Kimley»Horn

DRAINAGE COMPLIANCE LETTER

To:	Town of Parker
From:	Dan Skeehan, P.E. Kimley-Horn and Associates, Inc
Date:	August 27, 2020
Subject:	Parker and Pine Multi-Family Drainage Compliance Letter Lots 1 -3, Tract A-B-C, Parker and Pine Filing 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 the "Parker and Pine Filing No. 1 - Final Drainage Report" prepared by Kimley-Horn and Associates, Inc. Dated April 2020 (the "Existing Report").

PROJECT DESCRIPTION

The proposed multifamily development on Lots 1, 2, and 3, Parker and Pine Filing 2 (the "Site") is located at the near the corner of Pine Lane and Parker Road in the Town of Parker, Colorado ("the Town"). The project is the second phase in a multi-phase mixed used development. As part of phase 1, the overall developer graded the site, installed private drives and utility mains across the site, and made improvements to the existing shared detention pond. The multi-family project consists of a development plan of three vacant parcels consisting of approximately 6.44 acres and includes site grading, utility service installation, new building construction, parking and sidewalk improvements, and landscaping. The site is bordered to the north by undeveloped lots and a private drive, east by undeveloped lots and a private drive, south by Baldwin Gulch and an existing detention pond, and west by Twenty Mile Road.

EXISTING DRAINAGE INFORMATION

Per the "Parker and Pine Filing No. 1 - Final Drainage Report," Lots 1 – 3 and Tract B were divided into 5 onsite drainage basins with the following characteristics:

Table 1

Drainage Basin	Area (AC)	Imperviousness
SB 1.2	1.97	85%
SB 4.1	1.14	85%
SB 4.2	0.77	85%
SB 6.0	2.22	85%
SB 18.0	0.39	96%
Total	6.49	86%

Tract A (existing private roadway) and Tract C (existing detention pond) are intentionally excluded from this letter, having been previously addressed in the existing report, and no modifications to these drainage areas are proposed. The existing drainage report can be found in Appendix D.

COMPLIANCE WITH COLORADO DISCHARGE PERMIT SYSTEM GENERAL PERMIT COR090000

The Town of Parker has coverage under the Colorado Discharge Permit System General Permit COR090000 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.

"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.

The control measure for applicable development sites shall meet one of 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).

(B) Pollutant Removal Standard: The control measure(s) is designed to treat at a minimum the 80th percentile storm event. The control measure(s) shall be designed to treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS) to a median value of 30 mg/L or less.

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).

(C) Runoff Reduction Standard: The control measure(s) is designed to infiltrate into the ground where site geology permits, evaporate, or evapotranspire a quantity of water equal to 60% of what the calculated WQCV would be if all impervious area for the applicable development site discharged without infiltration. This base design standard can be met through practices such as green infrastructure. "Green infrastructure" generally refers to control measures that use vegetation, soils, and natural processes or mimic natural processes to manage stormwater. Green infrastructure can be used in place of or in addition to low impact development principles.

The development will meet the WQCV Standard listed above through the existing detention and water quality pond. The total on-site area (Lots 1-3 and Tracts A-C) is 9.49 acres; approximately 1.26 acres of the site is infeasible to be collected due to Site topographic constraints. The total area not collected or treated for water quality is 1.26 acres, which equates to 13.3% of the Site.

PROPOSED DRAINAGE INFORMATION

Drainage patterns proposed in the Existing Report are generally maintained for this project. Proposed storm sewer infrastructure includes area inlets, curb inlets, and storm sewer pipe that ultimately tie into the existing storm drain infrastructure on site. Stormwater will then follow the system proposed in the existing drainage report to the existing detention and water quality pond in the southwest corner of the site.

The Site has been divided into 37 sub drainage basins. Runoff from the sub drainage basins are proposed to be routed through the development via storm sewer and ultimately discharge into the system proposed in the existing drainage report to the existing detention and water quality pond in the southwest corner of the site. The proposed drainage basin locations and layout of the storm sewer is shown on the Proposed Drainage Map included in Appendix A of this Report. Calculations are included in Appendix B of this Report.

SB A1

SB A1 is approximately 0.71 acres and will consist of landscaping, asphalt paving, and sidewalk paving. SB A1 has been calculated to be 91% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.78 and 0.82 for the 5-year and 100-year storm, respectively. The tributary area from SB A1 shall be conveyed via curb inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB A2

SB A2 is approximately 0.11 acres and will consist of sidewalk paving and asphalt paving. SB A2 has been calculated to be 100% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.86 and 0.89 for the 5-year and 100-year storm, respectively. The tributary area from SB A2 shall be conveyed via a curb inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB A3

SB A3 is approximately 0.06 acres and will consist of landscaping, and sidewalk paving. SB A3 has been calculated to be 33% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.28 and 0.37 for the 5-year and 100-year storm, respectively. The tributary area from SB A3 shall be conveyed via an area inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB A4

SB A4 is approximately 0.07 acres and will consist of landscaping, and sidewalk paving. SB A4 has been calculated to be 33% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.28 and 0.37 for the 5-year and 100-year storm, respectively. The tributary area from SB A4 shall be conveyed via an area inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB B1

SB B1 is approximately 0.83 acres and will consist of roofing, landscaping, asphalt paving, and sidewalk paving. SB B1 has been calculated to be 75% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.65 and 0.70 for the 5-year and 100-year storm, respectively. The tributary area from SB B1 shall be conveyed via a curb inlet and proposed storm pipe to the existing onsite Storm Sewer stub.

SB B2

SB B2 is approximately 0.18 acres and will consist of landscape, and sidewalk paving. SB B2 has been calculated to be 54% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.46 and 0.53 for the 5-year and 100-year storm, respectively. The tributary area from SB B2 shall be conveyed via an area inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB C1

SB C1 is approximately 0.16 acres and will consist of landscaping, asphalt paving, and sidewalk paving. SB C1 has been calculated to be 91% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.78 and 0.82 for the 5-year and 100-year storm, respectively. The tributary area from SB C1 shall be conveyed via curb inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB C2

SB C2 is approximately 0.13 acres and will consist of landscaping, asphalt paving, and sidewalk paving. SB C2 has been calculated to be 94% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.81 and 0.85 for the 5-year and 100-year storm, respectively. The tributary area from SB C2 shall be conveyed via curb inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB C3

SB C3 is approximately 0.23 acres and will consist of landscaping, asphalt paving, and sidewalk paving. SB C3 has been calculated to be 96% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.82 and 0.86 for the 5-year and 100-year storm, respectively. The tributary area from SB C3 shall be conveyed via curb inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB C4

SB C4 is approximately 0.21 acres and will consist of landscaping and asphalt paving. SB C4 has been calculated to be 97% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.83 and 0.87 for the 5-year and 100-year storm, respectively. The tributary area from SB C4 shall be conveyed via curb inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB C5

SB C5 is approximately 0.28 acres and will consist of landscaping, asphalt paving, and sidewalk paving. SB C5 has been calculated to be 87% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.75 and 0.79 for the 5-year and 100-year storm, respectively. The tributary area from SB C5 shall be conveyed via curb inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB C6

SB C6 is approximately 0.12 acres and will consist of roofing, landscaping, sidewalk paving, and asphalt paving. SB C6 has been calculated to be 89% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.76 and 0.80 for the 5-year and 100-year storm, respectively. The tributary area from SB C6 shall be conveyed via an area inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB C7

SB C7 is approximately 0.13 acres and will consist of roofing, landscaping, sidewalk paving, and asphalt paving. SB C7 has been calculated to be 88% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.76 and 0.80 for the 5-year and 100-year storm, respectively. The tributary area from SB C7 shall be conveyed via an area inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB C8

SB C8 is approximately 0.07 acres and will consist of landscaping and sidewalk paving. SB C8 has been calculated to be 2% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.01 and 0.13 for the 5-year and 100-year storm, respectively. The tributary area from SB C8 shall be conveyed via an area inlet and proposed storm pipe to the existing onsite Storm Sewer system.

SB D1

SB D1 is approximately 0.39 acres and will consist of landscaping and sidewalk paving. SB D1 has been calculated to be 21% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.17 and 0.28 for the 5-year and 100-year storm, respectively. The tributary area from SB D1 shall be conveyed via sheetflow to the existing onsite detention and water quality pond.

SB R1 to R19

SB R1 to R19 consist entirely of proposed roof area. These areas vary between approximately 0.05 and 0.11 acres. SB R1 to R19 have been calculated to be 90% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.77 and 0.81 for the 5-year and 100-year storm, respectively. The tributary area from SB R1 to R19 shall be conveyed via roof downspout and sheet drain to area inlets and curb inlets followed by proposed storm pipe to the existing onsite Storm Sewer system.

OS-1

OS-1 is approximately 0.44 acres and consists of landscaping, sidewalk paving, and asphalt paving. It has been calculated to be 32% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.27 and 0.36 for the 5-year and 100-year storm, respectively. The tributary area from OS-1 shall sheetflow into public and private roadways and then conveyed via curb inlets to existing Storm Sewer infrastructure.

OS-2

OS-2 is approximately 0.45 acres and consists of landscaping, sidewalk paving, and asphalt paving. It has been calculated to be 37% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.31 and 0.40 for the 5-year and 100-year storm, respectively. The tributary area from OS-2 shall sheetflow into private roadways and then conveyed via curb inlets to existing on-site Storm Sewer infrastructure.

OS-3

OS-3 is approximately 0.37 acres and consists of landscaping, sidewalk paving, and asphalt paving. It has been calculated to be 33% impervious at its ultimate build out condition. The resulting runoff coefficients for this basin are 0.28 and 0.37 for the 5-year and 100-year storm, respectively. The tributary area from OS-3 shall sheetflow into private roadways and then conveyed via curb inlets to existing on-site Storm Sewer infrastructure.

CONCLUSION

The project proposes to reduce the impervious surface ratio for the Site. Table 2 below compares the Existing Overall Development design parameters to our Proposed design. Our design conforms to the Existing Report and generally maintains the proposed drainage patterns therein.

Table 2: Design Comparison

	Area	Imperviousness	Runoff Coefficient		Runoff (CFS)	
			5 Year	100 Year	5 Year	100 Year
Existing Report Design	6.49	85%	0.73	0.78	22.54	47.19
Proposed Design	6.44	79%	0.68	0.73	18.36	37.58

APPENDICES:

- Appendix A: Drainage Map
- Appendix B: Runoff Calculations
- Appendix C: Soil Information and FEMA Flood Plain Map
- Appendix D: Final Drainage Report for HIGHLANDS – Filing No. 1 Replat E

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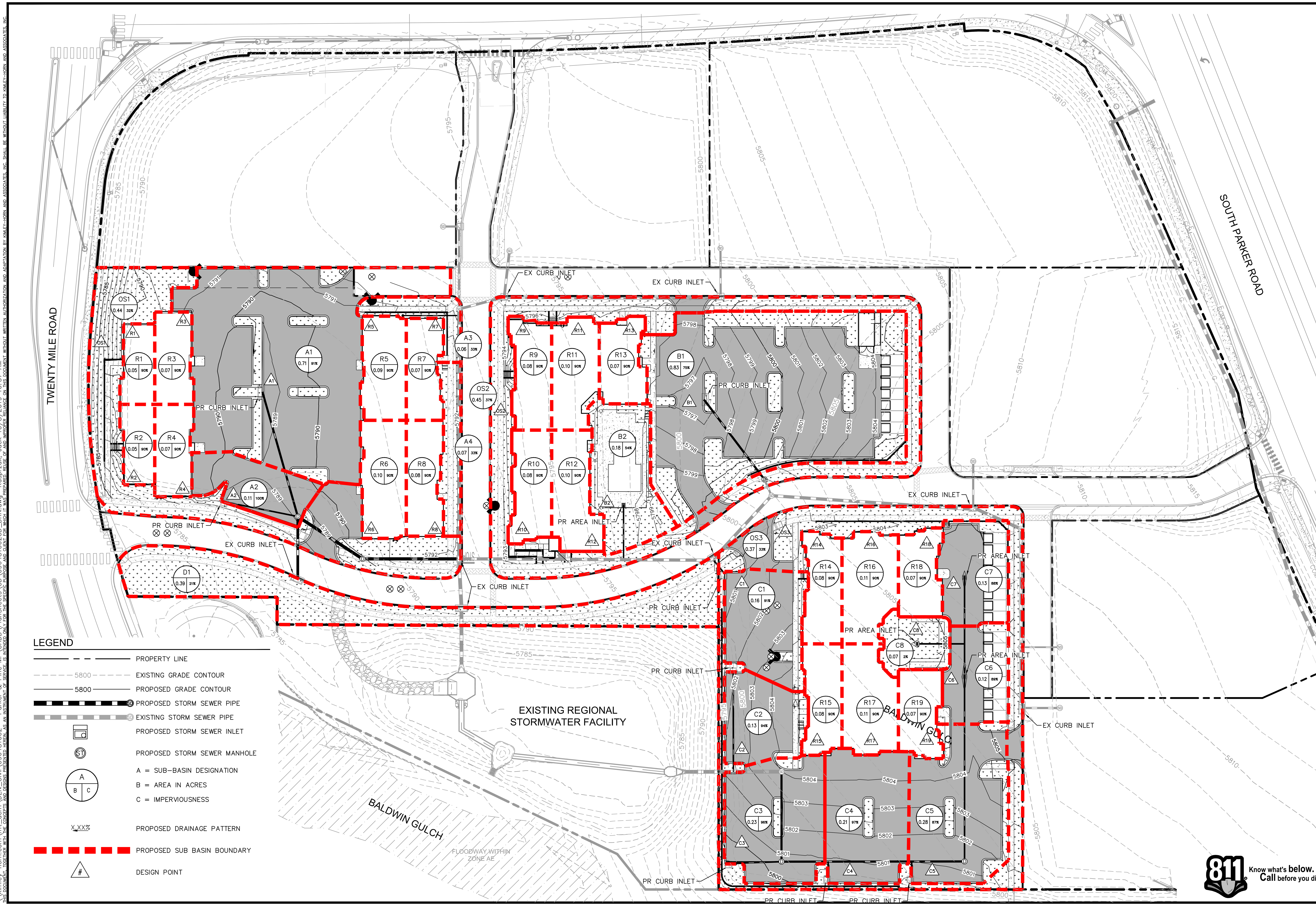
APPENDIX A



NO. | REVISION | BY | DATE | APPR.

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DESIGNED BY: DLS
DRAWN BY: JRK
CHECKED BY: DLS
DATE: 08/25/20

PARKER AND PINE MULTI-FAMILY
PARKER, CO
CONSTRUCTION DOCUMENTS
DRAINAGE MAP

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

PROJECT NO.
096481002

DRAWING NAME
096481002CD_DRN

DR 1

APPENDIX B

5. HYDROLOGIC CRITERIA

5.1 INTRODUCTION

This section presents the criteria and methodology for determining storm runoff design peaks and volumes to be used in the Town of Parker for preparation of storm drainage plans and facility design. In general, hydrologic analysis of the initial and major storm events for both the historic and fully developed site conditions is required. In addition to the hydrologic analysis for a site, a hydrologic analysis should be performed for all off site basins that impact the proposed site. The Town of Parker adopts procedures prescribed by the Urban Drainage and Flood Control District (UDFCD) for performing hydrologic analysis. These procedures may be found in the Rainfall and Runoff sections of the MANUAL. Standards and technical criteria found in the MANUAL should be followed except where superseded by specific requirements of this manual.

5.2 DESIGN RAINFALL

For any storm runoff technique, design rainfall must first be established. The design rainfall data to be used for the Town of Parker were obtained from NOAA Atlas 2, Precipitation– Frequency Atlas of the Western United States, Volume III– Colorado. The design storm events developed and utilized are the same as those used by UDFCD.

The one-hour point rainfall depths for different frequency events are shown in Table 5.1 herein. Rainfall intensity as a function of the one-hour point rainfall and the time of concentration can be approximated by the following equation which appears in the MANUAL as Equation RA-5.

$$I = (28.5P_1)/(10+t_c)^{0.786}$$

Where, I = rainfall intensity (in/hr)
P_1 = one-hour point rainfall depth (in)
t_c = time of concentration (min)

Graphical presentation of the equation is shown as the Time-Intensity-Frequency curves in Figure 5.1 herein. Rainfall intensity for use in the Rational Method may be taken from Figure 5.1 or calculated using the equation.

TABLE 5.1
ONE-HOUR POINT RAINFALL

Frequency of Design Event (yr)	One-hour Point Rainfall, P_1 (in)
2	0.99
5	1.39
10	1.64
25	1.98
50	2.31
100	2.60

5.3 FLOOD HYDROLOGY OVERVIEW

Various methods exist to determine appropriate flood peaks or hydrographs for storm drainage planning and design. Methods for determining flood peaks or hydrographs are the Rational Method, the Colorado Urban Hydrograph Procedure (CUHP), and Urban Drainage Stormwater Management (UDSWM) model. The Town of Parker discourages the use of computer models other than CUHP and UDSWM since these programs are preferred, if not required, by UDFCD for studies involving major drainageways where UDFCD approval is sought or where maintenance eligibility is requested.

The three methods are briefly described in this section, and a discussion of their applicability to the Town of Parker is discussed. UDSWM is mostly used to combine and route the hydrographs generated using CUHP.

In general, the Rational Method is the most widely used and accepted technique for determining peak flows in urban areas for small basins. Within the constraints outlined in the MANUAL, use of the Rational Method provides a relatively simple but effective way to analyze storm runoff.

CUHP is somewhat more complicated than the Rational Method. It allows a manual computation of a runoff hydrograph which may be used for further hydraulic routing through channels and/or detention ponds. Historically, CUHP is best used in urban areas for which runoff coefficients have been derived. However, recent improvements by UDFCD include consideration for different soil types, thus CUHP is now more applicable to rural areas. The reader is referred to UDFCD for the latest version of CUHP.

UDSWM is a computer model that generates runoff hydrographs and routes and combines these hydrographs. UDSWM is a modified version of the Runoff Block of the Environmental Protection Agency's Storm Water Management Model (SWMM). It has been modified to be used in conjunction with CUHP. Table 5.2 herein provides guidance on selecting the appropriate method for a given project.

Table 6-5. Runoff coefficients, *c*

Total or Effective % Impervious	NRCS Hydrologic Soil Group A						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.01	0.01	0.01	0.04	0.13	0.27
5%	0.02	0.02	0.02	0.03	0.07	0.15	0.29
10%	0.04	0.05	0.05	0.07	0.11	0.19	0.32
15%	0.07	0.08	0.08	0.1	0.15	0.23	0.35
20%	0.1	0.11	0.12	0.14	0.2	0.27	0.38
25%	0.14	0.15	0.16	0.19	0.24	0.3	0.42
30%	0.18	0.19	0.2	0.23	0.28	0.34	0.45
35%	0.21	0.23	0.24	0.27	0.32	0.38	0.48
40%	0.25	0.27	0.28	0.32	0.37	0.42	0.51
45%	0.3	0.31	0.33	0.36	0.41	0.46	0.54
50%	0.34	0.36	0.37	0.41	0.45	0.5	0.58
55%	0.39	0.4	0.42	0.45	0.49	0.54	0.61
60%	0.43	0.45	0.47	0.5	0.54	0.58	0.64
65%	0.48	0.5	0.51	0.54	0.58	0.62	0.67
70%	0.53	0.55	0.56	0.59	0.62	0.65	0.71
75%	0.58	0.6	0.61	0.64	0.66	0.69	0.74
80%	0.63	0.65	0.66	0.69	0.71	0.73	0.77
85%	0.68	0.7	0.71	0.74	0.75	0.77	0.8
90%	0.73	0.75	0.77	0.79	0.79	0.81	0.84
95%	0.79	0.81	0.82	0.83	0.84	0.85	0.87
100%	0.84	0.86	0.87	0.88	0.88	0.89	0.9
Total or Effective % Impervious	**NRCS Hydrologic Soil Group B**						
	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	0.1	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	0.5	0.59
20%	0.13	0.15	0.22	0.38	0.44	0.52	0.61
25%	0.17	0.19	0.26	0.41	0.47	0.54	0.63
30%	0.2	0.23	0.3	0.44	0.49	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	0.5	0.55	0.61	0.68
45%	0.33	0.36	0.42	0.53	0.58	0.64	0.7
50%	0.37	0.4	0.46	0.56	0.61	0.66	0.72
55%	0.42	0.45	0.5	0.6	0.63	0.68	0.74
60%	0.46	0.49	0.54	0.63	0.66	0.71	0.76
65%	0.5	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%	0.6	0.63	0.66	0.72	0.75	0.78	0.81
80%	0.64	0.67	0.7	0.75	0.77	0.8	0.83
85%	0.69	0.72	0.74	0.78	0.8	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	0.9

Rainfall Intensity

IDF - Intensity, Duration, Frequency Data

Time Intensity Frequency Tabulation

TIME	2 YR	5 YR	10 YR	100 YR
5	3.36	4.71	5.56	8.82
6	3.19	4.48	5.29	8.38
7	3.04	4.27	5.04	7.99
8	2.91	4.09	4.82	7.64
9	2.79	3.92	4.62	7.32
10	2.68	3.76	4.44	7.03
11	2.58	3.62	4.27	6.77
12	2.49	3.49	4.12	6.53
13	2.40	3.37	3.98	6.30
14	2.32	3.26	3.84	6.09
15	2.25	3.16	3.72	5.90
16	2.18	3.06	3.61	5.72
17	2.12	2.97	3.50	5.56
18	2.06	2.89	3.41	5.40
19	2.00	2.81	3.31	5.25
20	1.95	2.73	3.23	5.11
21	1.90	2.66	3.14	4.98
22	1.85	2.60	3.07	4.86
23	1.81	2.54	2.99	4.75
24	1.76	2.48	2.92	4.64
25	1.73	2.42	2.86	4.53
26	1.69	2.37	2.80	4.43
27	1.65	2.32	2.74	4.34
28	1.62	2.27	2.68	4.25
29	1.58	2.22	2.62	4.16
30	1.55	2.18	2.57	4.08
31	1.52	2.14	2.52	4.00
32	1.49	2.10	2.48	3.93
33	1.47	2.06	2.43	3.85
34	1.44	2.02	2.39	3.78
35	1.42	1.99	2.35	3.72
36	1.39	1.95	2.31	3.66
37	1.37	1.92	2.27	3.59
38	1.35	1.89	2.23	3.53
39	1.32	1.86	2.19	3.48
40	1.30	1.83	2.16	3.42
41	1.28	1.80	2.13	3.37
42	1.26	1.77	2.09	3.32
43	1.25	1.75	2.06	3.27
44	1.23	1.72	2.03	3.22
45	1.21	1.70	2.00	3.18
46	1.19	1.67	1.98	3.13
47	1.18	1.65	1.95	3.09
48	1.16	1.63	1.92	3.05
49	1.14	1.61	1.90	3.01
50	1.13	1.59	1.87	2.97
51	1.11	1.57	1.85	2.93
52	1.10	1.55	1.82	2.89
53	1.09	1.53	1.80	2.85
54	1.07	1.51	1.78	2.82
55	1.06	1.49	1.76	2.79
56	1.05	1.47	1.74	2.75
57	1.04	1.45	1.72	2.72
58	1.02	1.44	1.70	2.69
59	1.01	1.42	1.68	2.66
60	1.00	1.40	1.66	2.63

