



March 12, 2026

Project Narrative

Project Name: Franciscan Renewal Center – Major Special Use Permit Amendment application.

Address: 5802 E Lincoln Dr, Paradise Valley, AZ 85253

The project consists of the installation of four photovoltaic (PV) systems, mounted to 4 new carport structures located at the site's parking lot. This project is being planned out into four phases. These systems will generate electricity onsite, primarily providing power for the church and auxiliary use facilities. An APS approved bi-directional meter will be installed in parallel with the PV system; enabling any excess generation to be distributed onto APS's grid, so it is considered a grid interactive PV system, which will interconnect with the distribution grid at Franciscan Renewal Center. The proposed PV systems will consist of the following:

- Array One, 76.8 KW DC south facing PV array
 - 120 - 640 watt PV modules (solar panels)
 - Mounted on steel shade carport at 5 degree tilt with all exposed steel painted DE6137 "*Tan Plan*"
 - Structure dimensions are 91'-11" x 41'-8" x 11' minimum height and 16' maximum height
- Array Two, 89.6 KW DC east facing PV array
 - 140 – 640 watt PV modules (solar panels)
 - Mounted on steel shade carport at 5 degree tilt with all exposed steel painted DE6137 "*Tan Plan*"
 - Structure dimensions are 105'-11.5" x 41'-8" x 11' minimum height and 16' maximum height
- Array Three, 86.4 KW DC east facing PV array
 - 135 – 640 watt PV modules (solar panels)
 - Mounted on steel shade carport at 5 degree tilt with all exposed steel painted DE6137 "*Tan Plan*"
 - Structure dimensions are 105'-11.5" x 41'-8" x 11' minimum height and 16' maximum height
- Array Four, 137.6 KW DC west facing array
 - 215 – 640 watt PV modules (solar panels)
 - Mounted on steel shade carport at 5 degree tilt with all exposed steel painted DE6137 "*Tan Plan*"
 - Structure dimensions are 166'-10" x 41'-8" x 11' minimum height and 16' maximum height
- All 4 structures increase the site's floor area by 19,200.04 sq ft or an additional 9.42% increase to the existing 12281.00 sq ft, totaling 31,581.04 sq ft or 15.41% floor area.
- The PV canopies will provide power to the campus at Franciscan Renewal Center and shade portions of the parking lot.
- Removal of 16 trees will be necessary to make way for the structures. The existing shrubs grow well in shade, and an additional 20 pollinators and milkweed will be planted in place of the trees. 7 new trees will be planted on the west property line to screen the view of the canopies for our neighbors. The following is the plant list:



- (7) 24" Box *Acacia salicina* "Willow Acacia"
- (5) 3 gallon *Salvia greggi* "Autumn Sage"
- (5) 3 gallon *Asclepias angustifolia* "Bee Brush"
- (5) 3 gallon *Conoclinium greggii* "Gregy Mistflower"
- There will be no removal or addition of lighting fixtures with this project. 2 light poles will be trimmed down to 8' in order to fit under Array One.



Included in these plans are photometrics of both the south and north parking areas, both approved by the Town of Paradise Valley in 2017 (south) and 2019 (north). With no new lighting being installed, these photometric studies are still valid.

- The accessory structures will not add or modify the use of the site or the existing building use (religious facility).



Adjacent Residential Lot

Adjacent Property owned by Franciscan Renewal Center (Unincorporated County Island)

Adjacent Residential Lot

Array 3

Array 4

Array 2

Adjacent Residential Lot

Array 1

Adjacent Residential Lot

DATE	REVISION

Drawn By:	BG
Date:	04-27-2026
Case Number:	

Project Name:	FRANCISCAN RENEWAL CENTER PARKING LOT SOLAR CANOPIES
Project Address:	5802 EAST LINCOLN DRIVE SCOTTSDALE, AZ 85253

**PROJECT
INFORMATION**

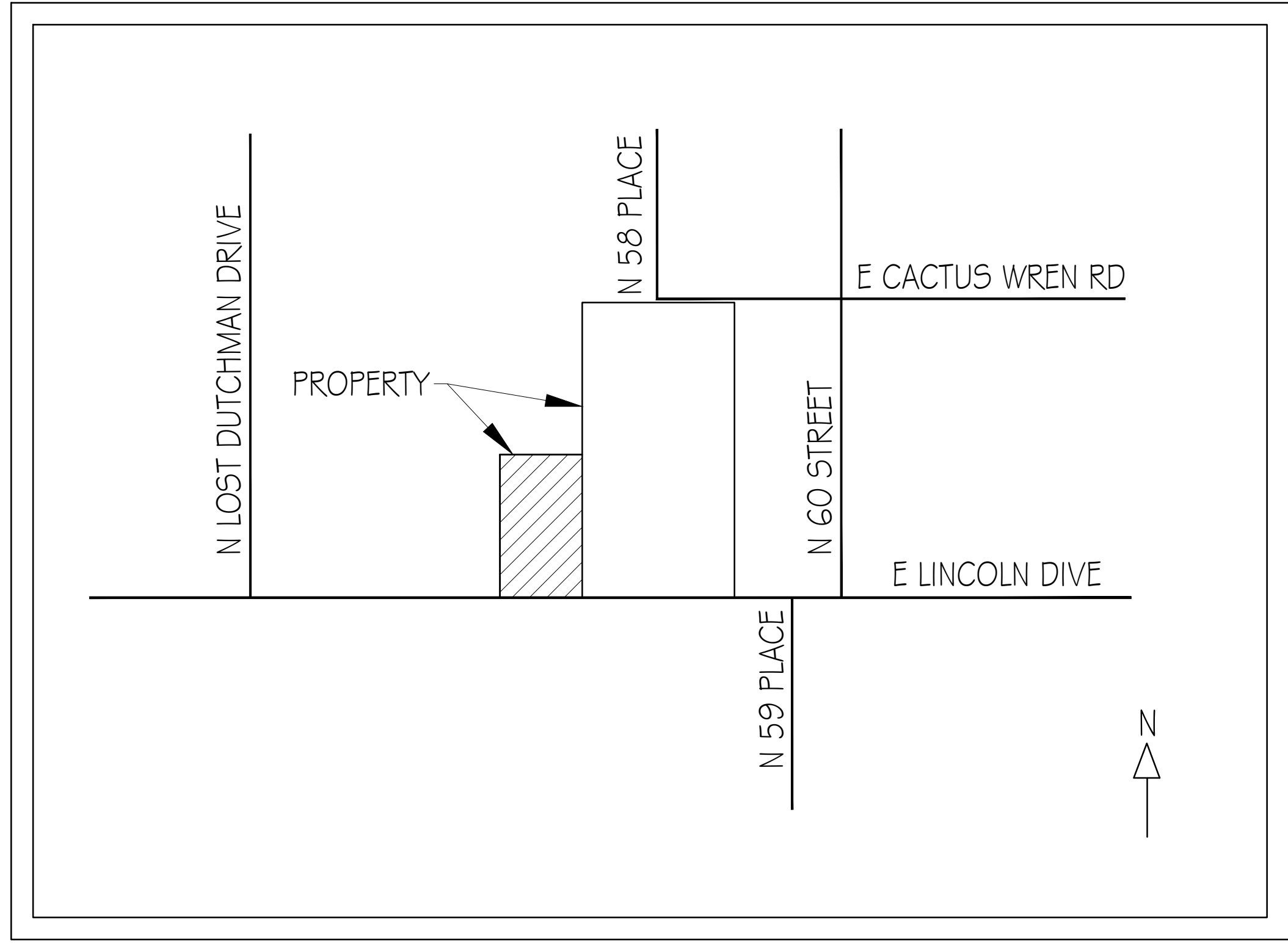
PROJECT INFORMATION	
DESCRIPTION OF PROJECT	PARKING LOT SOLAR CANOPIES
SITE ADDRESS	5802 EAST LINCOLN DRIVE, SCOTTSDALE, AZ 85253
AHJ	PARADISE VALLEY
ASSESSOR PARCEL	169-31-020
ZONING	SUP-PUBLIC
OWNER	FRANCISCAN RENEWAL CENTER INC.
PROJECT CONTACT	BRIAN GIBSON; 602-228-6384; BRIAN.G@SOLAR-AES.COM
PROJECT DESIGNER/CONTRACTOR	ADVANCED ENERGY SYSTEMS

CODE INFORMATION	
IBC (INTERNATIONAL BUILDING CODE)	2015
IRC (INTERNATIONAL RESIDENTIAL CODE)	2015
IPC (INTERNATIONAL PLUMBING CODE)	2015
NEC (NATIONAL ELECTRIC CODE)	2014
IMC (INTERNATIONAL MECHANICAL CODE)	2015
IFC (INTERNATIONAL FIRE CODE)	2015

DEFERRED SUBMITTALS
STEEL CANOPY STRUCTURALS

TABLE OF CONTENTS	
A.1	PROJECT INFORMATION
A.2	SITE PLAN
A.3	ARRAY ONE DETAILS
A.4	ARRAY TWO/THREE DETAILS
A.5	ARRAY FOUR DETAILS
D.1	DETAIL SHEET 1

LOT COVERAGE	
LOT AREA PARCEL 169-31-020.....	204,993 SQ FT
EXISTING LOT COVERAGE	
CLC BUILDING.....	12,281 SQ FT
EXISTING COVERAGE PERCENTAGE.....	5.99%
REVISED LOT COVERAGE	
EXISTING.....	12,281.00 SQ FT
PARKING ARRAY ONE.....	3,745.60 SQ FT
PARKING ARRAY TWO.....	4,370.44 SQ FT
PARKING ARRAY THREE.....	4,214.23 SQ FT
PARKING ARRAY FOUR.....	6,869.77 SQ FT
TOTAL.....	31,581.04
REVISED COVERAGE PERCENTAGE.....	15.41%



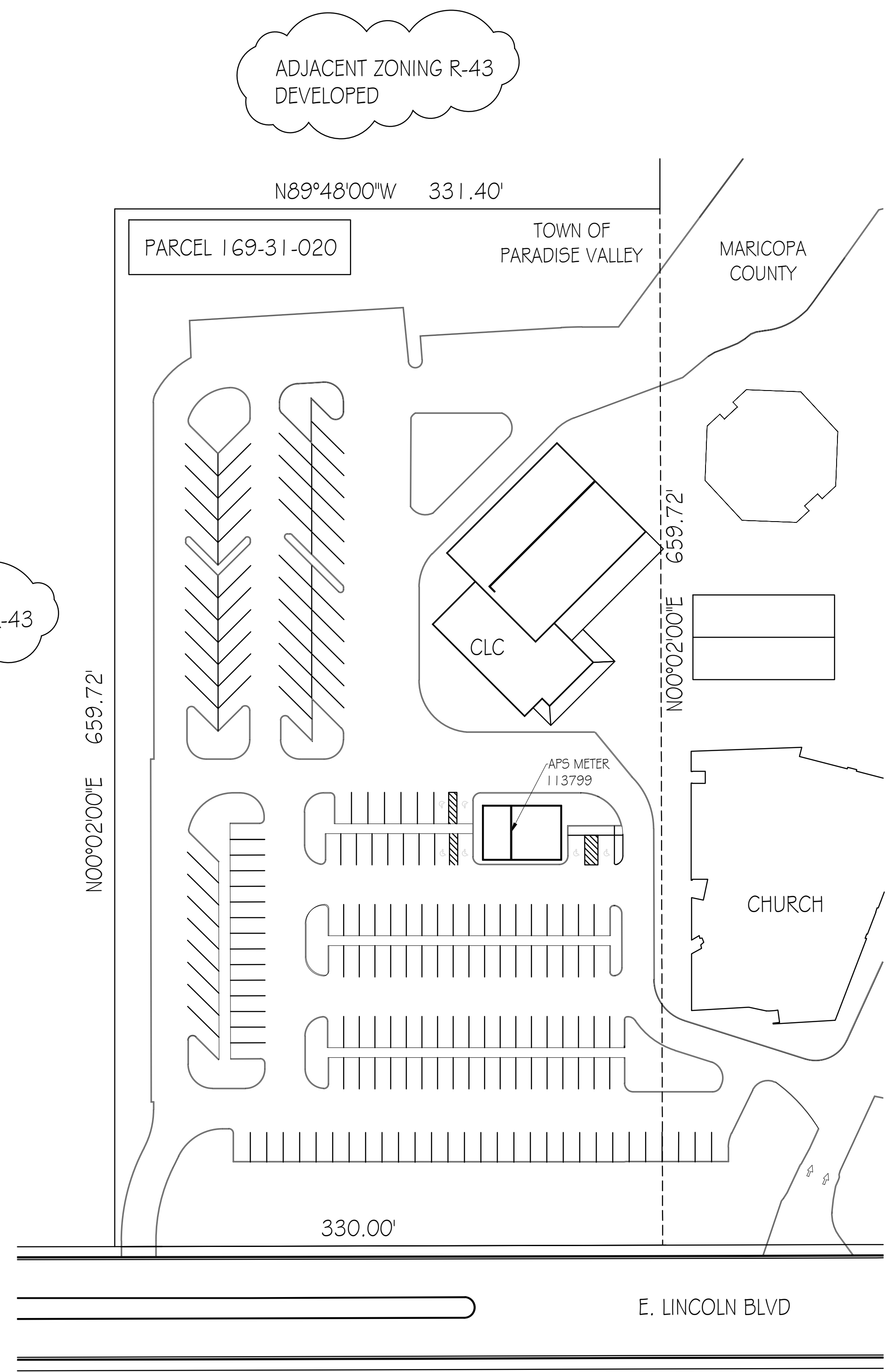
PROJECT DESCRIPTION

THIS PROJECT IS FOR THE INSTALLATION OF PHOTOVOLTAIC PARKING CANOPIES. THE SYSTEM IS GRID-TIED WHICH WILL INTERCONNECT WITH THE APS UTILITY IN THE WEST PARKING LOT OF THE FRANCISCAN RENEWAL CENTER. IT HAS BEEN DESIGNED INTO 4 SPECIFIC CANOPIES.

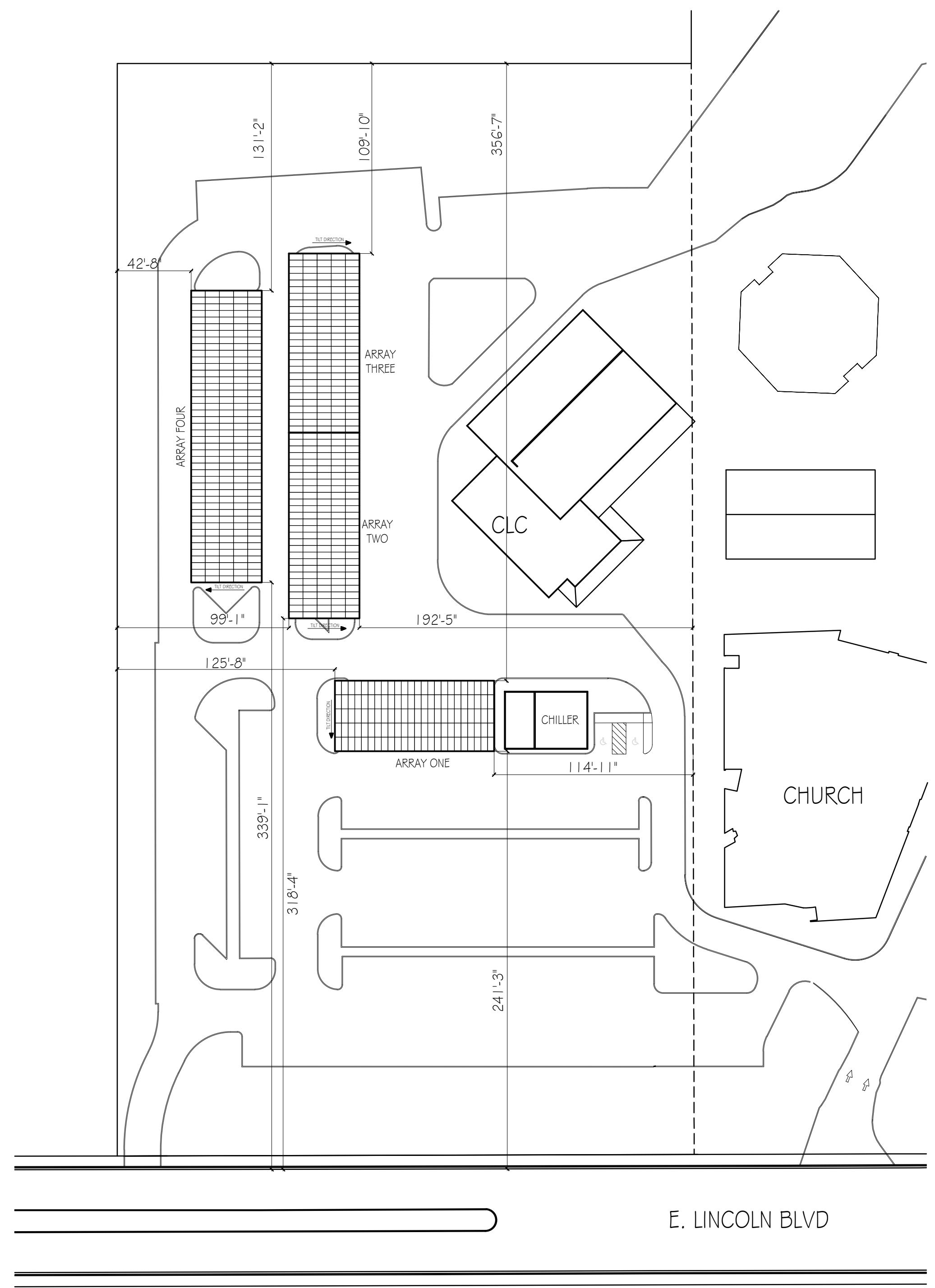
- ARRAY ONE:
- 76.8 KILOWATTS-DC
 - (120) HYUNDAI HiN-T640NJ SOLAR MODULES
- ARRAY TWO:
- 89.6 KILOWATTS-DC
 - (140) HYUNDAI HiN-T640NJ SOLAR MODULES
- ARRAY THREE:
- 86.4 KILOWATTS-DC
 - (135) HYUNDAI HiN-T640NJ SOLAR MODULES
- ARRAY FOUR:
- 137.6 KILOWATTS-DC
 - (215) HYUNDAI HiN-T640NJ SOLAR MODULES

GENERAL NOTES

1. ALL MATERIALS AND CONSTRUCTION METHODS SHALL CONFORM TO THE LATEST ADOPTED EDITIONS OF THE INTERNATIONAL RESIDENTIAL CODE AND ANY FEDERAL, STATE, OR LOCAL REQUIREMENTS.
2. ALL MATERIALS SHALL BE NEW.
3. ALL WORK WILL BE EXECUTED IN ACCORDANCE WITH THE OWNER'S DIRECTION WITH THE AID OF ARCHITECTURAL AND ENGINEERING DOCUMENTS.
4. SUBCONTRACTORS SHALL NOTIFY THE PRIME CONTRACTOR OF ANY OMISSION OF NECESSARY DIMENSIONS. ALL DIMENSIONS SHOULD BE READ OR CALCULATED AND NEVER SCALED.
5. VERIFY ALL ELEVATION AND DIMENSIONS OF STRUCTURAL ELEMENTS WITH ARCHITECTURAL DRAWINGS. NOTIFY THE PRIME CONTRACTOR OF ANY CONFLICT. THE SUBCONTRACTOR SHALL VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR THEM.
6. EXISTING LANDSCAPE AND LIGHTING TO REMAIN UNCHANGED.



SITE PLAN - EXISTING



SITE PLAN - WITH SOLAR CANOPIES

DATE	REVISION

Drawn By: BG
Date: 04-27-2026
Case Number:

Project Name: FRANCISCAN RENEWAL CENTER
PARKING LOT SOLAR CANOPIES
Project Address: 5802 EAST LINCOLN DRIVE
SCOTTSDALE, AZ 85253

SITE PLAN

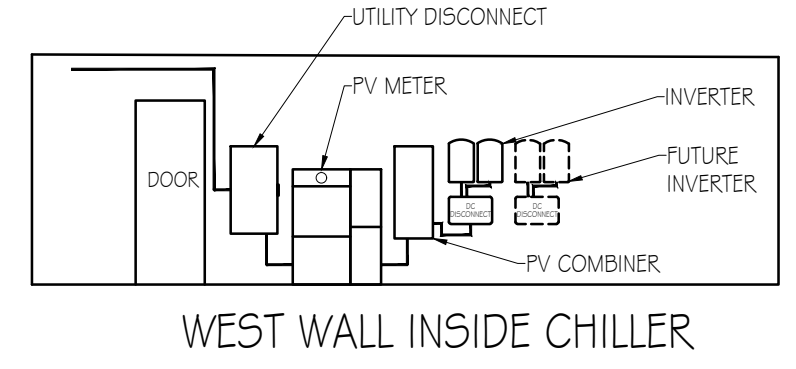
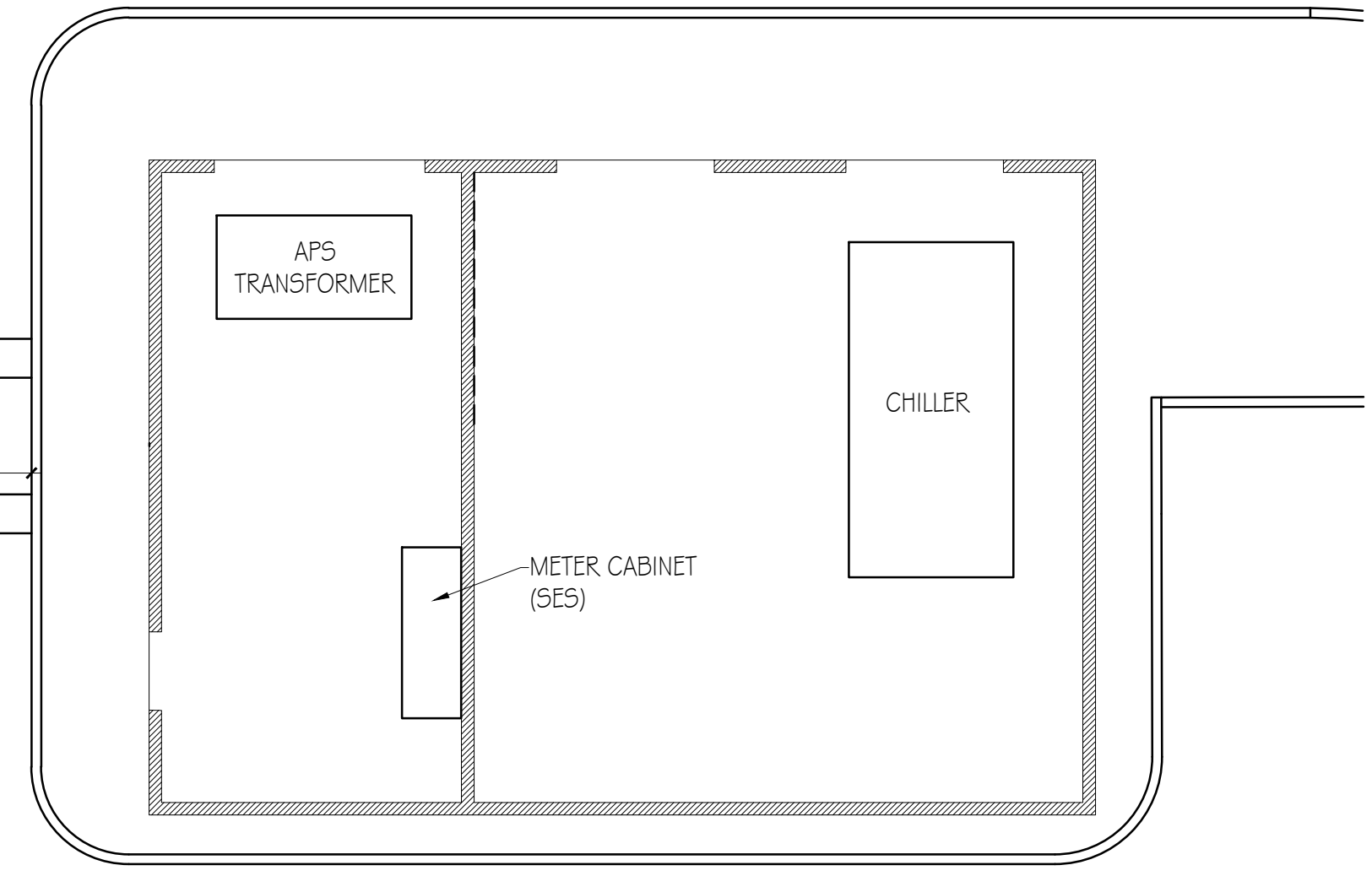
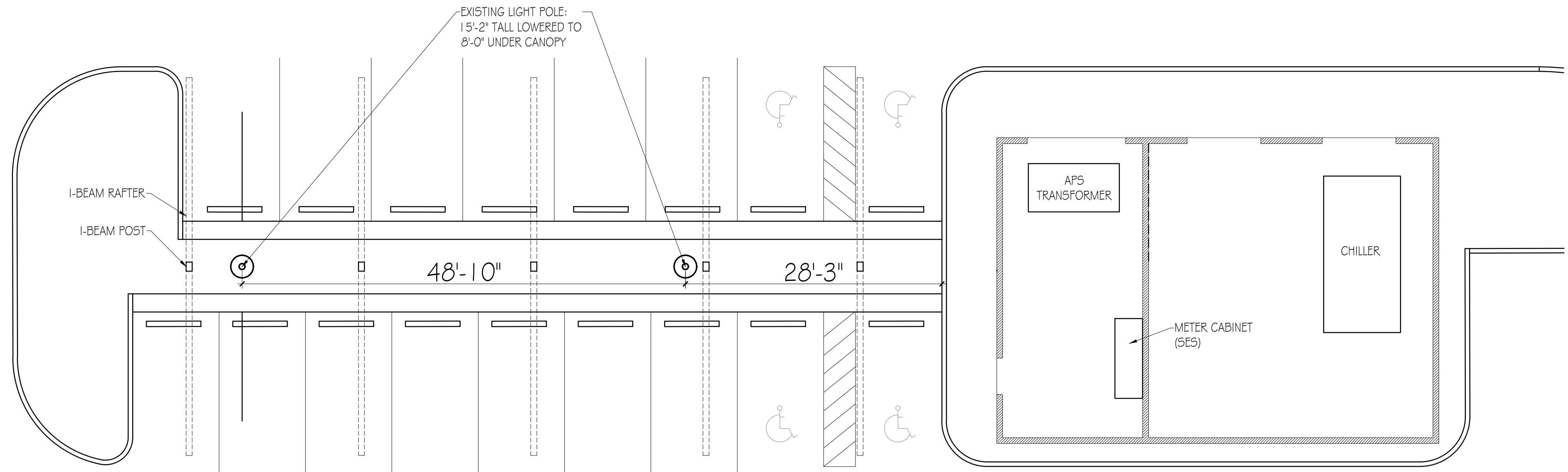
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Date: **04-27-2026**
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Project Name: **FRANCISCAN RENEWAL CENTER
PARKING LOT SOLAR CANOPIES**
Project Address: **5802 EAST LINCOLN DRIVE
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**ARRAY ONE
DETAILS**

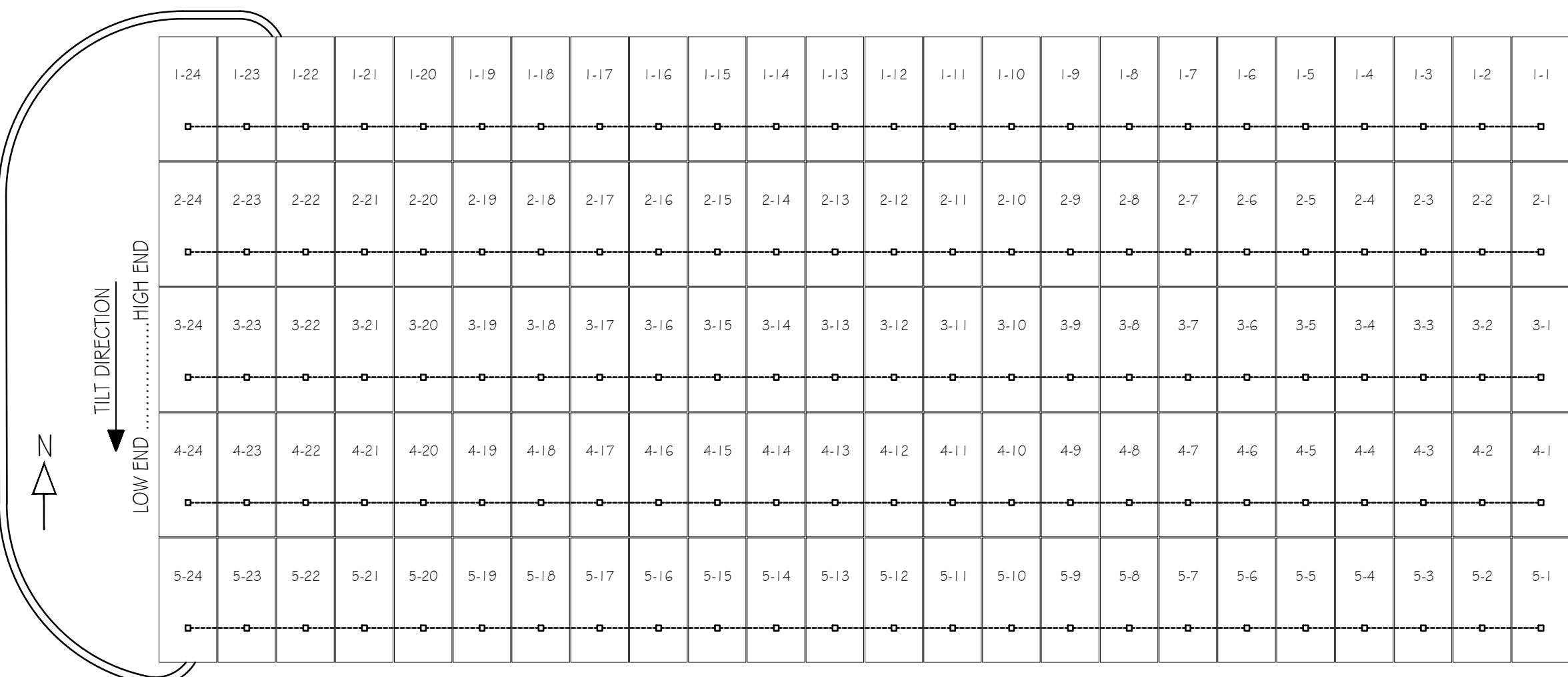
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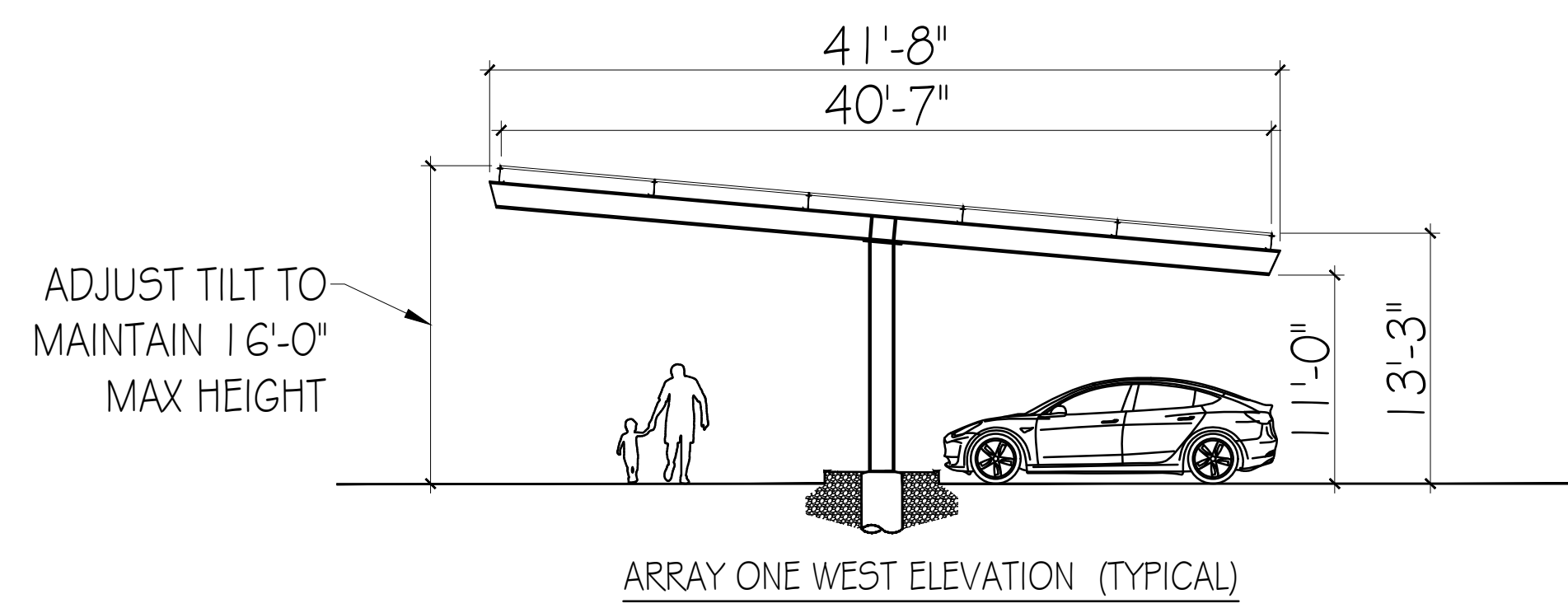
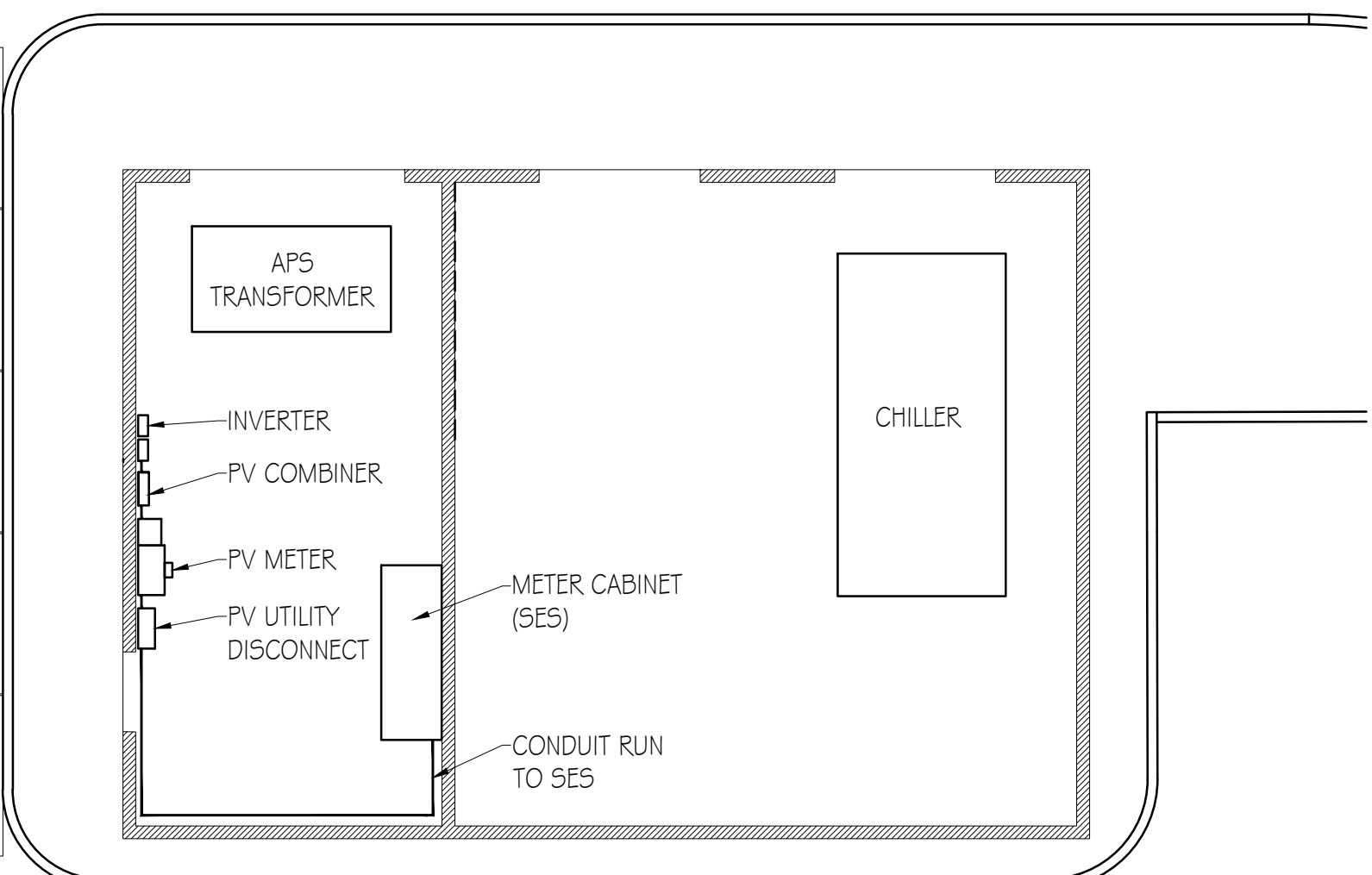
SOLAREdge DESIGN CRITERIA: 277/480V GRID
640 WATT SOLAR MODULES

	CG51U OPTIMIZER QTY	640-WATT MODULE QTY
STRING #1	24	24
STRING #2	24	24
STRING #3	24	24
STRING #4	24	24
STRING #5	24	24
TOTAL	120	120

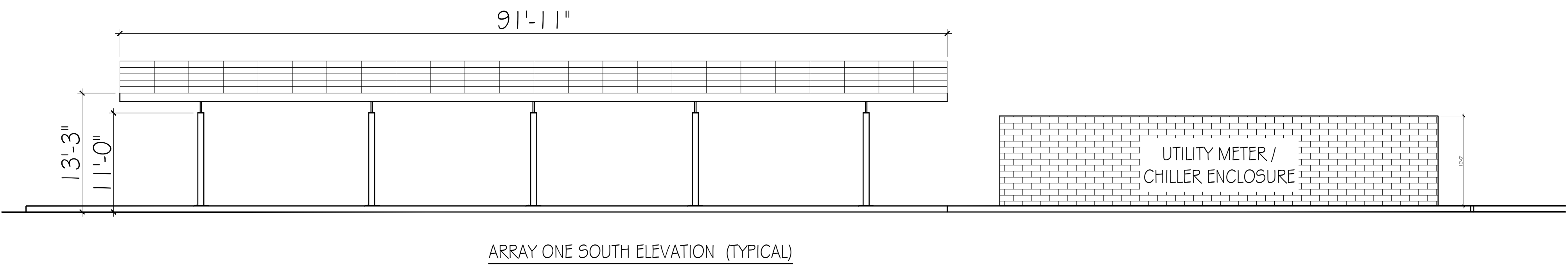
MINIMUM # OPTIMIZERS PER STRING = 18
MAXIMUM # 640-WATT MODULES PER STRING = 35 (1 STRING)
MAXIMUM # 640-WATT MODULES PER STRING = 47 (2 OR MORE STRINGS)
MAXIMUM 5 OPTIMIZER DIFFERENCE IN STRING LENGTH



ARRAY ONE: (120) 640 WATT MODULES = 76.8 KW
TILT 5° SOUTH



ARRAY ONE WEST ELEVATION (TYPICAL)



ARRAY ONE SOUTH ELEVATION (TYPICAL)

DATE	REVISION

Drawn By: **BG**

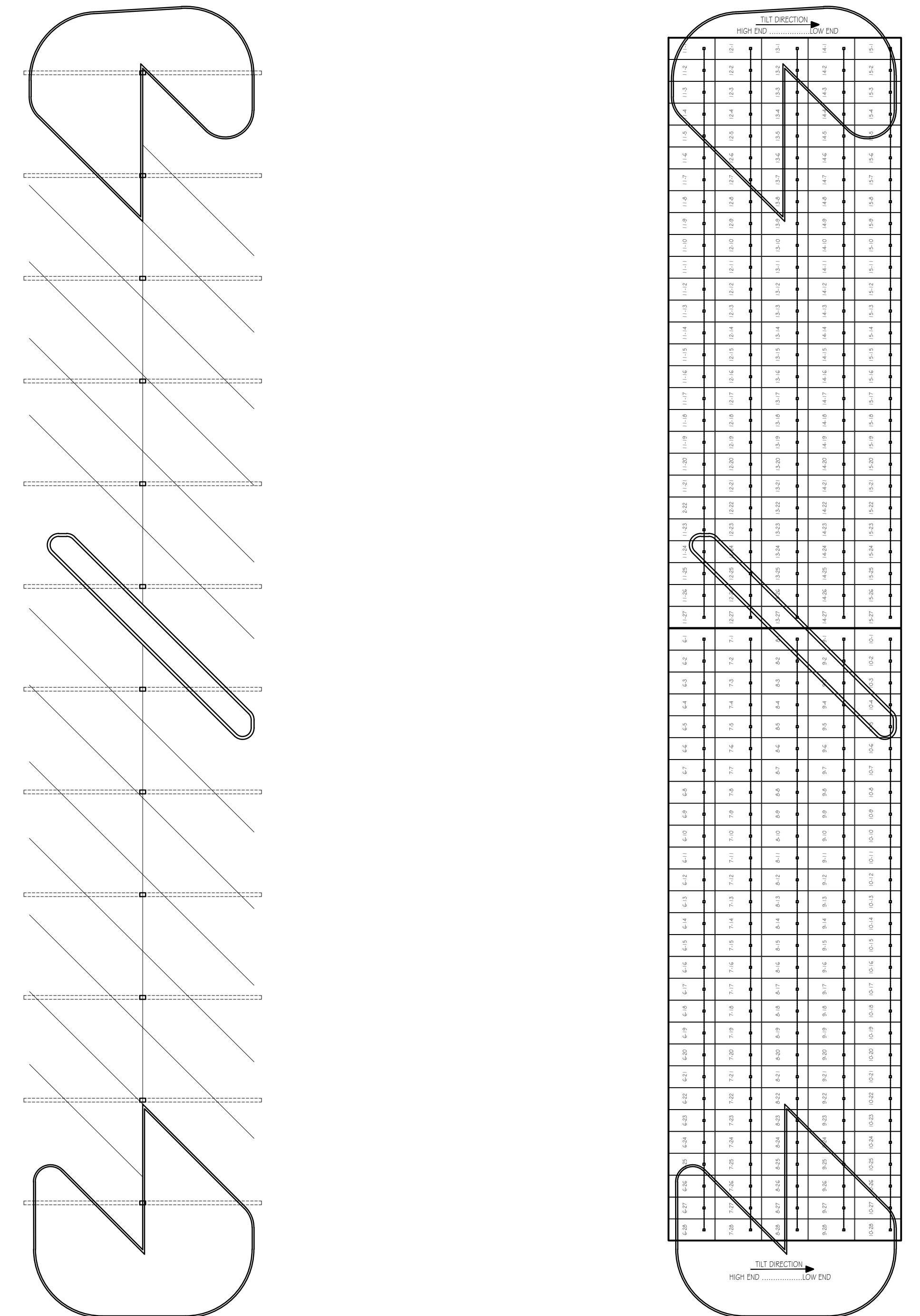
Date: **04-27-2026**

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Project Name: **FRANCISCAN RENEWAL CENTER
PARKING LOT SOLAR CANOPIES**

Project Address: **5802 EAST LINCOLN DRIVE
SCOTTSDALE, AZ 85253**

**ARRAY
TWO/THREE
DETAILS**



SOLAREDCR DESIGN CRITERIA: 277/480V GRID
640 WATT SOLAR MODULES

	CG51U OPTIMIZER QTY	640-WATT MODULE QTY
STRING #11	27	27
STRING #12	27	27
STRING #13	27	27
STRING #14	27	27
STRING #15	27	27
TOTAL	135	135

MINIMUM # OPTIMIZERS PER STRING = 18
MAXIMUM # 640-WATT MODULES PER STRING = 35
(1 STRING)
MAXIMUM # 640-WATT MODULES PER STRING = 47
(2 OR MORE STRINGS)
MAXIMUM 5 OPTIMIZER DIFFERENCE IN STRING LENGTH

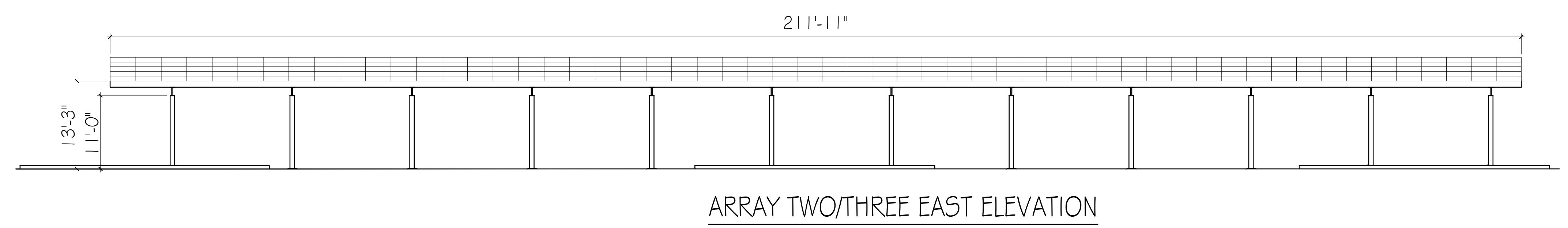
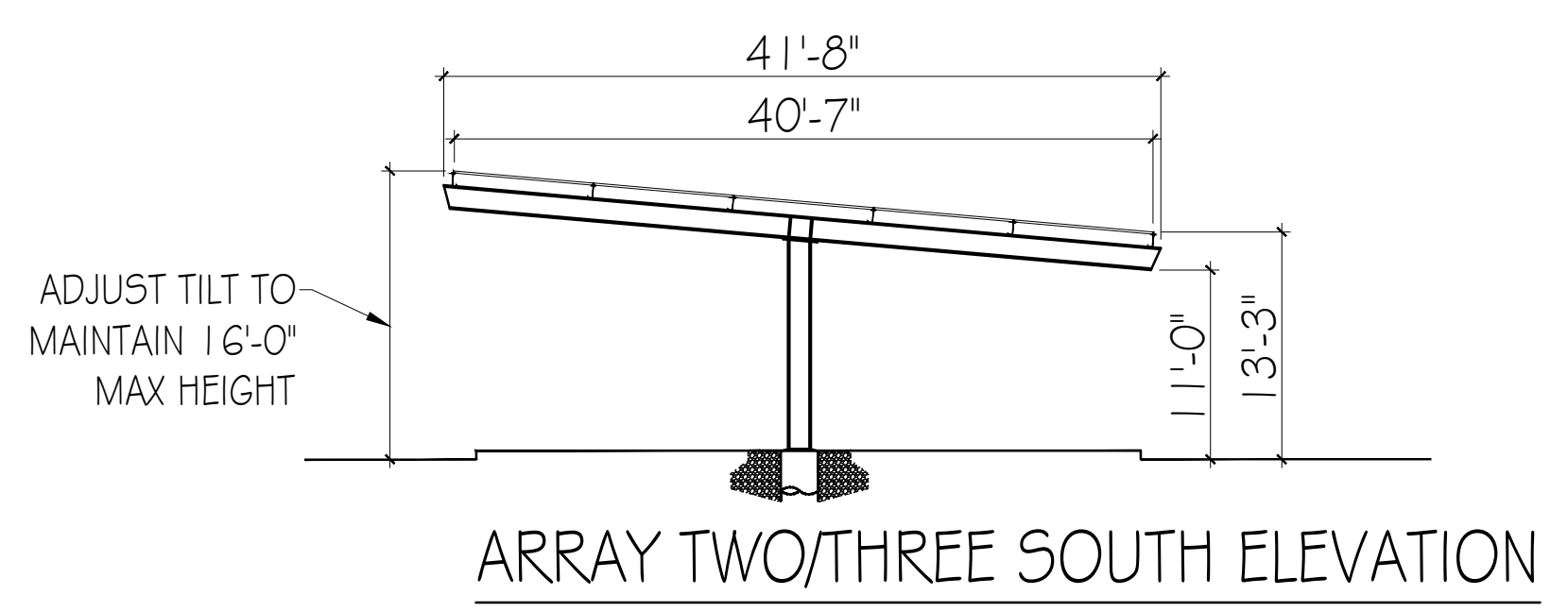
ARRAY THREE: (135) 640 WATT
MODULES = 86.4 KW
TILT 5° EAST

SOLAREDCR DESIGN CRITERIA: 277/480V GRID
640 WATT SOLAR MODULES

	CG51U OPTIMIZER QTY	640-WATT MODULE QTY
STRING #6	28	28
STRING #7	28	28
STRING #8	28	28
STRING #9	28	28
STRING #10	28	28
TOTAL	140	140

MINIMUM # OPTIMIZERS PER STRING = 18
MAXIMUM # 640-WATT MODULES PER STRING = 35
(1 STRING)
MAXIMUM # 640-WATT MODULES PER STRING = 47
(2 OR MORE STRINGS)
MAXIMUM 5 OPTIMIZER DIFFERENCE IN STRING LENGTH

ARRAY TWO: (140) 640 WATT
MODULES = 89.6 KW
TILT 5° EAST

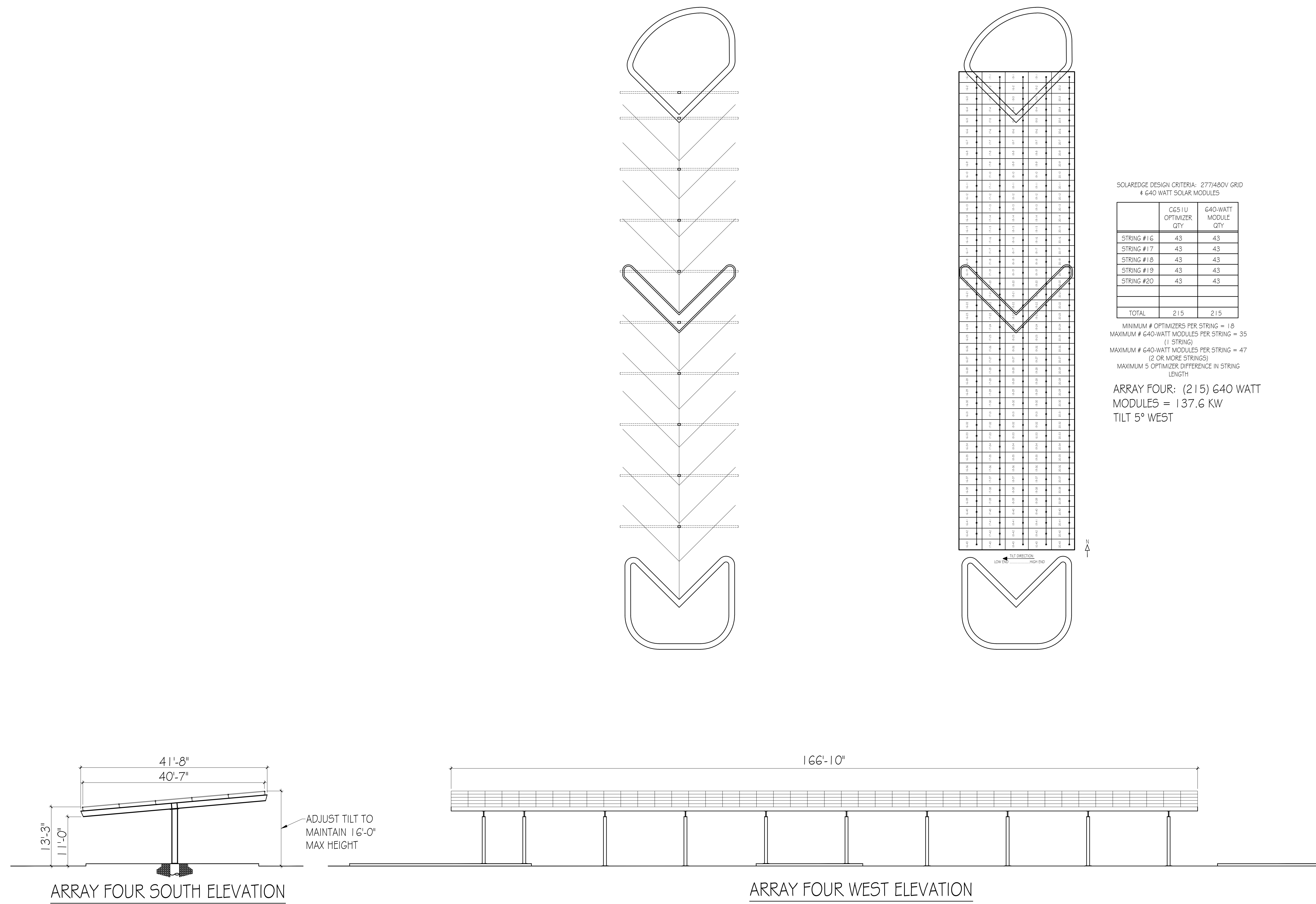


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**ARRAY FOUR
DETAILS**



Three Phase Inverter with Synergy Technology

USA Domestic Content Eligible

For North America
SE50KUS / SE80KUS / SE100KUS / SE110KUS / SE120KUS



Made in the USA

12-20 YEAR WARRANTY

SolarEdge's USA-manufactured Offering for C&I rooftops and carports

- Eligible for domestic content*. SolarEdge USA-manufactured inverters, when paired with certain SolarEdge USA-manufactured power optimizers, are intended to be eligible for the enhanced federal income tax credit for domestic content.
- Pre-commissioning feature for automated validation of system components and wiring during the site installation process and prior to grid connection.
- Easy two-person installation with lightweight, modular design (each inverter consists of two or three Synergy units and one Synergy Manager).
- Independent operation of each Synergy unit enables higher uptime and easy serviceability.
- Built-in thermal sensors detect faulty wiring, ensuring enhanced protection and safety.
- Built-in arc fault protection and rapid shutdown.
- Built-in PID mitigation for maximized system performance.
- Monitored** and field-replaceable surge protection devices, to better withstand surges caused by lightning or other events.
- Built-in module-level monitoring with Ethernet or cellular communication for full system visibility.

