



Civil Engineering, Landscape Architecture,
Survey, Planning & Program Management

710 W. Pinedale Avenue
Fresno, CA 93711
Office: 559.447.3119
Toll-free: 1.800.473.1887
ceieng.com

February 2, 2022

Town of Parker, CO – Stormwater Utility
20120 E. Main Street
Parker, CO 80138

Re: Quick N Clean Car Wash (Parker Road & Pine Lane Avenue) – Drainage Letter

To Whom It May Concern,

Along with the construction documents for the referenced project, please accept this written statement regarding stormwater requirements for the proposed development. The proposed development consists of a proposed Quick N Clean Car Wash, paving, parking, utilities, and landscaping within an overall development. Drainage calculations were performed using the Town of Parker Storm Drainage and Environmental Criteria Manual (Manual).

The intent of this letter is to demonstrate that the proposed Quick N Clean Car Wash development conforms to the Town of Parker Storm Drainage and Environmental Criteria Manual and also falls within the design criteria of the Parker and Pine Retail Final Drainage Report (FDR) prepared by Kimley Horn, April 2020.

1.0 Introduction

The proposed Quick N Clean Development lies at the corner of Parker Rd. and Pine Line Avenue in Parker, CO. The site is Lot 4 of Parker and Pine Filing No. 1, County of Douglas, State of Colorado and is approximately 1.85 acres. The site is bounded on the North by a proposed Slim Chickens development for Lot 3 of Parker and Pine Filing No. 1, to the East by Parker Rd, and to the South and West by Baldwin Gulch.

2.0 Drainage Design Criteria

A. Hydrologic Criteria

The 5yr and 100yr design storm events were used in determining the overall runoff for the project site per Table 2.3 of the Town of Parker Storm Drainage and Environmental Criteria Manual. Table 5.1 of the Manual was utilized for determining rainfall date for the 5yr and 100yr design storm events. Runoff was calculated utilizing the Rational Method. Runoff coefficients for the development were calculated using Table 6-5 of Volume 1 of the Urban Storm Drainage Criteria Manual. Please refer to the hydrologic calculations in the attachments for additional information.

Drainage from the Car Wash facilities will be captured through a series of drains inside the car wash and be routed to reclamation tanks as part of the sanitary sewer system. These flows will be kept separate from storm water drainage as the interior of the car wash will be sloped towards the internal drainage system, and the exterior paved areas around the car wash will be sloped away from the facility and drain to the proposed storm sewer facilities.

Per the findings in the FDR, stormwater detention mitigation and water quality were evaluated and provided within the overall development. Per section 8.3.2.3.b Regional Facilities of the Storm Drainage and Environmental Criteria Manual the development will not discharge runoff to state waters and regional detention is provided for the overall development. Therefore, no permanent BMPs would be required for this development.

B. Hydraulic Criteria

The proposed drainage facilities were designed in accordance with the Manual and were designed for both the 5yr and 100yr storm events in accordance with the Manual. Storm sewer pipes were sized and hydraulic grade lines calculated using UD-Sewer 2009 software. Private landscape inlets were sized utilizing manufacturer provided capacity charts, and all public inlets were sized utilizing UD-Inlet V5.01. Swale capacities were analyzed using Hydraflow Express Extension for AutoDesk Civil 3D software. Curb capacity for the landscape curb and gutter was analyzed using UD-Inlet V5.01. Full hydraulic calculations for the site can be found in the attachments.

3.0 Drainage Facility Design

A. Existing Drainage Basins

The existing drainage basin the site lies within is Sub-Basin 8.0 of the Parker and Pine Retail Final Drainage Report. The Sub-Basin area generally slopes Southwest towards Baldwin Gulch, and the Sub-Basin has a design imperviousness value of approximately 85% with a runoff rate of 6.13cfs and 12.90cfs for the 5yr and 100yr storm events respectively. The runoff for Sub-Basin 8.0 is intended to be routed to manhole B08.1 at design point 8.0 per the FDR. There is also an extremely small portion of the proposed development which will lie within Sub-Basin 17.0 of the FDR. Sub-Basin 17.0 has a design imperviousness value of approximately 100% with a runoff rate of 0.45cfs and 0.87cfs for the 5yr and 100yr storm events respectively. The runoff for Sub-Basin 17.0 is intended to be routed to Curb Inlet B08 at design point 17.0. Please refer to the FDR Drainage Area Map in the attachments for additional information.

B. Proposed Drainage Basins

Upon development, the site will be split into (6) Sub-Basins and will comprise a total drainage area of approximately 2.05acres. All of the drainage from the Sub-Basins except Sub-Basins E and F will eventually flow to the existing regional storm sewer system at Curb Inlet B08 of the FDR.

Sub-Basin A will consist of on-site and off-site drainage which comprises a total drainage area of approximately 0.01acres. Runoff consists of paved, sidewalk, and landscape drainage and totals 0.03cfs and 0.06cfs for the 5yr and 100yr storm events respectively. The runoff will sheet flow towards the existing Curb Inlet B08 (per the FDR) at design point 1 and connect to the regional storm sewer system.

Sub-Basin B will consist of on-site and off-site drainage which comprises a total drainage area of approximately 0.37 acres. Runoff consists of paved, sidewalk, and landscape drainage and totals 0.89cfs and 2.35cfs for the 5yr and 100yr storm events respectively. The runoff will be routed west to Grate Inlet GI-1 at design point 2.

Sub-Basin C will consist of on-site and off-site drainage which comprises a total drainage area of approximately 1.01 acres. Runoff consists of paved, sidewalk, roof, and landscape drainage and totals 3.41cfs and 7.36cfs for the 5yr and 100yr storm events respectively. The majority of runoff will sheet flow west towards proposed curb inlet CI-1 at design point 3. Some of the runoff will be captured by a curb and gutter system along the western drive aisle and then be routed east to curb inlet CI-1 at design point 3.

Sub-Basin D will consist of on-site and off-site drainage which comprises a total drainage area of approximately 0.56 acres. Runoff consists of landscape drainage and totals 0.06cfs and 2.21cfs for the 5yr and 100yr storm events respectively. The majority of the drainage will be collected in a landscape swale along the eastern side of the property behind the car wash and flow south then west via swale to a proposed raised curb and gutter system along the western edge of the property which will route the drainage northwest towards proposed yard inlet YI-1 at design point 4.

Sub-Basin E will consist of drainage from on-site runoff which comprises a total drainage area of approximately 0.06 acres. Runoff consists of landscape nuisance drainage and totals 0.003cfs and 0.24cfs for the 5yr and 100yr storm events respectively. This storm drainage which was unable to capture on-site will flow southwest towards Baldwin Gulch at design point 5.

Sub-Basin F will consist of drainage from on-site runoff which comprises a total drainage area of approximately 0.05 acres. Runoff consists of landscape nuisance drainage and totals 0.002cfs and 0.19cfs for the 5yr and 100yr storm events respectively. Storm drainage from Sub-Basin E was unable to be captured and routed to the storm sewer system due to the elevation of 100yr HGL's for the proposed regional storm sewer system which is at elevation 5802.10. This storm drainage will flow towards Baldwin Gulch per previous drainage patterns at design point 6.

It should be noted that the existing Curb Inlet B08 is also receiving drainage from the area represented by design Sub-Basin 17.0 per the FDR. The Curb Inlet capacity has been analyzed based on proposed site grading and total flows being routed to it.

For additional information on the proposed drainage facility design, please refer to the Grading and Drainage Plans as well as the hydrologic calculations in the attachments.

4.0 Conclusion

The Quick N Clean development is part of Sub-basin 8.0 per the FDR. This basin consists of 1.94 acres with a design impervious percentage of 85%. Allowable runoff rates for this basin are 6.13cfs and 12.90cfs for the 5yr and 100yr storm events respectively. The proposed development is approximately 62% impervious with proposed runoff rates of 4.40cfs and 12.41cfs for the 5yr and 100yr storm events respectively. The proposed development runoff is less than the allowable runoff for the subject basin. Also, per the FDR, regional water quality and detention is provided for the overall regional development. Since the runoff rates for the

proposed site are below the design rates in the FDR, and regional water quality and detention is provided, no additional on-site detention or permanent BMP's are required.

Runoff Comparison Table		
<i>Runoff (cfs)</i>	5yr	100yr
<i>Proposed Runoff</i>	4.40	12.41
<i>Allowable Runoff</i>	6.13	12.90
<i>Net Change</i>	-1.73	-0.49

Improvements outlined in this drainage letter and depicted on the construction documents shall not increase the risk of endangerment to life or have negative impacts on adjacent or downstream property or watersheds.