Note:
Intensity values utilized as published within the Town of Parker Storm Drainage Criteria Manual, Table 5.1

Time Intensity Frequency Tabulation

TIME	2 YR	5 YR	10 YR	100 YR
5	3.36	4.71	5.56	8.82
6	3.19	4.48	5.29	8.38
7	3.04	4.27	5.04	7.99
8	2.91	4.09	4.82	7.64
9	2.79	3.92	4.62	7.32
10	2.68	3.76	4.44	7.03
11	2.58	3.62	4.27	6.77
12	2.49	3.49	4.12	6.53
13	2.40	3.37	3.98	6.30
14	2.32	3.26	3.84	6.09
15	2.25	3.16	3.72	5.90
16	2.18	3.06	3.61	5.72
17	2.12	2.97	3.50	5.56
18	2.06	2.89	3.41	5.40
19	2.00	2.81	3.31	5.25
20	1.95	2.73	3.23	5.11
21	1.90	2.66	3.14	4.98
22	1.85	2.60	3.07	4.86
23	1.81	2.54	2.99	4.75
24	1.76	2.48	2.92	4.64
25	1.73	2.42	2.86	4.53
26	1.69	2.37	2.80	4.43
27	1.65	2.32	2.74	4.34
28	1.62	2.27	2.68	4.25
29	1.58	2.22	2.62	4.16
30	1.55	2.18	2.57	4.08
31	1.52	2.14	2.52	4.00
32	1.49	2.10	2.48	3.93
33	1.47	2.06	2.43	3.85
34	1.44	2.02	2.39	3.78
35	1.42	1.99	2.35	3.72
36	1.39	1.95	2.31	3.66
37	1.37	1.92	2.27	3.59
38	1.35	1.89	2.23	3.53
39	1.32	1.86	2.19	3.48
40	1.30	1.83	2.16	3.42
41	1.28	1.80	2.13	3.37
42	1.26	1.77	2.09	3.32
43	1.25	1.75	2.06	3.27
44	1.23	1.72	2.03	3.22
45	1.21	1.70	2.00	3.18
46	1.19	1.67	1.98	3.13
47	1.18	1.65	1.95	3.09
48	1.16	1.63	1.92	3.05
49	1.14	1.61	1.90	3.01
50	1.13	1.59	1.87	2.97
51	1.11	1.57	1.85	2.93
52	1.10	1.55	1.82	2.89
53	1.09	1.53	1.80	2.85
54	1.07	1.51	1.78	2.82
55	1.06	1.49	1.76	2.79
56	1.05	1.47	1.74	2.75
57	1.04	1.45	1.72	2.72
58	1.02	1.44	1.70	2.69
59	1.01	1.42	1.68	2.66
60	1.00	1.40	1.66	2.63

Kimley»Horn

STANDARD FORM SF-1

RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION

PROJECT NAME: PARKER AND PINE MULTI-FAMILY — 8/26/2020
PROJECT NUMBER: 96481002
CALCULATED BY: JK
CHECKED BY: DS

SOIL: B

LAND USE:	PAVEMENT AREA	ROOF AREA	LANDSCAPE AREA
2-YEAR COEFF.	0.84	0.73	0.01
5-YEAR COEFF.	0.86	0.77	0.01
100-YEAR COEFF.	0.89	0.81	0.13
IMPERVIOUS %	100%	90%	2%

DESIGN BASIN	DESIGN POINT	PAVEMENT AREA (AC)	ROOF AREA (AC)	LANDSCAPE AREA (AC)	TOTAL AREA (AC)	C(2)	C(5)	C(100)	Imp %
On-Site Basins									
A1	A1	0.65	0.00	0.07	**0.71**	0.76	0.78	0.82	91%
A2	A2	0.11	0.00	0.00	**0.11**	0.84	0.86	0.89	100%
A3	A3	0.02	0.00	0.04	**0.06**	0.27	0.28	0.37	33%
A4	A4	0.02	0.00	0.04	**0.07**	0.27	0.28	0.37	33%
B1	B1	0.59	0.03	0.21	**0.83**	0.63	0.65	0.70	75%
B2	B2	0.09	0.00	0.08	**0.18**	0.45	0.46	0.53	54%
C1	C1	0.15	0.00	0.02	**0.16**	0.76	0.78	0.82	91%
C2	C2	0.12	0.00	0.01	**0.13**	0.79	0.81	0.85	94%
C3	C3	0.22	0.00	0.01	**0.23**	0.80	0.82	0.86	96%
C4	C4	0.20	0.00	0.01	**0.21**	0.81	0.83	0.87	97%
C5	C5	0.24	0.00	0.04	**0.28**	0.73	0.75	0.79	87%
C6	C6	0.07	0.04	0.01	**0.12**	0.74	0.76	0.80	89%
C7	C7	0.08	0.04	0.01	**0.13**	0.73	0.76	0.80	88%
C8	C8	0.00	0.00	0.07	**0.07**	0.01	0.01	0.13	2%
D1	D1	0.07	0.00	0.31	**0.39**	0.17	0.17	0.28	21%
R1	R1	0.00	0.05	0.00	**0.05**	0.73	0.77	0.81	90%
R2	R2	0.00	0.05	0.00	**0.05**	0.73	0.77	0.81	90%
R3	R3	0.00	0.07	0.00	**0.07**	0.73	0.77	0.81	90%
R4	R4	0.00	0.07	0.00	**0.07**	0.73	0.77	0.81	90%
R5	R5	0.00	0.09	0.00	**0.09**	0.73	0.77	0.81	90%

Kimley»Horn

STANDARD FORM SF-1
RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION

PROJECT NAME: PARKER AND PINE MULTI-FAMILY 8/26/2020
PROJECT NUMBER: 96481002
CALCULATED BY: JK
CHECKED BY: DS

SOIL: B

LAND USE:	PAVEMENT AREA	ROOF AREA	LANDSCAPE AREA
2-YEAR COEFF.	0.84	0.73	0.01
5-YEAR COEFF.	0.86	0.77	0.01
100-YEAR COEFF.	0.89	0.81	0.13
IMPERVIOUS %	100%	90%	2%

DESIGN BASIN	DESIGN POINT	PAVEMENT AREA (AC)	ROOF AREA (AC)	LANDSCAPE AREA (AC)	TOTAL AREA (AC)	C(2)	C(5)	C(100)	Imp %
R6	R6	0.00	0.10	0.00	**0.10**	0.73	0.77	0.81	90%
R7	R7	0.00	0.07	0.00	**0.07**	0.73	0.77	0.81	90%
R8	R8	0.00	0.08	0.00	**0.08**	0.73	0.77	0.81	90%
R9	R9	0.00	0.08	0.00	**0.08**	0.73	0.77	0.81	90%
R10	R10	0.00	0.08	0.00	**0.08**	0.73	0.77	0.81	90%
R11	R11	0.00	0.10	0.00	**0.10**	0.73	0.77	0.81	90%
R12	R12	0.00	0.10	0.00	**0.10**	0.73	0.77	0.81	90%
R13	R13	0.00	0.07	0.00	**0.07**	0.73	0.77	0.81	90%
R14	R14	0.00	0.08	0.00	**0.08**	0.73	0.77	0.81	90%
R15	R15	0.00	0.08	0.00	**0.08**	0.73	0.77	0.81	90%
R16	R16	0.00	0.11	0.00	**0.11**	0.73	0.77	0.81	90%
R17	R17	0.00	0.11	0.00	**0.11**	0.73	0.77	0.81	90%
R18	R18	0.00	0.07	0.00	**0.07**	0.73	0.77	0.81	90%
R19	R19	0.00	0.07	0.00	**0.07**	0.73	0.77	0.81	90%
		2.64	**1.63**	**0.92**	**5.18**	0.66	0.68	0.73	80%
BASIN SUBTOTAL		**51%**	**31%**	**18%**	**100%**				
Off-Site Basins									
OS1	OS1	0.13	0.00	0.30	**0.44**	0.26	0.27	0.36	32%
OS2	OS2	0.16	0.00	0.29	**0.45**	0.31	0.31	0.40	37%
OS3	OS3	0.12	0.00	0.25	**0.37**	0.28	0.28	0.37	33%
		0.41	**0.00**	**0.85**	**1.26**	0.28	0.29	0.38	34%

Kimley»Horn

STANDARD FORM SF-1
RUNOFF COEFFICIENTS - IMPERVIOUS CALCULATION

PROJECT NAME: PARKER AND PINE MULTI-FAMILY — 8/26/2020
PROJECT NUMBER: 96481002
CALCULATED BY: JK
CHECKED BY: DS

SOIL: B

LAND USE:	PAVEMENT AREA	ROOF AREA	LANDSCAPE AREA
2-YEAR COEFF.	0.84	0.73	0.01
5-YEAR COEFF.	0.86	0.77	0.01
100-YEAR COEFF.	0.89	0.81	0.13
IMPERVIOUS %	100%	90%	2%

DESIGN BASIN	DESIGN POINT	PAVEMENT AREA (AC)	ROOF AREA (AC)	LANDSCAPE AREA (AC)	TOTAL AREA (AC)	C(2)	C(5)	C(100)	Imp %
BASIN SUBTOTAL		**33%**	**0%**	**67%**	**100%**				

Kimley»Horn

STANDARD FORM SF-2
Time of Concentration

PROJECT NAME: PARKER AND PINE MULTI-FAMILY
PROJECT NUMBER: 96481002
CALCULATED BY: JK
CHECKED BY: DS

DATE: 8/26/2020

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																
A1	0.714	0.782	25	2.0%	2.3						2.3	25	2.0%	91%	10.7	5.0
A2	0.111	0.860	25	2.0%	1.7						1.7	25	2.0%	100%	9.1	5.0
A3	0.055	0.276	25	2.0%	6.0						6.0	25	2.0%	33%	20.7	5.0
A4	0.065	0.279	25	2.0%	6.0						6.0	25	2.0%	33%	20.6	5.0
B1	0.827	0.645	25	5.0%	2.4						2.4	25	5.0%	75%	13.3	5.0
B2	0.175	0.460	25	2.0%	4.7						4.7	25	2.0%	54%	17.0	5.0
C1	0.164	0.779	25	3.0%	2.0						2.0	25	3.0%	91%	10.7	5.0
C2	0.127	0.810	25	4.0%	1.7						1.7	25	4.0%	94%	10.1	5.0
C3	0.226	0.823	25	4.0%	1.6						1.6	25	4.0%	96%	9.8	5.0
C4	0.209	0.834	25	4.0%	1.5						1.5	25	4.0%	97%	9.6	5.0
C5	0.280	0.750	25	4.0%	2.0						2.0	25	4.0%	87%	11.2	5.0
C6	0.122	0.763	25	4.0%	1.9						1.9	25	4.0%	89%	11.0	5.0
C7	0.135	0.758	25	4.0%	2.0						2.0	25	4.0%	88%	11.1	5.0
C8	0.072	0.010	25	2.0%	7.9						7.9	25	2.0%	2%	26.0	5.0
D1	0.387	0.174	25	2.0%	6.7						6.7	25	2.0%	21%	22.7	5.0
R1	0.050	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R2	0.050	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R3	0.066	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R4	0.066	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R5	0.088	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R6	0.101	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R7	0.069	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R8	0.079	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R9	0.082	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R10	0.084	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R11	0.096	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R12	0.098	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R13	0.072	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R14	0.079	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R15	0.078	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R16	0.109	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R17	0.108	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R18	0.069	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
R19	0.069	0.770	25	2.0%	2.4						2.4	25	2.0%	90%	10.8	5.0
Off-Site Basins																
OS1	0.44	0.27	25	2.0%	6.1						6.1	25	2.0%	32%	20.9	5.0
OS2	0.45	0.31	25	2.0%	5.7						5.7	25	2.0%	37%	19.9	5.0
OS3	0.37	0.28	25	2.0%	6.0						6.0	25	2.0%	33%	20.5	5.0

STANDARD FORM SF-2
Time of Concentration

PROJECT NAME: PARKER AND PINE MULTI-FAMILY
PROJECT NUMBER: 96481002
CALCULATED BY: JK
CHECKED BY: DS

DATE: 8/26/2020

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.

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

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

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

Kimley»Horn

STANDARD FORM SF-3
STORM DRAINAGE DESIGN - RATIONAL METHOD 2 YEAR EVENT

PROJECT NAME: PARKER AND PINE MULTI-FAMILY
PROJECT NUMBER: 96481002
CALCULATED BY: JK
CHECKED BY: DS

P_1 (1-Hour Rainfall) = 0.99

DATE: 8/26/2020

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
STORM LINE	DESIGN POINT	DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY	tt (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																					
	A1	A1	0.71	0.76	5.00	0.55	3.36	1.83													
	A2	A2	0.11	0.84	5.00	0.09	3.36	0.31													
	A3	A3	0.06	0.27	5.00	0.01	3.36	0.05													
	A4	A4	0.07	0.27	5.00	0.02	3.36	0.06													
	B1	B1	0.83	0.63	5.00	0.52	3.36	1.75													
	B2	B2	0.18	0.45	5.00	0.08	3.36	0.26													
	C1	C1	0.16	0.76	5.00	0.12	3.36	0.42													
	C2	C2	0.13	0.79	5.00	0.10	3.36	0.34													
	C3	C3	0.23	0.80	5.00	0.18	3.36	0.61													
	C4	C4	0.21	0.81	5.00	0.17	3.36	0.57													
	C5	C5	0.28	0.73	5.00	0.21	3.36	0.69													
	C6	C6	0.12	0.74	5.00	0.09	3.36	0.30													
	C7	C7	0.13	0.73	5.00	0.10	3.36	0.33													
	C8	C8	0.07	0.01	5.00	0.00	3.36	0.00													
	D1	D1	0.39	0.17	5.00	0.07	3.36	0.22													
	R1	R1	0.05	0.73	5.00	0.04	3.36	0.12													
	R2	R2	0.05	0.73	5.00	0.04	3.36	0.12													
	R3	R3	0.07	0.73	5.00	0.05	3.36	0.16													
	R4	R4	0.07	0.73	5.00	0.05	3.36	0.16													
	R5	R5	0.09	0.73	5.00	0.06	3.36	0.22													
	R6	R6	0.10	0.73	5.00	0.07	3.36	0.25													
	R7	R7	0.07	0.73	5.00	0.05	3.36	0.17													
	R8	R8	0.08	0.73	5.00	0.06	3.36	0.19													
	R9	R9	0.08	0.73	5.00	0.06	3.36	0.20													
	R10	R10	0.08	0.73	5.00	0.06	3.36	0.21													
	R11	R11	0.10	0.73	5.00	0.07	3.36	0.23													
	R12	R12	0.10	0.73	5.00	0.07	3.36	0.24													
	R13	R13	0.07	0.73	5.00	0.05	3.36	0.18													
	R14	R14	0.08	0.73	5.00	0.06	3.36	0.19													
	R15	R15	0.08	0.73	5.00	0.06	3.36	0.19													
	R16	R16	0.11	0.73	5.00	0.08	3.36	0.27													
	R17	R17	0.11	0.73	5.00	0.08	3.36	0.26													
	R18	R18	0.07	0.73	5.00	0.05	3.36	0.17													
	R19	R19	0.07	0.73	5.00	0.05	3.36	0.17													
Off-Site Basins																					
	OS1	OS1	0.44	0.26	5.00	0.113	3.36	0.38													
	OS2	OS2	0.45	0.31	5.00	0.139	3.36	0.47													
	OS3	OS3	0.37	0.28	5.00	0.101	3.36	0.34													

Kimley»Horn

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

PROJECT NAME: PARKER AND PINE MULTI-FAMILY

DATE: 8/26/2020

PROJECT NUMBER: 96481002

P_1 (1-Hour Rainfall) = **1.39**

CALCULATED BY: JK

CHECKED BY: DS

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
STORM LINE	DESIGN POINT	DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCIT Y	tt (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																					
	A1	A1	0.71	0.78	5.00	0.56	4.71	2.63													
	A2	A2	0.11	0.86	5.00	0.10	4.71	0.45													
	A3	A3	0.06	0.28	5.00	0.02	4.71	0.07													
	A4	A4	0.07	0.28	5.00	0.02	4.71	0.09													
	B1	B1	0.83	0.65	5.00	0.53	4.71	2.52													
	B2	B2	0.18	0.46	5.00	0.08	4.71	0.38													
	C1	C1	0.16	0.78	5.00	0.13	4.71	0.60													
	C2	C2	0.13	0.81	5.00	0.10	4.71	0.48													
	C3	C3	0.23	0.82	5.00	0.19	4.71	0.88													
	C4	C4	0.21	0.83	5.00	0.17	4.71	0.82													
	C5	C5	0.28	0.75	5.00	0.21	4.71	0.99													
	C6	C6	0.12	0.76	5.00	0.09	4.71	0.44													
	C7	C7	0.13	0.76	5.00	0.10	4.71	0.48													
	C8	C8	0.07	0.01	5.00	0.00	4.71	0.00													
	D1	D1	0.39	0.17	5.00	0.07	4.71	0.32													
	R1	R1	0.05	0.78	5.00	0.04	4.71	0.18													
	R2	R2	0.05	0.77	5.00	0.04	4.71	0.18													
	R3	R3	0.07	0.77	5.00	0.05	4.71	0.24													
	R4	R4	0.07	0.77	5.00	0.05	4.71	0.24													
	R5	R5	0.09	0.77	5.00	0.07	4.71	0.32													
	R6	R6	0.10	0.77	5.00	0.08	4.71	0.37													
	R7	R7	0.07	0.77	5.00	0.05	4.71	0.25													
	R8	R8	0.08	0.77	5.00	0.06	4.71	0.29													
	R9	R9	0.08	0.77	5.00	0.06	4.71	0.30													
	R10	R10	0.08	0.77	5.00	0.06	4.71	0.30													
	R11	R11	0.10	0.77	5.00	0.07	4.71	0.35													
	R12	R12	0.10	0.77	5.00	0.08	4.71	0.36													
	R13	R13	0.07	0.77	5.00	0.06	4.71	0.26													
	R14	R14	0.08	0.77	5.00	0.06	4.71	0.29													
	R15	R15	0.08	0.77	5.00	0.06	4.71	0.28													
	R16	R16	0.11	0.77	5.00	0.08	4.71	0.40													
	R17	R17	0.11	0.77	5.00	0.08	4.71	0.39													
	R18	R18	0.07	0.77	5.00	0.05	4.71	0.25													
	R19	R19	0.07	0.77	5.00	0.05	4.71	0.25													
Off-Site Basins																					
	OS1	OS1	0.44	0.27	5.00	0.116	4.71	0.55													
	OS2	OS2	0.45	0.31	5.00	0.142	4.71	0.67													
	OS3	OS3	0.37	0.28	5.00	0.104	4.71	0.49													

Kimley»Horn

STANDARD FORM SF-3

STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: PARKER AND PINE MULTI-FAMILY DATE: 8/26/2020

PROJECT NUMBER: 96481002 **P_1 (1-Hour Rainfall) =** **2.6**

CALCULATED BY: JK

CHECKED BY: DS

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
STORM LINE	DESIGN POINT	DESIGN BASIN	AREA (AC)	RUNOFF COEFF	tc (min)	C*A(ac)	I (in/hr)	Q (cfs)	tc(max)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCIT Y	tt (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																					
	A1	A1	0.71	0.82	5.00	0.59	8.82	5.16													
	A2	A2	0.11	0.89	5.00	0.10	8.82	0.87													
	A3	A3	0.06	0.37	5.00	0.02	8.82	0.18													
	A4	A4	0.07	0.37	5.00	0.02	8.82	0.21													
	B1	B1	0.83	0.70	5.00	0.58	8.82	5.09													
	B2	B2	0.18	0.53	5.00	0.09	8.82	0.82													
	C1	C1	0.16	0.82	5.00	0.13	8.82	1.18													
	C2	C2	0.13	0.85	5.00	0.11	8.82	0.94													
	C3	C3	0.23	0.86	5.00	0.19	8.82	1.71													
	C4	C4	0.21	0.87	5.00	0.18	8.82	1.60													
	C5	C5	0.28	0.79	5.00	0.22	8.82	1.95													
	C6	C6	0.12	0.80	5.00	0.10	8.82	0.86													
	C7	C7	0.13	0.80	5.00	0.11	8.82	0.95													
	C8	C8	0.07	0.13	5.00	0.01	8.82	0.08													
	D1	D1	0.39	0.28	5.00	0.11	8.82	0.94													
	R1	R1	0.05	0.81	5.00	0.04	8.82	0.36													
	R2	R2	0.05	0.81	5.00	0.04	8.82	0.36													
	R3	R3	0.07	0.81	5.00	0.05	8.82	0.47													
	R4	R4	0.07	0.81	5.00	0.05	8.82	0.47													
	R5	R5	0.09	0.81	5.00	0.07	8.82	0.63													
	R6	R6	0.10	0.81	5.00	0.08	8.82	0.72													
	R7	R7	0.07	0.81	5.00	0.06	8.82	0.50													
	R8	R8	0.08	0.81	5.00	0.06	8.82	0.57													
	R9	R9	0.08	0.81	5.00	0.07	8.82	0.59													
	R10	R10	0.08	0.81	5.00	0.07	8.82	0.60													
	R11	R11	0.10	0.81	5.00	0.08	8.82	0.68													
	R12	R12	0.10	0.81	5.00	0.08	8.82	0.70													
	R13	R13	0.07	0.81	5.00	0.06	8.82	0.51													
	R14	R14	0.08	0.81	5.00	0.06	8.82	0.56													
	R15	R15	0.08	0.81	5.00	0.06	8.82	0.56													
	R16	R16	0.11	0.81	5.00	0.09	8.82	0.78													
	R17	R17	0.11	0.81	5.00	0.09	8.82	0.77													
	R18	R18	0.07	0.81	5.00	0.06	8.82	0.50													
	R19	R19	0.07	0.81	5.00	0.06	8.82	0.50													
Off-Site Basins																					
	OS1	OS1	0.44	0.36	5.00	0.16	8.82	1.38													
	OS2	OS2	0.45	0.40	5.00	0.18	8.82	1.60													
	OS3	OS3	0.37	0.37	5.00	0.14	8.82	1.21													