*For more details, see Eligibility for Domestic Content on this page.
**Applicable only for DC and AC SPDs.

solaredge.com



INVERTER

Three Phase Inverter with Synergy Technology

USA Domestic Content Eligible for North America

SE50KUS / SE80KUS / SE100KUS / SE110KUS / SE120KUS

Model Number	SE-DBL-US000INXX		SE-TRI-US000INXX				UNITS
	SE50KUS	SE80KUS	SE100KUS	SE110KUS	SE120KUS		
OUTPUT							
Total Rated AC Output Capacity	80,000	100,000	100,000	100,000	100,000	W	
Rated AC Active Output Power	80,000	100,000	100,000	100,000	100,000	W	
Maximum AC Apparent Output Power	80,000	100,000	100,000	100,000	100,000	VA	
AC Output Line Connections	3 x P, 4, PE		3 x P, 4, PE				
Supported Grids	WV, TN		WV, TN, CT, VT, DE, MA, CT				
AC Output Voltage (Minimum-Nominal-Maximum) (L-N)	244 - 277 - 305	105 - 120 - 132	244 - 277 - 305	244 - 277 - 305	244 - 277 - 305	Vac	
AC Output Voltage (Minimum-Nominal-Maximum) (L-L)	423.2 - 480 - 520	183 - 208 - 230	423.2 - 480 - 520	423.2 - 480 - 520	423.2 - 480 - 520	Vac	
AC Frequency (Minimum-Nominal-Maximum)	59.9 - 60 - 60.1	59.9 - 60 - 60.1	59.9 - 60 - 60.1	59.9 - 60 - 60.1	59.9 - 60 - 60.1	Hz	
Maximum Continuous Output Current (per phase, P-N)	365	135	100	100	144.3	Aac	
GRID TRENCH							
Utility Monitoring, Islanding Protection, Configurable Power Factor, Country Configurable Termination	Yes		Yes				
Total Harmonic Distortion	< 3		< 3				%
Power Factor Range	0.95 to 1		0.95 to 1				
INPUT							
Maximum DC Power (Module STC Inverter / Synergy Unit)	180,000 / 70,000	87,500 / 29,167	175,000 / 58,333	175,000 / 58,333	270,000 / 70,000	W	
Transformerless, Ungrounded	Yes		Yes				
Maximum Input Voltage DC+ to DC-	1000	600	1000	1000	1000	Vdc	
Operating Voltage Range DC+ to DC-	850 - 1000	510 - 600	850 - 1000	850 - 1000	850 - 1000	Vdc	
Maximum Input Current	3,480.25	3,480.25	3 x 47	3 x 47	3,480.25	Aac	
Reverse-Polarity Protection	Yes		Yes				
Ground Fault Indication Detection	Yes		Yes				
DC Voltage Efficiency	98.5	97	98.5	98.5	98.5	%	
Nighttime Power Consumption	< 8		< 12				W
ADDITIONAL FEATURES							
Supported Communication Interfaces**	2 x RS485, Ethernet		Wi-Fi (optional), Cellular (optional)				
Smart Energy Management	Yes		Yes				
Inverter Commissioning	With the SetApp mobile application		Using built-in Wi-Fi access point for local connection				
Arc Fault Protection	Built-in unit		Optional (according to UL 9996)				
Photovoltaic Rapid Shutdown System	N/A, CEPS		2 built-in, 6-wired with CEPS				
MP-Tracker	Yes		Yes				
IS455 Surge Protection (ports 1-2)	Type 1		Optional, integrated				
DC Safety Switch	Type 1		Optional, integrated				
DC Disconnect	Built-in		Optional				
STANDARD COMPLIANCE							
Safety	UL 1741, UL 1741-1, IEC 62109-1, IEC 62109-2, IEC 62109-3, IEC 62109-4, IEC 62109-5, IEC 62109-6, IEC 62109-7, IEC 62109-8, IEC 62109-9, IEC 62109-10, IEC 62109-11, IEC 62109-12, IEC 62109-13, IEC 62109-14, IEC 62109-15, IEC 62109-16, IEC 62109-17, IEC 62109-18, IEC 62109-19, IEC 62109-20, IEC 62109-21, IEC 62109-22, IEC 62109-23, IEC 62109-24, IEC 62109-25, IEC 62109-26, IEC 62109-27, IEC 62109-28, IEC 62109-29, IEC 62109-30, IEC 62109-31, IEC 62109-32, IEC 62109-33, IEC 62109-34, IEC 62109-35, IEC 62109-36, IEC 62109-37, IEC 62109-38, IEC 62109-39, IEC 62109-40, IEC 62109-41, IEC 62109-42, IEC 62109-43, IEC 62109-44, IEC 62109-45, IEC 62109-46, IEC 62109-47, IEC 62109-48, IEC 62109-49, IEC 62109-50, IEC 62109-51, IEC 62109-52, IEC 62109-53, IEC 62109-54, IEC 62109-55, IEC 62109-56, IEC 62109-57, IEC 62109-58, IEC 62109-59, IEC 62109-60, IEC 62109-61, IEC 62109-62, IEC 62109-63, IEC 62109-64, IEC 62109-65, IEC 62109-66, IEC 62109-67, IEC 62109-68, IEC 62109-69, IEC 62109-70, 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**For other regional setups please contact SolarEdge support.
***For connectivity of inverters and power optimizers refer to [Connectivity Matrix](#).
****For specifications of the optional communication system, visit the [Connectivity Matrix](#) to download the relevant product document.

Three Phase Inverter with Synergy Technology

USA Domestic Content Eligible for North America

SE50KUS / SE80KUS / SE100KUS / SE110KUS / SE120KUS

Model Number	SE-DBL-US000INXX		SE-TRI-US000INXX				UNITS
	SE50KUS	SE80KUS	SE100KUS	SE110KUS	SE120KUS		
INSTALLATION SPECIFICATIONS							
Number of Synergy Units per Inverter	2		3				
AC Maximum Conduit Size	2" (51 mm)		2" (51 mm)				in
AC Maximum Conductor Size (Line / PE)	4/0 AWG / 1/0 AWG		4/0 AWG / 1/0 AWG				
DC Maximum Conduit Size	1.5" (38 mm)		1.5" (38 mm)				in
Inverter Unit / Synergy Manager	Multi-Input (Blue-Input) (DC-Non-Subscribed)	6 / 3 pairs, 6 - 10 AWG	3 pairs / 1 pair, 2 - 4 AWG, copper or aluminum	3 pairs / 1 pair, 2 - 4 AWG, copper or aluminum	3 pairs / 1 pair, 2 - 4 AWG, copper or aluminum	3 pairs / 1 pair, 2 - 4 AWG, copper or aluminum	
Dimensions (H x W x D)	Synergy Unit: 22" x 19" x 7.1" (558 x 483 x 179) Synergy Manager: 18.1" x 22.4" x 7.1" (459 x 569 x 179)		Synergy Unit: 22" x 19" x 7.1" (558 x 483 x 179) Synergy Manager: 18.1" x 22.4" x 7.1" (459 x 569 x 179)				in / mm
Weight	Synergy Unit: 20.4 / 32 Synergy Manager: 29.5 / 38		Synergy Unit: 20.4 / 32 Synergy Manager: 29.5 / 38				lb / kg
Operating Temperature Range	-40 to +50 / -40 to +50*		-40 to +50 / -40 to +50*				°F / °C
Cooling	Fan based refrigeration		Fan based refrigeration				
Noise	NEMA 3R		NEMA 3R				dB(A)
Protection Rating	NEMA 3R		NEMA 3R				
Mounting	Brackets provided		Brackets provided				

(*) Fanless unit included with the multi-input version of the Synergy Manager.
(**) For power wiring information, visit the [Cable and Conduit Sizing](#) document for North America.

*Eligibility for Domestic Content
As it relates to the domestic content rules, the U.S. Department of Treasury and the IRS have not yet issued proposed or final regulations. Rather, the IRS has issued three notices: Notice 2020-08, Notice 2021-04, and Notice 2021-06. These notices provide guidance regarding the domestic content rules. SolarEdge products identified herein were manufactured with the intent to be eligible for inclusion under the election with better substantiation of the Domestic Content Percentage under the "Right-to-Use" category under IRS Notice 2020-08 and Notice 2021-06. SolarEdge will continue to monitor the legislative and regulatory developments and will update this document as needed. SolarEdge does not provide the audit trail for the Domestic Content Percentage. This document is for informational purposes only and does not constitute an offer of tax advice. The tax consequences of any transaction may vary based on the facts and circumstances. Consult your tax advisor for more information. Please contact your local SolarEdge sales representative.

PN	Domestically produced MPCs per notice 2024-41*	Domestically produced MPCs per notice 2025-08*
USEUSA-US000INXX, when paired with CE5U	Printed Circuit Board Assemblies, Electrical Parts, Enclosures (US/IN)	Printed Circuit Board Assemblies (DC-DC) and (AC-AC), Enclosures (US/IN)
USEUSA-US000INXX, when paired with CE5U	Printed Circuit Board Assemblies, Enclosures (US/IN)	Printed Circuit Board Assemblies (DC-DC) and (AC-AC), Enclosures (US/IN)

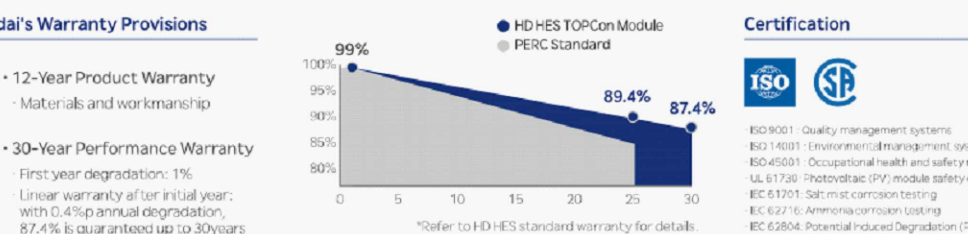
HD HYUNDAI SOLAR MODULE

NJ Series Premium N-Type TOPCon Module

HIN-T625NJ | HIN-T630NJ | HIN-T635NJ | HIN-T640NJ | HIN-T645NJ



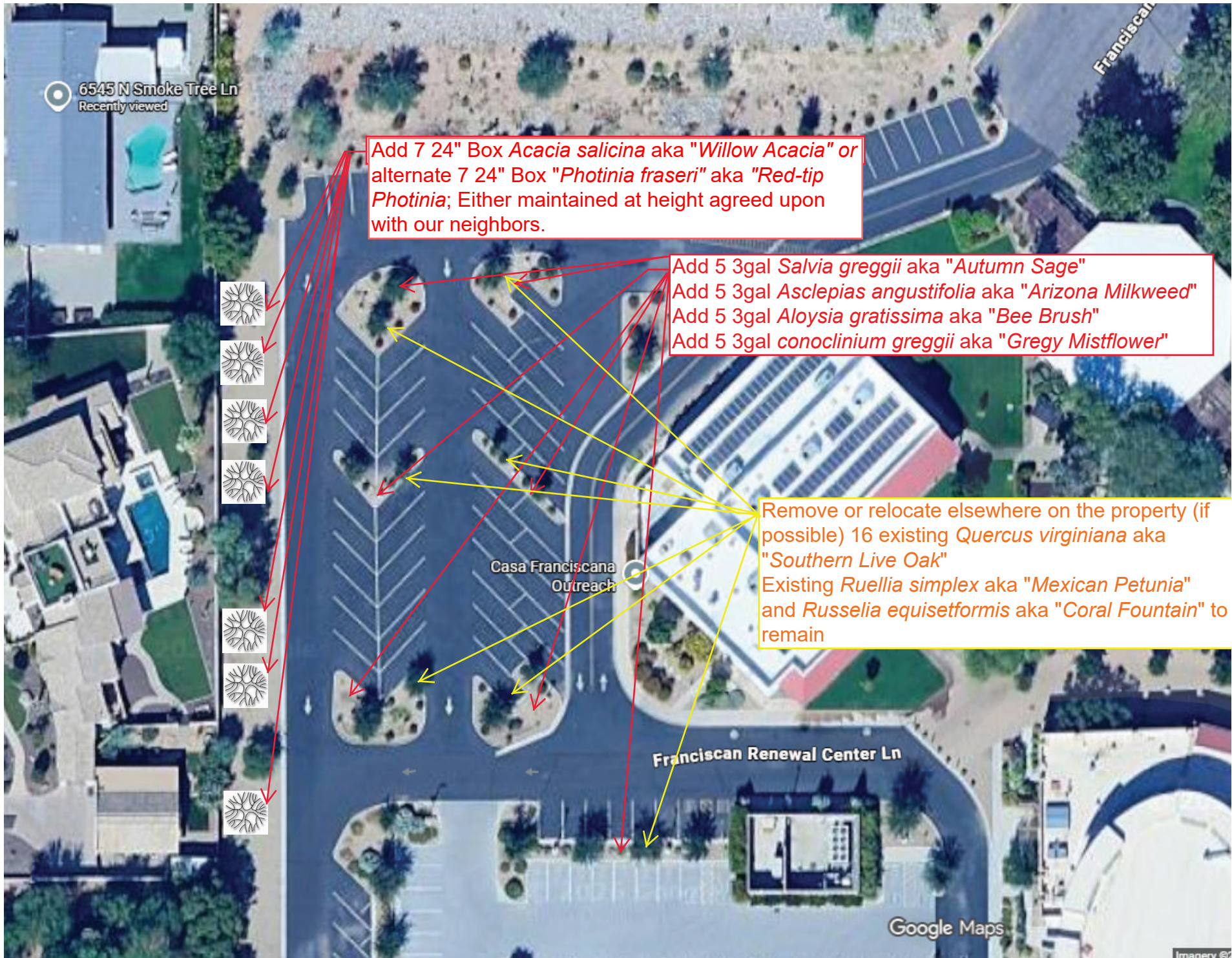
- 23.07% High Efficiency
- High-End TOPCon Technology
- Higher Bifaciality
- Long-Term Reliability
- Compatible with Carport Applications
- For Commercial & Utility Applications



Electrical Characteristics	HIN-T625NJ		HIN-T630NJ		HIN-T635NJ		HIN-T640NJ		HIN-T645NJ		
	Unit	Value	Value	Value	Value	Value	Value	Value	Value	Value	
Nominal output (Pmax)	W	325	393	430	498	535	600	670	745	815	
Open circuit voltage (Voc)	V	55.7	55.7	55.9	55.9	56.1	56.1	56.3	56.3	56.5	
Short circuit current (Isc)	A	14.20	15.80	14.31	15.90	14.36	15.95	14.41	15.97	16.02	
Voltage at Pmax (Vmp)	V	48.9	48.9	48.8	48.8	48.7	48.7	48.6	48.6	48.5	
Current at Pmax (Imp)	A	13.50	14.96	13.55	15.01	13.60	15.07	13.65	15.12	15.18	
Module efficiency	%	22.20	22.54	22.72	22.72	22.90	22.90	23.07	23.07	23.17	
Power Class Rating	W	6000									
Temperature coefficient of Pmax	%/°C	-0.30									
Temperature coefficient of Voc	%/°C	-0.25									
Temperature coefficient of Isc	%/°C	0.048									
Bifaciality	%	80±10%									

Additional Power Gain from rear side					
Prepass gain	Prepass (V)	Vmp (V)	Imp (A)	Voc (V)	Isc (A)
5%	66.7	46.70	14.28	56.10	15.08
15%	73.0	46.70	14.28	56.10	15.01
25%	79.4	46.70	14.28	56.10	14.95

Mechanical Characteristics		Installation Safety Guide	
Dimensions	2,460mm (L) x 1,134mm (W) x 35mm (H) DIT: max. 44.6mm		



6545 N Smoke Tree Ln
Recently viewed

Add 7 24" Box *Acacia salicina* aka "Willow Acacia" or alternate 7 24" Box "*Photinia fraseri*" aka "Red-tip *Photinia*"; Either maintained at height agreed upon with our neighbors.

Add 5 3gal *Salvia greggii* aka "Autumn Sage"
Add 5 3gal *Asclepias angustifolia* aka "Arizona Milkweed"
Add 5 3gal *Aloysia gratissima* aka "Bee Brush"
Add 5 3gal *conoclinium greggii* aka "Gregy Mistflower"

Remove or relocate elsewhere on the property (if possible) 16 existing *Quercus virginiana* aka "Southern Live Oak"
Existing *Ruellia simplex* aka "Mexican Petunia" and *Russelia equisetformis* aka "Coral Fountain" to remain



Casa Franciscana Outreach

Franciscan Renewal Center Ln

Google Maps

Imagery ©



ALL ARRAYS FROM NORTHWEST





ALL ARRAYS FROM SOUTHWEST





ALL ARRAYS FROM SOUTH





ALL ARRAYS FROM SOUTH (2)





ALL ARRAYS FROM NORTH





ALL ARRAYS BIRDS-EYE





ARRAY 1 FROM WEST



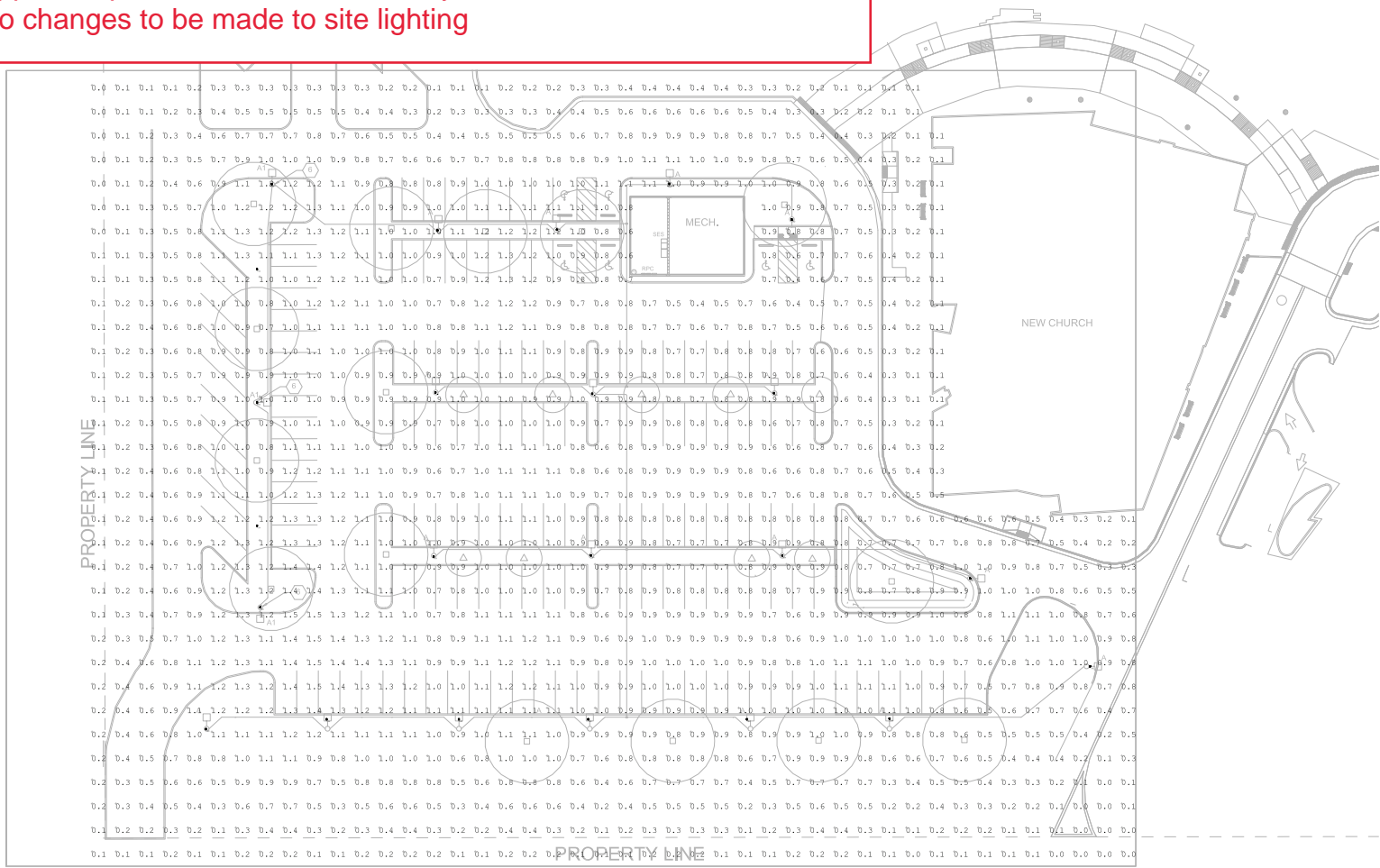


ARRAYS 2 THROUGH 4 FROM SOUTH



Issued / Revised		
No.	Date	Description
	08/09/17	PERMIT SET

Approved photometric for Community Life Center Phase 1
No changes to be made to site lighting



Luminaire Schedule				
Symbol	Qty	Label	Arrangement	Total Lamp Lumens
□	123	FSM	3x3	N.A.
Description: DS20 LED 20C 700 30K FSM MV057				

Calculation Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
Room 1 Floor	Illuminance	fc	0.91	1.5	0.0	N.A.

Client
**Franciscan Renewal Center -
 Parking Lighting
 Phase 1**
 5802 E. Lincoln Drive
 Maricopa County, AZ 85253
 Project No. 1110723

**Westlake
 Reed
 Leskosky** | One East Camelback Road
 Suite 690
 Phoenix, Arizona 85012
 T 602.212.0451
 F 602.212.1030
 www.WRLdesign.com
 © Westlake Reed Leskosky

**ELECTRICAL SITE
 PHOTOMETRIC PLAN**

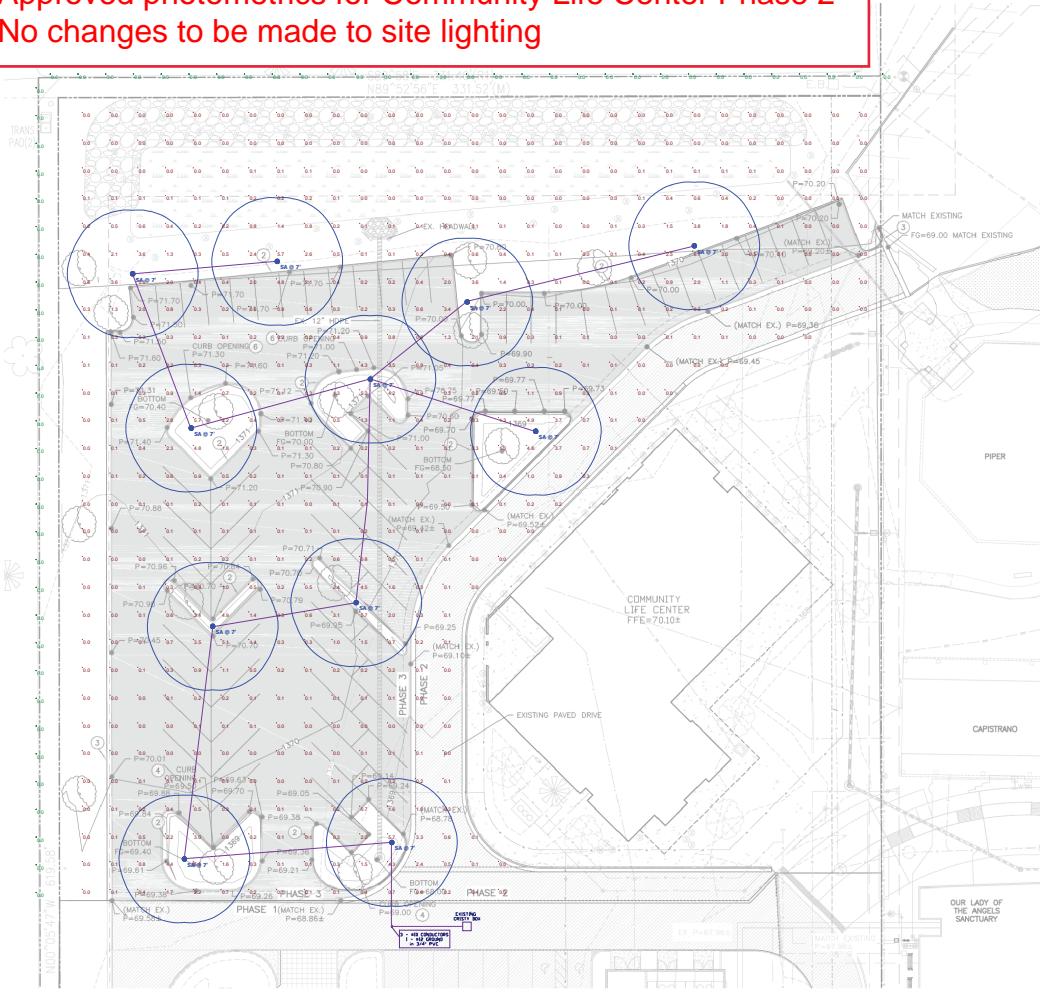
EL-002

1 SITE LIGHTING PHOTOMETRIC PLAN
 SCALE: NONE

Checked by: JAG

Drawn by: CRB

**Approved photometrics for Community Life Center Phase 2
No changes to be made to site lighting**



Plan View
Scale: 1" = 20'

Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Lamp	Number Lamps	Fluorescence	Lumens Per Lamp	Light Loss Factor	Wattage
○	SA	11	Lithonia Lighting	RADPT LED P3 3YK 5YM MVOLT P14 PIR 2700K	RADPT LED P3 3YK 5YM MVOLT P14 PIR 2700K COLOR TEMP Symmetric distribution / 7 OVERALL REPORT	LED - 3700K COLOR TEMP	1	RADPT_LED_P1_3YK_5YM_14	3271	0.91	25-4124

Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
COMPLIANCE AT GRADE	+	0.3 fc	5.8 fc	0.0 fc	N/A	N/A
LIGHT SPILL AT PROPERTY LINE	✖	0.0 fc	0.0 fc	0.0 fc	N/A	N/A

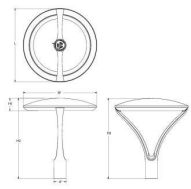


Radean Post Top LED Area Luminaire



Model: _____
 Name: _____
 Type: _____

Specifications
 EPL: 120" (3050mm)
 Length: 24" (610mm)
 Width: 24" (610mm)
 H1 Luminaire Height: 47" (1193mm)
 H2 Luminaire Height: 20" (508mm)
 Weight: 35lbs (17.2kg)

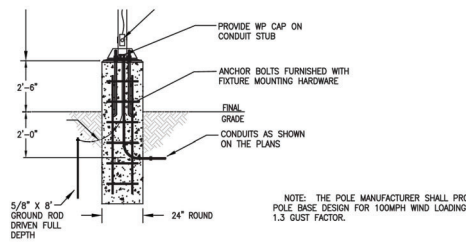


Introduction
 The architecturally inspired shape of the RADEAN™ post top area luminaire embodies the grace and strength of the RADEAN family. The twin copper-cow cast aluminum arms support the slender superstructure, creating a beautiful sculpture by day transforming into a beacon of comfort by night. Triangular arms redirect reflection maintaining its visually quiet appearance. With sleek lines and simple silhouettes, these LED luminaires use specialized lighting and visual comfort to transform common areas like courtyards, outdoor retail locations, universities and corporate campuses into pedestrian-friendly nighttime environments.

Ordering Information EXAMPLE: RADPT LED P3 3YK 5YM MVOLT P14 PIR DNAXD

Label	Dimensions	Material	Finish	Mounting	Color	Options
LED P3	120" length	304 304S	304 304S	304 304S	304 304S	304 304S
LED P3	120" length	304 304S	304 304S	304 304S	304 304S	304 304S
LED P3	120" length	304 304S	304 304S	304 304S	304 304S	304 304S
LED P3	120" length	304 304S	304 304S	304 304S	304 304S	304 304S

LITHONIA LIGHTING COMMERCIAL OUTDOOR One Lithonia Way • Corpes, Georgia 30135 • Phone: 1-800-778-5878 • FAX: 404-875-1111



POLE BASE DETAIL

- DRAWING NOTES:**
1. LIGHT EMITTING ELEMENT SHALL BE SHIELDED SO THAT NO BEAM OF LIGHT EXTENDS ABOVE THE HORIZON.
 2. LIGHT LEVELS AT THE PROPERTY LINE SHALL NOT EXCEED 0.5 FOOT CANDLES.
 3. NO LIGHT POLES SHALL BE LOCATED WITHIN SETBACK AREA



COMMUNITY LIFE CENTER PARKING - WEST PARKING
PARADISE VALLEY, AZ

Designer: _____
 Date: 9/15/2019
 Scale: _____
 Plot to Scale: _____
 Drawing No.: _____
 Summary: _____



February 28, 2026

Mike Slivers
Operations Director
Franciscan Renewal Center
5802 E. Lincoln Drive
Scottsdale, Arizona 85253

RE: Topic

Atwell Project Number: TSC25-1263

Mike,

I have reviewed the Preliminary Site Plan dated December 1, 2025, for the proposed addition of covered parking with solar panel canopies located in the parking areas south and west of the Community Life Center (CLC) building.

Existing Conditions

The project area is currently developed and utilized for parking. Existing surface coverage includes:

- Asphalt paving
- Concrete curb
- Landscaped and depressed medians
- Pavedrain® permeable articulated concrete block pavement (portion of southern parking lot)

Several drainage studies have previously evaluated this area:

1. *Master Plan Final Drainage Report – Franciscan Renewal Center*
 - Prepared by Coe & Van Loo Consultants, Inc. (2015)
2. *New Church Final Drainage Report – Franciscan Renewal Center*
 - Prepared by Coe & Van Loo Consultants, Inc. (2015)

These reports evaluated drainage for the overall campus and the Our Lady of the Angels Church site immediately east of the project area. They document the campus-wide detention and retention system constructed as part of those improvements.

Approximately 3 acre-feet of detention storage was constructed on campus to ensure post-development stormwater flows do not exceed historic conditions. As a result of these improvements, future development within the campus is only required to provide detention/retention for water quality purposes, not for peak flow attenuation.

Drainage for the CLC improvements was further evaluated in:

- *Franciscan Renewal Center Community Life Center Phase 1 Hydrology Study*
Prepared by Holistic Engineering and Land Management (HELM), 2017.



Existing Drainage Patterns

Runoff within the project area flows generally to the south and east. Depressed landscape medians provide shallow percolation areas for minor runoff volumes.

Excess runoff from the parking areas and the CLC building is directed to an existing water quality retention system located in the central portion of the southern CLC parking lot. This system consists of over 30,000 square feet of Pavedrain® permeable articulated concrete block and underground storage system

When the water quality system capacity is exceeded, runoff overtops and discharges into the onsite storm drain system constructed with the Our Lady of the Angels Church improvements. Excess flows are conveyed to the existing retention basin located east of the church, where stormwater percolates through an onsite drywell system.

Proposed Improvements

The proposed solar canopy structures will cover existing parking areas. The installation of these canopies will **not increase site imperviousness**, as the underlying parking surfaces remain unchanged.

Rainfall intercepted by the canopies will discharge onto the same paved and landscaped areas where rainfall currently lands. From there, runoff will continue to flow into the existing water quality retention system in the same manner as under existing conditions.

Conclusion

Based on this review, the proposed solar canopy improvements:

- Will not increase impervious area
- Will not significantly alter onsite drainage patterns
- Will not increase stormwater runoff volumes
- Will not create adverse drainage impacts to adjacent properties

Rainfall within the project area will continue to accumulate and discharge to the same locations and substantially the same volumes as under existing conditions.

Please let me know if you have any questions or would like to discuss this further.

Thank you,



David M West, PE, CFM
Project Manager

ATWELL, LLC

AZ: Phoenix



September 29, 2015
Revised November 20, 2015

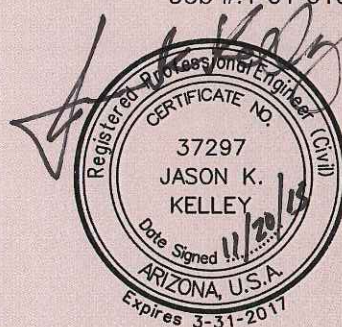
NEW CHURCH FRANCISCAN RENEWAL CENTER

Paradise Valley & Maricopa County, Arizona

Prepared for:
Franciscan Renewal Center
5802 East Lincoln Drive
Scottsdale, AZ 85253
480.948.7460

Prepared by:
Coe & Van Loo Consultants, Inc.
4550 N 12th Street
Phoenix, AZ 85014
Contact: Name
602.264.6831

Job #: 1-01-0199206



FINAL DRAINAGE REPORT

**Final Drainage Report
For
New Church Franciscan Renewal Center**

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	2
1.1. Scope.....	2
1.2. Site Location	2
1.3. Proposed Development	2
1.4. Regulatory Jurisdiction	2
2.0 EXISTING CONDITIONS.....	3
3.0 MANAGEMENT OF OFF-SITE RUNOFF.....	3
4.0 MANAGEMENT OF ON-SITE RUNOFF	3
5.0 FLOOD ZONE INFORMATION.....	5
6.0 SUMMARY AND CONCLUSIONS	5
REFERENCES	6

Figures

- Figure 1 Location Map
- Figure 2 Flood Insurance Rate Map (FIRM)

Appendices

- Appendix A NOAA Atlas 14 Data
- Appendix B Rational Method Calculations
- Appendix C Grate, Catch Basin & Storm Drain Calculations
- Appendix D Retention Basin, Rip-rap, Scupper and Drywell Calculations
- Appendix E Excerpts from the Master Drainage Report (Detention Basins) for the Franciscan Renewal Center

Plate

- Plate 1 Drainage Map



1.0 INTRODUCTION

1.1. Scope

Coe & Van Loo, Consultants, Inc. (CVL) has been contracted by Franciscan Renewal Center to provide engineering services in support of the proposed new church (the site). The purpose of this report is to provide hydrologic and drainage design information for the proposed improvements.

1.2. Site Location

The site is located within a portion of the Town of Paradise Valley jurisdiction and a portion of Maricopa County jurisdiction, Arizona. The Center is bounded on the north by East Cactus Wren Road and private land owners, on the south by East Lincoln Drive, on the west by private land owners, and on the east by private land owners (see Figure 1). In addition, the site is located in the southeast quarter of the northwest quarter of Section 9, Township 2 North, Range 4 East of the Gila and Salt River Meridian. The new church is located approximately in the south-central portion of the Center property.

1.3. Proposed Development

The new church will be constructed in coordination with the other phases of the site, specifically the permanent Offsite Detention Basins. The first phase consisted of the construction of the Assisi Lodging Building that was approved and completed in March 2015. The second phase includes the construction of the permanent detention basins. The New Church phase includes the construction of new buildings, access roads, and parking areas throughout the site.

1.4. Regulatory Jurisdiction

The Drainage Report has been prepared and the site will be designed in accordance with the current versions of the Maricopa County Drainage Policies and Standards (Reference 3), Drainage Design Manuals for Maricopa County, Volume 1 – Hydrology (Reference 1) and Volume 2 – Hydraulics (Reference 2) and Section 1205 of the Maricopa County Zoning Ordinance.

In addition and based on a meeting with the Maricopa County Building Department that took place on January 8, 2013, it was agreed to:

- Design the site on pre-developed versus post-developed flow conditions by reducing the impact of the offsite flow and detaining it upstream at the north edge of the site and therefore reducing the post developed peak flows downstream.
- It was also agreed that first flush would be addressed with each phase of development.

2.0 EXISTING CONDITIONS

The site is a church campus, which slopes generally southeasterly. The existing on-site runoff that emerges from the church facilities and open areas flows in a southeasterly direction to the east property line near the south end of the site. The on-site runoff is not retained. The offsite runoff flows proceed through the site as sheetflow and not through any conveyance systems. All flows discharge towards the adjacent private properties to the east.

3.0 MANAGEMENT OF OFF-SITE RUNOFF

The off-site runoff impacting the site is from the mountains located on the north side of the site. The off-site area is covered with open space, residential houses and local streets. The off-site watershed areas were delineated using the 2 foot contours obtained from FCDMC. The total watershed area is less than 160 acres, hence the Maricopa County's Rational Method along with NOAA Atlas 14 precipitation values were used to determine the flows (see Appendix A). The summary of offsite flows entering the property and mitigation via offsite detention basins is shown in Appendix E.

4.0 MANAGEMENT OF ON-SITE RUNOFF

All retained water in Offsite Basin R3 will be discharged within 36 hours through a 12" diameter bleed off pipe with a 24"x24" bubble-up structure on the downstream end as shown in Plate 1 – Drainage Map. Offsite Basin R4 retains one foot of water and will not require bleed off pipes or Drywells. Both of these basins protect the new church site from 100-year offsite flows.

Onsite stormwater generated south of Offsite Basin R3 and east of Offsite Basin R4 flows towards the proposed west parking lot for the new church. These flows are calculated anticipating future build-out of parking areas west of the church as shown in Plate 1 – Drainage Map. Portions of the total area affecting the west side of the church either drains into Offsite Basin R4 or into the low area near the south property line at Lincoln Drive. Additionally, portions of the total area southeast of Offsite Basin R4 are not anticipated for paving in the future. The C values for these areas are shown in the table in Appendix B and on Plate 1.

Collection of onsite stormwater (defined in this report as the water generated from the areas west of the church to the property line and the church site itself) will be accomplished via a grate in the west parking lot, a catch basin south of the church, area drains along the east side of the church and storm drain. Grate-inlet (GR-1) and catch basin (CB-1) calculations including clogging factors were performed adjacent to the west side of the new church to determine how much flow bypasses the parking lot grate (located in an inverted crown). Bypass flow is intercepted from the parking lot by a catch basin located at the south side of the new church. The storm drain will outfall into Onsite Basin R-C east of the church (see Appendix C for inlet capacity and storm drain calculations and Plate 1). Flow from Subbasin A and B will drain to GR-1. Flows from Subbasin C will drain into Basin R-A, overflow from R-A and bypass flows from GR-1 will drain to CB-1 (see Appendix D for Retention Basin calculations (pre versus post). Flows from Subbasin D will drain to R-B and R-C. Overtopping flows from R-B drain to R-C. Flows generated from the church building itself (2 cfs total) are intercepted by area drains located in landscaped areas around the church and connected by laterals to the proposed storm drain running west to east along the south side of the church building and into Basin R-C. Retention Basins R-A, R-B and R-C drain in 36 hrs via drywells (see Appendix D).

5.0 FLOOD ZONE INFORMATION

The Maricopa County, Arizona and Incorporated Areas, Flood Insurance Rate Map (FIRM), Community-Panel Number 04013C1765L, Map Revised October 16, 2013 (Reference 5), indicates the subject site falls within Zone X (see Figure 2).

Zone X within the project area is defined as "Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood". Therefore, coordination with FEMA is not required.

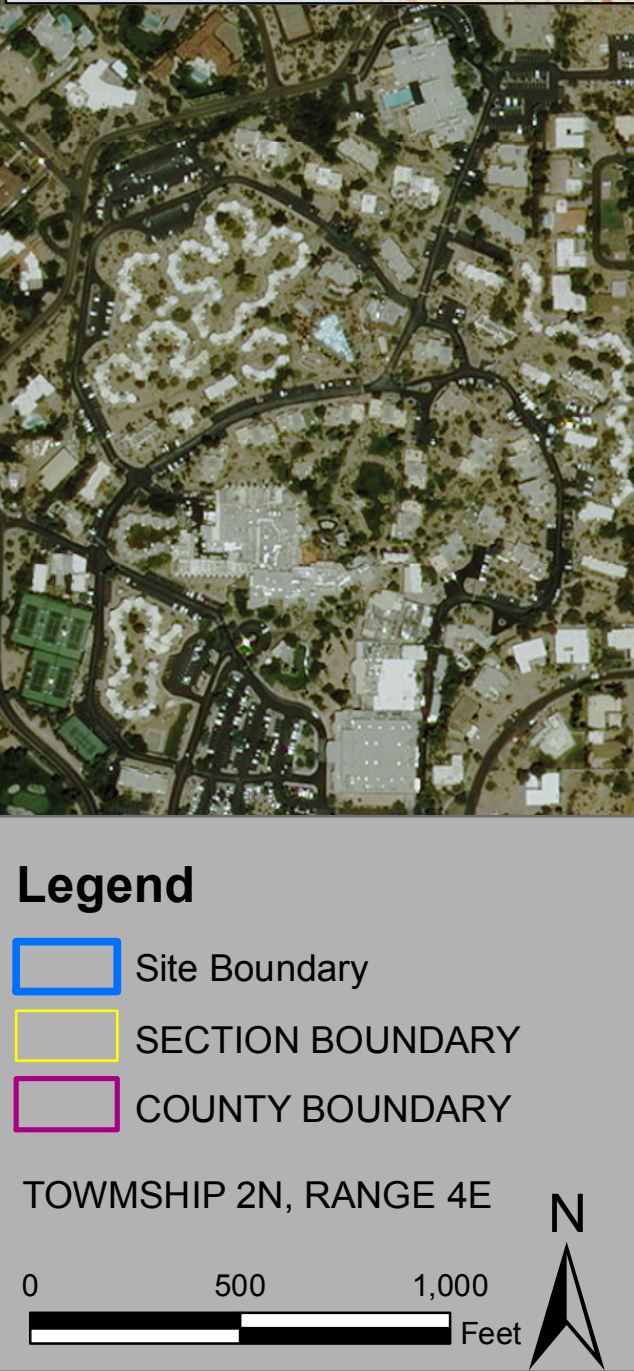
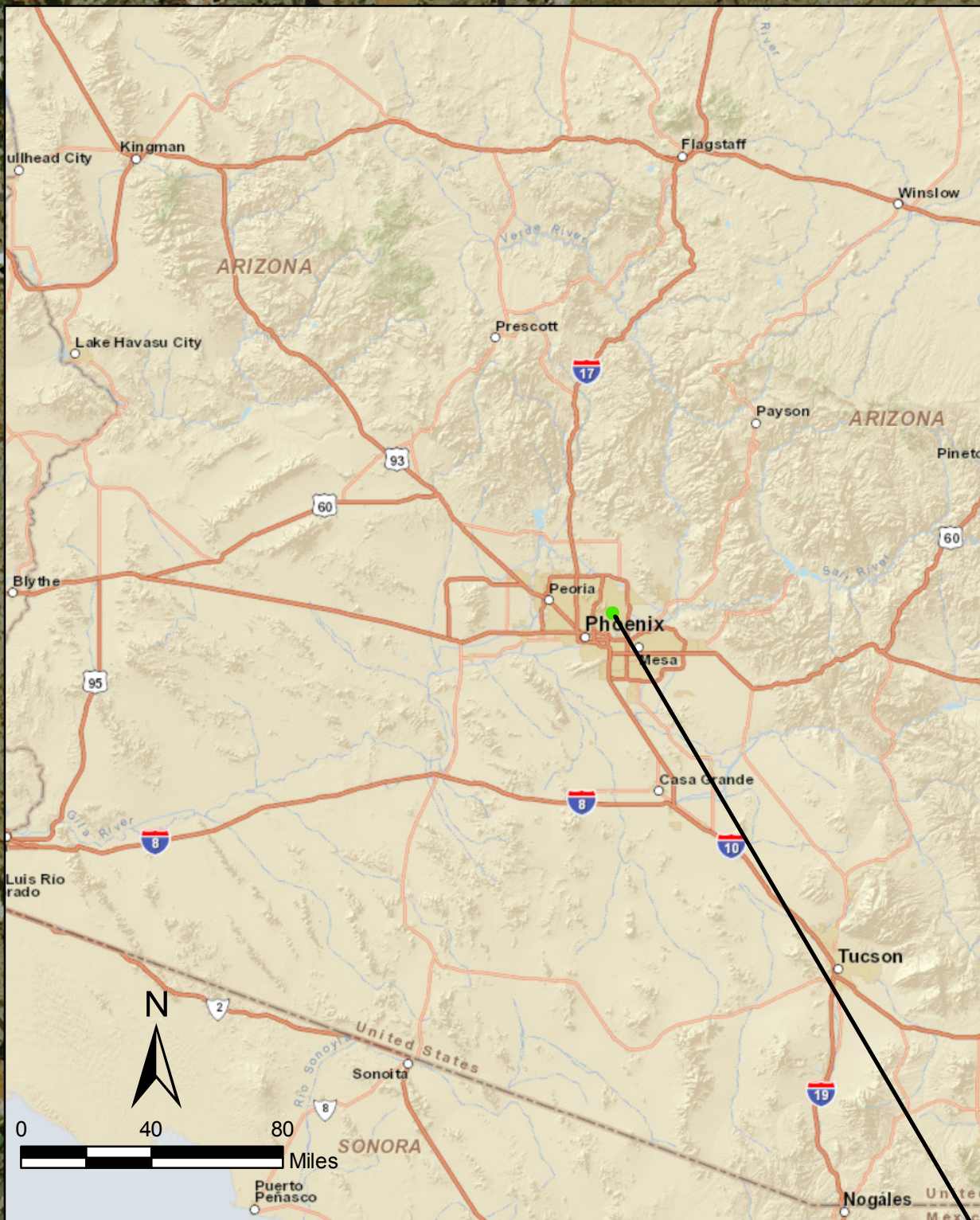
6.0 SUMMARY AND CONCLUSIONS

1. On-site storm water runoff affecting the new church from Subbasins A and B are collected in Retention Basin R-A via three scuppers (SC-1, SC-2, SC-3) and by a grate in the west parking lot.
2. A catch basin inlet (CB-1) intercepts bypass flow from Retention Basin R-A and GR-1.
3. Flow from the church building (D-1) are captured by area drains in the landscape areas around the church and routed to the stormdrain then to Retention Basin R-C.
4. Flows from Subbasin D (D2 and D3) sheet flow through the parking lot and drain into retention basins R-B and R-C via scuppers.
5. The proposed 100-year peak flow from onsite and offsite leaving the site (includes future phases) is equal or less than the current 100-year peak discharge (see Appendix E).
6. Offsite flows are detained in Offsite Basins R3 and R4. Therefore offsite flows coming from outside the Franciscan property will not affect the new church site.
7. A bubble-up structure drains Offsite Basin R3 at a rate that does not increase peak onsite flows affecting the new church site.

