DRAINAGE REPORT
FOR
WESTERN TECH OFFICE

Scottsdale, Arizona

April 14th, 2022

Plan # _____

Case # 3-DR-2022

Q-S # _____

X Accepted

____ Corrections

M.R. 07/05/2022

Reviewed By Date

DEVELOPER
Capital Project Management
7447 East Indian School Road, #205
Scottsdale, Arizona 85251

SITE ADDRESS
1395 North Hayden Road
Scottsdale, Arizona 85257

PREPARED BY

CYPRESS CIVIL
4450 north 12th street, #228
phoenix, arizona 85014
CYPRESS # 21.148

TABLE OF CONTENTS

I. INTRODUCTION

1. PROJECT NAME AND LOCATION

The Project is known as 'Western Tech Office' and is located in Scottsdale, Arizona at 1395 North Hayden Road, within the Scottsdale Commerce Center industrial park at the southeast corner of Hayden Road and McDowell Road.

The Project site occupies approximately 2.84 acres and is currently developed as an office building with associated parking and drainage infrastructure. The Project has street frontage and access to Commerce Court, a private roadway, along the northern boundary. To the east, west, and south, are developed commercial properties. Refer to Appendix A for Location Map and Aerial Photo. The project lies within an area that historically has been irrigated farmland but has been commercially developed since the early 1980s. The area has slopes consistently and gently to the northwest with average slopes in the range of 0.5% and 1.0%.

The Project consists of the construction of an expansion to the existing office building at the northeast corner of the Project with some minor parking lot improvements.

2. PURPOSE

The intent of this Drainage Report is to provide the drainage scheme for the Project in support the Improvement Plan Submittal.

3. EXISTING STUDIES & REGIONAL DRAINAGE PLAN

The LOOP ROAD GRADING AND PAVING plan for SCOTTSDALE COMMERCE CENTRE dated March 1984, prepared by Ellis Murphy Consulting Engineers was reviewed in preparation of this Drainage Report. The Commerce Court Private Roadway was designed to discharge at the southwest corner of the loop and each project was responsible for onsite retention.

4. FEMA FLOOD ZONE

According to the Federal Emergency Management Agency Flood Insurance Rate Map Panel Number 04013C2235M, dated September 9th, 2020, the Parcel is located in the Zone X area, which is defined as areas outside of the 0.2% annual chance flood. Refer to Appendix B for FEMA FIRM Map.

II. EXISTING DRAINAGE INFRASTRUCTURE

1. OFFSITE

According to a recent topographic survey and field investigations the Project is not impacted by offsite runoff. Runoff generated Commerce Court Private Roadway was

designed to discharge at the southwest corner of the private roadway loop via a depressed curb and sidewalk.

2. **ONSITE**

There currently exists onsite stormdrain and an existing retention basin at the northwest corner of the Project. Total retention volume stored in the existing drainage basin is equal to 9,550 CF.

III. PROPOSED DRAINAGE INFRASTRUCTURE

1. CONVEYANCE OF RUNOFF

In the developed condition, the disturbed portion of the site site is divided into a series of drainage areas (DA) based on proposed grading. The existing basin area consists of DA1. The north half of the new building expansion consists of DA2. The revised parking area at the northeast corner of the Project consists of DA3. The south half of the new building expansion and parking lot revisions immediately south and southeast of the new expansion consists of DA4. DA2, DA3, and DA4 all convey runoff to new drainage basins and ultimately discharges to the new onsite retention chambers. The retention basin in DA1 is modified to accommodate the new building expansion and new stormdrain infrastructure is to be installed to balance the new stormdrain chambers with the revised above ground retention basin. Refer to Appendix C for the Proposed Watershed Map + Calculations.