Kimley»Horn

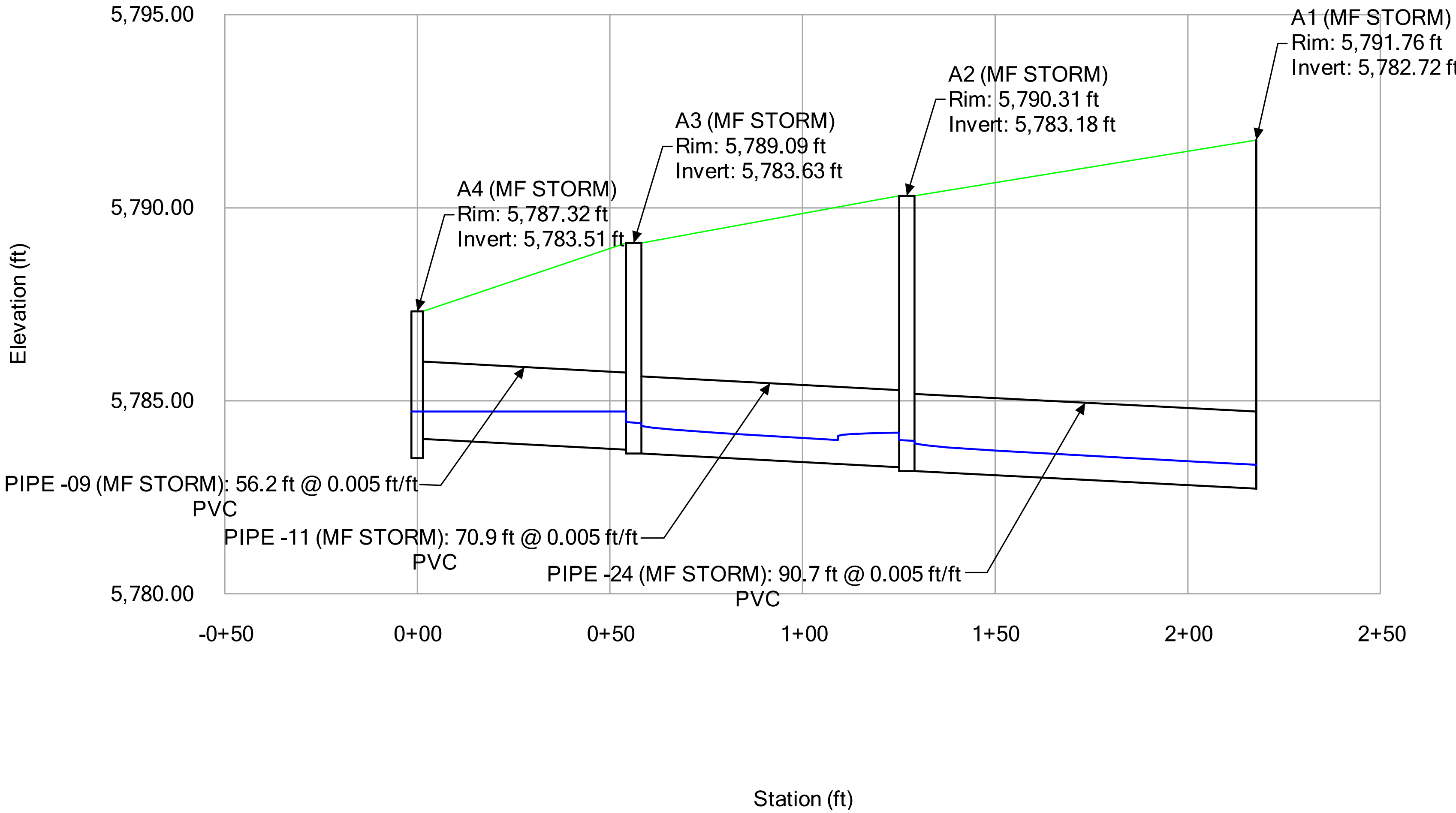
PROJECT NAME: PARKER AND PINE MULTI-FAMIL DATE: 8/26/2020
PROJECT NUMBER: 96481002
CALCULATED BY: JK
CHECKED BY: DS

RATIONAL CALCULATIONS SUMMARY

DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (AC)	PEAK FLOWS (CFS)		
			Q2	Q5	Q100
On-Site Basins					
A1	A1	0.71	1.83	2.63	5.16
A2	A2	0.11	0.31	0.45	0.87
A3	A3	0.06	0.05	0.07	0.18
A4	A4	0.07	0.06	0.09	0.21
B1	B1	0.83	1.75	2.52	5.09
B2	B2	0.18	0.26	0.38	0.82
C1	C1	0.16	0.42	0.60	1.18
C2	C2	0.13	0.34	0.48	0.94
C3	C3	0.23	0.61	0.88	1.71
C4	C4	0.21	0.57	0.82	1.60
C5	C5	0.28	0.69	0.99	1.95
C6	C6	0.12	0.30	0.44	0.86
C7	C7	0.13	0.33	0.48	0.95
C8	C8	0.07	0.00	0.00	0.08
D1	D1	0.39	0.22	0.32	0.94
R1	R1	0.05	0.12	0.18	0.36
R2	R2	0.05	0.12	0.18	0.36
R3	R3	0.07	0.16	0.24	0.47
R4	R4	0.07	0.16	0.24	0.47
R5	R5	0.09	0.22	0.32	0.63
R6	R6	0.10	0.25	0.37	0.72
R7	R7	0.07	0.17	0.25	0.50
R8	R8	0.08	0.19	0.29	0.57
R9	R9	0.08	0.20	0.30	0.59
R10	R10	0.08	0.21	0.30	0.60
R11	R11	0.10	0.23	0.35	0.68
R12	R12	0.10	0.24	0.36	0.70
R13	R13	0.07	0.18	0.26	0.51
R14	R14	0.08	0.19	0.29	0.56
R15	R15	0.08	0.19	0.28	0.56
R16	R16	0.11	0.27	0.40	0.78
R17	R17	0.11	0.26	0.39	0.77
R18	R18	0.07	0.17	0.25	0.50
R19	R19	0.07	0.17	0.00	0.50
TOTAL		**5.18**	11.46	16.40	33.38
Off-Site Basins					
OS1	OS1	0.44	0.38	0.55	1.38
OS2	OS2	0.45	0.47	0.67	1.60
OS3	OS3	0.37	0.34	0.49	1.21
TOTAL		**1.26**	**1.19**	**1.71**	**4.20**

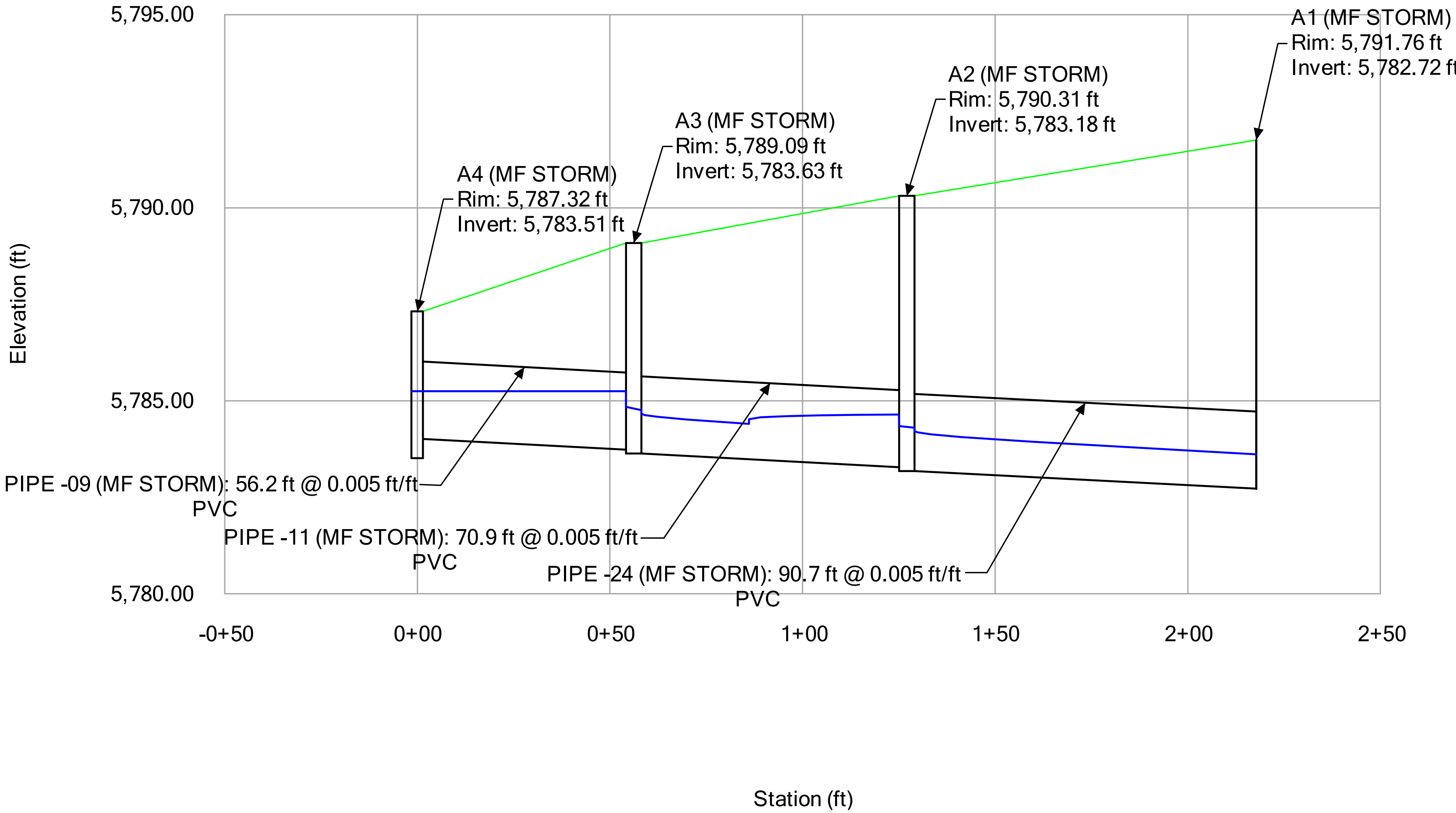
5 - YEAR

Profile Report
Engineering Profile - A1 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

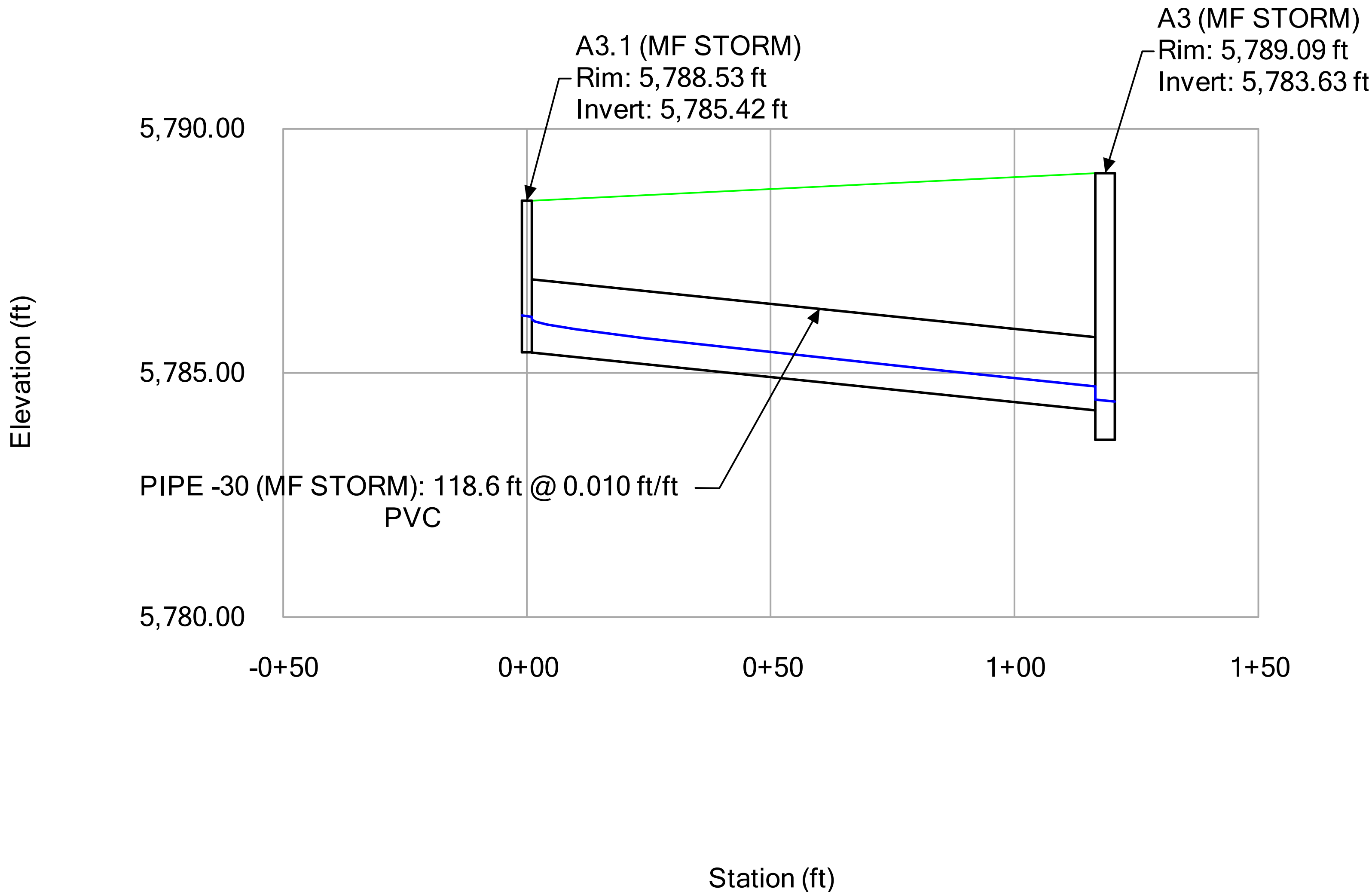
Profile Report
Engineering Profile - A1 (Parker and Pine MF StormCAD_2020.0823.stsw)



5 - YEAR

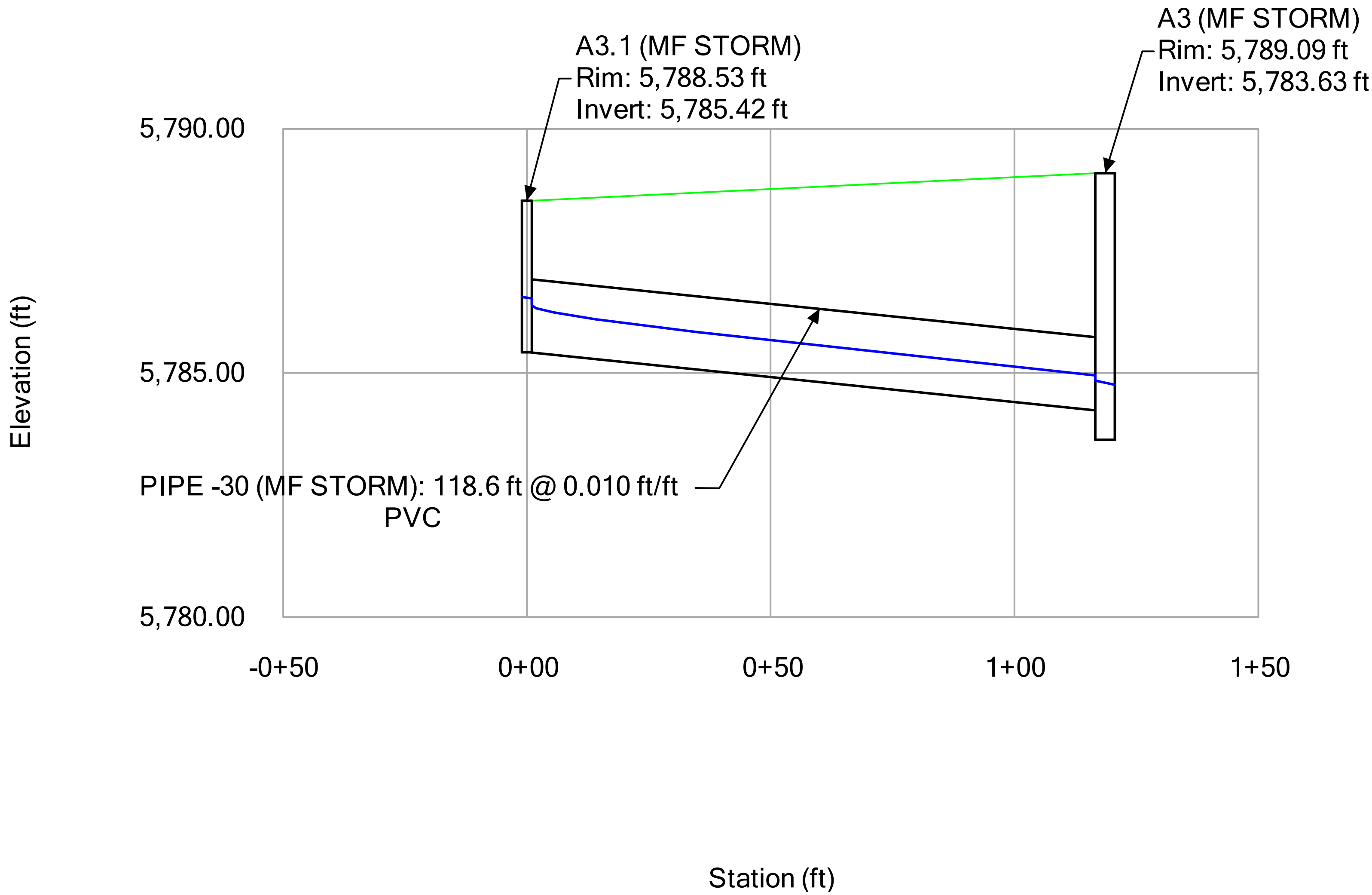
Profile Report

Engineering Profile - A2 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

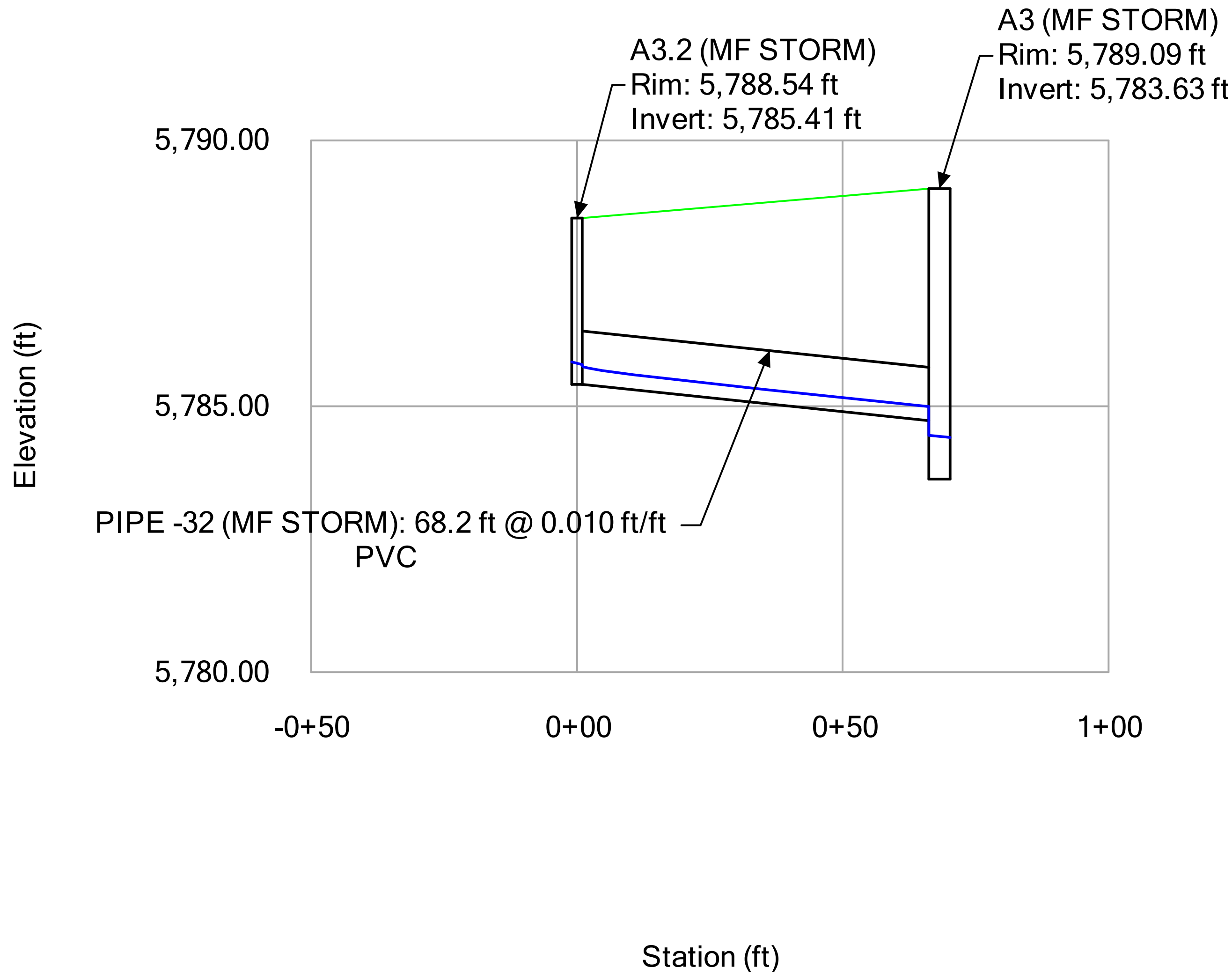
Profile Report
Engineering Profile - A2 (Parker and Pine MF StormCAD_2020.0823.stsw)



5 - YEAR

Profile Report

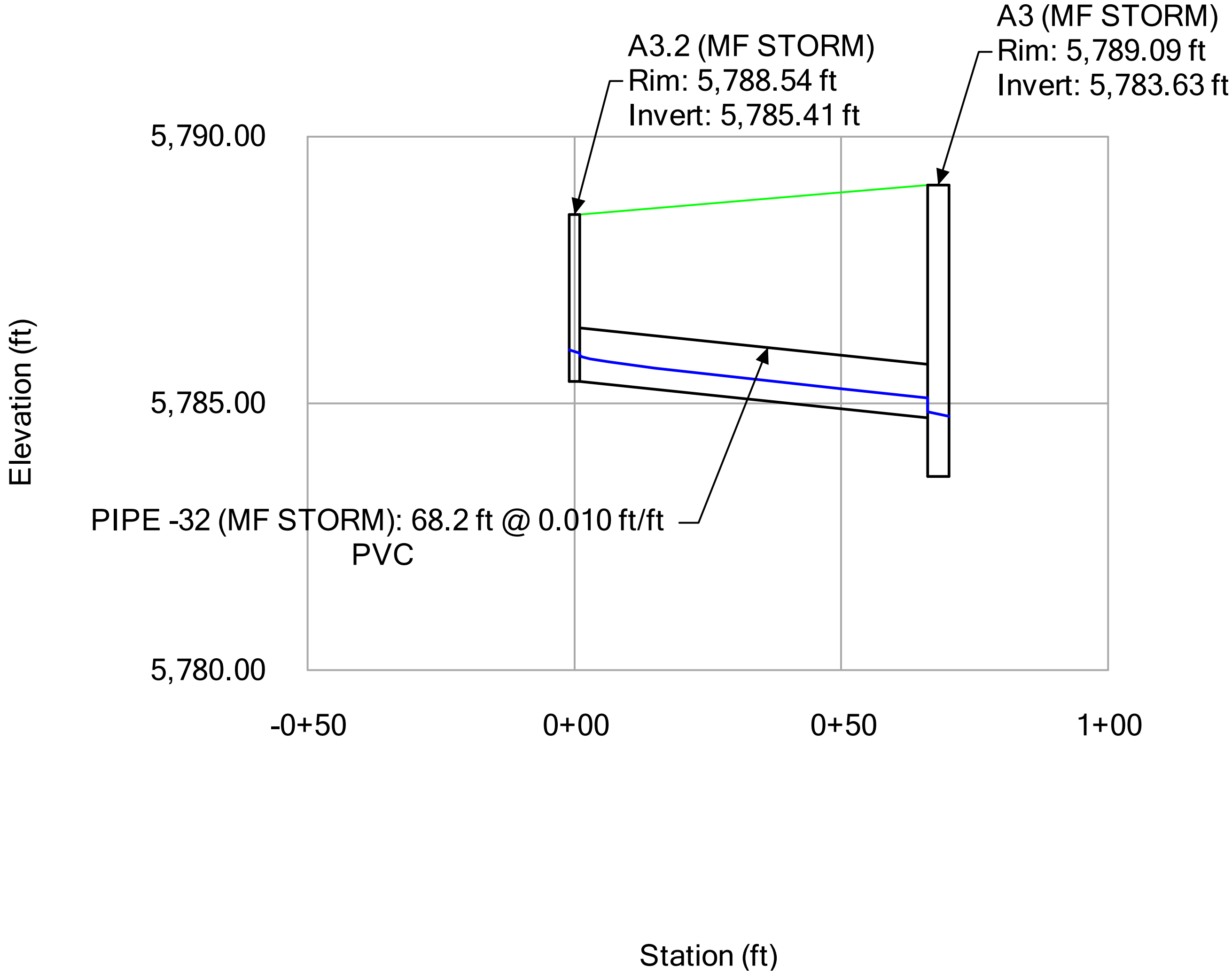
Engineering Profile - A3 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