Sincerely,



Eric Lawrence, PE
Project Designer



Tom Burry, PE
Department Manager - Engineer of Record

Attachments

Attachment 1: Drainage Map – Parker and Pine Retail Final Drainage Report

Attachment 2: Quick N Clean Grading Plan and Post Drainage Map

Attachment 3: Hydrologic Calculations

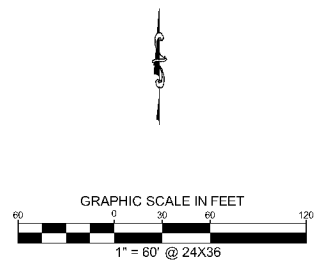
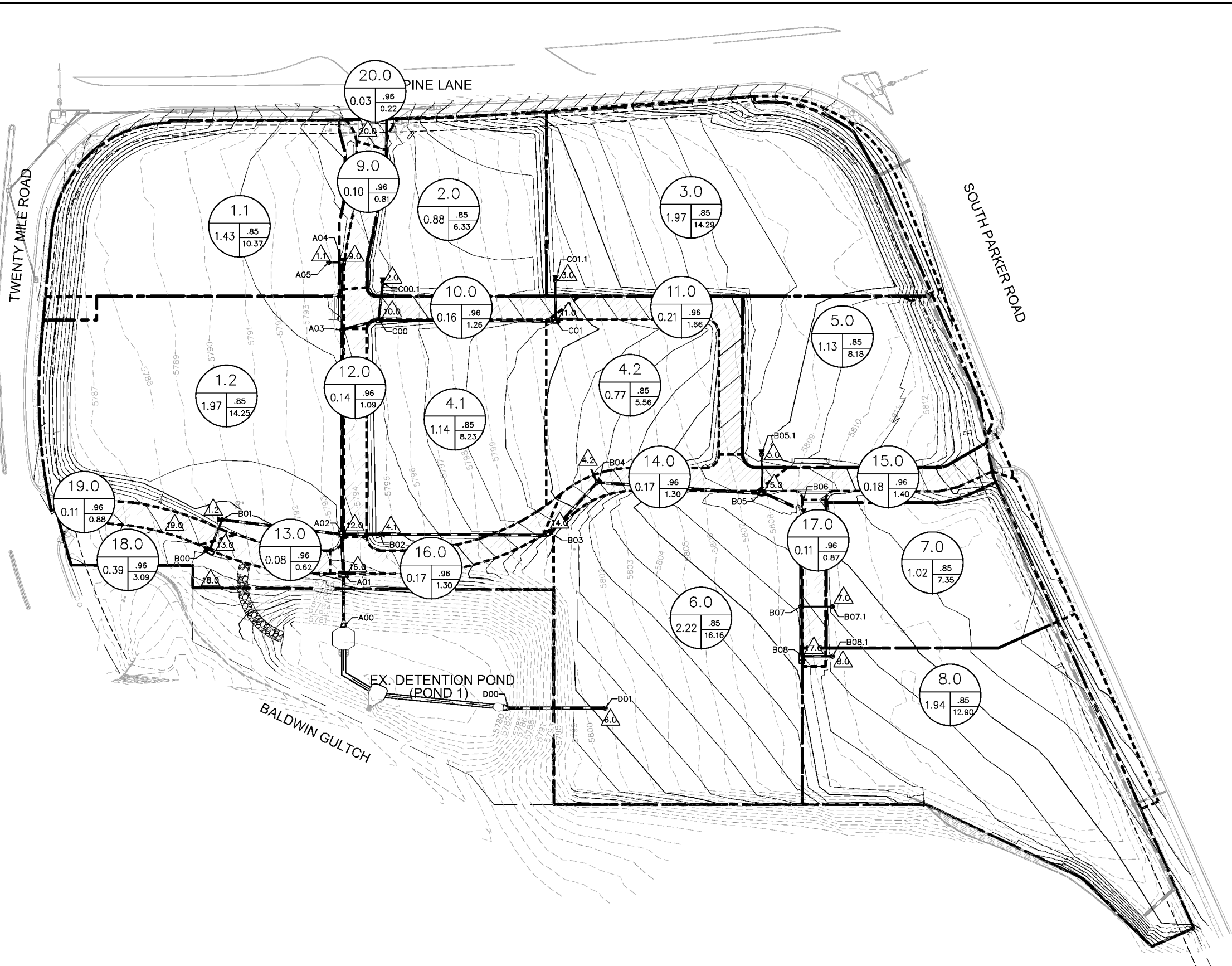
Attachment 4: Hydraulic Calculations

ATTACHMENT 1

OVERALL DEVELOPER DRAINAGE MAP

PARKER AND PINE RETAIL

K:\DEN_Civil\096502001 - Mixed Use Parker Rd\CADD\PlanSheets\096502001DRM.dwg - Zematlis, Even 10/5/2019 10:57 AM
 THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, IS AN INSTRUMENT OF SERVICE AS DEFINED IN THE STANDARD CONTRACT BETWEEN KIMLEY-HORN AND ASSOCIATES, INC. AND ITS CLIENTS. IT IS TO BE USED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. NO PART OF THIS DOCUMENT SHALL BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, WITHOUT THE WRITTEN AUTHORIZATION AND APPROVAL OF KIMLEY-HORN AND ASSOCIATES, INC.



LEGEND

- | |
|---|
| A |
| B |
| C |
| D |

 A = BASIN DESIGNATION
- B = AREA (ACRES)
- C = BASIN IMPERVIOUSNESS
- D = 100YR DESIGN STORM RUNOFF (CFS)
- FLOW DIRECTION
- DRAINAGE BASIN BOUNDARY
- EXISTING PROPERTY LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED STORM INLET

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn
 2019 KIMLEY-HORN AND ASSOCIATES, INC.
 1080 South U.S. Hwy. 1900
 Denver, Colorado 80237 (303) 728-3700

DESIGNED BY: DLS
 DRAWN BY: ECZ
 CHECKED BY: DLS
 DATE: 11/11/19

PARKER & PINE
 PARKER, CO
 CONSTRUCTION DOCUMENTS
PRELIMINARY DRAINAGE AREA MAP

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

PROJECT NO.
 096502001
 DRAWING NAME
 096502001DRM
DRAINAGE



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

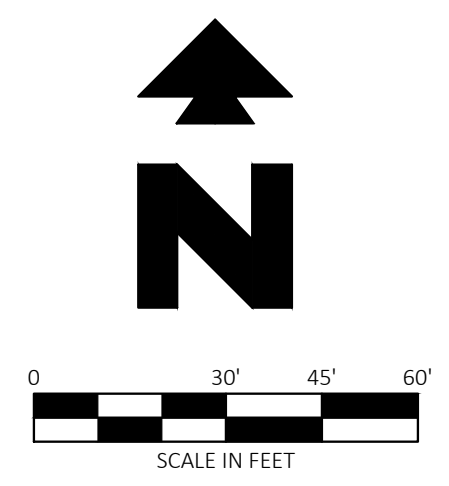
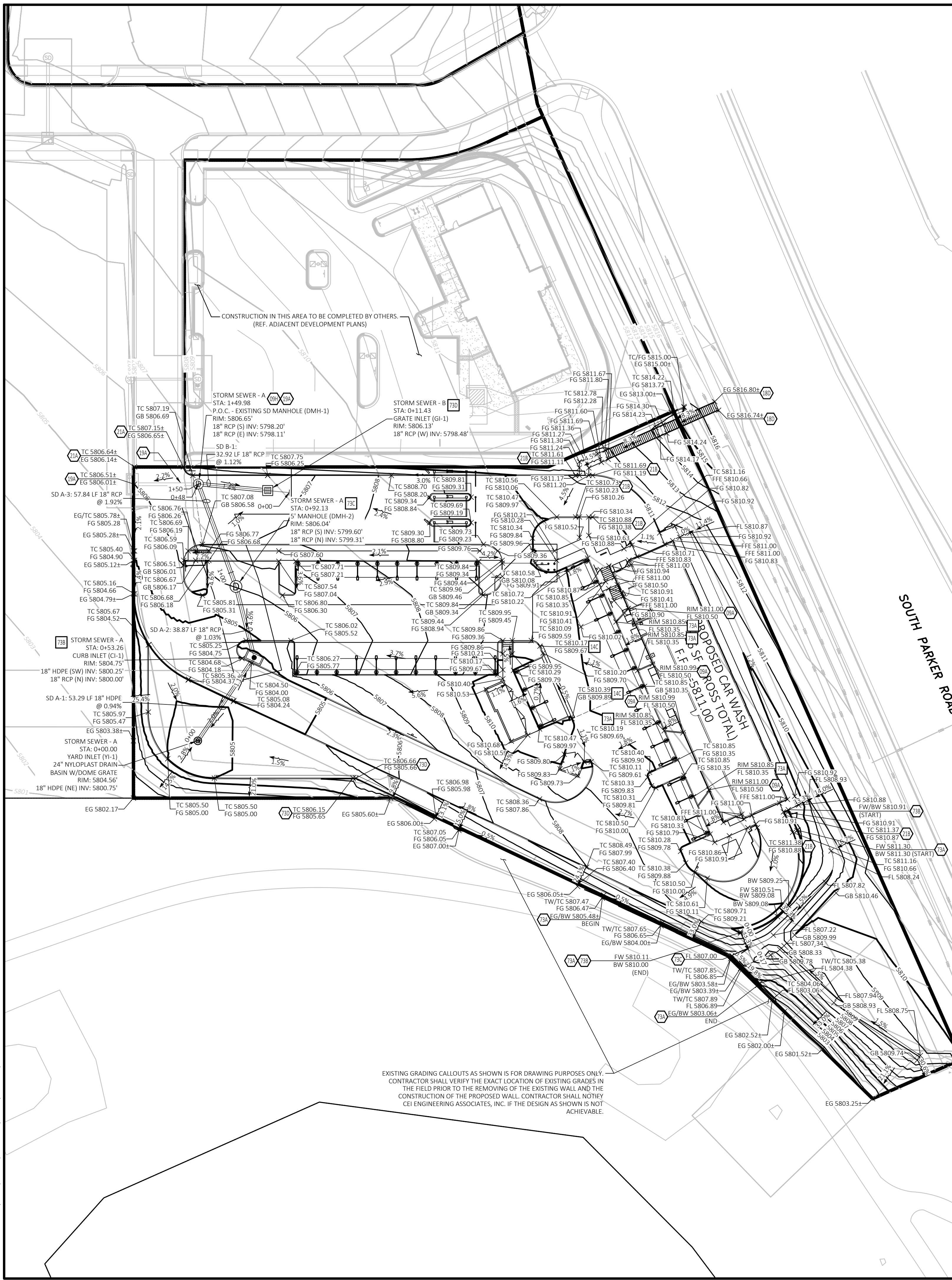
Sub-basins 19.0, and 20.0 are a total of 0.14 acres in size and are not detained. These sub-basins follow their historic flows onto the public right of way and into Baldwin Gulch.

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

ATTACHMENT 2

QUICK N CLEAN GRADING PLAN AND
POST DRAINAGE MAP



Know what's below.
Call before you dig.