REFERENCES

1. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology*, February 2011.
2. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics*, January 1996 (Effective).
3. Flood Control District of Maricopa County (FCDMC), *Drainage Policies and Standards for Maricopa County, Arizona*, January 2007 (Effective).
4. Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map (FIRM), Maricopa County, Arizona, and Incorporated Areas, Community Panel Number 04013C1765L*, Map Revised October 16, 2013.
5. Coe & Van Loo Consultants Inc., *Master Drainage Report (Retention Basins) for Franciscan Renewal Center*, September 2015.

FIGURES



LOCATION MAP

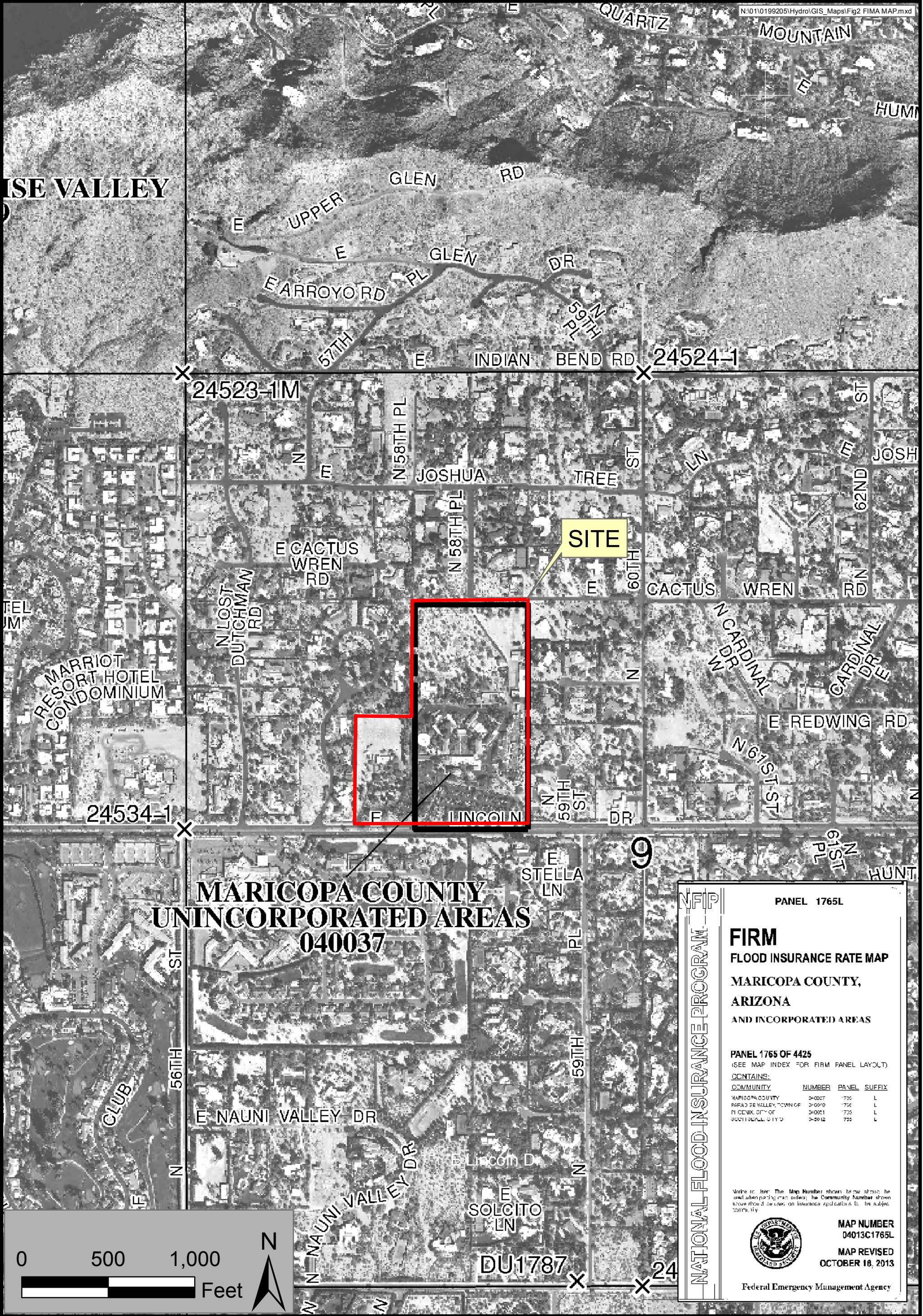
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

FRANCISCAN RENEWAL CENTER

COE & VAN LOO
PLANNING · ENGINEERING · LANDSCAPE ARCHITECTURE

JOB NO.
01-0199205

FIGURE 1
05/20/2015



PANEL 1765L


FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY,
ARIZONA
AND INCORPORATED AREAS

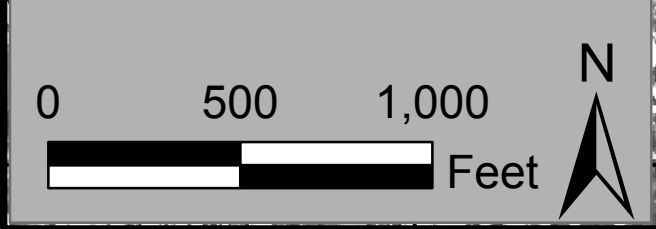
PANEL 1765 OF 4425
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	736	L
PARADISE VALLEY TOWN OF	040019	736	L
THE CITY OF PHOENIX	040051	735	L
SUNNYSIDE CITY OF	040012	735	L

Users to Use: The Map Number shown below shall be used when filing for a policy. The Community Number shown above should be used on insurance applications to be subject community.


MAP NUMBER
 04013C1765L
MAP REVISED
 OCTOBER 18, 2013
 Federal Emergency Management Agency



FLOOD INSURANCE RATE MAP

FRANCISCAN RENEWAL CENTER

JOB NO.
01-0199205

4550 NORTH 12TH STREET
 PHOENIX, ARIZONA 85014
 TELEPHONE (602) 264-6831

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FIGURE 2
05/20/2015

APPENDICES

APPENDIX A

NOAA Atlas 14 Data



NOAA Atlas 14, Volume 1, Version 5
Location name: Paradise Valley, Arizona, US*
Latitude: 33.5382°, Longitude: -111.9562°
Elevation: 1440 ft*
 * source: Google Maps



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](#)

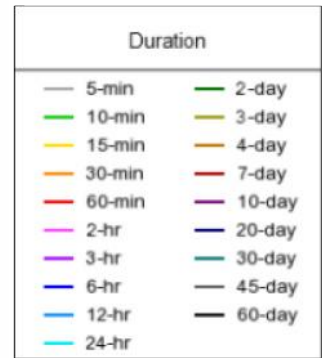
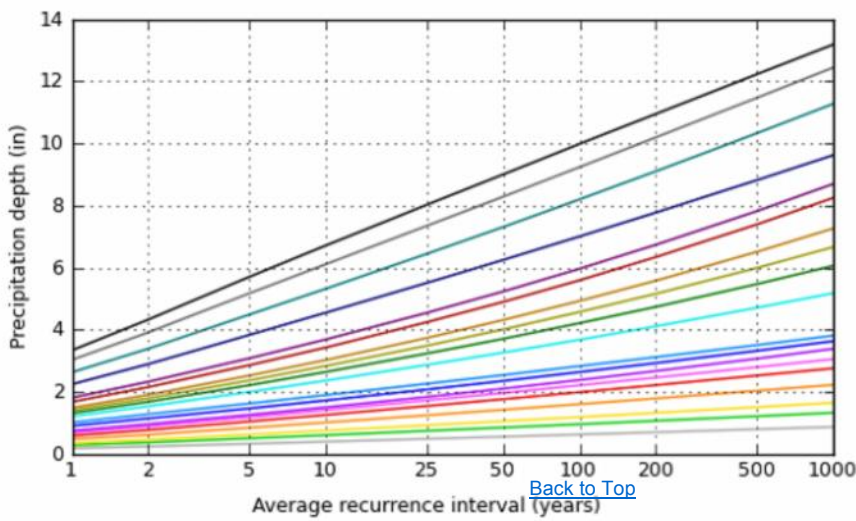
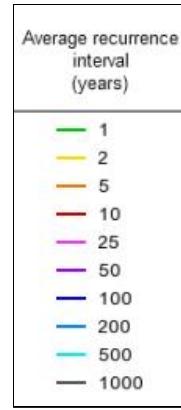
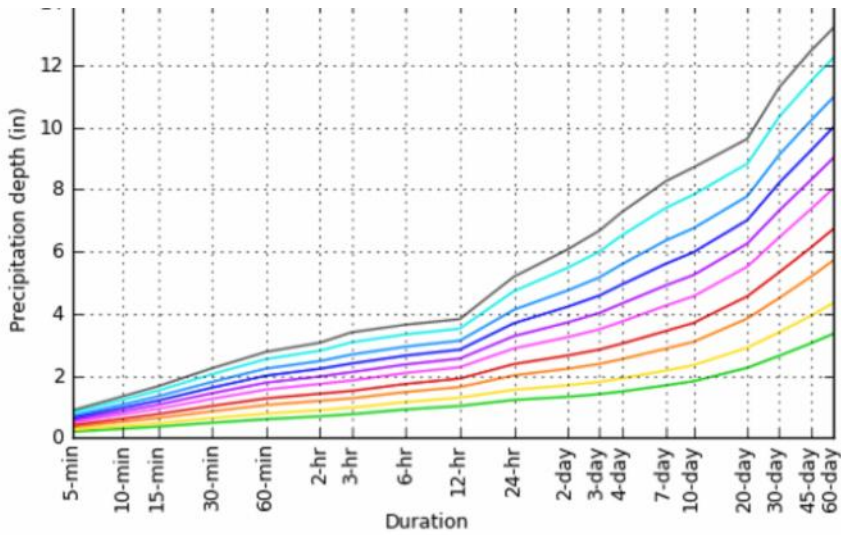
PF tabular

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	0.189 (0.158-0.231)	0.247 (0.208-0.302)	0.335 (0.279-0.408)	0.403 (0.334-0.488)	0.494 (0.402-0.596)	0.564 (0.454-0.676)	0.635 (0.502-0.760)	0.707 (0.550-0.845)	0.805 (0.609-0.963)	0.879 (0.652-1.05)
10-min	0.287 (0.240-0.352)	0.377 (0.316-0.460)	0.511 (0.425-0.621)	0.613 (0.508-0.743)	0.752 (0.612-0.907)	0.859 (0.690-1.03)	0.967 (0.764-1.16)	1.08 (0.837-1.29)	1.23 (0.927-1.47)	1.34 (0.992-1.60)
15-min	0.357 (0.298-0.436)	0.467 (0.392-0.570)	0.633 (0.527-0.770)	0.761 (0.629-0.921)	0.932 (0.759-1.12)	1.07 (0.856-1.28)	1.20 (0.947-1.43)	1.34 (1.04-1.60)	1.52 (1.15-1.82)	1.66 (1.23-1.99)
30-min	0.481 (0.401-0.587)	0.628 (0.528-0.768)	0.852 (0.710-1.04)	1.02 (0.847-1.24)	1.26 (1.02-1.51)	1.43 (1.15-1.72)	1.61 (1.28-1.93)	1.80 (1.40-2.15)	2.05 (1.55-2.45)	2.23 (1.66-2.68)
60-min	0.595 (0.497-0.727)	0.778 (0.654-0.950)	1.06 (0.878-1.28)	1.27 (1.05-1.54)	1.55 (1.27-1.87)	1.77 (1.43-2.13)	2.00 (1.58-2.39)	2.23 (1.73-2.66)	2.53 (1.92-3.03)	2.76 (2.05-3.31)
2-hr	0.689 (0.584-0.824)	0.892 (0.757-1.07)	1.19 (1.01-1.42)	1.42 (1.19-1.69)	1.74 (1.43-2.05)	1.97 (1.61-2.33)	2.22 (1.78-2.61)	2.47 (1.95-2.90)	2.80 (2.16-3.30)	3.06 (2.31-3.63)
3-hr	0.757 (0.639-0.917)	0.970 (0.823-1.18)	1.27 (1.07-1.54)	1.51 (1.26-1.82)	1.85 (1.52-2.20)	2.11 (1.72-2.51)	2.39 (1.91-2.84)	2.68 (2.10-3.18)	3.08 (2.34-3.66)	3.40 (2.53-4.05)
6-hr	0.912 (0.785-1.08)	1.15 (0.997-1.37)	1.48 (1.27-1.74)	1.73 (1.48-2.03)	2.08 (1.75-2.43)	2.36 (1.95-2.74)	2.64 (2.16-3.07)	2.93 (2.35-3.42)	3.33 (2.60-3.88)	3.64 (2.78-4.25)
12-hr	1.02 (0.890-1.20)	1.29 (1.12-1.51)	1.64 (1.41-1.90)	1.91 (1.64-2.21)	2.27 (1.93-2.62)	2.55 (2.14-2.94)	2.84 (2.35-3.27)	3.13 (2.56-3.61)	3.52 (2.80-4.08)	3.82 (2.99-4.46)
24-hr	1.22 (1.06-1.43)	1.55 (1.35-1.82)	2.01 (1.74-2.37)	2.37 (2.05-2.79)	2.88 (2.47-3.38)	3.27 (2.79-3.84)	3.69 (3.13-4.33)	4.12 (3.46-4.84)	4.71 (3.91-5.53)	5.19 (4.26-6.11)
2-day	1.32 (1.15-1.54)	1.69 (1.47-1.97)	2.22 (1.93-2.59)	2.65 (2.29-3.08)	3.24 (2.79-3.77)	3.72 (3.18-4.31)	4.22 (3.58-4.90)	4.74 (3.99-5.51)	5.48 (4.56-6.38)	6.07 (5.00-7.08)
3-day	1.41 (1.23-1.64)	1.80 (1.57-2.09)	2.38 (2.06-2.76)	2.84 (2.46-3.30)	3.49 (3.01-4.05)	4.02 (3.43-4.66)	4.58 (3.88-5.31)	5.17 (4.35-6.00)	6.00 (4.98-6.96)	6.67 (5.49-7.76)
4-day	1.49 (1.30-1.73)	1.91 (1.67-2.22)	2.53 (2.20-2.93)	3.03 (2.62-3.51)	3.74 (3.22-4.34)	4.32 (3.69-5.00)	4.93 (4.19-5.71)	5.59 (4.70-6.49)	6.51 (5.41-7.54)	7.27 (5.98-8.44)
7-day	1.69 (1.46-1.97)	2.16 (1.87-2.52)	2.87 (2.47-3.34)	3.44 (2.96-4.00)	4.25 (3.63-4.94)	4.90 (4.17-5.69)	5.60 (4.73-6.50)	6.35 (5.31-7.39)	7.40 (6.11-8.61)	8.25 (6.75-9.61)
10-day	1.82 (1.58-2.11)	2.33 (2.02-2.71)	3.09 (2.67-3.58)	3.70 (3.19-4.28)	4.55 (3.90-5.25)	5.24 (4.47-6.03)	5.97 (5.06-6.89)	6.74 (5.67-7.78)	7.83 (6.50-9.03)	8.70 (7.15-10.1)
20-day	2.25 (1.97-2.59)	2.90 (2.53-3.34)	3.84 (3.35-4.42)	4.55 (3.95-5.23)	5.52 (4.77-6.33)	6.25 (5.39-7.17)	7.01 (6.01-8.06)	7.78 (6.63-8.95)	8.82 (7.45-10.2)	9.63 (8.07-11.1)
30-day	2.64 (2.29-3.03)	3.40 (2.96-3.91)	4.49 (3.90-5.15)	5.33 (4.62-6.11)	6.45 (5.56-7.39)	7.31 (6.28-8.37)	8.20 (7.02-9.38)	9.11 (7.75-10.4)	10.3 (8.73-11.8)	11.3 (9.45-12.9)
45-day	3.04 (2.66-3.48)	3.92 (3.44-4.49)	5.18 (4.53-5.92)	6.11 (5.34-6.99)	7.35 (6.39-8.40)	8.29 (7.18-9.47)	9.24 (7.96-10.6)	10.2 (8.75-11.7)	11.5 (9.76-13.2)	12.4 (10.5-14.3)
60-day	3.35 (2.95-3.81)	4.33 (3.81-4.93)	5.71 (5.02-6.49)	6.72 (5.89-7.64)	8.03 (7.02-9.12)	9.00 (7.84-10.2)	9.99 (8.65-11.4)	11.0 (9.46-12.5)	12.2 (10.5-14.0)	13.2 (11.2-15.1)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical



[Back to Top](#)

Maps & aeriels

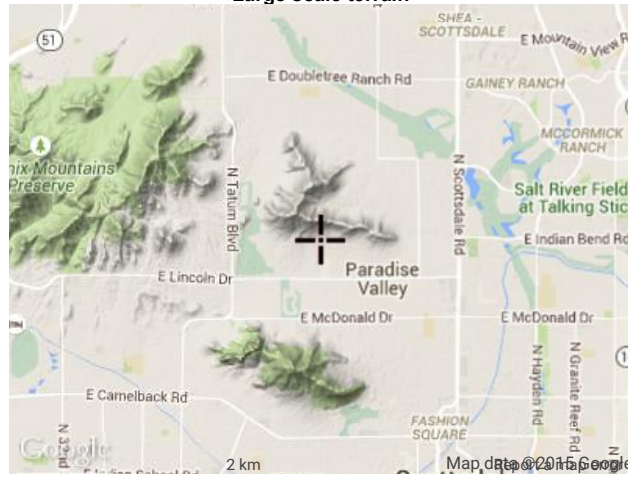
NOAA Atlas 14, Volume 1, Version 5

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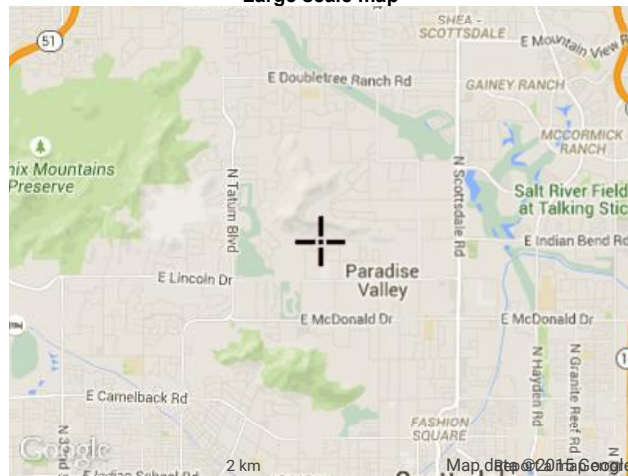
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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1325 East West Highway
Silver Spring, MD 20910

APPENDIX B

Rational Method Calculations

SUMMARY OF RATIONAL METHOD PEAK FLOW HYDROLOGY
Franciscan Renewal Center - New Church

CP Concentration Point	Sub- basin Area (ac)	Water Course Length ft	High Elevation ft	Low Elevation ft	C Weighted Runoff Coefficient			i Intensity (in/hr)			Tc Time of Concentration (min)			Q Peak Flow Rate (cfs)		
					Return Period			Return Period			Return Period			Return Period		
					10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year
A (to GR-1)	2.28	461	1371	1367	0.74	0.89	0.92	2.9	4.2	5	17.4	15	14.1	5	9	10
B+C (to SC-1,2,3 & CB-1)	1.17	240	1368	1367	0.52	0.62	0.65	3	4.5	5.2	15.9	13.6	12.8	2	3	4
D-1 (to area drains)	0.39	140	1367.6	1367	0.95	0.95	0.95	3.4	5.1	6	11.8	10.2	9.6	1	2	2
D-2 (to SC-4)	1.05	370	1367.2	1364.8	0.95	0.95	0.95	2.9	4.2	5	17.5	15.1	14.3	3	4	5
D-3 (to SC-5)	0.77	196	1366	1364.6	0.95	0.95	0.95	3.5	5.2	6	11.7	10	9.4	3	4	4

Reference: Drainage Design Manual for Maricopa County, Hydrology, February 10, 2011

Notes:

$T_c = \text{Time of concentration} = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$ (Equation 3.2, Papadakis and Kazan equation, 1987)

L = Length of the longest flow path, miles.

S = Watercourse slope, feet/mile.

$K_b = \text{Watershed resistance coefficient} = m \log_{10}A + b$, where A= drainage area in acres, m and b values from (Table 3.1).

Q = Peak discharge = C*I*A, cfs. (Equation 3.1)

i = Average rainfall intensity, in in/hr, lasting for a T_c . Determined using the I-D-F curve from the NOAA Atlas 14 PRECIPITATION FREQUENCY ESTIMATES

C = Runoff coefficient (see Appendix D).

APPENDIX C

Grate, Catch Basin & Storm Drain Calculations

Worksheet for Grate GR-1

Project Description

Solve For Efficiency

Input Data

Roughness Coefficient	0.016	
Slope	0.25	%
Left Side Slope	2.00	%
Right Side Slope	2.00	%
Bottom Width	2.0	ft
Discharge	10.0	ft ³ /s
Grate Width	2.0	ft
Grate Length	9.0	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50	%

Options

Grate Flow Option Exclude None

Results

Efficiency	70.69	%
Intercepted Flow	7.1	ft ³ /s
Bypass Flow	2.9	ft ³ /s
Flow Area	6.7	ft ²
Wetted Perimeter	36.7	ft
Top Width	36.6	ft
Velocity	1.5	ft/s
Splash Over Velocity	12.3	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.67	
Grate Flow Ratio	0.10	
Active Grate Length	4.5	ft
Critical Depth	0.28	ft
Critical Slope	0.0070	ft/ft
Froude Number	0.62	
Flow Type	Subcritical	
Specific Energy	0.38	ft
Velocity Head	0.03	ft
Depth	0.35	ft

Cross Section for Grate GR-1

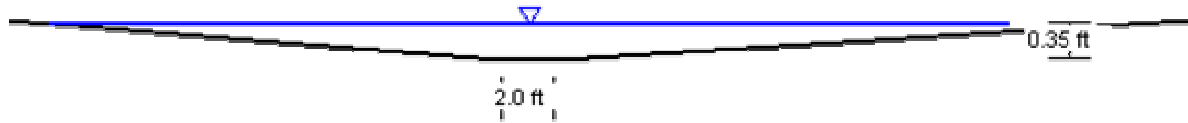
Project Description

Solve For Efficiency

Input Data

Roughness Coefficient		0.016
Slope		0.25 %
Left Side Slope		2.00 %
Right Side Slope		2.00 %
Bottom Width		2.0 ft
Discharge		10.0 ft ³ /s
Efficiency		70.69 %
Grate Width		2.0 ft
Grate Length		9.0 ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging		50 %

Cross Section Image



V: 4
H: 1

Worksheet for Catchbasin CB-1

Project Description

Solve For Efficiency

Input Data

Discharge	6.9	ft ³ /s
Slope	0.25	%
Gutter Width	1.42	ft
Gutter Cross Slope	0.059	ft/ft
Road Cross Slope	0.020	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	12.00	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	92.43	%
Intercepted Flow	6.4	ft ³ /s
Bypass Flow	0.5	ft ³ /s
Spread	19.1	ft
Depth	0.44	ft
Flow Area	3.7	ft ²
Gutter Depression	0.055	ft
Total Depression	0.22	ft
Velocity	1.9	ft/s
Equivalent Cross Slope	0.05207	ft/ft
Length Factor	0.76	
Total Interception Length	15.76	ft

Messages

Notes

Size on plans accounts for 1.25 clogging factor per County Requirements.

Cross Section for Catchbasin CB-1

Project Description

Solve For Efficiency

Input Data

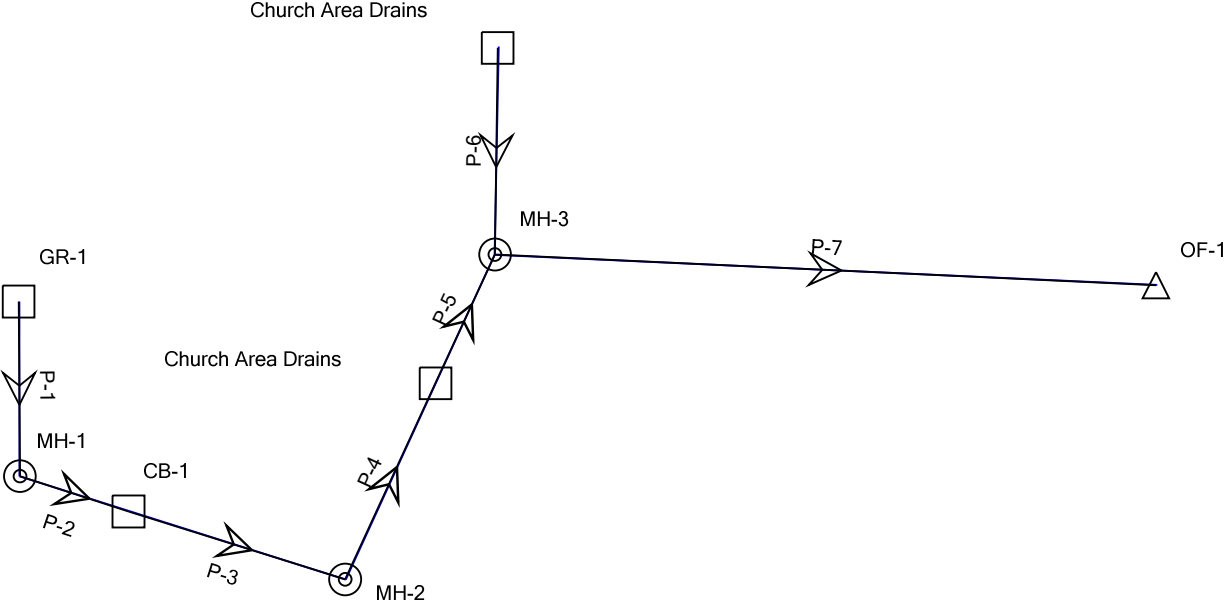
Discharge	6.9	ft ³ /s
Slope	0.25	%
Gutter Width	1.42	ft
Gutter Cross Slope	0.059	ft/ft
Road Cross Slope	0.020	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	1.42	ft
Efficiency	92.43	%
Curb Opening Length	12.00	ft

Cross Section Image



V: 4
H: 1

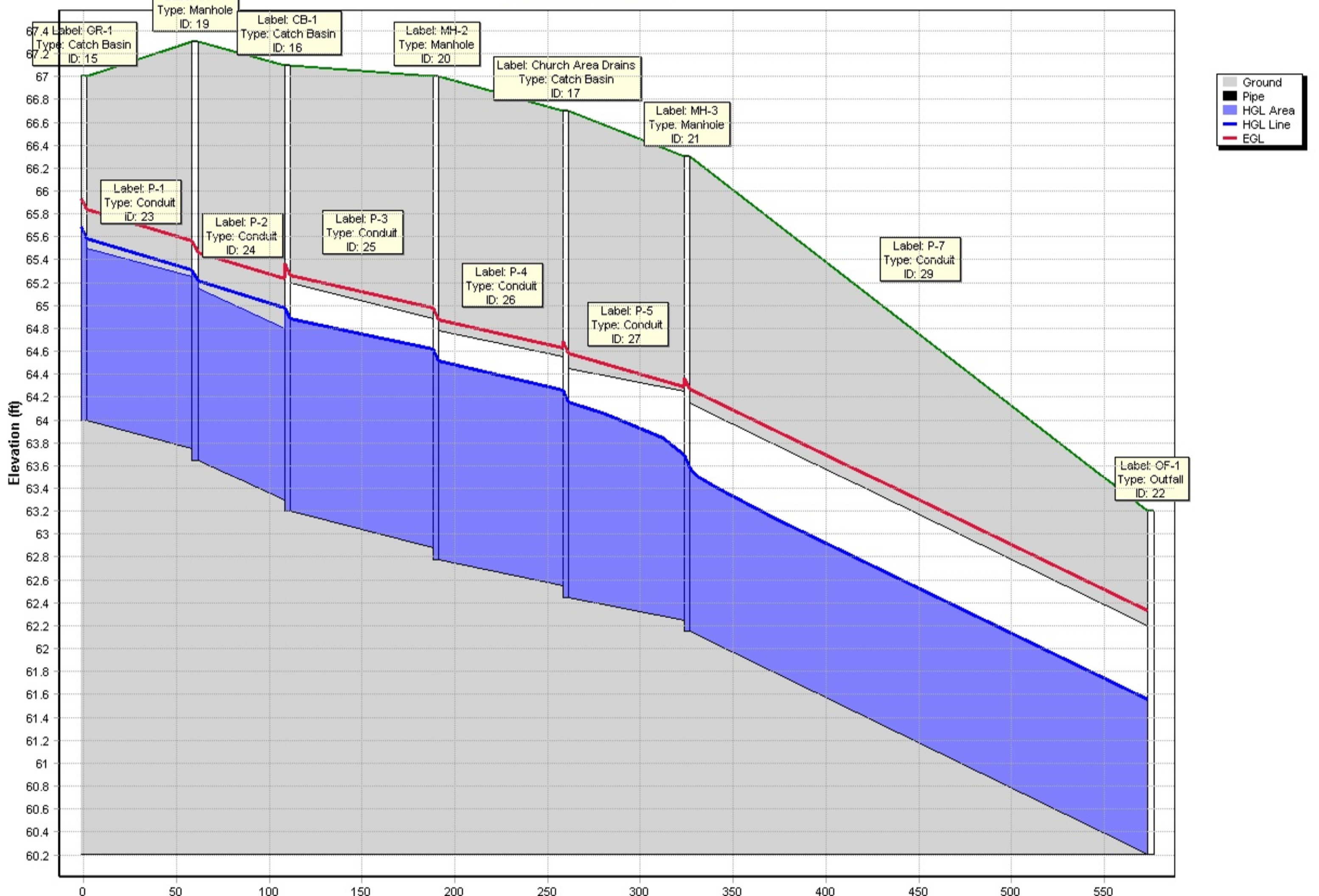
Print Preview

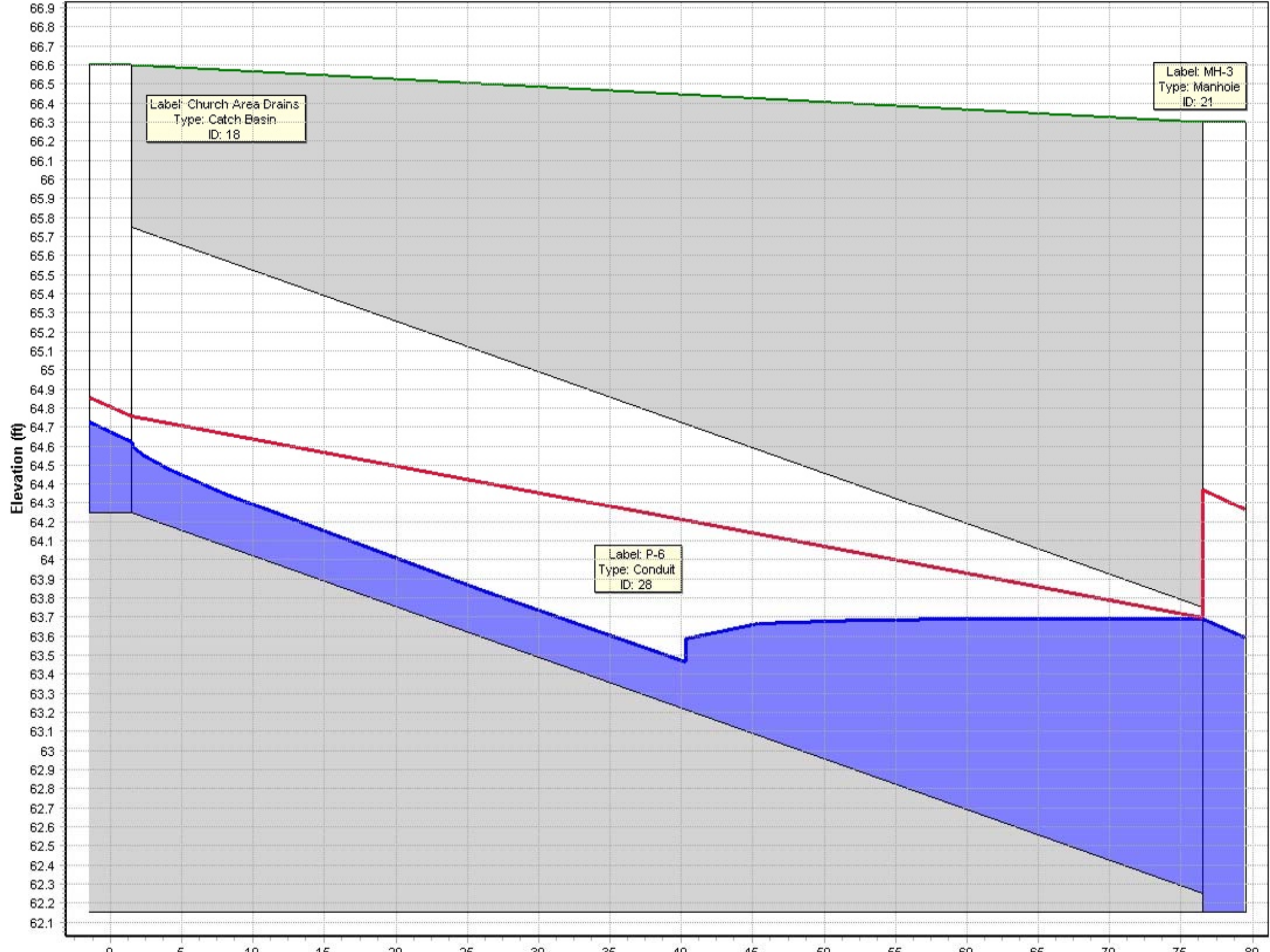


FlexTable: Conduit Table (New Church FRC.stc)

Current Time: 0.000 min

Label	Start Node	Stop Node	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Length (ft)	Slope (Calculated) (ft/ft)	Conduit Shape	Material	Manning's n	Diam eter (in)	Flow (ft ³ /s)	Capacity (Full Flow) (ft ³ /s)	Velocity (Average) (ft/s)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)
P-1	GR-1	MH-1	64.00	63.75	60.0	0.004	Circular Pipe	Concrete	0.013	18.0	7.10	6.78	4.02	67.00	67.30	65.59	65.31	1.50	2.05
P-2	MH-1	CB-1	63.65	63.30	50.0	0.007	Circular Pipe	Concrete	0.013	18.0	7.10	8.79	4.02	67.30	67.10	65.21	64.98	2.15	2.30
P-3	CB-1	MH-2	63.20	62.88	80.0	0.004	Circular Pipe	Concrete	0.013	24.0	14.00	14.31	5.19	67.10	67.00	64.88	64.62	1.90	2.12
P-4	MH-2	Church Area Drains	62.78	62.55	70.0	0.003	Circular Pipe	Concrete	0.013	24.0	14.00	12.97	4.46	67.00	66.70	64.52	64.26	2.22	2.15
P-5	Church Area Drains	MH-3	62.45	62.25	65.0	0.003	Circular Pipe	Concrete	0.013	24.0	15.00	12.55	4.77	66.70	66.30	64.16	63.69	2.25	2.05
P-6	Church Area Drains	MH-3	64.25	62.25	78.0	0.026	Circular Pipe	Concrete	0.013	18.0	1.00	16.82	5.22	66.60	66.30	64.62	63.69	0.85	2.55
P-7	MH-3	OF-1	62.15	60.20	250.0	0.008	Circular Pipe	Concrete	0.013	24.0	16.00	19.98	7.07	66.30	63.20	63.59	61.55	2.15	1.00





- Ground
- Pipe
- HGL Area
- HGL Line
- EGL

APPENDIX D

Retention Basin, Rip-rap, Scupper and Drywell Calculations

Franciscan Renewal Center - New Church
Post On-site Runoff Coefficient Factor Calculation

	Subbasin ¹	A ³	B	C	D
	TOT AREA (ac.)	2.28	0.66	0.51	2.21
C value ²	0.95	2.12	-	0.51	2.21
	0.65	0.15	0.66	-	-
	Weighted C	0.92	0.65	0.95	0.95

Notes:

1. See Plate 1 - Drainage Map
2. From Table 3.2, Hydrology Manual, FCDMC.
C = 0.95 - average 100-yr value for 'Pavement and Rooftops' (P)
C = 0.65 - average 100-yr value for 'Low Density Residential' (LDR)
3. A portion of Subbasin A has a C value of 0.65
4. Weighted C (for post retention)

Pre On-site Runoff Coefficient Factor Calculation

	Subbasin ¹	A	B	C	D
	TOT AREA (ac.)	2.28	0.66	0.51	2.21
C value ²	0.95	-	-	-	-
	0.65	2.28	0.66	0.51	2.21
	Weighted C	0.65	0.65	0.65	0.65

Notes:

1. See Plate 1 - Drainage Map
2. From Table 3.2, Hydrology Manual, FCDMC.
C = 0.65 - average 100-yr value for 'Low Density Residential'

Summary of Onsite Retention Basins
Franciscan Renewal Center - New Church

Retention ⁽¹⁾ Sub-Watershed ID	Drainage Area A (acres)	Runoff ⁽²⁾ Coefficient C	Precipitation ⁽³⁾ P (inches)	Volume ⁽⁴⁾ Required V _{req} (acre-ft)	Volume Provided ⁽⁵⁾				
					Retention Basin ⁽⁶⁾ ID	Depth D (ft)	Area A _{BOTT} (acres)	Area A _{TOP} (acres)	Total V _P (acre-ft)
C (pre)	0.51	0.65	2.22	0.061	R-A ⁽⁷⁾	1.0	0.0075	0.0250	0.016
C (post)	0.51	0.95	2.22	0.090					
C (first-flush)	0.51	1.00	0.500	0.021					
Sub-Total				0.028					0.016
A+B+C+D (pre)	5.66	0.65	2.22	0.681	R-B & R-C ⁽⁸⁾	3.0	0.051	0.132	0.276
A+B+C+D (post)	5.66	0.90	2.22	0.937					
A+B+C+D (first-flush)	5.66	1.00	0.500	0.236					
Sub-Total				0.257					0.276
TOTAL				0.285					0.292

Reference: Drainage Policies and Standards for Maricopa County, Arizona, Draft January 2013.
Drainage Design Manual for Maricopa County, Arizona, Hydrology, August, 2013.

Notes:

1. Sub-basin delineations per Drainage Map (Plate 1).
2. 100-year C-Value of 0.65 for pre 'LDR' and 0.945 for post 'P' (per Table 3.2, Hydrology Manual, FCDMC)
3. Estimated 100-year, 2-hour precipitation depth, P= 2.22 inches per NOAA 14 PRECIPITATION FREQUENCY ESTIMATES.
4. $V_{req} = A \times C \times (P/12) =$ volume required for retention in acre-ft.
5. $V_P = D \times (A_{TOP} + A_{BOTT})/2 =$ retention volume provided in acre-ft.
6. Proposed retention basins; retention basin R-B includes sump and basin.
7. Proposed retention basin R-A overflows to Catchbasin CB-1
8. Proposed retention basin R-B overflow/weirflows to R-C.

Franciscan Renewal Center - Proposed Conditions

Scupper Size Verification and Riprap Sizing Calculations - per Maricopa County

Blue = required inputs

(assume b and d until Qc is close to Qk)

ID	Unit Discharge q = Q/W (cfs/ft)	Width (wetted area/flow depth) W (ft)	Drop Slope S ₀ (S _f) (ft/ft)	Known Q Q _k (cfs)	Calculated Q Q _c (cfs)	Manning's 'n' 'n' ()	Flow Area b*d (ft)	Hydraulic Radius R (ft)	Scupper Width	Flow Depth in Scupper	Riprap Size		Riprap Layer Thickness	
									Top Width (of flow) b (ft)	Flow Depth (Manning's) d (ft)	Calculated d ₅₀ (ft)	Provided d ₅₀ (in)	T (in)	
SC-1	0.68	2.0	0.17	1.3	1.3	0.069	0.4	0.19	2.0	0.23	0.33	3.9	6.0	12.0
SC-2	0.67	2.0	0.17	1.3	1.3	0.069	0.5	0.19	2.0	0.23	0.32	3.9	6.0	12.0
SC-3	0.67	2.0	0.17	1.3	1.3	0.069	0.5	0.19	2.0	0.23	0.32	3.9	6.0	12.0
SC-4	1.25	4.0	0.17	5.0	5.0	0.069	1.3	0.28	4.0	0.33	0.45	5.4	6.0	12.0
SC-5	1.00	4.0	0.17	4.0	4.0	0.069	1.1	0.25	4.0	0.29	0.40	4.8	6.0	12.0

Sloped Drop Structure/Rock Chute

(Riprap Sizing, Equation 6.41 and 6.42 from FCDMC Volume II, Hydraulics Manual, 2013, page 6-55)

$$d_{50} = 2.12q^{0.529} S_0^{0.794} \quad 0.02 < S_0 < 0.10 \quad (6.41)$$

$$d_{50} = 0.69q^{0.529} S_0^{0.307} \quad 0.1 \leq S_0 \leq 0.4 \quad (6.42)$$

where:

- d₅₀ = the median diameter (ft),
- q = unit discharge (cfs/ft), (discharge divided by the width where the width is defined as the wetted area divided by the flow depth and the flow depth can be the Manning's equation-based normal depth or the maximum flow depth from HEC-RAS), and
- S₀ = channel bed slope (ft/ft).

It should be noted that these two equations are for loose riprap on the slope of the structure. For downstream of the sloped drop structure, the equation above for Downstream of Grade Control/ Drop Structure should be used. The thickness for the riprap layer on the slope should be at least 2d₅₀. A granular filter should be used beneath the riprap layer. The design for rock chutes and downstream energy dissipators can be found in Lorenz et al. (2000).

Notes:

- Equations include a safety factor of 1.5; Layer thickness (T) = 2*d₅₀.
- Rip-rap layer requires filter fabric.
- 4 cfs from Sub-watersheds B+C divided between three scuppers into R-A

Calculated Q = 1.486/n*A*R^(2/3)S_f^(1/2) (or from HEC-RAS, obtain b and d)
where S_f = S₀; assume rectangular channel

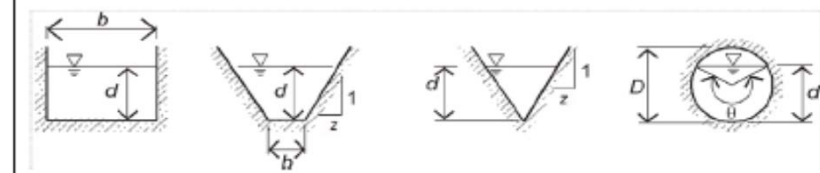
TABLE 6.1
ELEMENTS OF CHANNEL SECTIONS
(1)

Channel Section	Area	Wetted Perimeter	Hydraulic Radius	Top Width
Rectangle	bd	b + 2d	$\frac{bd}{b + 2d}$	b
Trapezoid	b + zd ²	$b + 2d\sqrt{z^2 + 1}$	$\frac{bd + zd^2}{b + 2d\sqrt{z^2 + 1}}$	b + 2zd
Triangle	zd ²	$2d\sqrt{z^2 + 1}$	$\frac{zd}{2\sqrt{z^2 + 1}}$	2zd
Circular < 1/2 full (2)	$\frac{D^2}{8}(\frac{\pi\theta}{180} - \sin\theta)$	$\frac{\pi D\theta}{360}$		D sin θ or $2\sqrt{d(D-d)}$
Circular > 1/2 full (3)	$\frac{D^2}{8}(2\pi - \frac{\pi\theta}{180} + \sin\theta)$	$\frac{\pi D(360 - \theta)}{360}$	$(\frac{45D}{\pi(360 - \theta)})^*$ $(2\pi - \frac{\pi\theta}{180} + \sin\theta)$	D sin θ or $2\sqrt{d(D-d)}$

(1) After USDA Soil Conservation Service ES-33 (NRCS), 1956.

(2) θ = 4 sin⁻¹ √d/D Insert θ in degrees

(3) θ = 4 cos⁻¹ √d/D Insert θ in degrees



Rectangle Trapezoid Triangle Circular

**Franciscan Church
Retention Basin Drywell Calculations**

Retention Basin ID ⁽¹⁾	Volume Required ⁽¹⁾ (acre-ft)	Volume Required ⁽¹⁾ (ft ³)	Flowrate Required to Drain Basin Within 36 Hours ⁽²⁾ (cfs)	Drywell Flowrate Capacity ⁽³⁾ (cfs)	Number of Drywells Required ⁽⁴⁾	Number of Drywells Provided ⁽⁵⁾
R-A	0.016	697	0.01	0.07	1	1
R-B	0.276	12,023	0.09	0.07	2	2
R-C	0.276	12,023	0.09	0.07	2	2
Total					4	4

Notes:

1. Volume Required To be Drained By Drywell.
2. Flowrate Required To Drain Basin Within 36 Hours = (Volume Required To Be Drain By Drywell) / (36 x 3600).
3. Per vicinity percolation testing, percolation rate is 0.34 cfs. Value de-rated by 5 per County requirements for clay soils. Drywell Flowrate will be verified at time of construction and drywells added to satisfy requirements.
4. Total number of drywells required = (Flowrate Required to Drain Basin within 36 Hours) / (Drywell Flowrate Capacity)
5. Initially one drywell will be installed to check the actual flowrate of drywell. Calculations will be revised with the new flowrates and accordingly to the City of Phoenix Standards.
The amount of drywells needed may change due to revised flow rate.

The watermark for drainage solutions.®



October 28, 2015

A.R. Mays Construction
6900 E. Indian School Road, Suite 210
Scottsdale, AZ 85251
ATTN: Joel Canchola

Re:
SWC Lincoln Dr. & 56th Street
Paradise Valley, AZ
Job15#: 10-002
Percolation Test Results for Drywell # 1

Dear Joel Canchola,

Pursuant to your request, we have performed a constant head percolation test on the Drainage System at the above referenced location.

The test on Drywell No. 1 commenced on 10/27/15 at 1:35 PM and was completed at 2:35 PM the same day with a total volume flow of 9,423 GAL. The average percolation rate for the well over the last fifteen minutes of the test is 0.34 cubic feet per second.

If you have any questions or require additional information, please do not hesitate to contact me.

Regards,

A handwritten signature in black ink, appearing to read 'Rob Morales'.

Rob Morales
Sales Engineer
Torrent Resources, Inc.

