Kimley»Horn

DRAINAGE COMPLIANCE LETTER

To:	Town of Parker
From:	Madeleine Reinke, P.E. Kimley-Horn and Associates, Inc
Date:	October 30, 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 standards listed below:
(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 three sub drainage basins, two 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 using the recommended imperviousness values from Table 6-3 of the USDCM Volume 1 are included in **Appendix B** of this Report. These calculations show the site is proposed to have an overall imperviousness 71%, which is well below the 95% proposed for the overall Basin B within the Master Drainage Report.

Sub-Basin 1

Sub-Basin 1 is approximately 0.13 acres and will consist of portions of drive-thru lanes, landscaping, sidewalk, and asphalt paving. Sub-Basin 1 has been calculated to be 78% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.67 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.

Sub-Basin 2

Sub-Basin 2 is approximately 0.66 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 70% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.61 and 0.77 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 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	0.66	70%
O1	0.01	45%
TOTAL	**0.79**	**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.

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.

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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 E: StormCAD Calculations

APPENDIX A –DRAINAGE MAPS

MASTER DRAINAGE MAP

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

BASIN DESIGNATION; BASIN SIZE IN ACRES; 5-YR RATIONAL C COEFFICIENT; 100-YR RATIONAL C COEFFICIENT; BASIN DESIGN POINT

SCALE: 1" = 30'

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

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

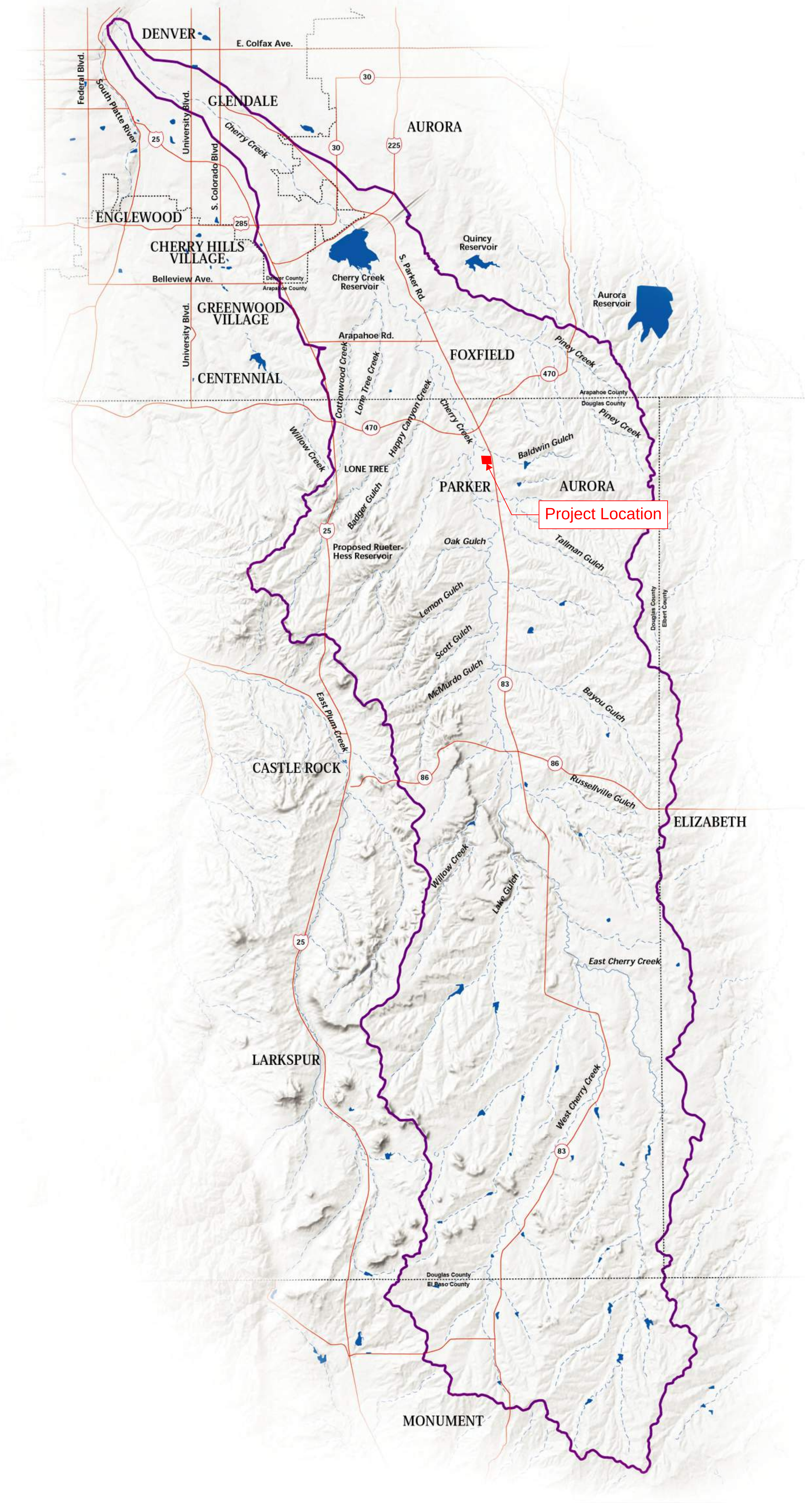
PLAZA STREET PARTNERS

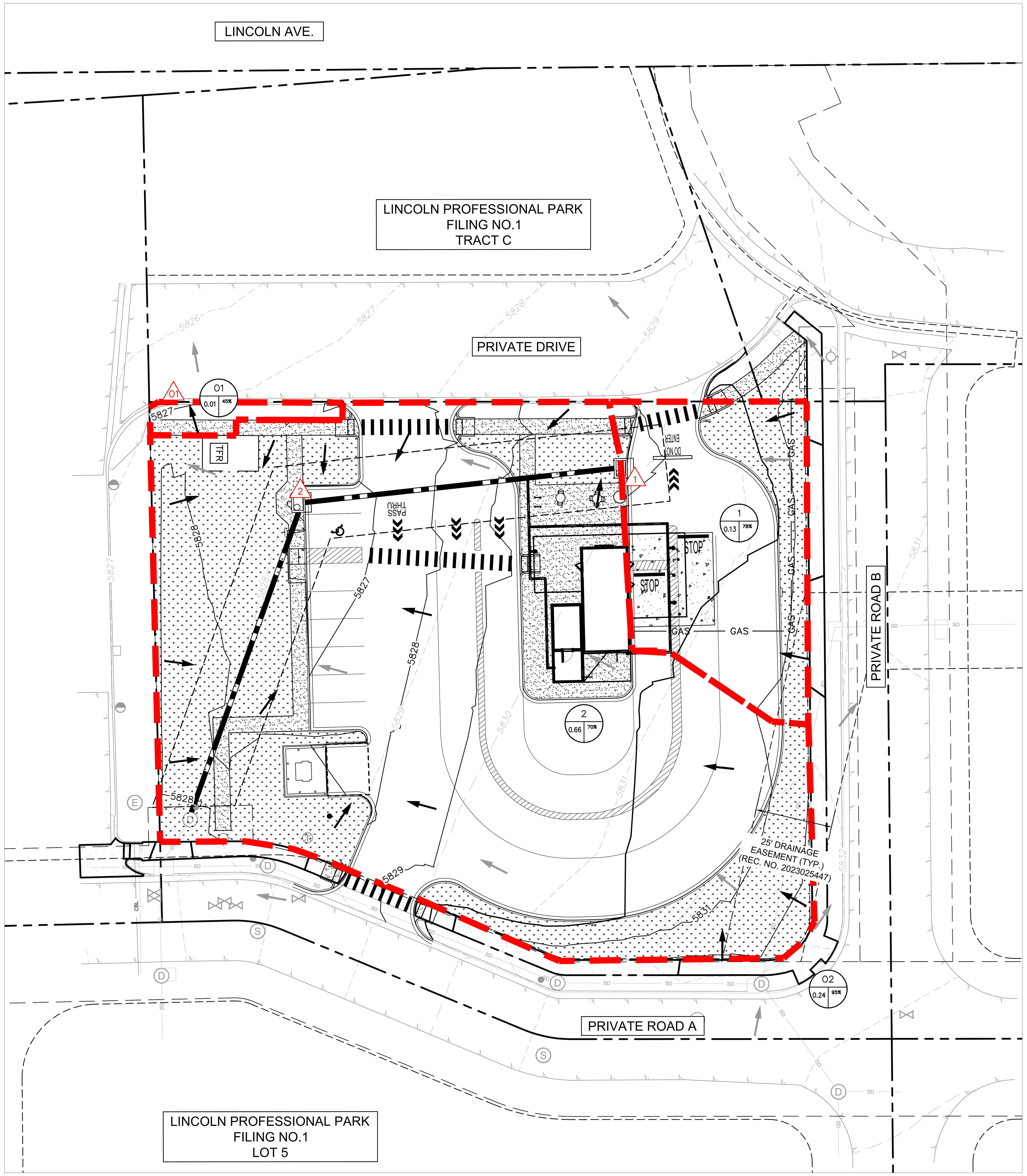
LINCOLN & DRANSFELDT
DRAINAGE MAP

COLORADO LICENSED PROFESSIONAL ENGINEER RACHEL C. PATTON 54450 07-13-2023

PROJECT #: 200829
SHEET NUMBER
1

CHERRY CREEK BASIN DRAINAGE MAP





NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

LEGEND

- PROPERTY LINE
- EASEMENT
- BUILDING OUTLINE
- BASIN BOUNDARY
- PROPOSED STORM DRAIN STRUCTURE
- EXISTING STORM DRAIN INLET
- PROPOSED FLOW ARROW
- EXISTING FLOW ARROW
- A = BASIN ID
- B = BASIN AREA (AC)
- C = BASIN IMPERVIOUSNESS (%)
- DESIGN POINT LABEL

NOTES:

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	PEAK FLOWS (CFS) Q100
On-Site Basins					
1	1	0.13	78%	0.31	0.81
2	2	0.66	70%	1.28	3.61
O1	O1	0.01	45%	0.00	0.00
TOTAL		**0.79**	**71%**	**1.58**	**4.42**

Know what's below. Call before you dig.

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn

6200 South Syracuse Way, Suite 300
Greenwood, Colorado 80111 (303) 228-2300

DESIGNED BY: MMR
DRAWN BY: KNP
CHECKED BY: KEW
DATE: 2/23/26

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

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, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.224 (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)

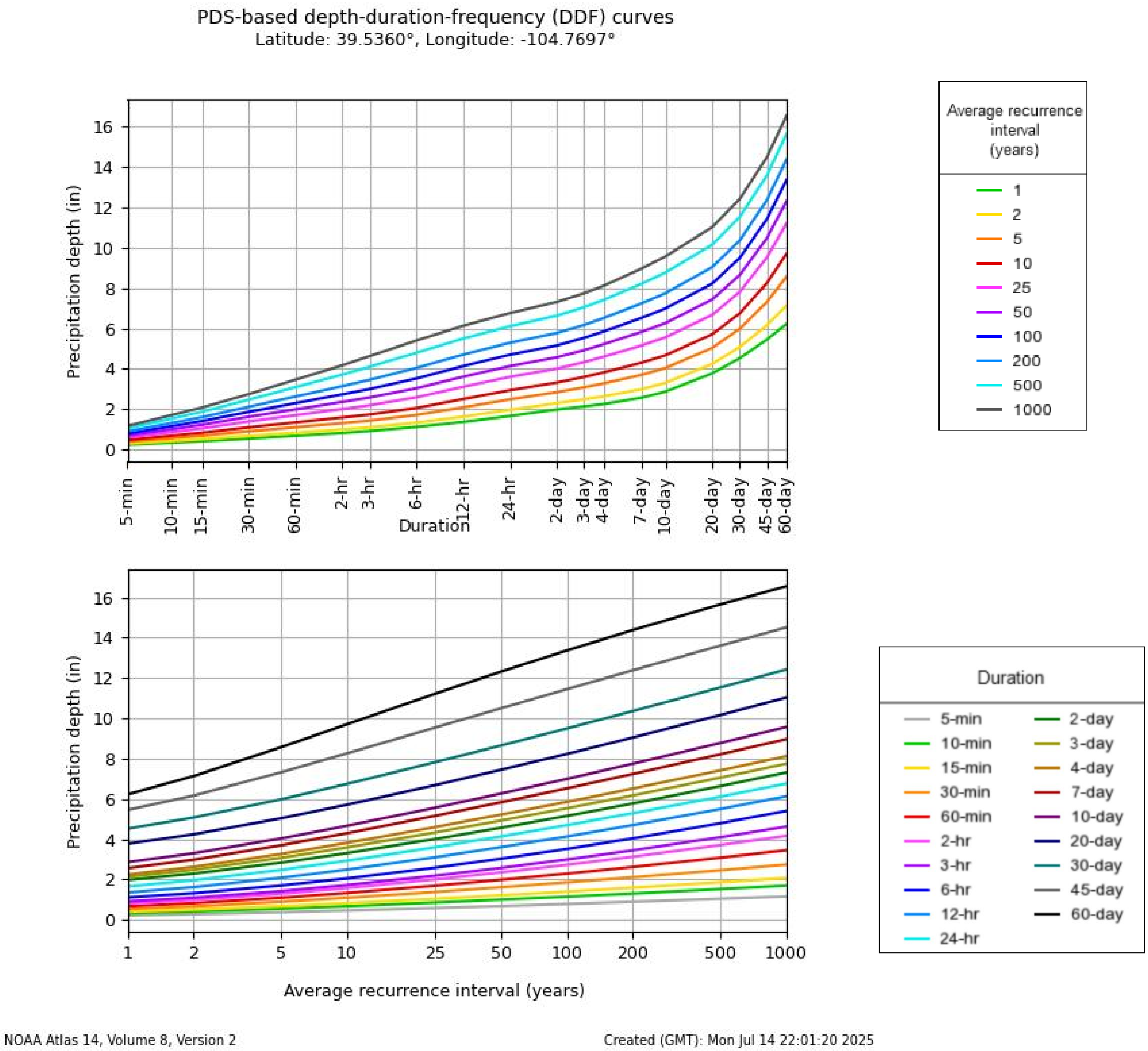
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Back to Top

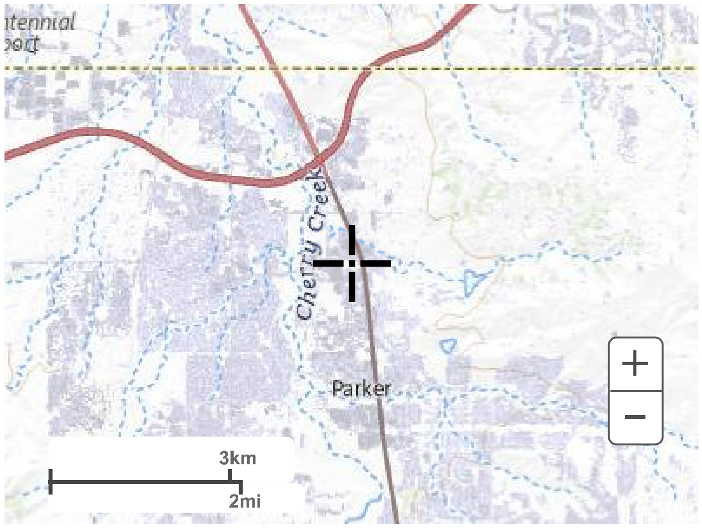
PF graphical



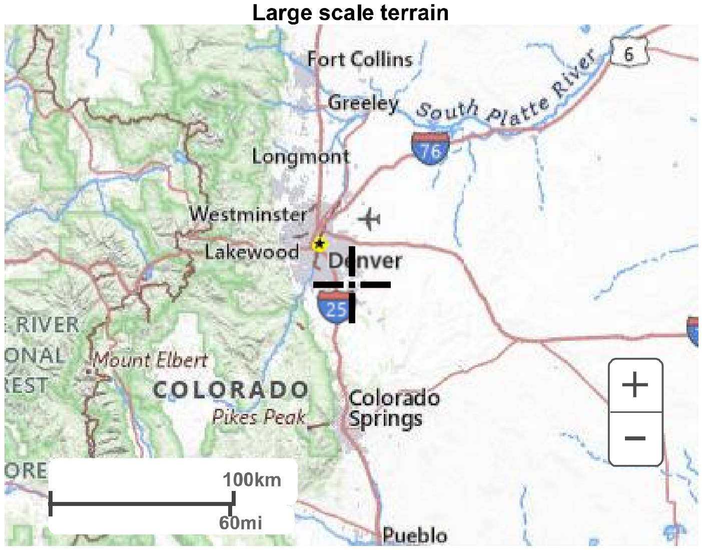
Back to Top

Maps & aerials

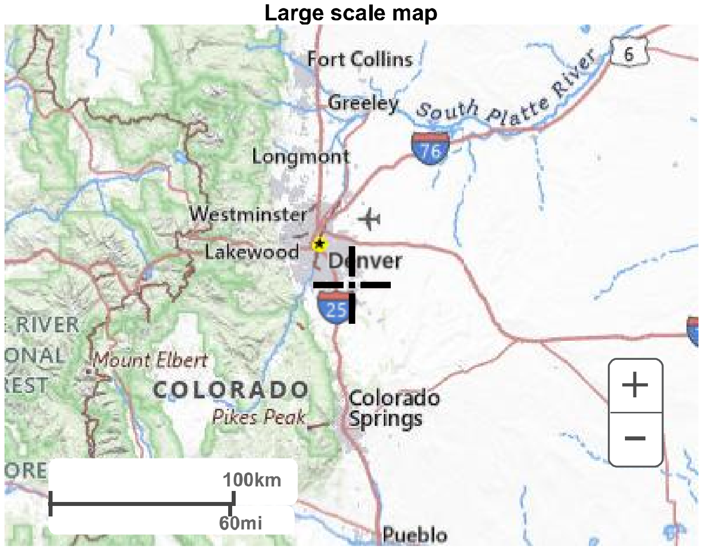
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

Back to Top

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

TABLE 6-7. RUNOFF COEFFICIENTS, *C*, NRCS HSG B

TOTAL OR EFFECTIVE % IMPERVIOUS	NRCS HSG B						
	WQE & 2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.01	0.07	0.26	0.34	0.44	0.54
5%	0.03	0.03	0.10	0.28	0.36	0.45	0.55
10%	0.06	0.07	0.14	0.31	0.38	0.47	0.57
15%	0.09	0.11	0.18	0.34	0.41	0.50	0.59
20%	0.13	0.15	0.22	0.37	0.44	0.52	0.61
25%	0.17	0.19	0.26	0.41	0.47	0.54	0.63
30%	0.20	0.23	0.30	0.44	0.50	0.57	0.65
35%	0.24	0.27	0.34	0.47	0.52	0.59	0.66
40%	0.29	0.32	0.38	0.50	0.55	0.61	0.68
45%	0.33	0.36	0.42	0.53	0.58	0.64	0.70
50%	0.37	0.40	0.46	0.56	0.61	0.66	0.72
55%	0.42	0.45	0.50	0.59	0.63	0.68	0.74
60%	0.46	0.49	0.54	0.63	0.66	0.71	0.76
65%	0.50	0.54	0.58	0.66	0.69	0.73	0.77
70%	0.55	0.58	0.62	0.69	0.72	0.75	0.79
75%	0.60	0.63	0.66	0.72	0.75	0.77	0.81
80%	0.64	0.67	0.70	0.75	0.77	0.80	0.83
85%	0.69	0.72	0.74	0.78	0.80	0.82	0.85
90%	0.74	0.76	0.78	0.81	0.83	0.84	0.87
95%	0.79	0.81	0.82	0.85	0.86	0.87	0.88
100%	0.84	0.86	0.86	0.88	0.89	0.89	0.90

Kimley»Horn

STANDARD FORM SF-1
RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION - PROPOSED

PROJECT NAME: 7 Brew Parker — 10/28/2025
PROJECT NUMBER: 296237001
CALCULATED BY: KNP
CHECKED BY: MMR

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	0.43	0.01	0.22	0.00	**0.66**	0.57	0.61	0.77	70%
O1	O1	0.00	0.00	0.01	0.00	**0.01**	0.35	0.40	0.67	45%
BASIN SUBTOTAL		**0.54**	**0.01**	**0.26**	**0.00**	**0.81**	**0.57**	**0.61**	**0.77**	**71%**
		67%	**1%**	**32%**	**0%**	**100%**				

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STANDARD FORM SF-2
Time of Concentration

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

DATE: 10/28/2025

SUB-BASIN DATA			INITIAL TIME (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)					FINAL Tc
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. tc (13)	TOTAL LENGTH (14)	TOTAL SLOPE (15)	TOTAL IMP. (16)	Tc 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	0.664	0.606	97	2.8%	6.3	134	2.9%	20.0	3.4	0.7	6.9	231	2.8%	70%	14.8	6.9
O1	0.011	0.400	12	5.0%	2.6			7.0			2.6	12	5.0%	45%		

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

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

Kimley»Horn

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

DATE: 10/28/2025

P_1 (1-Hour Rainfall) = **1.1**

			DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
STORM LINE		DESIGN POINT	DESIGN BASIN	AREA (AC)	RUNOFF COEFF	t_c (min)	C*A(ac)	I (in/hr)	Q (cfs)	t_c(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	t_t (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
On-Site Basins																						
		1	1	0.13	0.63	5.00	0.08	3.73	0.31													
		2	2	0.66	0.57	6.94	0.38	3.39	1.28													
		O1	O1	0.01	0.35	0.00	0.00	5.13	0.02													

Kimley»Horn

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: 10/28/2025

P_1 (1-Hour Rainfall) = **2.29**

STORM LINE		DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
			DESIGN BASIN	AREA (AC)	RUNOFF COEFF	t_c (min)	C*A(ac)	I (in/hr)	Q (cfs)	t_c(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	t_t (min)	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
On-Site Basins																						
		1	1	0.13	0.80	5.00	0.10	7.77	0.81													
		2	2	0.66	0.77	6.94	0.51	7.06	3.61													
		O1	O1	0.01	0.67	0.00	0.01	10.68	0.08													

Kimley»Horn

PROJECT NAME: 7 Brew Parker

DATE: 10/28/2025

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	0.66	70%	1.28	3.61
O1	O1	0.01	45%	0.00	0.00
TOTAL		**0.79**	**71%**	**1.58**	**4.42**

United States Department of Agriculture

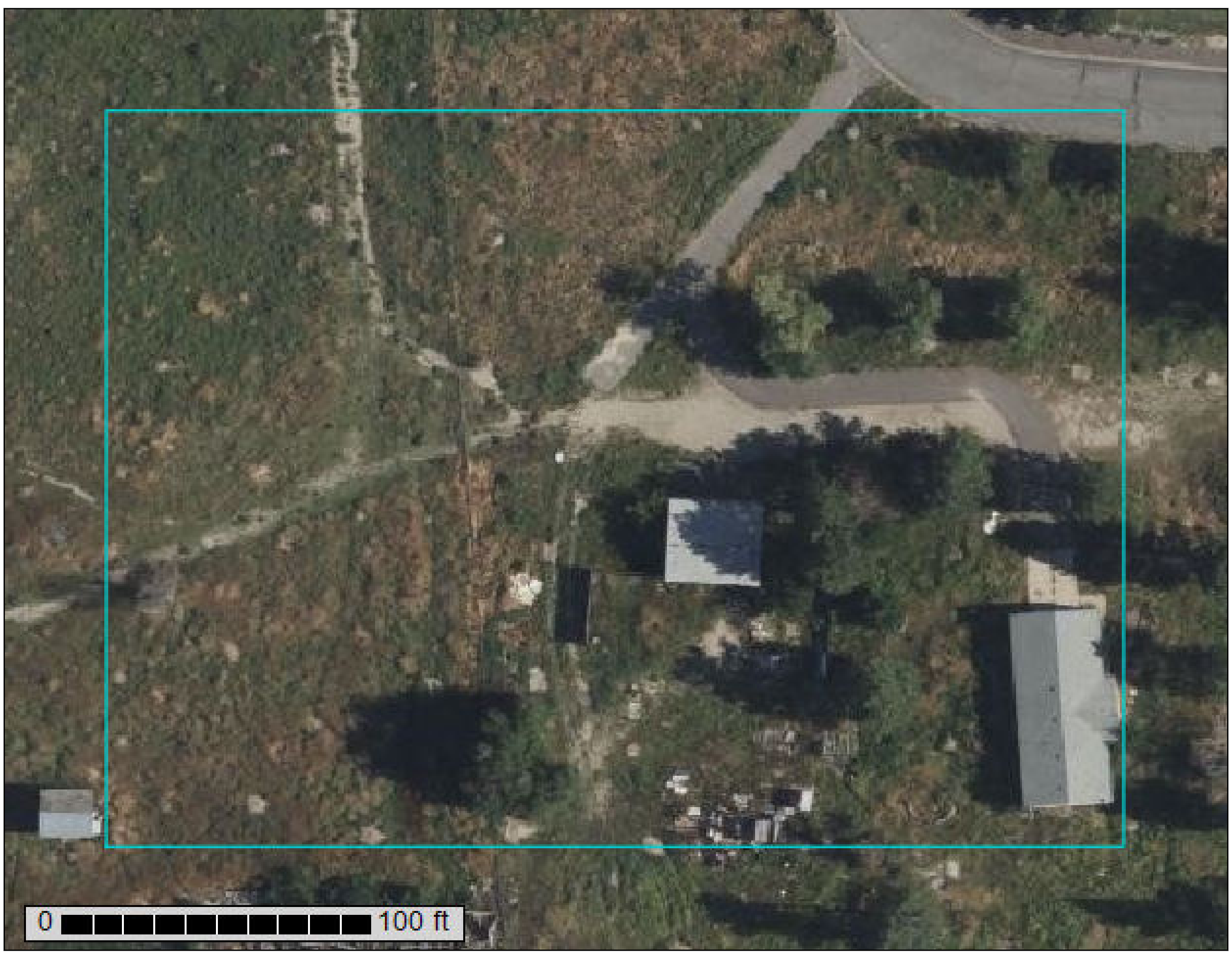
NRCS

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



July 14, 2025

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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Contents

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 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.