EXISTING LEGEND:

- PROPERTY LINE/RIGHT OF WAY LINE
- COMMUNICATIONS MANHOLE
- SANITARY SEWER MANHOLE
- STORM SEWER MANHOLE
- UNDERGROUND GAS LINES
- UNDERGROUND COMMUNICATIONS LINES
- UNDERGROUND STORM SEWER LINES

PROPOSED

- GRADE BREAK
- XXX--- CONTOUR ELEVATIONS
- STORM DRAIN
- XX.XX SPOT ELEVATIONS:
BW= BOTTOM OF WALL
EG= EXISTING GRADE
FFE= FINISH FLOOR ELEVATION
FG= FINISH GRADE
FL= FLOW LINE
FW= FRONT OF WALL
GB= GRADE BREAK
RIM= TOP OF STRUCTURE
TC= TOP OF CURB
TW= TOP OF WALL

GENERAL GRADING NOTES

- A. PRIOR TO INSTALLATION OF STORM OR SANITARY SEWER, THE CONTRACTOR SHALL EXCAVATE, VERIFY, AND CALCULATE ALL CROSSINGS AND INFORM THE OWNER AND THE ENGINEER OF ANY CONFLICTS PRIOR TO CONSTRUCTION. THE ENGINEER WILL BE HELD HARMLESS IN THE EVENT THE ENGINEER IS NOT NOTIFIED OF DESIGN CONFLICTS.
- B. CONTRACTOR HAS THE OPTION TO BID THE FOLLOWING MATERIAL FOR THE STORM SEWER SYSTEM EXCEPT WHERE OTHERWISE NOTED: RCP, OR HDPE AS INDICATED ON THIS PLAN WHERE THE WORD PIPE IS USED. ALL PIPES SHALL HAVE A MAXIMUM ROUGHNESS COEFFICIENT ("N") OF 0.013 AND SHALL MEET OR EXCEED THE PIPE MANUFACTURERS REQUIREMENTS FOR MINIMUM AND MAXIMUM COVER. CONTRACTOR SHALL REFER TO THE PROJECT CONTRACT REQUIREMENTS FOR STORM SEWER SYSTEMS FOR ACCEPTABLE TYPE AND MATERIAL.
- C. ALL SLOPES AND AREAS DISTURBED BY CONSTRUCTION SHALL BE GRADED SMOOTH AND 4" OF TOPSOIL APPLIED. IF ADEQUATE TOPSOIL IS NOT AVAILABLE ON SITE, THE CONTRACTOR SHALL PROVIDE TOPSOIL, APPROVED BY THE OWNER, AS NEEDED. THE AREA SHALL THEN BE SEEDED, FERTILIZED, MULCHED, WATERED AND MAINTAINED UNTIL HARDY GRASS GROWTH IS ESTABLISHED IN ALL AREAS (SEE LANDSCAPE PLAN FOR SEED MIX AND PROPER APPLICATION RATE). ANY AREAS DISTURBED FOR ANY REASON PRIOR TO FINAL ACCEPTANCE OF THE PROJECT SHALL BE CORRECTED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
- D. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES, AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES.
- E. UNLESS OTHERWISE SHOWN, CALLED OUT OR SPECIFIED HEREON OR WITHIN THE SPECIFICATIONS OF THE LOCAL AUTHORITIES:
ALL STORM DRAIN PIPE BEDDING SHALL BE INSTALLED PER DETAIL 28A (REF. CS. 2 - GRADING DETAILS).
ALL STORM DRAIN PIPES ARE MEASURED FROM CENTER OF STRUCTURE AND ENDS OF FLARED END SECTIONS.

GRADING DETAILS (REF. GRADING DETAIL SHEET)

- 14C CONCRETE SWALE IN PAVED AREA CS. 2 - GRADING DETAILS.
- 17A CURB CUT (REF. CS. 2 - GRADING DETAILS).
- 73A 6" CURB CHASE DRAIN (NON-RESIDENTIAL) LAYOUT - PER PARKER COLORADO STANDARD DETAIL 29 (REF. CS. 3 - GRADING DETAILS).
- 73B 10' CDOT TYPE R CURB INLET W/ TOWN OF PARKER MANHOLE COVER (REF. CS. 3 - GRADING DETAILS).
- 73C 5' CDOT MANHOLE W/TOWN OF PARKER MANHOLE COVER (REF. CS. 4 - GRADING DETAILS).
- 73D CDOT TYPE 13 INLET (REF. CS. 4 - GRADING DETAILS).

GRADING NOTES

- 09A DOWN SPOUTS - (TYP. - PER ARCH. PLANS).
- 09H REMOVE TOP OF EXISTING DRAINAGE STRUCTURE AND ADJUST RIM TO ELEVATION TO MATCH FINISH GRADE. IF EXISTING STRUCTURE TOP IS A GRATE, REPLACE WITH TOWN OF PARKER MANHOLE COVER.
- 18D MATCH EXISTING PAVEMENT ELEVATIONS.
- 19A EXISTING TO REMAIN.
- 21A TAPER CURB TO MATCH EXISTING CURB.
- 21B TAPER CURB FROM 6 INCHES TO 2 INCHES OVER 2 FEET.
- 73A RETAINING WALL (PER ARCH. PLANS).
- 73B FOUR (4) FOOT SCREEN WALL (PER ARCH. PLANS).
- 73C LANDSCAPE SWALE TERMINATION (REF SECTION VIEW THIS SHEET)
- 73D TRANSITION FROM 6" CURB AND GUTTER TO 12" RAISED CURB AND GUTTER

ADA STANDARD NOTE

THE PARTIES RESPONSIBLE FOR THIS PLAN HAVE FAMILIARIZED THEMSELVES WITH ALL CURRENT ACCESSIBILITY CRITERIA AND SPECIFICATIONS AND THE PROPOSED PLAN REFLECTS ALL SITE ELEMENTS REQUIRED BY THE APPLICABLE ADA DESIGN STANDARDS AND GUIDELINES AS PUBLISHED BY THE UNITED STATES DEPARTMENT OF JUSTICE. APPROVAL OF THIS PLAN BY THE CITY OF PARKER DOES NOT ASSURE COMPLIANCE WITH THE ADA OR ANY OTHER FEDERAL OR STATE ACCESSIBILITY LAWS OR ANY REGULATIONS OR GUIDELINES ENACTED OR PROMULGATED UNDER OR WITH RESPECT TO SUCH LAWS. SOLE RESPONSIBILITY FOR COMPLIANCE WITH FEDERAL AND STATE ACCESSIBILITY LAWS LIES WITH THE PROPERTY OWNER.

BENCHMARK

DOUGLAS CONTROL MONUMENT #1.095035, A 3" ALUMINUM CAP.
ELEVATION = 5906.34 FEET (NAVD1988), AS PUBLISHED BY DOUGLAS COUNTY

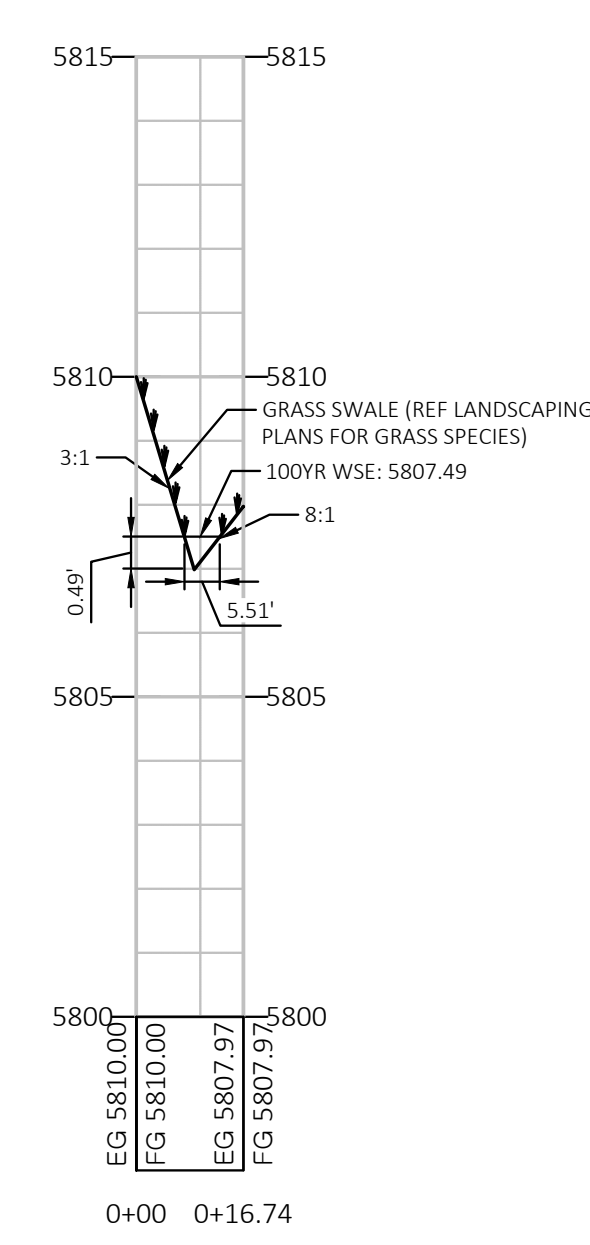
BASIS OF BEARINGS

THE BEARINGS ARE BASED ON THE WEST ROW LINE OF SOUTH PARKER ROAD ASSUMED TO BEAR S23°56'20"E BETWEEN MONUMENTS FOUND AND DESCRIBED HEREON.

FLOOD ZONE INFORMATION

SUBJECT PROPERTY IS LOCATED WITHIN ZONE "X", AREAS OF MINIMAL FLOOD HAZARD, AS DETERMINED BY THE NATIONAL FLOOD INSURANCE PROGRAM.
MAP NUMBER: 0803CD067G
EFFECTIVE DATE: MARCH 16, 2016

LANDSCAPE SWALE CROSS SECTION PROFILE
VERTICAL SCALE: 1"=3'
HORIZONTAL SCALE: 1"=30'



EXISTING GRADING CALLOUTS AS SHOWN IS FOR DRAWING PURPOSES ONLY. CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF EXISTING GRADES IN THE FIELD PRIOR TO THE REMOVING OF THE EXISTING WALL AND THE CONSTRUCTION OF THE PROPOSED WALL. CONTRACTOR SHALL NOTIFY CEI ENGINEERING ASSOCIATES, INC. IF THE DESIGN AS SHOWN IS NOT ACHIEVABLE.