RM/jb

Torrent Resources Incorporated
1509 East Elwood Street
Phoenix Arizona 85040-1391

phone 602-268-0785
fax 602-268-0820

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AZ Lic. ROC070465 A, ROC047067 B-4; ADWR 363
CA Lic. 528080 A, C-42, HAZ
NV Lic. 0035350 A - NM Lic. 90504 GF04

An evolution of McGuckin Drilling

Percolation Test Results

Project Name:	Client:	A.R. Mays Construction	
Location:	Lincoln & 56th St.	Date:	10/27/2015
City:	Paradise Valley	Project Number:	1510-002
Well Number:	# 1	Supervisor:	WL

Time	Gallons Cumulative Reading	Actual Rate (CFS)
1:35 PM	2170878	
1:40 PM	2171716	0.37
1:45 PM	2172567	0.38
1:50 PM	2173406	0.37
1:55 PM	2174171	0.34
2:00 PM	2174945	0.34
2:05 PM	2175698	0.34
2:10 PM	2176456	0.34
2:15 PM	2177217	0.34
2:20 PM	2177980	0.34
2:25 PM	2178746	0.34
2:30 PM	2179520	0.34
2:35 PM	2180301	0.35

TOTAL GALLONS USED: 9423

APPENDIX E

Excerpts of the Master Drainage Report for the Franciscan Renewal Center

April 2, 2015
2nd Revision: July 13, 2015
3rd Revision: August 18, 2015
4th Revision: September 18, 2015

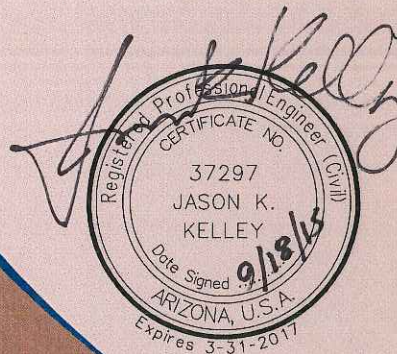
FRANCISCAN RENEWAL CENTER

Paradise Valley & Maricopa County, Arizona

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Prepared by:
Coe & Van Loo Consultants, Inc.
4550 N 12th Street
Phoenix, AZ 85014
602.264.6831

Job #: 1.01.0199206



MASTER DRAINAGE REPORT

**Master Drainage Report
for
Franciscan Renewal Center**

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
1.1. Scope.....	1
1.2. Site Location	1
1.3. Proposed Development	1
1.4. Regulatory Jurisdiction	1
2.0 EXISTING CONDITIONS.....	2
3.0 MANAGEMENT OF OFF-SITE RUNOFF.....	3
3.1. Off-site Hydrology.....	3
4.0 MANAGEMENT OF ON-SITE RUNOFF	4
4.1. On-site Hydrology	4
5.0 FLOOD ZONE INFORMATION.....	5
6.0 SUMMARY AND CONCLUSIONS	6
REFERENCES	7

Figures

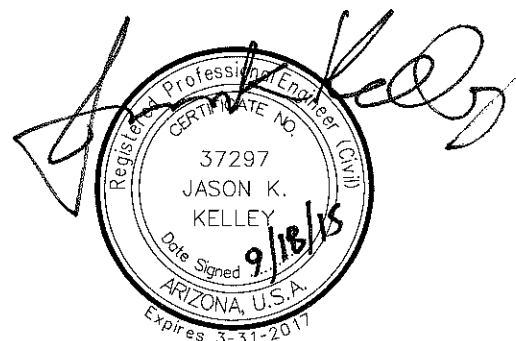
- Figure 1 Location Map
- Figure 2 Flood Insurance Rate Map (FIRM)
- Figure 3 Existing Impervious Area
- Figure 4 Proposed Impervious Areas

Appendices

- Appendix A NOAA Atlas 14 Data
- Appendix B On-site C factor calculations
- Appendix C Rational Calculations and Off-site C factor weighting
- Appendix D Detention Basin Volume and Rip-Rap Calculations
- Appendix E First Flush and Excerpts of the Franciscan Renewal Assisi Building Drainage Report

Plates

- Plate 1 Offsite Watershed Map
- Plate 2 Onsite Drainage Map



3.0 MANAGEMENT OF OFF-SITE RUNOFF

3.1. Off-site Hydrology

The off-site runoff impacting the site is from the mountains located on the north side of the site. The off-site area is covered with open space, residential houses and local streets. The off-site watershed areas were delineated using the 2 foot contours obtained from FCDMC. The total watershed area is less than 160 acres, hence the Maricopa County's Rational Method along with NOAA Atlas 14 precipitation values were used to determine the flows. The summary of offsite flows entering the subject site is shown in Appendices A & C.

The proposed conditions for off-site stormwater management consist of detention basins sized to attenuate the calculated off-site flows (see Appendix D). The design parameters for the basins are in accordance with the FCDMC standards (Reference 1).

As shown on Plate 2, the proposed Basins R1 and R2 are located in the northwest corner of the site to collect the off-site flow from the off-site sub-basin OFF2. These two retention basins collectively capture the entire flow. Basin R3 is proposed at the west end of the site to collect the off-site flow from the off-site sub-basins OFF3 and OFF4.

4.0 MANAGEMENT OF ON-SITE RUNOFF

4.1. On-site Hydrology

Basin R4 is proposed to collect onsite flows at the southwest area of the site (P-ON-3) (see Figure 4). Remaining on-site flow will drain towards the southeast corner of the site to point B (area ON2), and to the northeast through Point A (area ON1) as shown in Plate 2. Hydro flow has been used to simulate the flow under current conditions and proposed conditions at point A and point B and the runoff coefficient under proposed conditions is calculated to include all future phases of development (see Appendix B and Figures 3 & 4). A summary table for results is included on Plate 2. See CVL's grading plans for details of construction.

All retained water in basins R1, R2 and R3 will be discharged within 36 hours through a 12" diameter bleed off pipe with a 6" orifice opening on the upstream end as shown in the grading improvement plans prepared by CVL.

Basin R4 will retain one foot of water and will not require bleed off pipes or Drywells.

This master plan establishes a design of the site based on the criteria that the Post development flows leaving the site will be equal to or less than the pre-development flows (pre versus post) and each phase of development will provide first flush basins. The Franciscan Renewal Assisi Building was recently designed, approved, and constructed prior to the upstream basins with 100-year 2 hour retention. Now, as the proposed upstream basins will satisfy the Pre versus Post condition, CVL requests that the Franciscan Renewal Assisi Building Basins (R5-1 and R5-2) be changed to 1foot first flush basin (please refer to appendix E for R5-1 and R5-2 first flush calculations and excerpts of the Franciscan Renewal Assisi Building Drainage Report prepared by CVL)

**Franciscan Renewal Center
100-Year, 2-Hour Retention Basin Volume Calculations**

Retention ⁽¹⁾ Sub-Watershed ID	Drainage Area A (acres)	Runoff ⁽²⁾ Coefficient C	Precipitation ⁽³⁾ P (inches)	Volume ⁽⁴⁾ Required V _{req} (acre-ft)	Volume Provided ⁽⁵⁾				
					Retention Basin ⁽⁶⁾ ID	Depth D (ft)	Area A _{BOTT} (acres)	Area A _{TOP} (acres)	Total V _P (acre-ft)
OFF2	18.80	0.67	2.22	2.33	R1	3.0	0.28	0.58	1.29
					R2	3.0	0.19	0.48	1.00
OFF3+OFF4	6.33	0.53	2.22	0.62	R3	3.0	0.15	0.32	0.70
P-ON-3	0.40	0.8	2.22	0.06	R4	1.0	0.06	0.09	0.07
TOTAL	25.53			3.01					3.05

Reference: Drainage Policies and Standards for Maricopa County, Arizona, Draft January 2013.
Drainage Design Manual for Maricopa County, Arizona, Hydrology, February, 2011.

Notes:

1. Drainage sub-basin delineated per Drainage Map (Plate 1).
2. Weighted 100-year C-Value of 0.53 for residential areas and 0.95 for Infrastructure Roads
100-year runoff coefficients for portions of offsite from Table 3.2 and 3.3 for NHS and NMT landuses;
3. Estimated 100-year, 2-hour precipitation depth, P= 2.22 inches per
NOAA Atlas 14; For first flush basins, P= 1.0 inches.
4. $V_{req} = A \times C \times (P/12)$ = volume required for retention in acre-ft.
5. $V_P = D \times (A_{TOP} + A_{BOTT})/2$ = retention volume provided in acre-ft.
6. Proposed retention basins.
7. Rainfall Intensity per hydrology calculations located in Appendix B, in/hr.

Weighted C coefficient:

	Area (ac)	Weighted C
OFF2	18.8	0.67
NMT	5.76	0.90
NHS	3.08	0.70
LDR	9.99	0.53

OFF1	22.8	0.71
NMT	9.35	0.90
NHS	4.34	0.70
LDR	9.07	0.53

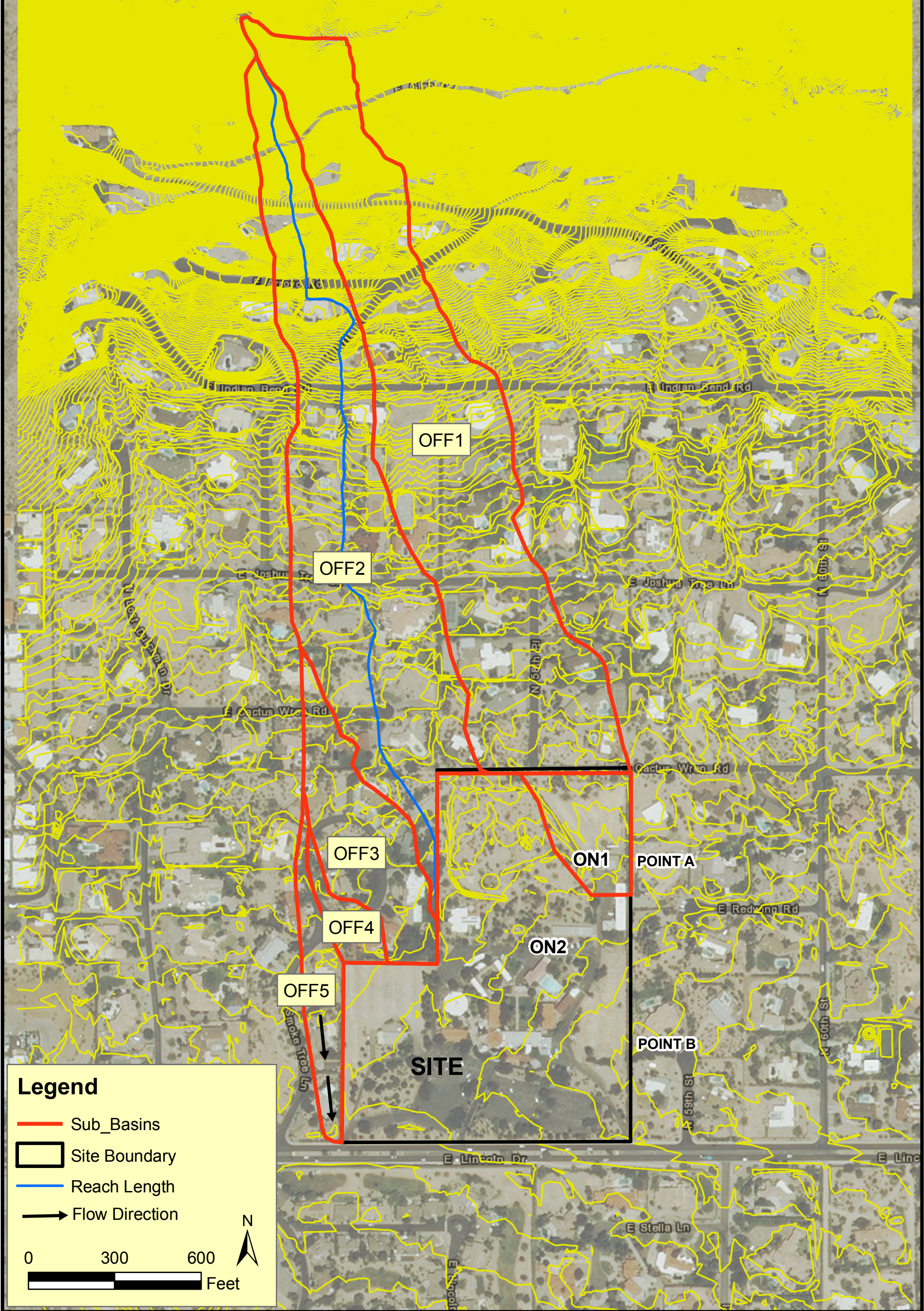
Notes: Areas from slope analysis in Civil3D (see Appendix C).
OFF1 for reference only - not used to size R1 or R2.

Franciscan Renewal Center
Bubbler Structure Percolation and Drain-down Time

Retention Basin ID	Bottom Area ⁽¹⁾ (ft ²)	Volume Required ⁽²⁾ (ft ³)	Percolation Rate ⁽³⁾ (in/hr)	Drain Time ⁽⁴⁾ (hr)
Basin R-3 Bubbler Box	36.0	206.4	1.9	35.5

Notes:

- (1) Area of well-graded AB layer below Bubbler Structure
- (2) Volume of Bubbler Pipe and Bubbler Structure with WSE at Grate Elev
 Pipe L = 245 ft; Pipe A = 0.79 sf; Pipe V = 193
 Bubbler Box Volume = 2*2*3.5 = 14 cf
 Total Volume Required = 206.4
- (3) Percolation rate of 3.8 inches/hour based on soil sampling in vicinity;
 Design Factor of 0.5 per Table 6.16, Policies and Standards.
- (4) Drain time per Eq. 6.17, Policies and Standards.



OFFSITE WATERSHED MAP

FRANSISCAN RENEWAL CENTER

JOB NO.
01-0199205

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

PLATE 1

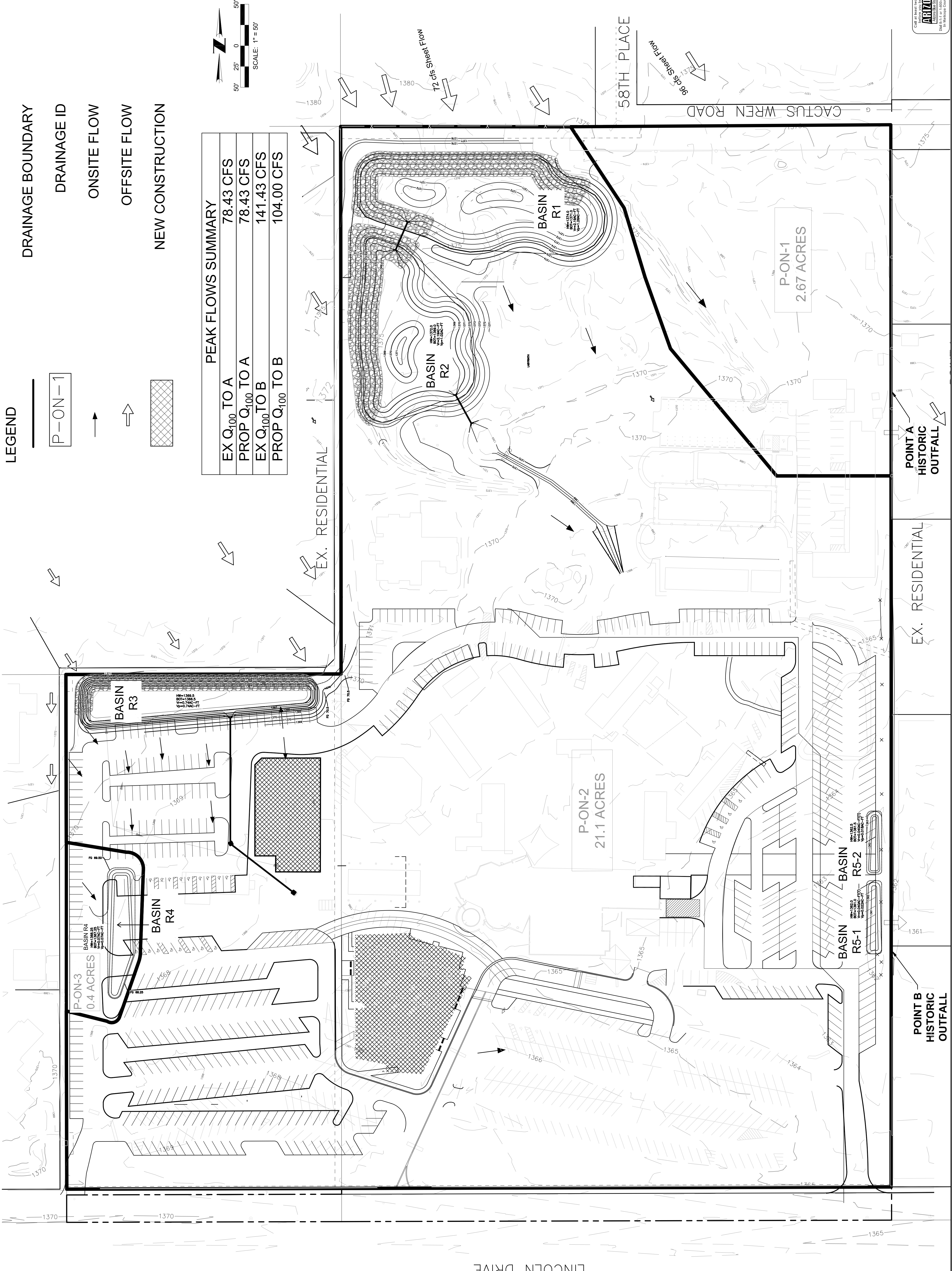
FRANCISCAN RENEWAL CENTER
 TOWN OF PARADISE VALLEY, ARIZONA

Coe & Van Loo Consultants, Inc.



ONSITE DRAINAGE MAP

NO.	REVISION	DATE

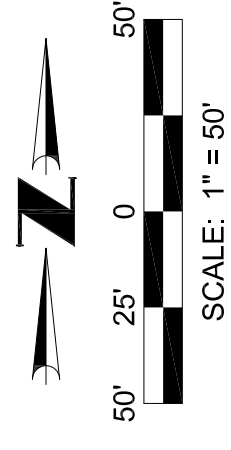


LEGEND

- DRAINAGE BOUNDARY
- DRAINAGE ID
- ONSITE FLOW
- OFFSITE FLOW
- NEW CONSTRUCTION

PEAK FLOWS SUMMARY

EX Q ₁₀₀ TO A	78.43 CFS
PROP Q ₁₀₀ TO A	78.43 CFS
EX Q ₁₀₀ TO B	141.43 CFS
PROP Q ₁₀₀ TO B	104.00 CFS



POINT A
 HISTORIC
 OUTFALL

EX. RESIDENTIAL

POINT B
 HISTORIC
 OUTFALL

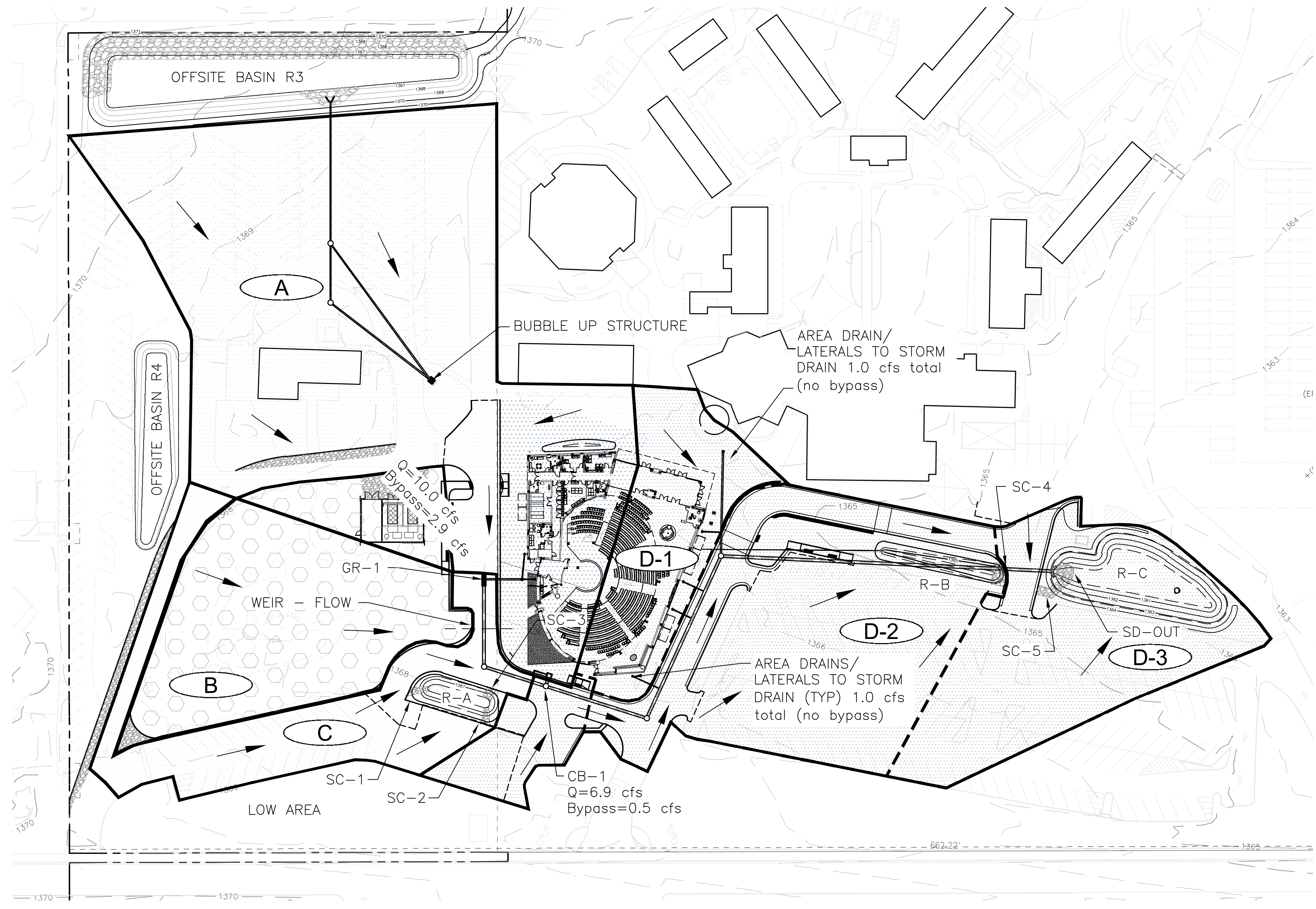
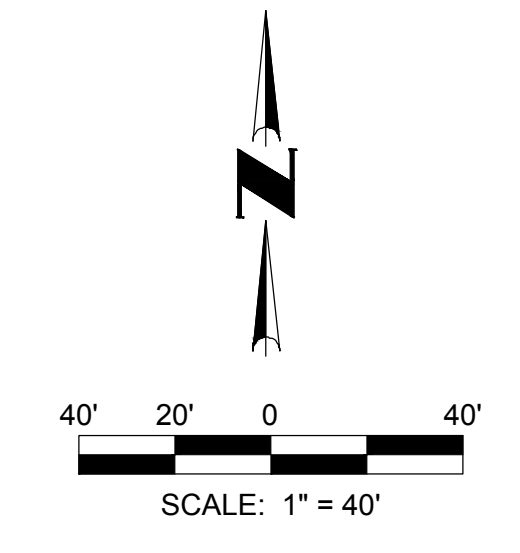
PLATE

LEGEND

- DRAINAGE BOUNDARY
- A SUB-WATERSHED ID
- ONSITE FLOW
- R-A RETENTION BASIN ID
- CB-1 / GR-1 CATCH BASIN / GRATE ID
- SC-1 SCUPPER ID
- SD-OUT STORMDRAIN OUTLET ID
- ▬ STORM DRAIN

ONSITE SUBBASIN TABLE		
I.D.	AREA	C
A	2.28 ac	0.92
B	0.66 ac	0.65
C	0.51 ac	0.95
D	2.21 ac	0.95
D1	0.39 ac	0.95
D2	1.05 ac	0.95
D3	0.77 ac	0.95

NOTE: SEE "APPENDIX D" FOR RETENTION VOLUME CALCULATIONS



April 2, 2015
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4th Revision: September 18, 2015

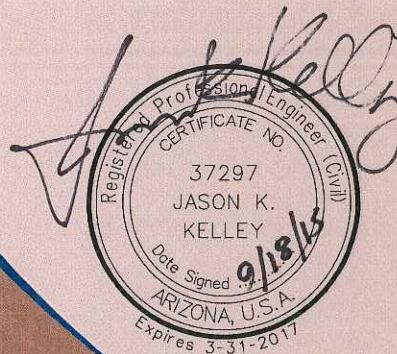
FRANCISCAN RENEWAL CENTER

Paradise Valley & Maricopa County, Arizona

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5802 E. Lincoln Drive
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Prepared by:
Coe & Van Loo Consultants, Inc.
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602.264.6831

Job #: 1.01.0199206



MASTER DRAINAGE REPORT

**Master Drainage Report
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TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
1.1. Scope.....	1
1.2. Site Location	1
1.3. Proposed Development	1
1.4. Regulatory Jurisdiction	1
2.0 EXISTING CONDITIONS.....	2
3.0 MANAGEMENT OF OFF-SITE RUNOFF.....	3
3.1. Off-site Hydrology.....	3
4.0 MANAGEMENT OF ON-SITE RUNOFF	4
4.1. On-site Hydrology	4
5.0 FLOOD ZONE INFORMATION.....	5
6.0 SUMMARY AND CONCLUSIONS	6
REFERENCES	7

Figures

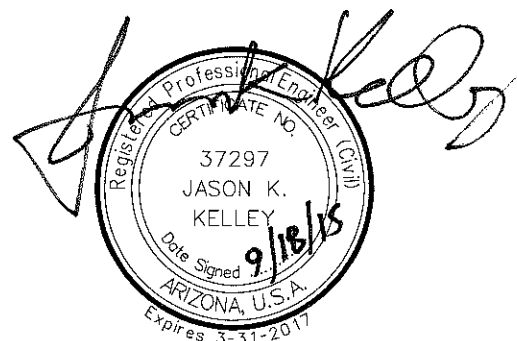
- Figure 1 Location Map
- Figure 2 Flood Insurance Rate Map (FIRM)
- Figure 3 Existing Impervious Area
- Figure 4 Proposed Impervious Areas

Appendices

- Appendix A NOAA Atlas 14 Data
- Appendix B On-site C factor calculations
- Appendix C Rational Calculations and Off-site C factor weighting
- Appendix D Detention Basin Volume and Rip-Rap Calculations
- Appendix E First Flush and Excerpts of the Franciscan Renewal Assisi Building Drainage Report

Plates

- Plate 1 Offsite Watershed Map
- Plate 2 Onsite Drainage Map



1.0 INTRODUCTION

1.1. Scope

Coe & Van Loo, Consultants, Inc. (CVL) has been contracted by Franciscan Renewal Center to provide engineering services in support of the proposed new facilities (the site). The purpose of this report is to provide hydrologic information of the proposed improvements of the site. In addition, this report addresses off-site runoff and on-site retention requirements.

1.2. Site Location

The site is located within a portion of the Town of Paradise Valley jurisdiction and a portion of Maricopa County jurisdiction, Arizona. The site is bounded on the north by East Cactus Wren Road and private land owners, on the south by the East Lincoln Drive, on the west by private land owners, and on the east by private land owners (see Figure 1). In addition, the site is located in the southeast quarter of the northwest quarter of Section 9, Township 2 North, Range 4 East of the Gila and Salt River Meridian.

1.3. Proposed Development

The proposed development will be constructed in multiple phases. The first phase consisted of the construction of the Assisi Lodging Building that was approved and completed in March 2015. The second phase includes the construction of the permanent retention basins. The future phases will include the construction of new buildings, access roads, and parking areas throughout the site.

1.4. Regulatory Jurisdiction

The Drainage Report has been prepared and the site will be designed in accordance with the current versions of the Maricopa County Drainage Policies and Standards (Reference 3), Drainage Design Manuals for Maricopa County, Volume 1 – Hydrology (Reference 1) and Volume 2 – Hydraulics (Reference 2) and Section 1205 of the Maricopa County Zoning Ordinance.

In addition and based on a meeting with the Maricopa County Building Department that took place on January 8, 2013, it was agreed to:

- Design the site on pre-developed versus post-developed flow conditions by reducing the impact of the offsite flow and detaining it upstream at the north edge of the site and therefore reducing the post developed peak flows downstream.
- It was also agreed that first flush would be addressed with each phase of development.

2.0 EXISTING CONDITIONS

The site is a church campus, which slopes generally southeasterly. The existing on-site runoff that emerges from the church facilities and open areas flows in a southeasterly direction to the east property line near the south end of the site. The on-site runoff is not retained. The offsite runoff flows through the site freely and not through any conveyance systems. All flows discharge towards the adjacent private properties to the east. The off-site runoff flows in a southeasterly direction through the site (Plate 1). The off-site runoff exits the site at two locations; the northeast and southeast corners of the site (referred to as point A and point B respectively in our calculations and maps).

3.0 MANAGEMENT OF OFF-SITE RUNOFF

3.1. Off-site Hydrology

The off-site runoff impacting the site is from the mountains located on the north side of the site. The off-site area is covered with open space, residential houses and local streets. The off-site watershed areas were delineated using the 2 foot contours obtained from FCDMC. The total watershed area is less than 160 acres, hence the Maricopa County's Rational Method along with NOAA Atlas 14 precipitation values were used to determine the flows. The summary of offsite flows entering the subject site is shown in Appendices A & C.

The proposed conditions for off-site stormwater management consist of detention basins sized to attenuate the calculated off-site flows (see Appendix D). The design parameters for the basins are in accordance with the FCDMC standards (Reference 1).

As shown on Plate 2, the proposed Basins R1 and R2 are located in the northwest corner of the site to collect the off-site flow from the off-site sub-basin OFF2. These two retention basins collectively capture the entire flow. Basin R3 is proposed at the west end of the site to collect the off-site flow from the off-site sub-basins OFF3 and OFF4.

4.0 MANAGEMENT OF ON-SITE RUNOFF

4.1. On-site Hydrology

Basin R4 is proposed to collect onsite flows at the southwest area of the site (P-ON-3) (see Figure 4). Remaining on-site flow will drain towards the southeast corner of the site to point B (area ON2), and to the northeast through Point A (area ON1) as shown in Plate 2. Hydro flow has been used to simulate the flow under current conditions and proposed conditions at point A and point B and the runoff coefficient under proposed conditions is calculated to include all future phases of development (see Appendix B and Figures 3 & 4). A summary table for results is included on Plate 2. See CVL's grading plans for details of construction.

All retained water in basins R1, R2 and R3 will be discharged within 36 hours through a 12" diameter bleed off pipe with a 6" orifice opening on the upstream end as shown in the grading improvement plans prepared by CVL.

Basin R4 will retain one foot of water and will not require bleed off pipes or Drywells.

This master plan establishes a design of the site based on the criteria that the Post development flows leaving the site will be equal to or less than the pre-development flows (pre versus post) and each phase of development will provide first flush basins. The Franciscan Renewal Assisi Building was recently designed, approved, and constructed prior to the upstream basins with 100-year 2 hour retention. Now, as the proposed upstream basins will satisfy the Pre versus Post condition, CVL requests that the Franciscan Renewal Assisi Building Basins (R5-1 and R5-2) be changed to 1foot first flush basin (please refer to appendix E for R5-1 and R5-2 first flush calculations and excerpts of the Franciscan Renewal Assisi Building Drainage Report prepared by CVL)

5.0 FLOOD ZONE INFORMATION

The Maricopa County, Arizona and Incorporated Areas, Flood Insurance Rate Map (FIRM), Community-Panel Number 04013C1765L, Map Revised October 16, 2013 (Reference 5), indicates the subject site falls within Zone X (see Figure 2).

Zone X within the project area is defined as "Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood".

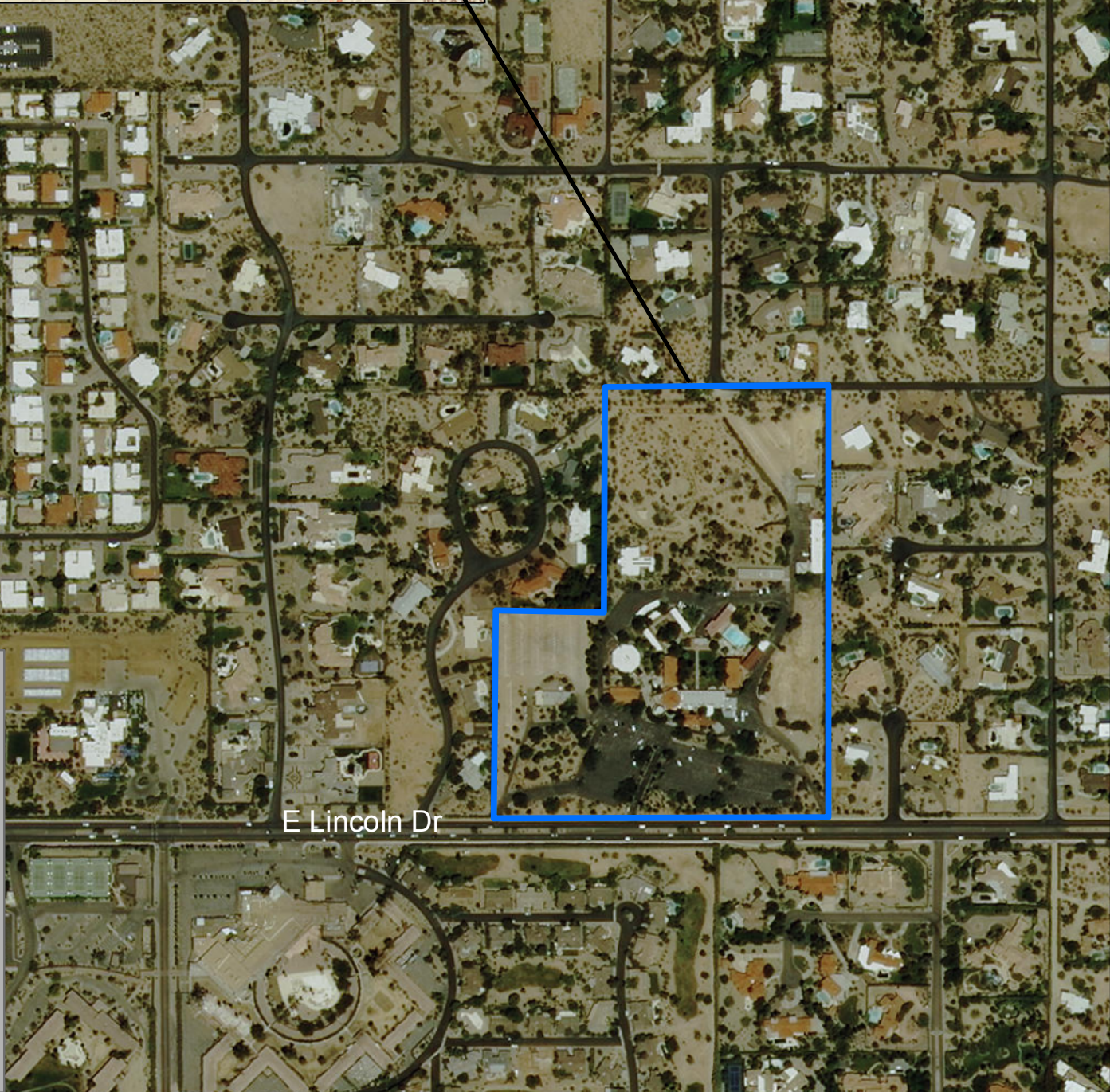
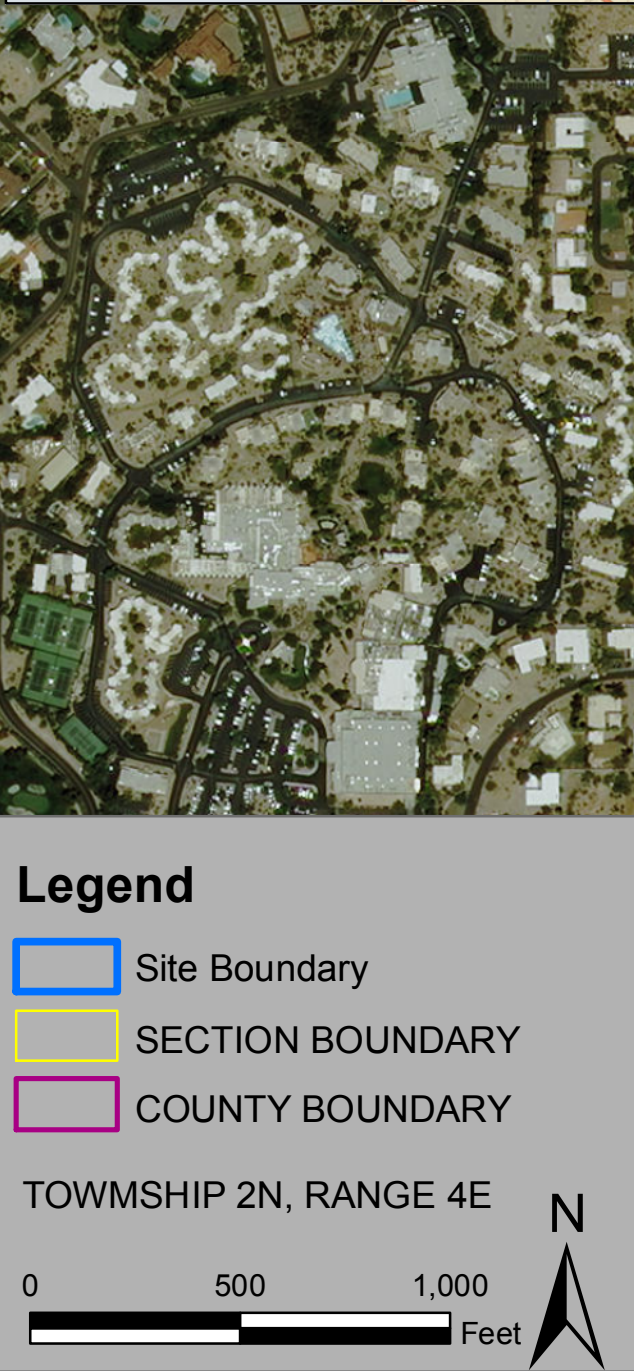
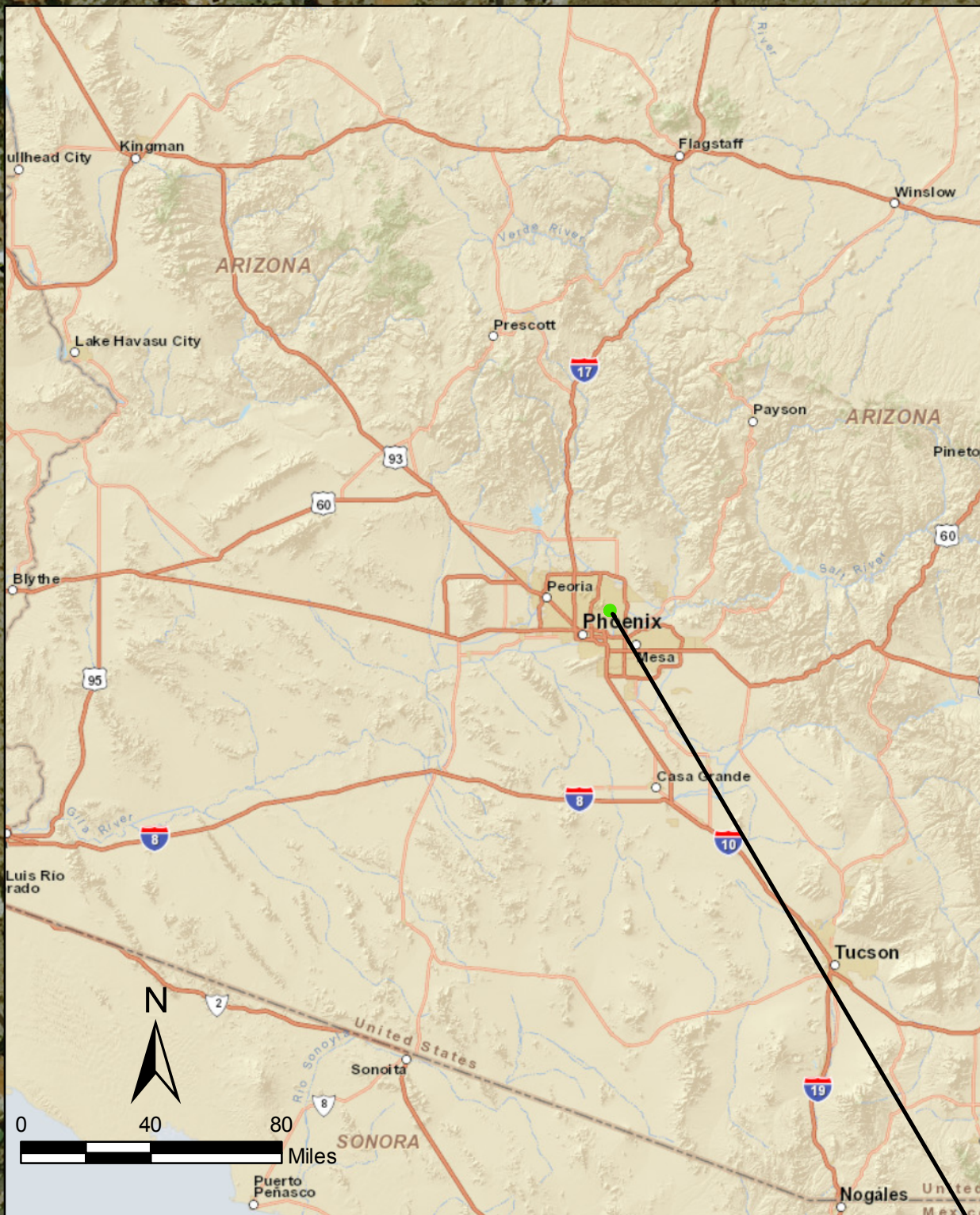
6.0 SUMMARY AND CONCLUSIONS

1. Off-site storm water runoff entering the site from the north is proposed to be collected onsite along the north property line in Basins (R1,R2 and R3).
2. The proposed 100 year peak flow from onsite and offsite leaving the site (includes future phases) is equal or less than the current 100 year peak discharge. (See Plate 2-Peak Flows Summary Table).
3. On-site runoff from the southwest corner of the site will be collected in proposed Basin R4 and the remaining on-site runoff will exit the site towards point A and point B as delineated in the drainage maps Plate 1 and Plate 2.
4. The Franciscan Renewal Assisi Building Basin is changed from a 100-year 2 hour basin to the first flush Basins R5-1 and R5-2.
5. First flush shall be addressed with each phase of the development.

REFERENCES

1. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology*, February 2011.
2. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics*, January 1996 (Effective).
3. Flood Control District of Maricopa County (FCDMC), *Drainage Policies and Standards for Maricopa County, Arizona*, January 2007 (Effective).
4. Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map (FIRM), Maricopa County, Arizona, and Incorporated Areas, Community Panel Number 04013C1765L*, Map Revised October 16, 2013.
5. Coe & Van Loo Consultants Inc., *Final Drainage Report for Franciscan Renewal Center Assisi Building, June 2014*.

FIGURES



LOCATION MAP

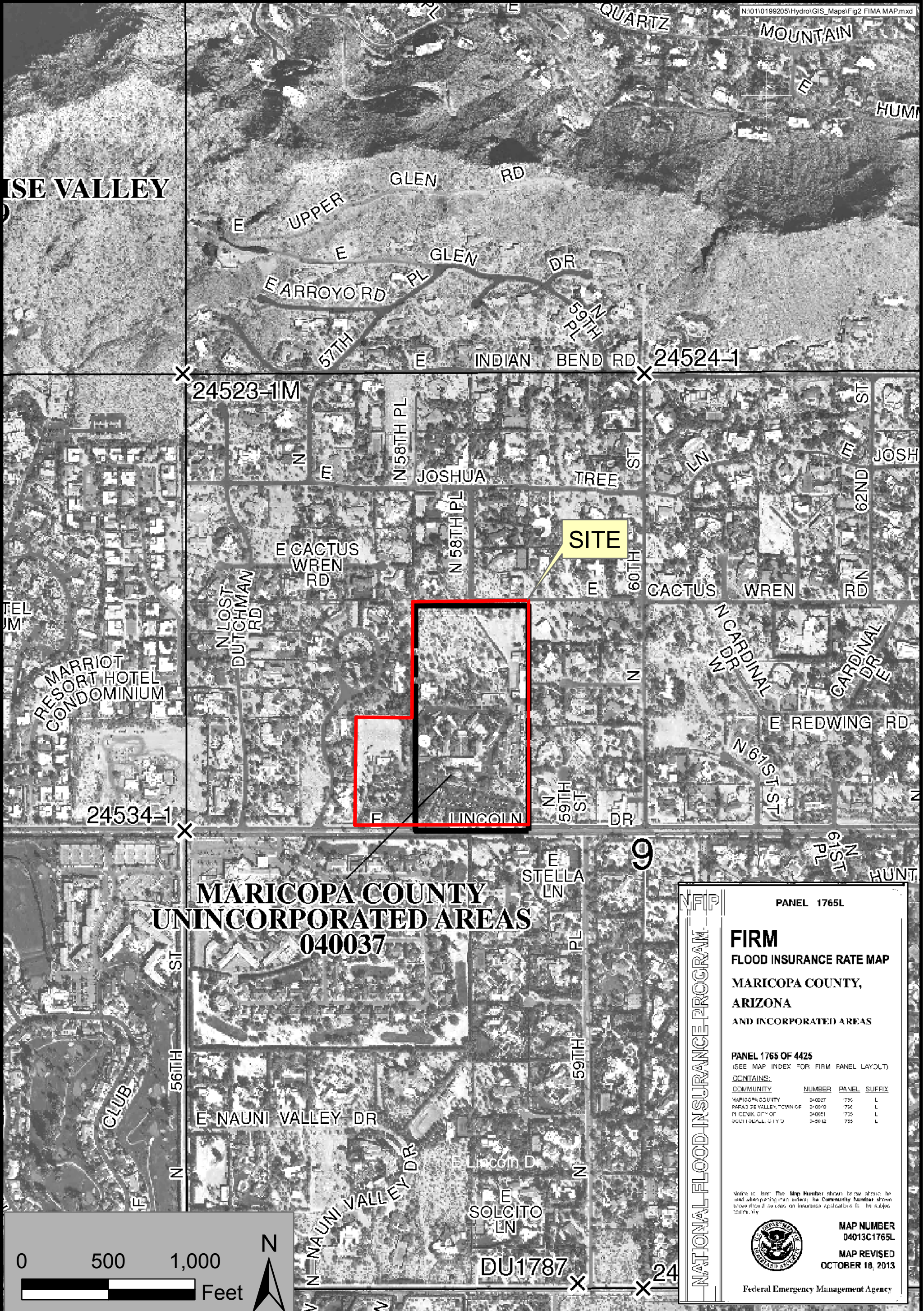
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

FRANCISCAN RENEWAL CENTER

COE & VAN LOO
PLANNING · ENGINEERING · LANDSCAPE ARCHITECTURE

JOB NO.
01-0199205

FIGURE 1
05/20/2015



**MARICOPA COUNTY
UNINCORPORATED AREAS
040037**

NFIP

PANEL 1765L


**FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY,
ARIZONA
AND INCORPORATED AREAS**

PANEL 1765 OF 4425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

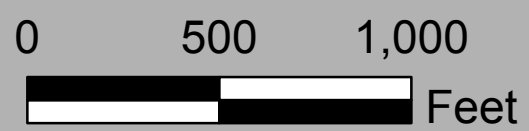
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	736	L
PARADISE VALLEY TOWN OF	040019	736	L
THE CITY OF PHOENIX	040051	735	L
SUNBELT CITY OF	040012	725	L

Notes to User: The Map Number shown below should be used when ordering maps. The Community Number shown above should be used on insurance applications to be subject community.

 **MAP NUMBER
04013C1765L**
**MAP REVISED
OCTOBER 18, 2013**

Federal Emergency Management Agency



FLOOD INSURANCE RATE MAP

FRANCISCAN RENEWAL CENTER

JOB NO.
01-0199205

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

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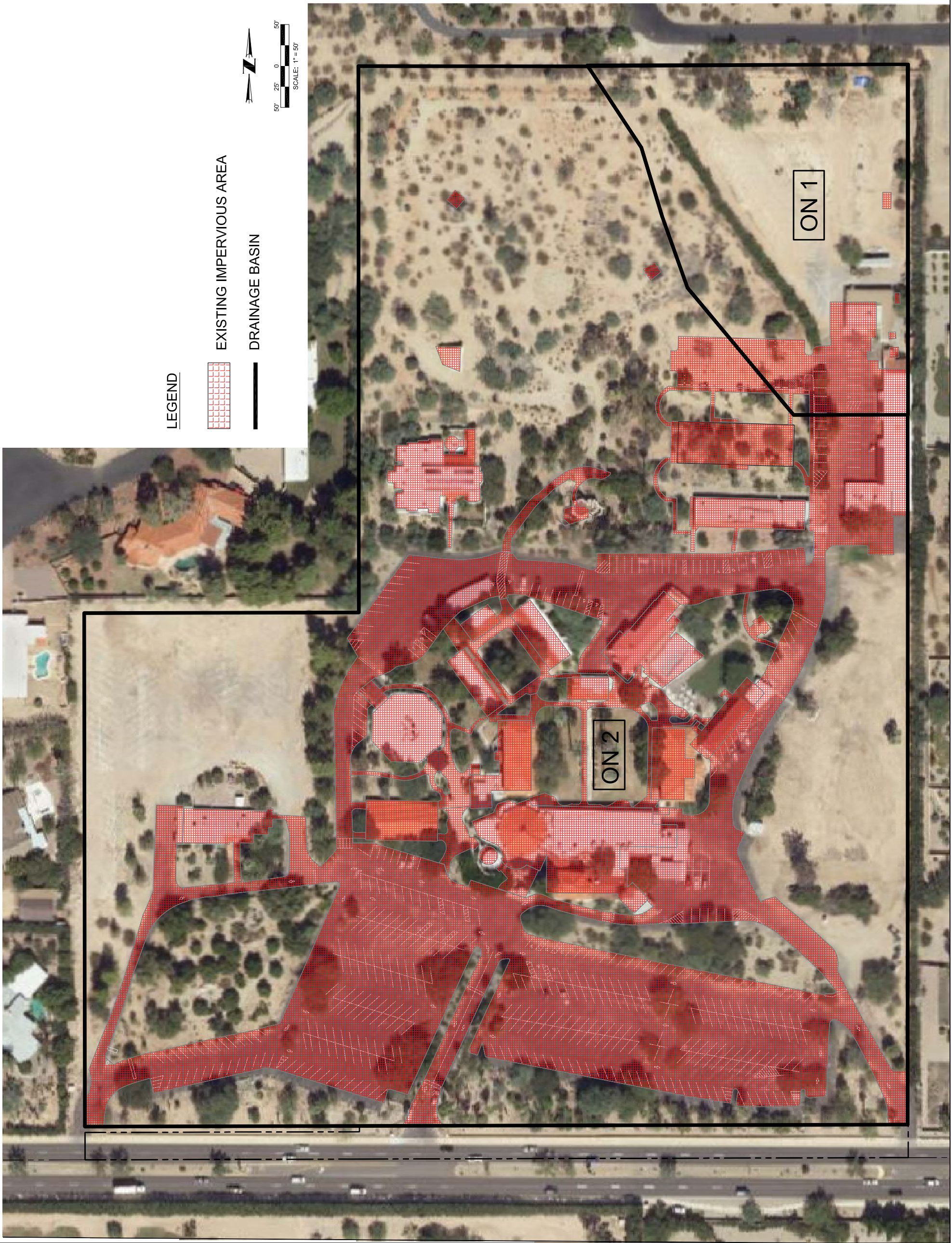
FIGURE 2
05/20/2015

EXISTING IMPERVIOUS AREA
 FRANCISCAN RENEWAL CENTER
 TOWN OF PARADISE VALLEY, ARIZONA

NO.	REVISION	DATE

Coe & Van Loo Consultants, Inc.