Soil Map

Map Scale: 1:613 if printed on A landscape (11" x 8.5") sheet.

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil 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 17, Aug 29, 2024

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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	1.8	100.0%
Totals for Area of Interest		**1.8**	**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 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: Terraces, hillslopes
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 supply, 0 to 60 inches: 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

Truckton

Percent of map unit: 5 percent
Landform: Terraces, hillslopes
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

Sampson

Percent of map unit: 5 percent
Landform: Alluvial fans, terraces
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 Palmer Divide
Hydric soil rating: No

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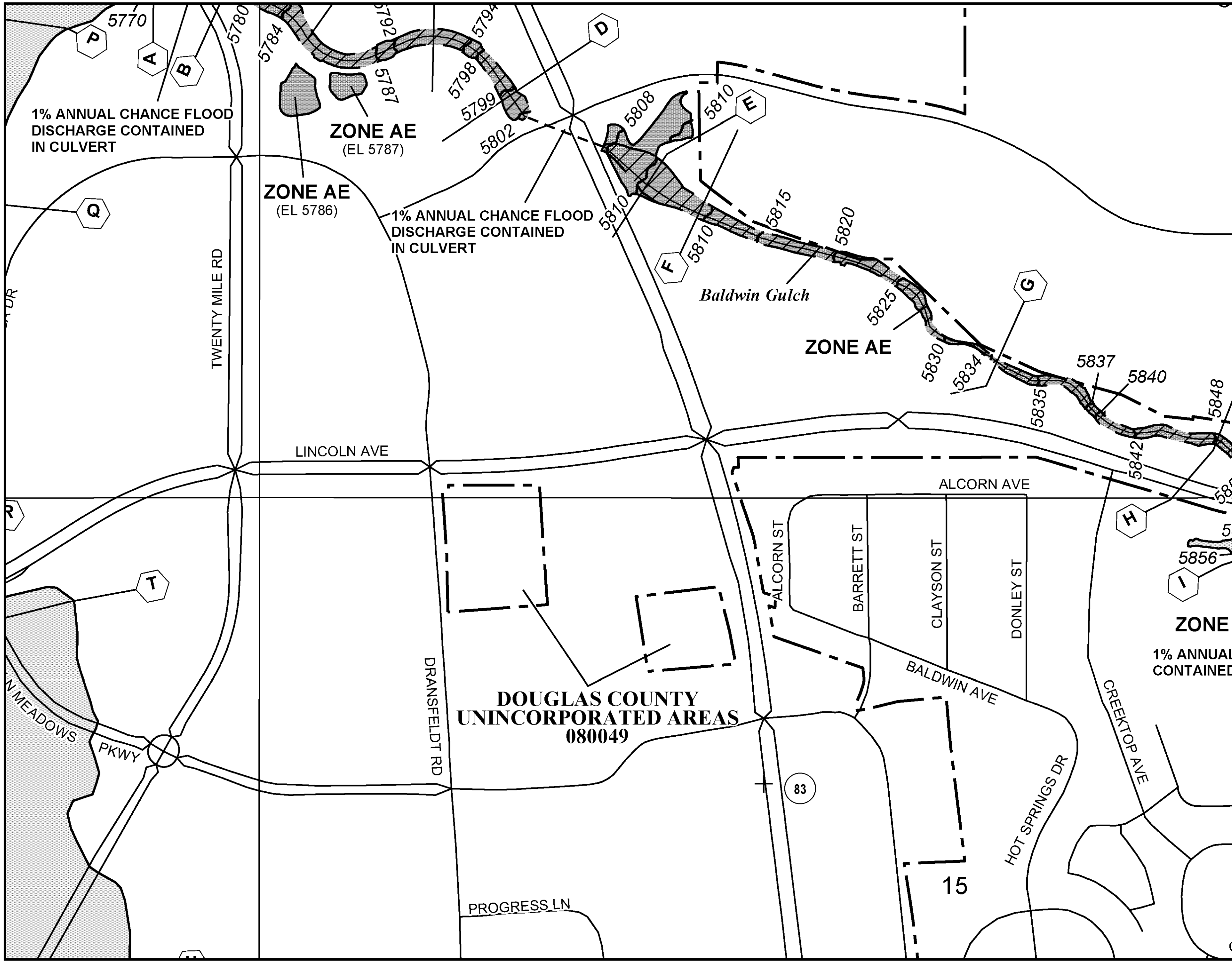

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

NFIP

PANEL 0067G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 67 OF 495

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0067	G
PARKER, TOWN OF	080310	0067	G

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

MAP NUMBER
08035C0067G

MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

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:

HKS HARRIS KOCHER SMITH

Rachel Patton, P.E.
1120 Lincoln Street, Suite 1000
Denver, CO 80203
Ph: 303-623-6300

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

TABLE OF CONTENTS

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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 ¼ of Section 15, Township 6 South, Range 66 West of the 6^{th} 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 [AC-FT]**	**VOLUME PROVIDED [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\xref\vic map.dwg Layout: layout1

SCALE: 1" = 1000'

HARRIS KOCHER SMITH

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

LINCOLN & DRANSFELDT

VICINITY MAP

PROJECT #: 200829

SHEET NUMBER

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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

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.

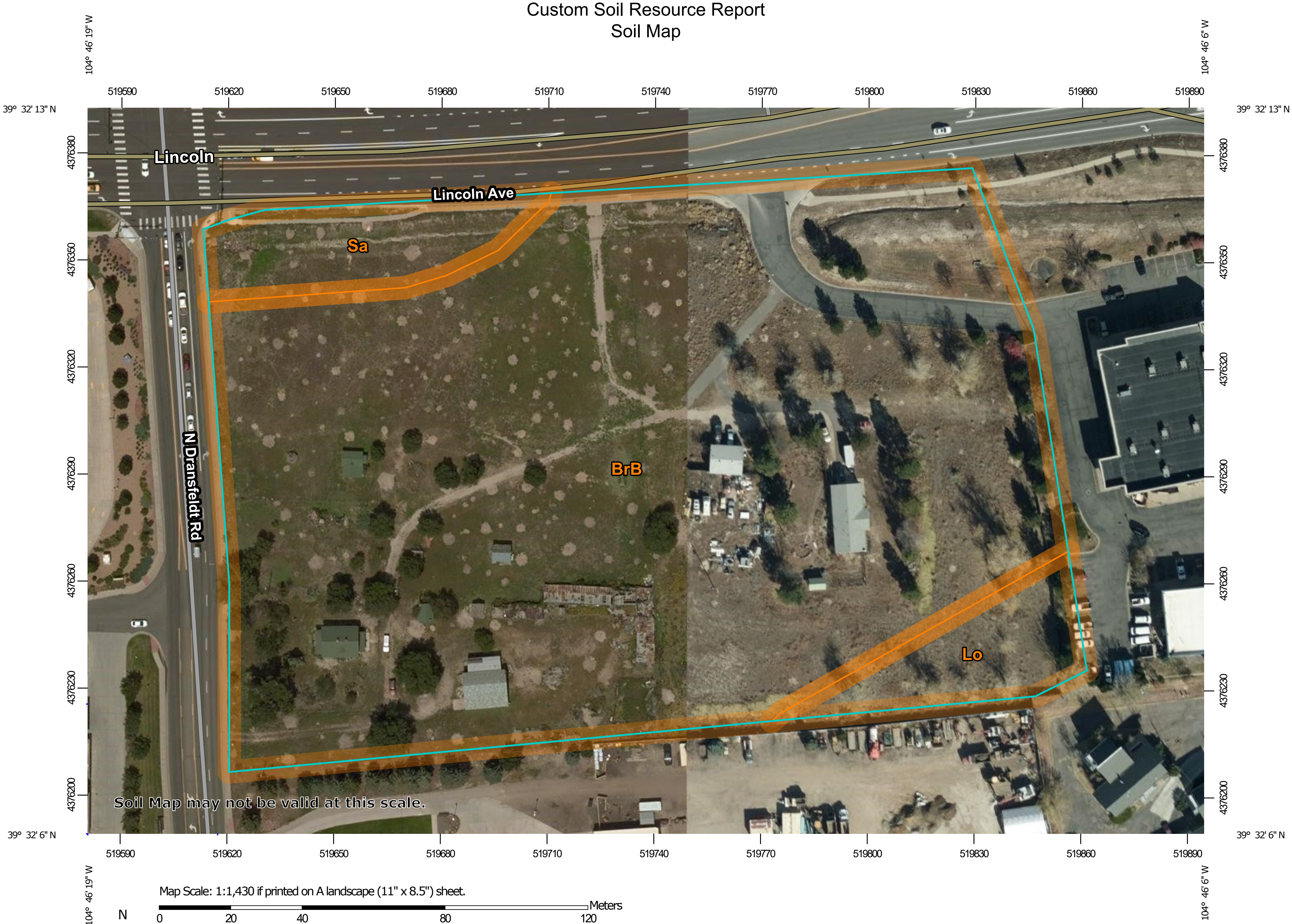
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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 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.

Soil Map



Map Scale: 1:1,430 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

N

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil 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 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

Map Scale: 1:1,430 if printed on A landscape (11" x 8.5") sheet.

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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.

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—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.

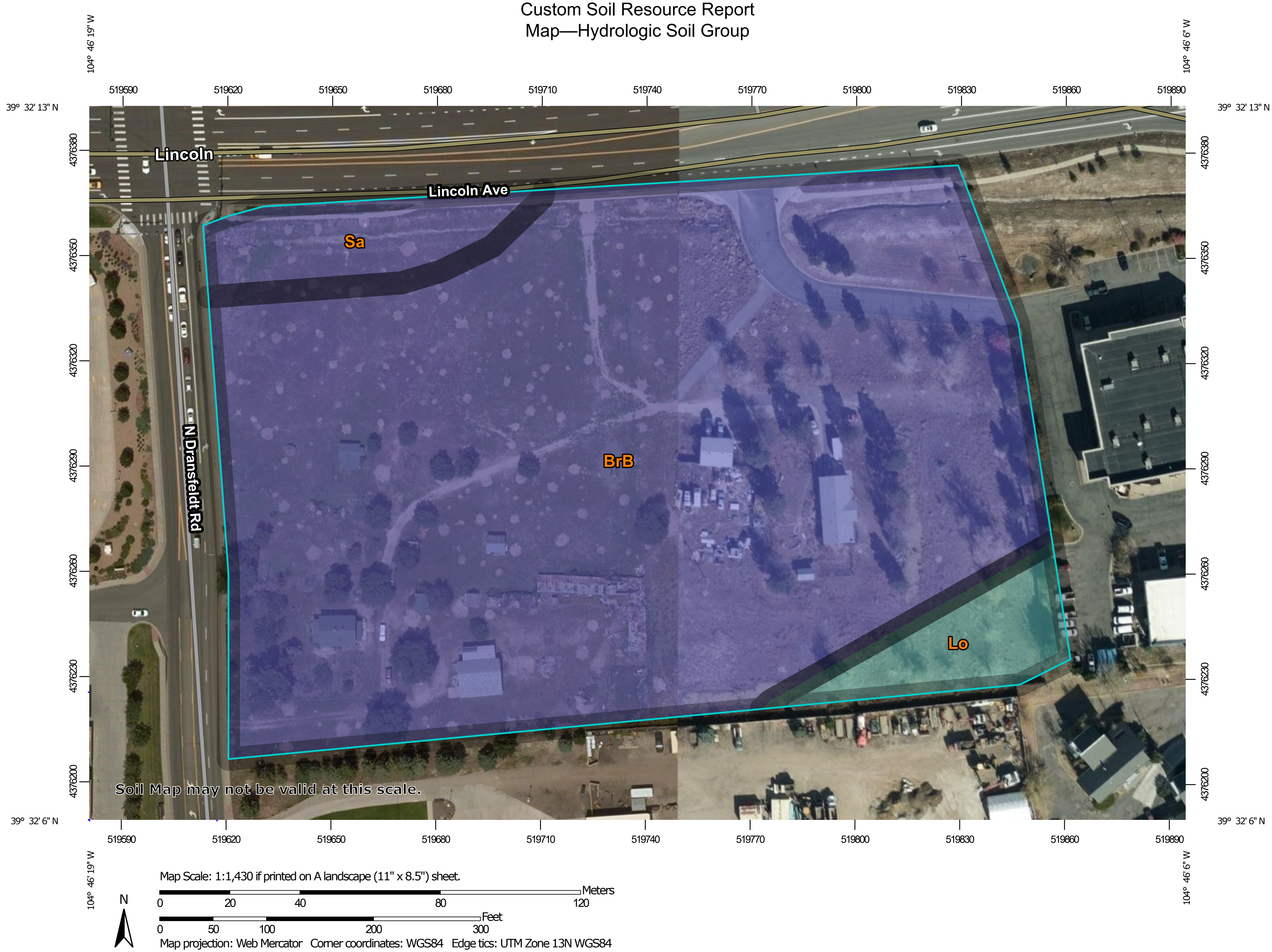
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Map—Hydrologic Soil Group



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.

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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—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

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NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

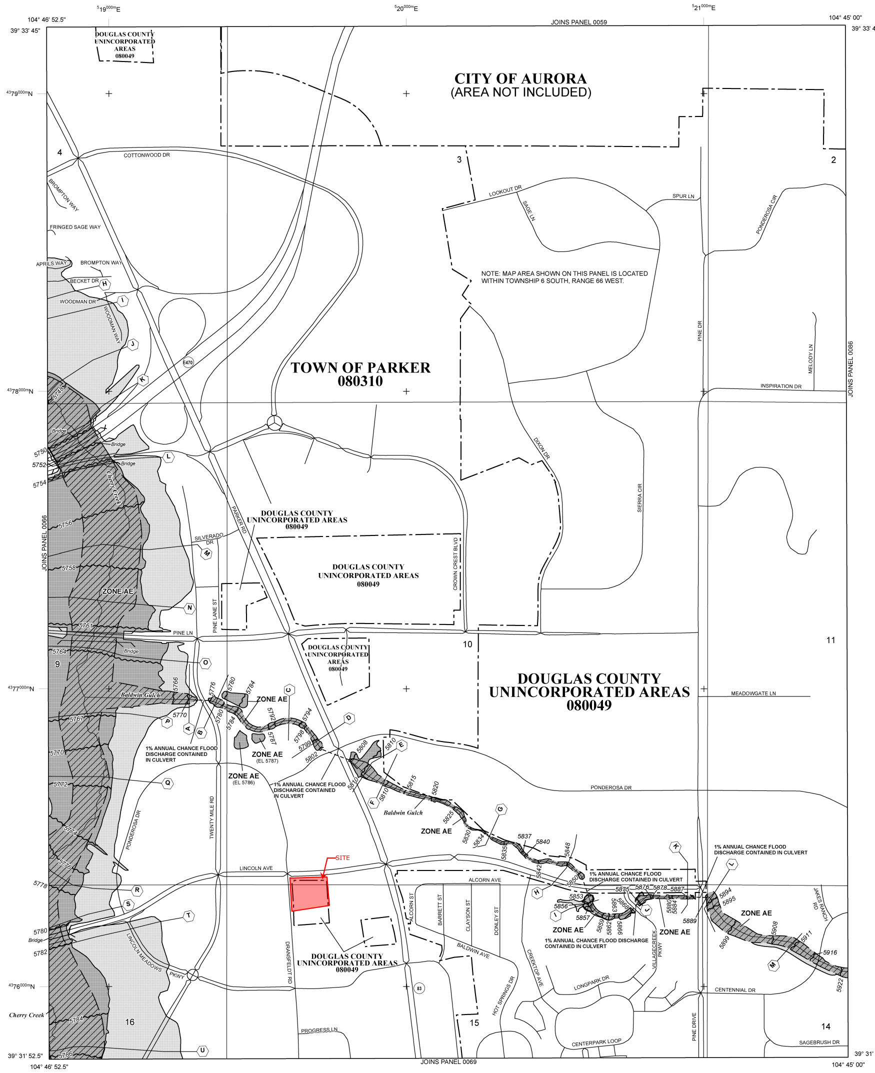
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary
0.2% Annual Chance Floodplain Boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000m N	1000-meter Universal Transverse Mercator grid values, zone 13
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0067G

FIRM
FLOOD INSURANCE RATE MAP
DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 67 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0067	G
PARKER, TOWN OF	080310	0067	G

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

MAP NUMBER
08035C0067G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

HARRIS KOCHER SMITH
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
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)

NCRS 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 (T_i)			TRAVEL TIME (T_t)					Tc CHECK (URBANIZED BASINS)			FINAL	REMARKS
BASIN	AREA (AC)	C_5	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

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

Project Name:	Lincoln & Dransfeldt	**STANDARD FORM SF-2**	Designed By:	ORM	
Project No:	200829	**Post-Development**	Checked By:	RCP	
Date:	07/30/21	**Rational Method Procedure**	Design Storm:	5	YR
Revised:	10/19/22				

		DIRECT RUNOFF						TOTAL RUNOFF				STREET/INLET					STORM SEWER PIPE				TRAVEL TIME			CARRYOVER FLOWS					
BASIN (s)	DESIGN POINT	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)	REMARKS
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 A 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 Liincoln 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	**STANDARD FORM SF-2**	Designed By:	ORM
Project No:	200829	**Post-Development**	Checked By:	RCP
Date:	07/30/21	**Rational Method Procedure**	Design Storm:	100 YR
Revised:	10/19/22			

		DIRECT RUNOFF						TOTAL RUNOFF				STREET/INLET					STORM SEWER PIPE				TRAVEL TIME			CARRYOVER FLOWS					
BASIN (s)	DESIGN POINT	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)	REMARKS
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		0.58	0.89	12.45	0.52	6.42	3.3																						
L11		1.91	0.93*	5.00	######		16.1																						Flow from Final Drainage Report for Liincoln 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

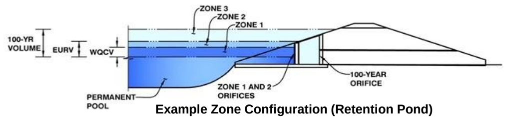
APPENDIX C – Hydraulic Computations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: Lincoln & Dransfeldt

Basin ID: BASINS A - RA6



Example Zone Configuration (Retention Pond)

Watershed Information

			Optional User Overrides	
Selected BMP Type =	**EDB**			
Watershed Area =	7.76	acres		
Watershed Length =	710	ft		
Watershed Length to Centroid =	330	ft		
Watershed Slope =	0.007	ft/ft		
Watershed Imperviousness =	95.00%	percent		
Percentage Hydrologic Soil Group A =	0.0%	percent		
Percentage Hydrologic Soil Group B =	0.0%	percent		
Percentage Hydrologic Soil Groups C/D =	100.0%	percent		
Target WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	Parker - Town Hall			

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.289	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.734	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.467	acre-feet		inches
5-yr Runoff Volume (P1 = 1.1 in.) =	0.649	acre-feet		inches
10-yr Runoff Volume (P1 = 1.34 in.) =	0.808	acre-feet		inches
25-yr Runoff Volume (P1 = 1.69 in.) =	1.043	acre-feet		inches
50-yr Runoff Volume (P1 = 1.98 in.) =	1.238	acre-feet		inches
100-yr Runoff Volume (P1 = 2.29 in.) =	1.447	acre-feet		inches
500-yr Runoff Volume (P1 = 3.08 in.) =	1.978	acre-feet		inches
Approximate 2-yr Detention Volume =	0.463	acre-feet		
Approximate 5-yr Detention Volume =	0.650	acre-feet		
Approximate 10-yr Detention Volume =	0.789	acre-feet		
Approximate 25-yr Detention Volume =	0.921	acre-feet		
Approximate 50-yr Detention Volume =	0.978	acre-feet		
Approximate 100-yr Detention Volume =	1.038	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.289	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.445	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.304	acre-feet
Total Detention Basin Volume =	1.038	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	44	0.001		
5815	--	0.04	--	--	--	103	0.002	3	0.000
5816	--	1.04	--	--	--	2,610	0.060	1,359	0.031
5817	--	2.04	--	--	--	9,147	0.210	7,237	0.166
5818	--	3.04	--	--	--	13,299	0.305	18,460	0.424
5819	--	4.04	--	--	--	16,234	0.373	33,227	0.763
5820	--	5.04	--	--	--	19,127	0.439	50,907	1.169
5820.04	--	5.08	--	--	--	19,267	0.442	51,675	1.186
5821.51	--	6.55	--	--	--	21,945	0.504	81,966	1.882
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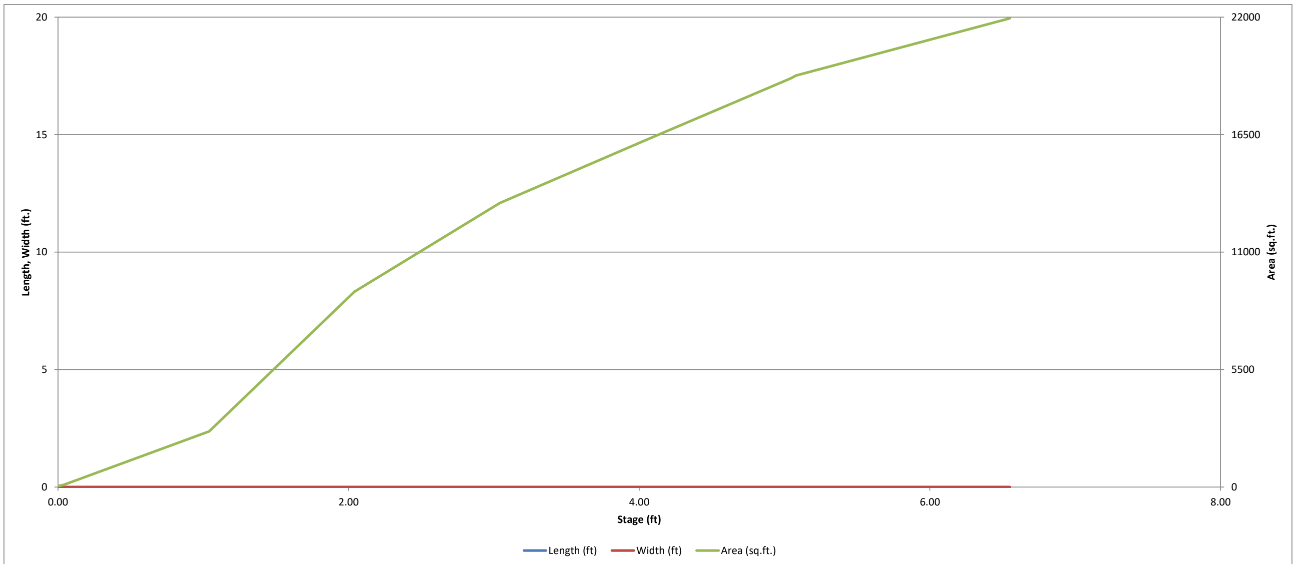
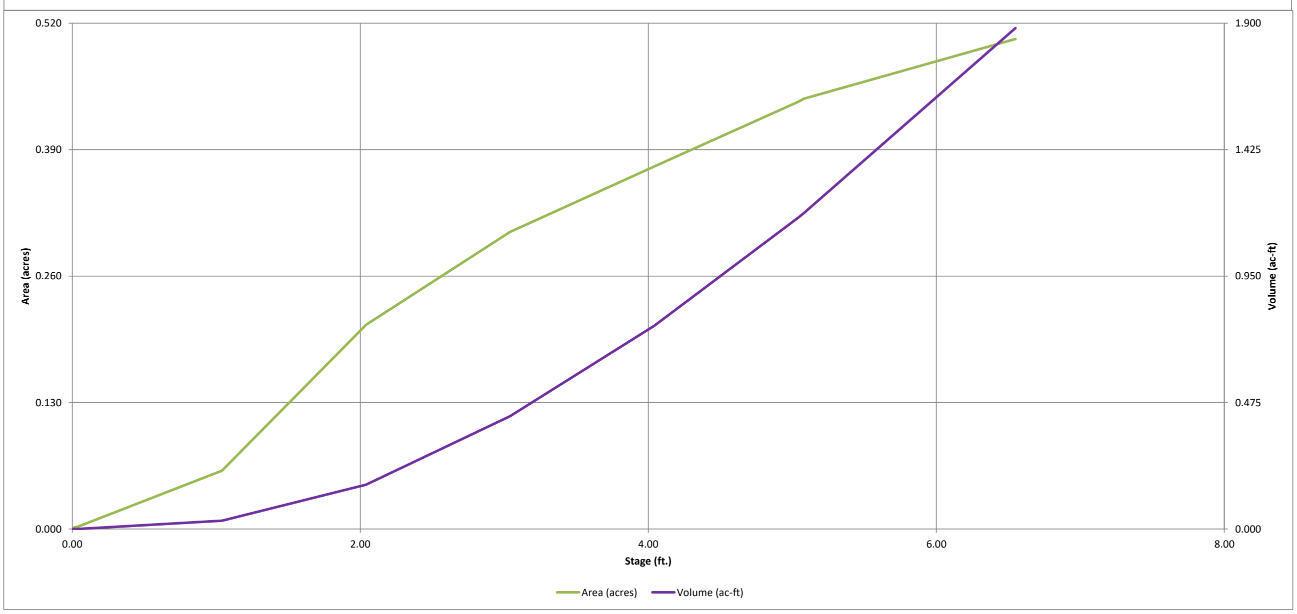
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