2. STORM WATER RETENTION

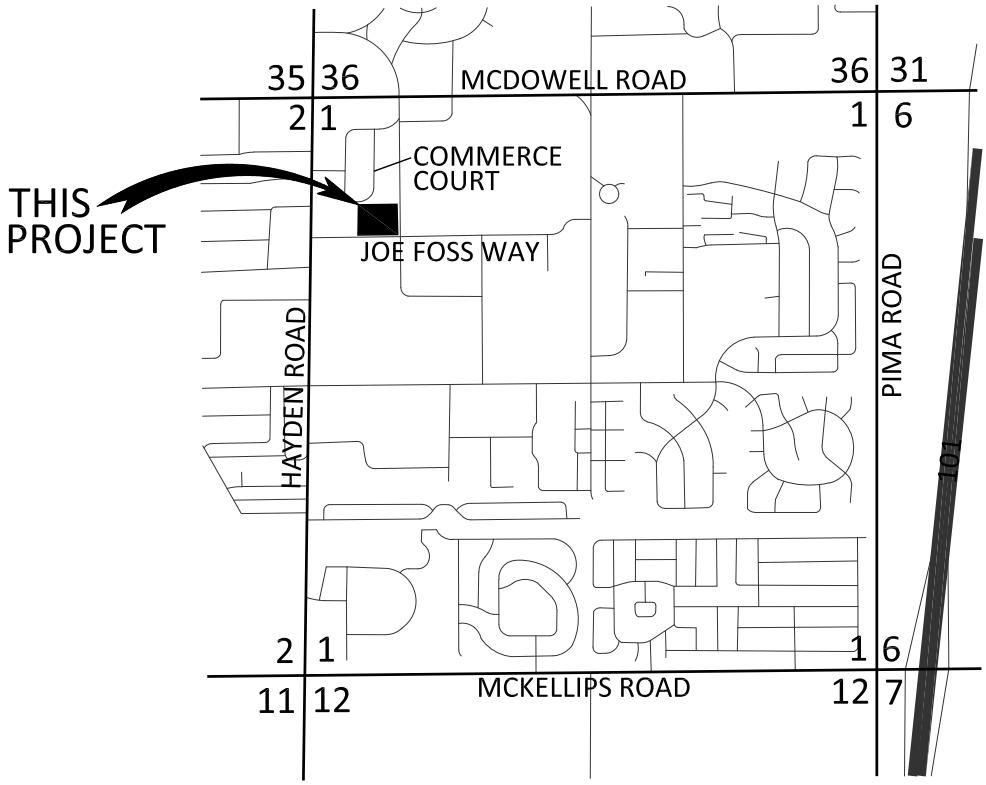
The Project shall match the existing retention volume provided as well as capture additional volume based on increases in the runoff coefficient due to the new building expansion replacing existing landscape and basin area. The site is designed with a network of storm drain pipes that outfalls to a surface retention basin located west of the proposed building expansion and additional stormdrain to balance retention volume between the above ground basin and underground retention chambers. The existing drywell in the above ground basin is being modified to allow for continued use and the underground retention chambers are to be planned with an underdrain and drywell, to be installed only if adequate perc rates cannot be achieved at the base of the new chamber system. When the retention chambers and basin are full, they will outfall to the private roadway loop at the southwest corner, as they did in the existing condition. The finished floor has been set more than 15" above the outfall. Thus, no offsite runoff will impact the Project. Refer to Appendix D for Retention Calculations.

IV. SUMMARY AND CONCLUSION

This Drainage Report is to accompany the Improvement Plan submittal for the Western

Tech Office development project. The Project is designed to convey the 100-year storm event. This Report was written utilizing generally accepted engineering practices and all information herein has been researched through archived documents and all calculations were accomplished through applying the City of Scottsdale Stormwater Policies and Standards Manual and the Hydrology/Hydraulic Manual published by the Maricopa County Flood Control District.

APPENDIX A
(Location Map + Aerial Photo)



IN THE NW 1/4 OF THE NW 1/4 OF SECTION 1,
T. 1 N., R. 4 E., G.&S.R.M.,
CITY OF SCOTTSDALE, MARICOPA COUNTY, ARIZONA

LOCATION MAP

NORTH

3" = 1 MILE

AERIAL PHOTO

APPENDIX B
(FEMA FIRM Map)

National Flood Hazard Layer FIRMette

FEMA

111°54'44"W 33°28'1"N

111°54'7"W 33°27'31"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

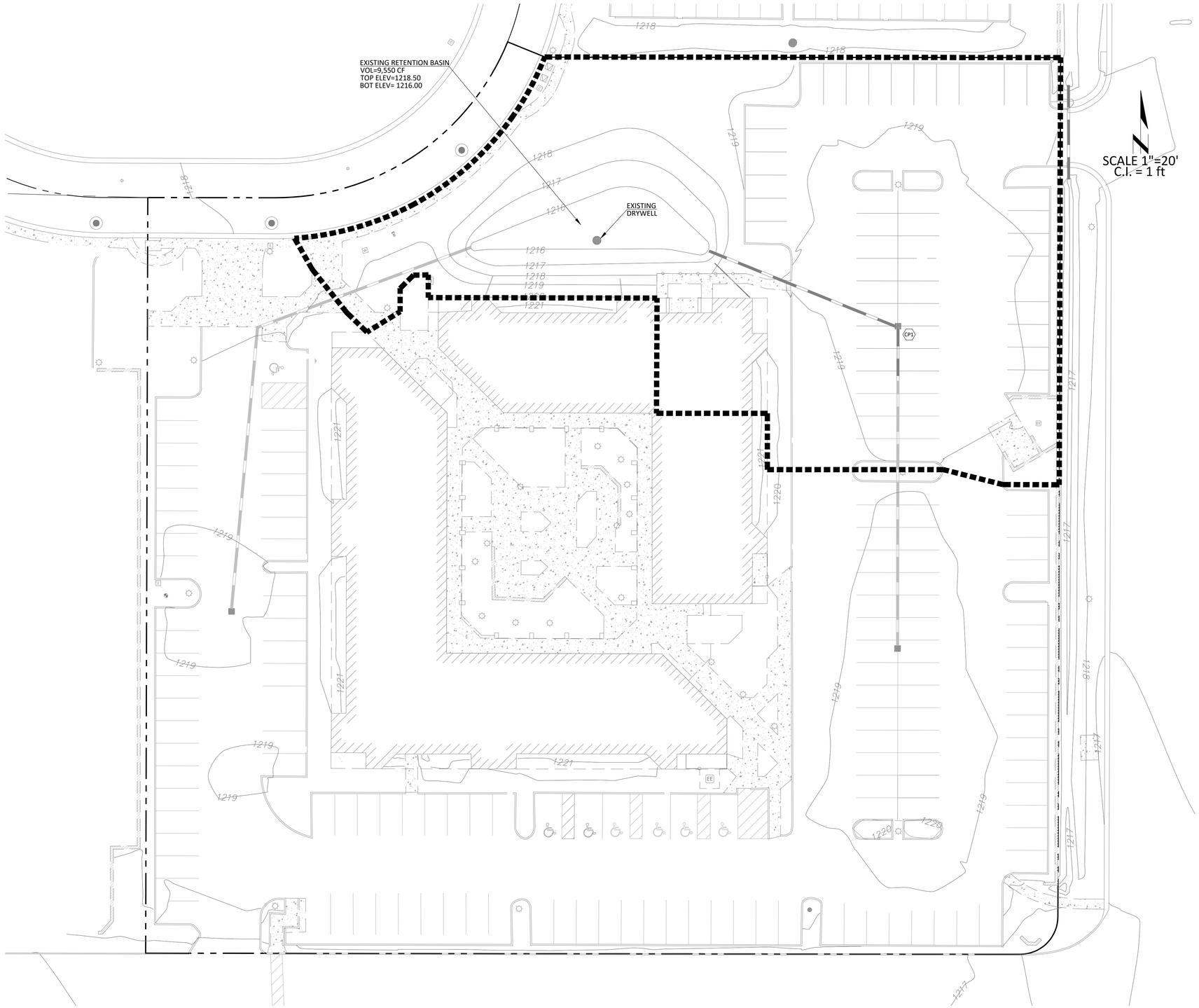
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/4/2022 at 3:08 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX C
(Proposed Watershed Map + Calculations)