4550 North 12th Street
 Phoenix, Arizona 85014
 602-264-6831
 www.cvlcl.com
CVL
 CONSULTANTS

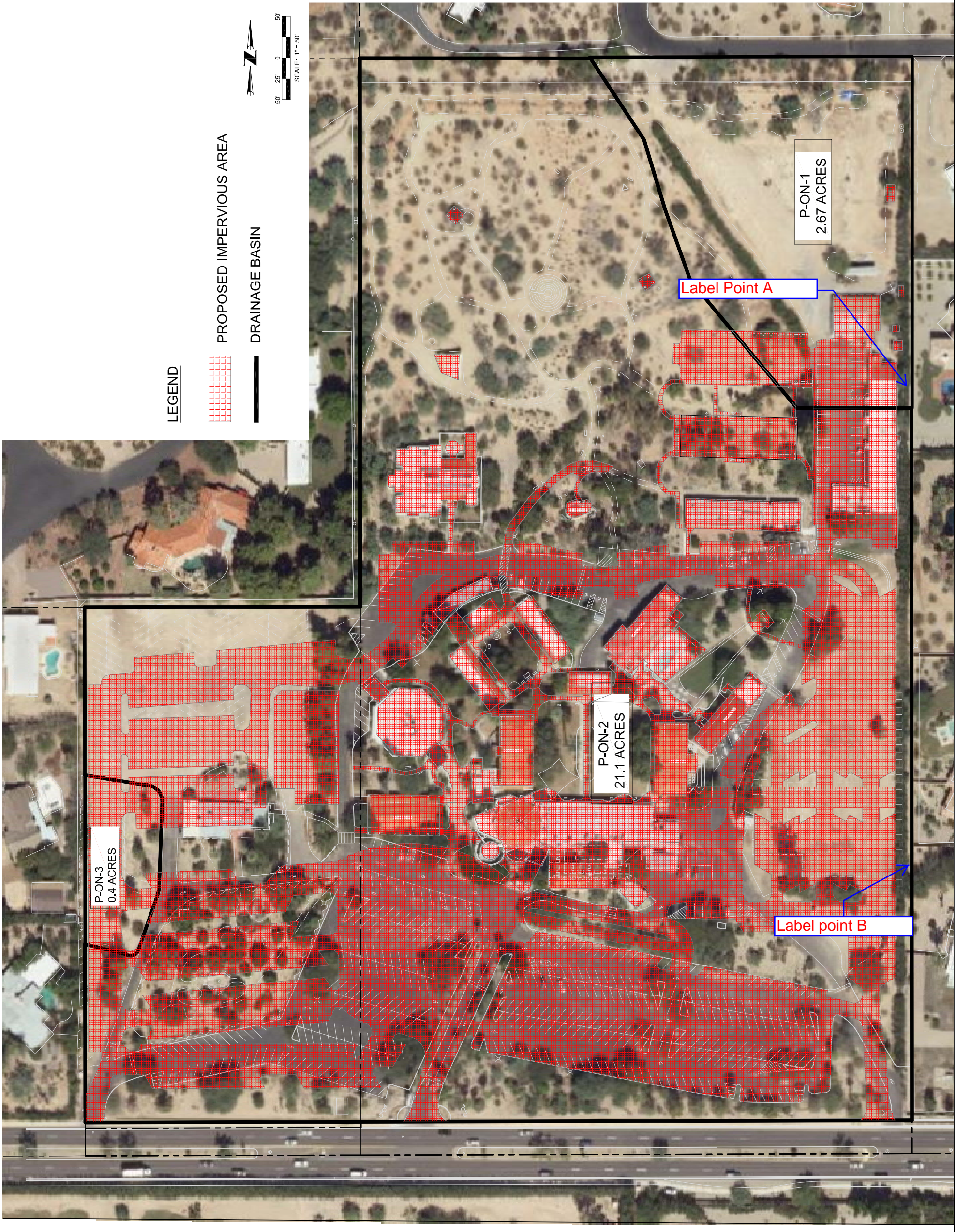


PROPOSED IMPERVIOUS AREA
 FRANCISCAN RENEWAL CENTER
 TOWN OF PARADISE VALLEY, ARIZONA

NO.	REVISION	DATE

Coe & Van Loo Consultants, Inc.

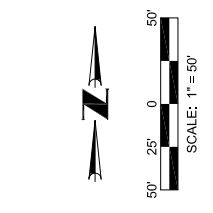
4550 North 12th Street
 Phoenix, Arizona 85014
 602-264-6831
 www.cvlcl.com
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 CONSULTANTS



LEGEND

PROPOSED IMPERVIOUS AREA

DRAINAGE BASIN



APPENDICES

APPENDIX A

NOAA Atlas 14 Data



NOAA Atlas 14, Volume 1, Version 5
Location name: Paradise Valley, Arizona, US*
Latitude: 33.5382°, Longitude: -111.9562°
Elevation: 1440 ft*
 * source: Google Maps



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](#)

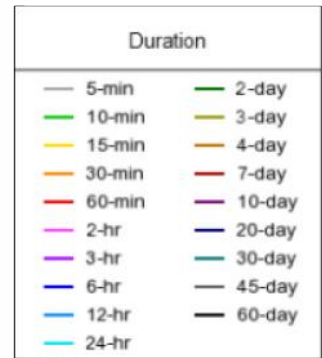
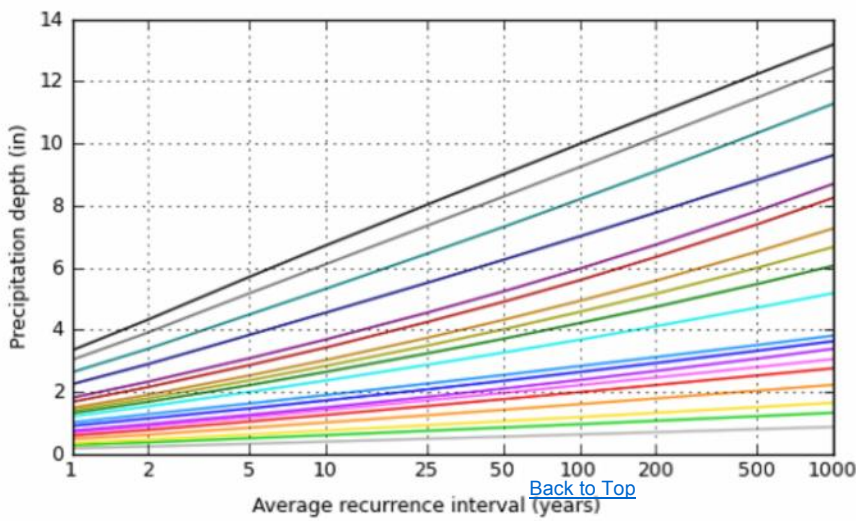
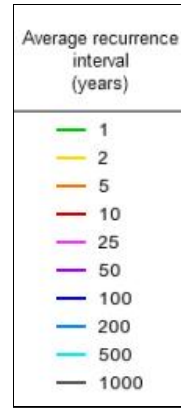
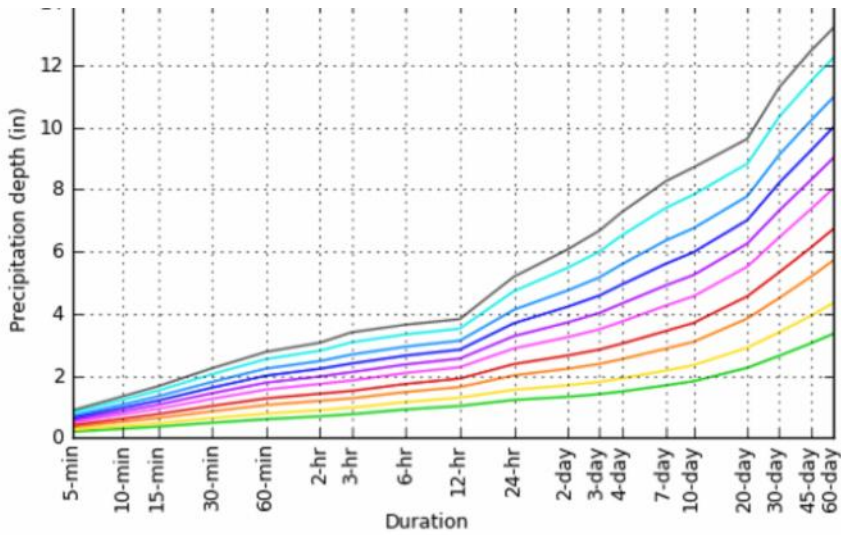
PF tabular

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	0.189 (0.158-0.231)	0.247 (0.208-0.302)	0.335 (0.279-0.408)	0.403 (0.334-0.488)	0.494 (0.402-0.596)	0.564 (0.454-0.676)	0.635 (0.502-0.760)	0.707 (0.550-0.845)	0.805 (0.609-0.963)	0.879 (0.652-1.05)
10-min	0.287 (0.240-0.352)	0.377 (0.316-0.460)	0.511 (0.425-0.621)	0.613 (0.508-0.743)	0.752 (0.612-0.907)	0.859 (0.690-1.03)	0.967 (0.764-1.16)	1.08 (0.837-1.29)	1.23 (0.927-1.47)	1.34 (0.992-1.60)
15-min	0.357 (0.298-0.436)	0.467 (0.392-0.570)	0.633 (0.527-0.770)	0.761 (0.629-0.921)	0.932 (0.759-1.12)	1.07 (0.856-1.28)	1.20 (0.947-1.43)	1.34 (1.04-1.60)	1.52 (1.15-1.82)	1.66 (1.23-1.99)
30-min	0.481 (0.401-0.587)	0.628 (0.528-0.768)	0.852 (0.710-1.04)	1.02 (0.847-1.24)	1.26 (1.02-1.51)	1.43 (1.15-1.72)	1.61 (1.28-1.93)	1.80 (1.40-2.15)	2.05 (1.55-2.45)	2.23 (1.66-2.68)
60-min	0.595 (0.497-0.727)	0.778 (0.654-0.950)	1.06 (0.878-1.28)	1.27 (1.05-1.54)	1.55 (1.27-1.87)	1.77 (1.43-2.13)	2.00 (1.58-2.39)	2.23 (1.73-2.66)	2.53 (1.92-3.03)	2.76 (2.05-3.31)
2-hr	0.689 (0.584-0.824)	0.892 (0.757-1.07)	1.19 (1.01-1.42)	1.42 (1.19-1.69)	1.74 (1.43-2.05)	1.97 (1.61-2.33)	2.22 (1.78-2.61)	2.47 (1.95-2.90)	2.80 (2.16-3.30)	3.06 (2.31-3.63)
3-hr	0.757 (0.639-0.917)	0.970 (0.823-1.18)	1.27 (1.07-1.54)	1.51 (1.26-1.82)	1.85 (1.52-2.20)	2.11 (1.72-2.51)	2.39 (1.91-2.84)	2.68 (2.10-3.18)	3.08 (2.34-3.66)	3.40 (2.53-4.05)
6-hr	0.912 (0.785-1.08)	1.15 (0.997-1.37)	1.48 (1.27-1.74)	1.73 (1.48-2.03)	2.08 (1.75-2.43)	2.36 (1.95-2.74)	2.64 (2.16-3.07)	2.93 (2.35-3.42)	3.33 (2.60-3.88)	3.64 (2.78-4.25)
12-hr	1.02 (0.890-1.20)	1.29 (1.12-1.51)	1.64 (1.41-1.90)	1.91 (1.64-2.21)	2.27 (1.93-2.62)	2.55 (2.14-2.94)	2.84 (2.35-3.27)	3.13 (2.56-3.61)	3.52 (2.80-4.08)	3.82 (2.99-4.46)
24-hr	1.22 (1.06-1.43)	1.55 (1.35-1.82)	2.01 (1.74-2.37)	2.37 (2.05-2.79)	2.88 (2.47-3.38)	3.27 (2.79-3.84)	3.69 (3.13-4.33)	4.12 (3.46-4.84)	4.71 (3.91-5.53)	5.19 (4.26-6.11)
2-day	1.32 (1.15-1.54)	1.69 (1.47-1.97)	2.22 (1.93-2.59)	2.65 (2.29-3.08)	3.24 (2.79-3.77)	3.72 (3.18-4.31)	4.22 (3.58-4.90)	4.74 (3.99-5.51)	5.48 (4.56-6.38)	6.07 (5.00-7.08)
3-day	1.41 (1.23-1.64)	1.80 (1.57-2.09)	2.38 (2.06-2.76)	2.84 (2.46-3.30)	3.49 (3.01-4.05)	4.02 (3.43-4.66)	4.58 (3.88-5.31)	5.17 (4.35-6.00)	6.00 (4.98-6.96)	6.67 (5.49-7.76)
4-day	1.49 (1.30-1.73)	1.91 (1.67-2.22)	2.53 (2.20-2.93)	3.03 (2.62-3.51)	3.74 (3.22-4.34)	4.32 (3.69-5.00)	4.93 (4.19-5.71)	5.59 (4.70-6.49)	6.51 (5.41-7.54)	7.27 (5.98-8.44)
7-day	1.69 (1.46-1.97)	2.16 (1.87-2.52)	2.87 (2.47-3.34)	3.44 (2.96-4.00)	4.25 (3.63-4.94)	4.90 (4.17-5.69)	5.60 (4.73-6.50)	6.35 (5.31-7.39)	7.40 (6.11-8.61)	8.25 (6.75-9.61)
10-day	1.82 (1.58-2.11)	2.33 (2.02-2.71)	3.09 (2.67-3.58)	3.70 (3.19-4.28)	4.55 (3.90-5.25)	5.24 (4.47-6.03)	5.97 (5.06-6.89)	6.74 (5.67-7.78)	7.83 (6.50-9.03)	8.70 (7.15-10.1)
20-day	2.25 (1.97-2.59)	2.90 (2.53-3.34)	3.84 (3.35-4.42)	4.55 (3.95-5.23)	5.52 (4.77-6.33)	6.25 (5.39-7.17)	7.01 (6.01-8.06)	7.78 (6.63-8.95)	8.82 (7.45-10.2)	9.63 (8.07-11.1)
30-day	2.64 (2.29-3.03)	3.40 (2.96-3.91)	4.49 (3.90-5.15)	5.33 (4.62-6.11)	6.45 (5.56-7.39)	7.31 (6.28-8.37)	8.20 (7.02-9.38)	9.11 (7.75-10.4)	10.3 (8.73-11.8)	11.3 (9.45-12.9)
45-day	3.04 (2.66-3.48)	3.92 (3.44-4.49)	5.18 (4.53-5.92)	6.11 (5.34-6.99)	7.35 (6.39-8.40)	8.29 (7.18-9.47)	9.24 (7.96-10.6)	10.2 (8.75-11.7)	11.5 (9.76-13.2)	12.4 (10.5-14.3)
60-day	3.35 (2.95-3.81)	4.33 (3.81-4.93)	5.71 (5.02-6.49)	6.72 (5.89-7.64)	8.03 (7.02-9.12)	9.00 (7.84-10.2)	9.99 (8.65-11.4)	11.0 (9.46-12.5)	12.2 (10.5-14.0)	13.2 (11.2-15.1)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical



[Back to Top](#)

Maps & aeriels

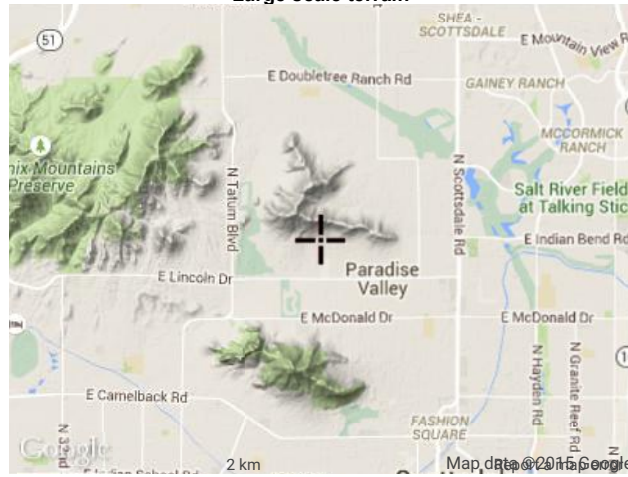
NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Tue Jun 30 15:31:36 2015

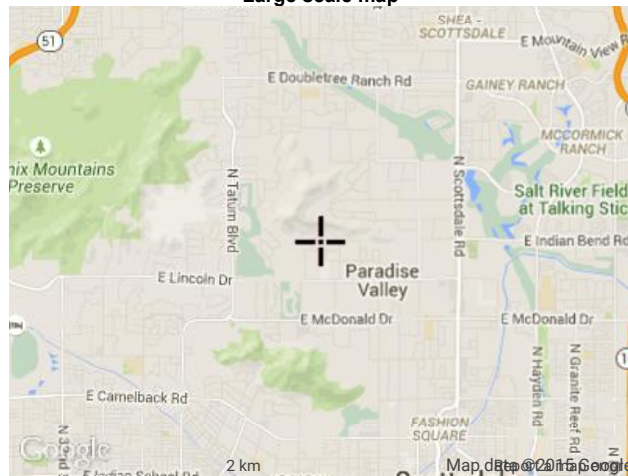
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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[National Weather Service](#)
[Office of Hydrologic Development](#)
1325 East West Highway
Silver Spring, MD 20910

APPENDIX B

On-site C Factor Calculations

Franciscan Renewal Center
On-site Runoff Coefficient Factor Calculation

	EX-ON-1	EX-ON-2	P-ON-1	P-ON-2	P-ON-3
TOT AREA (ac.)	2.67	21.50	2.67	21.10	0.40
A @ C=0.95	0.36	8.01	0.36	10.47	0.27
A @ C=0.5	2.31	13.49	2.31	10.63	0.13
Computed C	0.56	0.67	0.56	0.72	0.80

EX-ON= EXISTING ONSITE
P-ON= PROPOSED ONSITE

Note: See Figure 3 and 4.

APPENDIX C

Rational Calculations and Off-site C factor Weighting

SUMMARY OF RATIONAL METHOD PEAK FLOW HYDROLOGY
Franciscan Renewal Center - Existing Conditions

CP Concentration Point	Sub- basin Area (ac)	Water Course Length ft	High Elevation ft	Low Elevation ft	Roughness, Kb	C			i			Tc			Q		
						Weighted Runoff Coefficient			Intensity (in/hr)			Time of Concentration (min)			Peak Flow Rate (cfs)		
						Return Period			Return Period			Return Period			Return Period		
						10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year
OFF1	22.60	3072	2059	1375.5	0.1161 (C)	0.57	0.68	0.71	3.4	5.1	5.9	11.9	10.2	9.7	44	79	96
EX-ON-1	2.67	800	1376	1369	0.0373 (A)	0.45	0.54	0.56	4	6	6.9	8.7	7.5	7	5	9	10
OFF2	18.80	3280	1986	1371	0.1181 (C)	0.54	0.64	0.67	3.2	4.9	5.7	13.4	11.4	10.8	33	59	71
OFF3	5.23	1345	1394	1369.5	0.132 (C)	0.42	0.51	0.53	2.7	4	4.7	20	17.2	16.3	6	11	13
OFF4	1.10	523	1380	1371	0.149 (C)	0.42	0.51	0.53	3.4	5	5.8	12.5	10.7	10.1	2	3	3
EX-ON-2	21.50	1300	1378	1361	0.0317 (A)	0.54	0.64	0.67	3.9	5.9	6.8	9.1	7.7	7.3	45	81	98

Reference: Drainage Design Manual for Maricopa County, Hydrology, August 15, 2013

Notes:

$T_c = \text{Time of concentration} = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$ (Equation 3.2, Papadakis and Kazan equation, 1987)

L = Length of the longest flow path, miles.

S = Watercourse slope, feet/mile.

$K_b = \text{Watershed resistance coefficient} = m \log_{10}A + b$, where A= drainage area in acres, m and b values from (Table 3.1).

Q = Peak discharge = C*I*A, cfs. (Equation 3.1)

i = Average rainfall intensity, in in/hr, lasting for a T_c . Determined using the I-D-F curve from the NOAA Atlas 14 PRECIPITATION FREQUENCY ESTIMATES

C = On-site runoff coefficient per impervious areas and Land use category; off-site based on slope analysis.

SUMMARY OF RATIONAL METHOD PEAK FLOW HYDROLOGY
Franciscan Renewal Center - Proposed Conditions

CP Concentration Point	Sub- basin Area (ac)	Water Course Length ft	High Elevation ft	Low Elevation ft	Roughness, Kb	C			i			Tc			Q		
						Weighted Runoff Coefficient			Intensity (in/hr)			Time of Concentration (min)			Peak Flow Rate (cfs)		
						Return Period			Return Period			Return Period			Return Period		
						10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year
OFF1	22.60	3072	2059	1375.5	0.1161 (C)	0.57	0.69	0.71	3.4	5.1	5.9	11.9	10.2	9.7	44	79	96
P-ON-1	2.67	800	1376	1369	0.0373 (A)	0.45	0.54	0.56	4	6	6.9	8.7	7.5	7	5	9	10
OFF2	18.80	3280	1986	1371	0.1181 (C)	0.54	0.64	0.67	3.2	4.9	5.7	13.4	11.4	10.8	33	59	71
OFF3	5.23	1345	1394	1369.5	0.132 (C)	0.42	0.51	0.53	2.7	4	4.7	20	17.2	16.3	6	11	13
OFF4	1.10	523	1380	1371	0.149 (C)	0.42	0.51	0.53	3.4	5	5.8	12.5	10.7	10.1	2	3	3
P-ON-2	21.10	1300	1378	1361	0.0317 (A)	0.58	0.69	0.72	3.9	5.9	6.8	9.1	7.8	7.3	47	85	104
P-ON-3	0.40	62	1370	1368.25	0.0425 (A)	0.64	0.77	0.8	4.8	6.7	7.7	5	5	5	1	2	2

Reference: Drainage Design Manual for Maricopa County, Hydrology, August 15, 2013

Notes:

$T_c = \text{Time of concentration} = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$ (Equation 3.2, Papadakis and Kazan equation, 1987)

L = Length of the longest flow path, miles.

S = Watercourse slope, feet/mile.

$K_b = \text{Watershed resistance coefficient} = m \log_{10}A + b$, where A= drainage area in acres, m and b values from (Table 3.1).

Q = Peak discharge = C*I*A, cfs. (Equation 3.1)

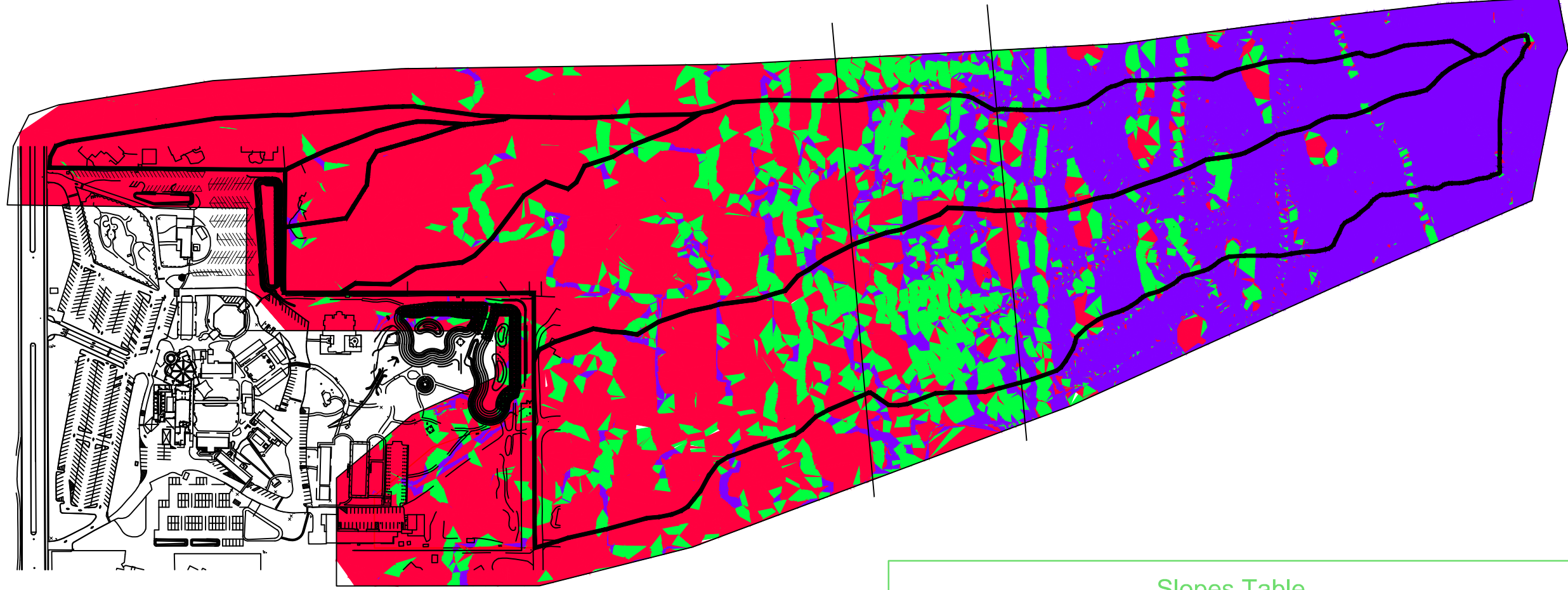
i = Average rainfall intensity, in in/hr, lasting for a T_c . Determined using the I-D-F curve from the NOAA Atlas 14 PRECIPITATION FREQUENCY ESTIMATES

C = On-site runoff coefficient per impervious areas and Land use category; off-site based on slope analysis.

Weighted C coefficient:

	Area (ac)	Weighted C
OFF2 Basin - Landuse	18.8	0.67
NMT	5.76	0.90
NHS	3.08	0.70
LDR	9.99	0.53
OFF1 Basin - Landuse	22.8	0.71
NMT	9.35	0.90
NHS	4.34	0.70
LDR	9.07	0.53

Notes: Areas from slope analysis in Civil3D - (see Exhibit - 'Weighted C Slope Analysis', Appendix C).
 OFF1 for reference only - not used to size R1 or R2.



Slopes Table				
Number	Minimum Slope	Maximum Slope	Area	Color
1	0.00%	4.99%	1816771.58	Red
2	5.00%	9.99%	607905.89	Green
3	10.00%	2400.00%	1097868.01	Purple



SCALE: N.T.S.

EXHIBIT

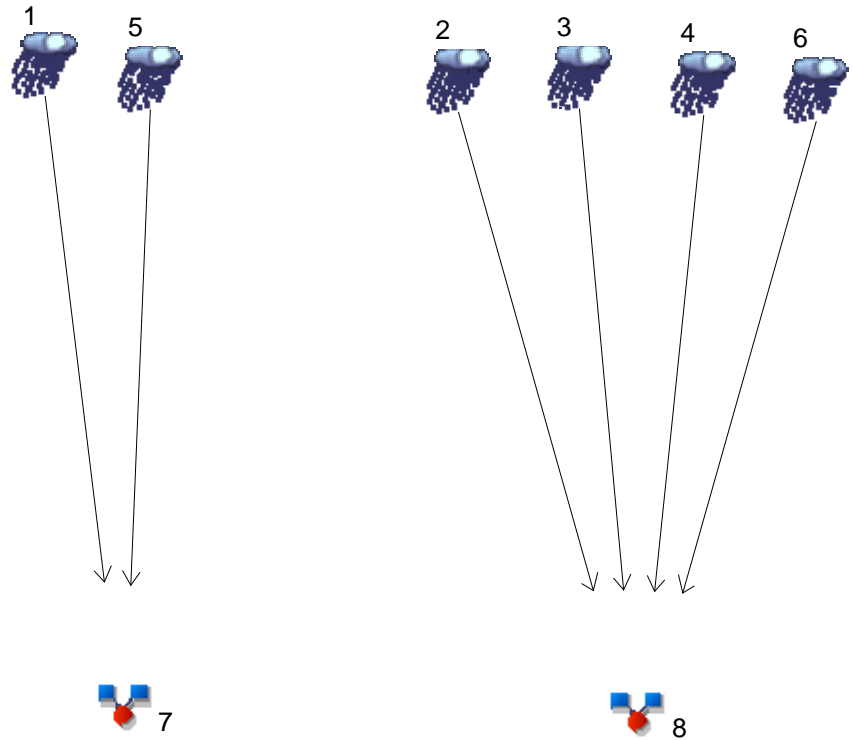
4550 North 12th Street
 Phoenix, Arizona 85014
 Phone 602-264-6831
<http://www.cvici.com>

FRANCISCAN RENEWAL CENTER

WEIGHTED 'C' SLOPE ANALYSIS

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	Manual	OFF1
2	Manual	OFF2
3	Manual	OFF3
4	Manual	OFF4
5	Manual	Ex-ON-1
6	Manual	Ex-ON-2
7	Combine	OFF1 and Ex-ON-1 (Point A)
8	Combine	OFF2, OFF3, OFF4 and Ex-ON-2 (Point B)

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description	
1	Manual	94.20	1	10	74,514	-----	-----	-----	OFF1	
2	Manual	70.20	1	11	61,380	-----	-----	-----	OFF2	
3	Manual	13.00	1	16	16,665	-----	-----	-----	OFF3	
4	Manual	3.000	1	10	2,403	-----	-----	-----	OFF4	
5	Manual	10.00	1	7	5,612	-----	-----	-----	Ex-ON-1	
6	Manual	98.00	1	7	55,002	-----	-----	-----	Ex-ON-2	
7	Combine	101.63	1	10	80,126	1, 5,	-----	-----	OFF1 and Ex-ON-1 (Point A)	
8	Combine	151.79	1	7	135,450	2, 3, 4, 6,	-----	-----	OFF2, OFF3, OFF4 and Ex-ON-2 (Po	
Existing Franciscan 08142015.gpw					Return Period: 100 Year			Monday, 08 / 17 / 2015		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

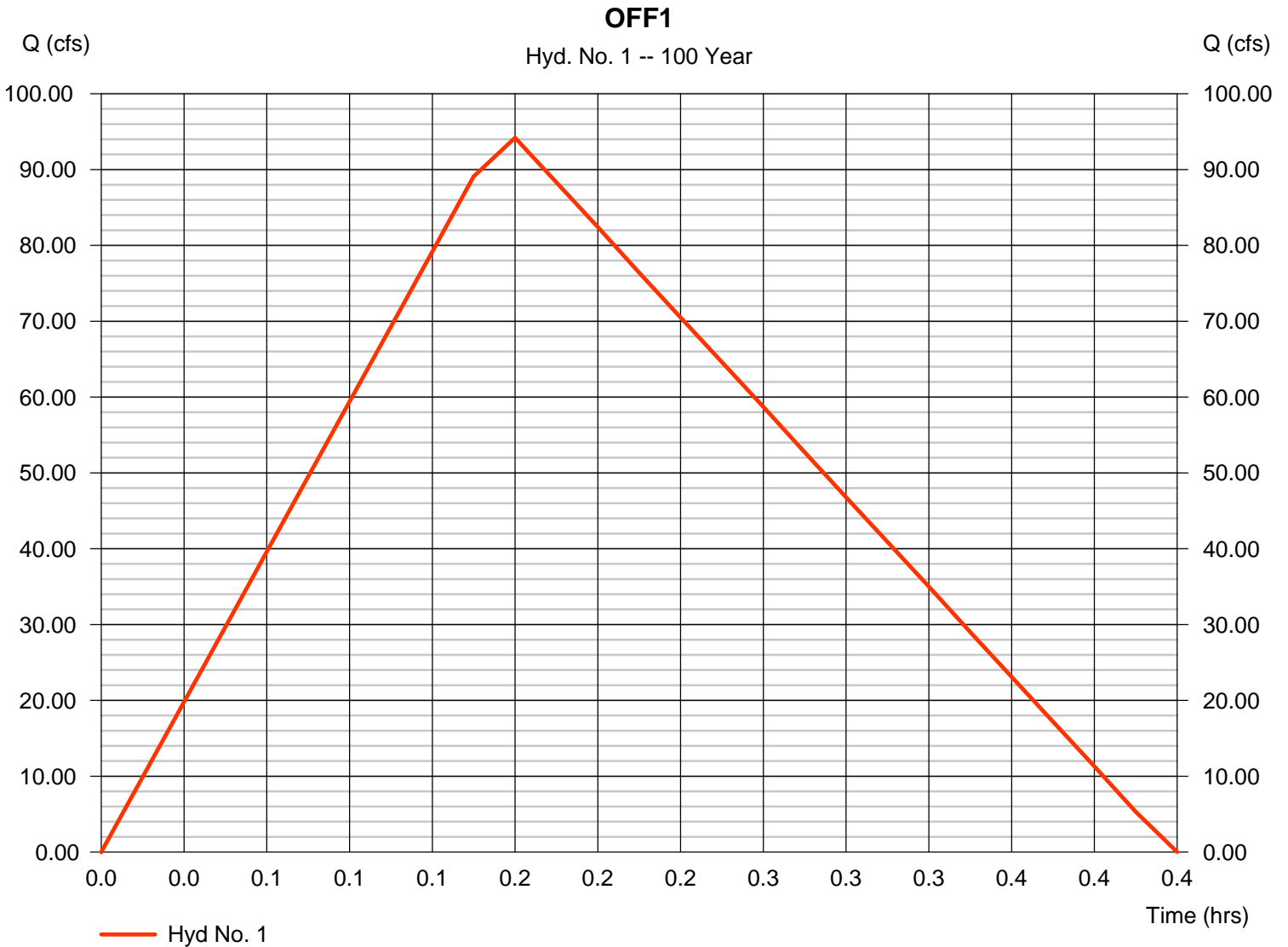
Monday, 08 / 17 / 2015

Hyd. No. 1

OFF1

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 94.20 cfs
Time to peak = 0.17 hrs
Hyd. volume = 74,514 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

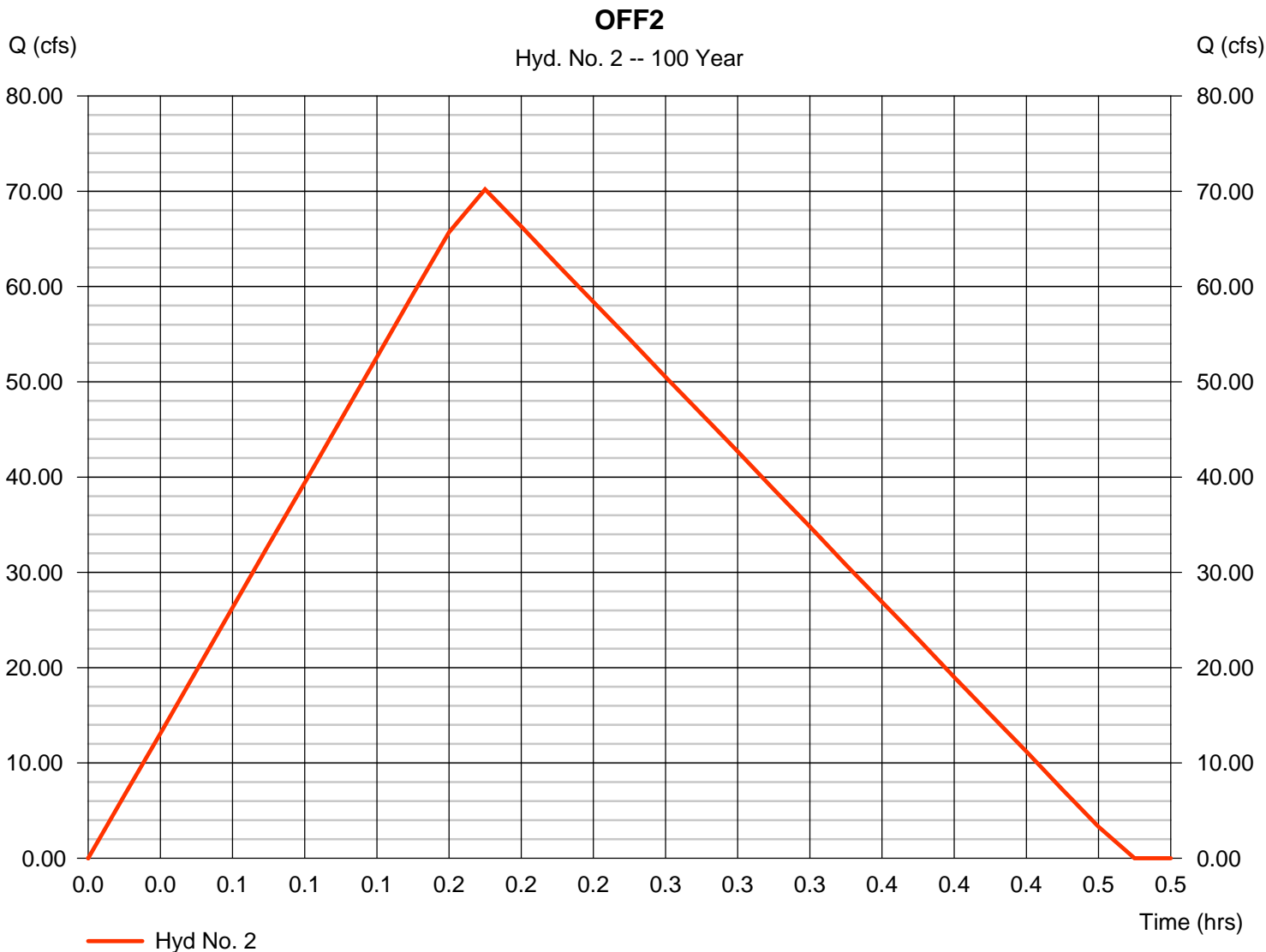
Monday, 08 / 17 / 2015

Hyd. No. 2

OFF2

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 70.20 cfs
Time to peak = 0.18 hrs
Hyd. volume = 61,380 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

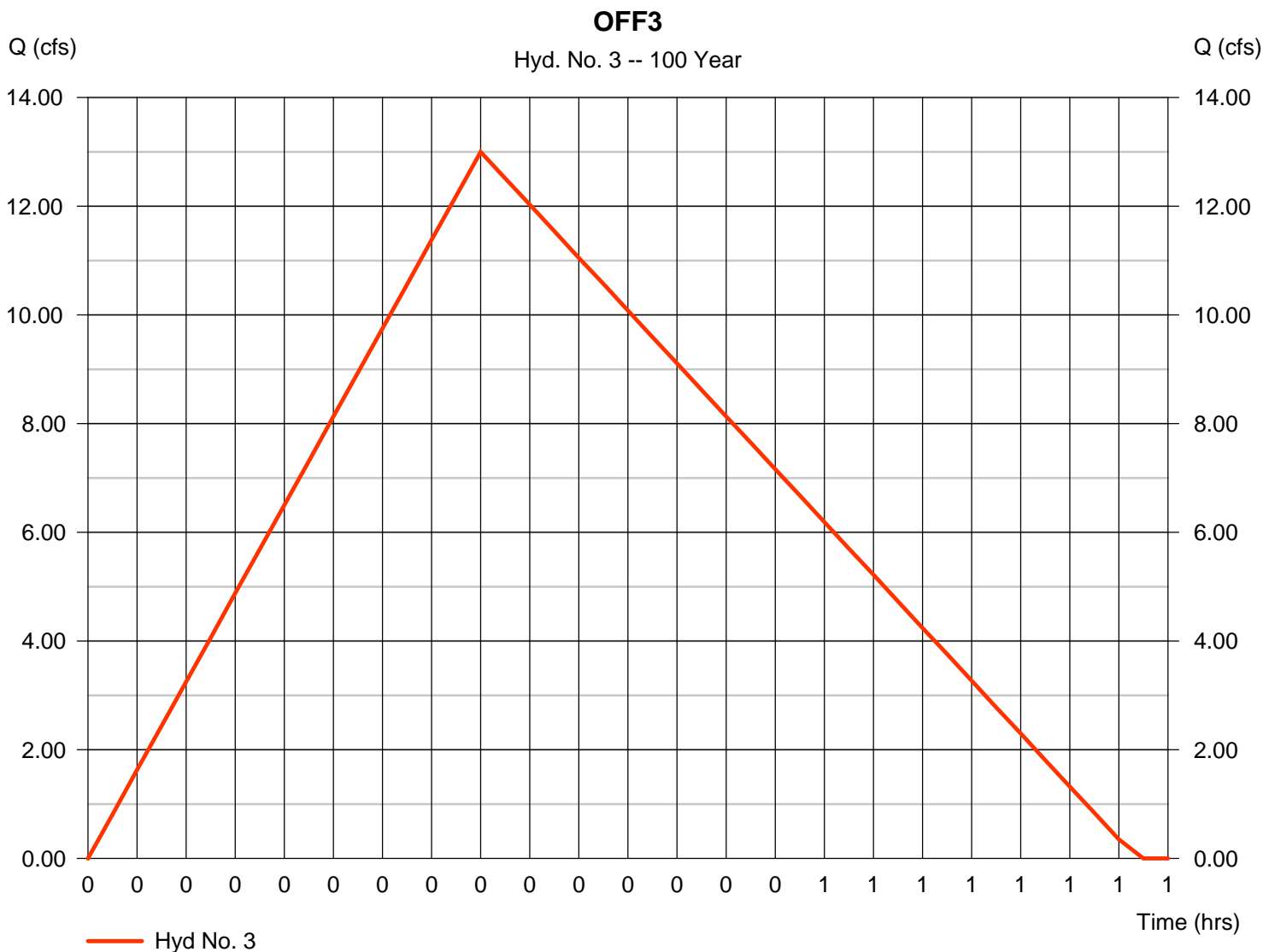
Monday, 08 / 17 / 2015

Hyd. No. 3

OFF3

Hydrograph type = Manual
 Storm frequency = 100 yrs
 Time interval = 1 min

Peak discharge = 13.00 cfs
 Time to peak = 0.27 hrs
 Hyd. volume = 16,665 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 08 / 17 / 2015

Hyd. No. 4

OFF4

Hydrograph type	= Manual	Peak discharge	= 3.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 2,403 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

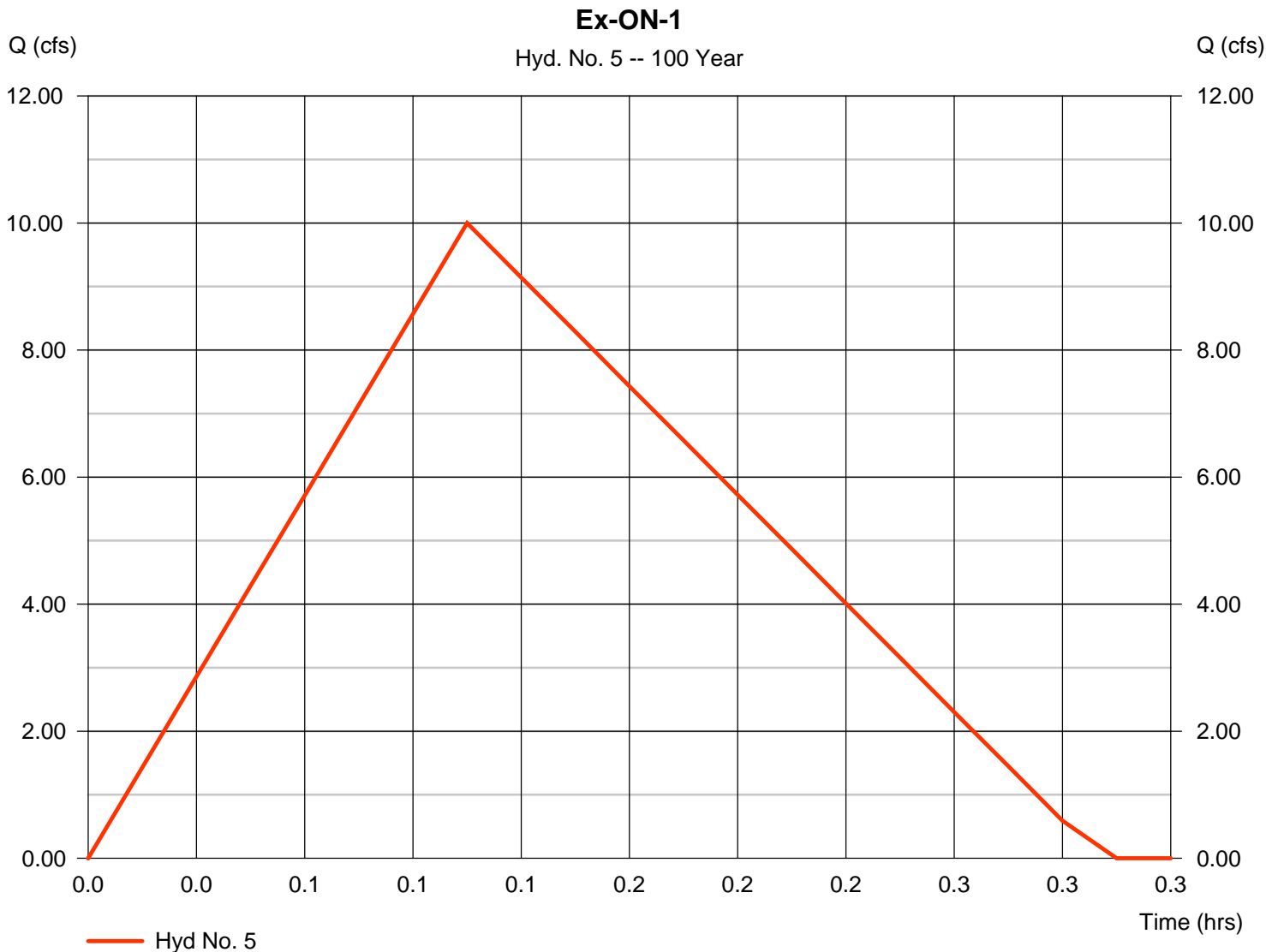
Monday, 08 / 17 / 2015

Hyd. No. 5

Ex-ON-1

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 10.00 cfs
Time to peak = 0.12 hrs
Hyd. volume = 5,612 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

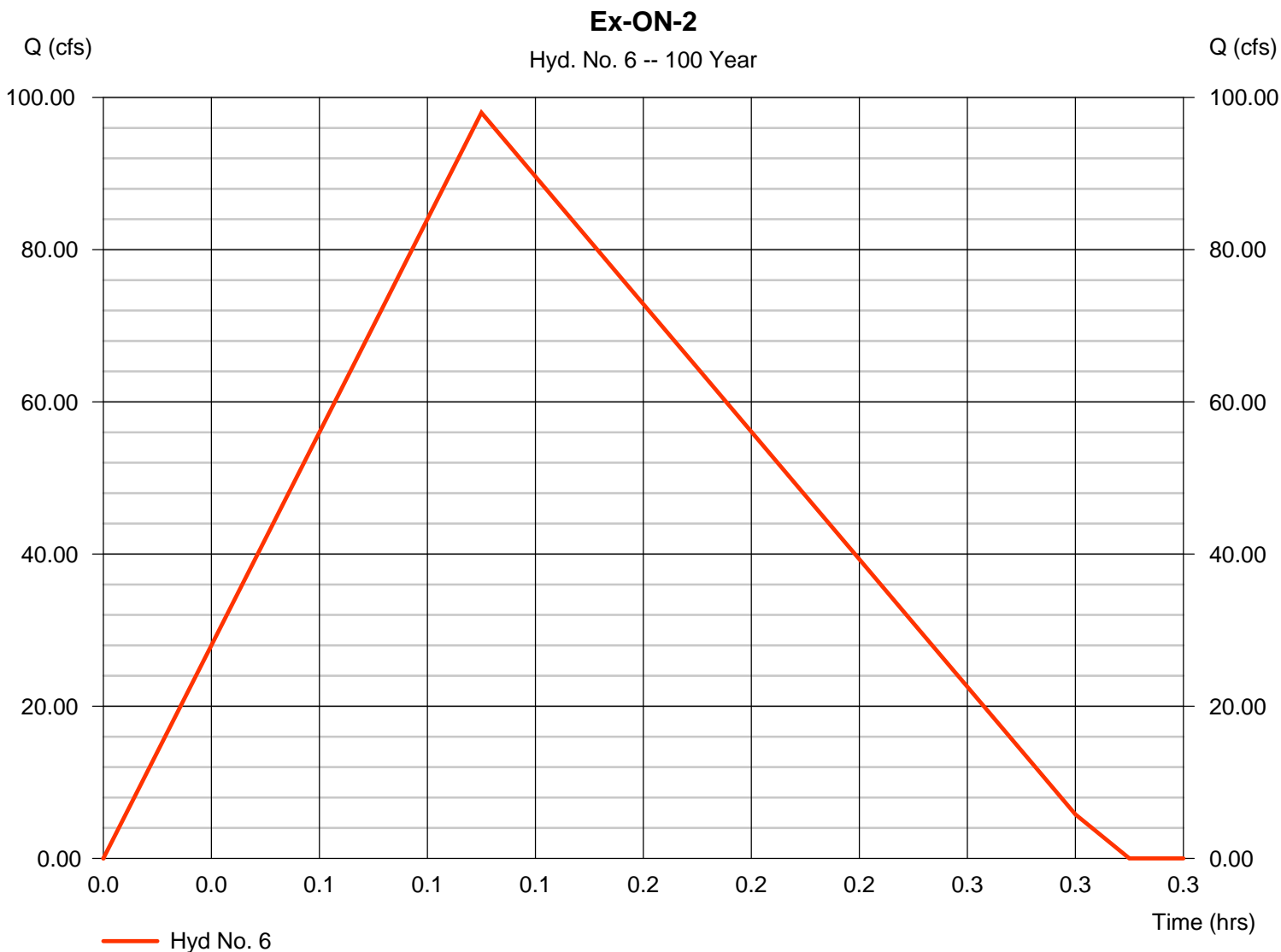
Monday, 08 / 17 / 2015

Hyd. No. 6

Ex-ON-2

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 98.00 cfs
Time to peak = 0.12 hrs
Hyd. volume = 55,002 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 08 / 17 / 2015