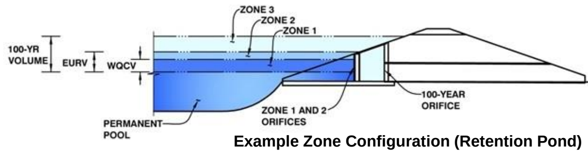


DETENTION BASIN OUTLET STRUCTURE DESIGN

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) — Calculated Parameters for Underdrain

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	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) — Calculated Parameters for Plate

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.007E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.97	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.45	sq. inches (diameter = 1-3/8 inches)	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	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) — Calculated Parameters for Vertical Orifice

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

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.73	N/A	feet
Overflow Weir Front Edge Length =	13.90	N/A	feet	Overflow Weir Slope Length =	3.01	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	58.08	N/A	
Horiz. Length of Weir Sides =	2.92	N/A	feet	Overflow Grate Open Area w/o Debris =	33.06	N/A	ft^2
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	16.53	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.92	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.57	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.31	N/A	feet
Restrictor Plate Height Above Pipe Invert =	6.45		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.28	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal) — Calculated Parameters for Spillway

Spillway Invert Stage=	5.08	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.47	feet
Spillway Crest Length =	25.00	feet	Stage at Top of Freeboard =	6.55	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.50	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.88	acre-ft

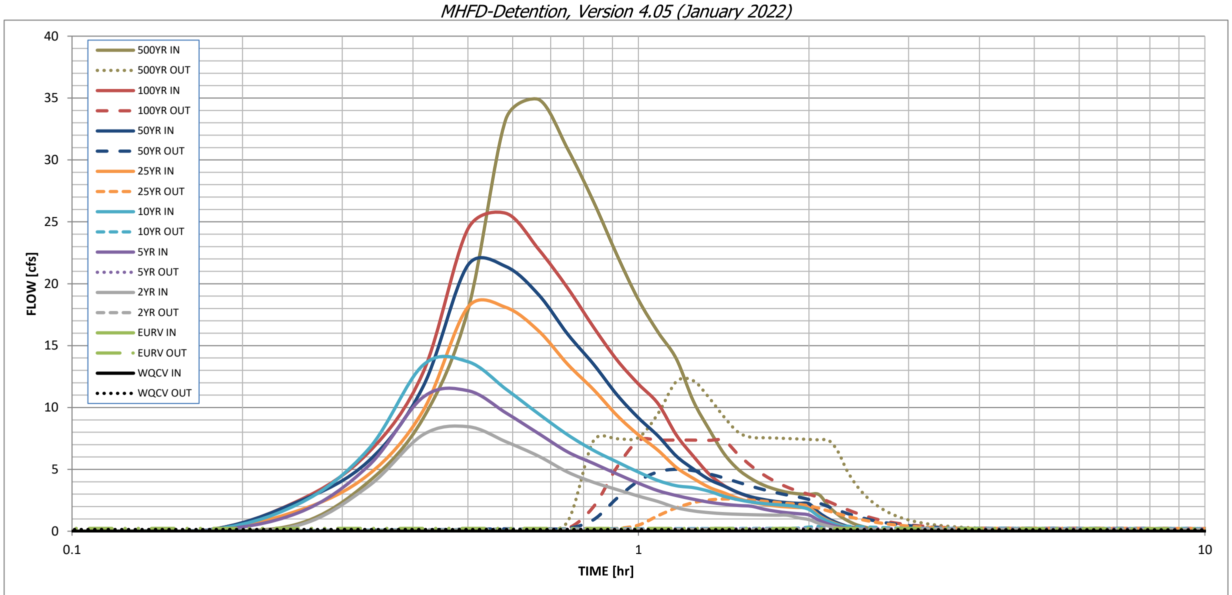
Routed Hydrograph Results

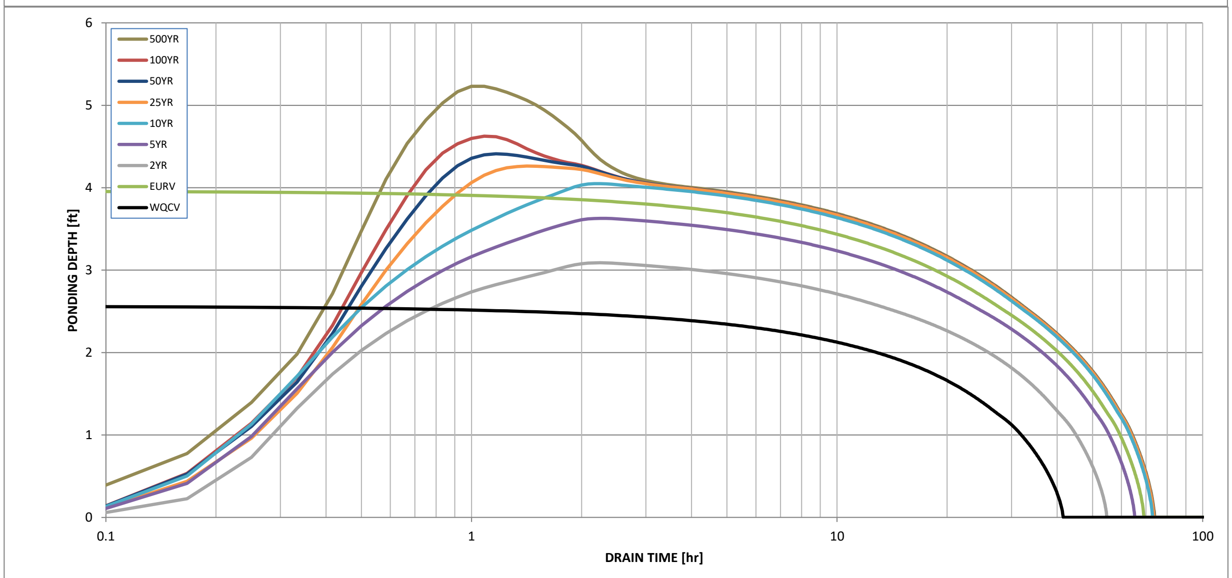
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

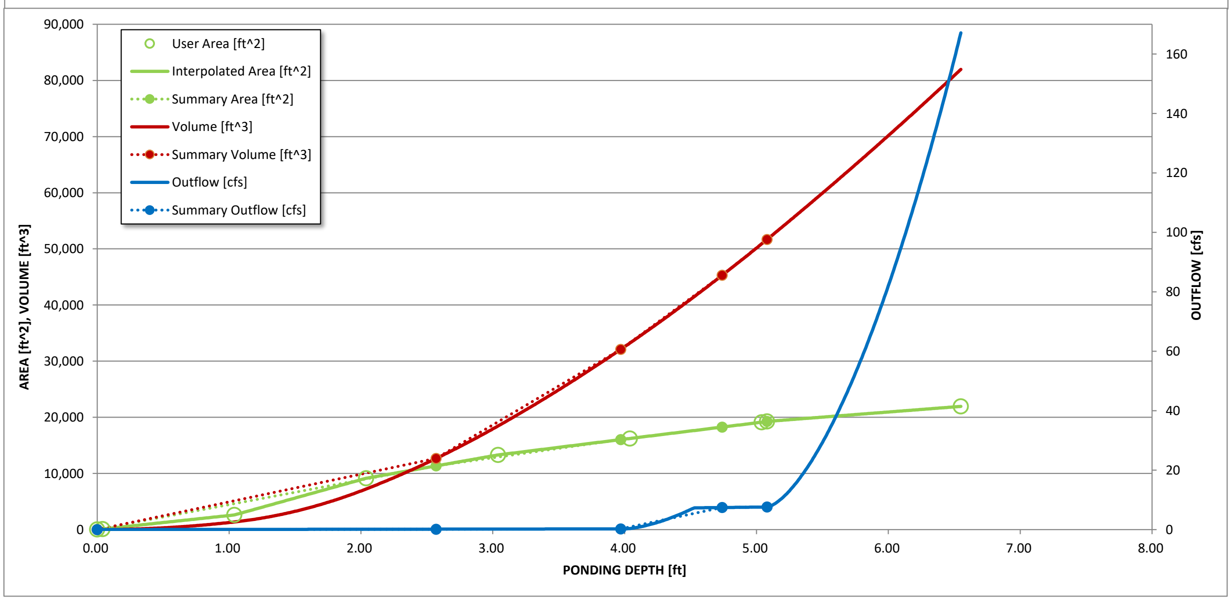
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.82	1.10	1.34	1.69	1.98	2.29	3.08
CUHP Runoff Volume (acre-ft) =	0.289	0.734	0.467	0.649	0.808	1.043	1.238	1.447	1.978
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.467	0.649	0.808	1.043	1.238	1.447	1.978
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.7	1.9	4.9	6.7	9.1	14.1
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

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Summary Stage-Area-Volume-Discharge Relationships

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.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft²]	Area [acres]	Volume [ft³]	Volume [ac-ft]	Total Outflow [cfs]
TOP OF MICROPOOL - 5814.96	0.00	44	0.001	0	0.000	0.00
WQCV - 5817.53	2.57	11,347	0.260	12,668	0.291	0.15
EURV - 5918.93	3.97	16,029	0.368	32,097	0.737	0.24
100-YR - 5819.70	4.74	18,259	0.419	45,299	1.040	7.43
SPILLWAY - 5820.04	5.08	19,267	0.442	51,675	1.186	7.60

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'.

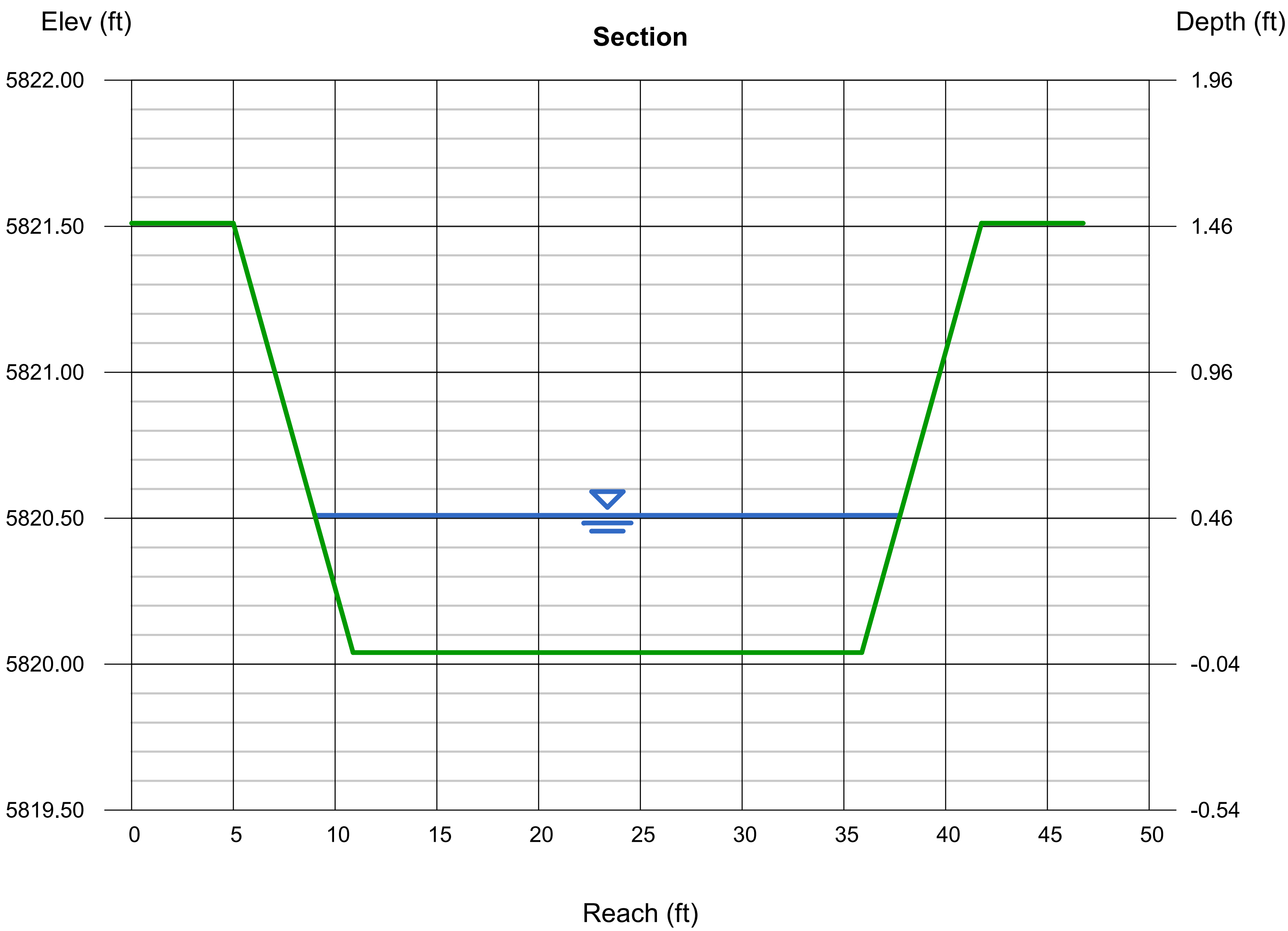
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 4 2023

Emergency Spillway Anaysis

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 25.00	Depth (ft)	= 0.47
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 85.51
Total Depth (ft)	= 1.47	Area (sqft)	= 12.63
Invert Elev (ft)	= 5820.04	Velocity (ft/s)	= 6.77
Slope (%)	= 2.50	Wetted Perim (ft)	= 28.88
N-Value	= 0.020	Crit Depth, Yc (ft)	= 0.69
		Top Width (ft)	= 28.76
Calculations		EGL (ft)	= 1.18
Compute by:	Known Depth		
Known Depth (ft)	= 0.47		



Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

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	I_a = 95.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.950
C) Contributing Watershed Area	Area = 7.760 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ● Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN}= 0.289 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$	$V_{DESIGN\ OTHER}$= ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$= ac-ft
I) NRCS Hydrologic Soil Groups of Tributary Watershed	
i) Percentage of Watershed consisting of Type A Soils	HSG_A = 0 %
ii) Percentage of Watershed consisting of Type B Soils	HSG_B = 0 %
iii) Percentage of Watershed consisting of Type C/D Soils	$HSG_{C/D}$ = 100 %
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	$EURV_{DESIGN}$ = 0.734 ac-f t
K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)	$EURV_{DESIGN\ USER}$= ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.5 : 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)

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	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0050 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 41 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 1.19 inches
E) Total Outlet Area	A_{ot} = 3.39 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 4 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 38 cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 13.6 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 117 square inches
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 are to the total screen are for the material specified.) Other (Y/N): N	*S.S. Well Screen with 60% Open Area*
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 194 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 5.06 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 89.08 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

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 = 40.00 ft / ft
11. Vegetation	Choose One ○ Irrigated ◉ Not Irrigated
12. Access A) Describe Sediment Removal Procedures	

Notes:

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	INLET F2 (BASIN RB1)	INLET A3 (BASIN RA4)	INLET B2 (BASIN RA5)
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

MHFD-Inlet, Version 5.01 (April 2021)

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

MHFD-Inlet, Version 5.01 (April 2021)

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

MHFD-Inlet, Version 5.01 (April 2021)

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

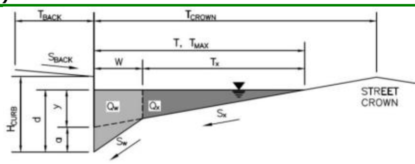
Minor Total Design Peak Flow, Q (cfs)	**0.4**	**0.2**	**1.8**
Major Total Design Peak Flow, Q (cfs)	**0.9**	**0.4**	**3.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

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	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

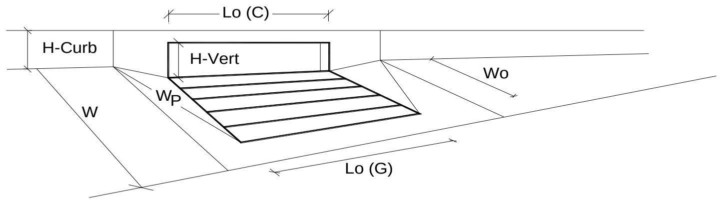
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



		MINOR	MAJOR	
Design Information (Input) — CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

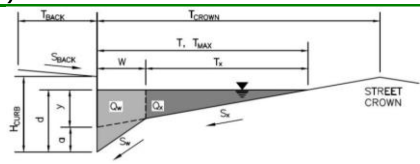
		MINOR	MAJOR	
Low Head Performance Reduction (Calculated)				
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**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:

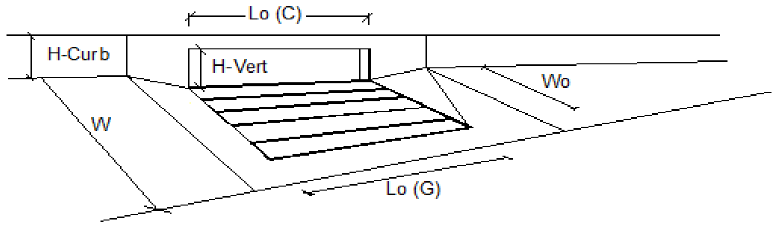
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**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)

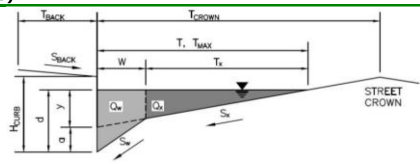


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.40**	**0.80**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/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 B2 (BASIN RA5)



Gutter Geometry:

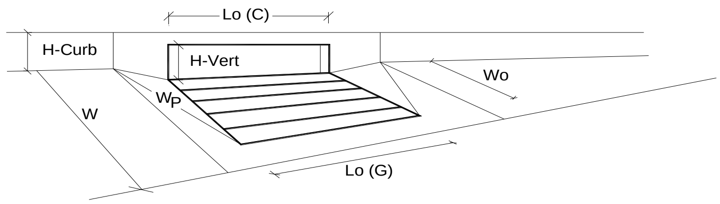
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.5	18.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

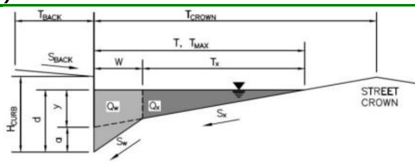


			MINOR	MAJOR	
Design Information (Input)	CDOT Type R Curb Opening				
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.33	0.33	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	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**5.3**	**5.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	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	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

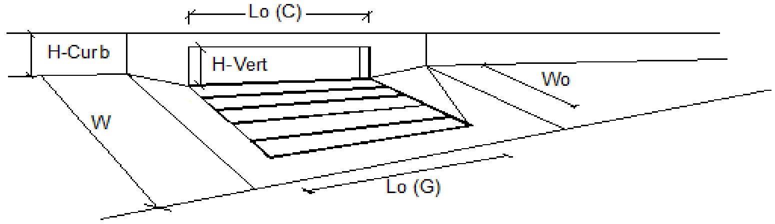
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**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)

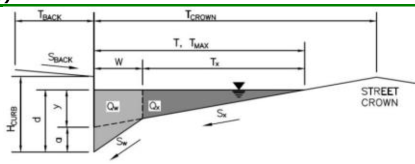


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.3**	**0.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/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:

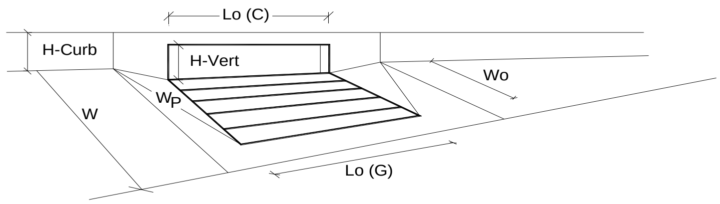
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.5	18.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLEET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

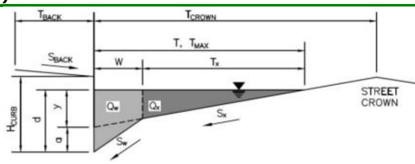
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.76	0.76	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**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:

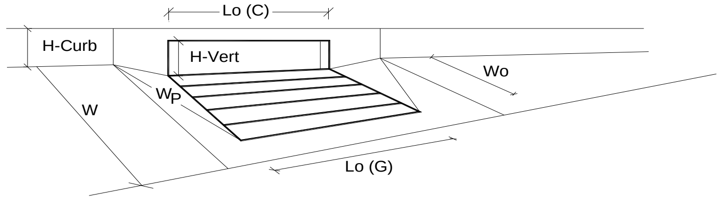
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLEST 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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

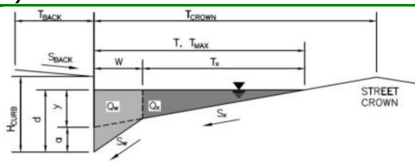
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.7**	**3.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	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	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.023	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

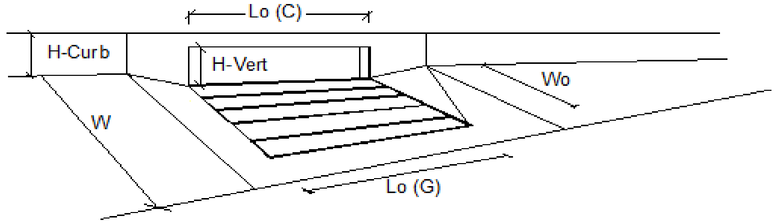
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**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)