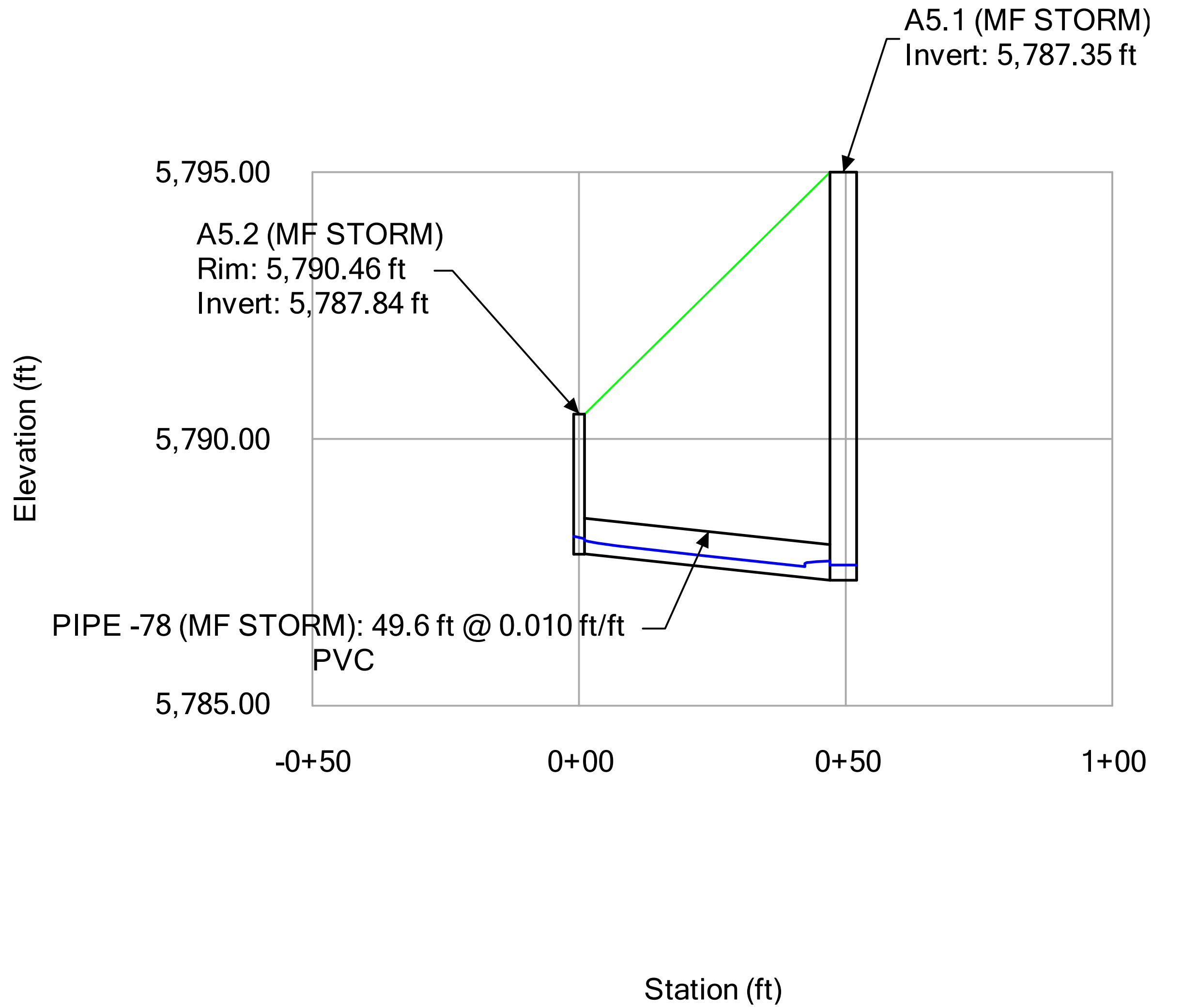
Profile Report

Engineering Profile - A3 (Parker and Pine MF StormCAD_2020.0823.stsw)



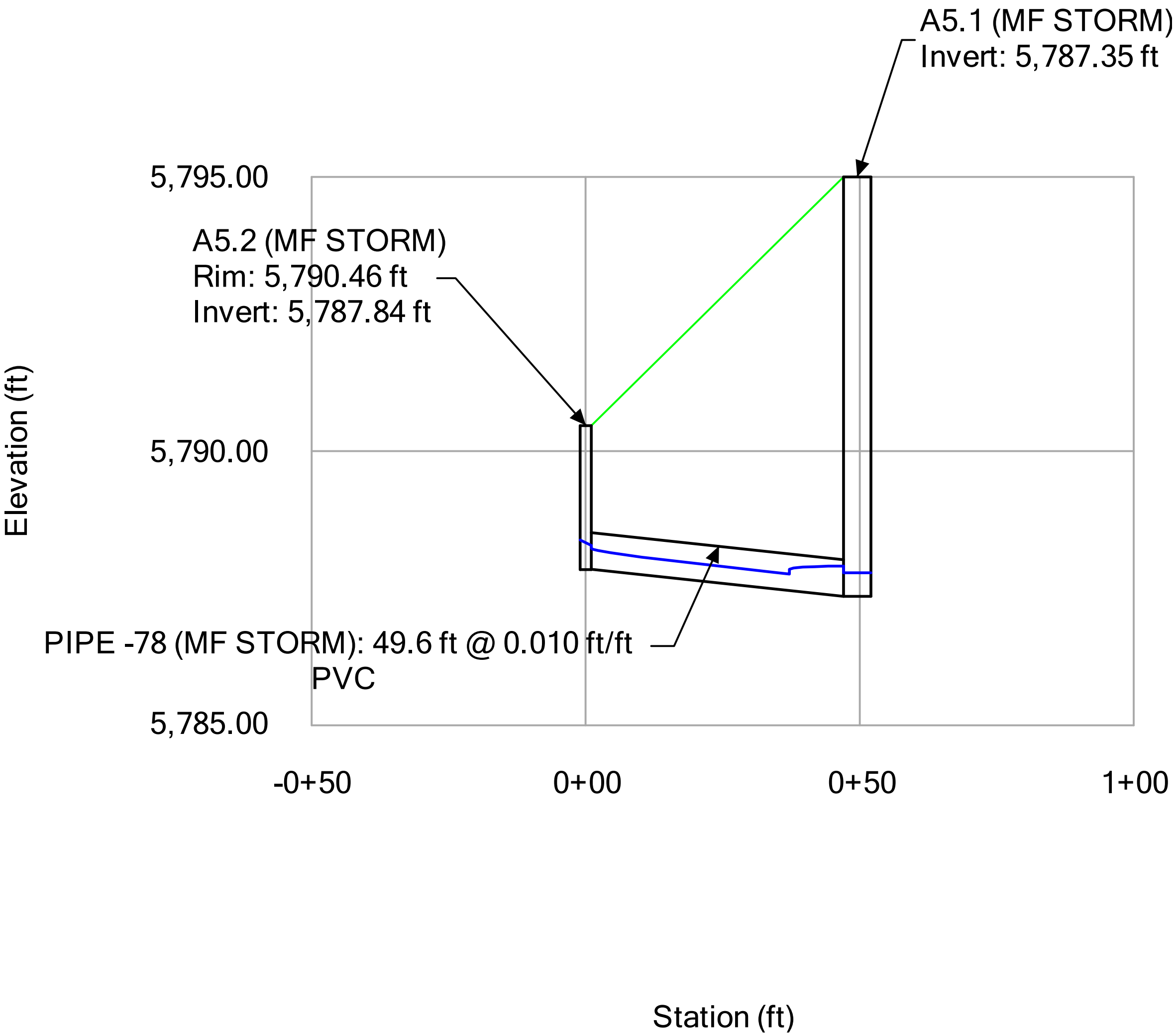
5 - YEAR

Profile Report
Engineering Profile - A4 (Parker and Pine MF StormCAD_2020.0823.stsw)



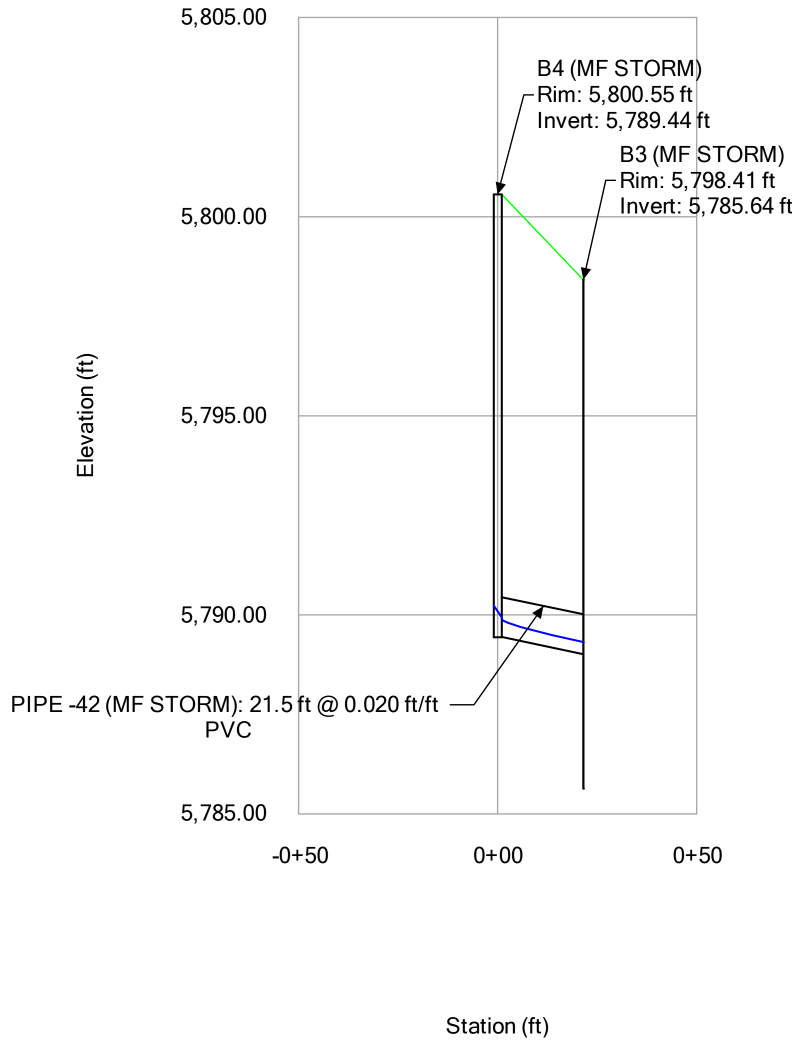
100 - YEAR

Profile Report
Engineering Profile - A4 (Parker and Pine MF StormCAD_2020.0823.stsw)



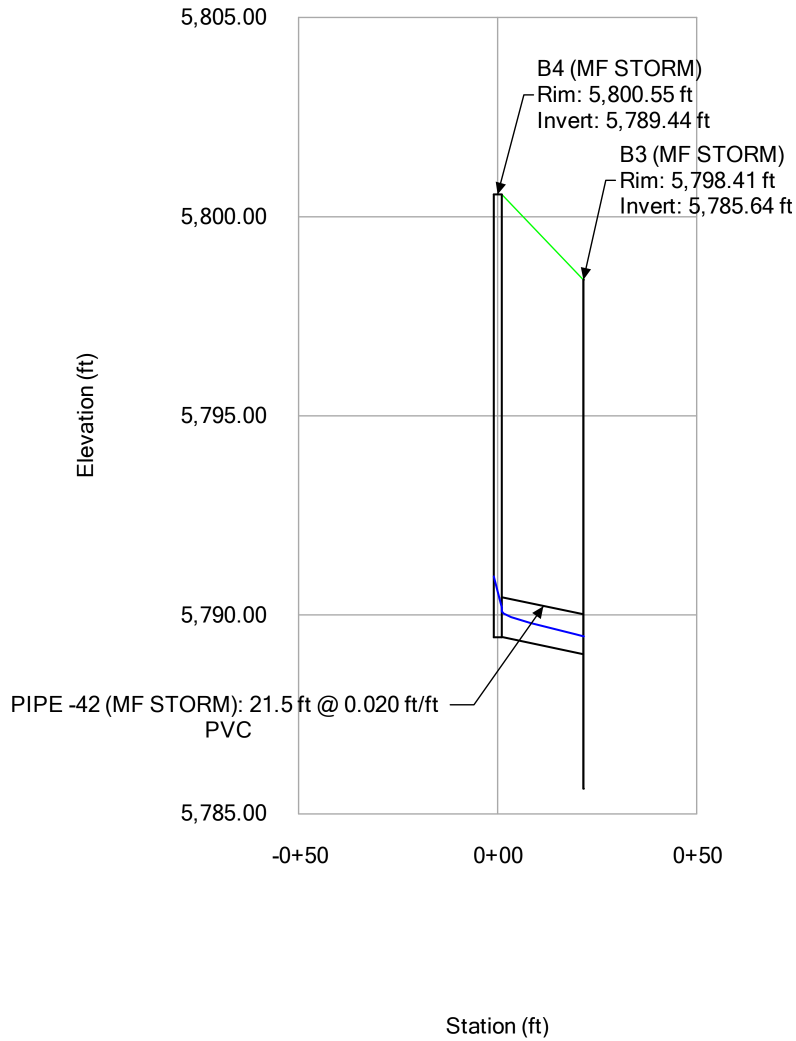
5 - YEAR

Profile Report
Engineering Profile - B1 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

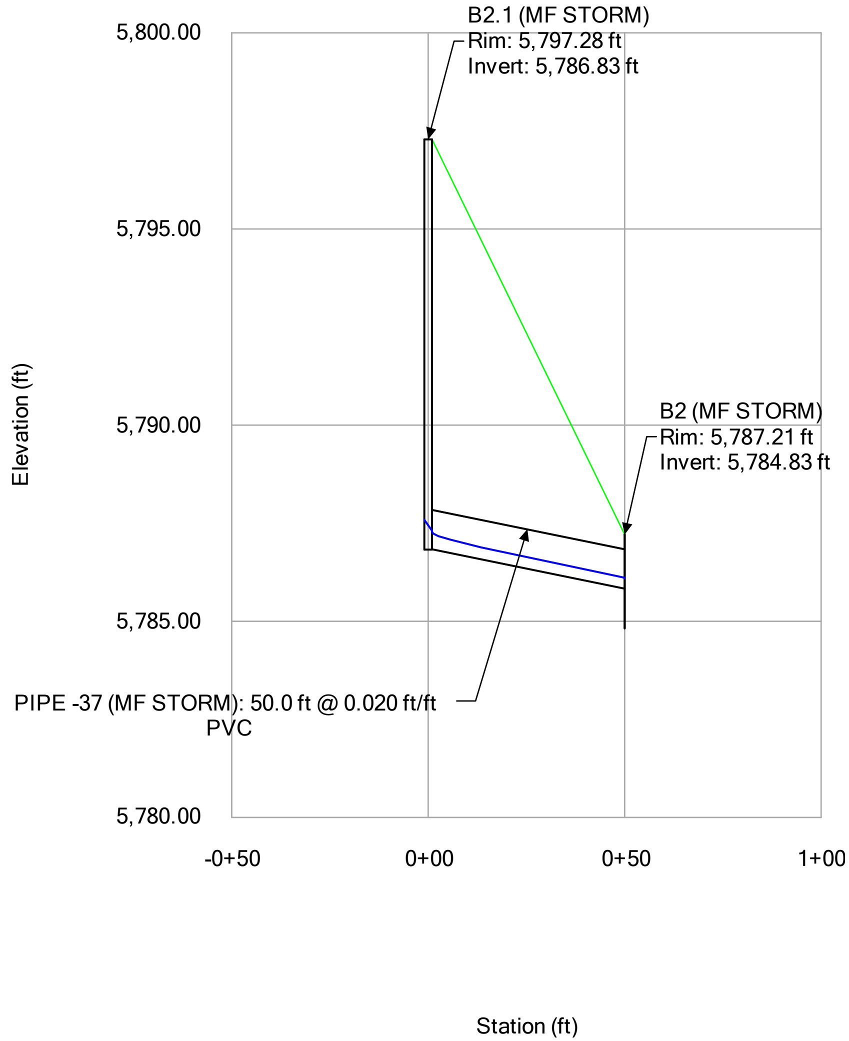
Profile Report
Engineering Profile - B1 (Parker and Pine MF StormCAD_2020.0823.stsw)



5 - YEAR

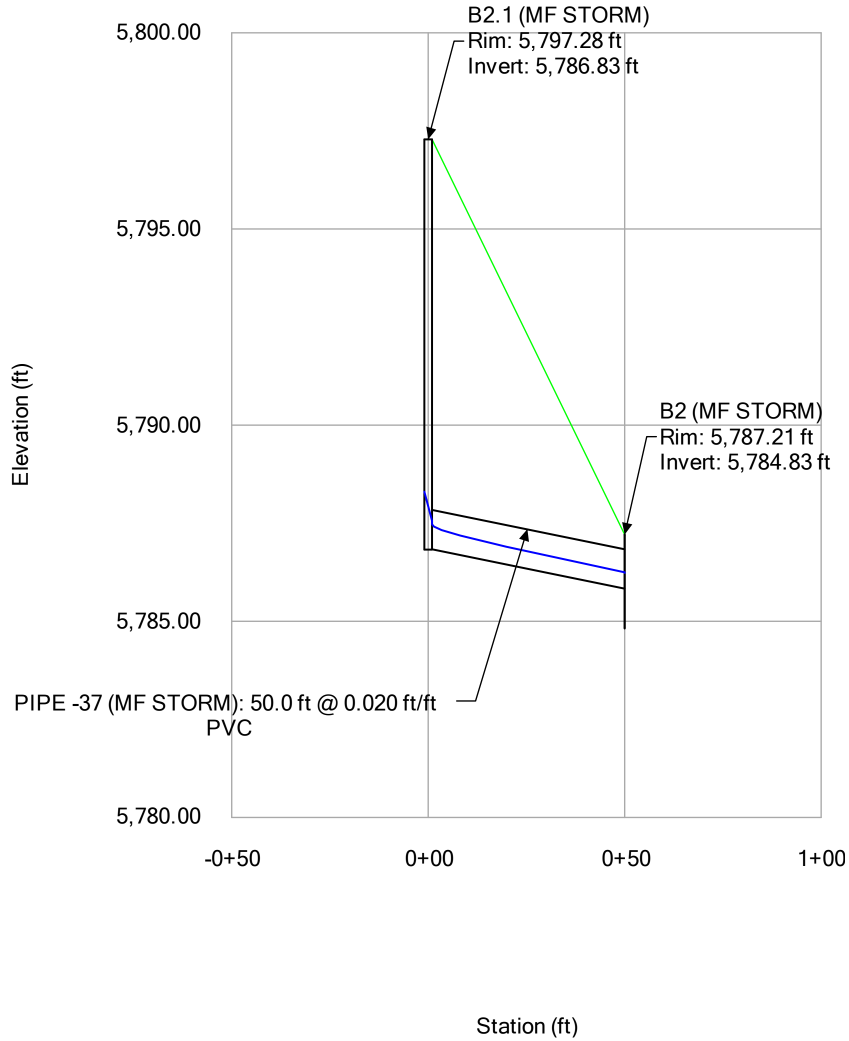
Profile Report

Engineering Profile - B2 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

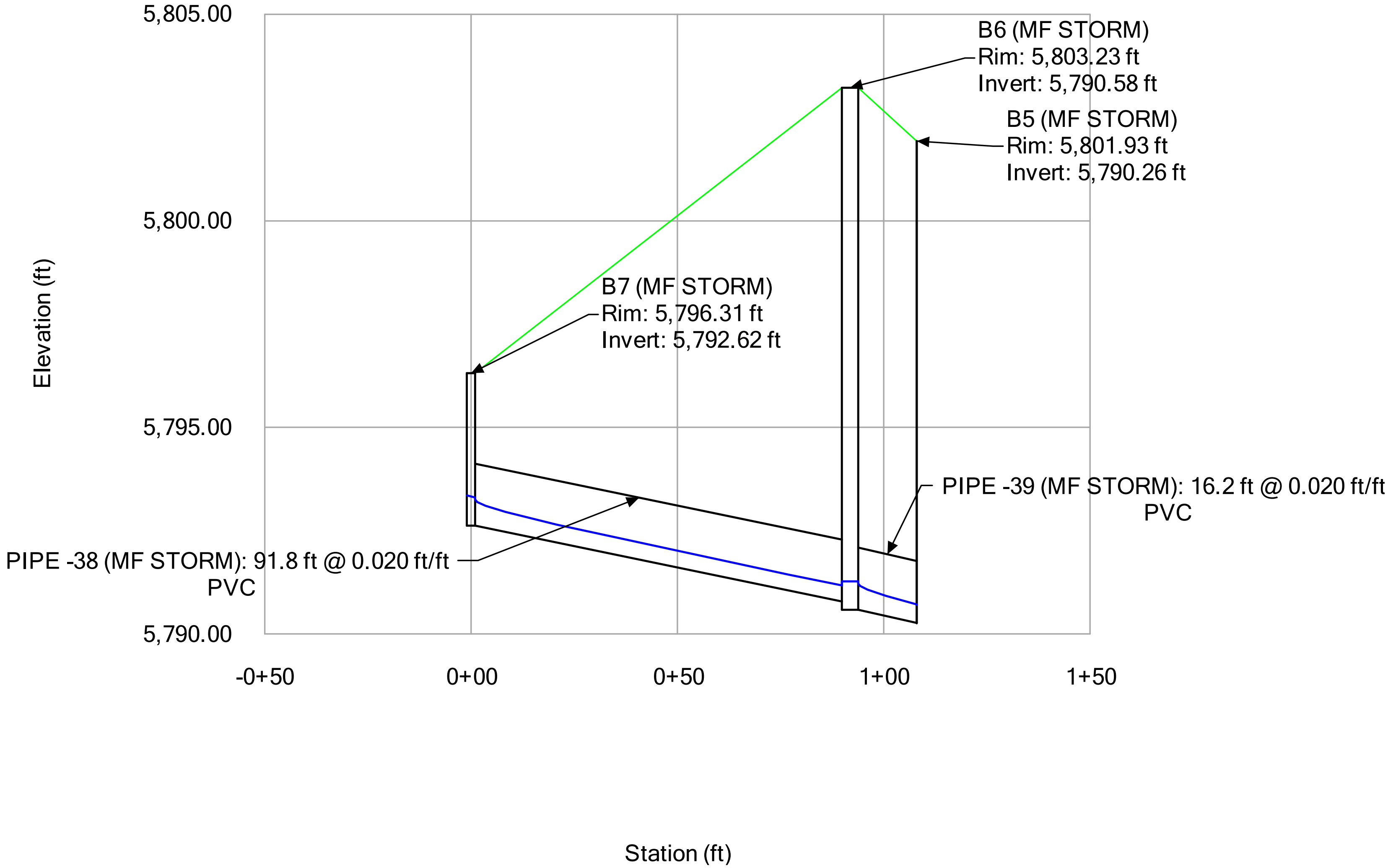
Profile Report
Engineering Profile - B2 (Parker and Pine MF StormCAD_2020.0823.stsw)