LEGEND

- EXISTING RIGHT-OF-WAY
- PROJECT/NEW PROPERTY LINE
- ROADWAY CENTERLINE
- FLOW ARROW
- WATERSHED BOUNDARY
- CONCENTRATION POINT
- EXISTING STORM DRAIN PIPE
- EXISTING CONTOUR

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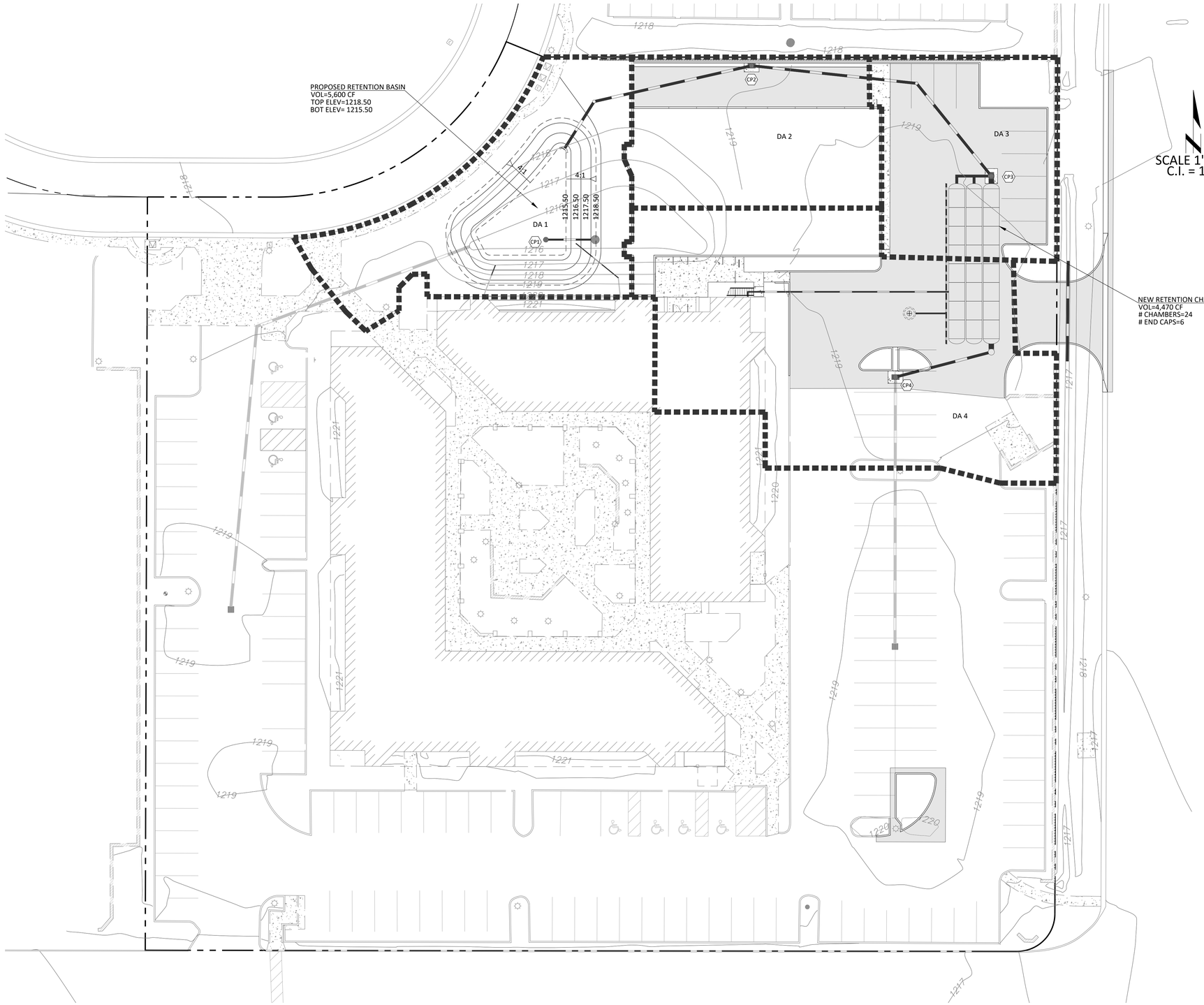
WESTERN TECH OFFICE