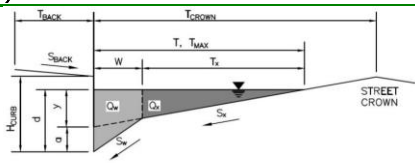
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**0.1**	**0.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/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 D2 (BASIN RB3)



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

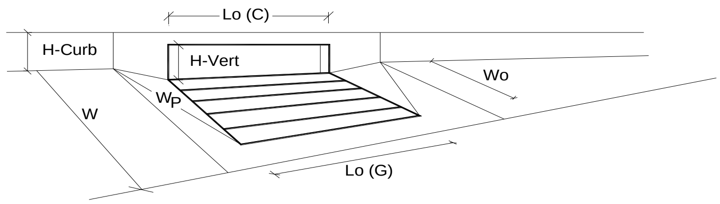
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



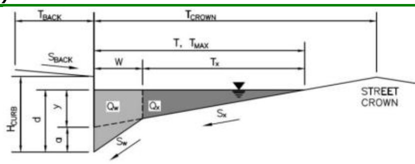
		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening				
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.26	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	$\mathbf{Q_a}$ =	**3.7**	**3.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.3	0.6	cfs

MHFD-Inlet, Version 5.01 (April 2021)

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	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

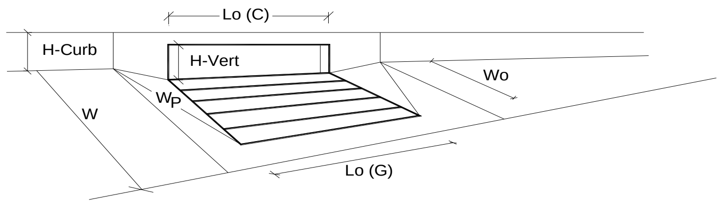
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

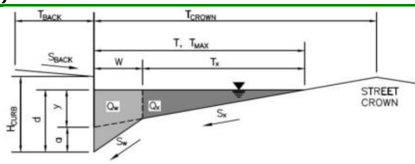
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.26	0.26	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.66	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	$\mathbf{Q_a}$ =	**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	T_{BACK} =	5.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
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

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

INLET IN A SUMP OR SAG LOCATION

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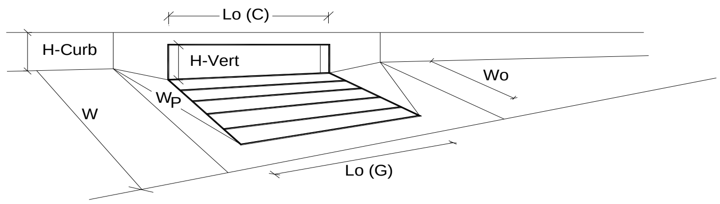
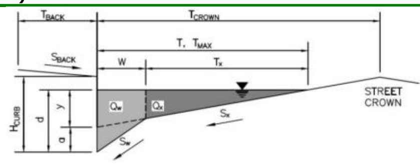


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth 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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.26	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**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)



<u>Gutter Geometry:</u>

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	15.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

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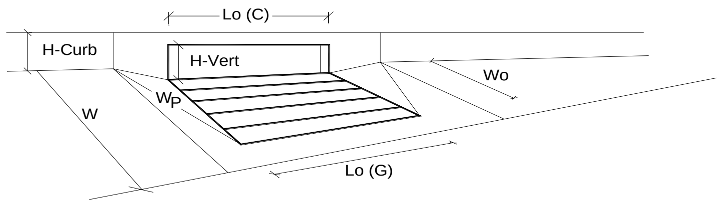
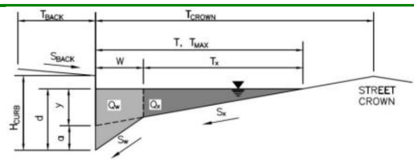


Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.26	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**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:

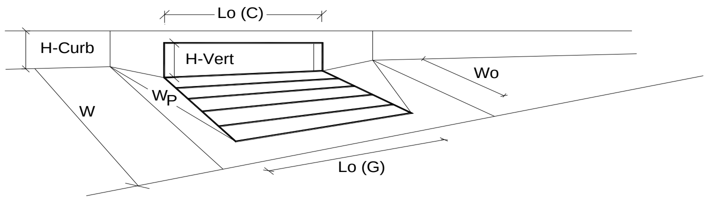
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	38.8	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.040	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.5	38.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

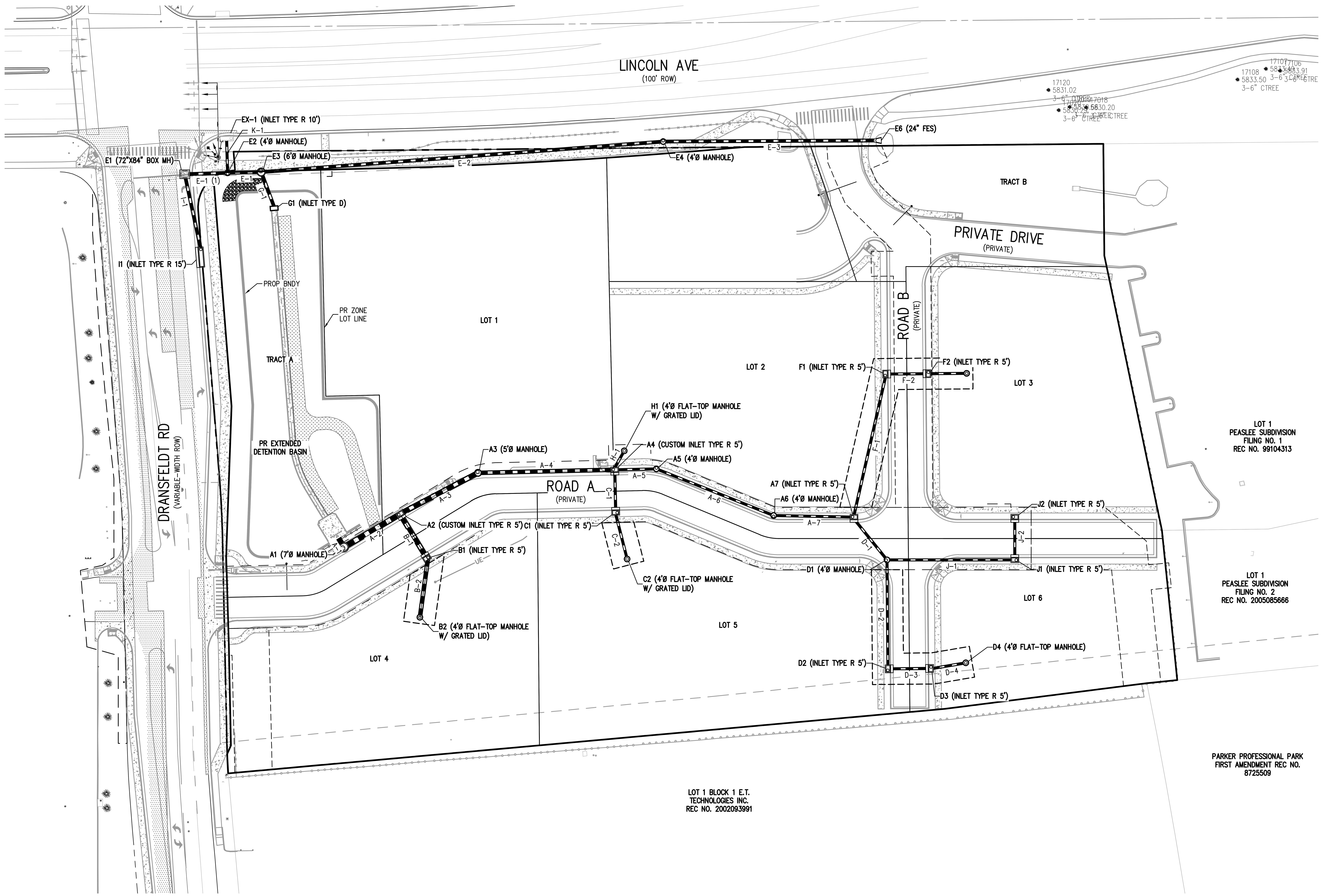
MHFD-Inlet, Version 5.01 (April 2021)



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	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	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	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.7**	**39.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.8	3.6	cfs



STORMCAD EXHIBIT

SCALE: 1" = 40'

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

N

40 0 40 80

SCALE: 1" = 40'

FlexTable: Conduit Table

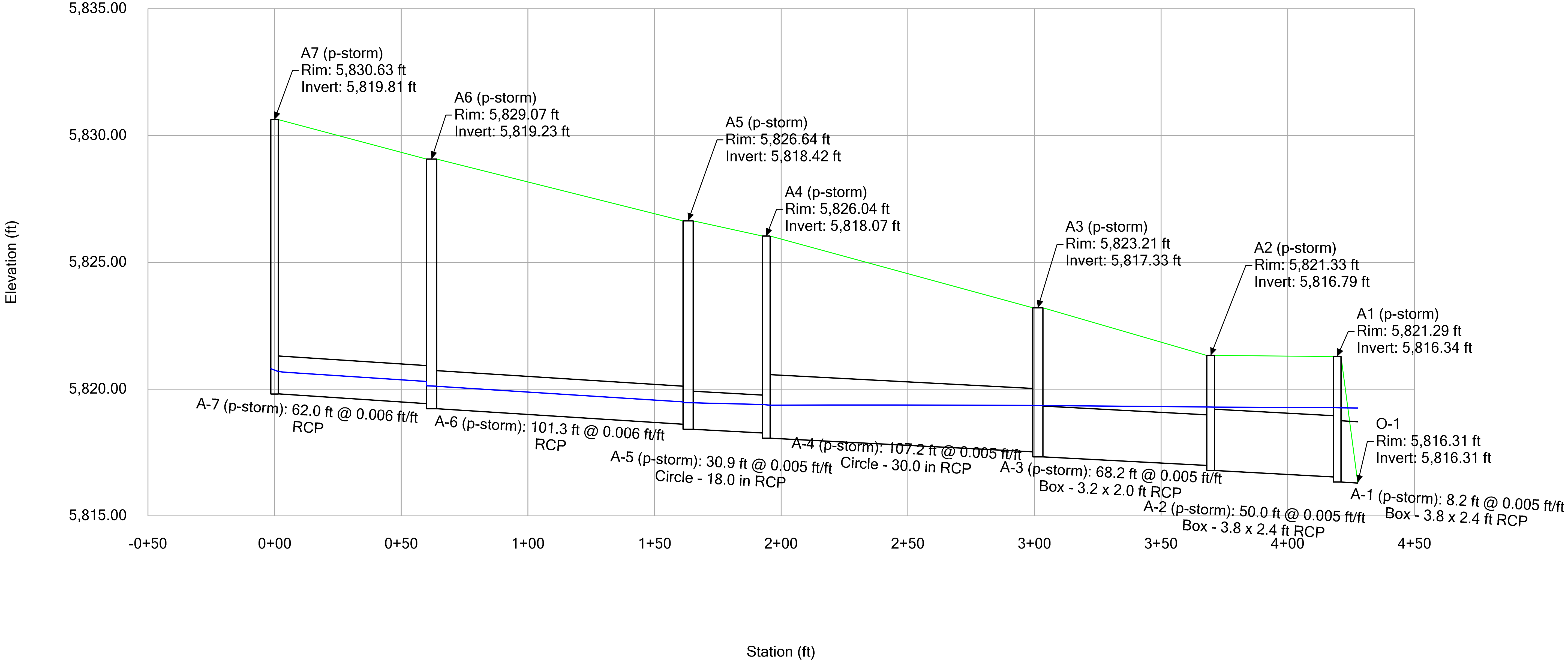
Active Scenario: 5 YR

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	

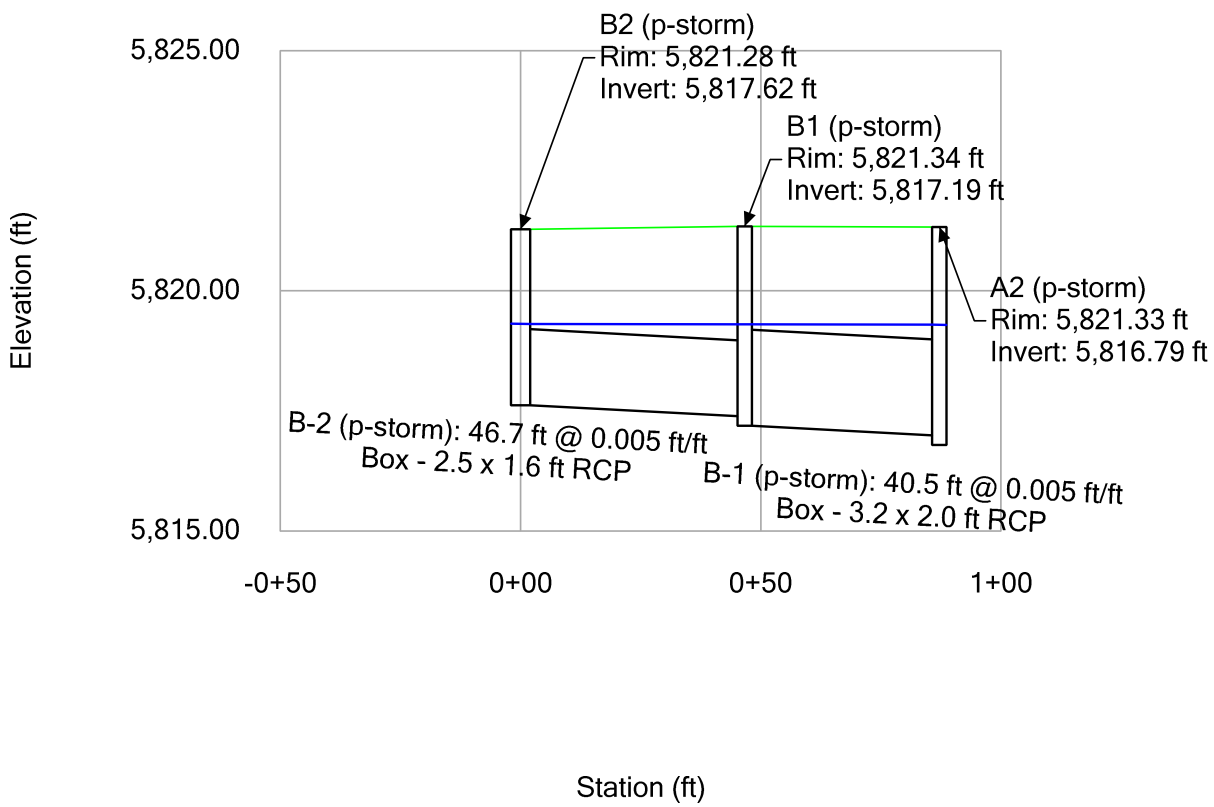
FlexTable: Manhole Table
Active Scenario: 5 YR

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	

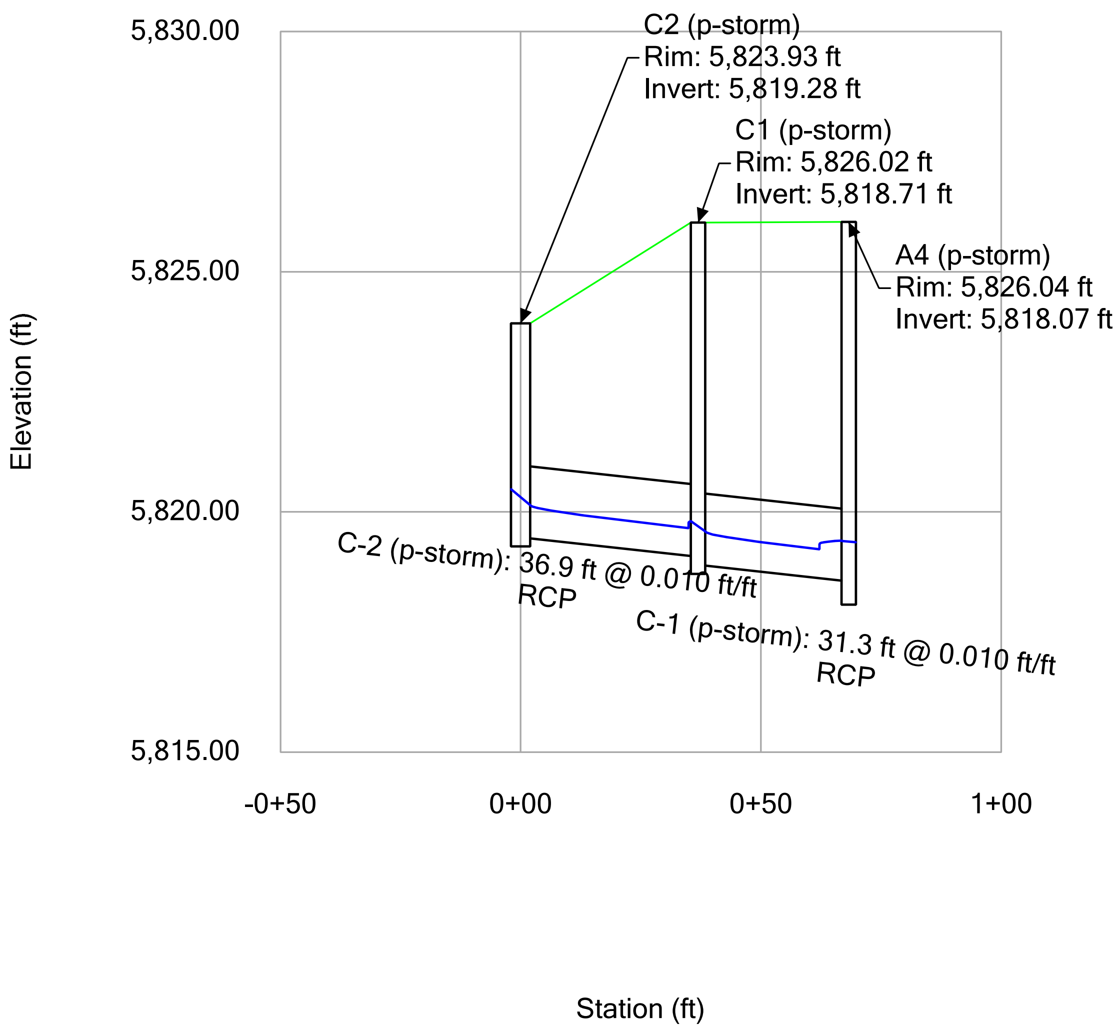
Profile Report
Engineering Profile - Storm Line A (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



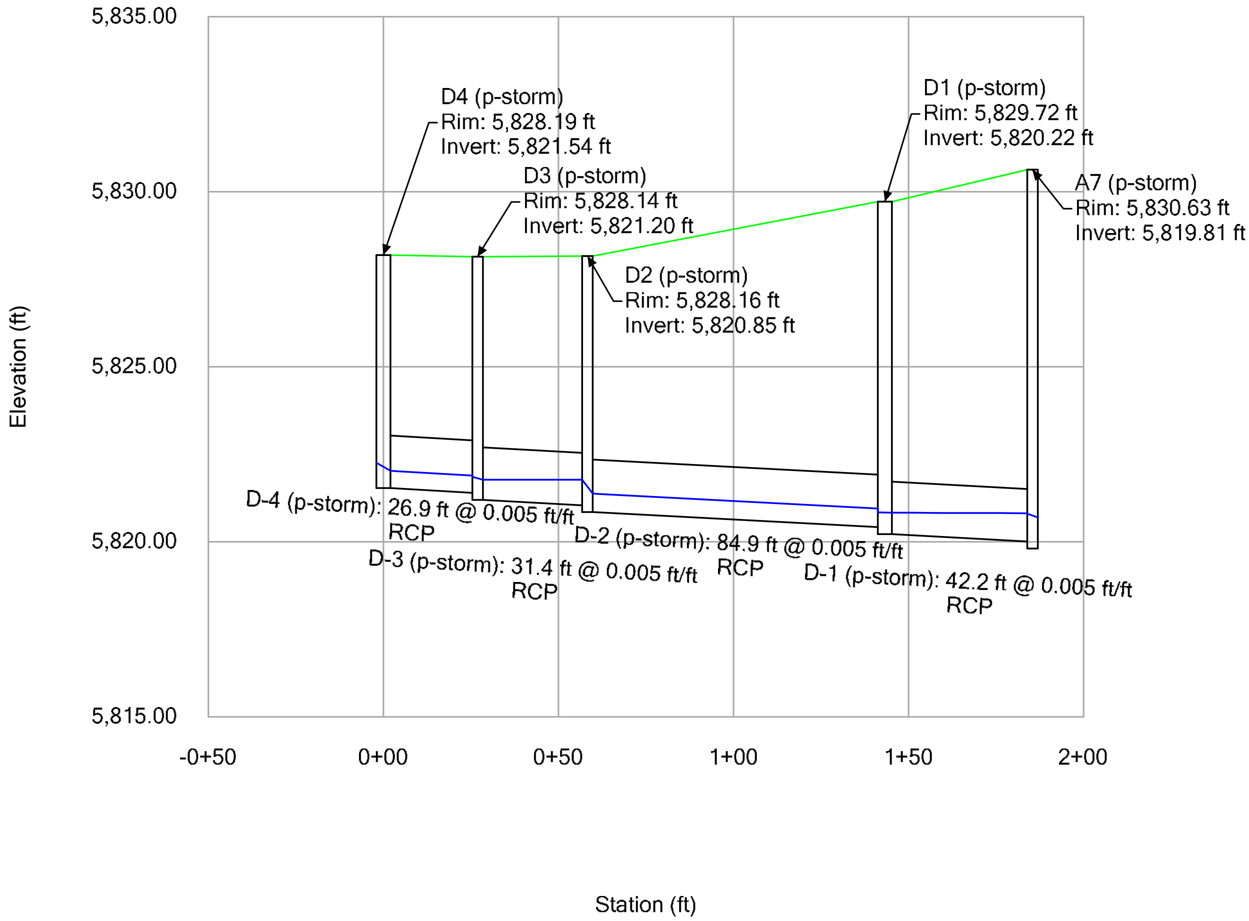
Profile Report
Engineering Profile - Storm Line B (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



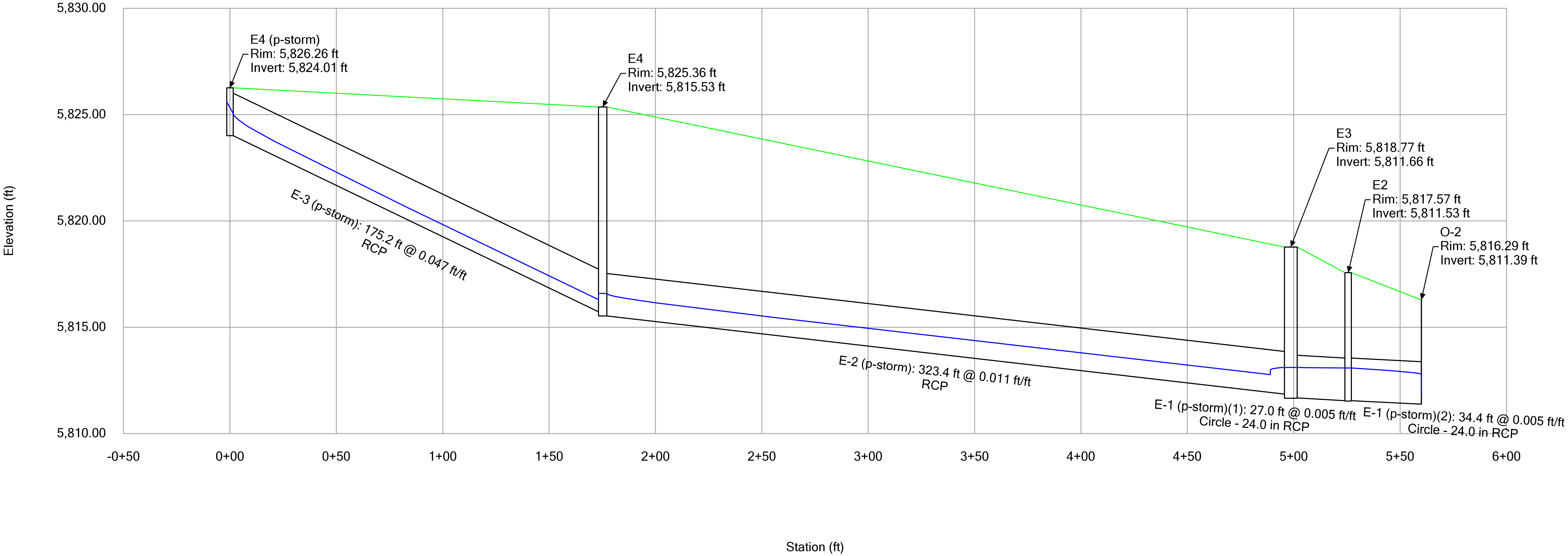
Profile Report
Engineering Profile - Storm Line C (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