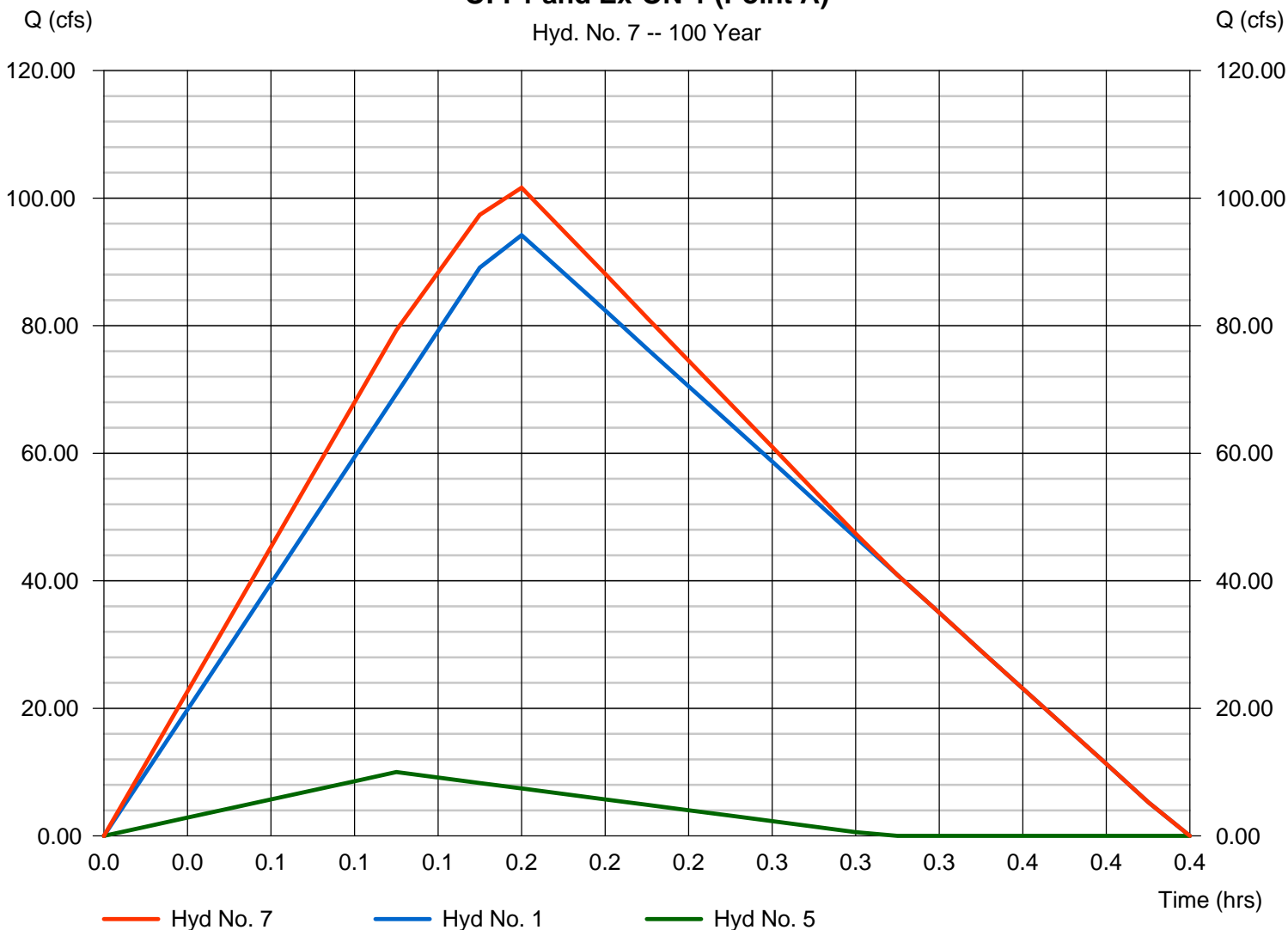
Hyd. No. 7

OFF1 and Ex-ON-1 (Point A)

Hydrograph type	= Combine	Peak discharge	= 101.63 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 80,126 cuft
Inflow hyds.	= 1, 5	Contrib. drain. area	= 0.000 ac

OFF1 and Ex-ON-1 (Point A)

Hyd. No. 7 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 08 / 17 / 2015

Hyd. No. 8

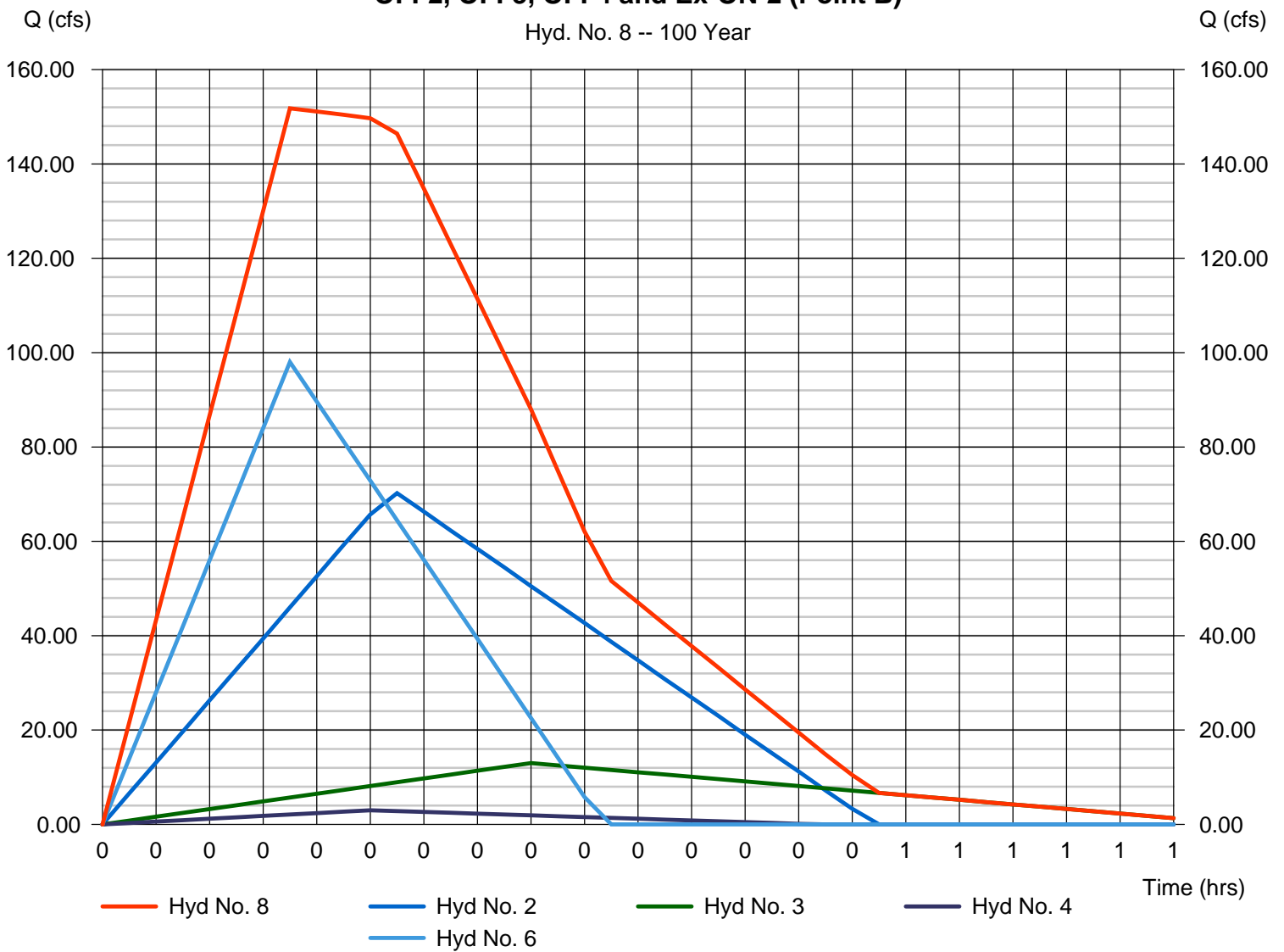
OFF2, OFF3, OFF4 and Ex-ON-2 (Point B)

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 1 min
 Inflow hyds. = 2, 3, 4, 6

Peak discharge = 151.79 cfs
 Time to peak = 0.12 hrs
 Hyd. volume = 135,450 cuft
 Contrib. drain. area = 0.000 ac

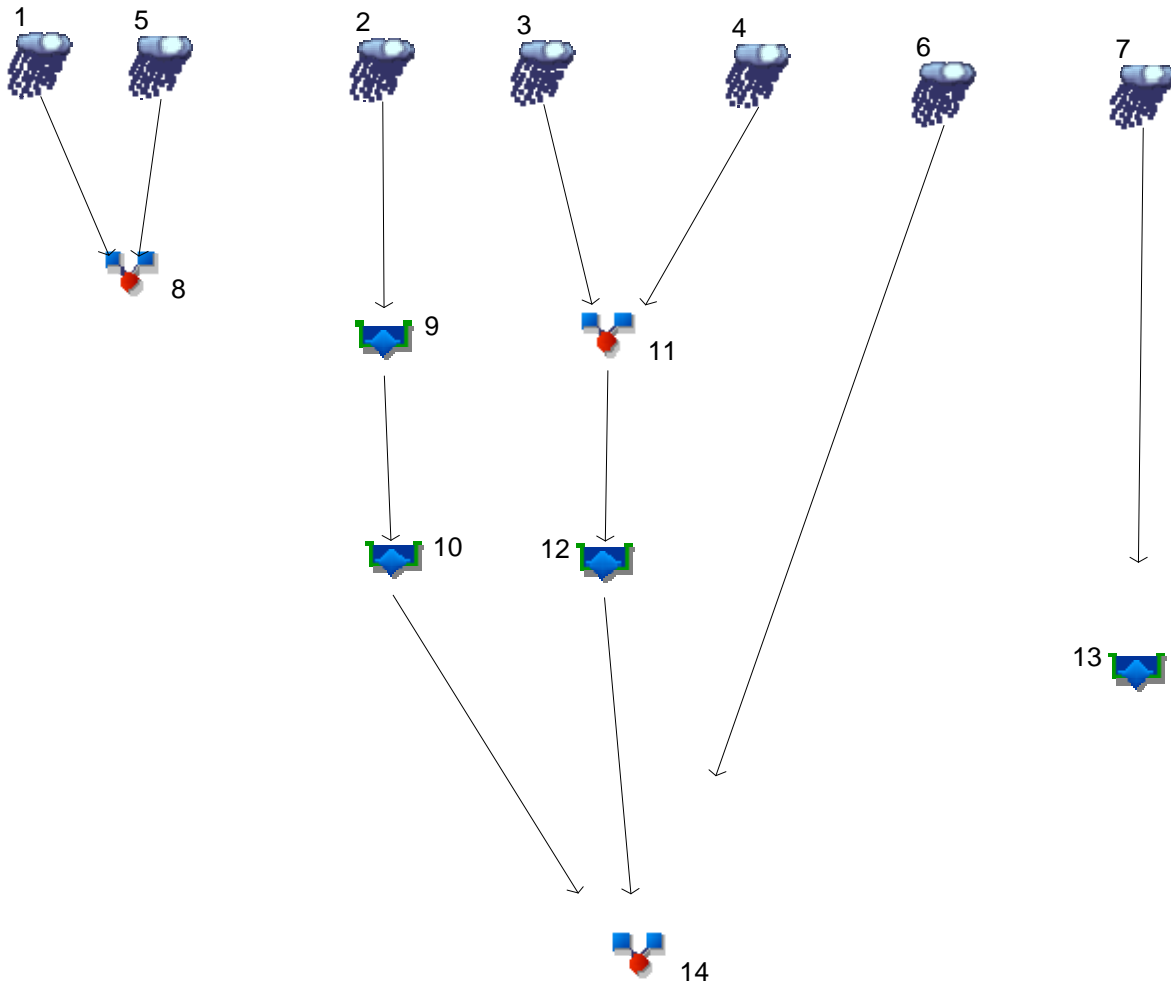
OFF2, OFF3, OFF4 and Ex-ON-2 (Point B)

Hyd. No. 8 -- 100 Year



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



Legend

Hyd. Origin	Description
1 Manual	OFF1
2 Manual	OFF2
3 Manual	OFF3
4 Manual	OFF4
5 Manual	P-ON-1
6 Manual	P-ON-2
7 Manual	P-ON-3
8 Combine	OFF1 and P-ON-1 (Point A)
9 Reservoir	OFF2 TO R1
10 Reservoir	R1 TO R2
11 Combine	OFF3 and OFF4
12 Reservoir	TO R3
13 Reservoir	P-ON-3 TO R4
14 Combine	R2, R3 and P-ON-2 (Point B)

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description	
1	Manual	94.20	1	10	74,514	-----	-----	-----	OFF1	
2	Manual	70.20	1	11	61,380	-----	-----	-----	OFF2	
3	Manual	13.00	1	16	16,665	-----	-----	-----	OFF3	
4	Manual	3.000	1	10	2,403	-----	-----	-----	OFF4	
5	Manual	10.00	1	7	5,612	-----	-----	-----	P-ON-1	
6	Manual	104.00	1	7	58,370	-----	-----	-----	P-ON-2	
7	Manual	2.000	1	5	802	-----	-----	-----	P-ON-3	
8	Combine	101.63	1	10	80,126	1, 5,	-----	-----	OFF1 and P-ON-1 (Point A)	
9	Reservoir	27.45	1	22	57,433	2	1373.84	48,780	OFF2 TO R1	
10	Reservoir	0.764	1	375	51,936	9	1370.87	23,038	R1 TO R2	
11	Combine	14.92	1	16	19,068	3, 4,	-----	-----	OFF3 and OFF4	
12	Reservoir	0.718	1	41	17,301	11	1368.52	17,859	TO R3	
13	Reservoir	0.000	1	n/a	0	7	1367.51	802	P-ON-3 TO R4	
14	Combine	104.00	1	7	127,607	6, 10, 12,	-----	-----	R2, R3 and P-ON-2 (Point B)	
Proposed Franciscan 08142015.gpw					Return Period: 100 Year			Monday, 08 / 17 / 2015		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

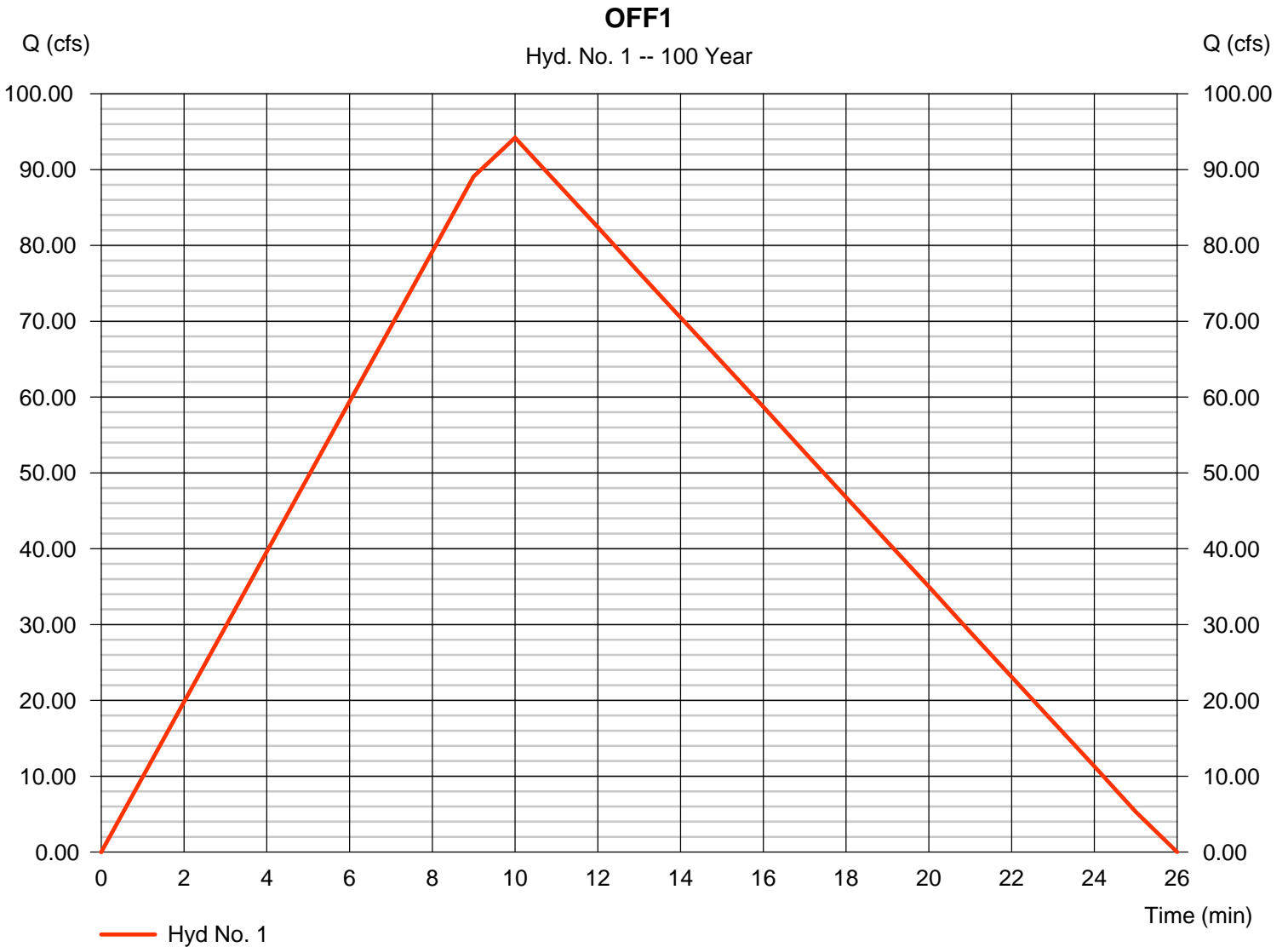
Monday, 08 / 17 / 2015

Hyd. No. 1

OFF1

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 94.20 cfs
Time to peak = 10 min
Hyd. volume = 74,514 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

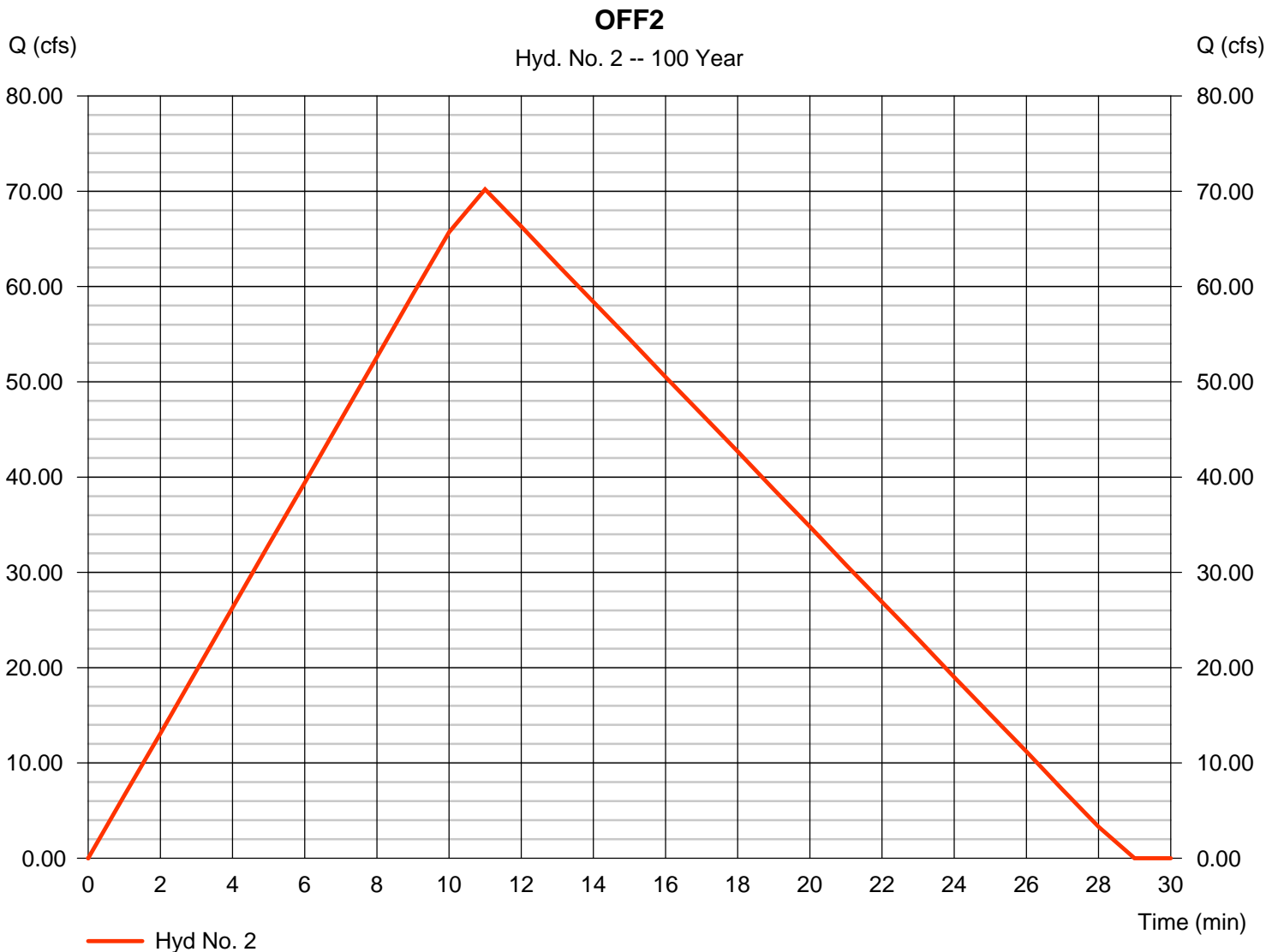
Monday, 08 / 17 / 2015

Hyd. No. 2

OFF2

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 70.20 cfs
Time to peak = 11 min
Hyd. volume = 61,380 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

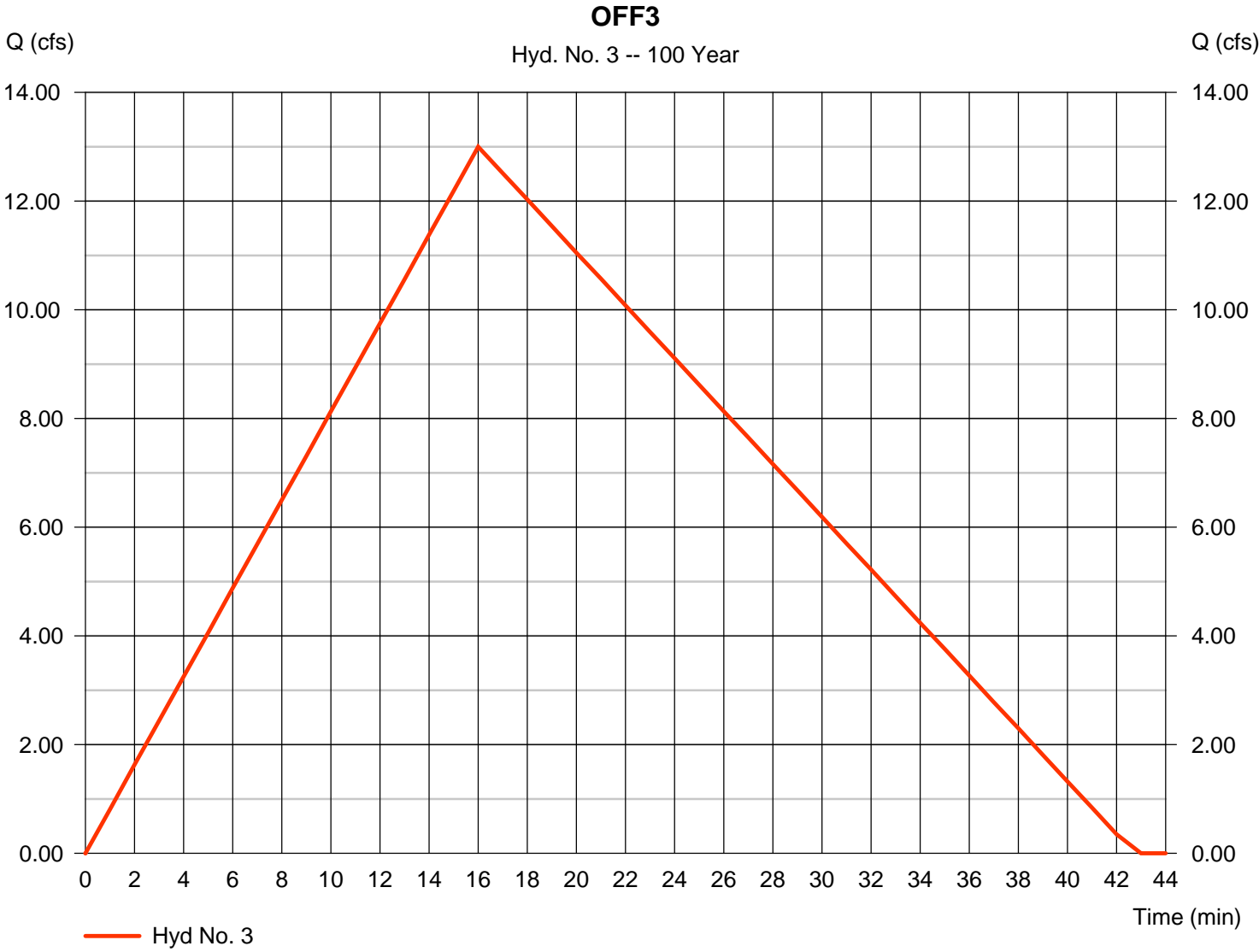
Monday, 08 / 17 / 2015

Hyd. No. 3

OFF3

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 13.00 cfs
Time to peak = 16 min
Hyd. volume = 16,665 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 08 / 17 / 2015

Hyd. No. 4

OFF4

Hydrograph type	= Manual	Peak discharge	= 3.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 2,403 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

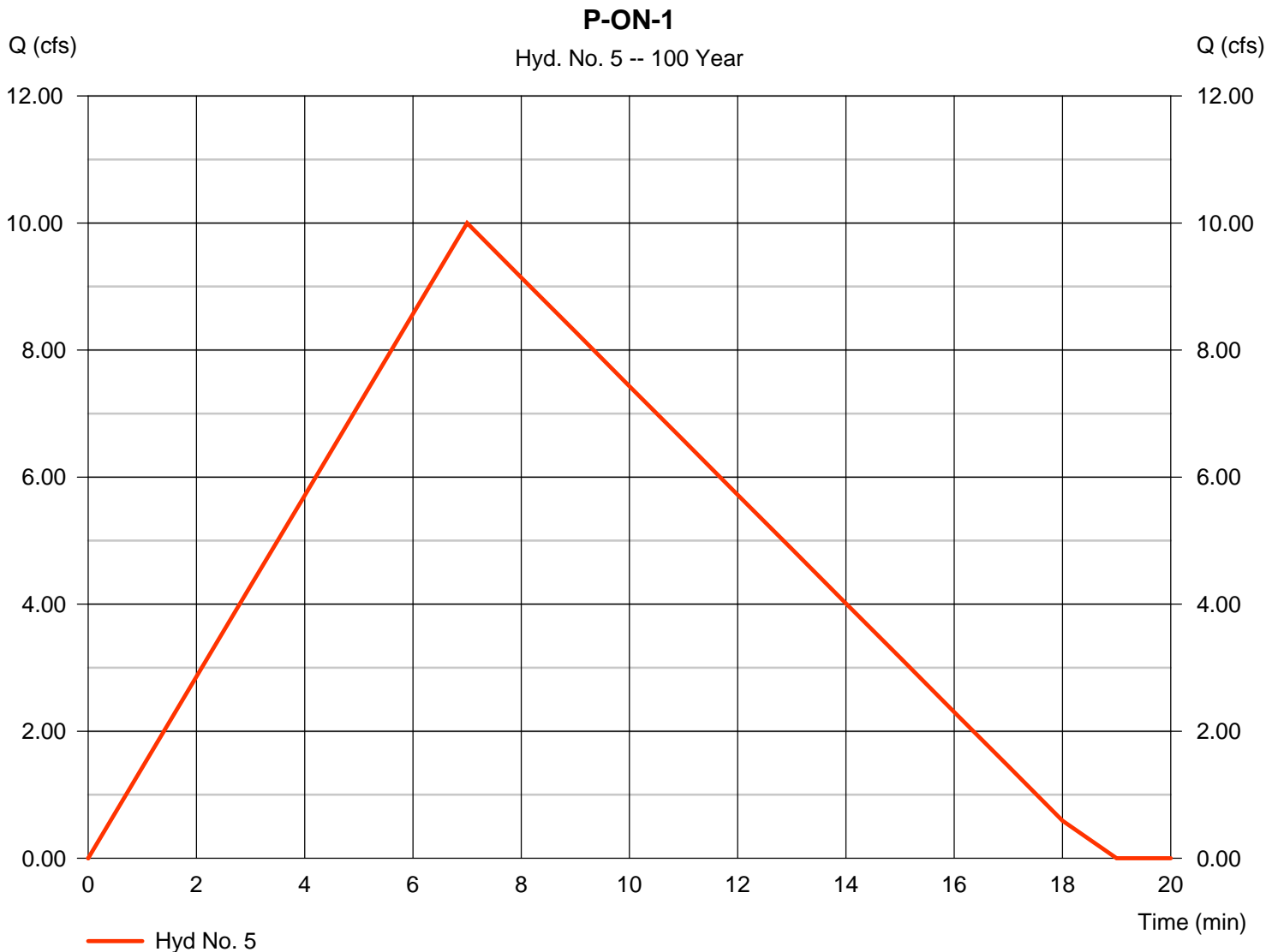
Monday, 08 / 17 / 2015

Hyd. No. 5

P-ON-1

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 10.00 cfs
Time to peak = 7 min
Hyd. volume = 5,612 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

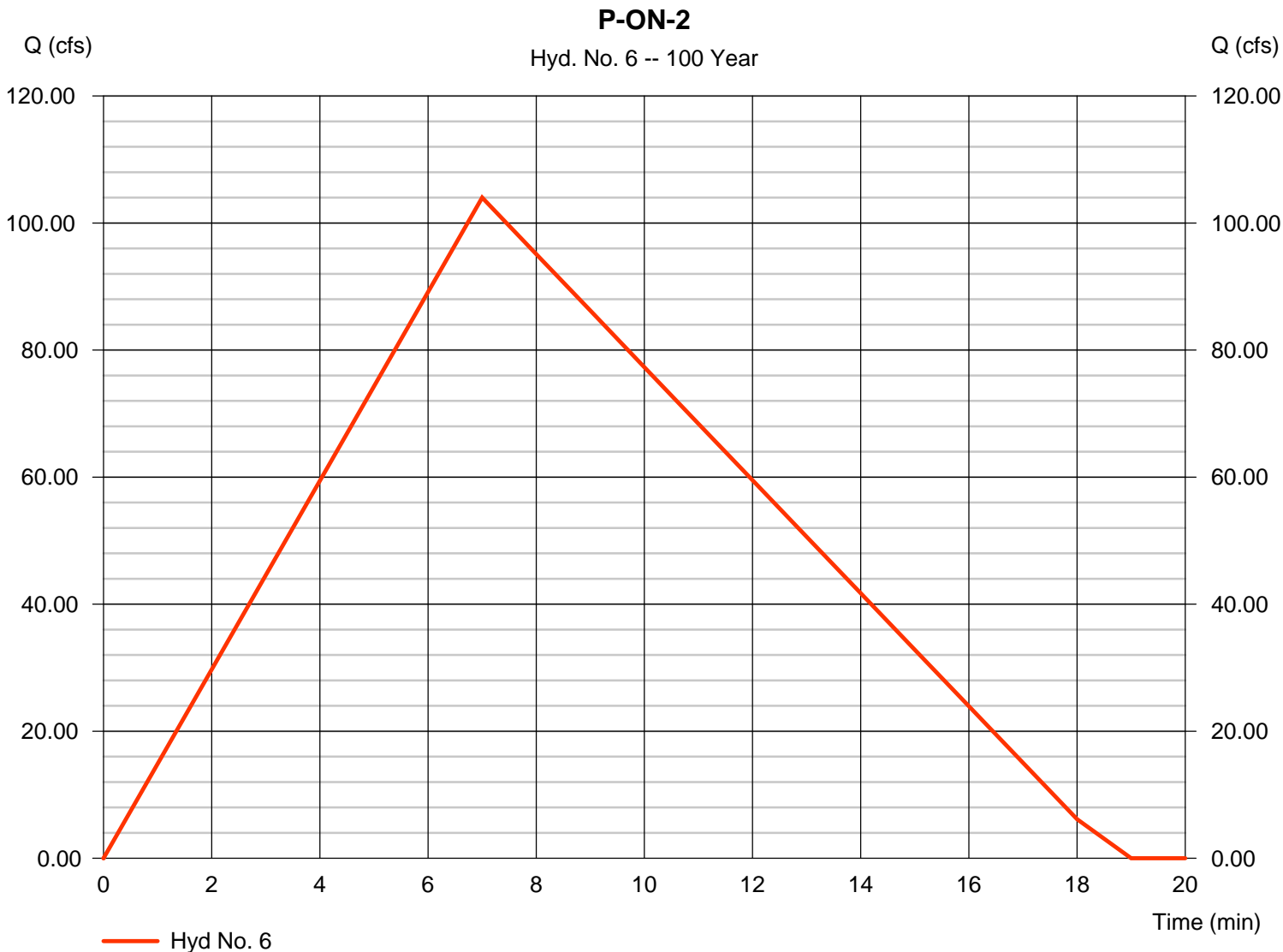
Monday, 08 / 17 / 2015

Hyd. No. 6

P-ON-2

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 104.00 cfs
Time to peak = 7 min
Hyd. volume = 58,370 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

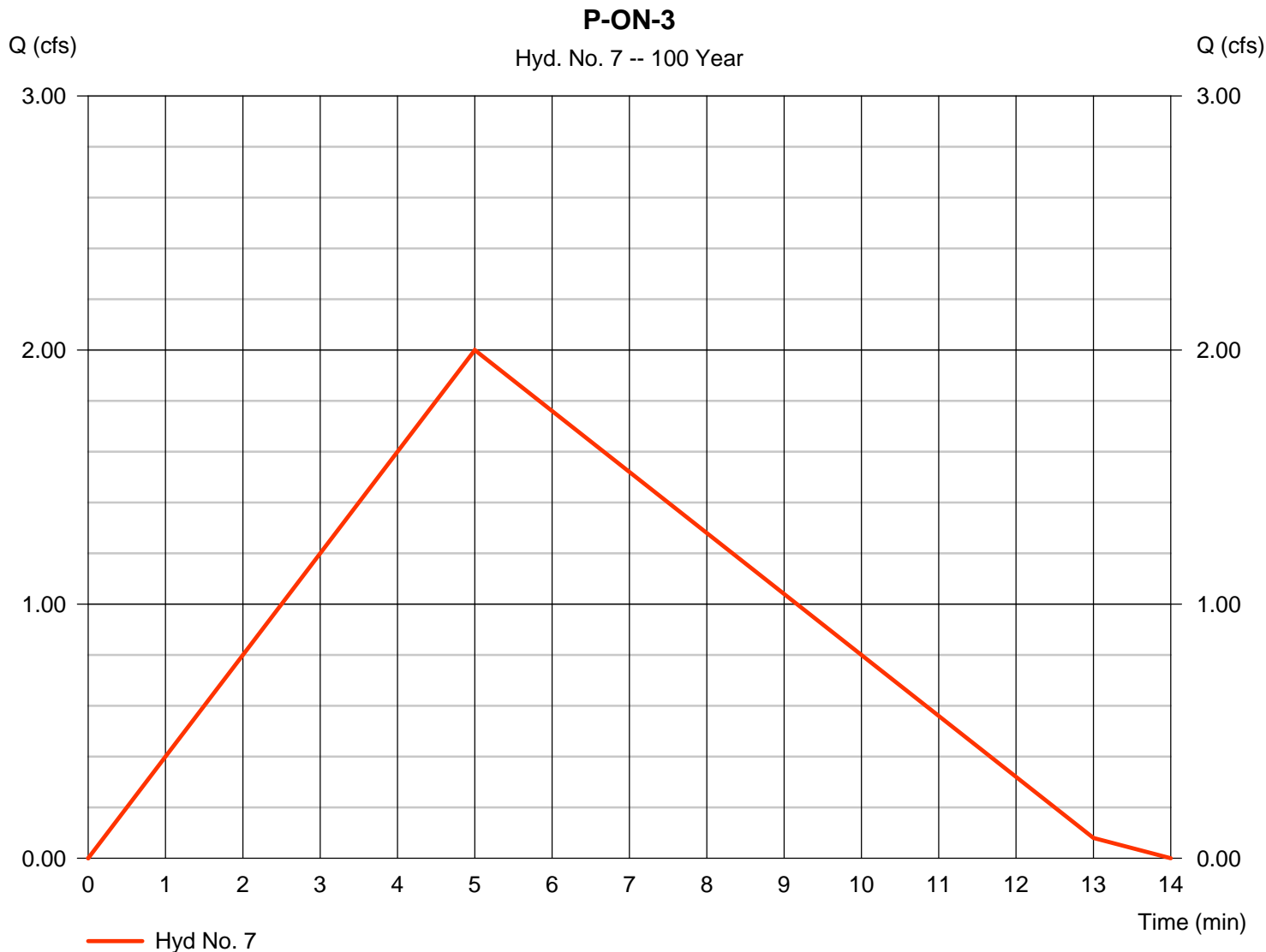
Monday, 08 / 17 / 2015

Hyd. No. 7

P-ON-3

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 1 min

Peak discharge = 2.000 cfs
Time to peak = 5 min
Hyd. volume = 802 cuft



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 08 / 17 / 2015

Hyd. No. 8

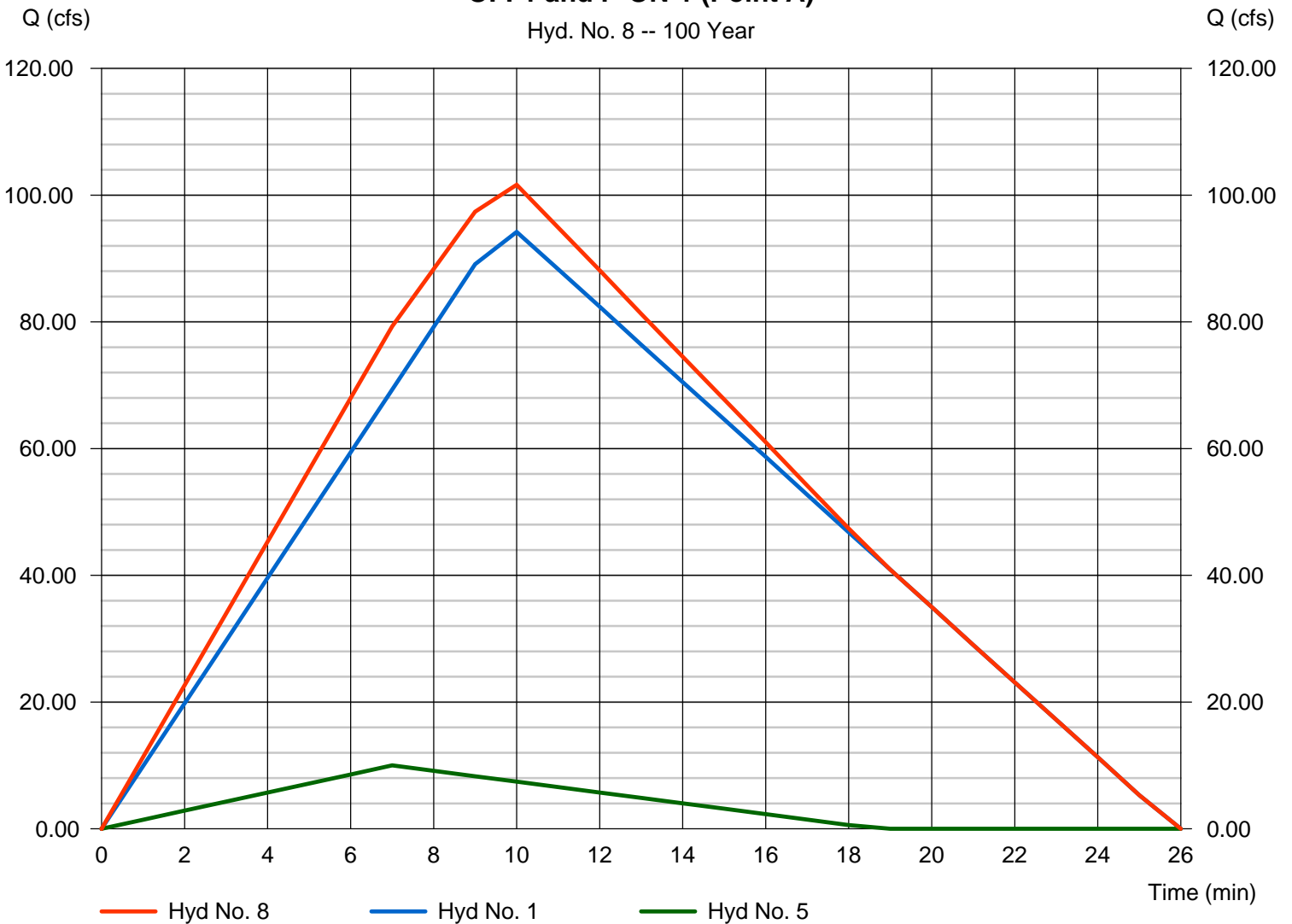
OFF1 and P-ON-1 (Point A)

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 1 min
 Inflow hyds. = 1, 5

Peak discharge = 101.63 cfs
 Time to peak = 10 min
 Hyd. volume = 80,126 cuft
 Contrib. drain. area = 0.000 ac

OFF1 and P-ON-1 (Point A)

Hyd. No. 8 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

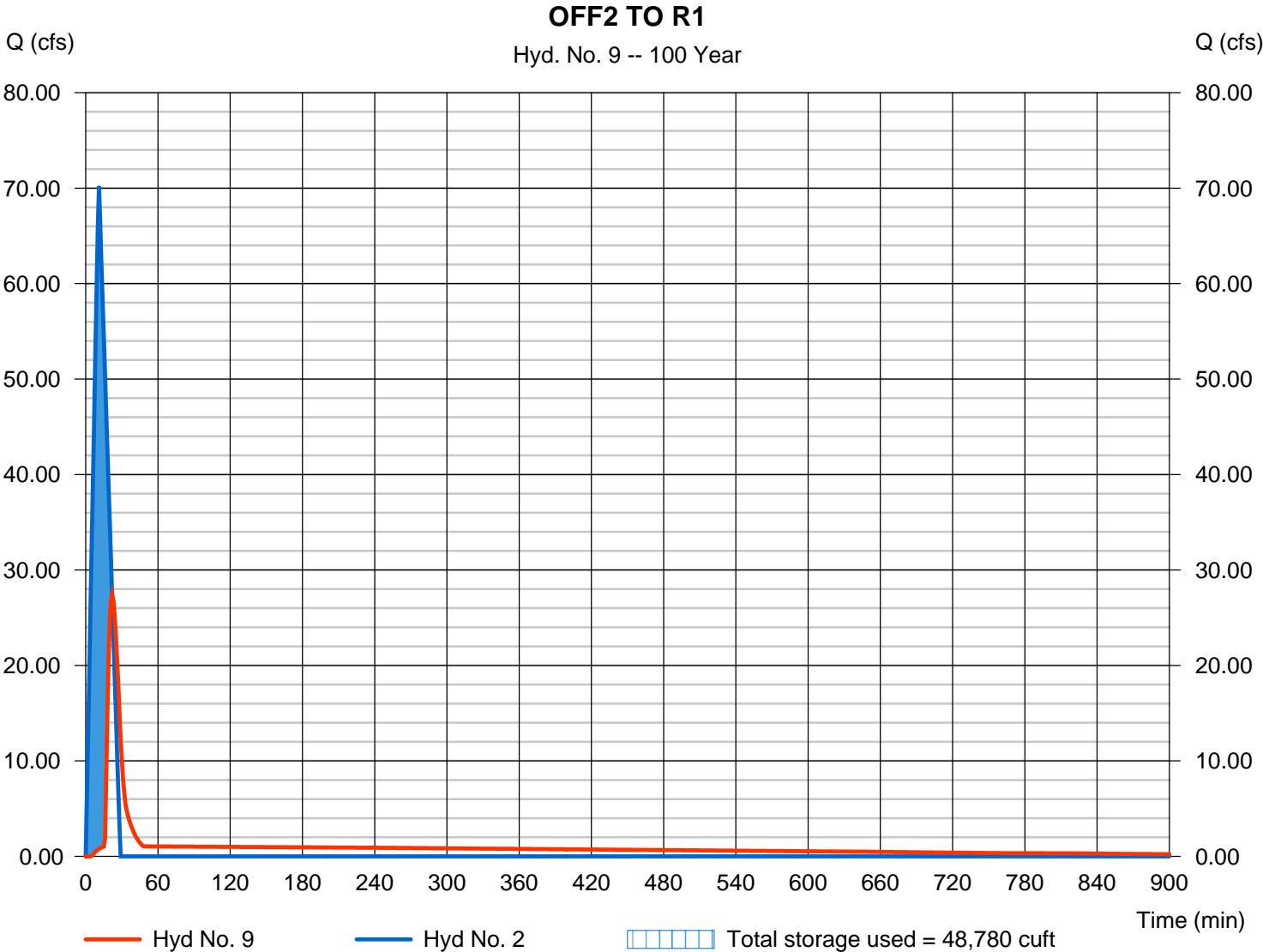
Monday, 08 / 17 / 2015

Hyd. No. 9

OFF2 TO R1

Hydrograph type	= Reservoir	Peak discharge	= 27.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 22 min
Time interval	= 1 min	Hyd. volume	= 57,433 cuft
Inflow hyd. No.	= 2 - OFF2	Max. Elevation	= 1373.84 ft
Reservoir name	= R1	Max. Storage	= 48,780 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - R1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1371.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1371.00	12,286	0	0
1.00	1372.00	13,048	12,664	12,664
2.00	1373.00	20,970	16,852	29,516
3.00	1374.00	25,092	22,998	52,514

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	0.00	0.00	0.00
Span (in)	= 6.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1371.30	0.00	0.00	0.00
Length (ft)	= 36.00	0.00	0.00	0.00
Slope (%)	= 0.55	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 40.00	0.00	0.00	0.00
Crest El. (ft)	= 1373.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	1371.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.10	1,266	1371.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.20	2,533	1371.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.30	3,799	1371.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.40	5,066	1371.40	0.03 ic	---	---	---	0.00	---	---	---	---	---	0.030
0.50	6,332	1371.50	0.11 ic	---	---	---	0.00	---	---	---	---	---	0.112
0.60	7,598	1371.60	0.22 oc	---	---	---	0.00	---	---	---	---	---	0.221
0.70	8,865	1371.70	0.31 oc	---	---	---	0.00	---	---	---	---	---	0.314
0.80	10,131	1371.80	0.34 oc	---	---	---	0.00	---	---	---	---	---	0.340
0.90	11,398	1371.90	0.41 oc	---	---	---	0.00	---	---	---	---	---	0.414
1.00	12,664	1372.00	0.48 oc	---	---	---	0.00	---	---	---	---	---	0.479
1.10	14,349	1372.10	0.54 oc	---	---	---	0.00	---	---	---	---	---	0.536
1.20	16,034	1372.20	0.59 oc	---	---	---	0.00	---	---	---	---	---	0.587
1.30	17,719	1372.30	0.63 oc	---	---	---	0.00	---	---	---	---	---	0.634
1.40	19,405	1372.40	0.68 oc	---	---	---	0.00	---	---	---	---	---	0.678
1.50	21,090	1372.50	0.72 oc	---	---	---	0.00	---	---	---	---	---	0.720
1.60	22,775	1372.60	0.76 oc	---	---	---	0.00	---	---	---	---	---	0.759
1.70	24,460	1372.70	0.80 oc	---	---	---	0.00	---	---	---	---	---	0.796
1.80	26,145	1372.80	0.83 oc	---	---	---	0.00	---	---	---	---	---	0.831
1.90	27,830	1372.90	0.87 oc	---	---	---	0.00	---	---	---	---	---	0.865
2.00	29,516	1373.00	0.90 oc	---	---	---	0.00	---	---	---	---	---	0.898
2.10	31,815	1373.10	0.93 oc	---	---	---	0.00	---	---	---	---	---	0.929
2.20	34,115	1373.20	0.96 oc	---	---	---	0.00	---	---	---	---	---	0.960
2.30	36,415	1373.30	0.99 oc	---	---	---	0.00	---	---	---	---	---	0.990
2.40	38,715	1373.40	1.02 oc	---	---	---	0.00	---	---	---	---	---	1.018
2.50	41,015	1373.50	1.05 oc	---	---	---	0.00	---	---	---	---	---	1.046
2.60	43,314	1373.60	1.07 oc	---	---	---	4.20	---	---	---	---	---	5.276
2.70	45,614	1373.70	1.10 oc	---	---	---	11.90	---	---	---	---	---	13.00
2.80	47,914	1373.80	1.13 oc	---	---	---	21.87	---	---	---	---	---	22.99
2.90	50,214	1373.90	1.15 oc	---	---	---	33.67	---	---	---	---	---	34.82
3.00	52,514	1374.00	1.18 oc	---	---	---	47.09	---	---	---	---	---	48.27

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

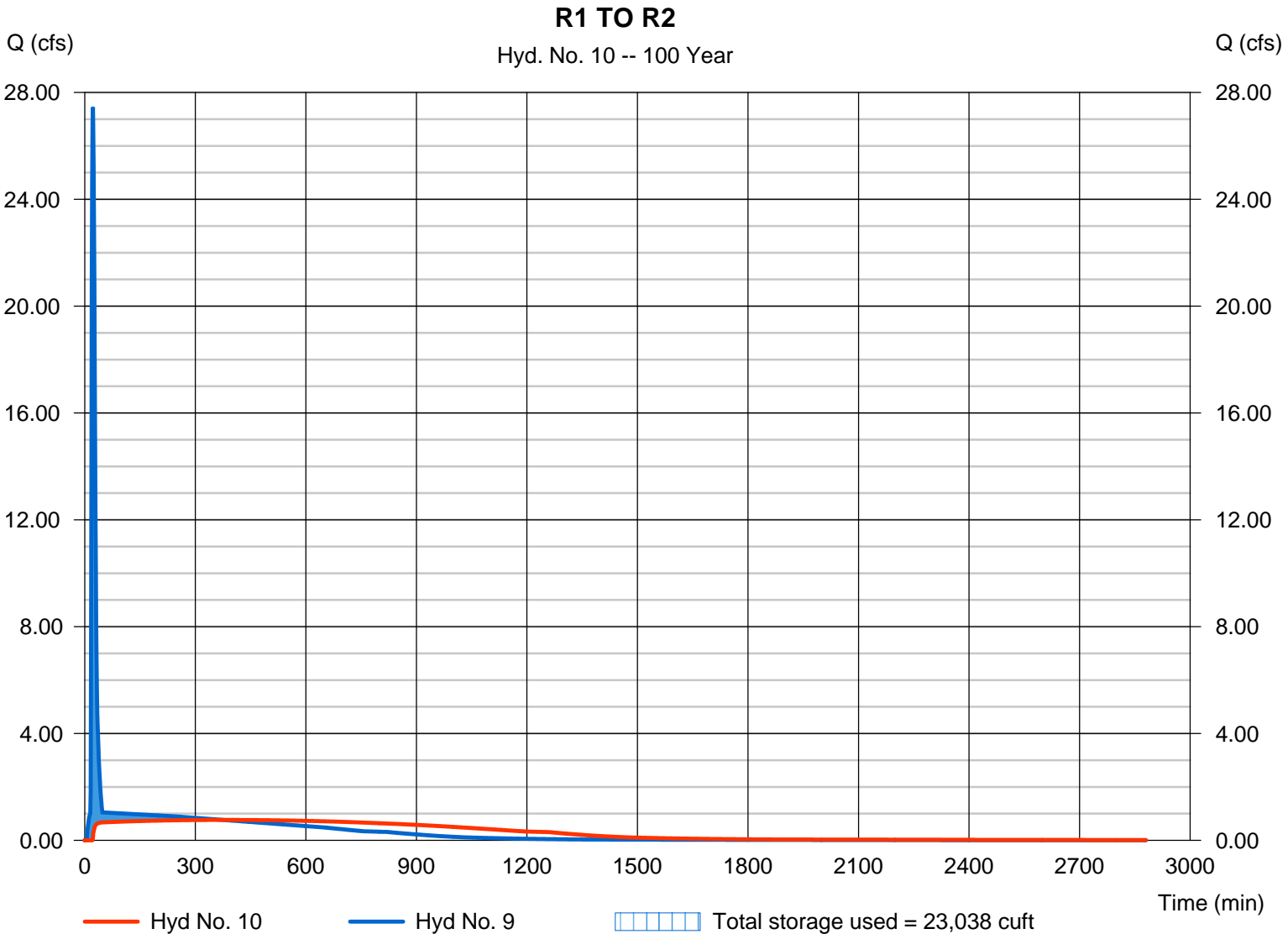
Monday, 08 / 17 / 2015

Hyd. No. 10

R1 TO R2

Hydrograph type	= Reservoir	Peak discharge	= 0.764 cfs
Storm frequency	= 100 yrs	Time to peak	= 375 min
Time interval	= 1 min	Hyd. volume	= 51,936 cuft
Inflow hyd. No.	= 9 - OFF2 TO R1	Max. Elevation	= 1370.87 ft
Reservoir name	= R2	Max. Storage	= 23,038 cuft

Storage Indication method used.