EXISTING CONDITIONS HYDROLOGY MAP

JOB NO.: 21.148

SHEET NUMBER



LEGEND

- EXISTING RIGHT-OF-WAY
- PROJECT/NEW PROPERTY LINE
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- FLOW ARROW
- WATERSHED BOUNDARY
- CONCENTRATION POINT
- EXISTING STORM DRAIN PIPE
- NEW STORM DRAIN PIPE
- 1200 EXISTING CONTOUR
- 1200 NEW CONTOUR
- FLOW-LINE

WATERSHED CONCENTATION POINTS

ID	AREA	Q 100
CP1	0.18 AC	0.7 CFS
CP2	0.14 AC	1.0 CFS
CP3	0.14 AC	1.0 CFS
CP4	0.34 AC	2.3 CFS

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WESTERN TECH OFFICE

PROPOSED CONDITIONS HYDROLOGY MAP

JOB NO.: 21.148

SHEET NUMBER

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SITE CONSULTING
SURVEY
SITE ENGINEERING

WATERSHED SUMMARY

PROJECT WESTERN TECH OFFICE

EXISTING

WATERSHED ID	CONCENTRATION POINT	AREA ROOF + C= 0.95 (SF)	AREA LANDSCAPING C= 0.50 (SF)	TOTAL AREA (AC)	WEIGHTED 'C'
DA1	1	21,065	13,360	0.79	0.78

PROPOSED

WATERSHED ID	CONCENTRATION POINT	AREA ROOF + C= 0.95 (SF)	AREA LANDSCAPING C= 0.50 (SF)	TOTAL AREA (AC)	WEIGHTED 'C'
DA1	1	400	7,500	0.18	0.52
DA2	2	5,975	0	0.14	0.95
DA3	3	4,975	980	0.14	0.88
DA4	4	13,145	1,450	0.34	0.91
			CONTRIBUTING AREA WEIGHTED C:	0.82	