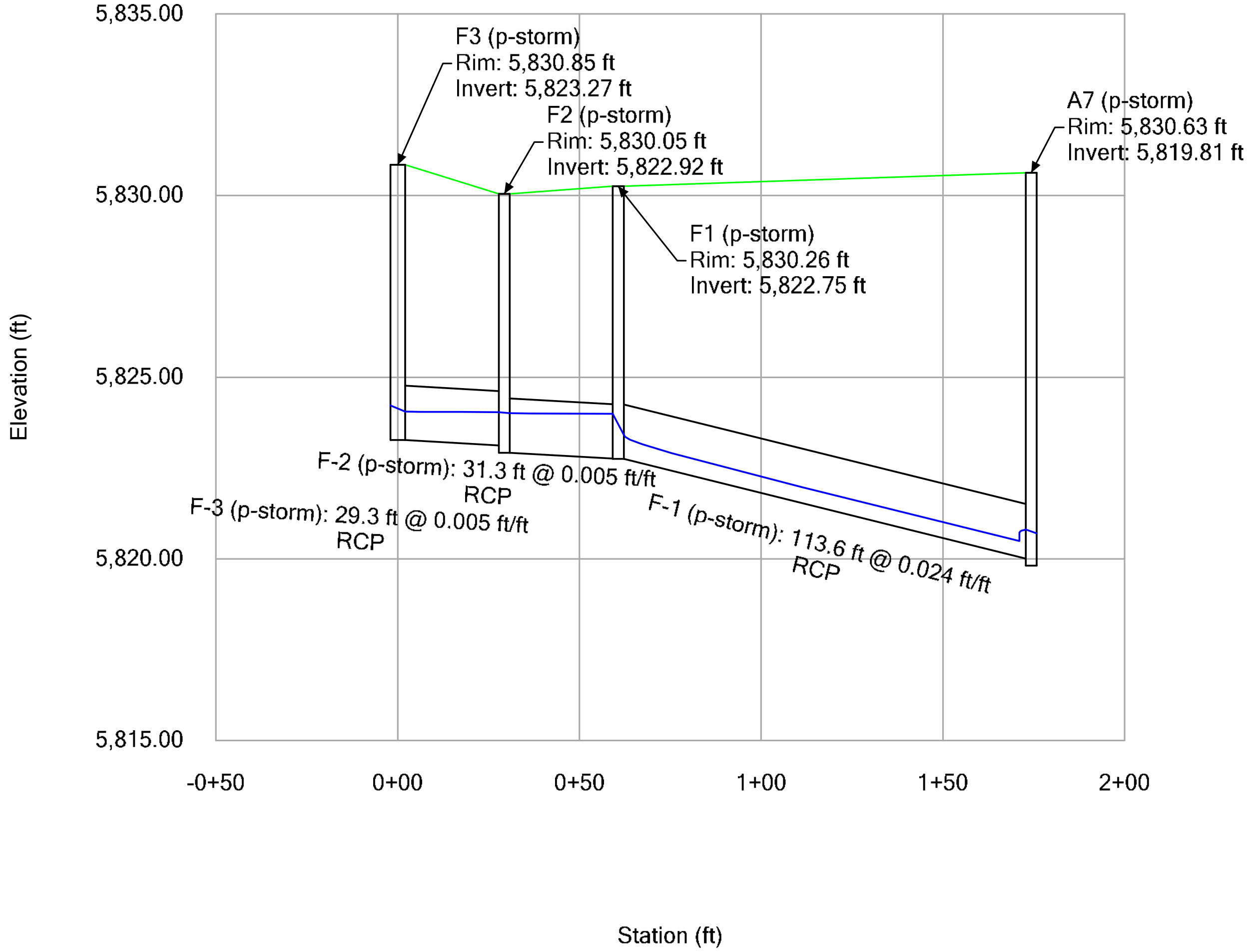
Profile Report
Engineering Profile - Storm Line D (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



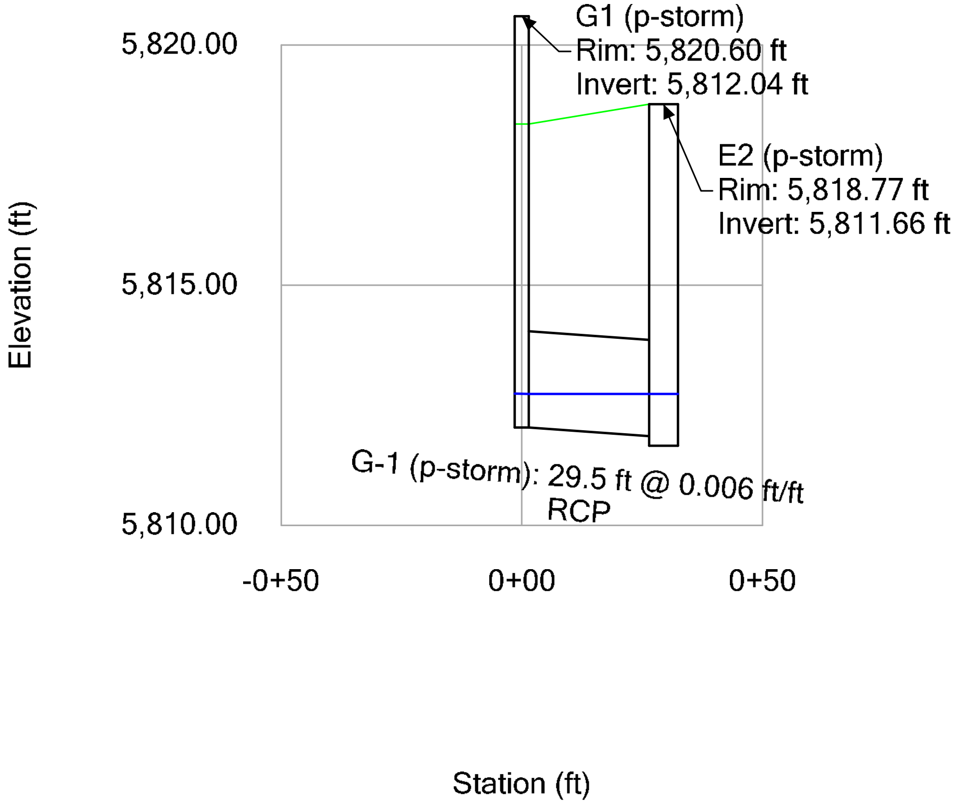
Profile Report
Engineering Profile - Storm Line E (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



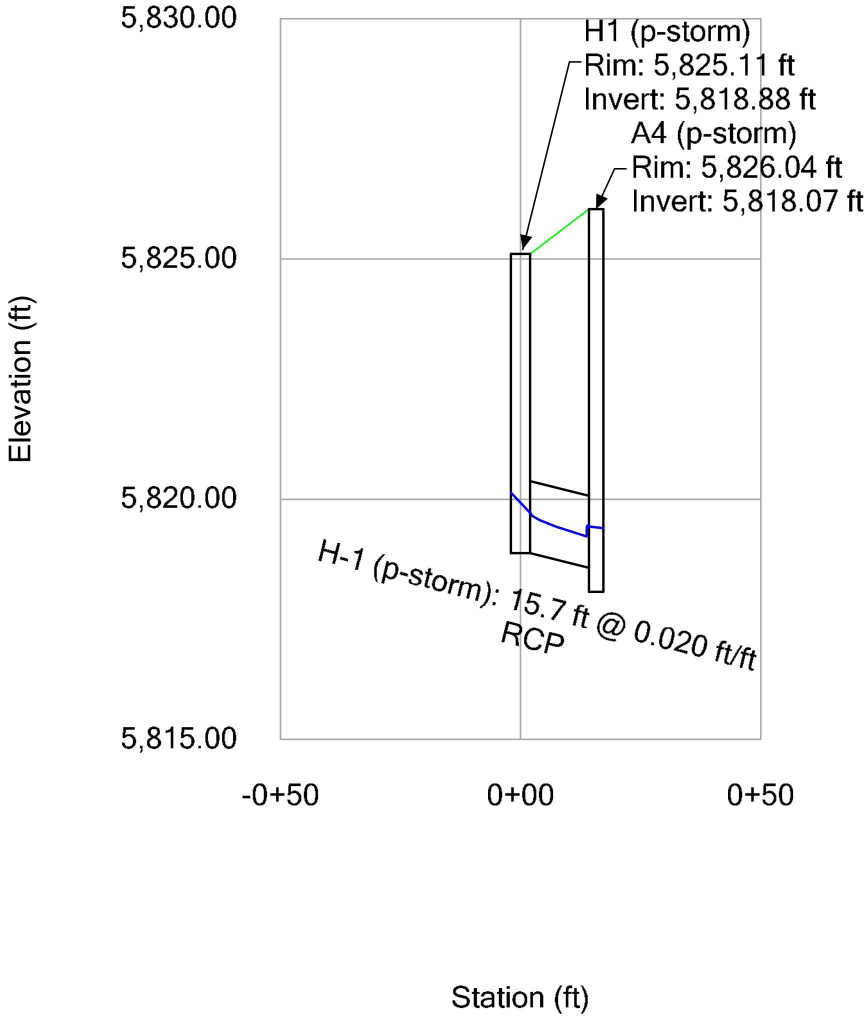
Profile Report
Engineering Profile - Storm Line F (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



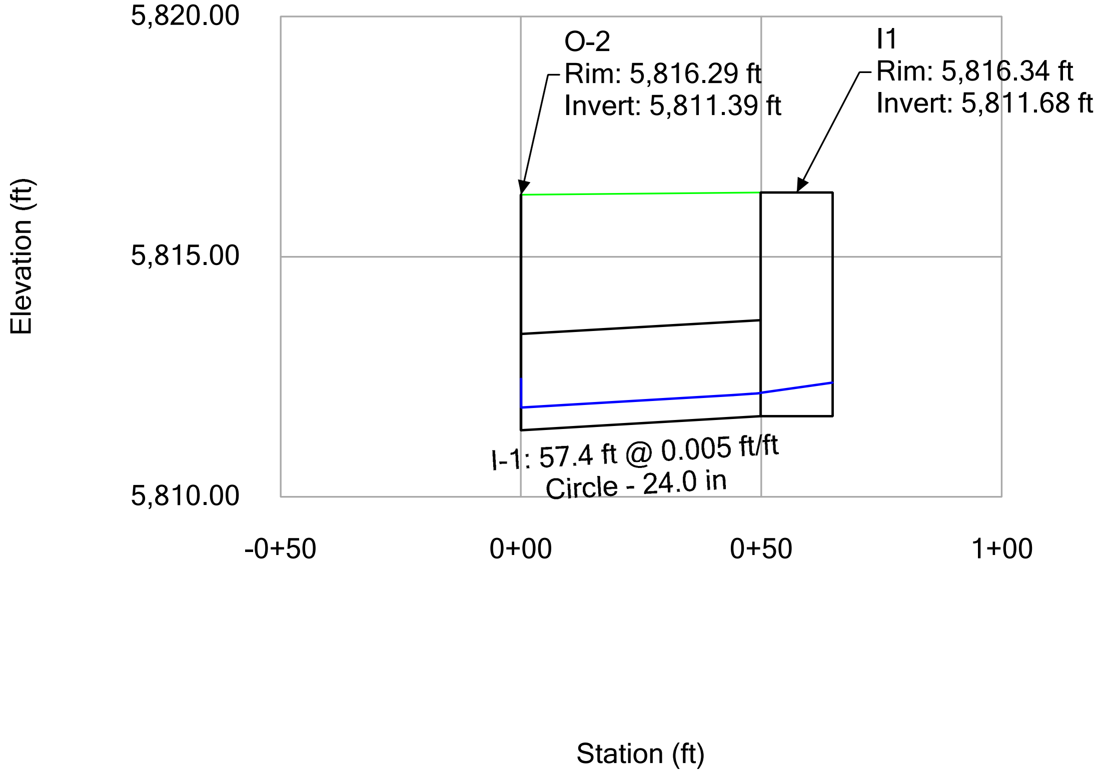
Profile Report
Engineering Profile - Storm Line G (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



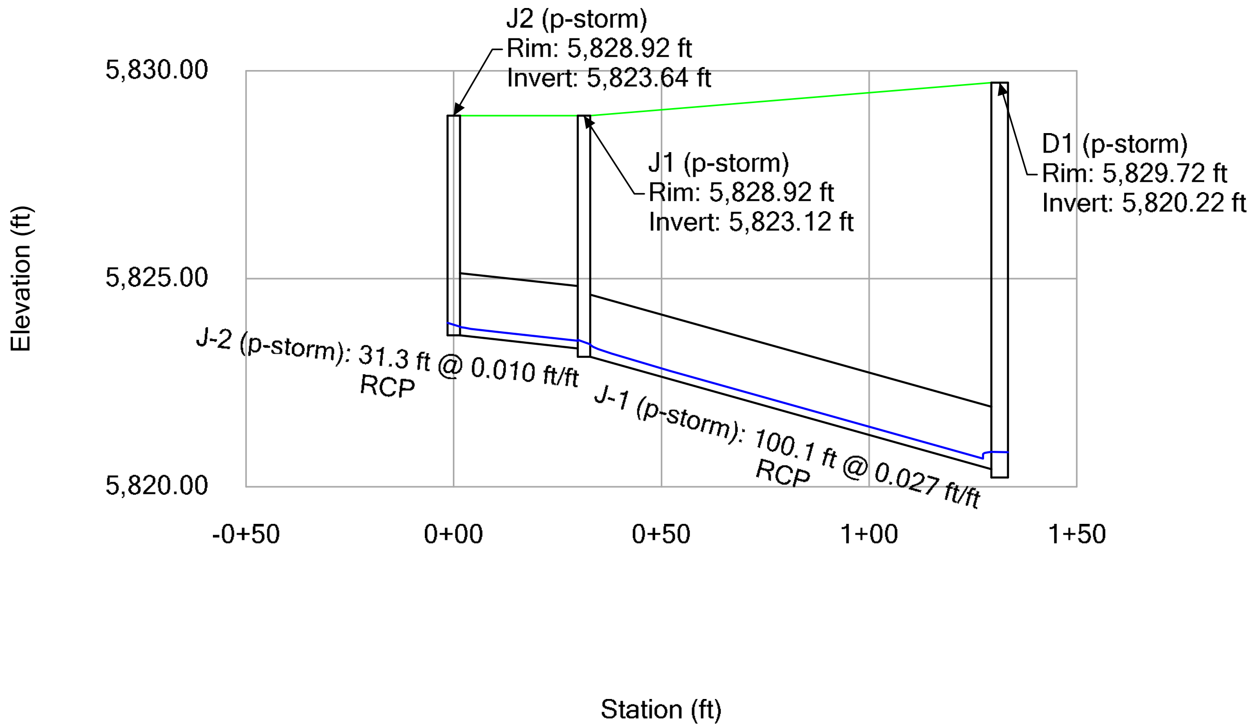
Profile Report
Engineering Profile - Storm Line H (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



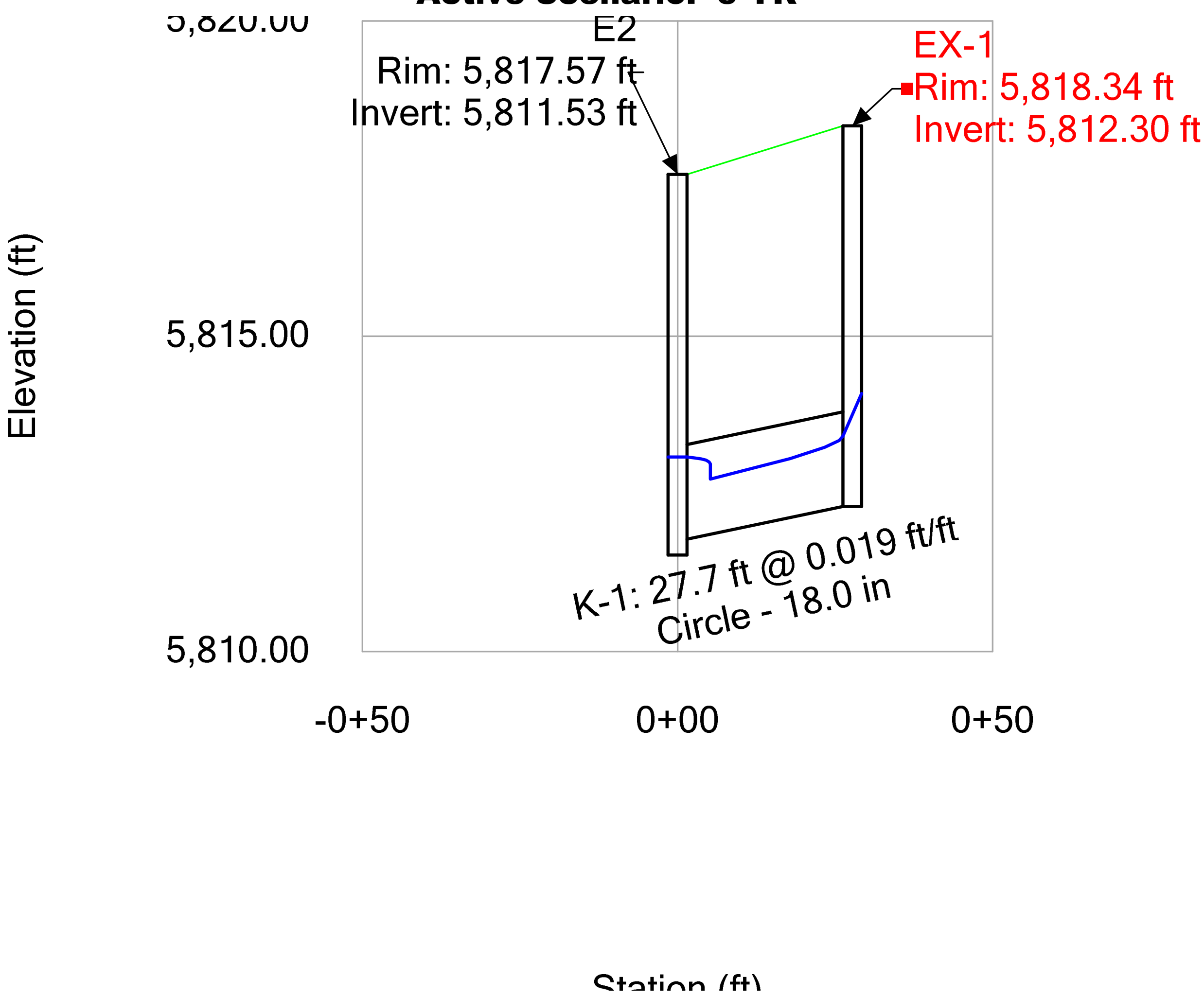
Profile Report
Engineering Profile - Storm Line I (StormCAD-10-6-2022.stsw)
Active Scenario: 5 YR



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

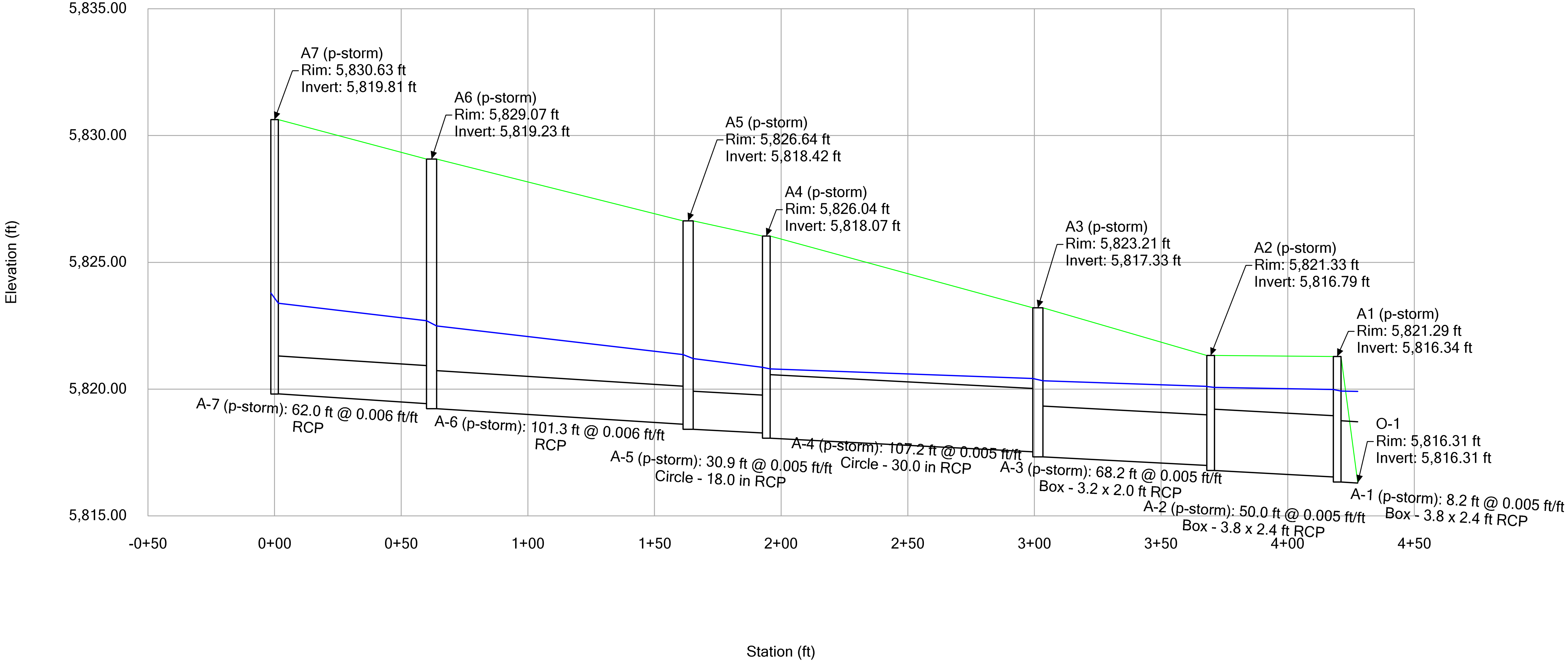
Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Notes
F-3 (p-storm)	F3 (p-storm)	5,823.27	F2 (p-storm)	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