CEI ENGINEERING ASSOCIATES, INC.
710 W. PINE DALE AVE.
FRESNO, CA 93711
PHONE: (559) 447-3119
FAX: (559) 447-3129



CLIENT
3K1 CONSULTING SERVICES, LLC.
11811 N. TATUM BOULEVARD,
PHOENIX, ARIZONA 85028
PHONE: (602) 850-8100



PLANS PREPARED FOR
QUICK N CLEAN
7291 E. ADOBE DRIVE, SUITE 115
SCOTTSDALE, AZ 85255
PHONE: (480) 707-3531

REVISION		
NO.	DESCRIPTION	DATE

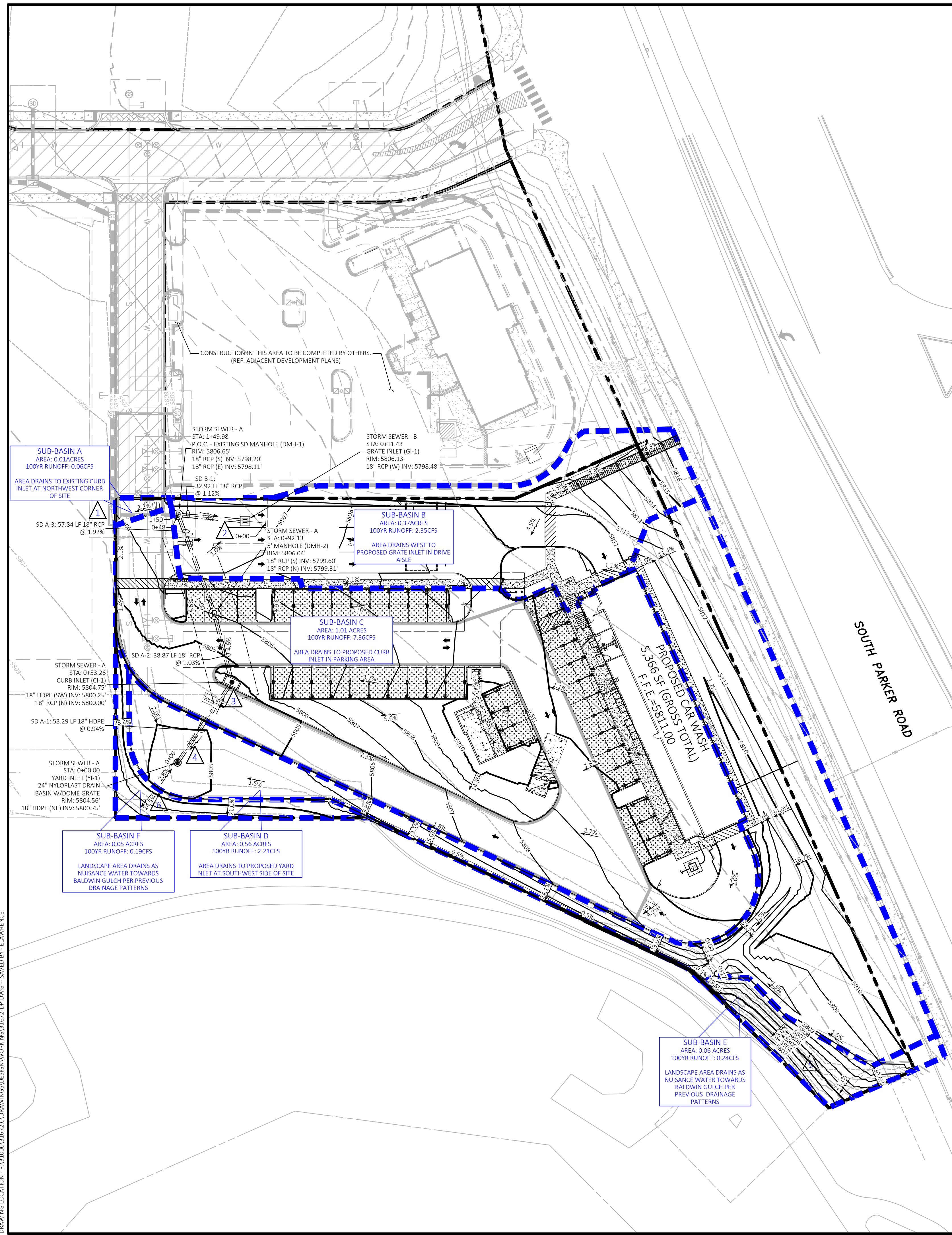
QUICK N CLEAN
PARKER RD. & PINE LANE AVE.
PARKER, COLORADO
CONSTRUCTION DOCUMENTS

FOR REVIEW ONLY
NOT FOR
CONSTRUCTION

PROFESSIONAL OF RECORD	TAB
PROJECT MANAGER	ASD
DESIGNER	RM
CEI PROJECT NUMBER	31672
DATE	2/2/2022
REVISION	REV-2

GRADING PLAN
SHEET TITLE
SHEET NUMBER

C5



POST DEVELOPMENT STORMWATER RUNOFF
Rational Method
Project: Quick N Clean
Address: Parker Rd. & Pine Lane Ave.
Parker, CO
Based Upon: City of Parker and UDFCD Drainage Manual

Time of Concentration

	Min	Notes
Tc		Min. Tc for urbanized conditions

Sub-Basin A (Onsite and Offsite)

Total Area	0.01 acres	350 SF	Notes
Paved Area	0.01 acres	350 SF	Area drains to existing curb inlet at northwest corner of site
Drive and Walks	0.00 acres	0 SF	
Lawns, Sandy Soil	0.00 acres	0 SF	
% Impervious (Composite)	100%		

Hydrologic Soil Group B

Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr
Rainfall Intensity (in/hr) (Equation RA-S UDFCD)	5yr	100yr
Runoff (cfs)	5yr	100yr

Sub-Basin B (Onsite and Offsite)

Total Area	0.37 acres	15,969 SF	Notes
Paved Area	0.20 acres	8,651 SF	Area drains to proposed grate inlet in drive aisle
Drive and Walks	0.03 acres	1,283 SF	
Lawns, Sandy Soil	0.14 acres	6,035 SF	
% Impervious (Composite)	62%		

Hydrologic Soil Group B

Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr
Rainfall Intensity (in/hr) (Equation RA-S UDFCD)	5yr	100yr
Runoff (cfs)	5yr	100yr

Sub-Basin C (Onsite and Offsite)

Total Area	1.01 acres	43,983 SF	Notes
Paved Area	0.69 acres	30,056 SF	Area drains towards proposed curb inlet CI-1 in parking area
Drive and Walks	0.05 acres	2,063 SF	
Roofs	0.12 acres	5,336 SF	
Lawns, Sandy Soil	0.15 acres	6,528 SF	
% Impervious (Composite)	84%		

Hydrologic Soil Group B

Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr
Rainfall Intensity (in/hr) (Equation RA-S UDFCD)	5yr	100yr
Runoff (cfs)	5yr	100yr

Sub-Basin D (Onsite and Offsite)

Total Area	0.58 acres	24,689 SF	Notes
Drives and Walks	0.03 acres	674 SF	Area drains towards proposed yard inlet W-1 at southwest corner of site
Lawns, Sandy Soil	0.54 acres	23,515 SF	
% Impervious (Composite)	4%		

Hydrologic Soil Group B

Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr
Rainfall Intensity (in/hr) (Equation RA-S UDFCD)	5yr	100yr
Runoff (cfs)	5yr	100yr

Sub-Basin E (Onsite and Offsite)

Total Area	0.06 acres	2,715 SF	Notes
Lawns, Sandy Soil	0.06 acres	2,715 SF	Landscape area drains as nuisance flow towards Baldwin Gulch per previous drainage patterns.
% Impervious (Composite)	2%		

Hydrologic Soil Group B

Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr
Rainfall Intensity (in/hr) (Equation RA-S UDFCD)	5yr	100yr
Runoff (cfs)	5yr	100yr

Sub-Basin F (Onsite and Offsite)

Total Area	0.05 acres	2,100 SF	Notes
Lawns, Sandy Soil	0.05 acres	2,100 SF	Landscape area drains as nuisance flow towards Baldwin Gulch per previous drainage patterns.
% Impervious (Composite)	2%		

Hydrologic Soil Group B

Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr
Rainfall Intensity (in/hr) (Equation RA-S UDFCD)	5yr	100yr
Runoff (cfs)	5yr	100yr

Total Runoff (CFS)

Total Area	2.05 acres	89,306 SF	
Paved Area	0.90 acres	39,057 SF	
Drive and Walks	0.09 acres	4,020 SF	
Roofs	0.12 acres	5,336 SF	
Lawns, Sandy Soil	0.94 acres	40,893 SF	
% Impervious (Composite)	62%		

Hydrologic Soil Group B

Runoff (cfs)	5yr	100yr
	4.40	12.41

Know what's below. Call before you dig.

EXISTING LEGEND:

- PROPERTY LINE/RIGHT OF WAY LINE
- COMMUNICATIONS MANHOLE
- SANITARY SEWER MANHOLE
- STORM SEWER MANHOLE
- UNDERGROUND GAS LINES
- UNDERGROUND COMMUNICATIONS LINES
- UNDERGROUND STORM SEWER LINES

PROPOSED LEGEND:

- BASIN BOUNDARY
- STORM DRAIN
- DESIGN POINT

FLOOD ZONE INFORMATION

SUBJECT PROPERTY IS LOCATED WITHIN ZONE "X", AREAS OF MINIMAL FLOOD HAZARD, AS DETERMINED BY THE NATIONAL FLOOD INSURANCE PROGRAM.
MAP NUMBER: 08035C0067G
EFFECTIVE DATE: MARCH 16, 2016

BENCHMARK

DOUGLAS CONTROL MONUMENT #1.095035, A 3" ALUMINUM CAP.
ELEVATION = 5906.34 FEET (NAVD1988), AS PUBLISHED BY DOUGLAS COUNTY

PROPOSED DRAINAGE MAP AND BASIN ARE BASED ON BASIN NO. 8 IN PARKER AND PINE RETAIL DRAINAGE REPORT PREPARED BY KIMLEY HORN ENGINEERING NOVEMBER 2019

DETENTION IS PROVIDED FOR THE OVERALL DEVELOPMENT PER OVERALL DEVELOPER PLANS

THE RUNOFF FROM THE PROPOSED QUICK N CLEAN SITE IS LESS THAN OR EQUAL TO THE RUNOFF ALLOCATED TO BASIN NO. 8 IN THE PARKER AND PINE RETAIL DRAINAGE REPORT

Runoff Summary

BASIN ID	AREA		
	Ac	CFS	Q ₁₀₀
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

BASIN NO. 8 RUNOFF VALUES PER PARKER AND PINE RETAIL DRAINAGE REPORT

THE TOWN OF PARKER REVIEW CONSTITUTES GENERAL COMPLIANCE WITH THE TOWN'S STANDARDS AND APPROVED VARIANCES, SUBJECT TO THESE PLANS BEING STAMPED, SIGNED, AND DATED BY THE PROFESSIONAL ENGINEER OF RECORD. REVIEW BY THE TOWN DOES NOT CONSTITUTE APPROVAL OF THE PLAN DESIGN OR ACCURACY AND CORRECTNESS OF ENGINEERING CALCULATIONS. ERRORS IN THE DESIGN OR CALCULATIONS REMAIN THE RESPONSIBILITY OF THE REGISTERED PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE ARE AFFIXED TO THIS DOCUMENT.

