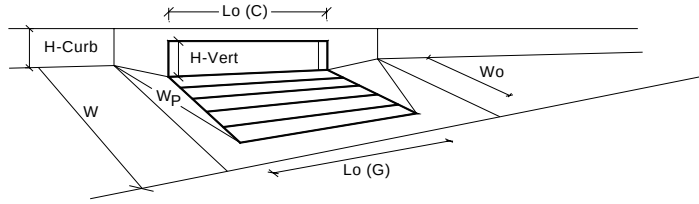
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

$Q_{allow} =$

	Minor Storm	Major Storm	
	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



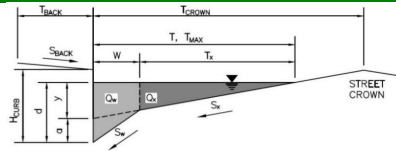
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		N_o =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	3.2	5.9	inches
<u>Grate Information</u>		MINOR		MAJOR	
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)		$C_l (G)$ =	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	
<u>Curb Opening Information</u>		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		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_l (C)$ =	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	
<u>Low Head Performance Reduction (Calculated)</u>		MINOR		MAJOR	
Depth for Grate Midwidth		d_{grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{curb} =	0.18	0.41	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} =	0.95	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{combination}$ =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q_{in} =	1.6	5.7	cfs
		$Q_{PEAK REQUIRED}$ =	0.3	0.8	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: Inlet 2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.010	ft/ft
n_{BACK}	=	0.013	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	100.0	ft
W	=	1.00	ft
S_x	=	0.028	ft/ft
S_w	=	0.083	ft/ft
S_0	=	0.000	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	10.0	20.0	ft
d_{MAX}	4.0	6.0	inches

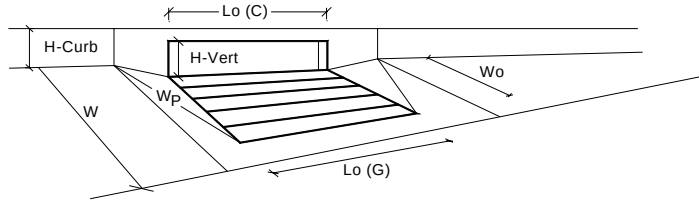
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	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 =	4.0	6.0	inches
<u>Grate Information</u>			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)		$C_1 (G)$ =	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	
<u>Curb Opening Information</u>			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		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_1 (C)$ =	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	
<u>Low Head Performance Reduction (Calculated)</u>			MINOR	MAJOR	
Depth for Grate Midwidth		d_{grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{curb} =	0.25	0.42	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	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q_{in} =	2.8	5.9	cfs
		$Q_{PEAK REQUIRED}$ =	1.3	3.3	cfs

NYLOPLAST VALLEY INLET CALCULATIONS

Basin No. 3

Size: 24" (CIRCLE)

Dimensions:

Length (in.): 24.00

Width (in.): 24.00

Approx Drain Area (sq-in): 194.60

5 YEAR

Q5	=	0.08	cfs
Area of Opening, A	=	1.35	sf
Coefficient C	=	0.60	
Max Ponding Elevation	=	0.20	ft
Entrance Elevation	=	0.00	ft
Difference, h	=	0.20	ft

$$Q = CA (2gh)^{1/2} = 0.60 \times A (2 \times 32.2)^{1/2} \times h^{1/2}$$

$$Q = 2.91 \times h^{1/2}$$

For h = 0.20

Q intercepted, Qi = 2.91 cfs

Using a factor of safety of 4, Qi = 2.91 x 1/4 = 0.73 cfs

Q intercepted, Qi = 0.73 > Q5 = 0.08 cfs, Total Interception OK

100 YEAR

Q ₁₀₀	=	0.52	cfs
Area of Opening, A	=	1.35	sf
Coefficient C	=	0.60	
Max Ponding Elevation	=	0.40	ft
Entrance Elevation	=	0.00	ft
Difference, h	=	0.40	ft

$$Q = CA (2gh)^{1/2} = 0.60 \times A (2 \times 32.2)^{1/2} \times h^{1/2}$$

$$Q = 4.12 \times h^{1/2}$$

For h = 0.40

Q intercepted, Qi = 4.12 cfs

Using a factor of safety of 4, Qi = 4.12 x 1/4 = 1.03 cfs

Q intercepted, Qi = 1.03 > Q₁₀₀ = 0.52 cfs, Total Interception OK