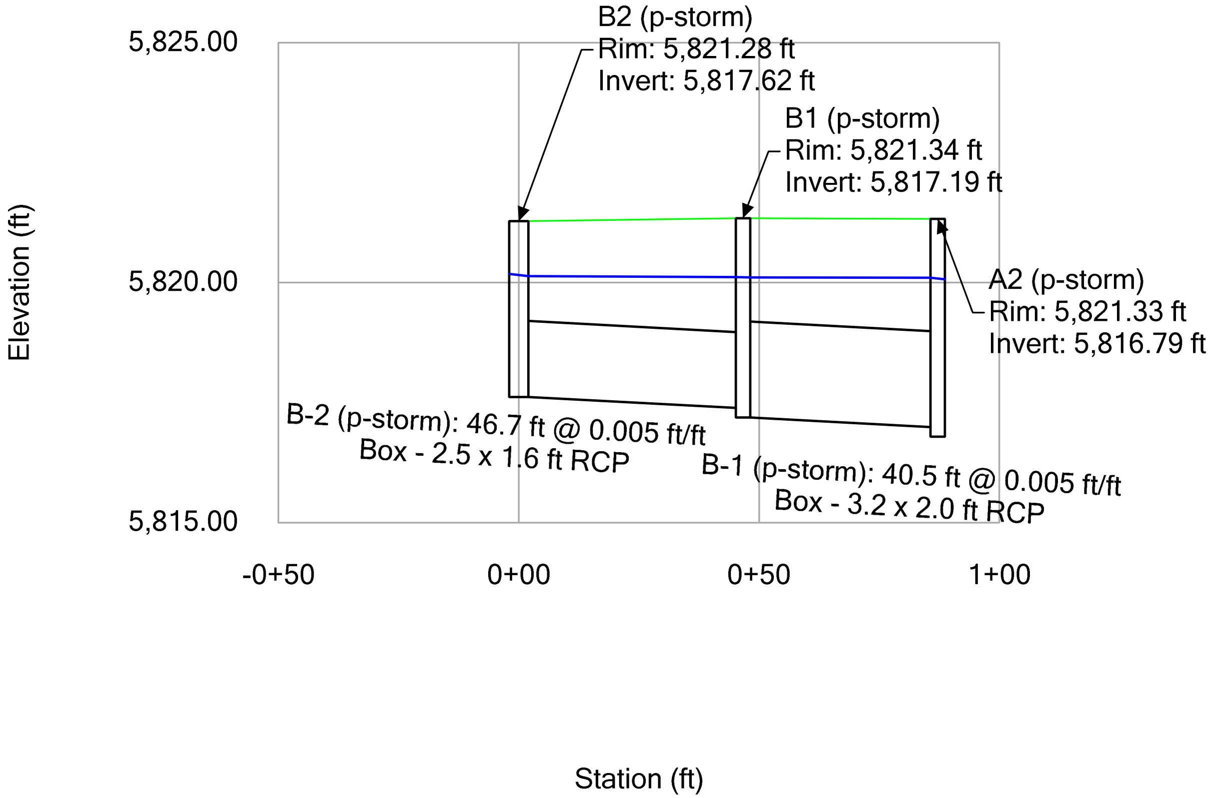
Active Scenario: 100 YR

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	

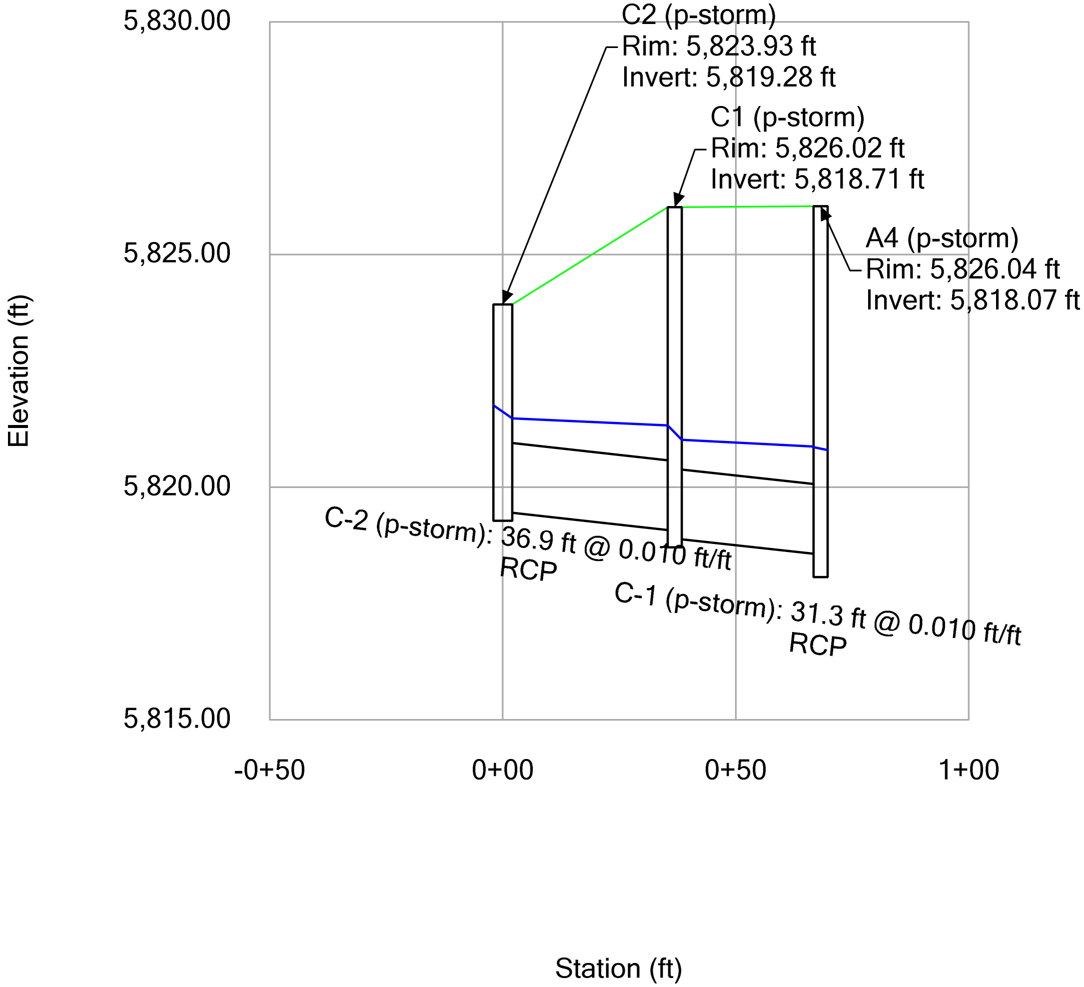
Profile Report
Engineering Profile - Storm Line A (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



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
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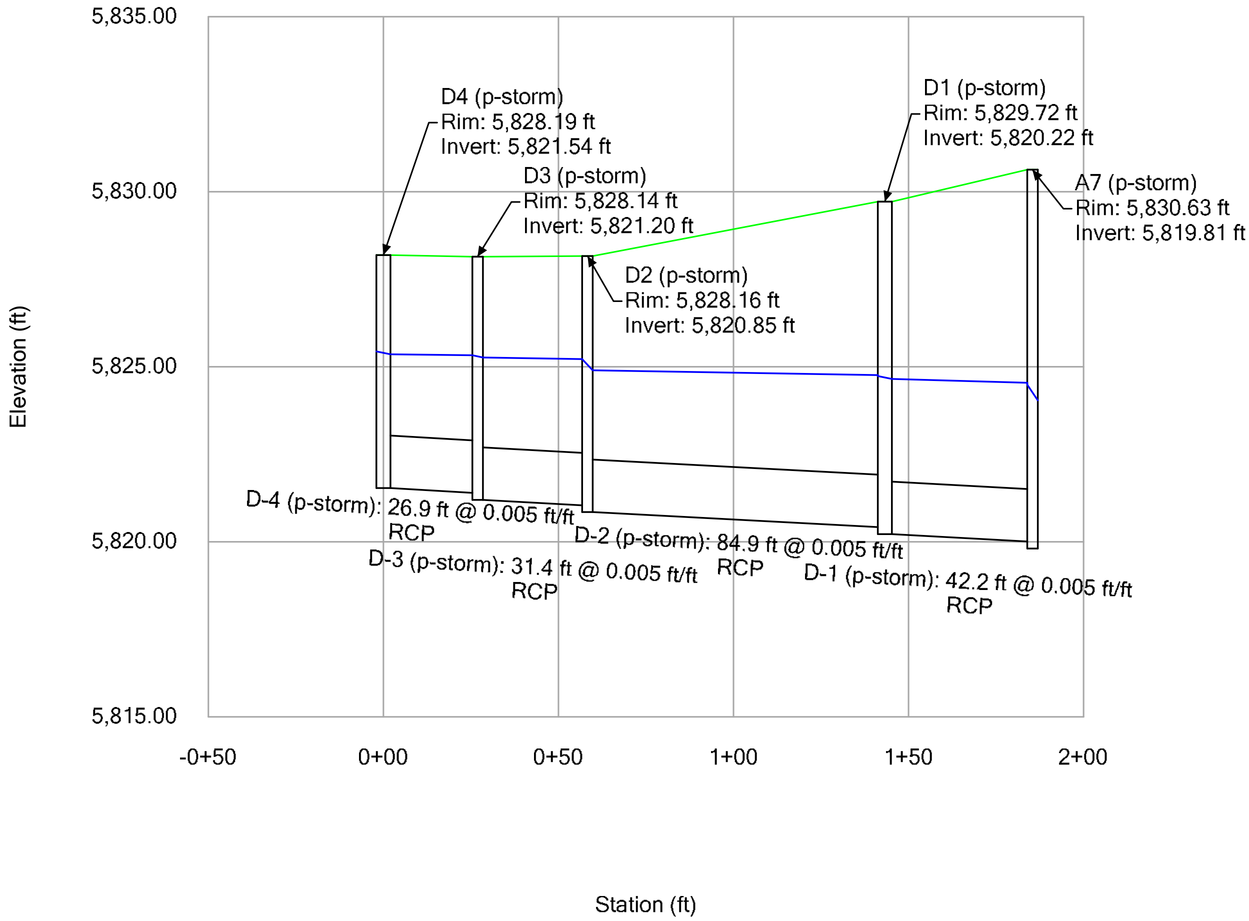

Profile Report
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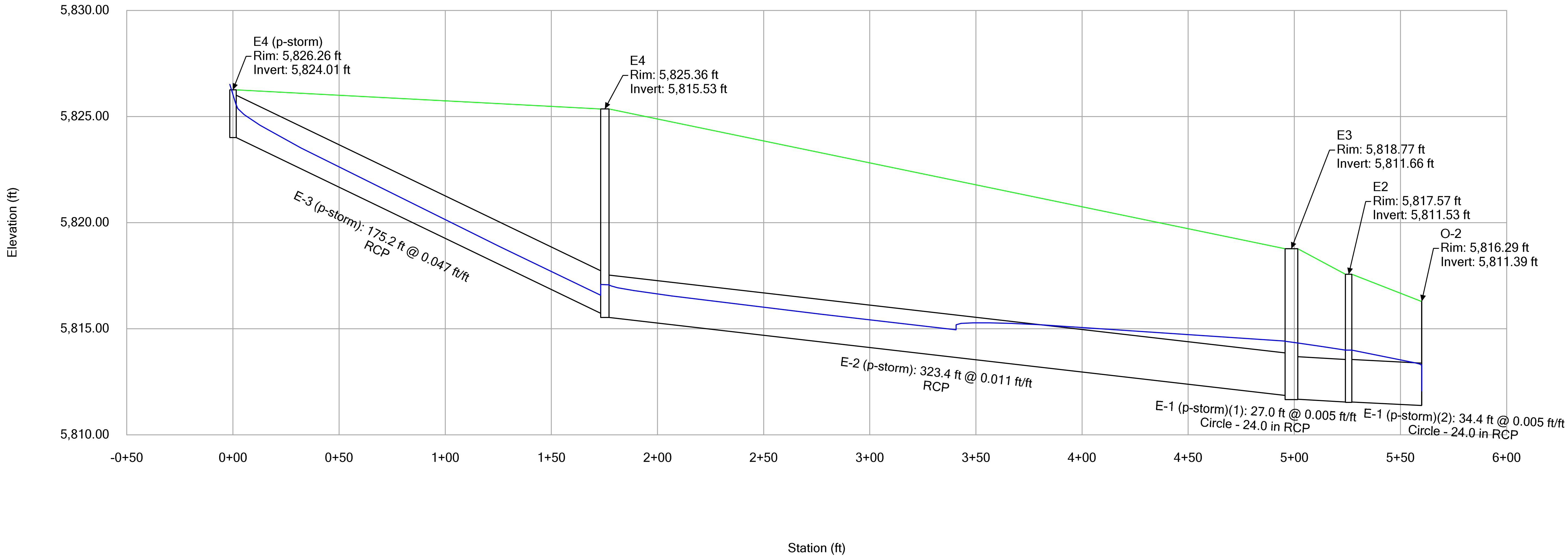
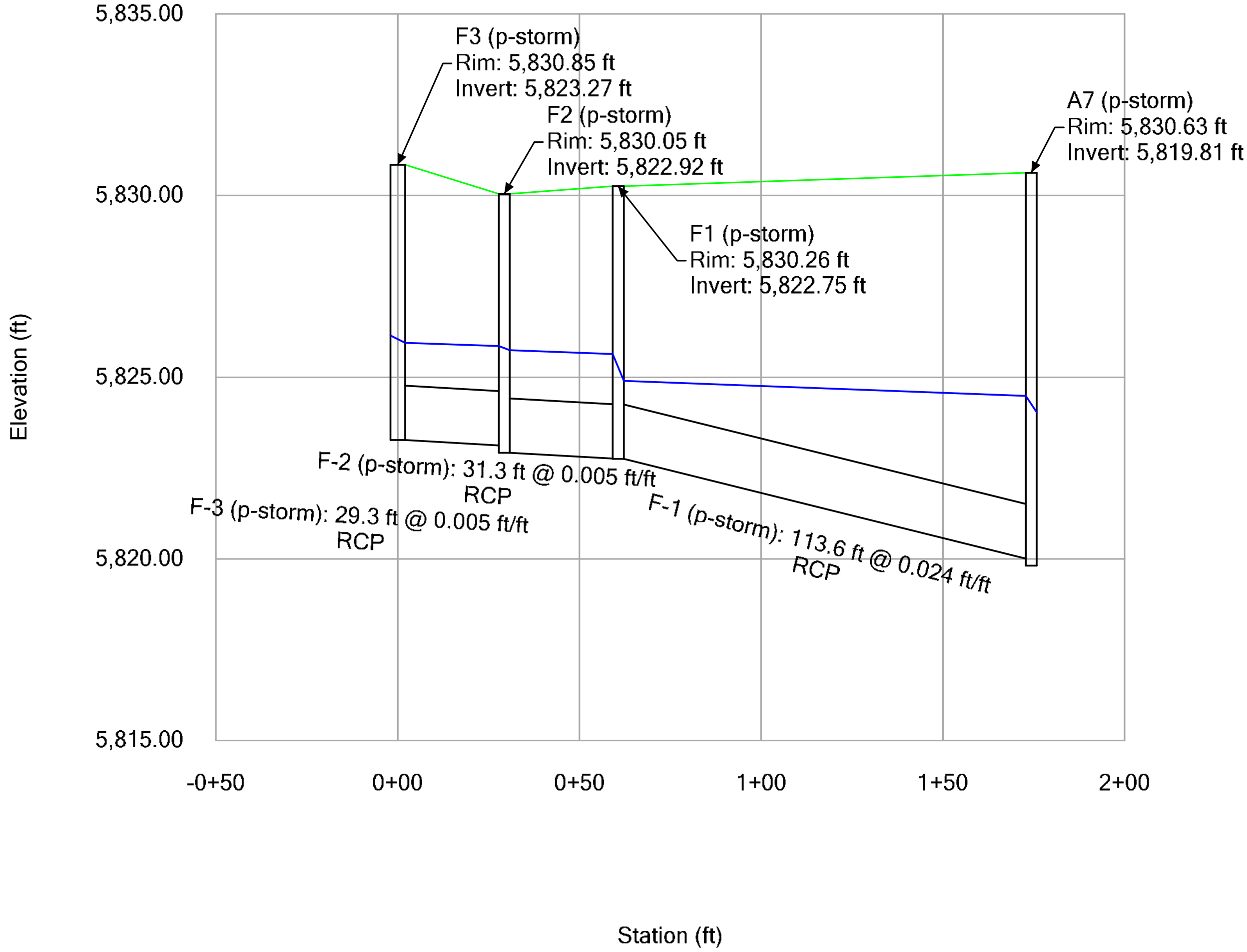
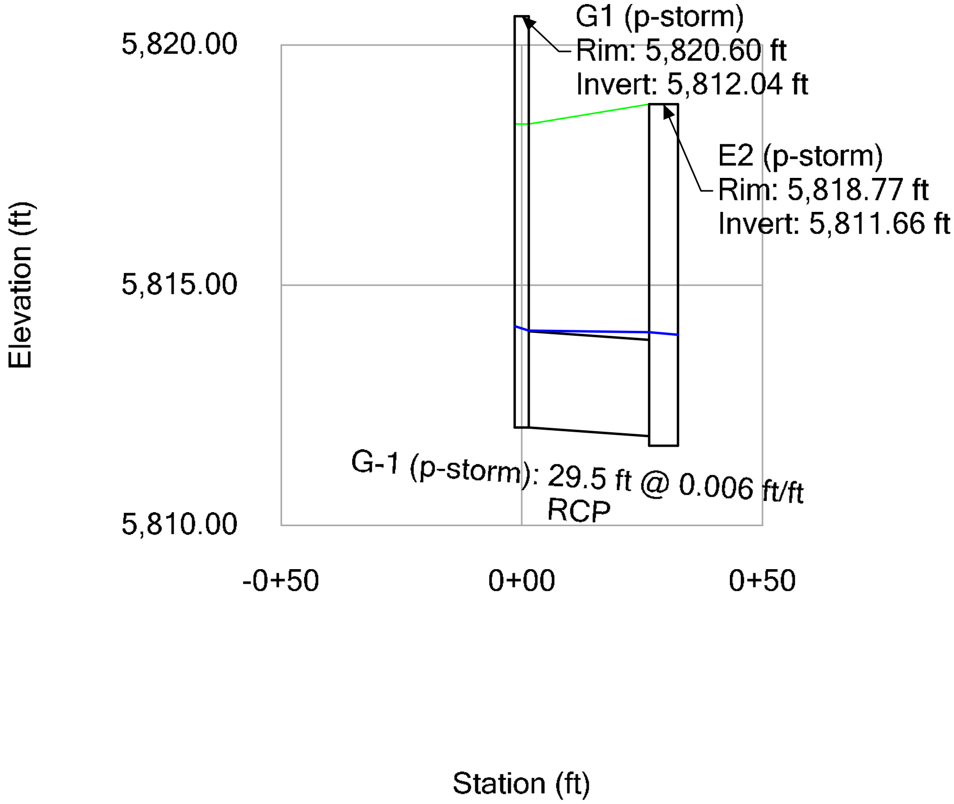
Active Scenario: 100 YR



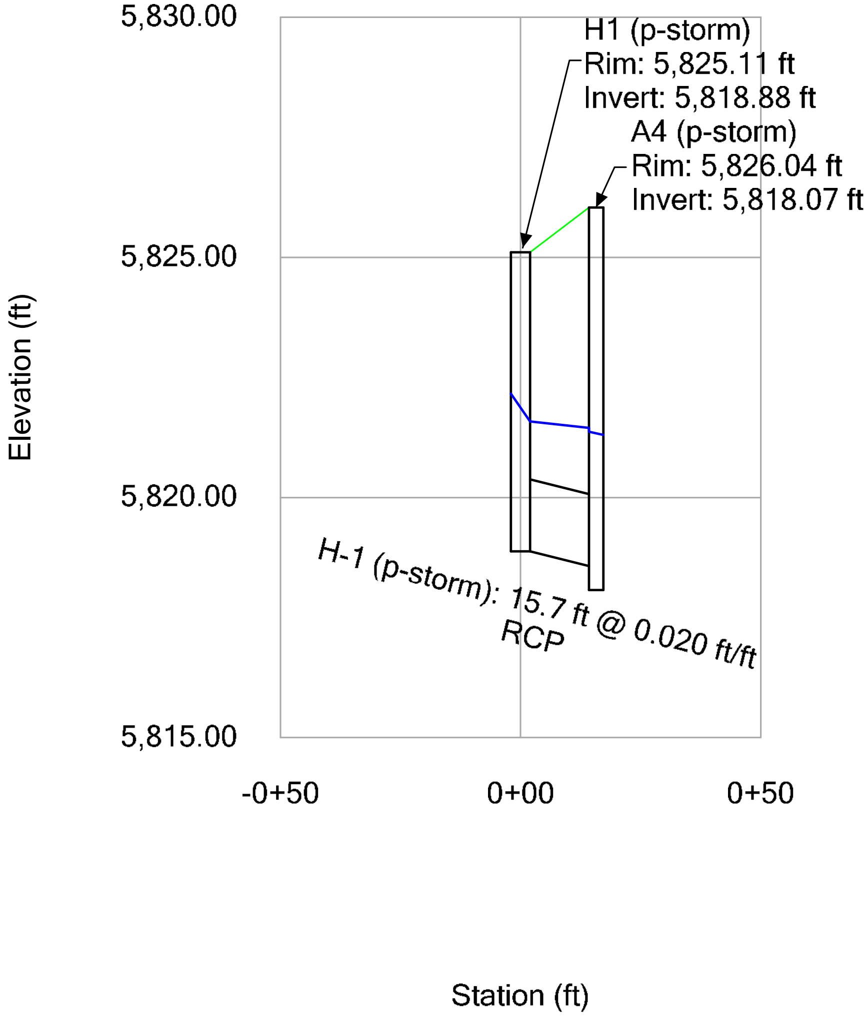
Profile Report
Engineering Profile - Storm Line F (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



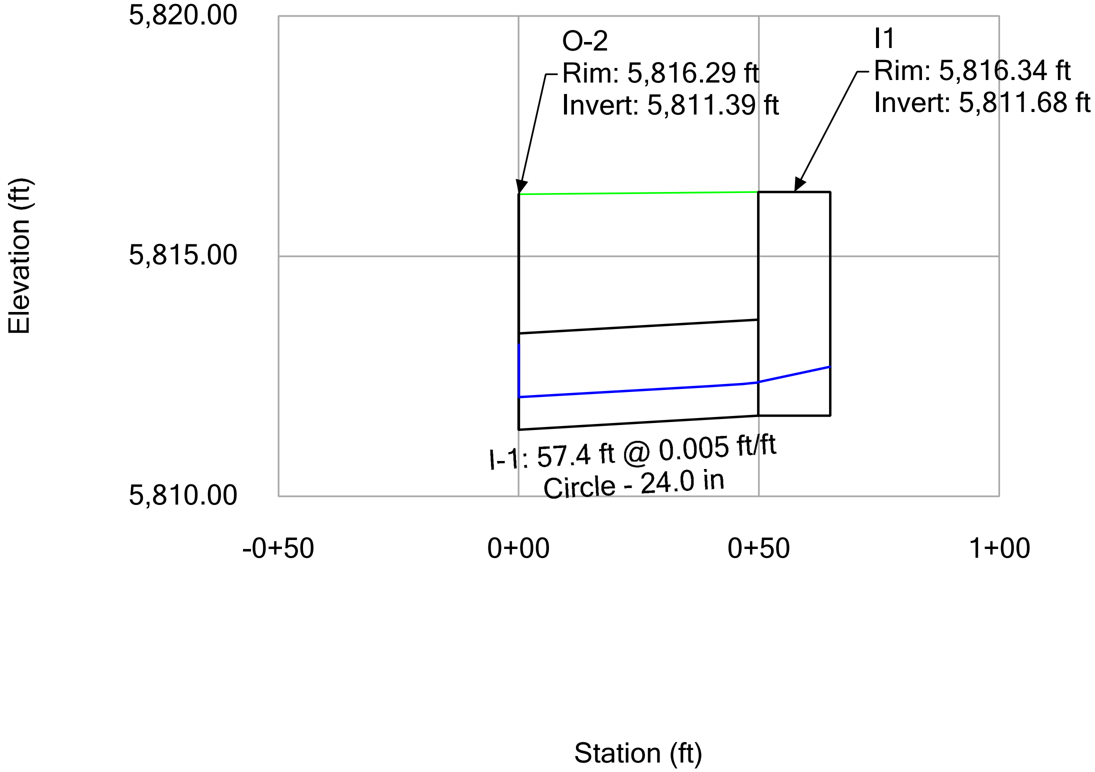
Profile Report
Engineering Profile - Storm Line G (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