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.4628°, Longitude: -111.9071°
Elevation: 1212.06 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**2.18** (1.84-2.65)	**2.86** (2.41-3.47)	**3.88** (3.25-4.70)	**4.67** (3.89-5.63)	**5.74** (4.70-6.88)	**6.58** (5.32-7.84)	**7.42** (5.89-8.82)	**8.28** (6.47-9.84)	**9.44** (7.18-11.2)	**10.3** (7.69-12.3)
10-min	**1.66** (1.40-2.02)	**2.17** (1.84-2.64)	**2.95** (2.48-3.58)	**3.55** (2.96-4.28)	**4.37** (3.58-5.24)	**5.00** (4.04-5.97)	**5.64** (4.48-6.71)	**6.30** (4.92-7.49)	**7.18** (5.46-8.54)	**7.85** (5.86-9.36)
15-min	**1.37** (1.15-1.67)	**1.79** (1.52-2.18)	**2.44** (2.05-2.96)	**2.94** (2.45-3.54)	**3.61** (2.96-4.33)	**4.13** (3.34-4.93)	**4.66** (3.70-5.55)	**5.21** (4.07-6.19)	**5.93** (4.51-7.06)	**6.49** (4.84-7.74)
30-min	**0.924** (0.776-1.12)	**1.21** (1.02-1.47)	**1.64** (1.38-1.99)	**1.98** (1.65-2.38)	**2.43** (1.99-2.91)	**2.78** (2.25-3.32)	**3.14** (2.49-3.73)	**3.51** (2.74-4.17)	**4.00** (3.04-4.75)	**4.37** (3.26-5.21)
60-min	**0.572** (0.480-0.695)	**0.747** (0.632-0.909)	**1.02** (0.853-1.23)	**1.22** (1.02-1.47)	**1.50** (1.23-1.80)	**1.72** (1.39-2.06)	**1.94** (1.54-2.31)	**2.17** (1.69-2.58)	**2.47** (1.88-2.94)	**2.71** (2.02-3.22)
2-hr	**0.332** (0.283-0.395)	**0.430** (0.367-0.513)	**0.576** (0.490-0.684)	**0.687** (0.578-0.814)	**0.839** (0.697-0.988)	**0.956** (0.784-1.12)	**1.08** (0.869-1.26)	**1.20** (0.950-1.41)	**1.36** (1.05-1.60)	**1.49** (1.13-1.76)
3-hr	**0.240** (0.204-0.288)	**0.307** (0.263-0.371)	**0.405** (0.343-0.485)	**0.481** (0.405-0.574)	**0.589** (0.488-0.699)	**0.675** (0.551-0.798)	**0.765** (0.613-0.903)	**0.858** (0.677-1.01)	**0.987** (0.755-1.17)	**1.09** (0.815-1.29)
6-hr	**0.144** (0.125-0.170)	**0.183** (0.160-0.215)	**0.235** (0.204-0.276)	**0.277** (0.238-0.322)	**0.333** (0.282-0.386)	**0.377** (0.315-0.436)	**0.424** (0.348-0.489)	**0.471** (0.379-0.545)	**0.536** (0.421-0.621)	**0.587** (0.450-0.683)
12-hr	**0.080** (0.071-0.093)	**0.102** (0.089-0.118)	**0.129** (0.113-0.149)	**0.150** (0.130-0.173)	**0.179** (0.154-0.206)	**0.201** (0.171-0.231)	**0.224** (0.187-0.257)	**0.247** (0.204-0.284)	**0.278** (0.224-0.321)	**0.303** (0.239-0.352)
24-hr	**0.048** (0.043-0.054)	**0.061** (0.055-0.068)	**0.079** (0.071-0.088)	**0.093** (0.084-0.104)	**0.113** (0.101-0.126)	**0.129** (0.114-0.143)	**0.145** (0.127-0.161)	**0.162** (0.141-0.180)	**0.185** (0.159-0.206)	**0.203** (0.173-0.227)
2-day	**0.026** (0.023-0.029)	**0.033** (0.030-0.037)	**0.044** (0.039-0.049)	**0.052** (0.046-0.058)	**0.063** (0.056-0.071)	**0.073** (0.064-0.081)	**0.082** (0.072-0.092)	**0.092** (0.081-0.103)	**0.107** (0.092-0.119)	**0.118** (0.101-0.133)
3-day	**0.018** (0.016-0.020)	**0.023** (0.021-0.026)	**0.031** (0.028-0.034)	**0.037** (0.033-0.041)	**0.045** (0.040-0.050)	**0.052** (0.046-0.058)	**0.059** (0.052-0.066)	**0.066** (0.058-0.074)	**0.077** (0.066-0.086)	**0.085** (0.073-0.096)
4-day	**0.014** (0.013-0.016)	**0.019** (0.017-0.021)	**0.024** (0.022-0.027)	**0.029** (0.026-0.032)	**0.036** (0.032-0.040)	**0.041** (0.037-0.046)	**0.047** (0.041-0.052)	**0.053** (0.046-0.059)	**0.062** (0.053-0.069)	**0.069** (0.059-0.077)
7-day	**0.009** (0.008-0.010)	**0.012** (0.011-0.013)	**0.015** (0.014-0.017)	**0.018** (0.016-0.021)	**0.023** (0.020-0.025)	**0.026** (0.023-0.029)	**0.030** (0.026-0.033)	**0.034** (0.029-0.037)	**0.039** (0.034-0.044)	**0.044** (0.037-0.049)
10-day	**0.007** (0.006-0.008)	**0.009** (0.008-0.010)	**0.012** (0.011-0.013)	**0.014** (0.013-0.016)	**0.017** (0.015-0.019)	**0.020** (0.018-0.022)	**0.023** (0.020-0.025)	**0.025** (0.022-0.028)	**0.029** (0.025-0.033)	**0.033** (0.028-0.036)
20-day	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.007** (0.007-0.008)	**0.009** (0.008-0.010)	**0.010** (0.009-0.011)	**0.012** (0.010-0.013)	**0.013** (0.012-0.015)	**0.015** (0.013-0.016)	**0.016** (0.014-0.018)	**0.018** (0.016-0.020)
30-day	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.006** (0.005-0.006)	**0.007** (0.006-0.007)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.010** (0.009-0.011)	**0.011** (0.010-0.012)	**0.013** (0.011-0.014)	**0.014** (0.012-0.015)
45-day	**0.003** (0.002-0.003)	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.006** (0.006-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.008** (0.008-0.009)	**0.010** (0.008-0.011)	**0.010** (0.009-0.011)
60-day	**0.002** (0.002-0.002)	**0.003** (0.002-0.003)	**0.004** (0.003-0.004)	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.006** (0.005-0.006)	**0.006** (0.006-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.008** (0.007-0.009)

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

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

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SITE CONSULTING
SURVEY
SITE ENGINEERING

PROPOSED RATIONAL METHOD

PROJECT WESTERN TECH OFFICE

$$T_C = 11.4L^{0.5}K_b^{.52}S^{-0.31}i^{-0.38} \times 60$$

$$Q = CiA$$

Tc= Time of Concentration (min)
L= Length of longest flow path (miles)
Kb= Watershed resistance coefficient
S= Watercourse slope (ft/mi)
i= rainfall intensity (in/hr)

Q = Peak discharge (cfs)
C = Runoff coefficient
i = Rainfall intensity (inch/hr)
A = Drainage area (Acres)

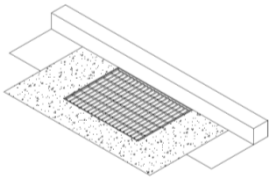
100-YR, 5-MIN	7.42	in/hr
100-YR, 10-MIN	5.64	in/hr
100-YR, 15-MIN	4.66	in/hr
100-YR, 30-MIN	3.17	in/hr

WATERSHED ID	CONCENTRATION POINT	L	Kb	S		i	Tc	C	i	A	Q
DA 1	1	0.01	0.04	15	0.3%	7.42	2.5	0.52	7.42	0.18	0.7
DA 2	2	0.01	0.04	20	0.4%	7.42	2.3	0.95	7.42	0.14	1.0
DA 3	3	0.02	0.04	105	2.0%	7.42	1.9	0.88	7.42	0.14	1.0
DA 4	4	0.02	0.04	55	1.0%	7.42	2.4	0.91	7.42	0.34	2.3

CYPRESS CIVIL

SITE CONSULTING
SURVEY
SITE ENGINEERING

INLET CALCULATION



PROJECT WESTERN TECH OFFICE
LOCATION CP2

INLET TYPE	Nyloplast - 2'x3'	
LENGTH	2	FT
WIDTH	3	FT
WEIR LENGTH*	5.7	FT
OPEN AREA*	5.2	SF
Cw	3.0	
Co	0.67	
CLOGGING FACTOR	50%	