5 - YEAR

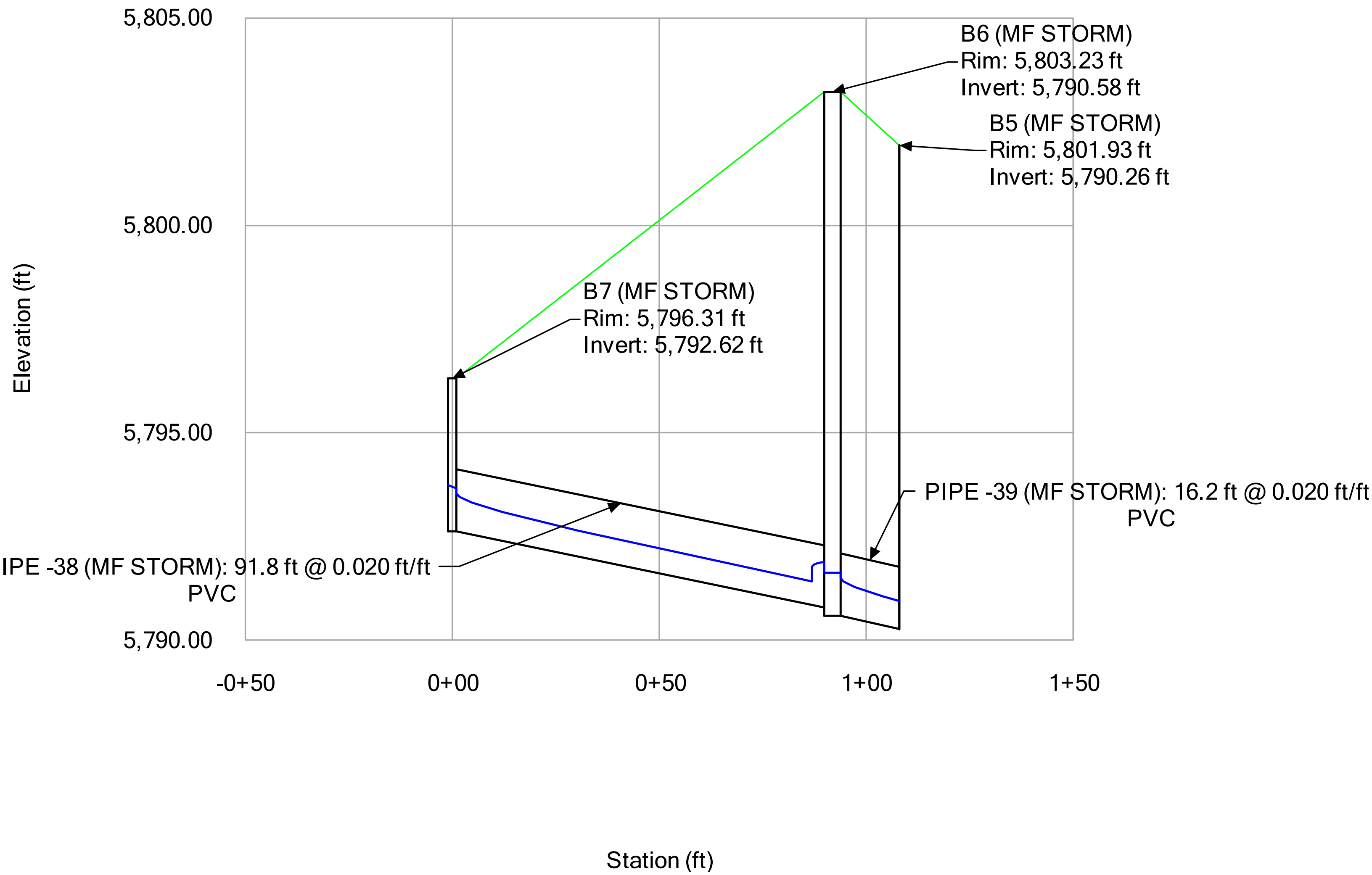
Profile Report

Engineering Profile - B3 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

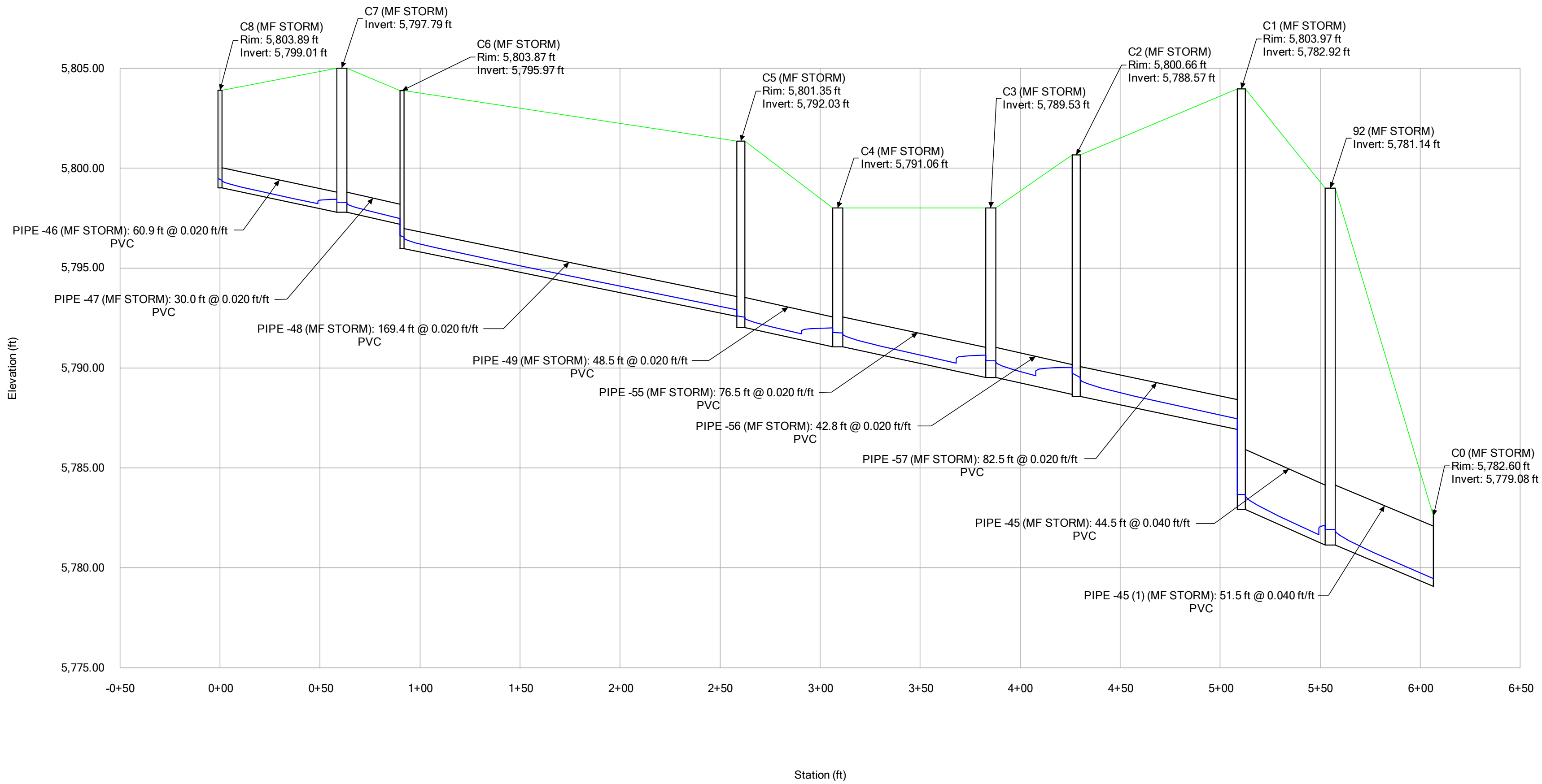
Profile Report
Engineering Profile - B3 (Parker and Pine MF StormCAD_2020.0823.stsw)



5 - YEAR

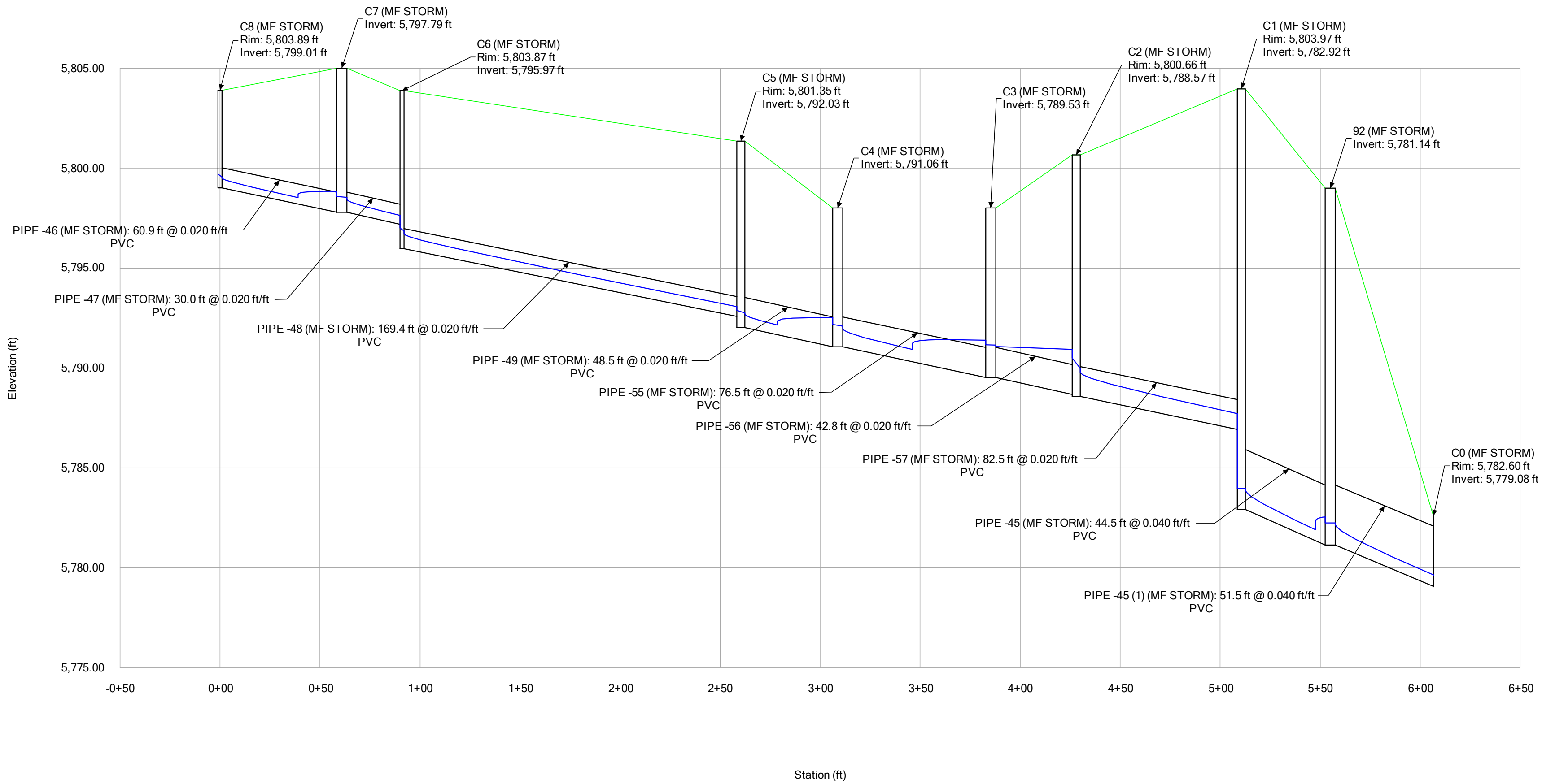
Profile Report

Engineering Profile - C1 (Parker and Pine MF StormCAD_2020.0823.stsw)



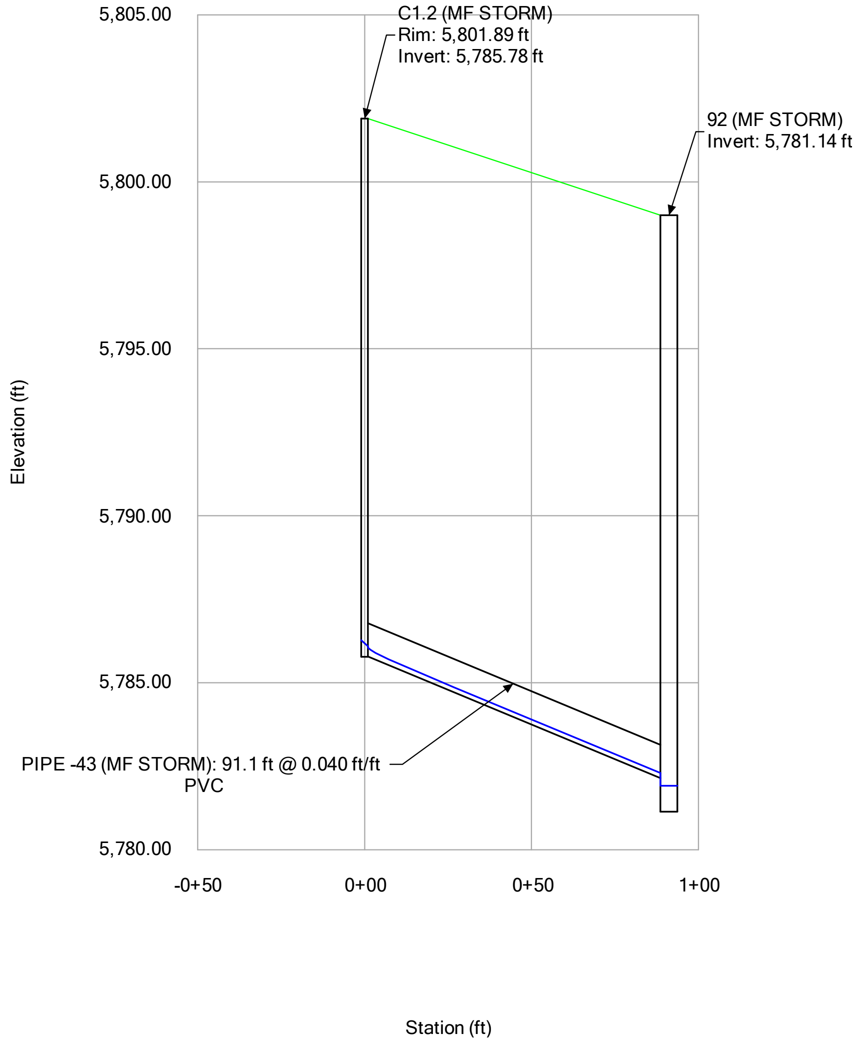
100 - YEAR

Profile Report
Engineering Profile - C1 (Parker and Pine MF StormCAD_2020.0823.stsw)



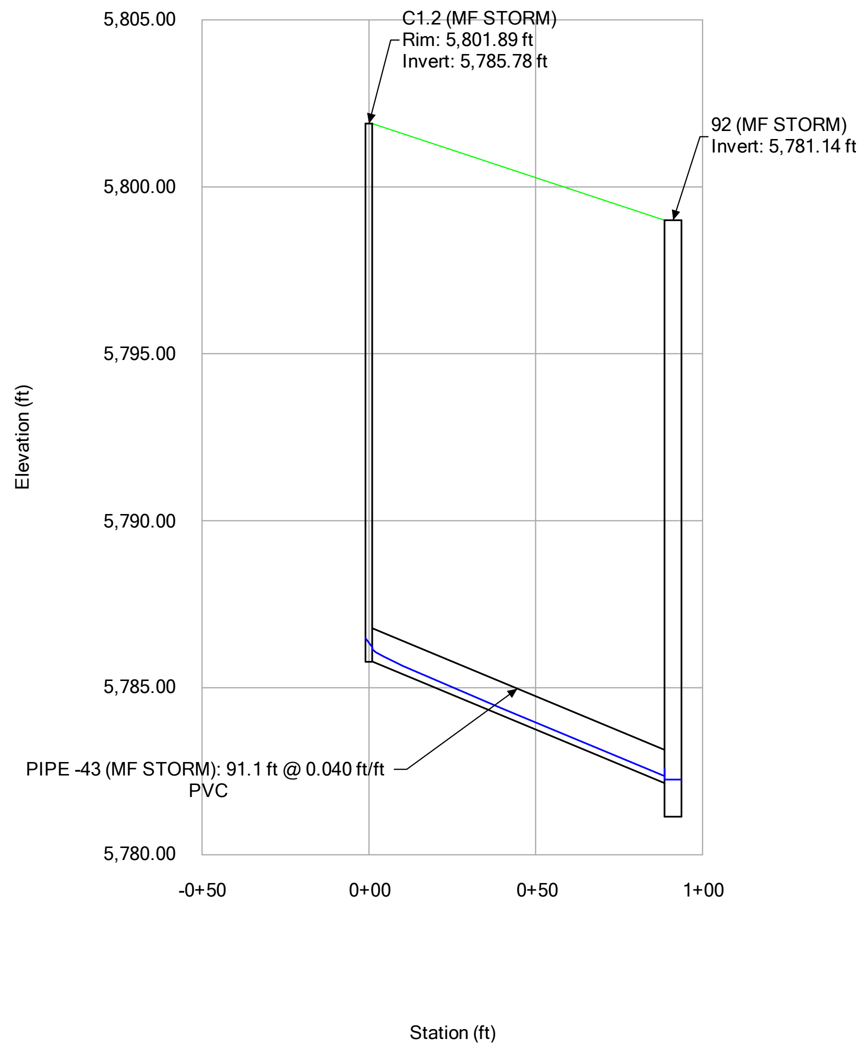
5 - YEAR

Profile Report
Engineering Profile - C2 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

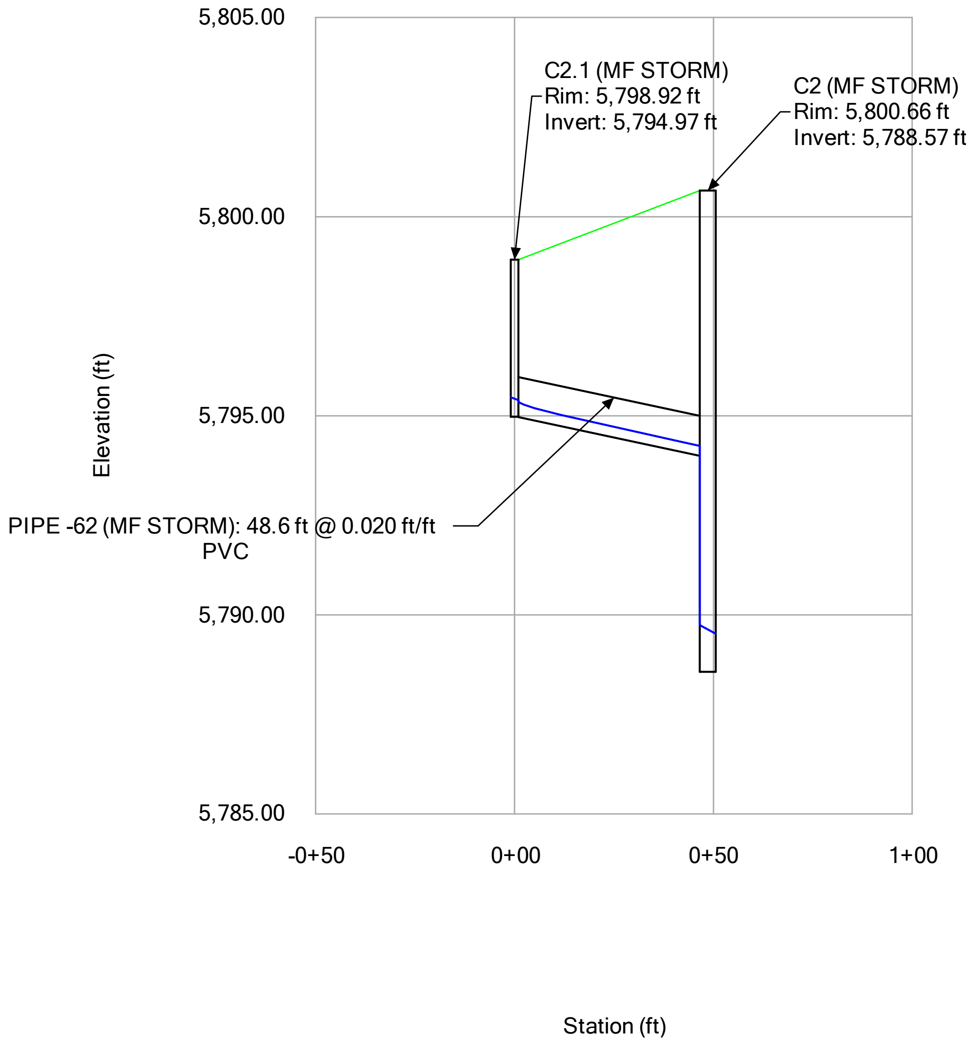
Profile Report
Engineering Profile - C2 (Parker and Pine MF StormCAD_2020.0823.stsw)