Pond No. 2 - R2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1369.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1369.00	8,146	0	0
1.00	1370.00	12,561	10,273	10,273
2.00	1371.00	16,932	14,691	24,964
3.00	1372.00	20,752	18,808	43,772
4.00	1373.00	24,611	22,652	66,424

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	0.00	0.00	0.00
Span (in)	= 6.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1369.50	0.00	0.00	0.00
Length (ft)	= 39.00	0.00	0.00	0.00
Slope (%)	= 0.51	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	0.00	0.00	0.00
Crest El. (ft)	= 1369.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	1369.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.10	1,027	1369.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.20	2,055	1369.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.30	3,082	1369.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.40	4,109	1369.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.50	5,137	1369.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.60	6,164	1369.60	0.03 ic	---	---	---	0.00	---	---	---	---	---	0.030
0.70	7,191	1369.70	0.11 ic	---	---	---	0.00	---	---	---	---	---	0.112
0.80	8,219	1369.80	0.22 oc	---	---	---	0.00	---	---	---	---	---	0.216
0.90	9,246	1369.90	0.31 oc	---	---	---	0.00	---	---	---	---	---	0.307
1.00	10,273	1370.00	0.33 oc	---	---	---	0.00	---	---	---	---	---	0.330
1.10	11,742	1370.10	0.40 oc	---	---	---	0.00	---	---	---	---	---	0.404
1.20	13,211	1370.20	0.47 oc	---	---	---	0.00	---	---	---	---	---	0.467
1.30	14,680	1370.30	0.52 oc	---	---	---	0.00	---	---	---	---	---	0.522
1.40	16,149	1370.40	0.57 oc	---	---	---	0.00	---	---	---	---	---	0.572
1.50	17,619	1370.50	0.62 oc	---	---	---	0.00	---	---	---	---	---	0.618
1.60	19,088	1370.60	0.66 oc	---	---	---	0.00	---	---	---	---	---	0.661
1.70	20,557	1370.70	0.70 oc	---	---	---	0.00	---	---	---	---	---	0.701
1.80	22,026	1370.80	0.74 oc	---	---	---	0.00	---	---	---	---	---	0.739
1.90	23,495	1370.90	0.78 oc	---	---	---	0.00	---	---	---	---	---	0.775
2.00	24,964	1371.00	0.81 oc	---	---	---	0.00	---	---	---	---	---	0.810
2.10	26,845	1371.10	0.84 oc	---	---	---	0.00	---	---	---	---	---	0.843
2.20	28,726	1371.20	0.87 oc	---	---	---	0.00	---	---	---	---	---	0.875
2.30	30,606	1371.30	0.91 oc	---	---	---	0.00	---	---	---	---	---	0.905
2.40	32,487	1371.40	0.94 oc	---	---	---	0.00	---	---	---	---	---	0.935
2.50	34,368	1371.50	0.96 oc	---	---	---	0.00	---	---	---	---	---	0.964
2.60	36,249	1371.60	0.99 oc	---	---	---	0.00	---	---	---	---	---	0.992
2.70	38,129	1371.70	1.02 oc	---	---	---	0.00	---	---	---	---	---	1.019
2.80	40,010	1371.80	1.05 oc	---	---	---	0.00	---	---	---	---	---	1.046
2.90	41,891	1371.90	1.07 oc	---	---	---	0.00	---	---	---	---	---	1.071
3.00	43,772	1372.00	1.10 oc	---	---	---	0.00	---	---	---	---	---	1.097
3.10	46,037	1372.10	1.12 oc	---	---	---	0.00	---	---	---	---	---	1.121
3.20	48,302	1372.20	1.15 oc	---	---	---	0.00	---	---	---	---	---	1.146
3.30	50,567	1372.30	1.17 oc	---	---	---	0.00	---	---	---	---	---	1.169
3.40	52,833	1372.40	1.19 oc	---	---	---	0.00	---	---	---	---	---	1.192
3.50	55,098	1372.50	1.22 oc	---	---	---	0.00	---	---	---	---	---	1.215
3.60	57,363	1372.60	1.24 oc	---	---	---	0.00	---	---	---	---	---	1.237
3.70	59,628	1372.70	1.26 oc	---	---	---	0.00	---	---	---	---	---	1.259

Continues on next page...

R2

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.80	61,893	1372.80	1.28 oc	---	---	---	0.00	---	---	---	---	---	1.281
3.90	64,159	1372.90	1.30 oc	---	---	---	0.00	---	---	---	---	---	1.302
4.00	66,424	1373.00	1.32 oc	---	---	---	0.00	---	---	---	---	---	1.323

...End

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

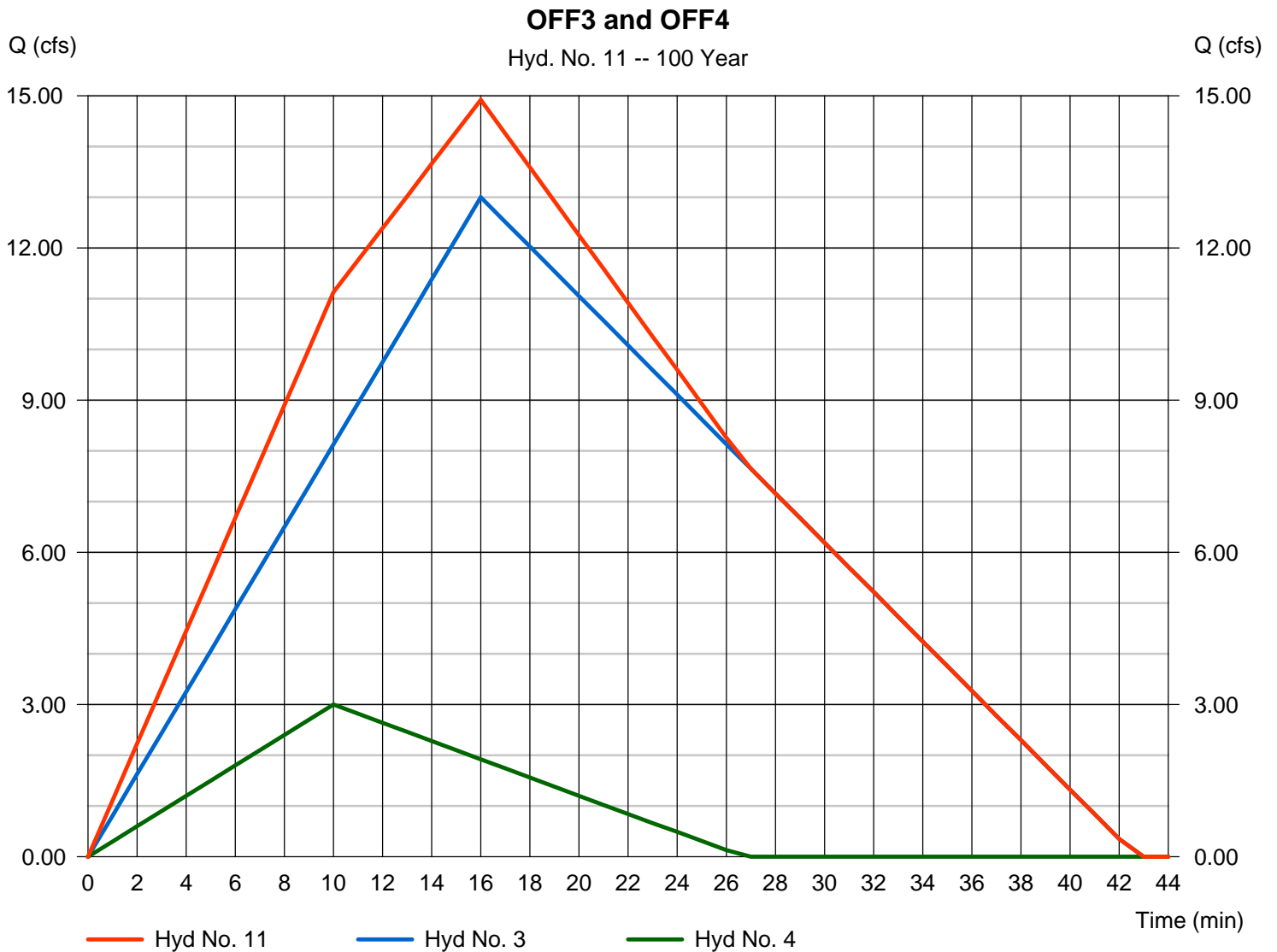
Monday, 08 / 17 / 2015

Hyd. No. 11

OFF3 and OFF4

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 1 min
 Inflow hyds. = 3, 4

Peak discharge = 14.92 cfs
 Time to peak = 16 min
 Hyd. volume = 19,068 cuft
 Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

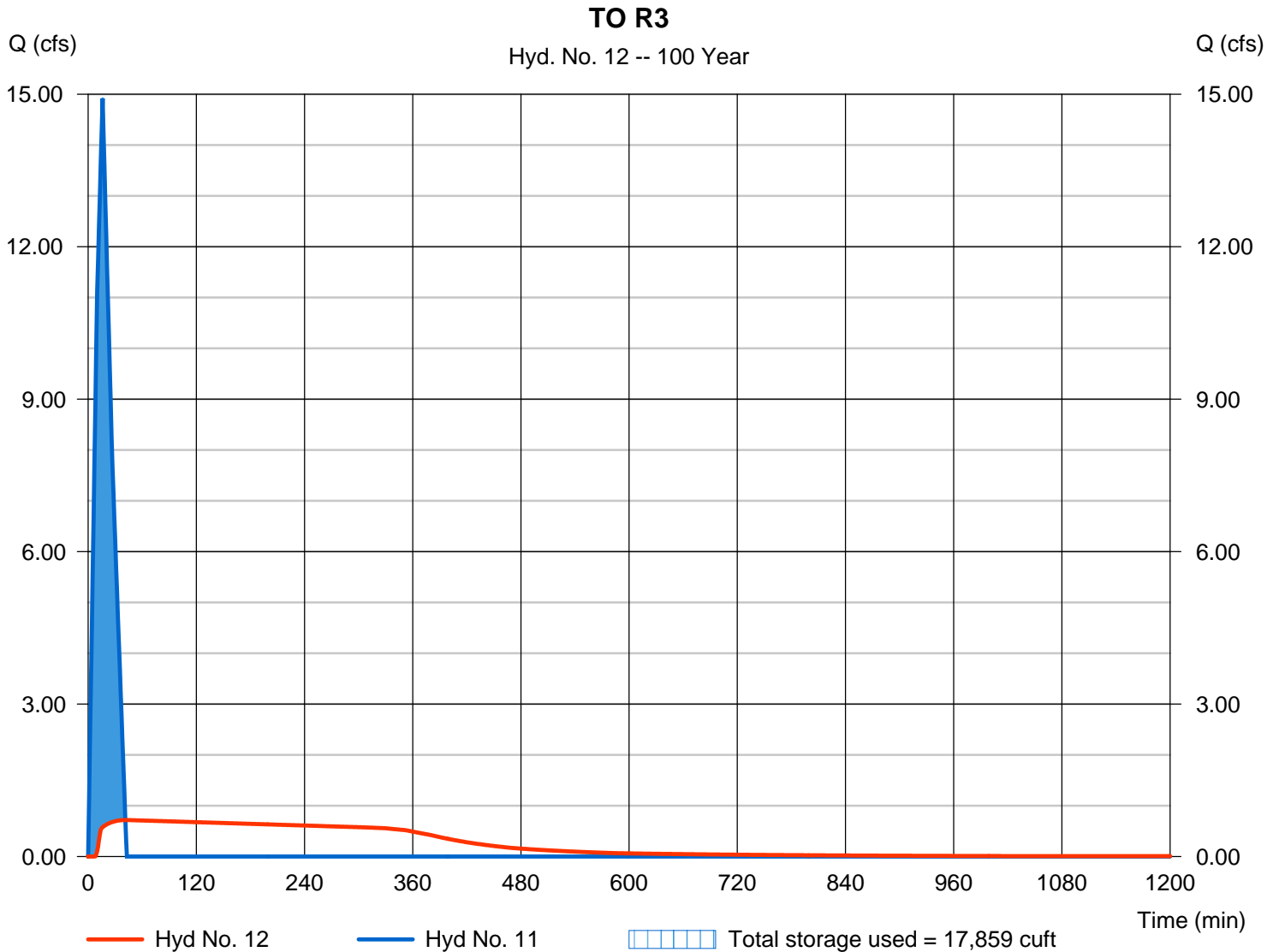
Monday, 08 / 17 / 2015

Hyd. No. 12

TO R3

Hydrograph type	= Reservoir	Peak discharge	= 0.718 cfs
Storm frequency	= 100 yrs	Time to peak	= 41 min
Time interval	= 1 min	Hyd. volume	= 17,301 cuft
Inflow hyd. No.	= 11 - OFF3 and OFF4	Max. Elevation	= 1368.52 ft
Reservoir name	= R3	Max. Storage	= 17,859 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

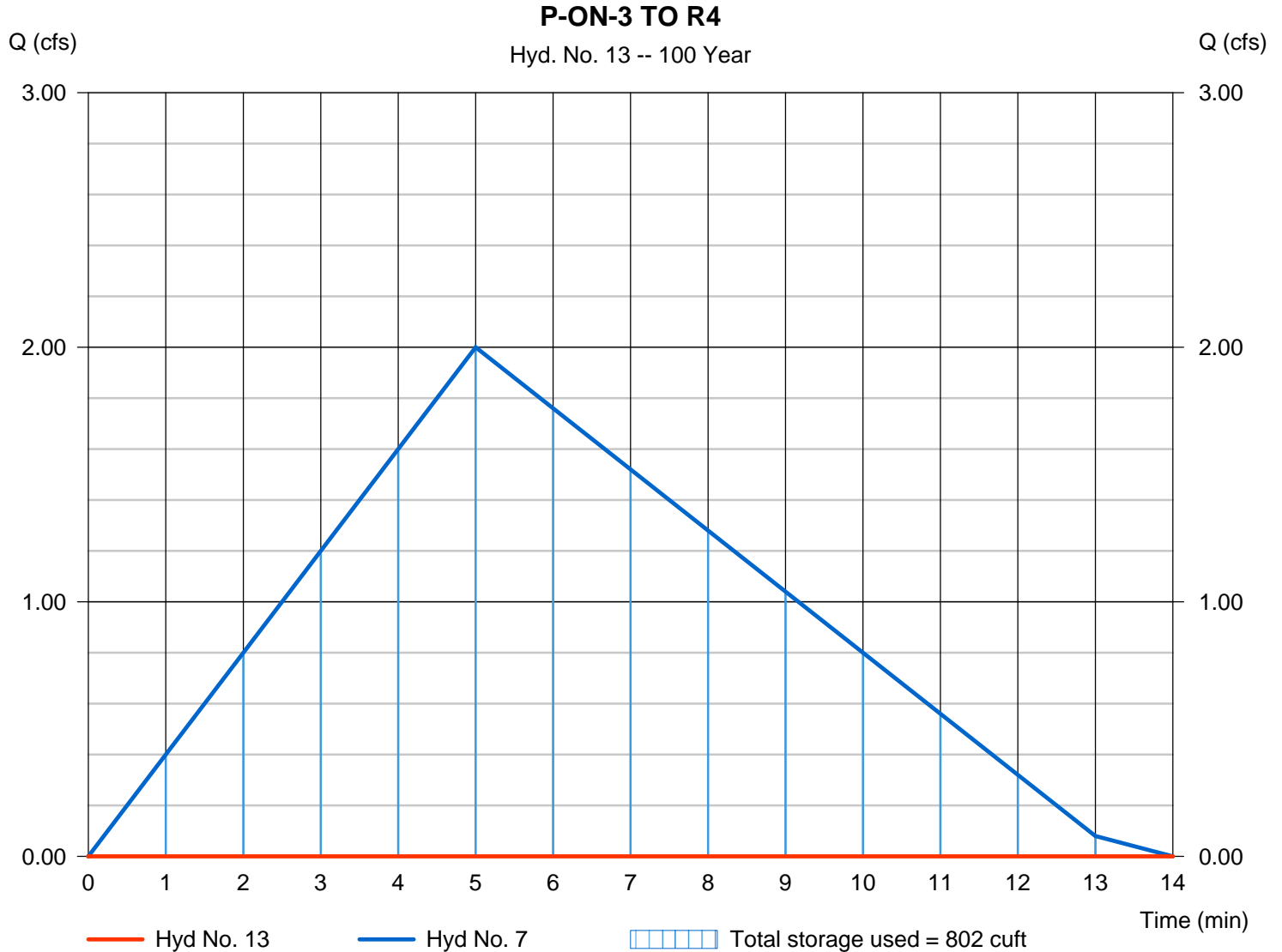
Monday, 08 / 17 / 2015

Hyd. No. 13

P-ON-3 TO R4

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 7 - P-ON-3	Max. Elevation	= 1367.51 ft
Reservoir name	= R4	Max. Storage	= 802 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Monday, 08 / 17 / 2015

Hyd. No. 14

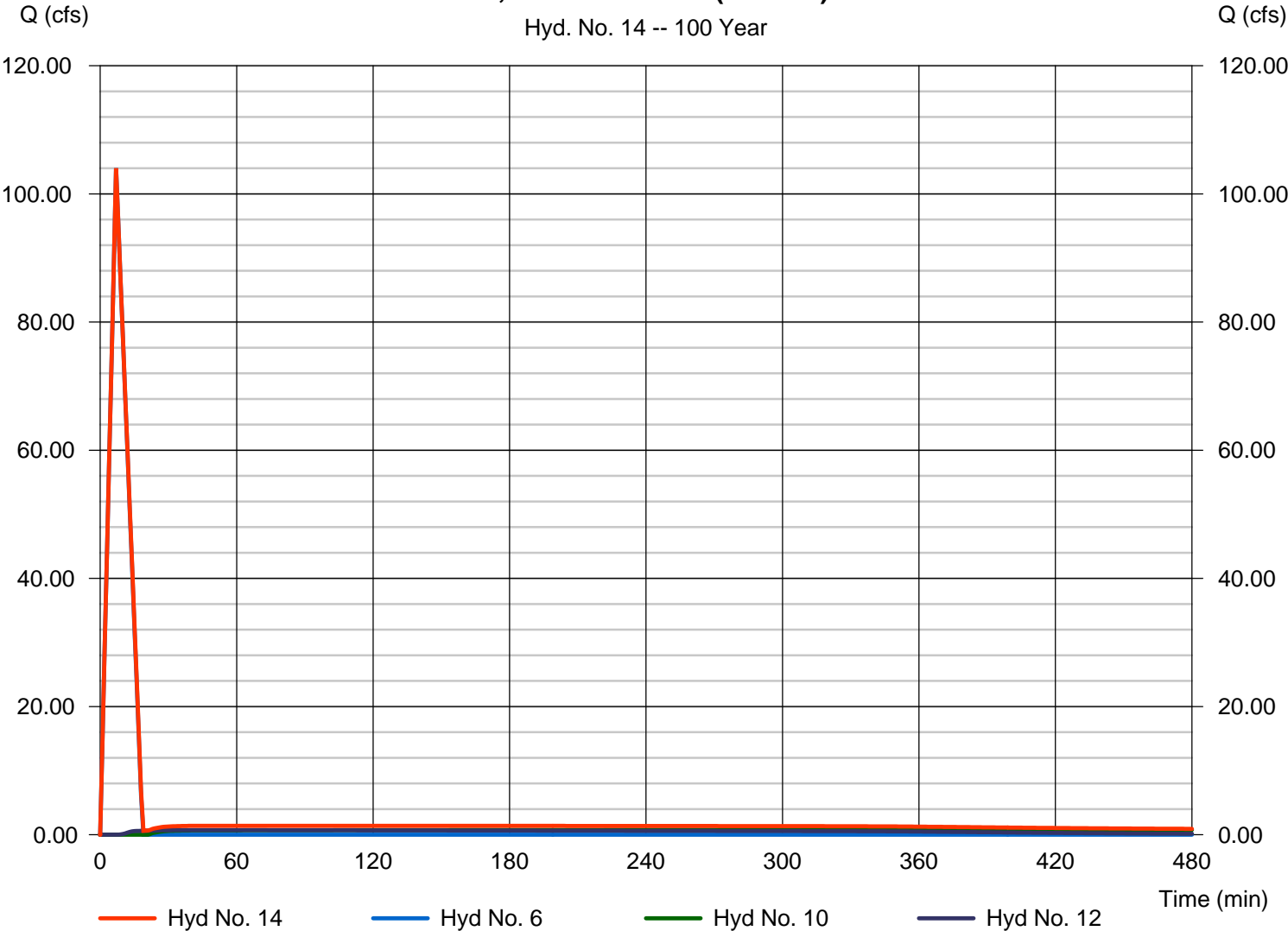
R2, R3 and P-ON-2 (Point B)

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 6, 10, 12

Peak discharge = 104.00 cfs
Time to peak = 7 min
Hyd. volume = 127,607 cuft
Contrib. drain. area = 0.000 ac

R2, R3 and P-ON-2 (Point B)

Hyd. No. 14 -- 100 Year



APPENDIX D

Detention Basins Volume and Rip-Rap Calculations

**Franciscan Renewal Center
100-Year, 2-Hour Retention Basin Volume Calculations**

Retention ⁽¹⁾ Sub-Watershed ID	Drainage Area A (acres)	Runoff ⁽²⁾ Coefficient C	Precipitation ⁽³⁾ P (inches)	Volume ⁽⁴⁾ Required V _{req} (acre-ft)	Volume Provided ⁽⁵⁾				
					Retention Basin ⁽⁶⁾ ID	Depth D (ft)	Area A _{BOTT} (acres)	Area A _{TOP} (acres)	Total V _P (acre-ft)
OFF2	18.80	0.67	2.22	2.33	R1	3.0	0.28	0.58	1.29
					R2	3.0	0.19	0.48	1.00
OFF3+OFF4	6.33	0.53	2.22	0.62	R3	3.0	0.15	0.32	0.70
P-ON-3	0.40	0.8	2.22	0.06	R4	1.0	0.06	0.09	0.07
TOTAL	25.53			3.01					3.05

Reference: Drainage Policies and Standards for Maricopa County, Arizona, Draft January 2013.
Drainage Design Manual for Maricopa County, Arizona, Hydrology, February, 2011.

Notes:

1. Drainage sub-basin delineated per Drainage Map (Plate 1).
2. Weighted 100-year C-Value of 0.53 for residential areas and 0.95 for Infrastructure Roads
100-year runoff coefficients for portions of offsite from Table 3.2 and 3.3 for NHS and NMT landuses;
3. Estimated 100-year, 2-hour precipitation depth, P= 2.22 inches per
NOAA Atlas 14; For first flush basins, P= 1.0 inches.
4. $V_{req} = A \times C \times (P/12)$ = volume required for retention in acre-ft.
5. $V_P = D \times (A_{TOP} + A_{BOTT})/2$ = retention volume provided in acre-ft.
6. Proposed retention basins.
7. Rainfall Intensity per hydrology calculations located in Appendix B, in/hr.

Weighted C coefficient:

	Area (ac)	Weighted C
OFF2	18.8	0.67
NMT	5.76	0.90
NHS	3.08	0.70
LDR	9.99	0.53

OFF1	22.8	0.71
NMT	9.35	0.90
NHS	4.34	0.70
LDR	9.07	0.53

Notes: Areas from slope analysis in Civil3D (see Appendix C).
OFF1 for reference only - not used to size R1 or R2.

Franciscan Renewal Center
Bubbler Structure Percolation and Drain-down Time

Retention Basin ID	Bottom Area ⁽¹⁾ (ft ²)	Volume Required ⁽²⁾ (ft ³)	Percolation Rate ⁽³⁾ (in/hr)	Drain Time ⁽⁴⁾ (hr)
Basin R-3 Bubbler Box	36.0	206.4	1.9	35.5

Notes:

- (1) Area of well-graded AB layer below Bubbler Structure
- (2) Volume of Bubbler Pipe and Bubbler Structure with WSE at Grate Elev
 Pipe L = 245 ft; Pipe A = 0.79 sf; Pipe V = 193
 Bubbler Box Volume = 2*2*3.5 = 14 cf
 Total Volume Required = 206.4
- (3) Percolation rate of 3.8 inches/hour based on soil sampling in vicinity;
 Design Factor of 0.5 per Table 6.16, Policies and Standards.
- (4) Drain time per Eq. 6.17, Policies and Standards.

Franciscan Renewal Center - Proposed Conditions

Basin Embankment Riprap Sizing Calculations - per Maricopa County

Blue = required inputs

(assume b and d until Qc is close to Qk)

ID	Unit Discharge	Width (wetted area/flow depth)	Drop Slope	Known Q	Calculated Q	Manning's 'n'	Flow Area	Hydraulic Radius	Top Width (of flow)	Flow Depth (Manning's)	Riprap Size Calculated		Riprap Size Provided	Riprap Layer Thickness
	q = Q/W	W	S ₀ (S _f)	Q _k	Q _c	'n'	b*d	R	b	d	d ₅₀		d ₅₀	T
	(cfs/ft)	(lb/ft ³)	(ft/ft)	(cfs)	(cfs)	()	(ft)	(ft)	(ft)	(ft)	(ft)	(in)	(in)	(in)
Into Basin R1 and R2	0.71	100.0	0.17	71.0	71.9	0.069	22.3	0.22	100.0	0.22	0.33	4.0	6.0	12.0

Sloped Drop Structure/Rock Chute

(Riprap Sizing, Equation 6.41 and 6.42 from FCDMC Volume II, Hydraulics Manual, 2013, page 6-55)

$$d_{50} = 2.12q^{0.529} S_0^{0.794} \quad 0.02 < S_0 < 0.10 \quad (6.41)$$

$$d_{50} = 0.69q^{0.529} S_0^{0.307} \quad 0.1 \leq S_0 \leq 0.4 \quad (6.42)$$

where:

- d_{50} = the median diameter (ft),
- q = unit discharge (cfs/ft), (discharge divided by the width where the width is defined as the wetted area divided by the flow depth and the flow depth can be the Manning's equation-based normal depth or the maximum flow depth from HEC-RAS), and
- S_0 = channel bed slope (ft/ft).

It should be noted that these two equations are for loose riprap on the slope of the structure. For downstream of the sloped drop structure, the equation above for Downstream of Grade Control/ Drop Structure should be used. The thickness for the riprap layer on the slope should be at least $2d_{50}$. A granular filter should be used beneath the riprap layer. The design for rock chutes and downstream energy dissipators can be found in Lorenz et al. (2000).

Notes:

- Equations include a safety factor of 1.5; Layer thickness (T) = $2 \cdot d_{50}$.
- Rip-rap layer requires filter fabric.
- Four feet of rip-rap apron extends from toe of Basins R2 and R3 to allow sheet flow to settle into the basin bottoms.
A Manning's Equation calculation was used assuming a 100-foot wide rectangular channel (representing broad-crested weir flow/sheet flow into the basins over the basin side-slopes); Hydraulic parameters included: S = 0.17 /ft (6:1), 'n' = 0.069 and Q = 71 cfs from Subbasin OFF-2. This hydraulic sheet-flow condition produces a 0.22-foot (2.6 inches) flow-depth with a velocity at the toe of the basin side slope of 3.2 fps. Maricopa County rip-rap apron length calculations do not extend to these shallow flow depths and/or low velocities. Additionally, a four-foot apron length of D50 = 6" rip-rap is launchable to account for minor erosion occurring at the toe of basin side slopes.

Calculated Q = $1.486/n \cdot A \cdot R^{(2/3)} S_f^{(1/2)}$ (or from HEC-RAS, obtain b and d)
where $S_f = S_0$; assume rectangular channel

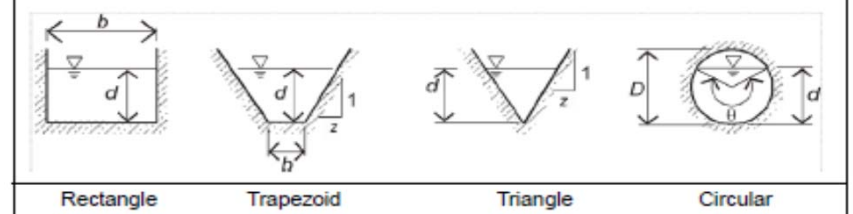
TABLE 6.1
ELEMENTS OF CHANNEL SECTIONS
(1)

Channel Section	Area	Wetted Perimeter	Hydraulic Radius	Top Width
Rectangle	bd	$b + 2d$	$\frac{bd}{b + 2d}$	b
Trapezoid	$bd + zd^2$	$b + 2d\sqrt{z^2 + 1}$	$\frac{bd + zd^2}{b + 2d\sqrt{z^2 + 1}}$	$b + 2zd$
Triangle	zd^2	$2d\sqrt{z^2 + 1}$	$\frac{zd}{2\sqrt{z^2 + 1}}$	$2zd$
Circular < 1/2 full (2)	$\frac{D^2}{8} (\pi\theta - \sin\theta)$	$\frac{\pi D\theta}{360}$		$D \sin\theta$ or $2\sqrt{d(D-d)}$
Circular > 1/2 full (3)	$\frac{D^2}{8} (2\pi - \pi\theta + \sin\theta)$	$\frac{\pi D(360 - \theta)}{360}$	$\left(\frac{45D}{\pi(360 - \theta)}\right)^*$ $\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right)$	$D \sin\theta$ or $2\sqrt{d(D-d)}$

(1) After USDA Soil Conservation Service ES-33 (NRCS), 1956.

(2) $\theta = 4 \sin^{-1} \sqrt{d/D}$ Insert θ in degrees

(3) $\theta = 4 \cos^{-1} \sqrt{d/D}$ Insert θ in degrees



APPENDIX E
**First Flush and Excerpts of the Franciscan
Renewal Assisi Building Drainage Report**

**Franciscan Renewal Center-Assisi Building
Retention Basin Volume Calculations**

Retention ⁽¹⁾ Sub-Watershed ID	Drainage Area A (acres)	Runoff ⁽²⁾ Coefficient C	First Flush ⁽³⁾ Precipitation P (inches)	100 - Y Volume ⁽⁴⁾ Required V _{req} (acre-ft)	Volume Provided ⁽⁵⁾				
					Retention Basin ⁽⁶⁾ ID	Depth D (ft)	Area A _{bot} (acres)	Area A _{top} (acres)	Total V _P (acre-ft)
Onsite	0.96	1	0.5	0.04	R5-1	1.0	0.01	0.03	0.022
					R5-2	1.0	0.01	0.02	0.018
TOTAL				0.04					0.04

Reference: Maricopa County Drainage Manual

Notes:

1. Drainage sub-basin delineated per Drainage Map (Plate 1).
2. Assumed 100-year weighted runoff coefficient C=0.58
3. First Flush Precipitation of 0.5" Per Maricopa County Requirements
4. $V_{req} = A \times C \times (P/12) =$ volume required for retention in acre-ft.
5. $V_P = D \times (A_{bot} + A_{top})/2 =$ retention volume provided in acre-ft.

June 12, 2014

FRANCISCAN RENEWAL CENTER ASSISI BUILDING

Paradise Valley, Arizona

Prepared for:
Franciscan Renewal Center
5802 E. Lincoln Drive
Scottsdale, AZ 85253
(480) 948-7460

Prepared by:
Coe & Van Loo Consultants, Inc.
4550 N 12th Street
Phoenix, AZ 85014
602.264.6831

Job #:1-01-0199201



Franciscan Renewal Center-Assisi Building
Retention Basin Volume Calculations

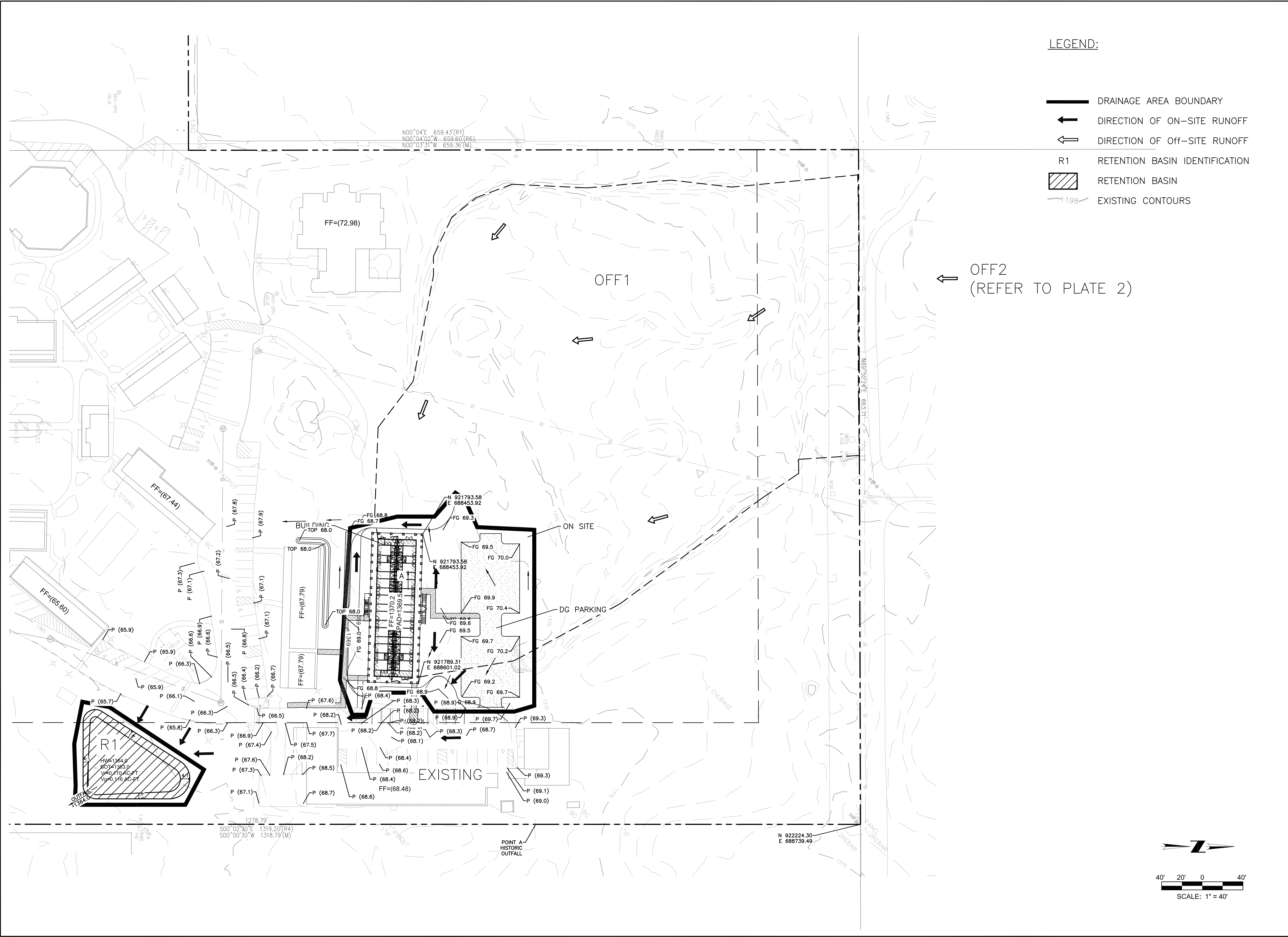
Retention ⁽¹⁾ Sub-Watershed ID	Drainage Area A (acres)	Runoff ⁽²⁾ Coefficient C	Precipitation ⁽³⁾ 100-Yr, 6-Hr P (inches)	100 - Y Volume ⁽⁴⁾ Required V _{req} (acre-ft)	Volume Provided ⁽⁵⁾				
					Retention Basin ⁽⁶⁾ ID	Depth D (ft)	Area A _{BOU} (acres)	Area A _{TOP} (acres)	Total V _P (acre-ft)
Onsite	0.96	0.58	2.21	0.10	R1	1.0	0.10	0.14	0.12
TOTAL				0.10					0.12

Reference: Maricopa County Drainage Manual

Notes:

1. Drainage sub-basin delineated per Drainage Map (Plate 1).
2. Assumed 100-year weighted runoff coefficient C=0.58
3. Estimated precipitation depth per NOAA 14 PRECIPITATION FREQUENCY ESTIMATES
4. $V_{req} = A \times C \times (P/12) =$ volume required for retention in acre-ft.
5. $V_P = D \times (A_{bot} + A_{top})/2 =$ retention volume provided in acre-ft.

Printed By: Emaline File Name: N:\01019201\Hydro-Assist Bldg\CAD\Drainage Map.dwg

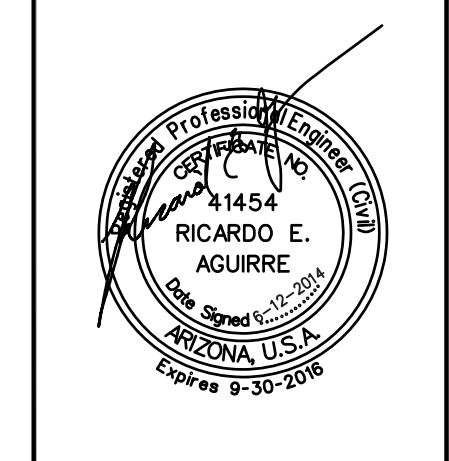


- LEGEND:**
- DRAINAGE AREA BOUNDARY
 - DIRECTION OF ON-SITE RUNOFF
 - DIRECTION OF OFF-SITE RUNOFF
 - R1 RETENTION BASIN IDENTIFICATION
 - RETENTION BASIN
 - EXISTING CONTOURS

OFF2
(REFER TO PLATE 2)

NO.	REVISION	DATE

**WATER SHED MAP
 ONSITE**
**FRANCISCAN RENEWAL CENTER
 PHOENIX, ARIZONA**



Franciscan Renewal Center-Assisi Building
Retention Basin Volume Calculations

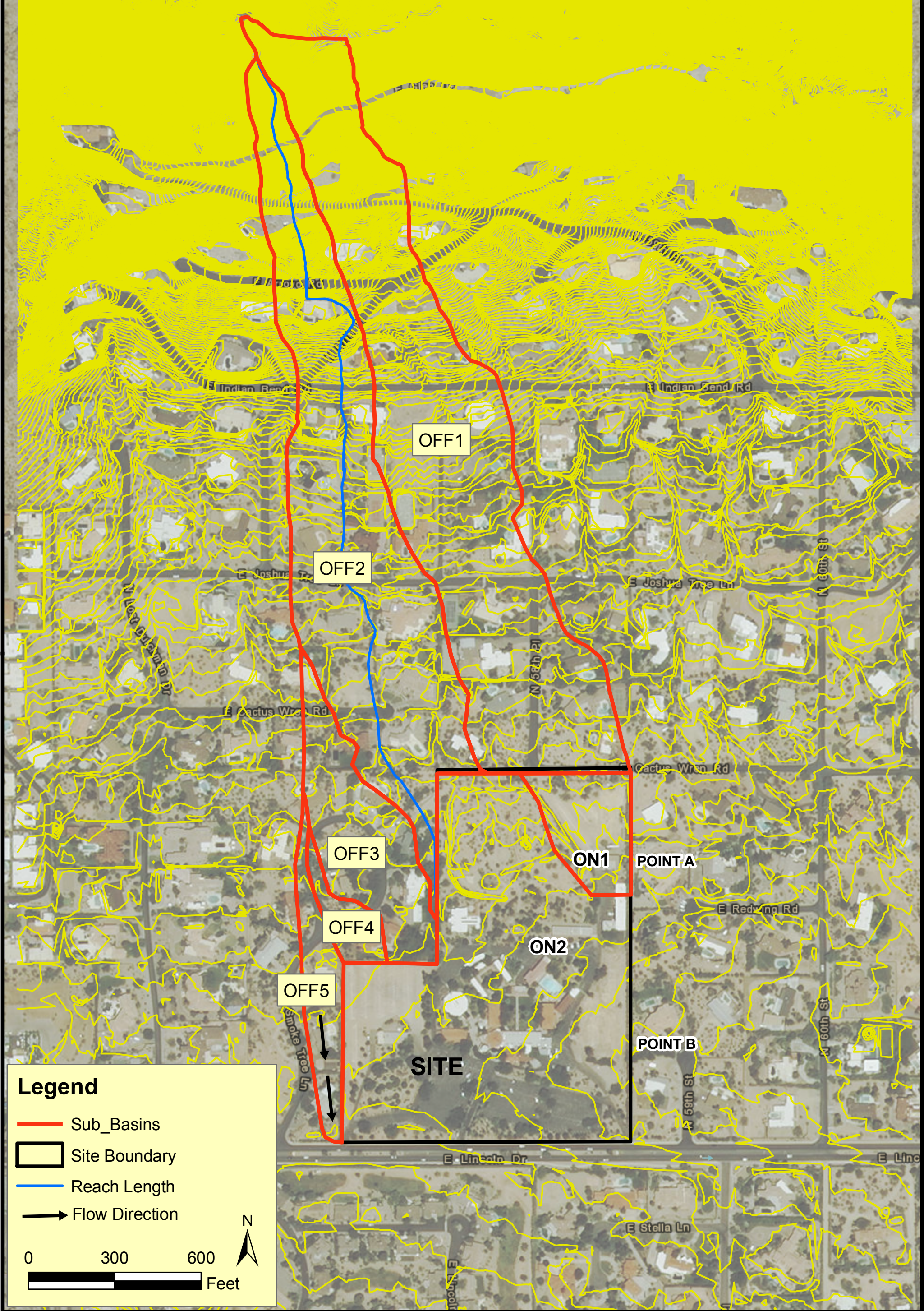
Retention ⁽¹⁾ Sub-Watershed ID	Drainage Area A (acres)	Runoff ⁽²⁾ Coefficient C	Precipitation ⁽³⁾ 100-Yr, 2-Hr P (inches)	100 - Y Volume ⁽⁴⁾ Required V _{req} (acre-ft)	Volume Provided ⁽⁵⁾				
					Retention Basin ⁽⁶⁾ ID	Depth D (ft)	Area A _{BOTT} (acres)	Area A _{TOP} (acres)	Total V _P (acre-ft)
Onsite	0.96	0.58	2.22	0.10	R5-1	1.0	0.01	0.03	0.022
					R5-2	1.0	0.01	0.02	0.017
TOTAL				0.10					0.02

Reference: Maricopa County Drainage Manual

Notes:

1. Drainage sub-basin delineated per Drainage Map (Plate 1).
2. Assumed 100-year weighted runoff coefficient C=0.58
3. Estimated precipitation depth per NOAA 14 PRECIPITATION FREQUENCY ESTIMATES
4. $V_{req} = A \times C \times (P/12) =$ volume required for retention in acre-ft.
5. $V_P = D \times (A_{bot} + A_{top})/2 =$ retention volume provided in acre-ft.