THIS REVIEW DOES NOT CONSTITUTE APPROVAL OF ANY PRIVATE ON-SITE IMPROVEMENTS WHICH MAY BE CONSTRUCTION CANNOT COMMENCE UNTIL ALL REQUIRED DRAINAGE/TRAFFIC REPORT(S), FINAL DEVELOPMENT PLAN(S), SPECIAL REVIEW(S), GRADING PERMIT, AND/OR OTHER PERMITS ARE COMPLETE, APPROVED AND ON FILE WITH THE TOWN OF PARKER.

TOWN OF PARKER, DIRECTOR OF ENGINEERING / PUBLIC WORKS DATE

CEI Solutions for Land and Life

CEI ENGINEERING ASSOCIATES, INC.
710 W. PINEDALE AVE.
FRESNO, CA 93711
PHONE: (559) 447-3119
FAX: (559) 447-3129

CLIENT
3K1 CONSULTING SERVICES, LLC.
11811 N. TATUM BOULEVARD,
PHOENIX, ARIZONA 85028
PHONE: (602) 850-8101

PLANS PREPARED FOR
QUICK N CLEAN
7291 E. ADOBE DRIVE, SUITE 115
SCOTTSDALE, AZ 85255
PHONE: (480) 707-3531

REVISION

NO.	DESCRIPTION	DATE

QUICK N CLEAN
PARKER RD. & PINE LANE AVE.
PARKER, COLORADO

CONSTRUCTION DOCUMENTS

FOR REVIEW ONLY
NOT FOR
CONSTRUCTION

PROFESSIONAL OF RECORD	TAB
PROJECT MANAGER	ASD
DESIGNER	RM
CEI PROJECT NUMBER	31672
DATE	2/2/2022
REVISION	REV-2

DRAINAGE PLAN

SHEET TITLE
SHEET NUMBER

C6

ATTACHMENT 3

HYDROLOGIC CALCULATIONS

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

POST DEVELOPMENT STORMWATER RUNOFF

Rational Method
 Project: Quick N Clean
 Address: Parker Rd. & Pine Lane Ave.
 Parker, CO
 Based Upon: City of Parker and UDFCD Drainage Manual

Time of Concentration

	Min	Notes
Tc	5	Min. Tc for urbanized conditions

Sub-Basin A (Onsite and Offsite)

Total Area	0.01	acres	350	SF	Notes
Paved Area	0.01	acres	350	SF	Area drains to existing curb inlet at northwest corner of site
Drive and Walks	0.00	acres	0	SF	
Lawns, Sandy Soil	0.00	acres	0	SF	
% Impervious (Composite)	100	%			
Hydrologic Soil Group	B				
Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr			
	0.86	0.89			
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr			
	1.39	2.6			
Rainfall Intensity (in/hr) (Equation RA-5 UDFCD)	5yr	100yr			
	4.71	8.82			
Runoff (cfs)	5yr	100yr			
	0.03	0.06			

Sub-Basin B (Onsite and Offsite)

Total Area	0.37	acres	15,969	SF	Notes
Paved Area	0.20	acres	8,651	SF	Area drains to proposed grate inlet in drive aisle
Drive and Walks	0.03	acres	1,283	SF	
Lawns, Sandy Soil	0.14	acres	6,035	SF	
% Impervious (Composite)	62	%			
Hydrologic Soil Group	B				
Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr			
	0.51	0.72			
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr			
	1.39	2.6			
Rainfall Intensity (in/hr) (Equation RA-5 UDFCD)	5yr	100yr			
	4.71	8.82			
Runoff (cfs)	5yr	100yr			
	0.89	2.35			

Sub-Basin C (Onsite and Offsite)					
Total Area	1.01	acres	43,983	SF	Notes
					Area drains towards proposed curb inlet CI-1 in parking area
Paved Area	0.69	acres	30,056	SF	
Drive and Walks	0.05	acres	2,063	SF	
Roofs	0.12	acres	5,336	SF	
Lawns, Sandy Soil	0.15	acres	6,528	SF	
% Impervious (Composite)	84	%			
Hydrologic Soil Group	B				
Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr			
	0.71	0.82			
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr			
	1.39	2.6			
Rainfall Intensity (in/hr) (Equation RA-5 UDCFC)	5yr	100yr			
	4.71	8.82			
Runoff (cfs)	5yr	100yr			
	3.41	7.36			
Sub-Basin D (Onsite and Offsite)					
Total Area	0.56	acres	24,189	SF	Notes
Drives and Walks	0.02	acres	674	SF	
					Area drains towards proposed yard inlet YI-1 at southwest corner of site
Lawns, Sandy Soil	0.54	acres	23,515	SF	
% Impervious (Composite)	4	%			
Hydrologic Soil Group	B				
Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr			
	0.02	0.45			
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr			
	1.39	2.6			
Rainfall Intensity (in/hr) (Equation RA-5 UDCFC)	5yr	100yr			
	4.71	8.82			
Runoff (cfs)	5yr	100yr			
	0.06	2.21			
Sub-Basin E (Onsite and Offsite)					
Total Area	0.06	acres	2,715	SF	Notes
					Landscape area drains as nuisance flow towards Baldwin Gulch per previous drainage patterns.
Lawns, Sandy Soil	0.06	acres	2,715	SF	
% Impervious (Composite)	2	%			
Hydrologic Soil Group	B				
Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr			
	0.01	0.44			
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr			
	1.39	2.6			
Rainfall Intensity (in/hr) (Equation RA-5 UDCFC)	5yr	100yr			
	4.71	8.82			
Runoff (cfs)	5yr	100yr			
	0.003	0.24			

Sub-Basin F (Onsite and Offsite)

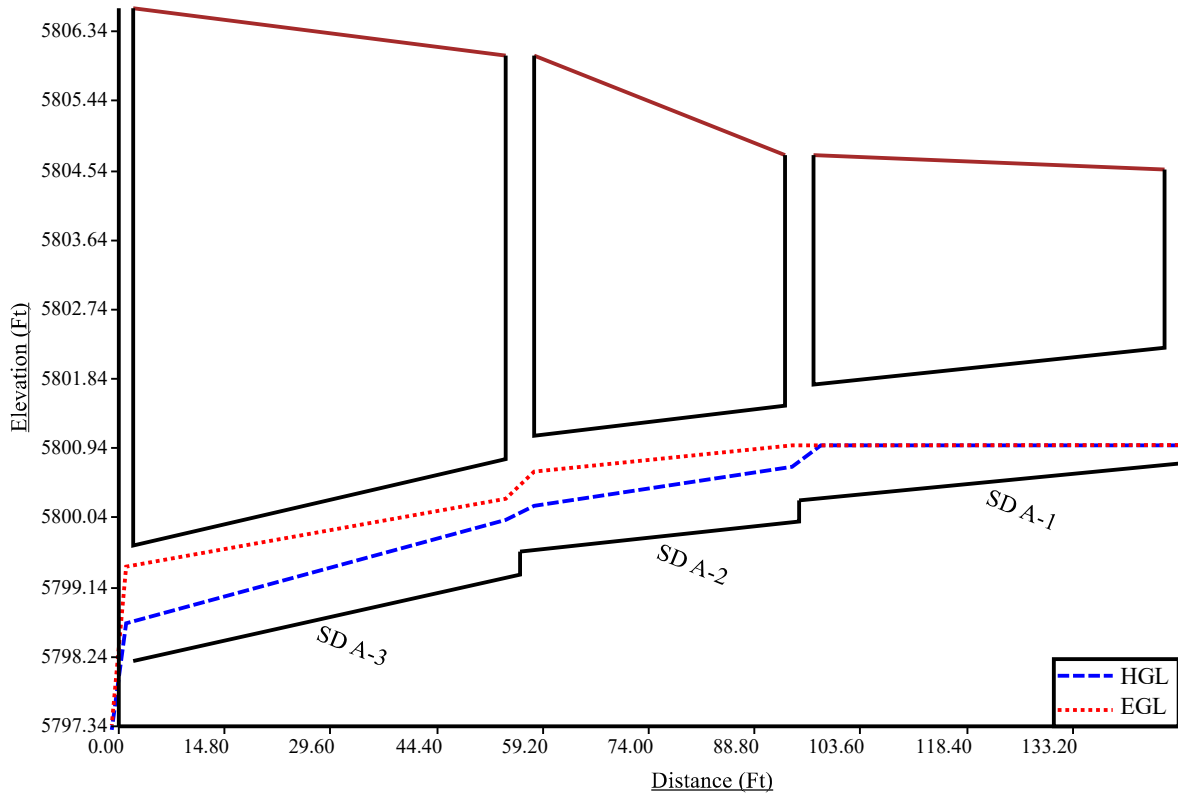
Total Area	0.05	acres	2,100	SF	Notes
					Landscape area drains as nuisance flow towards Baldwin Gulch per previous drainage patterns.
Lawns, Sandy Soil	0.05	acres	2,100	SF	
% Impervious (Composite)	2	%			
Hydrologic Soil Group	B				
Runoff Coefficient (UDFCD NRCS Table)	5yr	100yr			
	0.01	0.44			
One Hour Point Rainfall (in) (Table 5.1 Town of Parker Manual)	5yr	100yr			
	1.39	2.6			
Rainfall Intensity (in/hr) (Equation RA-5 UDFCD)	5yr	100yr			
	4.71	8.82			
Runoff (cfs)	5yr	100yr			
	0.002	0.19			
Total Runoff (CFS)					
Total Area	2.05	acres	89,306	SF	
Paved Area	0.90	acres	39,057	SF	
Drive and Walks	0.09	acres	4,020	SF	
Roofs	0.12	acres	5,336	SF	
Lawns, Sandy Soil	0.94	acres	40,893	SF	
% Impervious (Composite)	62	%			
Hydrologic Soil Group	B				
Runoff (cfs)	5yr	100yr			
	4.40	12.41			