5 - YEAR

Profile Report

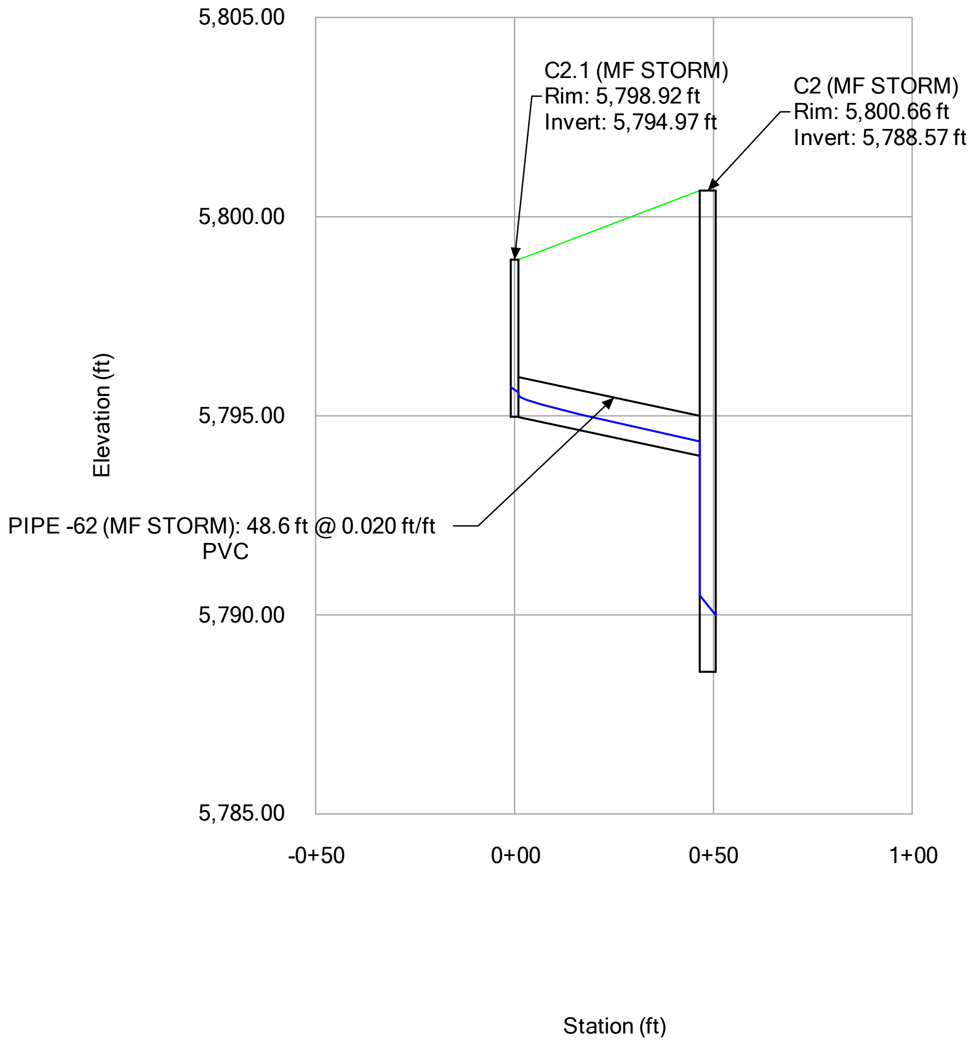
Engineering Profile - C3 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

Profile Report

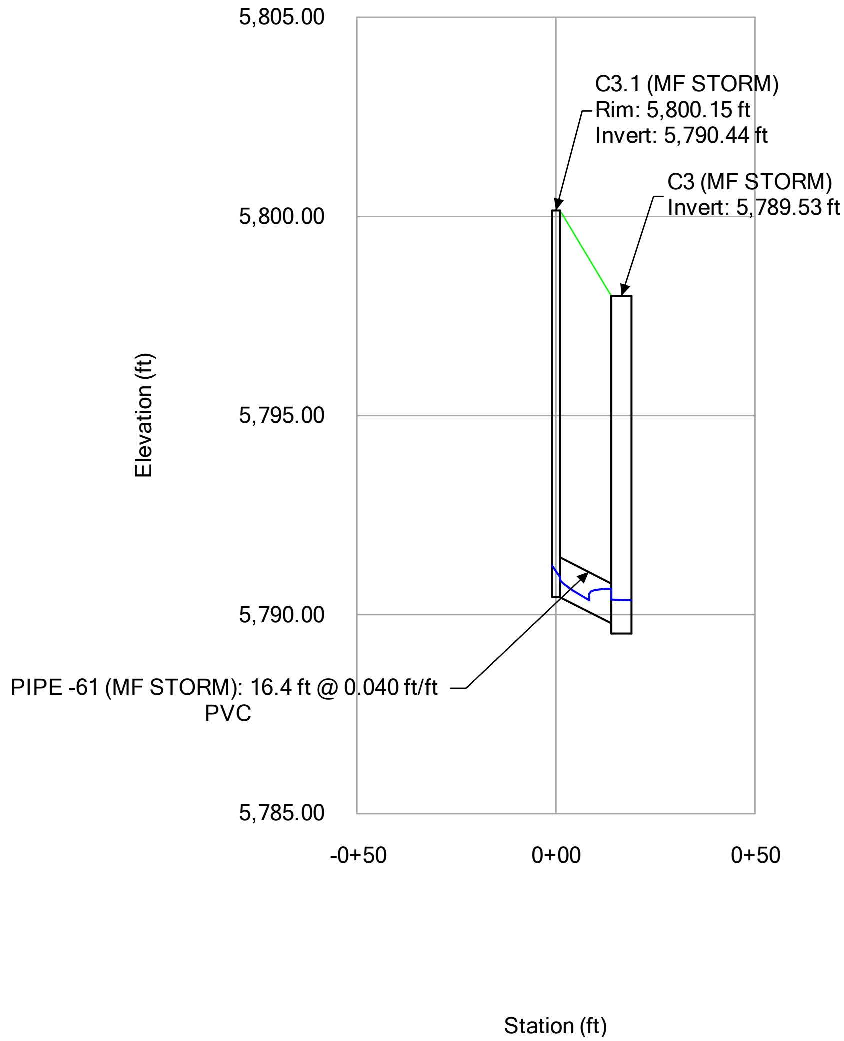
Engineering Profile - C3 (Parker and Pine MF StormCAD_2020.0823.stsw)



5 - YEAR

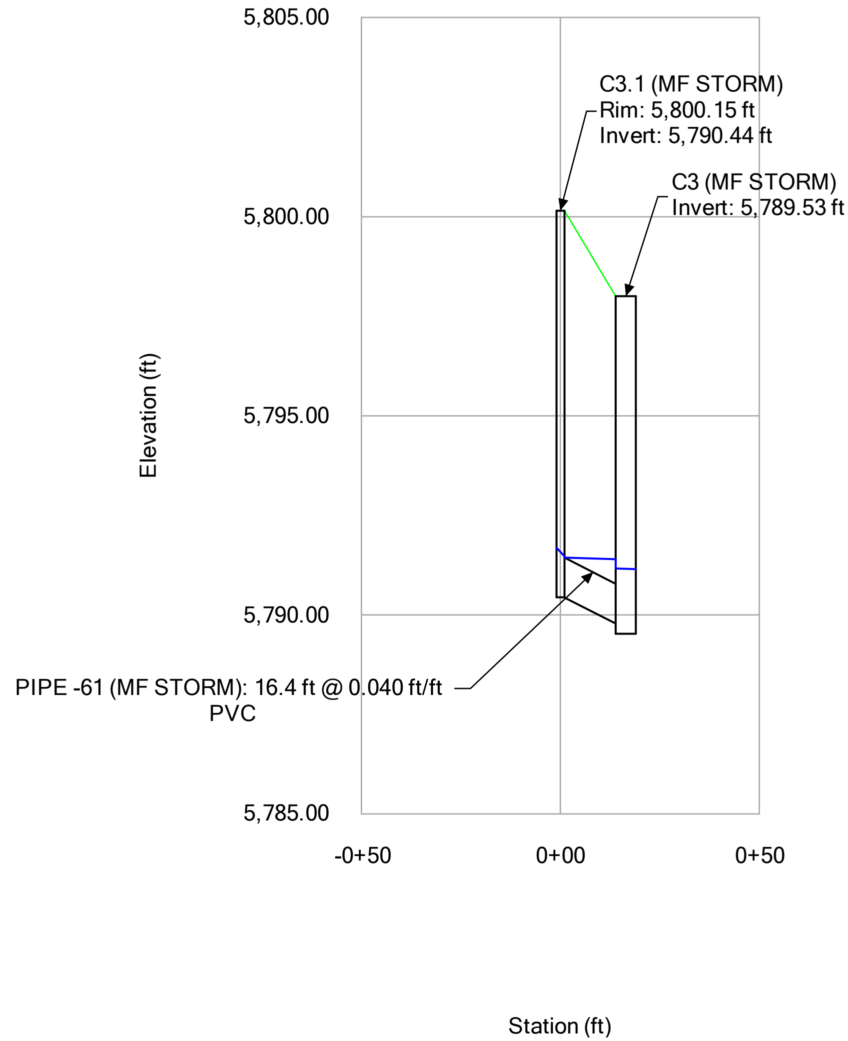
Profile Report

Engineering Profile - C4 (Parker and Pine MF StormCAD_2020.0823.stsw)



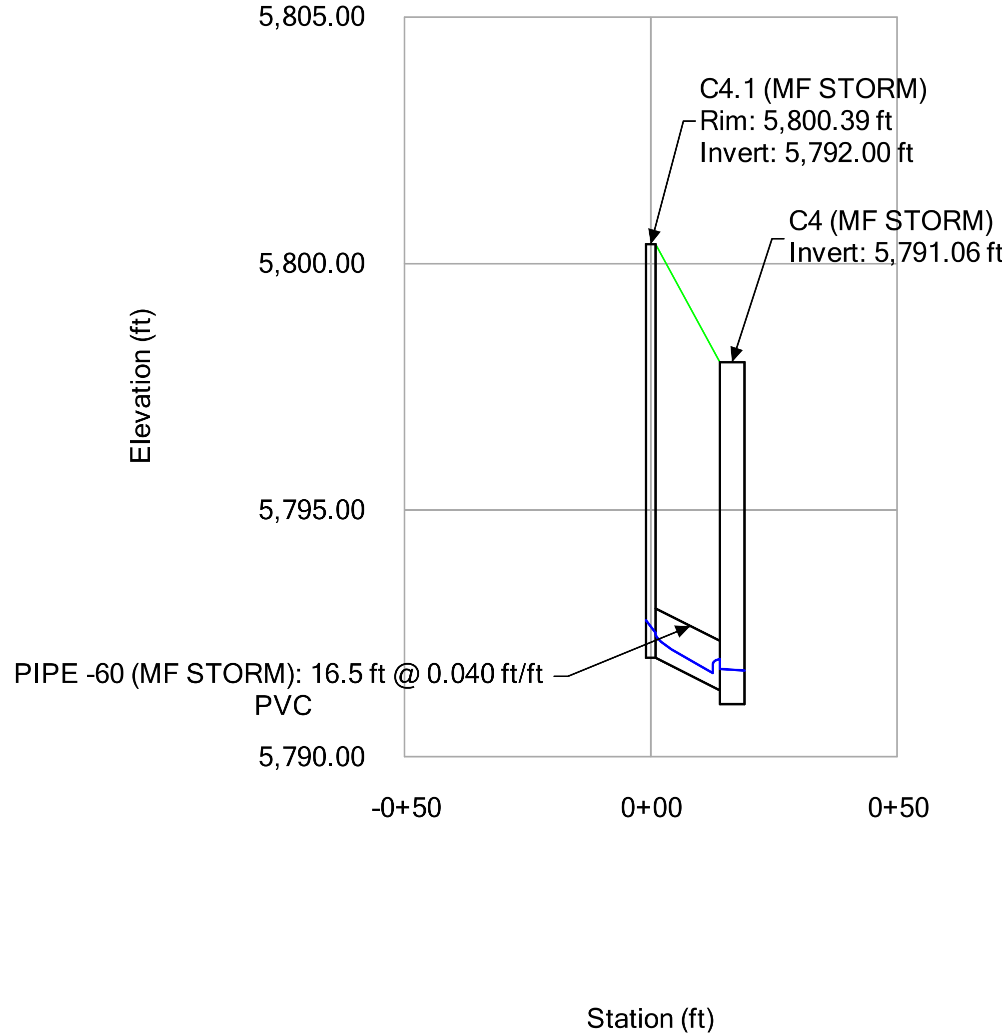
100 - YEAR

Profile Report
Engineering Profile - C4 (Parker and Pine MF StormCAD_2020.0823.stsw)



5 - YEAR

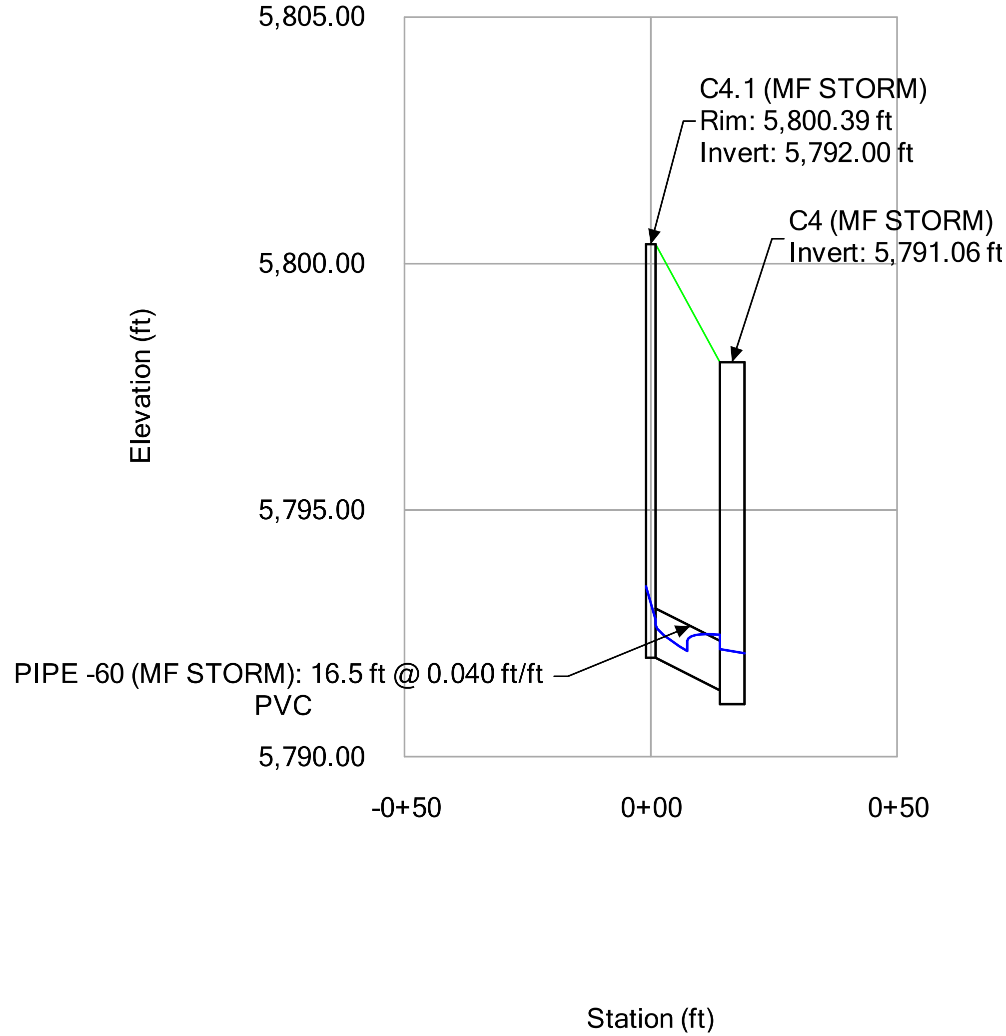
Profile Report
Engineering Profile - C5 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

Profile Report

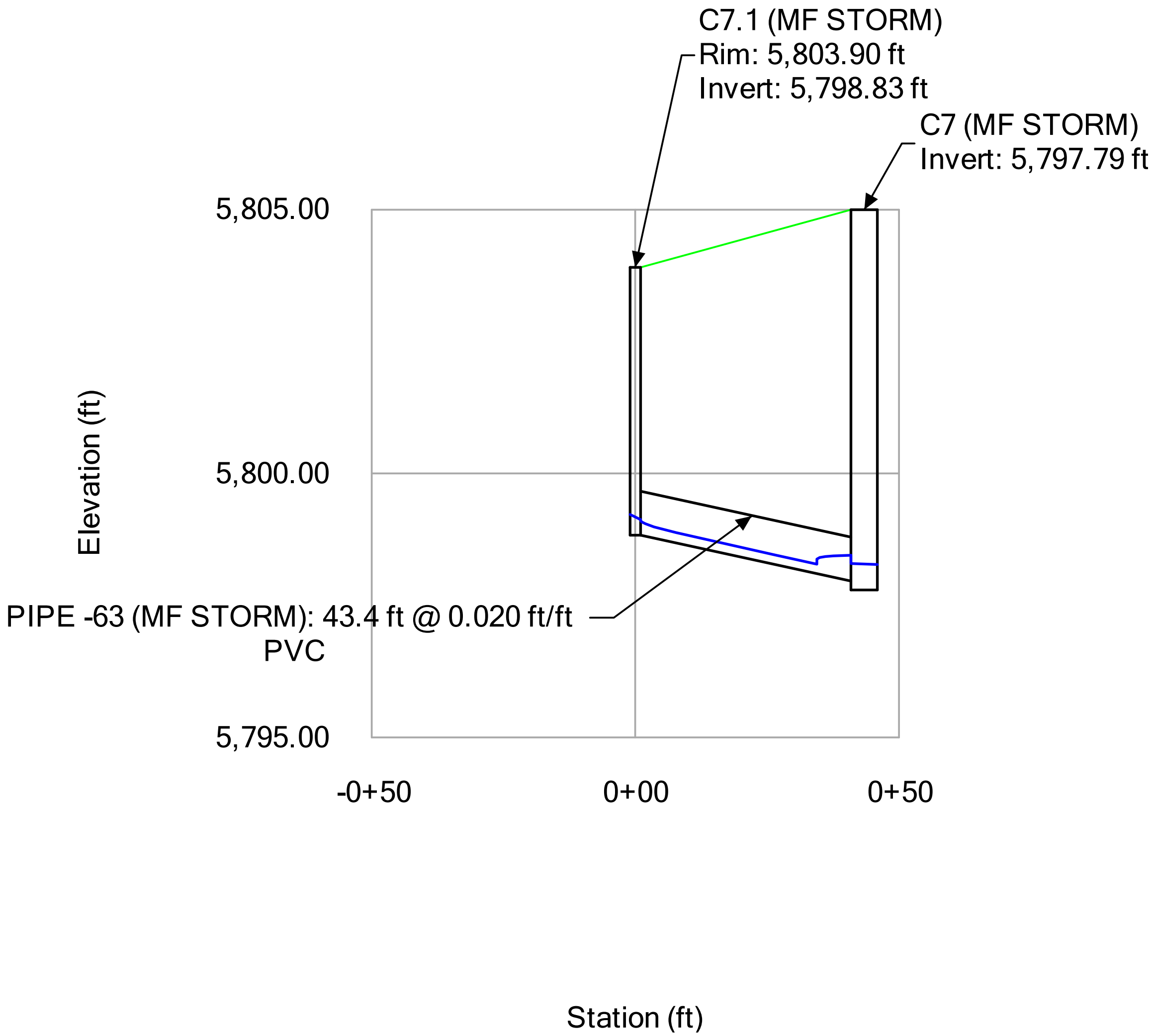
Engineering Profile - C5 (Parker and Pine MF StormCAD_2020.0823.stsw)



5 - YEAR

Profile Report

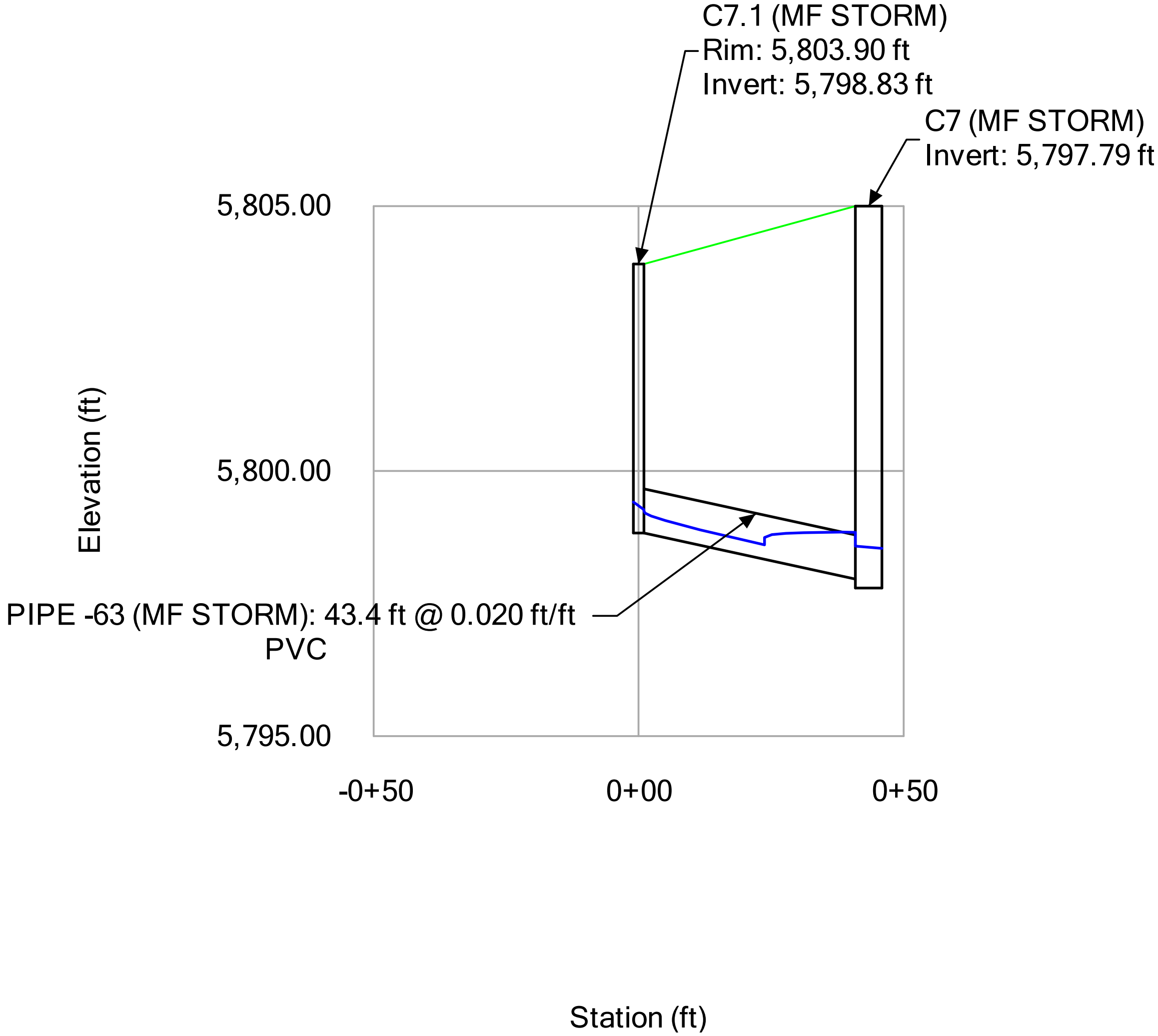
Engineering Profile - C6 (Parker and Pine MF StormCAD_2020.0823.stsw)