Weir Equation:

$$Q_i = C_w P d^{1.5}$$

where:
- C_w = Weir coefficient
- P = Perimeter of the grate, disregarding bars and side against curb, ft
- d = Depth of flow at curb, ft

Orifice Equation:

$$Q_i = C_o A_g (2gd)^{0.5}$$

where:
- C_o = Orifice coefficient
- A_g = Clear opening area of the grate, sq ft
- d = Depth of flow at curb, ft
- g = Gravity, 32.2 ft/sec^2

DEPTH (FT)	WEIR (CFS)	ORIFICE (CFS)	CONTROLLING (CFS)
0.00	0.0	0.0	0.0
0.05	0.1	3.1	0.1
0.10	0.3	4.4	0.3
0.15	0.5	5.4	0.5
0.20	0.8	6.2	0.8
0.25	1.1	6.9	1.1
0.30	1.4	7.6	1.4
0.35	1.8	8.2	1.8
0.40	2.2	8.8	2.2
0.45	2.6	9.3	2.6
0.50	3.0	9.8	3.0
0.55	3.5	10.3	3.5
0.60	4.0	10.8	4.0
0.65	4.5	11.2	4.5
0.70	5.0	11.6	5.0
0.75	5.6	12.0	5.6
0.80	6.1	12.4	6.1
0.85	6.7	12.8	6.7

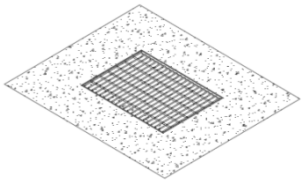
100-YR FLOW	1.0	CFS
CALCULATED DEPTH	0.25	FT

NOTE: * Open area and weir length are reduced by width of grate bars and transverse rods.

CYPRESS CIVIL

SITE CONSULTING
SURVEY
SITE ENGINEERING

INLET CALCULATION



PROJECT WESTERN TECH OFFICE
LOCATION CP3

INLET TYPE	Nyloplast - 2'x3'	
LENGTH	2	FT
WIDTH	3	FT
WEIR LENGTH*	7.9	FT
OPEN AREA*	5.2	SF
Cw	3.0	
Co	0.67	
CLOGGING FACTOR	25%	

Weir Equation:

$$Q_i = C_w P d^{1.5}$$

where:
C_w = Weir coefficient
P = Perimeter of the grate, disregarding bars and side against curb, ft
d = Depth of flow at curb, ft

Orifice Equation:

$$Q_i = C_o A_g (2gd)^{0.5}$$

where:
C_o = Orifice coefficient
A_g = Clear opening area of the grate, sq ft
d = Depth of flow at curb, ft
g = Gravity, 32.2 ft/sec^2

DEPTH (FT)	WEIR (CFS)	ORIFICE (CFS)	CONTROLLING (CFS)
0.00	0.0	0.0	0.0
0.05	0.2	4.7	0.2
0.10	0.6	6.6	0.6
0.15	1.0	8.1	1.0
0.20	1.6	9.3	1.6
0.25	2.2	10.4	2.2
0.30	2.9	11.4	2.9
0.35	3.7	12.3	3.7
0.40	4.5	13.2	4.5
0.45	5.4	14.0	5.4
0.50	6.3	14.7	6.3
0.55	7.3	15.4	7.3
0.60	8.3	16.1	8.3
0.65	9.3	16.8	9.3
0.70	10.4	17.4	10.4
0.75	11.6	18.0	11.6
0.80	12.7	18.6	12.7
0.85	14.0	19.2	14.0

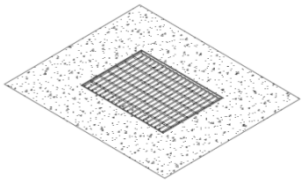
100-YR FLOW	1.0	CFS
CALCULATED DEPTH	0.15	FT

NOTE: * Open area and weir length are reduced by width of grate bars and transverse rods.

CYPRESS CIVIL

SITE CONSULTING
SURVEY
SITE ENGINEERING

INLET CALCULATION



PROJECT WESTERN TECH OFFICE
LOCATION CP4

INLET TYPE	Nyloplast - 2'x3'	
LENGTH	2	FT
WIDTH	3	FT
WEIR LENGTH*	7.9	FT
OPEN AREA*	5.2	SF
Cw	3.0	
Co	0.67	
CLOGGING FACTOR	25%	

Weir Equation:

$$Q_i = C_w P d^{1.5}$$

where:
C_w = Weir coefficient
P = Perimeter of the grate, disregarding bars and side against curb, ft
d = Depth of flow at curb, ft

Orifice Equation:

$$Q_i = C_o A_g (2gd)^{0.5}$$

where:
C_o = Orifice coefficient
A_g = Clear opening area of the grate, sq ft
d = Depth of flow at curb, ft
g = Gravity, 32.2 ft/sec^2

DEPTH (FT)	WEIR (CFS)	ORIFICE (CFS)	CONTROLLING (CFS)
0.00	0.0	0.0	0.0
0.05	0.2	4.7	0.2
0.10	0.6	6.6	0.6
0.15	1.0	8.1	1.0
0.20	1.6	9.3	1.6
0.25	2.2	10.4	2.2
0.30	2.9	11.4	2.9
0.35	3.7	12.3	3.7
0.40	4.5	13.2	4.5
0.45	5.4	14.0	5.4
0.50	6.3	14.7	6.3
0.55	7.3	15.4	7.3
0.60	8.3	16.1	8.3
0.65	9.3	16.8	9.3
0.70	10.4	17.4	10.4
0.75	11.6	18.0	11.6
0.80	12.7	18.6	12.7
0.85	14.0	19.2	14.0

100-YR FLOW	2.3	CFS
CALCULATED DEPTH	0.30	FT

NOTE: * Open area and weir length are reduced by width of grate bars and transverse rods.