STORM DRAIN ROUTING SUMMARY					
SUB-BASIN ID	AREA (AC)	DESIGN POINT	Q5 (CFS)	Q100 (CFS)	NOTES
A	0.37	1	0.03	0.06	FLOWS FROM SUB-BASIN A ROUTE TO CURB INLET AT NORTHWEST CORNER OF SITE
17.0 (PER DEVELOPER DRAINAGE REPORT)	0.11	1	0.45	0.87	FLOWS FROM DESIGN SUB- BASIN 17.0 PER PARKER AND PINE RETAIL DRAINAGE REPORT ROUTE TO CURB INLET (B08) AT NORTHWEST CORNER OF SITE
TOTAL	0.48	1	0.48	0.93	
B	0.37	2	0.89	2.35	FLOWS FROM SUB-BASIN B ROUTE TO GRATE INLET GI-1 IN DRIVE AISLE
C	1.01	3	3.41	7.36	FLOWS FROM SUB-BASIN C ROUTE TO CURB INLET CI-1 IN PARKING AREA
D	0.56	4	0.06	2.21	FLOWS FROM SUB-BASIN D ROUTE THROUGH LANDSCAPE SWALE TO YARD INLET YI-1 AT SOUTHWEST CORNER OF SITE
E	0.06	5	0.003	0.24	DRAINAGE FROM SUB-BASIN E FLOWS OFFSITE AS NUISANCE WATER TOWARDS BALDWIN GULCH PER PREVIOUS DRAINAGE PATTERNS
F	0.05	6	0.002	0.19	DRAINAGE FROM SUB-BASIN F FLOWS OFFSITE AS NUISANCE WATER TOWARDS BALDWIN GULCH PER PREVIOUS DRAINAGE PATTERNS