100 - YEAR

Profile Report

Engineering Profile - C6 (Parker and Pine MF StormCAD_2020.0823.stsw)



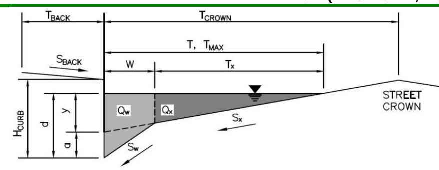
Version 4.06 Released August 2018

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: A3.1 (BASINS A1, R3, R5)



Gutter Geometry (Enter data in the blue cells)

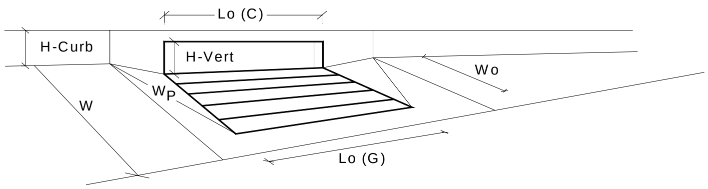
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	1.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	20.0	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

Version 4.06 Released August 2018



Design Information (Input)	CDOT Type R Curb Openir	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 =	3.9	5.6	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) =	10.00	10.00	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 =	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} =	0.24	0.38	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.37	0.52	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.78	0.91	
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 =	**3.6**	**8.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.2	6.3	cfs

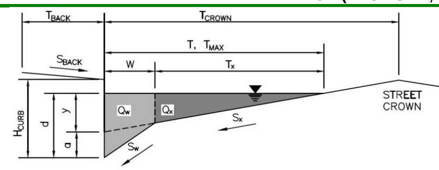
Version 4.06 Released August 2018

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: A3.2 (BASINS A2, R4)



Gutter Geometry (Enter data in the blue cells)

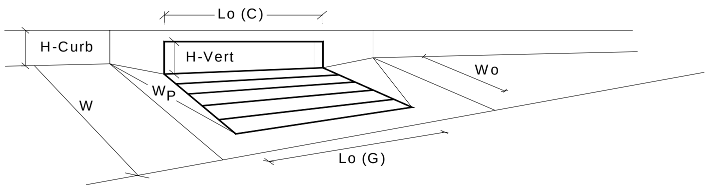
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	1.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	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

Version 4.06 Released August 2018



Design Information (Input)	CDOT Type R Curb Openir	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 =	3.9	3.9	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
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 =	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} =	0.24	0.24	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.50	0.50	
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 =	**2.6**	**2.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.7	1.3	cfs

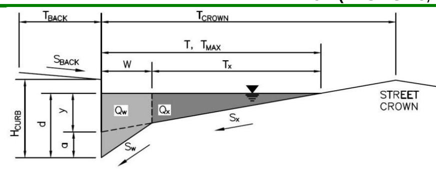
Version 4.06 Released August 2018

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: A5.2 (BASINS A3, R7)



Gutter Geometry (Enter data in the blue cells)

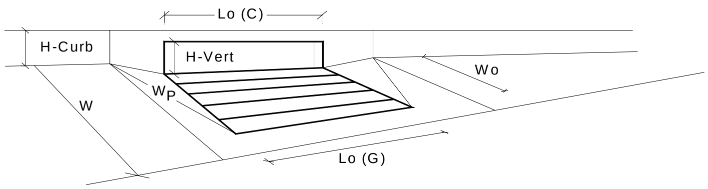
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	3.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	5.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.010	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	3.0	3.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	3.0	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

Version 4.06 Released August 2018



Design Information (Input)	CDOT Type C Grat		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	12.00	12.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	3.0	3.0	inches
Grate Information			MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92	feet
Width of a Unit Grate		W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.641	0.641	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.47	0.47	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.1**	**2.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.3	0.7	cfs

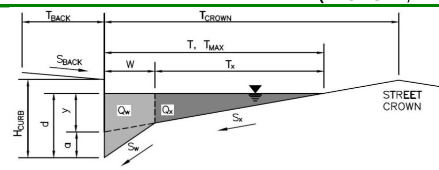
Version 4.06 Released August 2018

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: B2.1 (BASINS B2, R11, R12)



Gutter Geometry (Enter data in the blue cells)

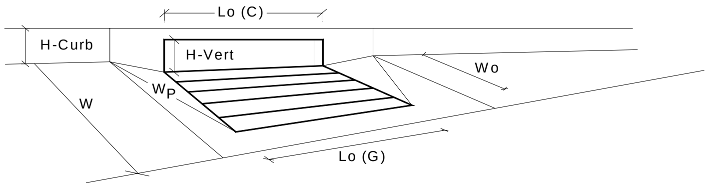
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	3.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	5.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.010	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	3.0	5.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	4.0	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

Version 4.06 Released August 2018



		MINOR	MAJOR	
Design Information (Input) — CDOT Type C Grat				
Type of Inlet	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	12.00	12.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.0	3.2	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	2.92	2.92	feet
Width of a Unit Grate	W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.67	0.67	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.641	0.661	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.47	0.51	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**2.1**	**2.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.1	2.2	cfs

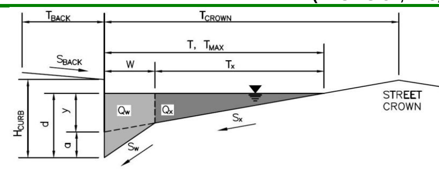
Version 4.06 Released August 2018

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

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

Project: **PARKER AND PINE MULTI-FAMILY**

Inlet ID: **B4 (BASINS C1, R13, R14)**



Gutter Geometry (Enter data in the blue cells)

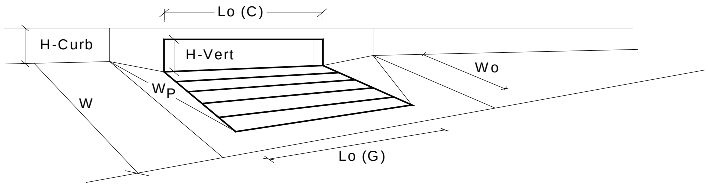
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	1.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	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

Version 4.06 Released August 2018



Design Information (Input)	CDOT Type R Curb Openir		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 =	3.9	3.9	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
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 =	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} =	0.24	0.24	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.50	0.50	
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 =	**2.6**	**2.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.2	2.3	cfs

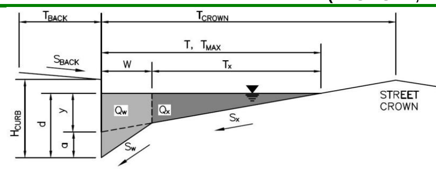
Version 4.06 Released August 2018

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

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

Project: **PARKER AND PINE MULTI-FAMILY**

Inlet ID: **B7 (BASINS B1, R13)**



Gutter Geometry (Enter data in the blue cells)

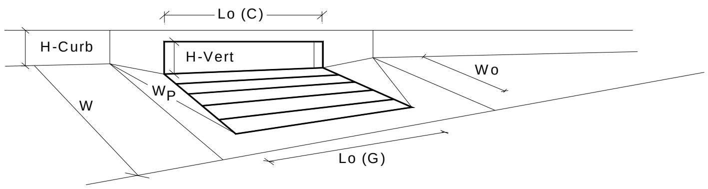
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	1.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	20.0	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

Version 4.06 Released August 2018



Design Information (Input) CDOT Type R Curb Openir		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 =	3.9	5.6	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) =	10.00	10.00	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 =	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} =	0.24	0.38	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.37	0.52	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.78	0.91	
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 =	**3.6**	**8.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.8	5.6	cfs

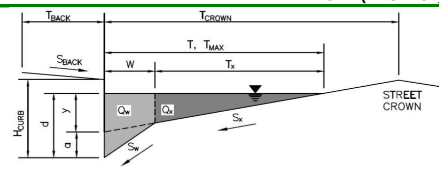
Version 4.06 Released August 2018

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: C1.2 (BASIN C2)



Gutter Geometry (Enter data in the blue cells)

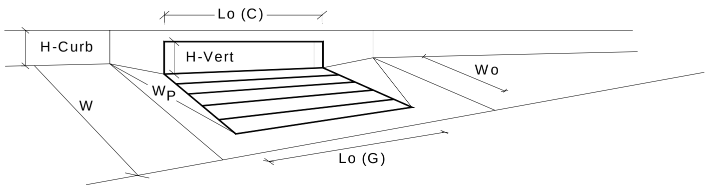
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	1.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	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

Version 4.06 Released August 2018



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Openir)	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 =	3.9	3.9	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
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 =	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} =	0.24	0.24	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.50	0.50	
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	

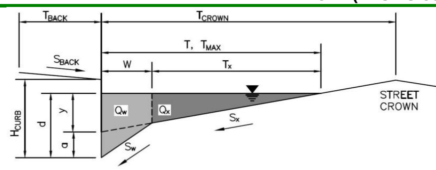
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**2.6**	**2.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.5	0.9	cfs

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: C2.1 (BASINS C3)



Gutter Geometry (Enter data in the blue cells)

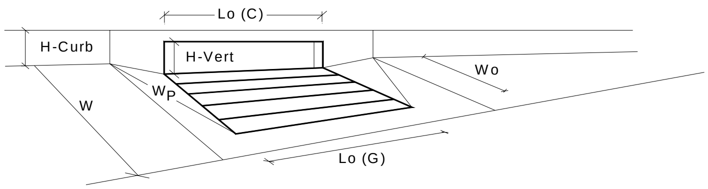
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	1.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	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

Version 4.06 Released August 2018



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Openir)	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 =	3.9	3.9	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
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 =	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} =	0.24	0.24	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.50	0.50	
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 =	**2.6**	**2.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.9	1.7	cfs

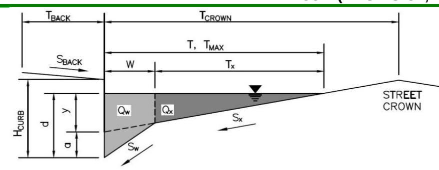
Version 4.06 Released August 2018

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: C3.1 (BASINS C4, R17)



Gutter Geometry (Enter data in the blue cells)

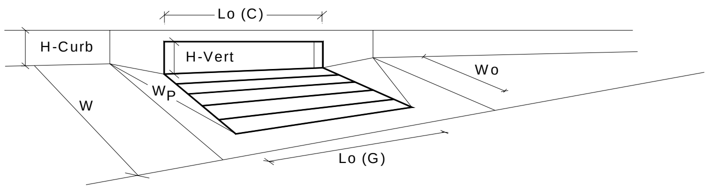
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	1.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	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

Version 4.06 Released August 2018



		MINOR	MAJOR	
Design Information (Input)				
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 =	3.9	3.9	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
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 =	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} =	0.24	0.24	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.50	0.50	
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 =	**2.6**	**2.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.2	2.4	cfs

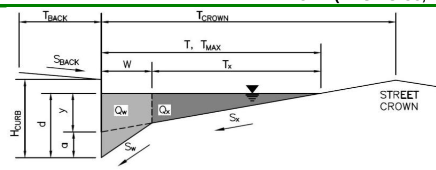
Version 4.06 Released August 2018

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

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

Project: **PARKER AND PINE MULTI-FAMILY**

Inlet ID: **C4.1 (BASINS C5, R19)**



Gutter Geometry (Enter data in the blue cells)

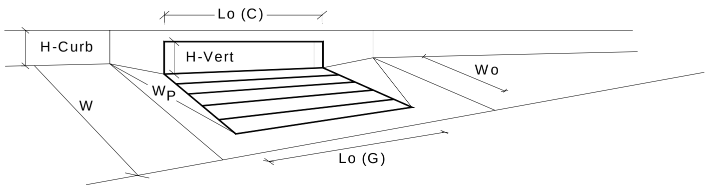
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	1.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	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

Version 4.06 Released August 2018



Design Information (Input)	CDOT Type R Curb Openir	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 =	3.9	3.9	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
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 =	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} =	0.24	0.24	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.50	0.50	
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 =	**2.6**	**2.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.2	2.5	cfs

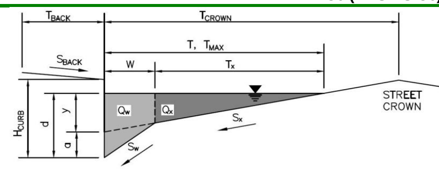
Version 4.06 Released August 2018

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: C6 (BASINS C6)



Gutter Geometry (Enter data in the blue cells)

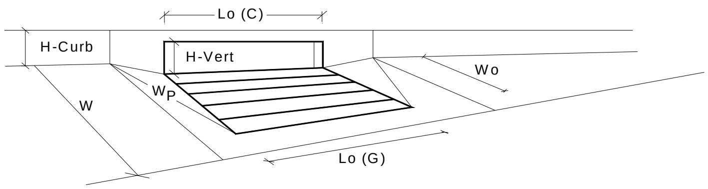
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	3.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	3.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	3.0	3.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	3.0	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

Version 4.06 Released August 2018



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type C Grat)	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	12.00	12.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.0	3.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	2.92	2.92	feet
Width of a Unit Grate	W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.67	0.67	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.641	0.641	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.47	0.47	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**2.1**	**2.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.4	0.9	cfs

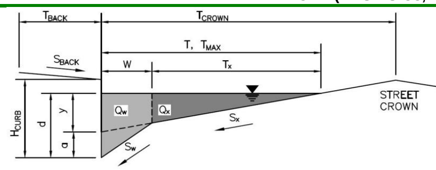
Version 4.06 Released August 2018

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: C7.1 (BASINS C8, R16)



Gutter Geometry (Enter data in the blue cells)

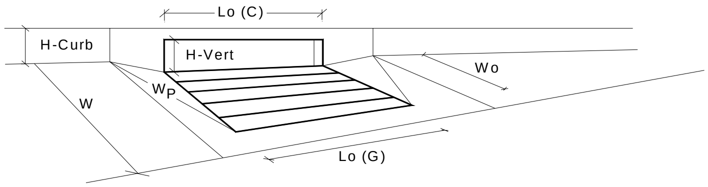
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	2.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	3.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	5.0	ft
Gutter Width	W =	3.00	ft
Street Transverse Slope	S_X =	0.010	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	3.0	3.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	3.0	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

Version 4.06 Released August 2018



Design Information (Input)	CDOT Type C Grat		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	12.00	12.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	3.0	3.0	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	2.92	2.92	feet
Width of a Unit Grate		W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.67	0.67	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.641	0.641	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.47	0.47	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.1**	**2.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.4	0.9	cfs

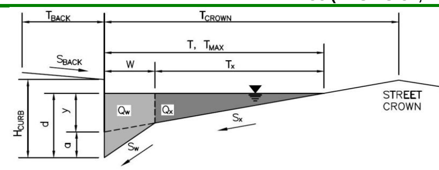
Version 4.06 Released August 2018

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

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

Project: PARKER AND PINE MULTI-FAMILY

Inlet ID: C8 (BASINS C7, R18)



Gutter Geometry (Enter data in the blue cells)

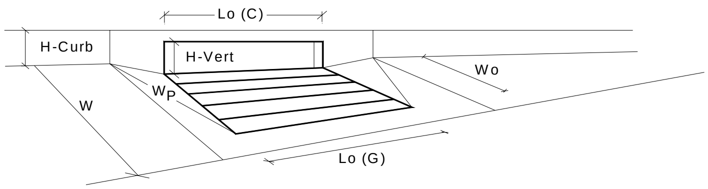
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	3.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	3.00	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} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	3.0	3.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	3.0	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

Version 4.06 Released August 2018



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	12.00	12.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.0	3.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	2.92	2.92	feet
Width of a Unit Grate	W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.67	0.67	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.641	0.641	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.47	0.47	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**2.1**	**2.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.7	1.4	cfs

APPENDIX C

Hydrologic Soil Group—Castle Rock Area, Colorado
(Web Soil Survey)

Map Scale: 1:2,180 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

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 9, Sep 22, 2016

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—Aug 21, 2014

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Castle Rock Area, Colorado (CO622)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
BrD	Bresser sandy loam, cool, 5 to 9 percent slopes	B	11.2	73.8%
Lo	Loamy alluvial land	C	0.5	3.3%
Sa	Sampson loam	B	3.5	22.9%
Totals for Area of Interest			**15.2**	**100.0%**

Description

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

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

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

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

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

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

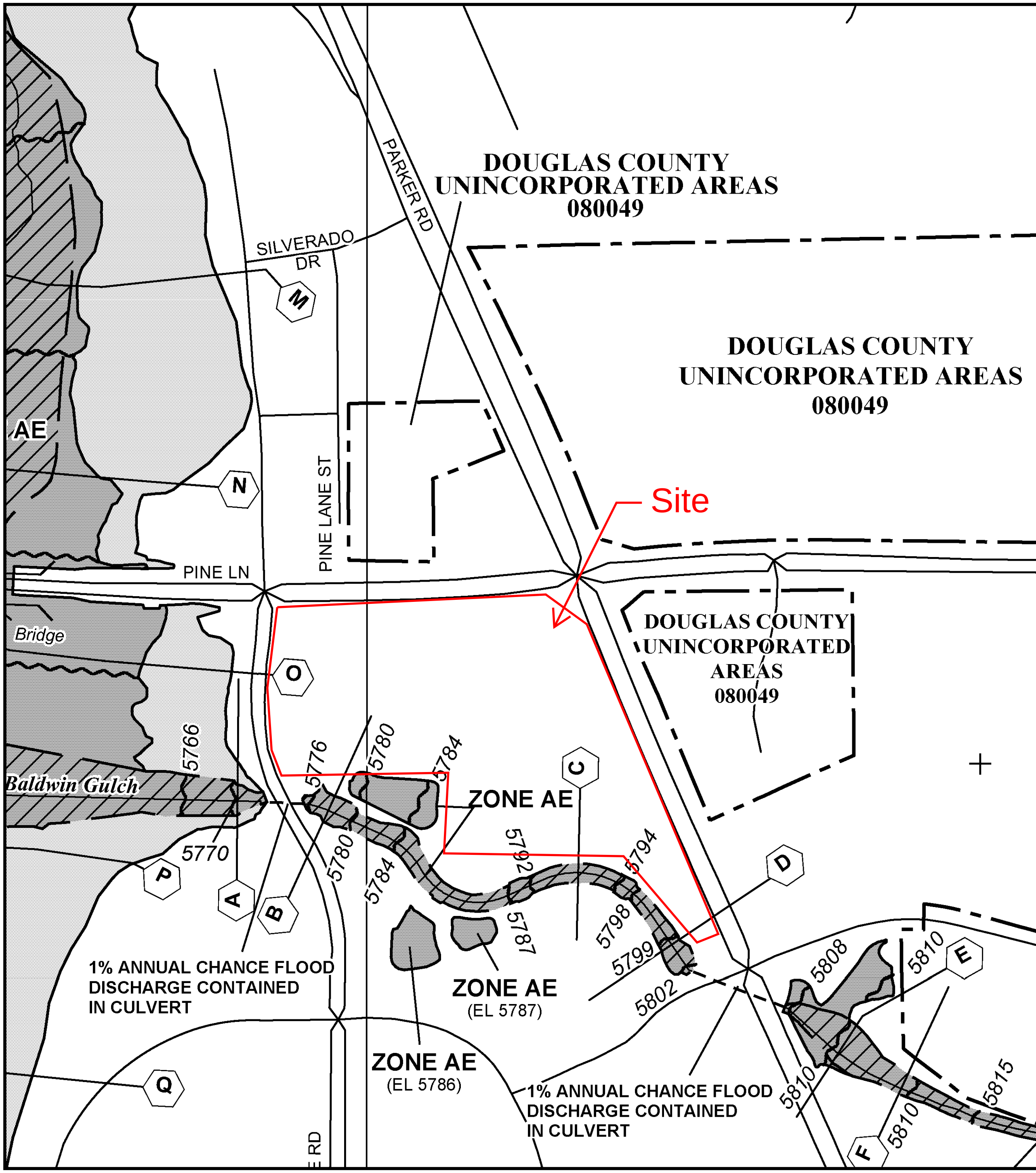
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



N

MAP SCALE 1" = 500'

250 0 500 1000 FEET

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.

U.S. DEPARTMENT OF HOMELAND SECURITY

MAP NUMBER
08035C0067G

MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX D

Town of Parker

Parker and Pine

Filing 1

Parker and Pine
Final Drainage Report

APRIL 2020 | VERSION 1

Prepared By:

Kimley»Horn

4582 South Ulster Street, Suite 1500

Denver, CO 80237

CERTIFICATION

ENGINEERS STATEMENT

This report for the final design of Parker and Pine Development 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.

Signature

Daniel L. Skeehan, P.E.

Colorado P.E. License No. 46391

04/24/2020

Seal and Date

TABLE OF CONTENTS

VICINITY MAP

VICINITY MAP
1"=2,000'

GENERAL LOCATION AND DESCRIPTION

The purpose of this report is to outline the drainage plan for the Parker and Pine Development located between Twenty Mile Road and Parker Road, south of Pine Lane in the Town of Parker, County of Douglas, State of Colorado (herein the “Project”).

LOCATION

The proposed Parker and Pine Development lies within 1 parcel of land, located in the southeast quarter of Section 9 and a part of the northeast quarter of section 16 within Township 6 South, Range 66 West of the Sixth Principal Meridian, Town of Parker, County of Douglas, State of Colorado (see Vicinity Map). South Parker Road (State Highway No. 83) borders the project to the east, Pine Lane borders the project to the north, and Twenty Mile Road to the west. An existing detention pond and Baldwin Gulch abut the project to the south. The Site is currently vacant.

DESCRIPTION OF PROPERTY

The Project Site is 15.952 acres in size, a majority of which is currently native grass and overgrown vegetation. The project slopes from east to west from an elevation of ±5820 feet on the east side to an elevation of ±5783 feet on the west side at a slope of about 3.5%. There is a flat area in the southeast corner of the property at an elevation of ±5811 feet that prevents a portion of the site from flowing west. This southeast corner of the site flows south, directly into Baldwin Gulch.

Soils onsite are generally USCS Type BrD, Lo, and Sa as verified by the soil survey included in Appendix A. There are 4 existing storm sewer inlets adjacent to the property. The proposed site conditions will convey stormwater to the existing detention pond via overland sheet flows and a proposed underground storm drain system. Currently, there are no storm inlets or detention facility improvements located on the site. The existing site conditions sheet flow to an existing off-site detention basin and ultimately discharge into Baldwin Gulch.

Water quality treatment is provided by means of an extended detention basin with a water quality outlet structure. The existing detention basin is located adjacent to Baldwin Gulch on the southwest side of the Site. The controlled WQCV, EURV, and 100-year release will outfall to Baldwin Gulch.