APPENDIX D
(Retention Calculations)

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.4628°, Longitude: -111.9071°
Elevation: 1212.06 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.182** (0.153-0.221)	**0.238** (0.201-0.289)	**0.323** (0.271-0.392)	**0.389** (0.324-0.469)	**0.478** (0.392-0.573)	**0.548** (0.443-0.653)	**0.618** (0.491-0.735)	**0.690** (0.539-0.820)	**0.787** (0.598-0.935)	**0.860** (0.641-1.02)
10-min	**0.276** (0.233-0.337)	**0.362** (0.306-0.440)	**0.492** (0.413-0.596)	**0.592** (0.494-0.714)	**0.728** (0.597-0.873)	**0.833** (0.674-0.995)	**0.940** (0.746-1.12)	**1.05** (0.820-1.25)	**1.20** (0.910-1.42)	**1.31** (0.976-1.56)
15-min	**0.343** (0.288-0.417)	**0.448** (0.379-0.545)	**0.610** (0.512-0.739)	**0.734** (0.612-0.884)	**0.902** (0.740-1.08)	**1.03** (0.836-1.23)	**1.17** (0.925-1.39)	**1.30** (1.02-1.55)	**1.48** (1.13-1.77)	**1.62** (1.21-1.93)
30-min	**0.462** (0.388-0.562)	**0.604** (0.510-0.734)	**0.822** (0.689-0.995)	**0.989** (0.824-1.19)	**1.22** (0.996-1.46)	**1.39** (1.13-1.66)	**1.57** (1.25-1.87)	**1.75** (1.37-2.08)	**2.00** (1.52-2.38)	**2.19** (1.63-2.61)
60-min	**0.572** (0.480-0.695)	**0.747** (0.632-0.909)	**1.02** (0.853-1.23)	**1.22** (1.02-1.47)	**1.50** (1.23-1.80)	**1.72** (1.39-2.06)	**1.94** (1.54-2.31)	**2.17** (1.69-2.58)	**2.47** (1.88-2.94)	**2.71** (2.02-3.22)
2-hr	**0.663** (0.566-0.790)	**0.859** (0.734-1.03)	**1.15** (0.979-1.37)	**1.37** (1.16-1.63)	**1.68** (1.39-1.98)	**1.91** (1.57-2.25)	**2.15** (1.74-2.53)	**2.40** (1.90-2.81)	**2.73** (2.11-3.21)	**2.99** (2.26-3.53)
3-hr	**0.720** (0.612-0.864)	**0.923** (0.789-1.11)	**1.22** (1.03-1.46)	**1.45** (1.22-1.73)	**1.77** (1.47-2.10)	**2.03** (1.66-2.40)	**2.30** (1.84-2.71)	**2.58** (2.03-3.04)	**2.96** (2.27-3.50)	**3.28** (2.45-3.89)
6-hr	**0.865** (0.751-1.02)	**1.10** (0.956-1.29)	**1.41** (1.22-1.65)	**1.66** (1.42-1.93)	**1.99** (1.69-2.31)	**2.26** (1.89-2.61)	**2.54** (2.08-2.93)	**2.82** (2.27-3.26)	**3.21** (2.52-3.72)	**3.51** (2.69-4.09)
12-hr	**0.969** (0.850-1.12)	**1.23** (1.07-1.42)	**1.55** (1.36-1.79)	**1.81** (1.57-2.08)	**2.16** (1.85-2.48)	**2.43** (2.06-2.78)	**2.70** (2.26-3.10)	**2.98** (2.45-3.42)	**3.35** (2.69-3.87)	**3.65** (2.88-4.24)
24-hr	**1.15** (1.04-1.29)	**1.46** (1.32-1.64)	**1.90** (1.70-2.12)	**2.24** (2.00-2.50)	**2.72** (2.41-3.02)	**3.09** (2.73-3.43)	**3.48** (3.05-3.86)	**3.88** (3.38-4.31)	**4.44** (3.82-4.94)	**4.88** (4.16-5.44)
2-day	**1.25** (1.12-1.40)	**1.60** (1.44-1.79)	**2.09** (1.88-2.34)	**2.49** (2.23-2.78)	**3.05** (2.71-3.40)	**3.49** (3.08-3.89)	**3.96** (3.47-4.42)	**4.44** (3.87-4.96)	**5.12** (4.41-5.73)	**5.66** (4.83-6.37)
3-day	**1.32** (1.19-1.47)	**1.69** (1.52-1.89)	**2.22** (1.99-2.47)	**2.65** (2.36-2.95)	**3.25** (2.89-3.61)	**3.73** (3.29-4.15)	**4.24** (3.72-4.72)	**4.78** (4.16-5.33)	**5.54** (4.76-6.18)	**6.15** (5.23-6.88)
4-day	**1.39** (1.25-1.55)	**1.78** (1.60-1.99)	**2.34** (2.10-2.61)	**2.80** (2.50-3.11)	**3.45** (3.06-3.83)	**3.97** (3.51-4.41)	**4.53** (3.97-5.03)	**5.12** (4.45-5.69)	**5.95** (5.11-6.63)	**6.63** (5.63-7.40)
7-day	**1.53** (1.38-1.71)	**1.96** (1.77-2.19)	**2.59** (2.32-2.89)	**3.09** (2.77-3.45)	**3.81** (3.39-4.24)	**4.39** (3.88-4.87)	**5.00** (4.39-5.56)	**5.65** (4.92-6.29)	**6.57** (5.64-7.32)	**7.31** (6.21-8.16)
10-day	**1.67** (1.50-1.86)	**2.14** (1.92-2.38)	**2.82** (2.53-3.13)	**3.37** (3.01-3.74)	**4.13** (3.68-4.58)	**4.75** (4.20-5.26)	**5.40** (4.75-5.99)	**6.09** (5.31-6.76)	**7.05** (6.07-7.83)	**7.82** (6.67-8.70)
20-day	**2.05** (1.85-2.28)	**2.64** (2.38-2.93)	**3.48** (3.13-3.86)	**4.12** (3.70-4.57)	**4.98** (4.45-5.52)	**5.64** (5.02-6.25)	**6.31** (5.59-7.00)	**6.99** (6.16-7.76)	**7.91** (6.90-8.80)	**8.61** (7.46-9.60)
30-day	**2.39** (2.16-2.66)	**3.08** (2.78-3.42)	**4.06** (3.65-4.49)	**4.80** (4.31-5.31)	**5.80** (5.19-6.41)	**6.56** (5.85-7.24)	**7.35** (6.52-8.11)	**8.14** (7.18-9.00)	**9.22** (8.07-10.2)	**10.0** (8.71-11.1)
45-day	**2.78** (2.51-3.08)	**3.58** (3.24-3.97)	**4.72** (4.26-5.23)	**5.56** (5.01-6.15)	**6.67** (5.98-7.37)	**7.50** (6.71-8.30)	**8.34** (7.43-9.23)	**9.18** (8.13-10.2)	**10.3** (9.04-11.4)	**11.1** (9.71-12.4)
60-day	**3.08** (2.79-3.41)	**3.98** (3.60-4.40)	**5.23** (4.73-5.78)	**6.14** (5.53-6.78)	**7.33** (6.59-8.08)	**8.20** (7.35-9.05)	**9.08** (8.10-10.0)	**9.94** (8.83-11.0)	**11.1** (9.77-12.3)	**11.9** (10.4-13.2)