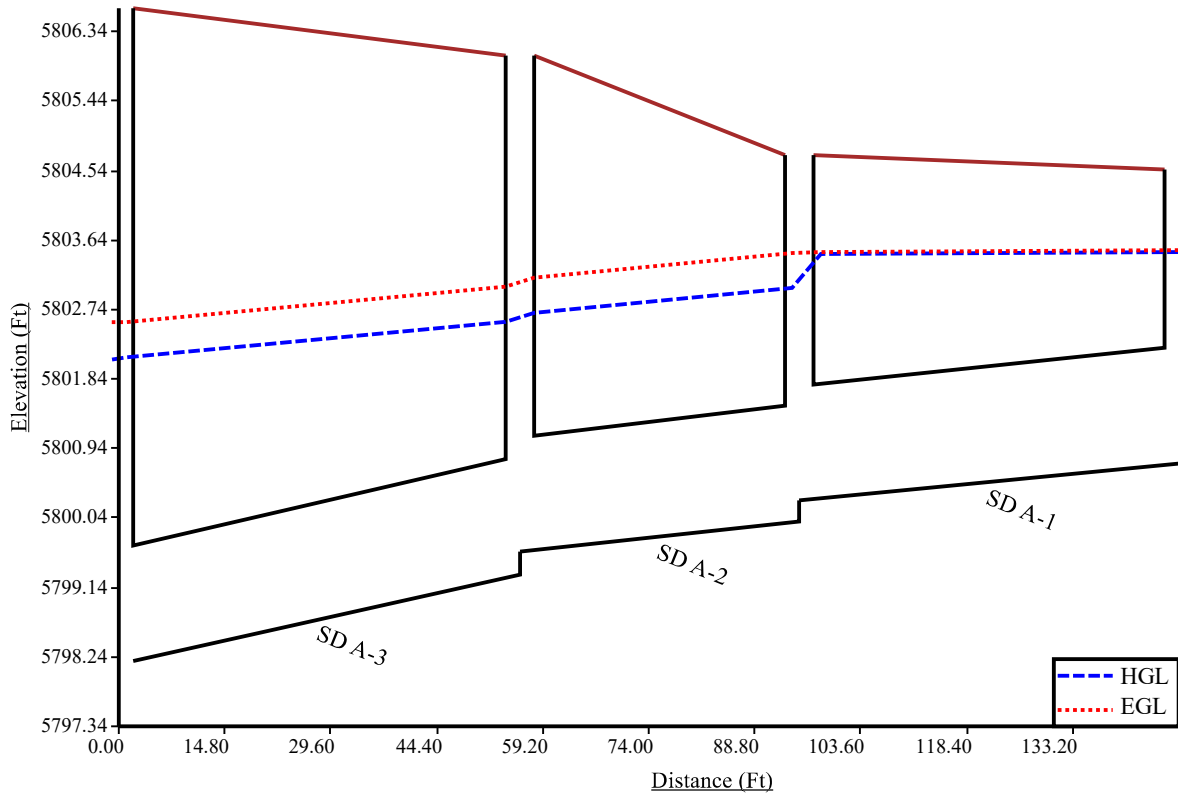
ATTACHMENT 4

HYDRAULIC CALCULATIONS

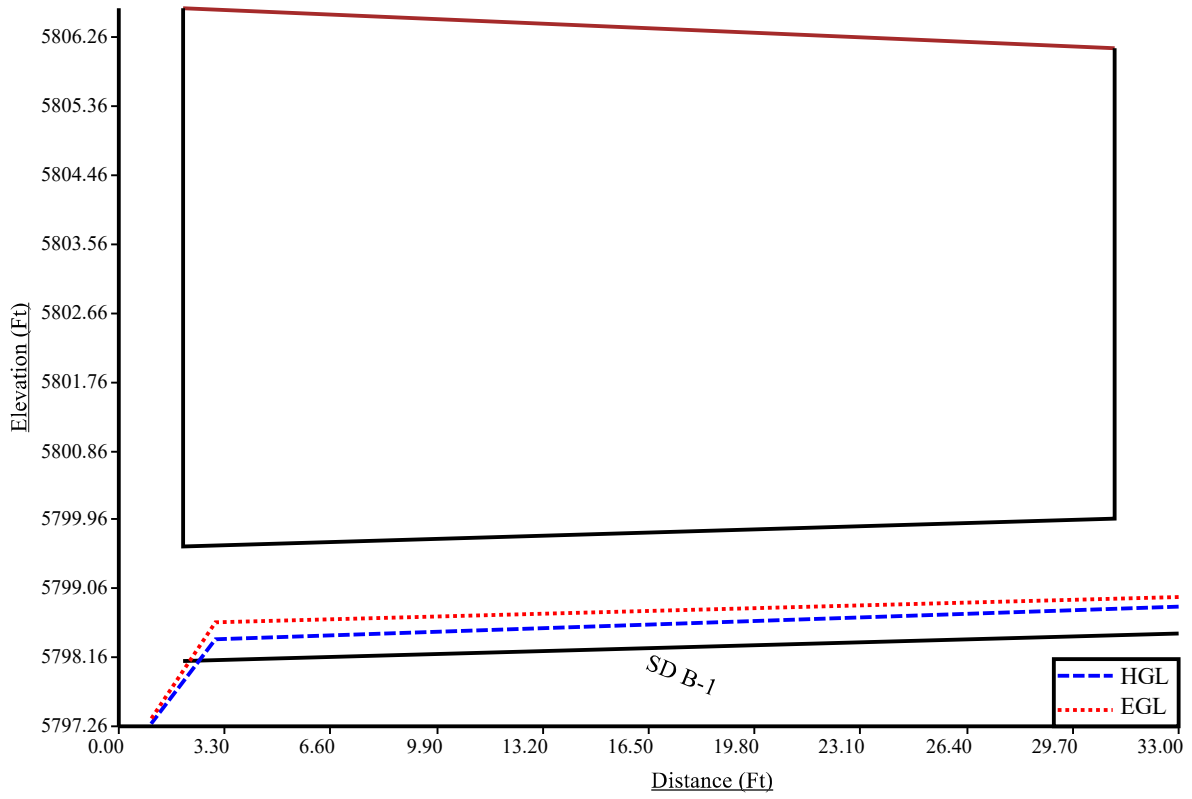
31672 - Storm Sewer A - 5yr



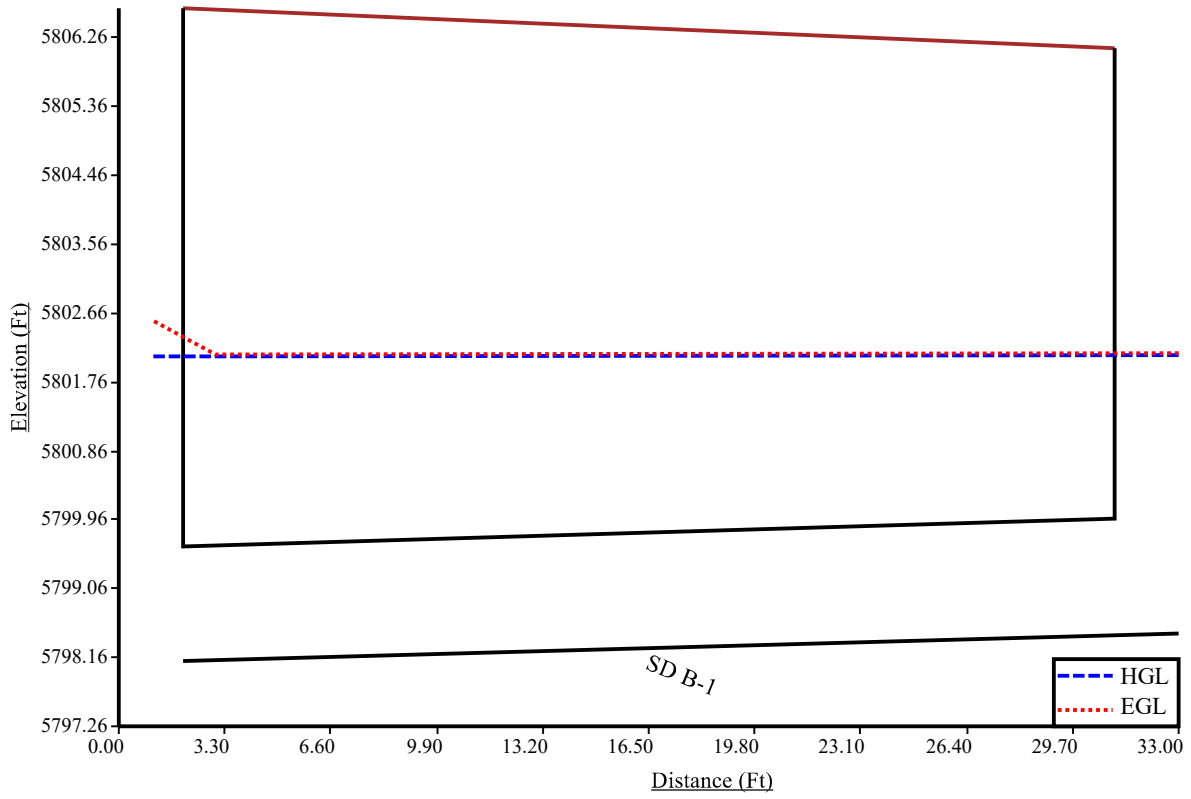
31672 - Storm Sewer A - 100yr



31672 - Storm Sewer B - 5yr



31672 - Storm Sewer B - 100yr

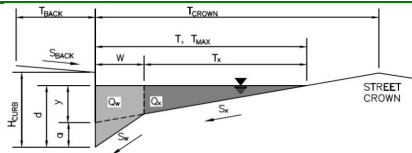


ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

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

Project:
Inlet ID:

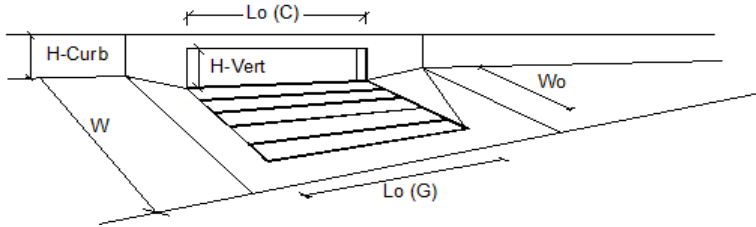
31672 - Quick N Clean Car Wash
Existing Curb Inlet-B08



Gutter Geometry:							
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.0"/> ft						
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value=""/> ft/ft						
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px; text-align: center;" type="text" value="0.012"/>						
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px; text-align: center;" type="text" value="6.00"/> inches						
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px; text-align: center;" type="text" value="13.0"/> ft						
Gutter Width	$W = $ <input style="width: 50px; text-align: center;" type="text" value="1.00"/> ft						
Street Transverse Slope	$S_X = $ <input style="width: 50px; text-align: center;" type="text" value="0.021"/> ft/ft						
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = $ <input style="width: 50px; text-align: center;" type="text" value="0.083"/> ft/ft						
Street Longitudinal Slope - Enter 0 for sump condition	$S_O = $ <input style="width: 50px; text-align: center;" type="text" value="0.021"/> ft/ft						
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px; text-align: center;" type="text" value="0.012"/>						
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="13.0"/></td> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="13.0"/></td> <td style="text-align: right; padding: 2px;">ft</td> </tr> </table>	Minor Storm	Major Storm		<input style="width: 50px; text-align: center;" type="text" value="13.0"/>	<input style="width: 50px; text-align: center;" type="text" value="13.0"/>	ft
Minor Storm	Major Storm						
<input style="width: 50px; text-align: center;" type="text" value="13.0"/>	<input style="width: 50px; text-align: center;" type="text" value="13.0"/>	ft					
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="6.0"/></td> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="6.0"/></td> <td style="text-align: right; padding: 2px;">inches</td> </tr> </table>	Minor Storm	Major Storm		<input style="width: 50px; text-align: center;" type="text" value="6.0"/>	<input style="width: 50px; text-align: center;" type="text" value="6.0"/>	inches
Minor Storm	Major Storm						
<input style="width: 50px; text-align: center;" type="text" value="6.0"/>	<input style="width: 50px; text-align: center;" type="text" value="6.0"/>	inches					
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;"><input type="checkbox"/></td> <td style="text-align: center; padding: 2px;"><input type="checkbox"/></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>				
<input type="checkbox"/>	<input type="checkbox"/>						
MINOR STORM Allowable Capacity is based on Spread Criterion							
MAJOR STORM Allowable Capacity is based on Spread Criterion							
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'							
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'							
$Q_{allow} = $	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 2px;">Minor Storm</td> <td style="text-align: center; padding: 2px;">Major Storm</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="10.5"/></td> <td style="text-align: center;"><input style="width: 50px; text-align: center;" type="text" value="10.5"/></td> <td style="text-align: right; padding: 2px;">cfs</td> </tr> </table>	Minor Storm	Major Storm		<input style="width: 50px; text-align: center;" type="text" value="10.5"/>	<input style="width: 50px; text-align: center;" type="text" value="10.5"/>	cfs
Minor Storm	Major Storm						
<input style="width: 50px; text-align: center;" type="text" value="10.5"/>	<input style="width: 50px; text-align: center;" type="text" value="10.5"/>	cfs					

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity			
Total Inlet Interception Capacity	0.5	0.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	0.0	cfs
Capture Percentage = Q_i/Q_s =	100	100	%

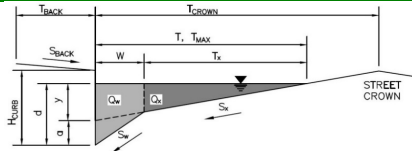
ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

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

Project:
Inlet ID:

31672 - Quick N Clean Car Wash

Grate Inlet GI-1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

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

Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} =$ inches
 $T_{CROWN} =$ ft
 $W =$ ft
 $S_x =$ ft/ft
 $S_w =$ ft/ft
 $S_o =$ ft/ft
 $n_{STREET} =$

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	<input type="text" value="20.0"/>	<input type="text" value="20.0"/>	ft
$d_{MAX} =$	<input type="text" value="6.0"/>	<input type="text" value="6.0"/>	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

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

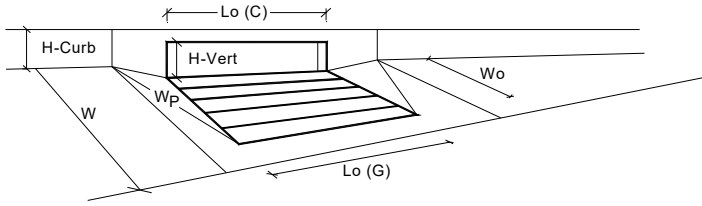
$Q_{allow} =$

Minor Storm	Major Storm
<input type="text" value="SUMP"/>	<input type="text" value="SUMP"/>

 cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



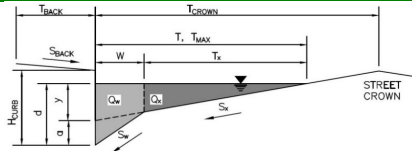
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT/Denver 13 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	6.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	3.00	3.00	feet
Width of a Unit Grate	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	0.60	0.60	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	N/A	N/A	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	0.593	0.593	ft
Depth for Curb Opening Weir Equation	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	0.94	0.94	
Total Inlet Interception Capacity (assumes clogged condition)	3.2	3.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	0.9	2.4	cfs

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

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)
31672 - Quick N Clean Car Wash

Project:
Inlet ID:

Curb Inlet CI-1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)
 Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$ ft
 $S_{BACK} =$ ft/ft
 $n_{BACK} =$
 $H_{CURB} =$ inches
 $T_{CROWN} =$ ft
 $W =$ ft
 $S_x =$ ft/ft
 $S_w =$ ft/ft
 $S_o =$ ft/ft
 $n_{STREET} =$

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	<input type="text" value="20.0"/>	<input type="text" value="20.0"/>	ft
$d_{MAX} =$	<input type="text" value="6.0"/>	<input type="text" value="6.0"/>	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

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

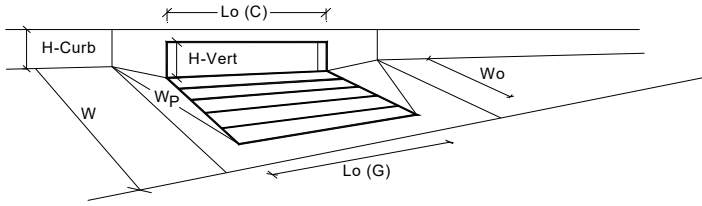
$Q_{allow} =$

Minor Storm	Major Storm
<input type="text" value="SUMP"/>	<input type="text" value="SUMP"/>