DESCRIPTION OF PROJECT

The Project involves the construction of interior streets, vacant lots with native seeding, and utility mains including storm sewer infrastructure intended to convey flows for the phased site development. Modifications to an existing stormwater pond south of the site to current code is also in the scope of the project.

DRAINAGE BASINS AND SUB-BASINS

The Project falls within the limits of the “Parker Auto Plaza Final Drainage Report” (FDR), prepared by Kiowa Engineering Corporation dated July 12, 2004 and included in Appendix F, as part of the Parker Auto Plaza development. The Project will ensure that the requirements of the FDR are met. For a detailed look at the requirements and how they are met, refer to the “Existing Parker Auto Plaza Storm Sewer Requirements” of this report.

The FDR provides design for the overall development of approximately 52.7 acres. The Project includes sub-basins 1A, 2A, 3A and 4A from the FDR which total to 13.95 acres. The drainage map from the Parker Auto Plaza FDR is included in Appendix F. Portions of sub-basins 1C and 5C from the FDR are also included in the Project site as part of detained sub-basins. The Project also captures offsite runoff from approximately 0.33 acres between the property line on the east side of the Project and the existing sidewalk in the right of way along South Parker Road. Runoff from basins 1A-4A were planned to be conveyed to the detention basin (noted as sub-basin 5A in the FDR) via an underground storm sewer system that has not been implemented. Sub-basins 1C and 5C were planned to flow directly into Baldwin Gulch via grassed swales and a separate storm sewer system. The Project detains runoff from a total of 15.81 acres, which includes the entirety of FDR sub-basins 1A, 2A, 3A and 5A, a majority of FDR sub-basins 4A and 1C, and approximately a third of FDR sub-basin 5C.

MAJOR DRAINAGE BASIN DESCRIPTION

Baldwin Gulch is mapped as a Zone AE, which is defined by FEMA as 'Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods' The existing FEMA Flood Insurance Rate Map (FIRM) is number 08035C0067G, effective date March 16, 2016.

The current FIRM Panel shows no portion of the subject property to be located within the 100-year floodplain; however, Baldwin Gulch is designated as a major drainageway by UDFCD. There are no planned improvements to the existing Baldwin Gulch.

The FIRM panel referenced above is included in Appendix B1. The overall drainage basin is mostly developed. The proposed development is ultimately tributary to Cherry Creek. Drainage facilities are provided to allow drainage into the detention pond on the southwest corner of the Site and ultimately discharging into Baldwin Gulch. The proposed Site consists of twenty-two (22) on-site drainage basins. Twenty (20) drainage basins are conveyed to the detention pond via overland flow or by storm sewer. There are 0.34 acres of off-site runoff included within the twenty (20) on-site basins that drain onsite and are conveyed to the existing detention pond via storm sewer. More specifically, sub-basins 3.0, 5.0, 7.0, 8.0, and 15.0 all account for portions of the off-site runoff totaling to 0.34 acres. Two (2) of the twenty-two (22) onsite drainage basins (sub-basins 19.0 and 20.0) drain overland into Pine Lane and Twenty Mile Road, mimicking conditions which currently exist onsite. One (1) of the twenty-two (22) drainage basins (sub-basin 18.0) drains directly into Baldwin Gulch, mimicking conditions which currently exist onsite. The existing detention pond discharges into Baldwin Gulch.

DRAINAGE DESIGN CRITERIA

REGULATIONS

There are no deviations from the Town of Parker and UDFCD floodplain regulations.

COMPLIANCE WITH TOWN'S STREAM PRESERVATION STANDARDS

There are no existing stream buffers within the Project area. Baldwin Gulch is preserved with no drainage upgrades required to maintain compliance with Town of Parker and UDFCD regulations.

DEVELOPMENT DESIGN CRITERIA REFERENCE AND CONSTRAINTS

The FIRM panel cited in the Major Drainage Basin Description Section shows no portion of the

Site to be located within the 100-year floodplain. The proposed storm facilities are in compliance with the Town of Parker Storm Drainage and Environmental Criteria Manual (the "CRITERIA") and the Urban Storm Drainage Criteria Manual (the "MANUAL). Site drainage is not significantly impacted by such constraints as utilities or existing development.

The proposed approach includes pipe flow into an existing detention pond. Additional detail regarding onsite drainage patterns is provided in the Drainage Facility Design Section.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage system per Table 2.3 of the CRITERIA. Table 5.1 of the CRITERIA is the source for rainfall data for the 5-year and 100-year design storm events. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table RO-5 of the MANUAL by calculating weighted impervious values for each specific site basin. The detention storage requirement was calculated using the same method and formulae used by Kiowa Engineering Corporation in the Parker Auto Plaza FDR.

An existing orifice plate placed in the first bay of a drop box outlet (Figure 2 of the Parker Auto Plaza FDR, UDFCD, Typical WQCV Outlet Structure Profiles) controls the release rate for the 10-year event. An orifice plate mounted to the second bay wall of the detention basin outlet structure controls the 100-year release rate. The release of flow is limited to 3.6 cubic feet per second (cfs) in the 10-year event and 13.1 cfs in the 100-year event. Flows from this existing detention basin discharge directly into Baldwin Gulch, and limited modifications (replacing existing orifice plate) to the existing outlet structure are being proposed.

HYDRAULIC CRITERIA

The proposed drainage facilities are designed in accordance with the CRITERIA and MANUAL. Floodplain identification was determined using FIRM panels by FEMA and information provided in the CRITERIA.

Hydrologic and hydraulic calculations are summarized in Appendix D.

DRAINAGE FACILITY DESIGN

GENERAL CONCEPT

The Project consists of interior streets, vacant lots with native seeding, and utility mains including storm sewer infrastructure intended to convey flows for the phased site development.

The Project provides water quality treatment by means of an existing water quality outlet structure and detention through an existing surface detention pond for the entirety of the site. The detention pond outfalls to Baldwin Gulch. Improvements to the pond will consist of a proposed forebay, trickle channel, and access road.

The Site has been divided into twenty-two (22) sub-basins, sub-basins 1.1 through 20.0, which represent small sub-basins that are tributary to the adjacent right-of-way and Baldwin Gulch which mimics current site conditions. Ultimately the developed runoff is conveyed downstream to the existing detention pond. Further information regarding the basins and drainage patterns can be found in Appendix C.

SUB-BASIN DESCRIPTION

Sub-basin 1.1 is 1.43 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter Storm Stub 1.1 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 4.93 and 10.37 for the 5-year and 100-year storm, respectively. If Storm Stub 1.1 were to plug, the runoff for the basin would flow east onto sub-basin 9.0 and drain into inlet A04.

Sub-basin 1.2 is 1.97 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter inlet B01 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 6.77 and 14.25 for the 5-year and 100-year storm, respectively. If inlet B01 were to plug, the runoff for the basin would flow south onto sub-basin 13.0 and drain into inlet B00.

Sub-basin 2.0 is 0.88 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter inlet C00.1 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 3.00 and 6.33 for the 5-year and 100-year storm, respectively. If inlet C00.1 were to plug, the runoff for the basin would flow south onto sub-basin 10.0 and drain into inlet C00.

Sub-basin 3.0 is 1.97 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter inlet C01.1 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 6.80 and 14.29 for the 5-year and 100-year storm, respectively. If inlet C01.1 were to plug, the runoff for the basin would flow south and drain onto sub-basin 11.0 and drain into inlet C01.

Sub-basin 4.1 is 1.14 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter inlet B02 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 3.91 and 8.23 for the 5-year and 100-year storm, respectively. If inlet B02 were to plug, the runoff for the basin would flow south onto sub-basin 16.0 and drain to inlet A01.

Sub-basin 4.2 is 0.77 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter Storm Stub 4.2 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 2.65 and 5.56 for the 5-year and 100-year storm, respectively. If inlet Storm Stub 4.2 were to plug, the runoff for the basin would flow south onto sub-basin 14.0 and drain into inlet B03.

Sub-basin 5.0 is 1.13 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter inlet B05.1 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 3.89 and 8.18 for the 5-year and 100-year storm, respectively. If inlet B05.1 were to plug, the runoff for the basin would flow south onto sub-basin 15 and drain into inlet B05.

Sub-basin 6.0 is 2.22 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter via a connection to manhole D01 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 7.62 and 16.06 for the 5-year and 100-year storm, respectively. If the connection to manhole D01 were to clog, the runoff for the basin would flow south directly into Baldwin Gulch.

Sub-basin 7.0 is 1.02 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter inlet B07.1 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 3.48 and 7.35 for the 5-year and 100-year storm, respectively. If inlet B07.1 were to plug, the runoff for the basin would flow south onto sub-basin 17 and drain into inlet B08.

Sub-basin 8.0 is 1.94 acres consisting of open lot with assumed imperviousness of 85%. Runoff will enter inlet B08.1 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 6.13and 12.90 for the 5-year and 100-year storm, respectively. If inlet B08.1 were to plug, the runoff for the basin would flow west onto sub-basin 17 and drain into inlet B08.

Sub-basin 9.0 is 0.10 acres consisting of streets, curb, and gutter. Runoff will enter inlet A04 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 0.42 and 0.81 for the 5-year and 100-year storm, respectively. If the inlet were to plug, the runoff for the basin would flow south onto sub-basin 12 and drain into inlet A02.

Sub-basin 10.0 is 0.16 acres consisting of streets, curb, and gutter. Runoff will enter inlet C00 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 0.65 and 1.26 for the 5-year and 100-year storm, respectively. If inlet C00 were to plug, the runoff for the basin would flow west onto sub-basin 12 and drain into inlet A02.

Sub-basin 11.0 is 0.21 acres consisting of streets, curb, and gutter. Runoff will enter inlet C01 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 0.86 and 1.66 for the 5-year and 100-year storm, respectively. If inlet C01 were to plug, the runoff for the basin would flow west onto sub-basin 10 and drain into inlet C00.

Sub-basin 12.0 is 0.14 acres consisting of streets, curb, and gutter. Runoff will enter inlet A02 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 0.57 and 1.09 for the 5-year and 100-year storm, respectively. If inlet A02 were to plug, the runoff for the basin would flow south into sub-basin 16.0 and drain into inlet A01.

Sub-basin 13.0 is 0.08 acres consisting of streets, curb, and gutter. Runoff will enter inlet B00 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 0.32 and 0.62 for the 5-year and 100-year storm, respectively. If inlet B00 were to plug, the runoff for the basin would flow south and west onto sub-basin 19, flowing offsite following its historic path.

Sub-basin 14.0 is 0.17 acres consisting of streets, curb, and gutter. Runoff will enter inlet B03 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 0.67 and 1.30 for the 5-year and 100-year storm, respectively. If inlet B03 were to plug, the runoff for the basin would flow west onto sub-basin 16.0 and drain into inlet A01.

Sub-basin 15.0 is 0.18 acres consisting of streets, curb, and gutter. Runoff will enter inlet B05 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 0.72 and 1.40 for the 5-year and 100-year storm, respectively. If inlet B05 were to plug, the runoff for the basin would flow west onto sub-basin 17 and drain into inlet B08.

Sub-basin 16.0 is 0.17 acres consisting of streets, curb, and gutter. Runoff will be conveyed to inlet A01 and outfall into Pond 1 through future private underground storm sewer. The runoff coefficients for this sub-basin are 0.67 and 1.30 for the 5-year and 100-year storm, respectively. This sub-basin will sheet flow directly into Pond 1.

Sub-basin 17.0 is 0.11 acres consisting of streets, curb, and gutter. Runoff will enter inlet B08 and be conveyed to Pond 1 through a private underground storm sewer. The runoff coefficients for this sub-basin are 0.45 and 0.87 for the 5-year and 100-year storm, respectively.

Sub-basin 18.0 is 0.39 acres consisting of landscaping. Runoff will sheet flow to Baldwin Gulch, following its historic path. The runoff coefficients for this sub-basin are 1.59 and 3.09 for the 5-year and 100-year storm, respectively.

Sub-basin 19.0 is 0.11 acres consisting of streets, curb, and gutter. Runoff will flow onto Twenty Mile Road, following its historic path. The runoff coefficients for this sub-basin are 0.45 and 0.88 for the 5-year and 100-year storm, respectively.

Sub-basin 20.0 is 0.03 acres consisting of streets, curb, and gutter. Runoff will flow onto Pine Lane, following its historic path. The runoff coefficients for this sub-basin are 0.11 and 0.22 for the 5-year and 100-year storm, respectively.

Runoff from the proposed development will generally be collected by means of curb and gutter in the paved driveways and access roads within each delineated basin area. The runoff collected from each basin will be conveyed to the existing detention pond at the southwest corner of the Site. The controlled stormwater release from the detention and water quality structures will be conveyed through the existing outlet structure into Baldwin Gulch.

There are two (2) drainage basins (0.14 acres) of the Project Site that drain off-site, following their historic paths. Sub-basins 19.0 & 20.0 drain into the adjacent right-of way to the North and West. These drainage basins represent the landscape area between the perimeter buildings and the adjacent roadways (Twenty Mile Road to the west and Pine Lane to the north).

DETAINED SUB-BASINS

Sub-Basins 1.1 – 18.0

Sub-basins 1.1-18.0 are bound between Twenty Mile Road, Pine Lane and Baldwin Gulch. Some sub-basins being detained on-site include a total of 0.34 acres of off-site runoff. Sub-basins 3.0, 5.0, 7.0, 8.0, and 15.0 all account for portions of the off-site runoff being detained on-site. Each sub-basin contains a combination of paved areas, landscaping and streets. Overland flows will be directed to catch basins throughout the site. Curb inlets and grate inlets have been designed to accommodate the 100-yr storm. The landscaping areas overland flow to grate inlets or curb and gutter within each respective sub-basin. Runoff from the sub-basins is conveyed through an underground storm sewer system to the existing detention pond on the southwest corner of the site.

Refer to Table 1 for a summary of areas and post-development flows for the detained sub-basins.

Table 1. Runoff Summary for All Detained Sub-Basins

Runoff Summary			
BASIN ID	AREA	Q_5	Q_{100}
	Ac	CFS	CFS
1.1	1.43	4.93	10.37
1.2	1.97	6.77	14.25
2.0	0.88	3.00	6.33
3.0	1.97	6.80	14.29
4.1	1.14	3.91	8.23
4.2	0.77	2.65	5.56
5.0	1.13	3.89	8.18
6.0	2.22	7.62	16.06
7.0	1.02	3.48	7.35
8.0	1.94	6.13	12.90
9.0	0.10	0.42	0.81
10.0	0.16	0.65	1.26
11.0	0.21	0.86	1.66
12.0	0.14	0.57	1.09
13.0	0.08	0.32	0.62
14.0	0.17	0.67	1.30
15.0	0.18	0.72	1.40
16.0	0.17	0.67	1.30
17.0	0.11	0.45	0.87
18.0	0.39	1.59	3.09

UNDETAINED SUB-BASINS

Sub-Basins 19.0, and 20.0

Sub-basins 19.0, and 20.0 are a total of 0.14 acres in size and are not detained. These sub-basins follow their historic flows onto the public right of way and into Baldwin Gulch.

Table 2. Runoff Summary for Undetained Sub-Basins

Runoff Summary			
BASIN ID	AREA	Q_5	Q_{100}
	Ac	CFS	CFS
19.0	0.11	0.45	0.88
20.0	0.03	0.11	0.22

PARKER AUTO PLAZA FINAL DRAINAGE REPORT COMPLIANCE

The Parker Auto Plaza Final Drainage Report, dated July 12, 2004 was prepared as part of the Parker Auto Plaza Development by Kiowa Engineering Corporation.

The FDR extended detention basin is sized to store 15.45 acres of a proposed 95% impervious site. The Project extended detention basin will actually detain 15.81 acres of the proposed 85% impervious site.

The existing detention basin was sized based on a required 10-year and 100-year capacity of 2.06 ac-ft and 2.97 ac-ft, respectively. The Project site only requires 1.26 ac-ft and 2.13 ac-ft for the 10-year and 100-year capacities, respectively. The Project's required volumes were calculated to include WQCV capture volume. Based on this approach, the drainage design provided for the Project is in keeping with the Parker Auto Plaza FDR. Appendix D5 shows the calculations for the required 10-year and 100-year storage capacities for proposed development configuration.

FLOODPLAIN DEVELOPMENT PERMIT

A floodplain development permit from the Town of Parker is not required.

ENVIRONMENTAL PROTECTION CRITERIA

GENERAL

The Site is influenced by Baldwin Gulch. Baldwin Gulch is in the Town of Parker and Urban Drainage and Flood Control District jurisdictions. No impacts to threatened or endangered species are anticipated as a result of the Project, and the Project is understood to comply with the State and Federal environmental permitting regulations.

CONSTRUCTION BMP PLAN

Construction BMPs will be used throughout the redevelopment of the Site in order to comply with section 8.2 of the CRITERIA. Construction BMPs implemented onsite include temporary sediment basins, diversion ditches, silt fence and construction fence around the perimeter of the Site, vehicle tracking control, and a concrete washout area. The full list of construction BMPs to be implemented is shown on sheets C3.0- C3.11 of the Project's Civil Construction Documents.

PERMANENT BMP PLAN

The permanent plan to implement BMPs was designed in accordance with section 8.3 of the CRITERIA. For this Tier 3 redevelopment according to the CRITERIA, the primary permanent BMP that will be implemented is the existing detention pond for the Site drainage. The pond will satisfy the requirements for the permanent BMPs onsite.

CONCLUSIONS

COMPLIANCE WITH STANDARDS

The drainage design presented within this report conforms to the Town of Parker Storm Drainage and Environmental Criteria Manual. The major drainageway in the area, Baldwin Gulch, will not be adversely affected by the Project, and the Project meets Urban Drainage and Flood Control District requirements.

DRAINAGE CONCEPT

The drainage design discussed herein effectively controls the storm runoff from the Project by conveying developed runoff to the detention pond at the southwest portion of the Site. The proposed 10-year and 100-year volume requirements fall below the Parker Auto Plaza FDR's 10-year and 100-year volume requirements, to which the existing detention pond was designed. The existing outlet structure and release rates will not be modified as part of the proposed development. The released drainage from the pond is carried through a storm sewer and outfalls into Baldwin Gulch.

SEDIMENT AND EROSION CONTROL CONCEPT

The Construction BMP plans are designed to prevent erosion within the Site during and after construction. BMPs are in place to prevent erosion during construction including a temporary sediment basin, diversion ditch, silt fence around the perimeter of the Site, vehicle tracking control, and a concrete washout area. The forebay structure will prevent erosion at the bottom of the pond. Furthermore, the proposed concrete trickle channels within the pond will prevent erosion in the permanent condition.

REFERENCES

1. Town of Parker Storm Drainage and Environmental Criterial Manual, February 1996, Revised and Adopted February 2014.

2. Urban Drainage and Flood Control District Drainage Criteria Manual (UDFCDCM), Vol. 1, prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.

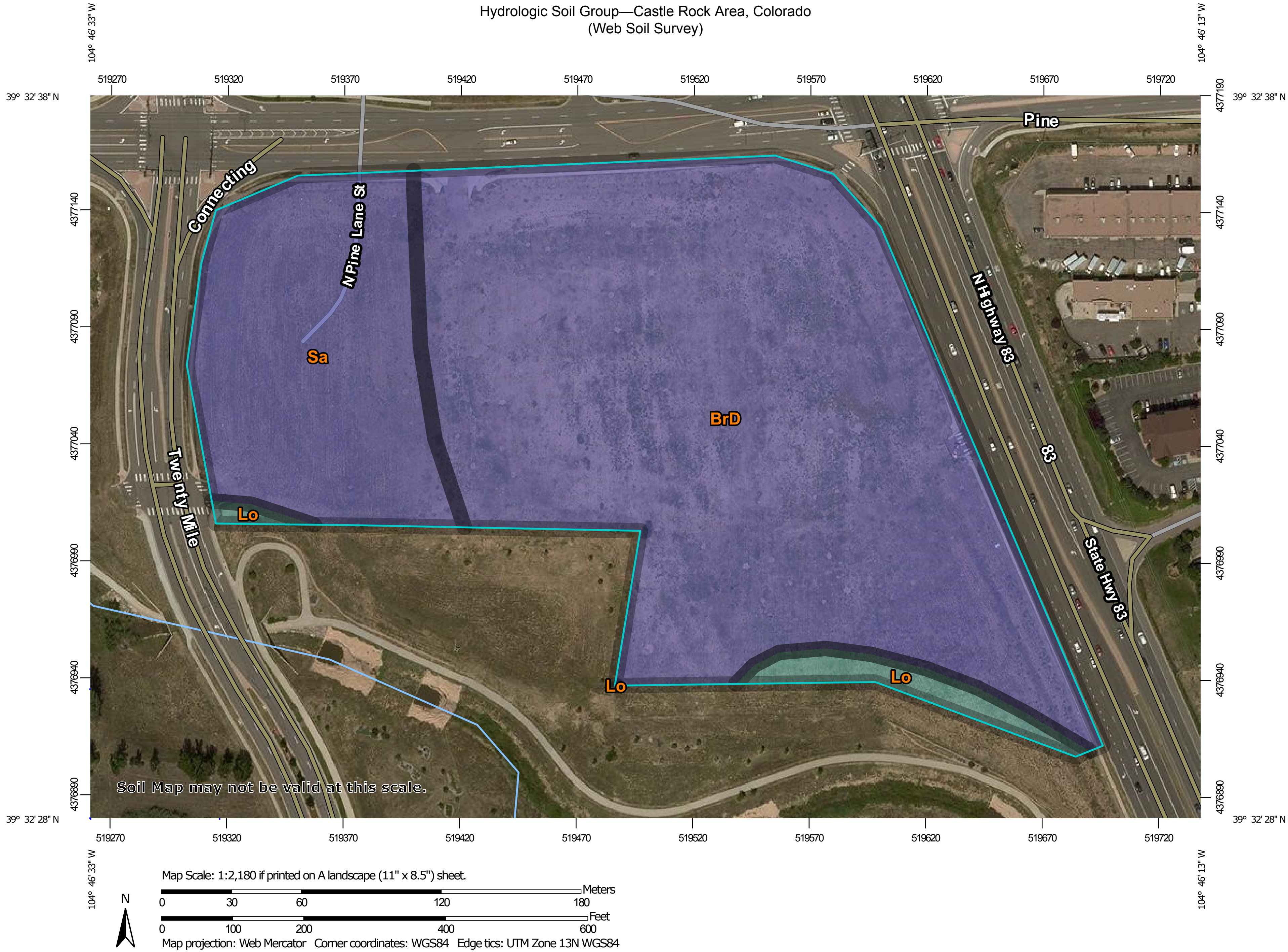
3. Flood Insurance Rate Map, Douglas County, Colorado and Incorporated Areas, Map Number 08035C0067G, Revised March 16, 2016, prepared by the Federal Emergency Management Agency (FEMA).

4. Parker Auto Plaza Final Drainage Report, July 12, 2004, prepared by Kiowa Engineering Corporation.

APPENDIX

APPENDIX A - HYDROLOGIC SOIL GROUP MAP

Hydrologic Soil Group—Castle Rock Area, Colorado
(Web Soil Survey)



MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 9, Sep 22, 2016

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—Aug 21, 2014

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.