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

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PROJECT RETENTION REQUIREMENTS

$REQUIRED\ RETENTION\ (100-YEAR, 2-HOUR\ PRE\ VS\ POST)$

$EXISTING\ RETENTION\ VOLUME\ =\ 9{,}550\ CF$

$PRE\ VS\ POST\ (DISTURBED\ AREA)$
$Cw\ (PRE)\ =\ (0.50\ x\ 13{,}360\ SF\ )\ +\ (0.95\ x\ 21{,}065\ SF\ )\ /\ 34{,}425\ SF$
$Cw\ (PRE)\ =\ 0.78$

$Cw\ (POST)\ =\ (0.50\ x\ 9{,}930\ SF)\ +\ (0.95\ x\ 24{,}495\ SF)\ /\ 34{,}425\ SF$
$Cw\ (POST)\ =\ 0.82$

$V\ =\ Cw\ x\ (d/12)\ x\ A$
$V\ (PRE)\ =\ 0.78\ x\ (2.15/12)\ x\ 34{,}425\ =\ 4{,}811\ CF$
$V\ (POST)\ =\ 0.82\ x\ (2.15/12)\ x\ 34{,}425\ =\ 5{,}058\ CF$

$PRE\ VS\ POST\ VOLUME\ =\ 5{,}058\ -\ 4{,}811\ =\ 247\ CF$

$TOTAL\ REQUIRED\ VOLUME\ =\ 9{,}550\ +\ 247\ =\ 9{,}797\ CF$

$PROVIDED$:
$SURFACE\ BASIN\ =\ 5{,}600\ CF$
$STORMTECH\ CHAMBERS\ =\ 4{,}470\ CF$

-24 MC-3500 CHAMBERS @ 175.0 CF/CHAMBER = 4,200 CF

-6 END CAPS @ 45.1 CF PER END CAP = 270.6 CF (WITH 9" BASE STONE)

$TOTAL\ =\ 10{,}070\ CF$

CYPRESS CIVIL

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SURVEY
SITE ENGINEERING

BASIN VOLUME CALCULATIONS

EXISTING BASIN RETENTION

ELEVATION	AREA (SF)	CUMULATIVE VOLUME (CF)
1215.6	528	
1216	1468	399.2
1217	3,057	2262.5
1218	4,927	3992.0
1218.5	6,667	2898.5
VOLUME PROVIDED:		**9552.2**

PROPOSED BASIN RETENTION

ELEVATION	AREA (SF)	CUMULATIVE VOLUME (CF)
1215.5	919	
1216.5	1,502	1210.5
1217.5	2,187	1844.5
1218.5	2,971	2579.0
VOLUME PROVIDED:		**5634.0**