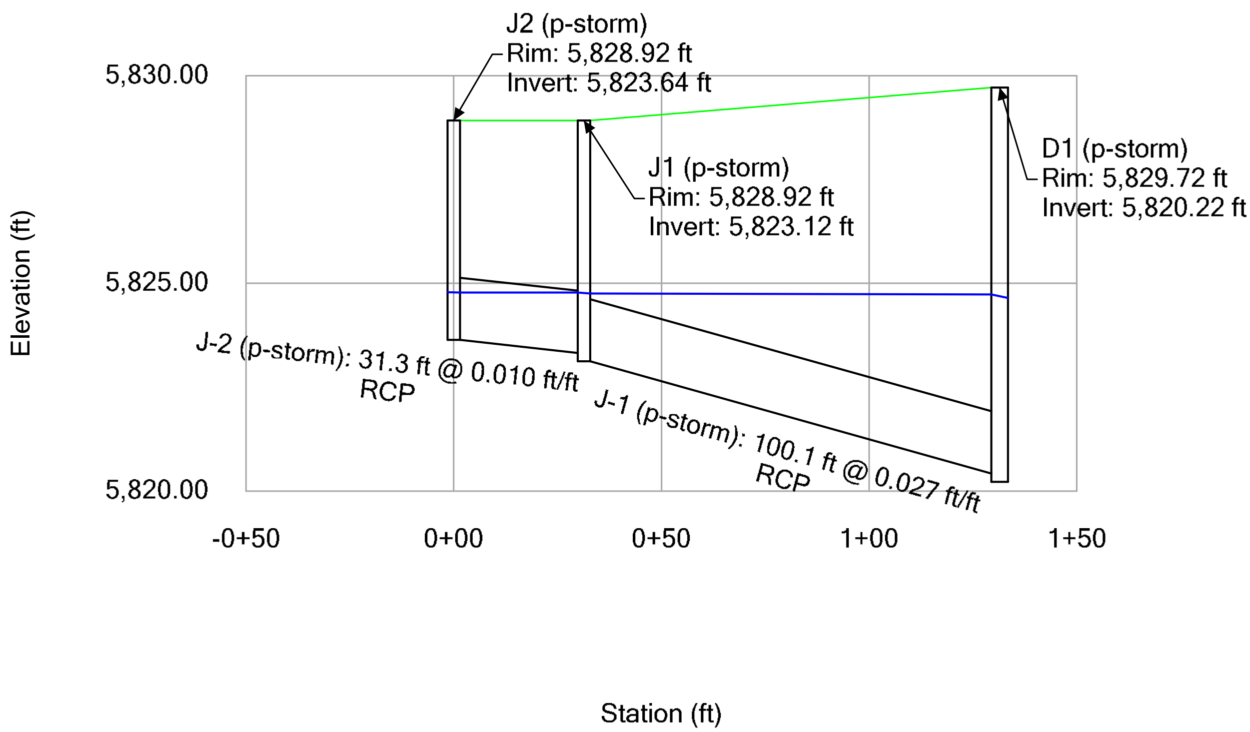
Profile Report
Engineering Profile - Storm Line H (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



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



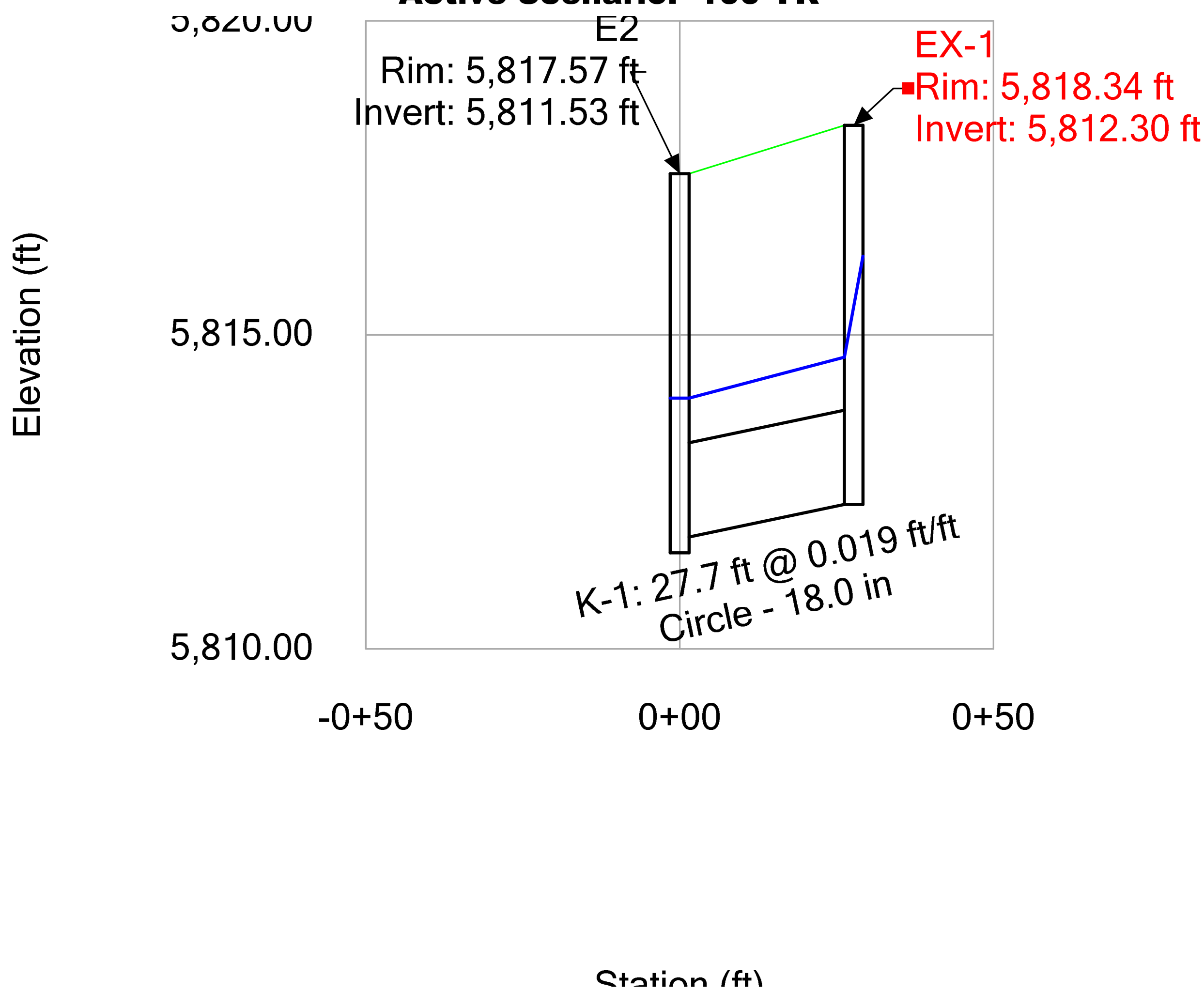
Profile Report
Engineering Profile - Storm Line J (StormCAD-10-6-2022.stsw)
Active Scenario: 100 YR



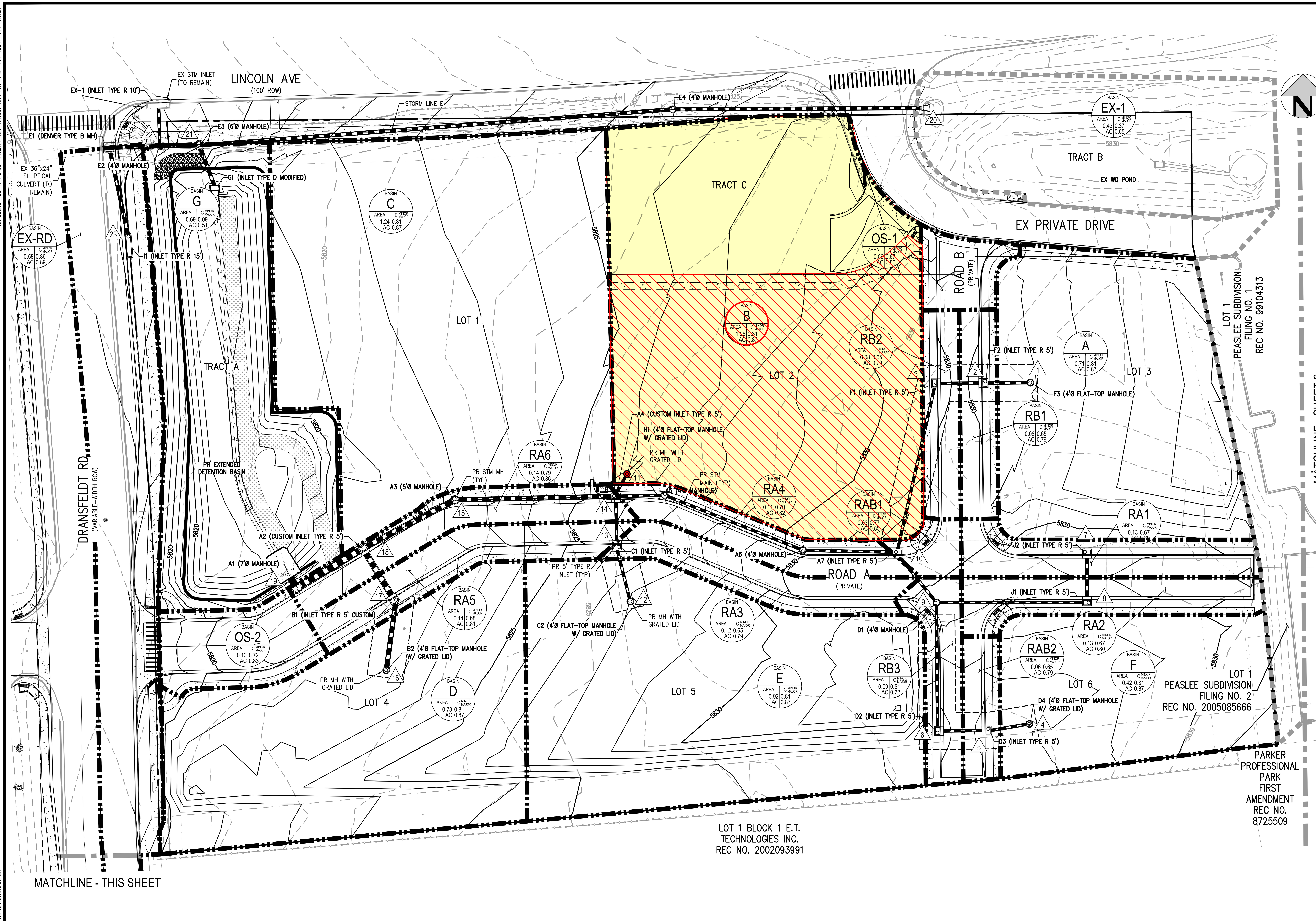
Profile Report

Engineering Profile - Storm Line K (StormCAD-10-6-2022.stsw)

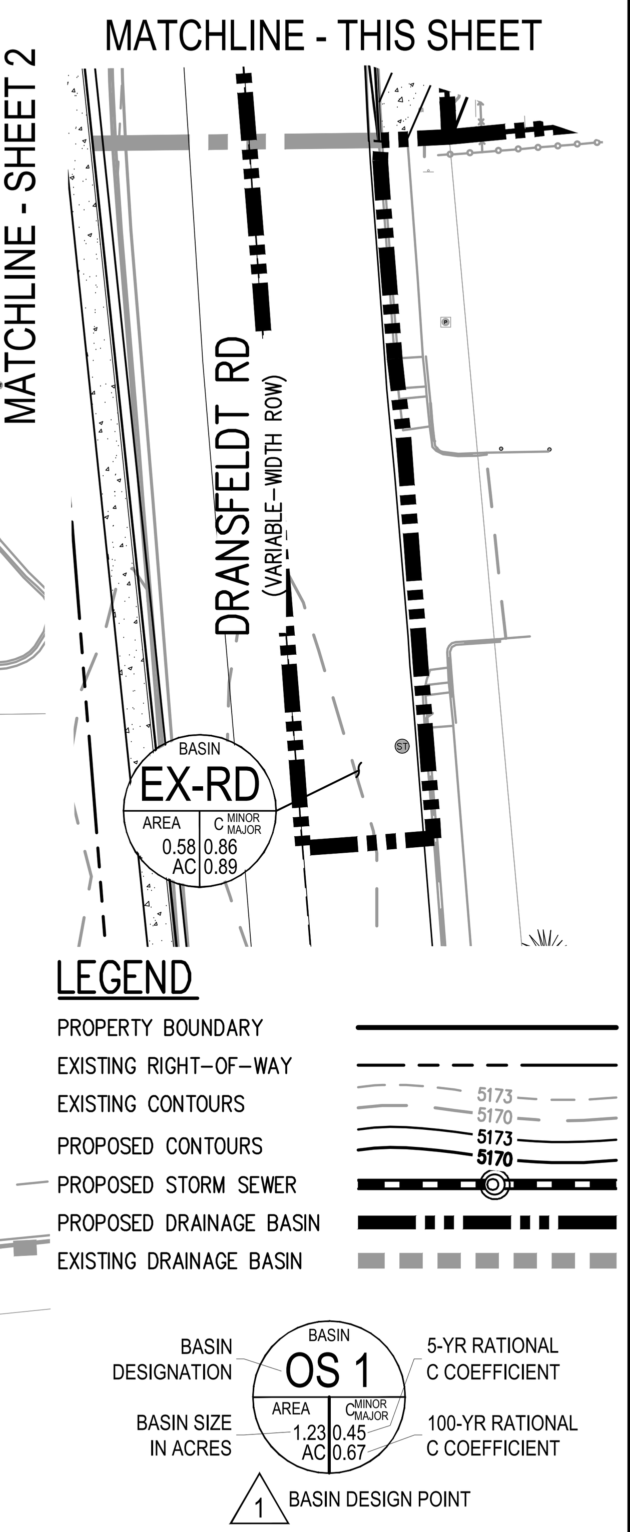
Active Scenario: 100 YR



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



SCALE: 1" = 30'

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

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

811 Know what's below. Call before you dig.

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PLAZA STREET PARTNERS

LINCOLN & DRANSFELDT
DRAINAGE MAP

COLORADO LICENSED RACHEL C. PATTON 54450 07-13-2023 PROFESSIONAL ENGINEER

PROJECT #: 200829
SHEET NUMBER
1
1 OF 2

FILEPATH: K:\200829\ENGINEERING\DRAINAGE\DRAINAGE PLAN.DWG LAYOUT: LAYOUT1
7 XREFs: e-base, e-legal, e-util, p-base, p-legal, p-util, stamp - cd
PLOTTED: WED 07/12/23 1:05:17P BY: OLIVIA MCCRACKEN

APPENDIX E – Excerpts from Existing Drainage Report

Avenue and Parker Road. This sub-basin flows directly to a roadside ditch along Lincoln Avenue, eventually draining to Dransfeldt Road.

c. Sub-basin 121 has an approximate area of 3.4 acres. The land cover for this sub-basin is mostly grassland with some surrounding houses. This sub-basin sheet flows towards Lincoln Avenue. After Dransfeldt Road improvements, the runoff from this sub-basin will be captured along a roadside ditch that will direct the flow to the proposed culverts at the intersection of Dransfeldt Road and Lincoln Avenue.

d. Sub-basin 131 is the portion of Dransfeldt Road runoff draining to Lincoln Avenue. The area of this small sub-basin is approximately 0.4 acres. For the proposed conditions the runoff generated by this basin will flow along the proposed curb and gutter to be collected at a proposed 10-ft Type R inlet (DP #13) located at the southeast corner of the intersection between Dransfeldt Road and Lincoln Avenue.

2. Hot Springs Tributary Basin has a total area draining to Dransfeldt Road of approximately 354 acres. It flows under Parker Road though a 60" CMP. This tributary has a wide, shallow and undefined flood area about 400 feet downstream of Parker Road. As stated on reference 7, it is anticipated that without improvements at this location floodwaters will not be able to flow through the pipe; they will travel west along Lincoln. There is no riparian habitat and no base flow. The land use in the area includes open space and residential with some commercial and industrial. The detention pond at Hot Springs Drive drains into this tributary. Currently, for greater than the 10-year flow, flow is diverted to Baldwin Gulch. A 60" pipe was proposed to outfall into a proposed 100-year channel from Dransfeldt Road to Cherry Creek (Ref. 7).

   Hot Springs Tributary Basin was divided into three sub-basins draining to proposed culverts under Dransfeldt Road. These sub-basins are:

   Hot Springs Tributary North (Basin 200's on Drainage Map)

   a. Sub-basin 211 (Basin A-095 per reference 5) is approximately 250 acres in area. This sub-basin extends east of Pine Drive (Douglas County Road 45). Land use is primarily residential. Future land use is projected to be mainly low-density residential. The runoff generated by this basin flows into an existing detention pond which outflows into sub-basin 221 by twin 29"x45" reinforced concrete arch pipes. The *Newlin/Baldwin Gulches and Basin 4600-09 Outfall System Planning Study* calculated the detention pond release rates as 214 cfs for the 100-year storm and 40 cfs for the 5-year storm.

   b. Sub-basin 221 is located downstream of sub-basin 211. It has an approximate drainage area of 34.1 acres. The land use for this area is mostly residential. All the runoff generated by this basin combined with the release from the detention pond in sub-basin 211 is anticipated not to flow through the pipe 60" CMP crossing Parker Road. The diverted flow will travel west along Lincoln Baldwin Gulch for storms greater than the 10-year. The flow drain through the 60" RCP discharges into sub-basin 231, where it flows westerly through an existing ditch. The amount of flow that the existing 60" CMP was calculated to carry is 163 cfs for the 100-year storm and 84 cfs for the 5-year storm (*Newlin/Baldwin Gulches and Basin 4600-09 Outfall System Planning Study*). Approximately 131 cfs will be diverted north to Baldwin Gulch during the 100-year

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision : Dransfeld Road on Town of Parker

Calculated by : PMG   Date : 14-Feb-2003

Tc = Ti + Tt

Sub-Basin Data				Overland Flow			Travel Time (Tt)				Urban Check				Remarks
Des. Pt. #	Area Design.	Area (ac)	C 5 yr.	L (ft)	Slope (%)	Ti (min)	L (ft)	Slope (%)	Vel (fps)	Tt (min)	Comp. Tc (min.)	L (ft)	Urban Tc (min)	Final Tc** (min)	
10	101	31.1	0.38	300.0	5.0	13.2	2600	2.0	2.1	20.4	33.6	2900	26.1	26.1	
11	111	4.3	0.54	50.0	2.0	5.7	1100	0.9	1.4	12.8	18.5	1150	16.4	16.4	
12	121 101,111,121	3.4 38.8	0.38 0.40	115.0 300.0	1.7 5.0	11.6 12.6	660 3700	0.8 1.7	1.3 1.9	8.4 31.8	20.0 44.4	775 4000	14.3 32.2	14.3 32.2	
13	131	0.4	0.90	10.0	3.0	0.8	580	0.6	1.5	6.2	7.0	590	13.3	7.0	
14	101,111,121,131	39.2	0.40	300.0	5.0	12.6	3780	1.7	1.9	32.4	45.0	4080	32.7	32.7	
21	211	250.0	0.22											55.0	Tc taken from Kiowa Report
22	221 211,221	34.1 284.1	0.41 0.24	100.0	3.0	8.6	2300 1400	2.2 2.0	2.2 5.0	17.2 4.7	25.9	2400	23.3	23.3 59.7	
23	231 211-231	13.6 297.7	0.59 0.26	50.0	2.0	5.2	1220 1250	0.8 0.8	1.4 5.0	15.0 4.2	20.1	1270	17.1	17.1 63.8	
31	311	17.7	0.59	50.0	2.0	5.2	1580	0.9	1.4	18.7	23.8	1630	19.1	19.1	
32	321 311-321	0.6 18.3	0.90 0.60	10.0 50.0	2.0 2.0	0.9 5.2	610 1580	2.8 0.9	5.0 1.4	2.0 18.7	2.9 23.8	620 1630	13.4 19.1	5.0 19.1	Min Tc = 5.0

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision : Dransfeld Road on Town of Parker 5-year

Calculated by : PMG Date : 14-Feb-2003

Street	Design Pt.	Direct Runoff							Total Runoff				Max Street		Max Pipe			Travel Time		
		Area Design	Area (ac)	Runoff Coeff. (C)	Tc min	C*A (ac)	I in/hr	Q (cfs)	Tc min	Σ(C*A) (ac)	I in/hr	Q (cfs)	S (%)	Str. Flow (cfs)	Q cfs	S (%)	Pipe Size (in)	L (ft)	V fps	Tt min
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	10	101	31.1	0.38	26.1	11.8	2.4	28.4												
	11	111	4.3	0.54	16.4	2.3	3.1	7.2												
	12	121	3.4	0.38	14.3	1.3	3.3	4.2												
		101-121							32.2	15.4	2.1	32.4								
	13	131	0.4	0.90	7.0	0.4	4.4	1.7												
	14	101-131	39.2						32.7	15.8	2.1	33.2								
	21	211	250.0	0.22					55.0			40.0								
	22	221	34.1	0.41	23.3	14.0	2.6	36.4												
		211,221	284.1	0.24					59.7			84.0								
	23	231	13.6	0.59	17.1	8.0	3.0	24.1												
		211-231	13.6	0.59	63.8	8.0	1.4	11.2	63.8			95.2								
	31	311	17.7	0.59	19.1	10.4	2.9	29.8												
	32	321	0.6	0.90	5.0	0.5	4.9	2.6												
		311-321	18.3	0.60	19.1	0.5	2.9	1.5	19.1	11.0	2.9	31.3								
	33	331	0.6	0.90	5.0	0.5	4.9	2.6												
		311-331	18.9	0.61	19.1	0.5	2.9	1.5	19.1	11.5	2.9	32.8								

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

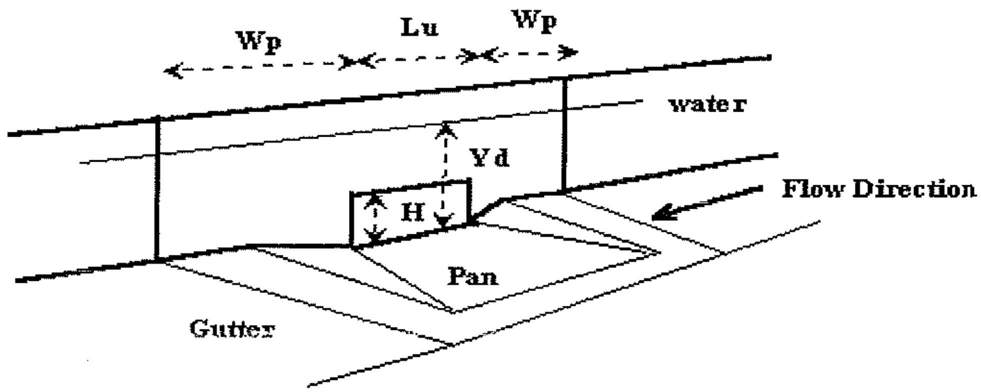
Subdivision : Dransfeld Road on Town of Parker 100-year

Calculated by : PMG Date : 14-Feb-2003

Street	De-sign Pt.	Direct Runoff: Area De-sign	Area (ac)	Runoff Coeff. (C)	Tc min	C*A (ac)	I in/hr	Q (cfs)	Total Runoff: Tc min	Σ(C*A) (ac)	I in/hr	Q (cfs)	Max Street: S (%)	Str. Flow (cfs)	Max Pipe: Q cfs	S (%)	Pipe Size (in)	Travel Time: L (ft)	V fps	Tt min
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	10	101	31.1	0.54	26.1	16.8	4.4	73.9												
	11	111	4.3	0.66	16.4	2.8	5.8	16.3												
	12	121	3.4	0.54	14.3	1.8	6.1	11.1												
		101-121							32.2	21.4	3.8	81.5								
	13	131	0.4	0.96	7.4	0.4	8.0	3.4												
	14	101-131	39.2						32.7	21.9	3.8	83.1								
	21	211	250.0	0.46																
									55.0			214.0								
	22	221	34.1	0.56	23.3	19.1	4.7	89.8												
		211,221	284.1	0.47					59.7			163.0								
	23	231	13.6	0.70	17.1	9.5	5.5	52.4												
		211-231	13.6	0.70	63.8	9.5	2.5	23.8	63.8			186.8								
	31	311	17.7	0.70	19.1	12.4	5.2	64.4												
	32	321	0.6	0.96	5.0	0.6	9.0	5.2												
		311-321	18.3	0.60	19.1	0.6	5.2	3.0	19.1	13.0	5.2	67.4								
	33	331	0.6	0.96	5.0	0.6	9.0	5.2												
		311-331	18.9	0.61	19.1	0.6	5.2	3.0	19.1	13.5	5.2	70.4								

CURB OPENING INLET IN A SUMP

Project = Dransfeldt Road Expansion
Inlet ID = Dransfeldt Road Design Point #13 (Minor Storm)



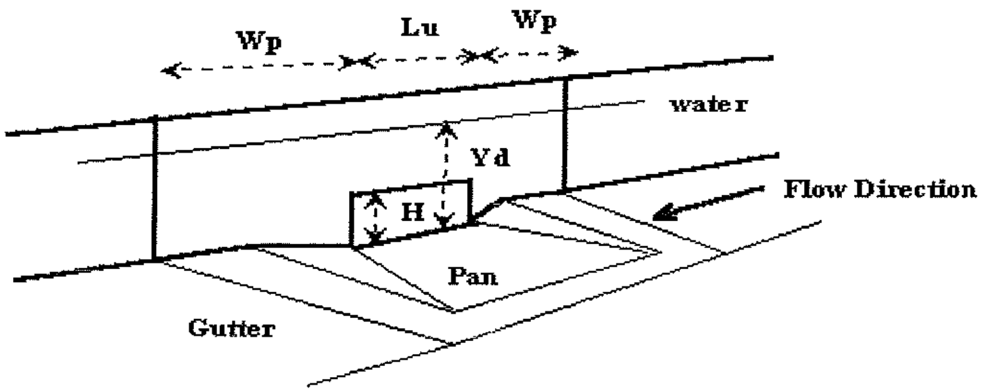
Design Information (Input)		
Design Discharge on the Street (from *Street Hy*)	Q_o =	**6.3 cfs**
Length of a Unit Inlet	L_u =	5.00 ft
Side Width for Depression Pan	W_p =	3.00 ft
Clogging Factor for a Single Unit	C_o =	0.10
Height of Curb Opening in Inches	H =	6.00 inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.4 degrees
Orifice Coefficient (see USDCM Figure ST-5)	C_d =	0.67
Weir Coefficient (see USDCM Figure ST-5)	C_w =	3.00
Water Depth for the Design Condition	Y_d =	6.00 inches
Number of Curb Opening Inlets	No =	1

Curb Opening Inlet Capacity in a Sump		
As a Weir		
Total Length of Curb Opening Inlet	L =	5.00 ft
Capacity as a Weir without Clogging	Q_{wi} =	11.0 cfs
Clogging Coefficient for Multiple Units	Coef =	1.00
Clogging Factor for Multiple Units	Clog =	0.10
Capacity as a Weir with Clogging	Q_{wa} =	10.5 cfs
As an Orifice		
Capacity as an Orifice without Clogging	Q_{oi} =	7.1 cfs
Capacity as an Orifice with Clogging	Q_{oa} =	6.4 cfs
Capacity for Design with Clogging	Q_a =	**6.4 cfs**
Capture Percentage for this Inlet = Q_a / Q_o =	C% =	**100.00 %**

Note: Unless additional ponding depth or spilling over the curb is acceptable, a capture percentage of less than 100% in a sump may indicate the need for additional inlet units.