 cfs

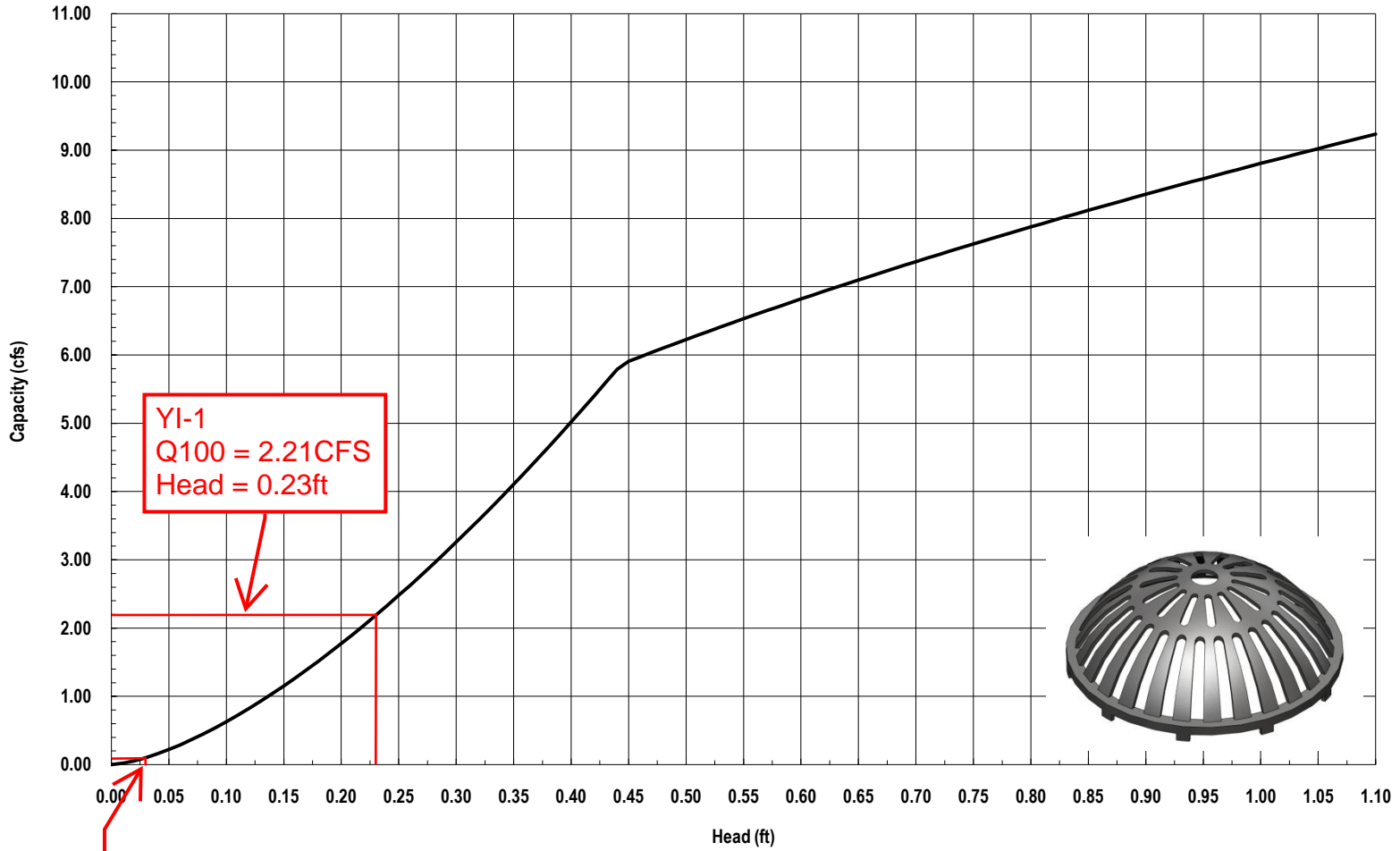
INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	4.0	6.0	inches
Grate Information	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
Curb Opening Information	MINOR	MAJOR	
Length of a Unit Curb Opening	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	0.50	0.50	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
Low Head Performance Reduction (Calculated)	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.29	0.46	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.38	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	0.79	0.93	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	4.6	10.7	cfs
Q _{PEAK REQUIRED}	3.4	7.4	cfs

Nyloplast 24" Dome Grate Inlet Capacity Chart



YI-1
Q100 = 2.21CFS
Head = 0.23ft



YI-1
Q5 = 0.06CFS
Head = 0.03ft



INLET MANAGEMENT

Worksheet Protected

INLET NAME	Curb & Gutter to YI-1
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	On Grade
Inlet Type	

USER-DEFINED INPUT

User-Defined Design Flows	
Minor Q_{Known} (cfs)	0.1
Major Q_{Known} (cfs)	2.2
Bypass (Carry-Over) Flow from Upstream	
Receive Bypass Flow from:	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0
Watershed Characteristics	
Subcatchment Area (acres)	
Percent Impervious	
NRCS Soil Type	
Watershed Profile	
Overland Slope (ft/ft)	
Overland Length (ft)	
Channel Slope (ft/ft)	
Channel Length (ft)	
Minor Storm Rainfall Input	
Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	
Major Storm Rainfall Input	
Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

CALCULATED OUTPUT

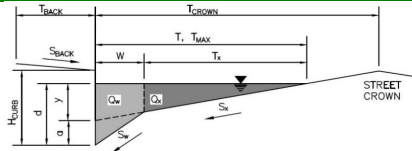
Minor Total Design Peak Flow, Q (cfs)	0.1
Major Total Design Peak Flow, Q (cfs)	2.2
Minor Flow Bypassed Downstream, Q_b (cfs)	
Major Flow Bypassed Downstream, Q_b (cfs)	

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

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)
31672 - Quick N Clean Car Wash

Project:
Inlet ID:

Curb & Gutter to YI-1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

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

Height of Curb at Gutter Flow Line
Distance from Curb Face to Street Crown
Gutter Width
Street Transverse Slope
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
Street Longitudinal Slope - Enter 0 for sump condition
Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} =$ inches
 $T_{CROWN} =$ ft
 $W =$ ft
 $S_X =$ ft/ft
 $S_W =$ ft/ft
 $S_0 =$ ft/ft
 $n_{STREET} =$

Max. Allowable Spread for Minor & Major Storm
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	<input type="text" value="9.0"/>	<input type="text" value="9.0"/>	ft
$d_{MAX} =$	<input type="text" value="12.0"/>	<input type="text" value="12.0"/>	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

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

$Q_{allow} =$

Minor Storm	Major Storm
<input type="text" value="4.7"/>	<input type="text" value="4.7"/>

 cfs

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

Channel Report

Landscape Swale - 5yr

Triangular

Side Slopes (z:1) = 3.00, 8.00

Total Depth (ft) = 0.97

Invert Elev (ft) = 5807.00

Slope (%) = 1.50

N-Value = 0.040

Calculations

Compute by: Known Q

Known Q (cfs) = 0.06

Highlighted

Depth (ft) = 0.13

Q (cfs) = 0.060

Area (sqft) = 0.09

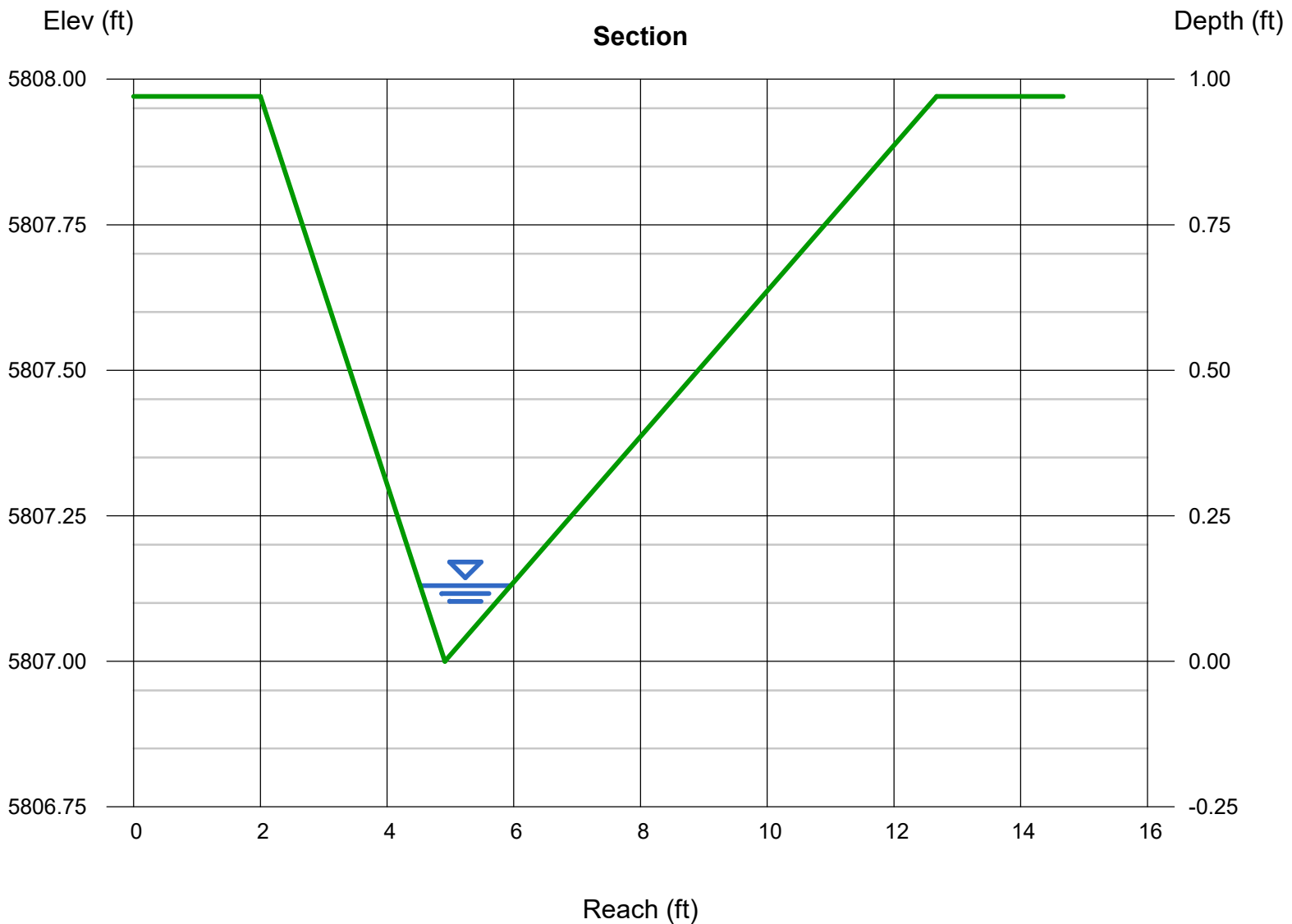
Velocity (ft/s) = 0.65

Wetted Perim (ft) = 1.46

Crit Depth, Yc (ft) = 0.10

Top Width (ft) = 1.43

EGL (ft) = 0.14



Channel Report

Landscape Swale - 100yr

Triangular

Side Slopes (z:1) = 3.00, 8.00

Total Depth (ft) = 0.97

Invert Elev (ft) = 5807.00

Slope (%) = 1.50

N-Value = 0.040

Calculations

Compute by: Known Q

Known Q (cfs) = 2.21

Highlighted

Depth (ft) = 0.49

Q (cfs) = 2.210

Area (sqft) = 1.32

Velocity (ft/s) = 1.67

Wetted Perim (ft) = 5.50

Crit Depth, Yc (ft) = 0.40

Top Width (ft) = 5.39

EGL (ft) = 0.53