CURB OPENING INLET IN A SUMP

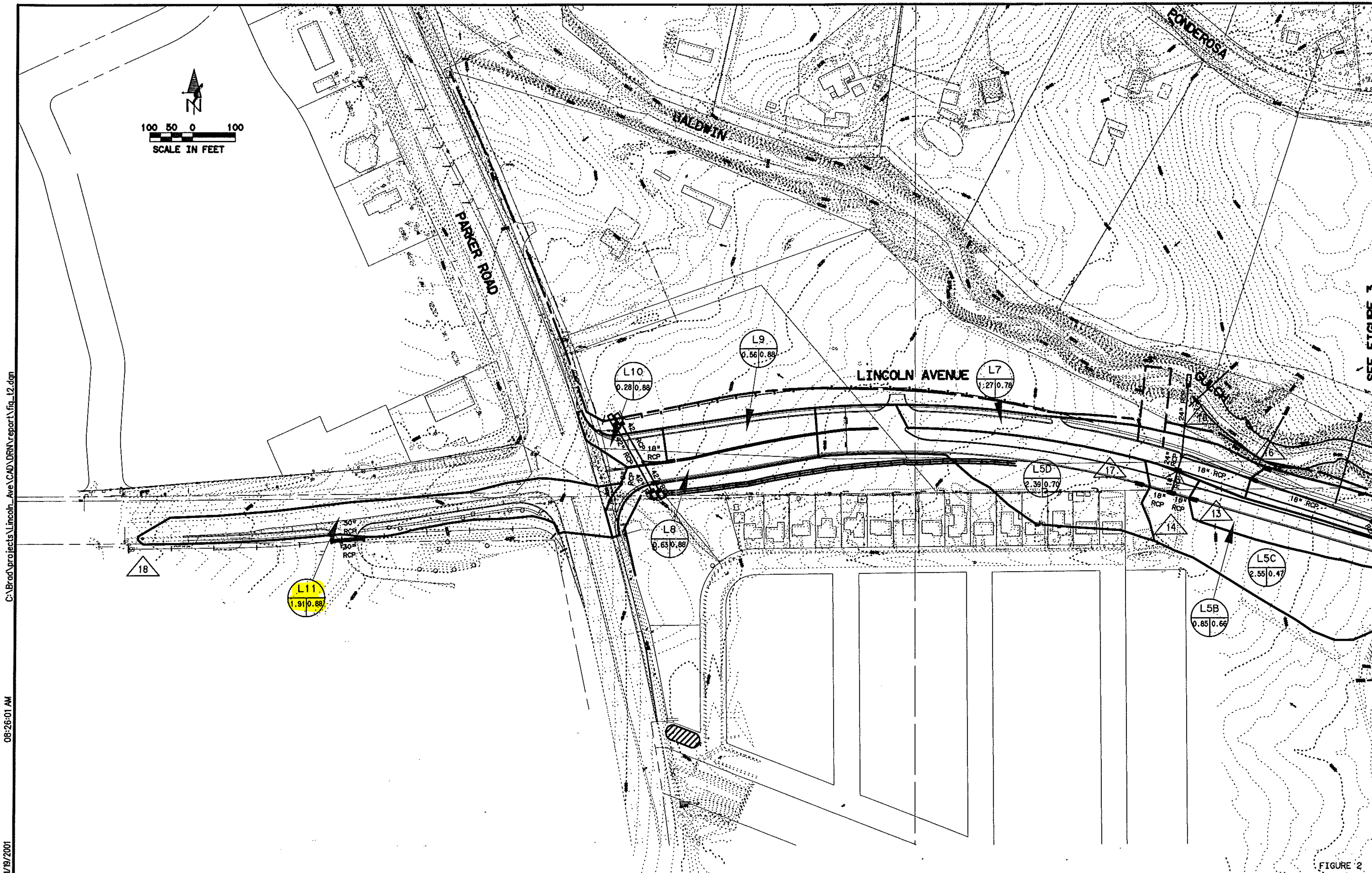
Project = **Dransfeldt Road Expansion**
Inlet ID = **Dransfeldt Road Design Point #13 (Major Storm)**



Design Information (Input)			
Design Discharge on the Street (from *Street Hy*)	**Q_o =**	**14.3**	**cfs**
Length of a Unit Inlet	L_u =	10.00	ft
Side Width for Depression Pan	W_p =	3.00	ft
Clogging Factor for a Single Unit	C_o =	0.10	
Height of Curb Opening in Inches	H =	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.4	degrees
Orifice Coefficient (see USDCM Figure ST-5)	C_d =	0.67	
Weir Coefficient (see USDCM Figure ST-5)	C_w =	3.00	
Water Depth for the Design Condition	Y_d =	7.00	inches
Number of Curb Opening Inlets	No =	1	

Curb Opening Inlet Capacity in a Sump			
As a Weir			
Total Length of Curb Opening Inlet	L =	10.00	ft
Capacity as a Weir without Clogging	Q_{wi} =	20.6	cfs
Clogging Coefficient for Multiple Units	Coef =	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	
Capacity as a Weir with Clogging	Q_{wa} =	19.2	cfs
As an Orifice			
Capacity as an Orifice without Clogging	Q_{oi} =	16.1	cfs
Capacity as an Orifice with Clogging	Q_{oa} =	14.5	cfs
Capacity for Design with Clogging	**Q_a =**	**14.5**	**cfs**
Capture Percentage for this Inlet = Q_a / Q_o =	**C% =**	**100.00**	**%**

Note: Unless additional ponding depth or spilling over the curb is acceptable, a capture percentage of less than 100% in a sump may indicate the need for additional inlet units.



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LINCOLN AVENUE EXTENSION
DOUGLAS COUNTY, CO
PROJECT INITIAL (ROADWAY) DRAINAGE SYSTEM

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STORM SEWER - RATIONAL METHOD PEAK FLOWS

BASIN	AREA (ac)	C_5	C_{100}	T_c (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (cfs)	Q_{100} (cfs)
L1	0.65	0.88	0.93	5.0	4.92	9.05	2.8	5.5
L2	0.88	0.88	0.93	5.0	4.92	9.05	3.8	7.4
L3	0.34	0.88	0.93	5.0	4.92	9.05	1.5	2.9
L4	0.58	0.88	0.93	5.0	4.92	9.05	2.5	4.9
L5	6.39	0.61	0.72	9.1	3.84	7.02	15.0	32.5
L6	1.53	0.74	0.82	5.0	4.92	9.05	5.5	11.3
L7	1.27	0.78	0.85	5.0	4.92	9.05	4.9	9.8
L8	0.63	0.88	0.93	5.0	4.92	9.05	2.7	5.3
L9	0.56	0.88	0.93	5.0	4.92	9.05	2.4	4.7
L10	0.28	0.88	0.93	5.0	4.92	9.05	1.2	2.4
L11	1.91	0.88	0.93	5.0	4.92	9.05	8.3	16.1
L5A	0.60	0.81	0.88	5.0	4.92	9.05	2.4	4.8
L5B	0.85	0.66	0.76	5.0	4.92	9.05	2.8	5.9
L5C	2.55	0.47	0.61	9.1	3.84	7.02	4.6	11.0
L5D	2.39	0.70	0.79	7.0	4.25	7.85	7.1	14.8

LINCOLN AVENUE EXTENSION
TOWN OF PARKER, CO
PROJECT INITIAL (ROADWAY) DRAINAGE SYSTEM

STORM SEWER - RATIONAL METHOD PEAK FLOWS

DES PT	BASINS	AREA (ac)	C_5	C_{100}	T_c (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (cfs)	Q_{100} (cfs)
11	L3,Bypass L1	0.34	0.88	0.93	5.9	4.60	8.40	2.4	5.3
12	L5A,Bypass DP11	0.60	0.81	0.88	7.3	4.20	7.80	3.3	6.8
13	L5B,Bypass DP12	0.85	0.66	0.76	8.4	4.05	7.50	4.3	8.6
14	L5C,Bypass L5D,DP13	2.55	0.47	0.61	9.1	3.84	7.02	6.3	22.0
15	L4,Bypass L2	0.58	0.88	0.93	6.1	4.50	8.20	3.9	8.5
16	L6,Bypass DP15	1.53	0.74	0.82	8.1	4.10	7.60	6.2	14.5
17	L7,Bypass DP16	1.27	0.78	0.85	9.0	3.84	7.02	6.6	14.8
ST1	DP14,Pickup 13,L5D							15.8	34.3
ST2	ST1,DP17							22.4	49.2
ST3	Pickup DP12,DP16							4.6	10.3
ST4	L5,L6,L7,Bypass L3,L4	9.19	0.66	0.76	9.3	3.84	7.02	26.0	56.5
18	*L11,Walgreens,SH 83							33.7	67.7

* Walgreens detention pond release Q_5=0.43 cfs, Q_{100}=1.59cfs
SH 83 (Parker Road from HDR e-mail) Q_5=25 cfs, Q_{100}=50 cfs

APPENDIX D – INLET CALCULATIONS

MHFD-Inlet, Version 5.03 (August 2023)

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	3.6

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)		

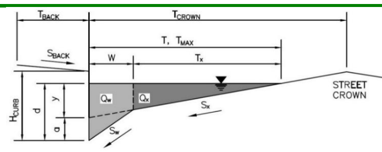
CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.3	1.3
Major Total Design Peak Flow, Q (cfs)	0.8	3.6
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:

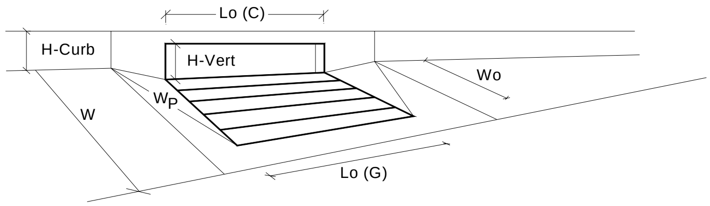
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	3.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.014	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	21.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.045	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	5.0	10.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

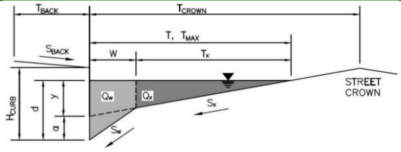


		MINOR	MAJOR	
Design Information (Input) CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.2	5.9	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	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_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} =	0.18	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	1.6	5.7	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	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	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.010	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	100.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.028	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

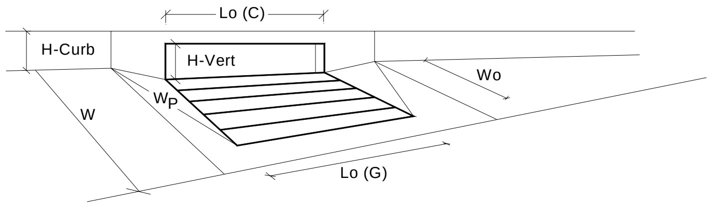
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	10.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

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

INLET IN A SUMP OR SAG LOCATION

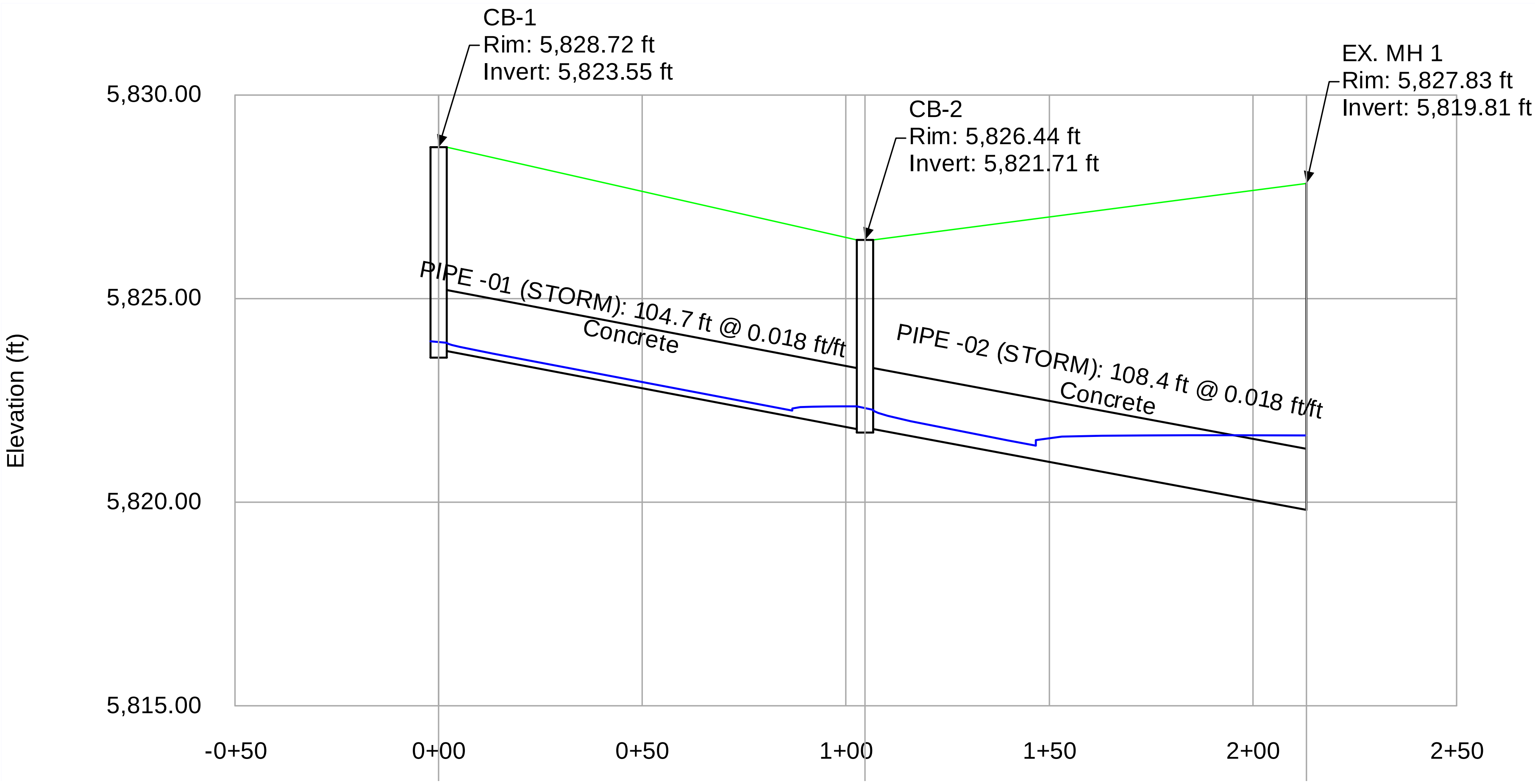
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	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
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		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_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} =	0.25	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	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		Q_a =	2.8	5.9	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK\ REQUIRED}$ =	1.3	3.6	cfs

APPENDIX E – STORMCAD CALCULATIONS

7 Brew Parker
Profile Report
Engineering Profile - Profile - 1 (7 Brew Parker.stsw)
Active Scenario: 5 Year
12/3/2025



7 Brew Parker
FlexTable: Catch Basin Table
Active Scenario: 5 Year
12/3/2025

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-1	5,828.72	5,823.55	Standard	0.500	0.04	0.31	5,823.95	5,823.92
CB-2	5,826.44	5,821.71	Standard	0.500	0.09	1.59	5,822.35	5,822.27

7 Brew Parker

FlexTable: Conduit Table

Active Scenario: 5 Year

12/3/2025

Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Headloss (ft)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-1	5,823.71	CB-2	5,821.80	104.7	0.018	18.0	0.013	1.56	0.31	3.27	14.21	5,823.92	5,822.35
CB-2	5,821.80	EX. MH 1	5,819.81	108.4	0.018	18.0	0.013	0.63	1.59	5.31	14.21	5,822.27	5,821.64

7 Brew Parker
FlexTable: Outfall Table
Active Scenario: 5 Year
12/3/2025

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
EX. MH 1	5,827.83	5,819.81	User Defined Tailwater	5,821.64	5,821.64	1.59

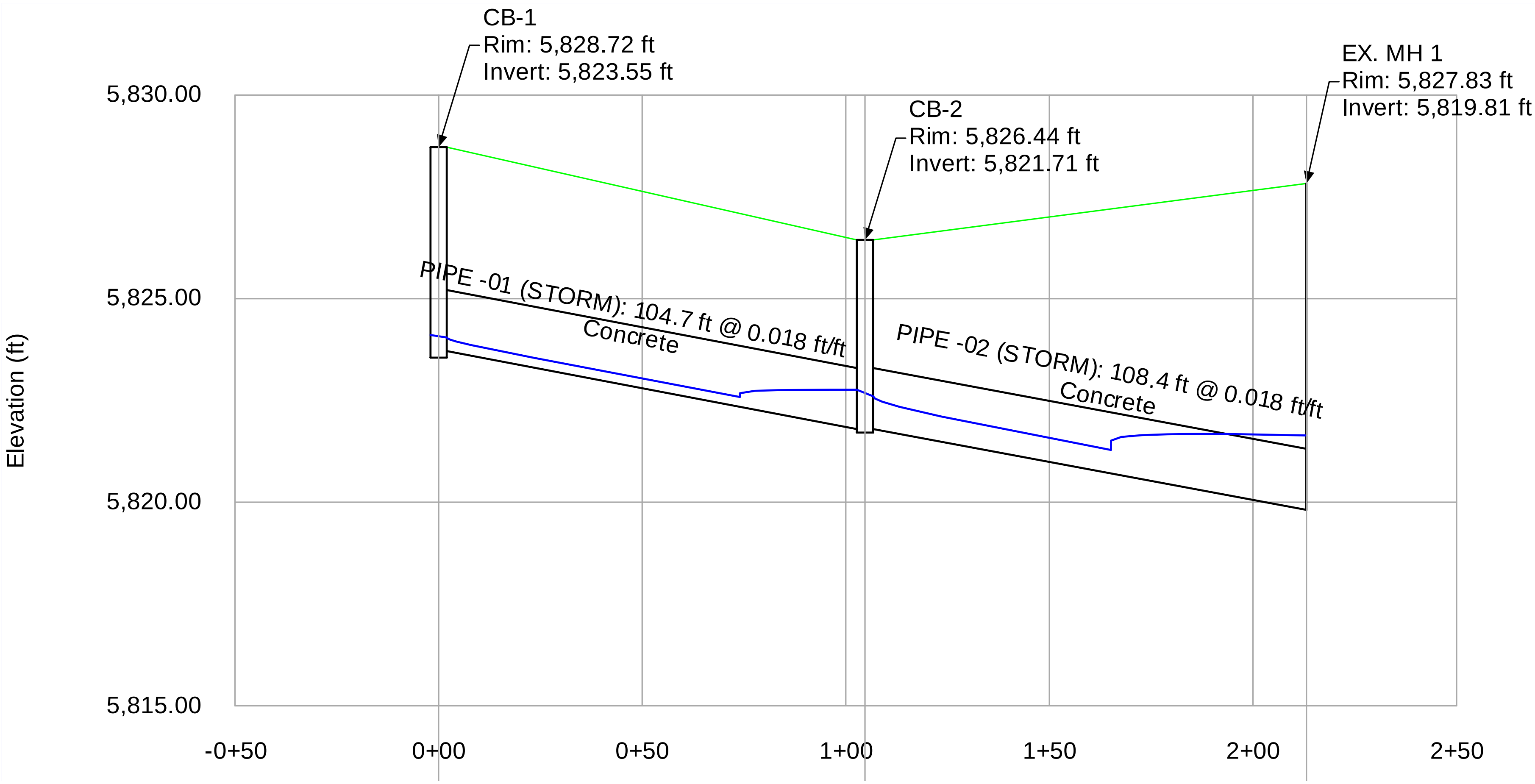
7 Brew Parker

Profile Report

Engineering Profile - Profile - 1 (7 Brew Parker.stsw)

Active Scenario: 100 Year

12/3/2025



7 Brew Parker
FlexTable: Catch Basin Table
Active Scenario: 100 Year
12/3/2025

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Method	Headloss Coefficient (Standard)	Headloss (ft)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-1	5,828.72	5,823.55	Standard	0.500	0.06	0.81	5,824.11	5,824.05
CB-2	5,826.44	5,821.71	Standard	0.500	0.16	4.42	5,822.76	5,822.60

7 Brew Parker

FlexTable: Conduit Table

Active Scenario: 100 Year

12/3/2025

Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Headloss (ft)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
CB-1	5,823.71	CB-2	5,821.80	104.7	0.018	18.0	0.013	1.28	0.81	4.36	14.21	5,824.05	5,822.76
CB-2	5,821.80	EX. MH 1	5,819.81	108.4	0.018	18.0	0.013	0.96	4.42	7.10	14.21	5,822.60	5,821.64

7 Brew Parker

FlexTable: Outfall Table

Active Scenario: 100 Year

12/3/2025

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
EX. MH 1	5,827.83	5,819.81	User Defined Tailwater	5,821.64	5,821.64	4.42