PLATES



OFFSITE WATERSHED MAP

FRANSISCAN RENEWAL CENTER

JOB NO.
01-0199205

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

PLATE 1

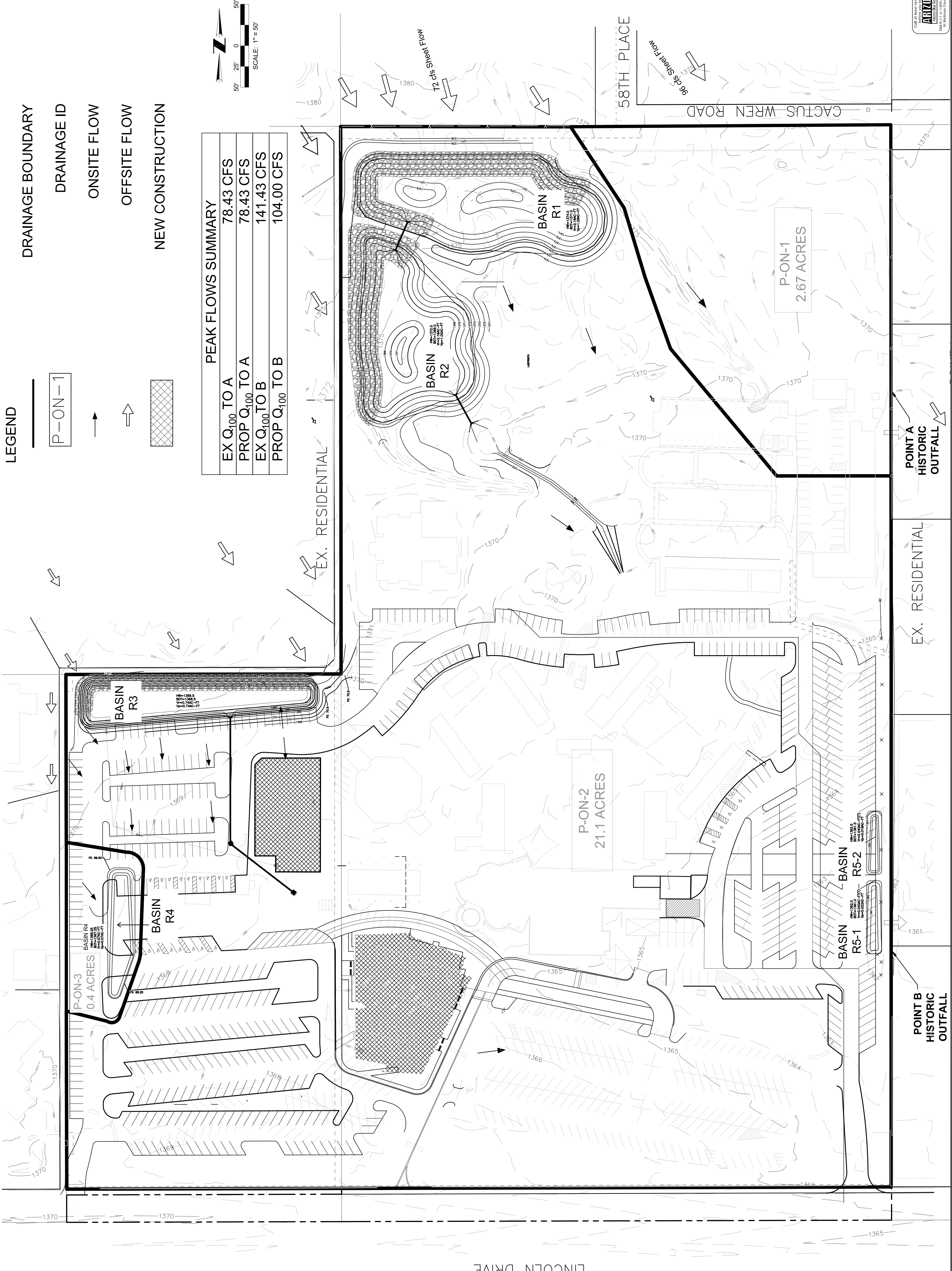
FRANCISCAN RENEWAL CENTER
 TOWN OF PARADISE VALLEY, ARIZONA

Coe & Van Loo Consultants, Inc.



ONSITE DRAINAGE MAP

NO.	REVISION	DATE

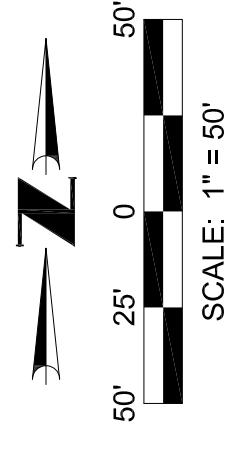


LEGEND

- DRAINAGE BOUNDARY
- DRAINAGE ID
- ONSITE FLOW
- OFFSITE FLOW
- NEW CONSTRUCTION

PEAK FLOWS SUMMARY

EX Q ₁₀₀ TO A	78.43 CFS
PROP Q ₁₀₀ TO A	78.43 CFS
EX Q ₁₀₀ TO B	141.43 CFS
PROP Q ₁₀₀ TO B	104.00 CFS



POINT A
 HISTORIC
 OUTFALL

EX. RESIDENTIAL

POINT B
 HISTORIC
 OUTFALL

Franciscan Renewal Center Community Life Center Parking Phase 1

Hydrology Study

July 11, 2017

Prepared For:
Town of Paradise Valley

Prepared By:
Holistic Engineering and Land Management, PLLC
9638 N. 16th Street, Building C
Phoenix, AZ 85020

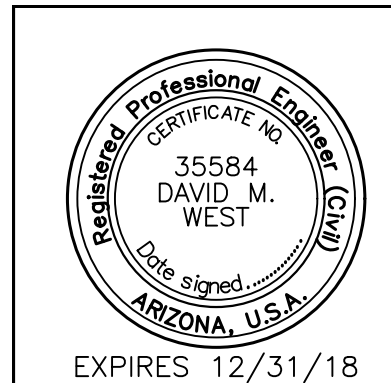
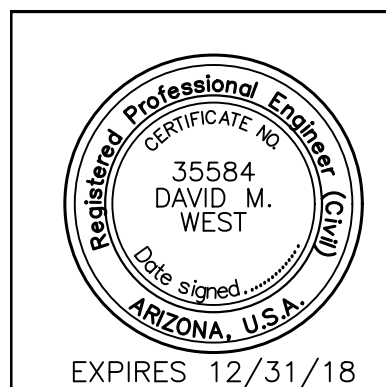


Table of Contents

1	INTRODUCTION.....	1-1
1.1	PURPOSE AND LOCATION	1-1
1.2	WATERSHED BOUNDARIES	1-1
2	EXISTING CONDITIONS.....	2-1
2.1	LANDFORM.....	2-1
2.2	OFFSITE DRAINAGE CONDITIONS	2-1
2.3	DRAINAGE WITHIN THE PROJECT.....	2-1
3	PROPOSED IMPROVEMENTS.....	3-2
3.1	PROJECT IMPACT	3-2
3.2	HYDROLOGY	3-2
3.2.1	<i>Rainfall</i>	3-2
3.2.2	<i>Runoff</i>	3-2
3.3	HYDRAULICS	3-2
3.4	STORMWATER STORAGE.....	3-2
3.5	HANDLING THE EXTRAORDINARY EVENT.....	3-2

List of Appendices

Appendix A	Drainage Area and Peak Flow Computation
Appendix B	Coe & Van Loo Reports



1 INTRODUCTION

1.1 Purpose and Location

The Franciscan Renewal Center has contracted Holistic Engineering and Land Management to provide engineering services in support of development on the campus. The current project is the parking lot on the southern portion of the 5-acre Paradise Valley portion of the campus. The development of the second phase will happen later along with the construction of the Community Life Center (CLC) building.

1.2 Watershed Boundaries

The offsite watershed extends north of the campus and up Mummy Mountain. The watershed for the portion of the campus contributing to this portion of the campus is shorter and extends just past E. Cactus Wren Rd. The onsite basins are all contained within the 5-acre Paradise Valley portion of the 25-acre Franciscan Renewal Center Campus.

2 EXISTING CONDITIONS

2.1 Landform

The site has been previously developed. Improvements on the property include structures, paving, landscaping and drainage improvements. Many of those prior improvements have been subsequently demolished or will be demolished as part of this project. Existing and proposed slopes onsite are on average between half a percent and two percent.

2.2 Offsite Drainage Conditions

Offsite drainage conditions were thoroughly analyzed in the *Master Drainage Report (Retention Basins) for Franciscan Renewal Center* prepared by Coe & Van Loo Consultants, Inc. in September 2015. While the upper portions of the watersheds that drain to the other portions of the site are very steep, the portion of the watershed that contributes to Basin R3 and this project has slopes less than 5%. The offsite drainage is captured in the retention basin and anything that exceeds the storage capacity is released through a bubbler located in the area for the second phase of this project. During the subsequent phase of the project, the bubbler system will need to be relocated to allow the construction of the Community Life Center.

2.3 Drainage within the Project

The site generally drains from the west to the east and has a slope of approximately 1/2 percent. The site will drain via a sheet flow regime during storm episodes producing enough flow to generate runoff. Stormwater will sheet flow into the landscaping areas and into the pervious pavers. The PaveDrain system will allow the first flush drainage to be captured and stored. The PaveDrain system is a Permeable Articulating Concrete Block (P-ACB) system. When the available storage is filled, the excess runoff will enter the storm drain constructed adjacent to the Our Lady of the Angels Church or south around the end of the church.

3 PROPOSED IMPROVEMENTS

3.1 Project Impact

The project has been designed to minimize the impact of the development on the site hydrology. While this project is primarily a parking lot improvement project, the impervious area is less than 1/3 of the total project area. The remainder is either permeable interlocking concrete block or landscaping.

3.2 Hydrology

The project is designed in accordance with the Maricopa County Drainage Policies and Standards as well as the standards agreed to for further development on this campus at a meeting with the Maricopa County Building Department on January 8, 2013.

3.2.1 Rainfall

NOAA Atlas 14 point precipitation frequency estimates for the site design has been determined to be 2.22 inches for the 100-year, 2-hour design event. The rainfall data was retrieved from the NOAA Precipitation Frequency Data Server.

3.2.2 Runoff

Based on a watershed area consisting of less than 160 acres peak discharges are calculated using the rational method. The peak discharge for the site is calculated to be 8 cfs prior routing to the retention basin. All flows, including offsite flows are routed through the retention basin. The existing peak runoff was estimated to be 10 cfs.

3.3 Hydraulics

The site has been designed to convey runoff above ground via overland flow and directed to the storm drain system constructed along with the Our Lady of the Angels project. Runoff will enter the storm drain system after the volume provided in the permeable interlocking block system and the small median basins is exceeded.

3.4 Stormwater Storage

Stormwater storage is provided in existing Basin R3 located at the north end of the parcel. The purpose of Basin R3 is to detain the offsite flows at the north end of the site and therefor reduce the post development peak flows downstream. The only modifications planned for Basin R3 is the relocation of the bubbler unit during the construction of the CLC building. Storage Basin R4 is replaced by the storage in the landscape islands and the storage under the PaveDrain system. A summary of storage onsite is provided in Appendix A.

3.5 Handling the Extraordinary Event

Emergency overflow is located at the existing conditions outfall and is designed to manage design events beyond the 100-year, 2-hour event. The flows are routed around the southern end of the new Our Lady of Angels Church.

APPENDIX A

DRAINAGE AREA AND PEAK FLOW COMPUTATIONS

Storage Summary

Required First Flush Retention Calculations				
Watershed Subarea	Drainage Area A (acres)	Runoff Coefficient C	Precipitation (Inches)	Volume Required (acre-ft)
PH2-1*	0.70	1.00	0.50	0.029
PH2-2	1.75	1.00	0.50	0.073
PH1-1	0.34	1.00	0.50	0.014
PH1-2	0.92	1.00	0.50	0.038
PH1-3	0.81	1.00	0.50	0.034

Total First Flush Required= 0.188

*Basin PH2-1 drains to Retention Basin R3 for first flush retention= -0.029

New First Flush Retention Required 0.159

Provided Retention Volumes	
Basin Name	Volume Provided (acre-ft)
Phase 1 - A	0.039
Phase 1 - B	0.006
Phase 1 - C	0.005
Phase 1 - D	0.005
PaveDrain System	0.177
Phase 2 E	0.023
Phase 2 F	0.011
Phase 2 G	0.013
Phase 2 H	0.008

Total First Flush Provided= 0.287

Total First Flush Volume Provided (.0.287 ac-ft) exceeds the Total First Flush Volume Required (0.188 ac-ft).



NOAA Atlas 14, Volume 1, Version 5
 Location name: Paradise Valley, Arizona, USA*
 Latitude: 33.5324°, Longitude: -111.9568°
 Elevation: 1369.45 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	0.189 (0.158-0.231)	0.247 (0.208-0.301)	0.335 (0.279-0.407)	0.402 (0.333-0.487)	0.493 (0.402-0.595)	0.563 (0.453-0.675)	0.635 (0.501-0.759)	0.707 (0.549-0.844)	0.804 (0.609-0.961)	0.878 (0.651-1.05)
10-min	0.287 (0.240-0.350)	0.376 (0.316-0.458)	0.510 (0.425-0.620)	0.613 (0.507-0.741)	0.751 (0.612-0.905)	0.858 (0.690-1.03)	0.966 (0.763-1.15)	1.08 (0.836-1.28)	1.22 (0.926-1.46)	1.34 (0.992-1.60)
15-min	0.356 (0.298-0.435)	0.466 (0.392-0.568)	0.631 (0.526-0.769)	0.760 (0.629-0.919)	0.931 (0.759-1.12)	1.06 (0.855-1.27)	1.20 (0.946-1.43)	1.33 (1.04-1.59)	1.52 (1.15-1.81)	1.66 (1.23-1.99)
30-min	0.479 (0.401-0.585)	0.627 (0.527-0.765)	0.851 (0.709-1.03)	1.02 (0.847-1.24)	1.25 (1.02-1.51)	1.43 (1.15-1.72)	1.61 (1.27-1.93)	1.80 (1.40-2.15)	2.04 (1.55-2.44)	2.23 (1.66-2.67)
60-min	0.593 (0.496-0.725)	0.776 (0.653-0.947)	1.05 (0.877-1.28)	1.27 (1.05-1.53)	1.55 (1.26-1.87)	1.77 (1.43-2.12)	2.00 (1.58-2.38)	2.22 (1.73-2.65)	2.53 (1.91-3.02)	2.76 (2.05-3.31)
2-hr	0.687 (0.583-0.821)	0.889 (0.755-1.07)	1.19 (1.01-1.42)	1.42 (1.19-1.69)	1.73 (1.43-2.05)	1.97 (1.61-2.32)	2.21 (1.78-2.61)	2.46 (1.94-2.90)	2.79 (2.16-3.29)	3.06 (2.31-3.62)
3-hr	0.752 (0.636-0.910)	0.965 (0.819-1.17)	1.26 (1.07-1.53)	1.50 (1.26-1.81)	1.84 (1.51-2.19)	2.10 (1.71-2.50)	2.38 (1.90-2.83)	2.67 (2.10-3.16)	3.06 (2.33-3.64)	3.38 (2.52-4.03)
6-hr	0.907 (0.782-1.07)	1.15 (0.993-1.36)	1.47 (1.26-1.73)	1.73 (1.47-2.02)	2.07 (1.75-2.42)	2.35 (1.95-2.73)	2.63 (2.15-3.06)	2.92 (2.34-3.40)	3.32 (2.59-3.86)	3.63 (2.77-4.24)
12-hr	1.02 (0.887-1.19)	1.29 (1.12-1.50)	1.63 (1.41-1.89)	1.90 (1.63-2.20)	2.26 (1.92-2.61)	2.54 (2.13-2.93)	2.83 (2.34-3.26)	3.12 (2.55-3.60)	3.50 (2.79-4.06)	3.81 (2.98-4.44)
24-hr	1.22 (1.07-1.41)	1.55 (1.35-1.80)	2.00 (1.75-2.33)	2.37 (2.06-2.75)	2.87 (2.48-3.33)	3.27 (2.81-3.78)	3.68 (3.14-4.27)	4.12 (3.48-4.77)	4.71 (3.94-5.45)	5.18 (4.29-6.02)
2-day	1.32 (1.16-1.52)	1.69 (1.48-1.95)	2.22 (1.94-2.56)	2.64 (2.31-3.04)	3.24 (2.81-3.72)	3.71 (3.19-4.27)	4.21 (3.60-4.85)	4.74 (4.02-5.45)	5.47 (4.59-6.31)	6.06 (5.03-7.01)
3-day	1.40 (1.23-1.62)	1.80 (1.57-2.07)	2.37 (2.07-2.73)	2.83 (2.47-3.26)	3.49 (3.02-4.01)	4.01 (3.45-4.61)	4.57 (3.90-5.25)	5.16 (4.37-5.93)	5.99 (5.01-6.88)	6.66 (5.51-7.68)
4-day	1.49 (1.30-1.72)	1.91 (1.67-2.20)	2.52 (2.20-2.90)	3.02 (2.63-3.47)	3.73 (3.23-4.29)	4.31 (3.70-4.95)	4.92 (4.20-5.65)	5.58 (4.71-6.41)	6.50 (5.43-7.46)	7.25 (5.99-8.35)
7-day	1.68 (1.46-1.94)	2.15 (1.87-2.48)	2.85 (2.48-3.29)	3.42 (2.96-3.94)	4.23 (3.64-4.87)	4.88 (4.17-5.61)	5.58 (4.73-6.41)	6.32 (5.32-7.28)	7.37 (6.12-8.49)	8.22 (6.76-9.49)
10-day	1.81 (1.58-2.09)	2.32 (2.03-2.67)	3.08 (2.68-3.53)	3.68 (3.19-4.22)	4.53 (3.91-5.19)	5.22 (4.48-5.96)	5.95 (5.07-6.81)	6.72 (5.68-7.69)	7.80 (6.51-8.93)	8.67 (7.17-9.94)
20-day	2.24 (1.97-2.56)	2.89 (2.53-3.30)	3.82 (3.35-4.36)	4.53 (3.96-5.16)	5.49 (4.77-6.25)	6.22 (5.39-7.08)	6.98 (6.01-7.95)	7.75 (6.64-8.84)	8.78 (7.46-10.0)	9.59 (8.08-11.0)
30-day	2.62 (2.29-3.00)	3.38 (2.96-3.86)	4.47 (3.90-5.10)	5.30 (4.62-6.03)	6.42 (5.56-7.31)	7.28 (6.28-8.27)	8.16 (7.02-9.27)	9.06 (7.75-10.3)	10.3 (8.73-11.7)	11.2 (9.46-12.8)
45-day	3.03 (2.66-3.44)	3.91 (3.44-4.45)	5.16 (4.54-5.87)	6.09 (5.34-6.93)	7.33 (6.39-8.32)	8.26 (7.18-9.38)	9.21 (7.97-10.5)	10.2 (8.76-11.6)	11.4 (9.78-13.1)	12.4 (10.5-14.2)
60-day	3.33 (2.95-3.78)	4.32 (3.82-4.89)	5.70 (5.03-6.44)	6.70 (5.89-7.58)	8.01 (7.02-9.05)	8.98 (7.85-10.2)	9.96 (8.67-11.3)	10.9 (9.47-12.4)	12.2 (10.5-13.9)	13.2 (11.3-15.0)

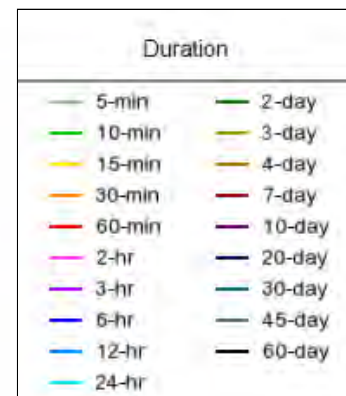
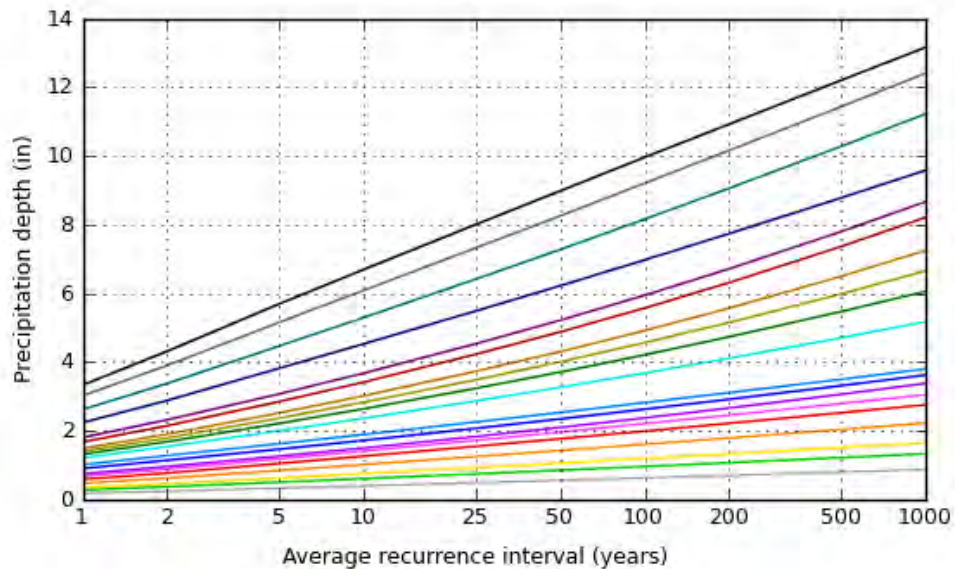
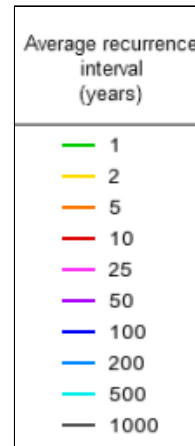
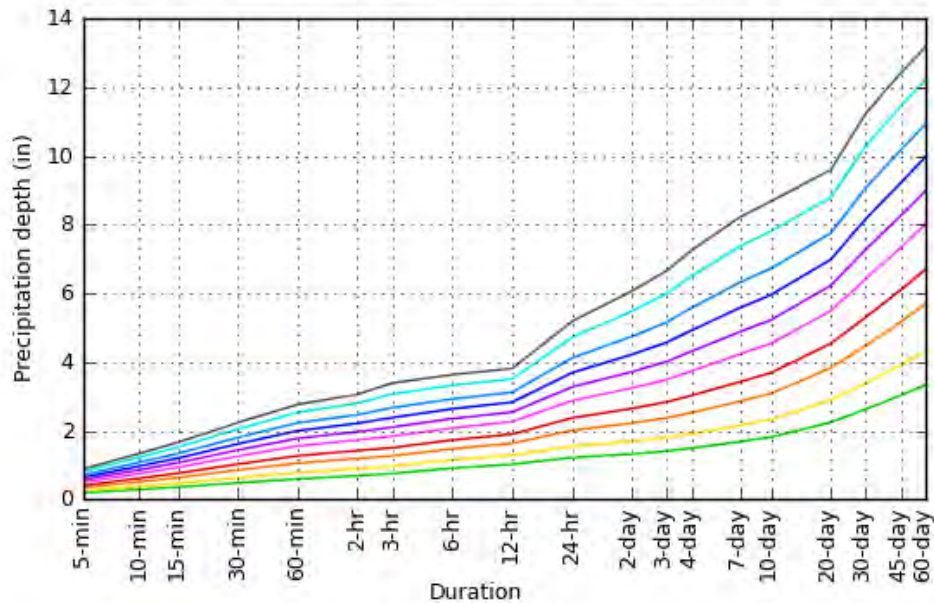
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical

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

Latitude: 33.5324°, Longitude: -111.9568°



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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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Questions?: HDSC.Questions@noaa.gov

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NOAA Atlas 14, Volume 1, Version 5
 Location name: Paradise Valley, Arizona, USA*
 Latitude: 33.5324°, Longitude: -111.9568°
 Elevation: 1369.45 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	2.27 (1.90-2.77)	2.96 (2.50-3.61)	4.02 (3.35-4.88)	4.82 (4.00-5.84)	5.92 (4.82-7.14)	6.76 (5.44-8.10)	7.62 (6.01-9.11)	8.48 (6.59-10.1)	9.65 (7.31-11.5)	10.5 (7.81-12.6)
10-min	1.72 (1.44-2.10)	2.26 (1.90-2.75)	3.06 (2.55-3.72)	3.68 (3.04-4.45)	4.51 (3.67-5.43)	5.15 (4.14-6.17)	5.80 (4.58-6.92)	6.46 (5.02-7.70)	7.34 (5.56-8.78)	8.02 (5.95-9.61)
15-min	1.42 (1.19-1.74)	1.86 (1.57-2.27)	2.52 (2.10-3.08)	3.04 (2.52-3.68)	3.72 (3.04-4.49)	4.25 (3.42-5.10)	4.79 (3.78-5.72)	5.34 (4.15-6.37)	6.07 (4.60-7.26)	6.63 (4.92-7.94)
30-min	0.958 (0.802-1.17)	1.25 (1.05-1.53)	1.70 (1.42-2.07)	2.05 (1.69-2.48)	2.51 (2.04-3.02)	2.86 (2.30-3.43)	3.22 (2.55-3.85)	3.59 (2.79-4.29)	4.09 (3.09-4.89)	4.46 (3.31-5.35)
60-min	0.593 (0.496-0.725)	0.776 (0.653-0.947)	1.05 (0.877-1.28)	1.27 (1.05-1.53)	1.55 (1.26-1.87)	1.77 (1.43-2.12)	2.00 (1.58-2.38)	2.22 (1.73-2.65)	2.53 (1.91-3.02)	2.76 (2.05-3.31)
2-hr	0.344 (0.292-0.410)	0.444 (0.378-0.533)	0.594 (0.503-0.708)	0.709 (0.594-0.843)	0.864 (0.716-1.02)	0.983 (0.804-1.16)	1.11 (0.890-1.30)	1.23 (0.972-1.45)	1.40 (1.08-1.65)	1.53 (1.15-1.81)
3-hr	0.250 (0.212-0.303)	0.321 (0.273-0.390)	0.421 (0.356-0.509)	0.500 (0.419-0.601)	0.611 (0.504-0.730)	0.700 (0.569-0.832)	0.792 (0.633-0.941)	0.888 (0.698-1.05)	1.02 (0.777-1.21)	1.13 (0.838-1.34)
6-hr	0.151 (0.131-0.179)	0.192 (0.166-0.227)	0.245 (0.211-0.289)	0.288 (0.246-0.338)	0.346 (0.292-0.404)	0.392 (0.325-0.456)	0.440 (0.359-0.511)	0.488 (0.391-0.568)	0.554 (0.433-0.645)	0.606 (0.463-0.707)
12-hr	0.085 (0.074-0.099)	0.107 (0.093-0.125)	0.135 (0.117-0.157)	0.157 (0.135-0.183)	0.188 (0.160-0.217)	0.211 (0.177-0.243)	0.235 (0.194-0.270)	0.259 (0.211-0.298)	0.291 (0.232-0.337)	0.316 (0.247-0.369)
24-hr	0.051 (0.044-0.059)	0.064 (0.056-0.075)	0.084 (0.073-0.097)	0.099 (0.086-0.115)	0.120 (0.103-0.139)	0.136 (0.117-0.158)	0.154 (0.131-0.178)	0.171 (0.145-0.199)	0.196 (0.164-0.227)	0.216 (0.179-0.251)
2-day	0.027 (0.024-0.032)	0.035 (0.031-0.041)	0.046 (0.040-0.053)	0.055 (0.048-0.063)	0.067 (0.058-0.078)	0.077 (0.067-0.089)	0.088 (0.075-0.101)	0.099 (0.084-0.114)	0.114 (0.096-0.131)	0.126 (0.105-0.146)
3-day	0.020 (0.017-0.022)	0.025 (0.022-0.029)	0.033 (0.029-0.038)	0.039 (0.034-0.045)	0.048 (0.042-0.056)	0.056 (0.048-0.064)	0.063 (0.054-0.073)	0.072 (0.061-0.082)	0.083 (0.070-0.096)	0.092 (0.077-0.107)
4-day	0.016 (0.014-0.018)	0.020 (0.017-0.023)	0.026 (0.023-0.030)	0.032 (0.027-0.036)	0.039 (0.034-0.045)	0.045 (0.039-0.052)	0.051 (0.044-0.059)	0.058 (0.049-0.067)	0.068 (0.057-0.078)	0.076 (0.062-0.087)
7-day	0.010 (0.009-0.012)	0.013 (0.011-0.015)	0.017 (0.015-0.020)	0.020 (0.018-0.023)	0.025 (0.022-0.029)	0.029 (0.025-0.033)	0.033 (0.028-0.038)	0.038 (0.032-0.043)	0.044 (0.036-0.051)	0.049 (0.040-0.056)
10-day	0.008 (0.007-0.009)	0.010 (0.008-0.011)	0.013 (0.011-0.015)	0.015 (0.013-0.018)	0.019 (0.016-0.022)	0.022 (0.019-0.025)	0.025 (0.021-0.028)	0.028 (0.024-0.032)	0.033 (0.027-0.037)	0.036 (0.030-0.041)
20-day	0.005 (0.004-0.005)	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.009 (0.008-0.011)	0.011 (0.010-0.013)	0.013 (0.011-0.015)	0.015 (0.013-0.017)	0.016 (0.014-0.018)	0.018 (0.016-0.021)	0.020 (0.017-0.023)
30-day	0.004 (0.003-0.004)	0.005 (0.004-0.005)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.013)	0.013 (0.011-0.014)	0.014 (0.012-0.016)	0.016 (0.013-0.018)
45-day	0.003 (0.002-0.003)	0.004 (0.003-0.004)	0.005 (0.004-0.005)	0.006 (0.005-0.006)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.009 (0.007-0.010)	0.009 (0.008-0.011)	0.011 (0.009-0.012)	0.011 (0.010-0.013)
60-day	0.002 (0.002-0.003)	0.003 (0.003-0.003)	0.004 (0.003-0.004)	0.005 (0.004-0.005)	0.006 (0.005-0.006)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.008 (0.007-0.010)	0.009 (0.008-0.010)

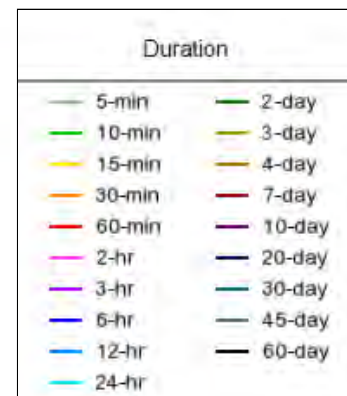
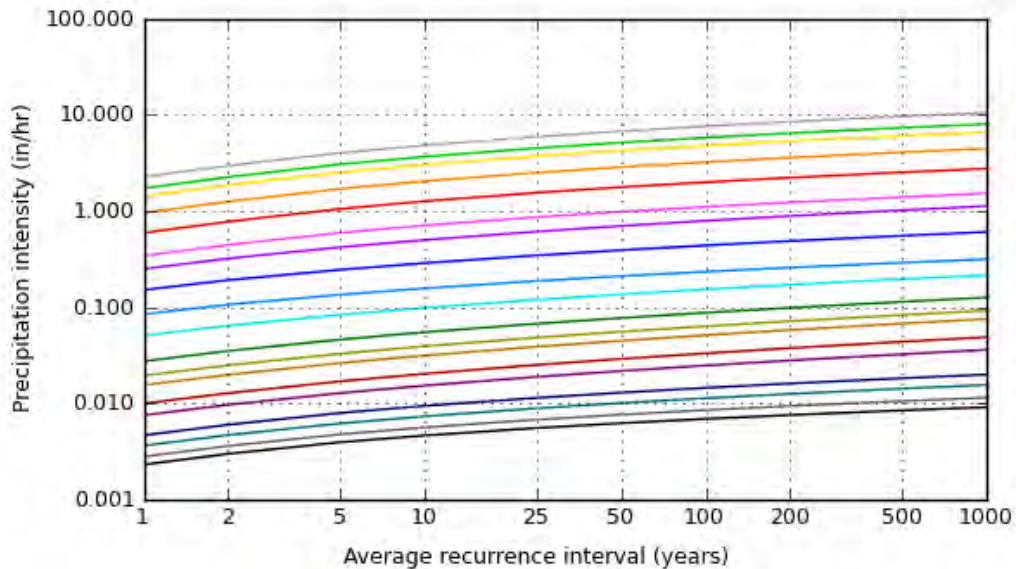
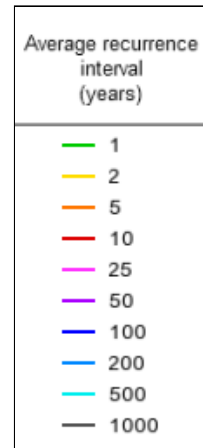
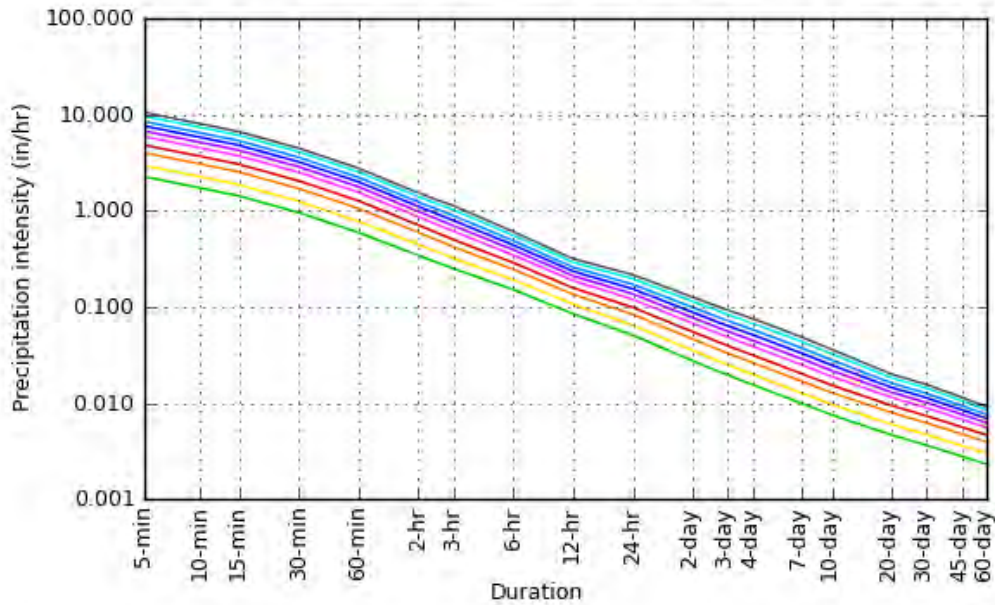
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical

PDS-based intensity-duration-frequency (IDF) curves

Latitude: 33.5324°, Longitude: -111.9568°



[Back to Top](#)

Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

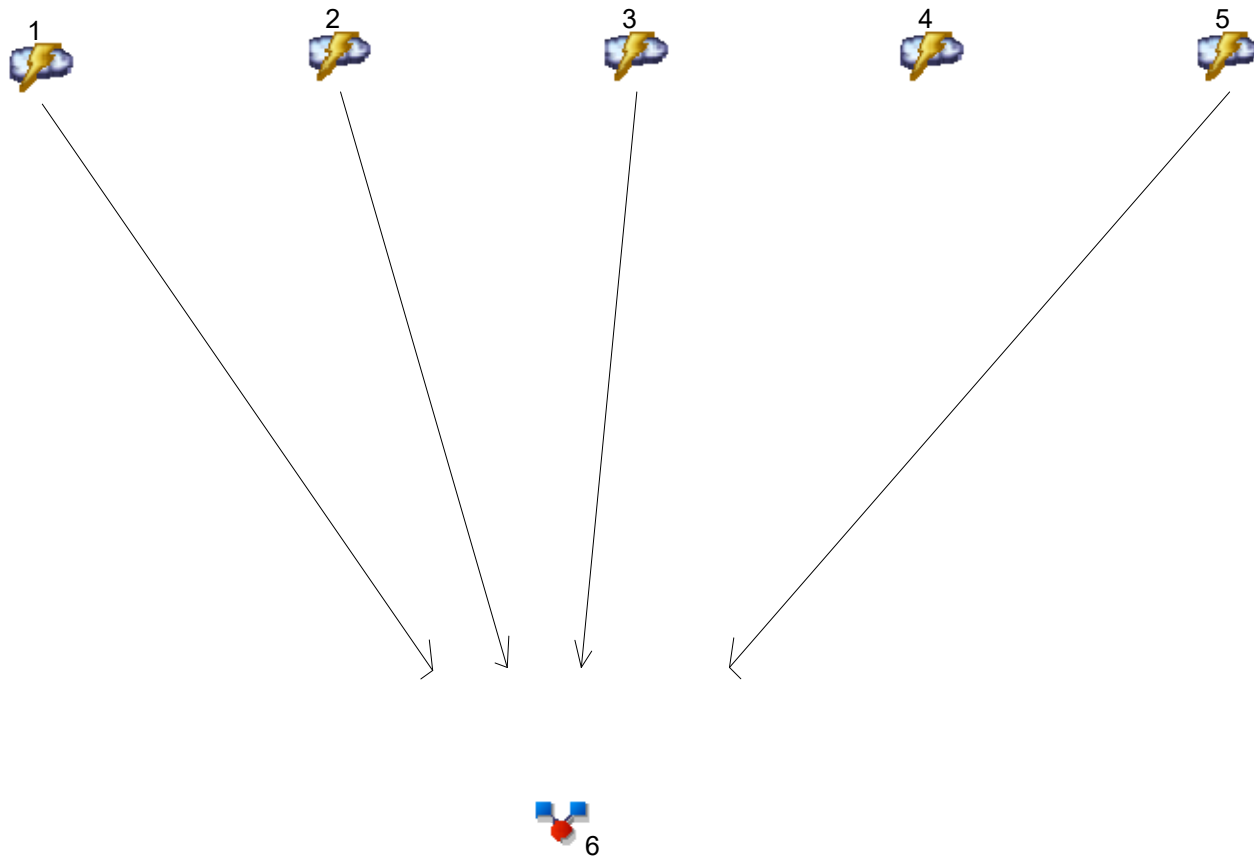
[US Department of Commerce](#)
[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)

Watershed Model Schematic.....	1
Hydrograph Return Period Recap.....	2
2 - Year	
Summary Report.....	3
Hydrograph Reports.....	4
Hydrograph No. 1, Rational, PH1-1.....	4
5 - Year	
Summary Report.....	5
Hydrograph Reports.....	6
Hydrograph No. 1, Rational, PH1-1.....	6
10 - Year	
Summary Report.....	7
Hydrograph Reports.....	8
Hydrograph No. 1, Rational, PH1-1.....	8
25 - Year	
Summary Report.....	9
Hydrograph Reports.....	10
Hydrograph No. 1, Rational, PH1-1.....	10
50 - Year	
Summary Report.....	11
Hydrograph Reports.....	12
Hydrograph No. 1, Rational, PH1-1.....	12
100 - Year	
Summary Report.....	13
Hydrograph Reports.....	14
Hydrograph No. 1, Rational, PH1-1.....	14

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514



Legend

<u>Hyd. Origin</u>	<u>Origin</u>	<u>Description</u>
1	Rational	PH1-1
2	Rational	PH1-2
3	Rational	PH1-3
4	Rational	PH1-1
5	Rational	PH2-1
6	Combine	Combined Flows for CLC Phase 1 and 2

Hydrograph Return Period Recap

Hydratlow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Rational	-----	-----	0.504	-----	0.687	0.826	1.014	1.156	1.300	PH1-1
2	Rational	-----	-----	1.993	-----	2.718	3.266	4.010	4.572	5.140	PH1-2
3	Rational	-----	-----	1.219	-----	1.663	1.998	2.453	2.796	3.144	PH1-3
4	Rational	-----	-----	0.504	-----	0.687	0.826	1.014	1.156	1.300	PH1-1
5	Rational	-----	-----	3.591	-----	4.899	5.885	7.227	8.238	9.263	PH2-1
6	Combine	1, 2, 3, 5	-----	7.306	-----	9.967	11.97	14.70	16.76	18.85	Combined Flows for CLC Phase 1 an

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.504	1	10	302	----	----	----	PH1-1
2	Rational	1.993	1	10	1,196	----	----	----	PH1-2
3	Rational	1.219	1	10	731	----	----	----	PH1-3
4	Rational	0.504	1	10	302	----	----	----	PH1-1
5	Rational	3.591	1	10	2,155	----	----	----	PH2-1
6	Combine	7.306	1	10	4,384	1, 2, 3, 5	----	----	Combined Flows for CLC Phase 1 an
FRC-CLC-PH1.gpw					Return Period: 2 Year			Wednesday, 04 / 12 / 2017	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

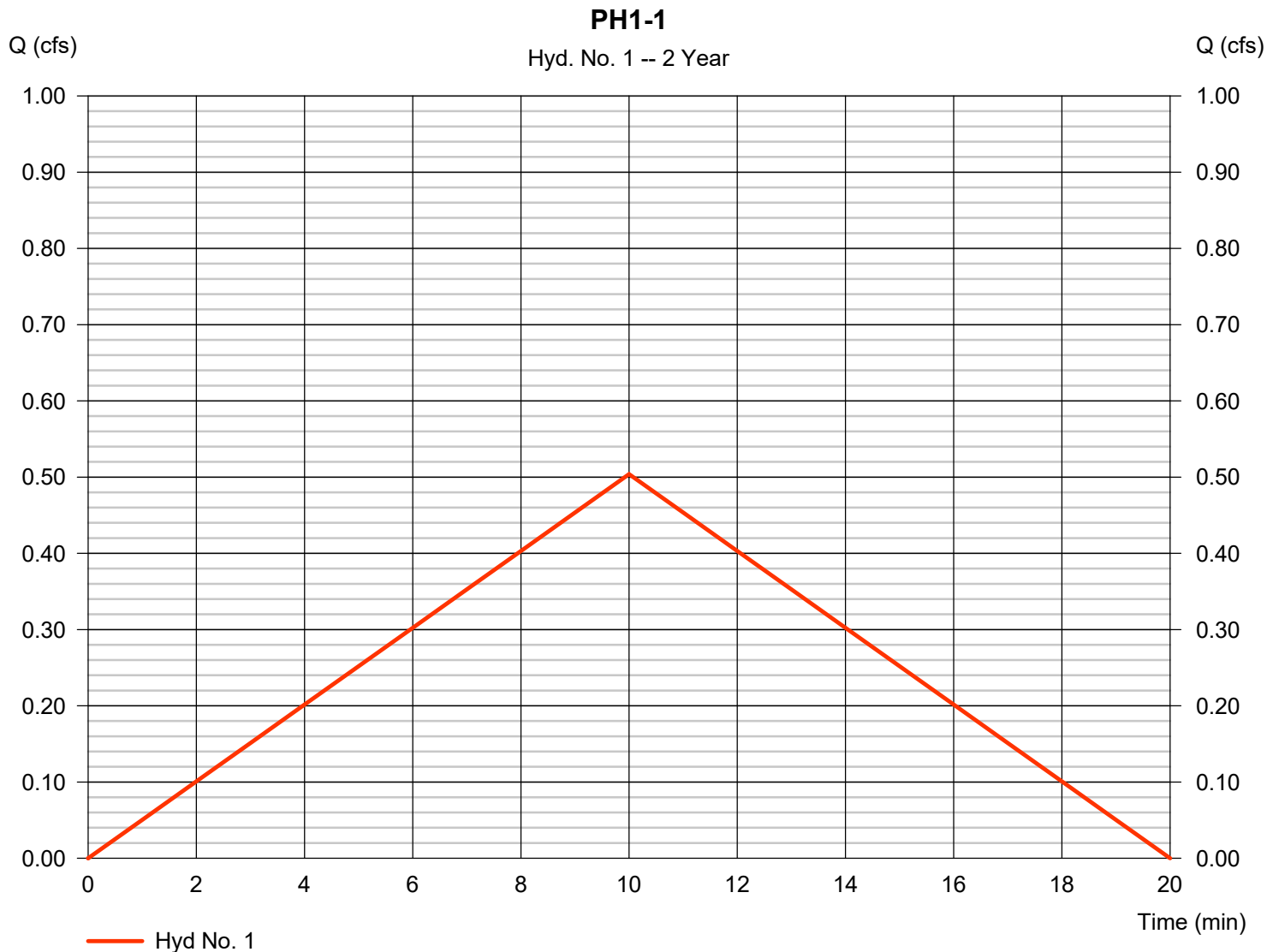
Wednesday, 04 / 12 / 2017

Hyd. No. 1

PH1-1

Hydrograph type	= Rational	Peak discharge	= 0.504 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 302 cuft
Drainage area	= 0.340 ac	Runoff coeff.	= 0.65*
Intensity	= 2.280 in/hr	Tc by User	= 10.00 min
IDF Curve	= Paradise Valley.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.110 x 0.95) + (0.230 x 0.50)] / 0.340



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description	
1	Rational	0.687	1	10	412	----	----	----	PH1-1	
2	Rational	2.718	1	10	1,631	----	----	----	PH1-2	
3	Rational	1.663	1	10	998	----	----	----	PH1-3	
4	Rational	0.687	1	10	412	----	----	----	PH1-1	
5	Rational	4.899	1	10	2,939	----	----	----	PH2-1	
6	Combine	9.967	1	10	5,980	1, 2, 3, 5	----	----	Combined Flows for CLC Phase 1 an	
FRC-CLC-PH1.gpw					Return Period: 5 Year			Wednesday, 04 / 12 / 2017		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

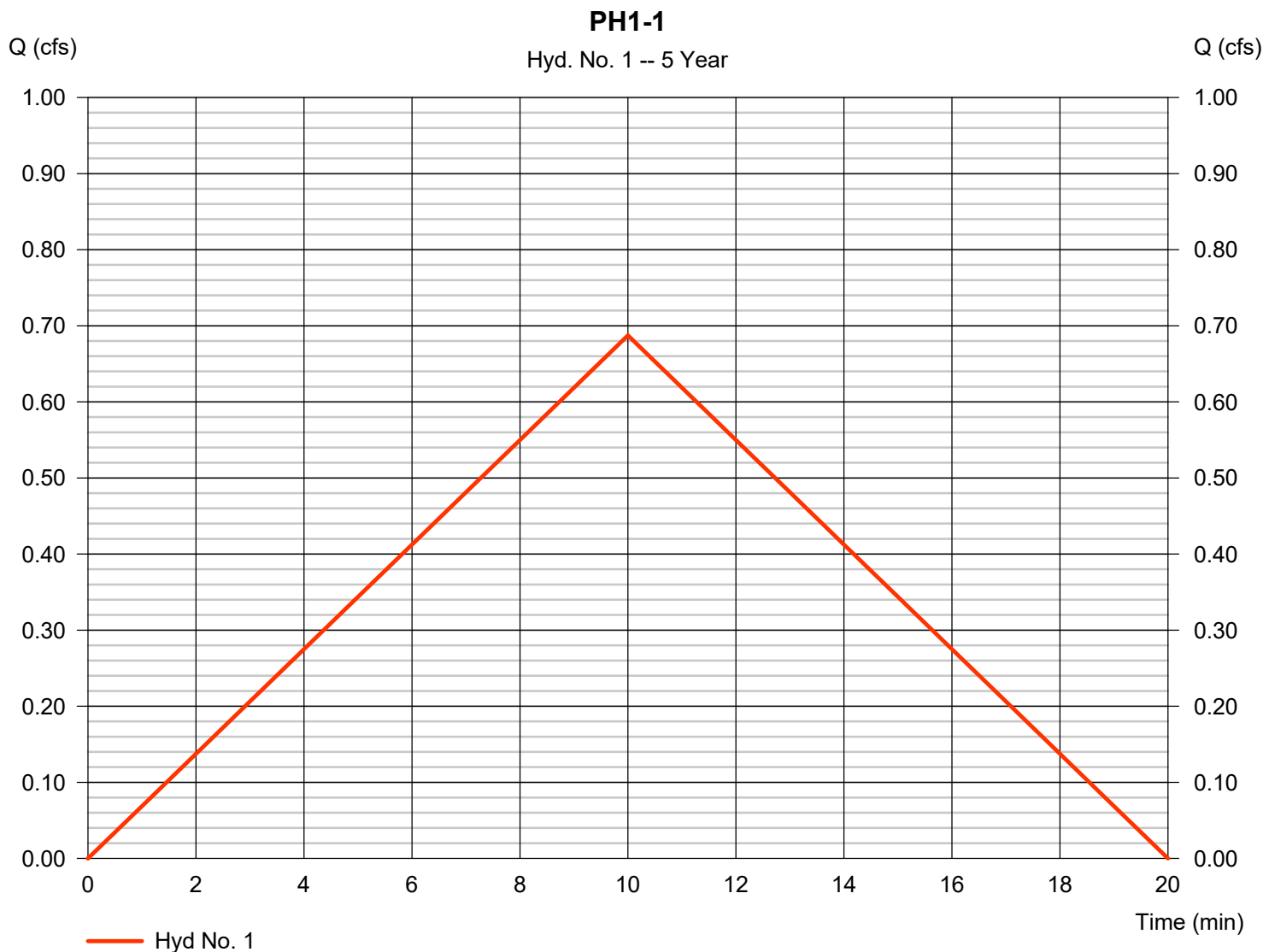
Wednesday, 04 / 12 / 2017

Hyd. No. 1

PH1-1

Hydrograph type	= Rational	Peak discharge	= 0.687 cfs
Storm frequency	= 5 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 412 cuft
Drainage area	= 0.340 ac	Runoff coeff.	= 0.65*
Intensity	= 3.110 in/hr	Tc by User	= 10.00 min
IDF Curve	= Paradise Valley.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.110 x 0.95) + (0.230 x 0.50)] / 0.340



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.826	1	10	495	----	----	----	PH1-1
2	Rational	3.266	1	10	1,959	----	----	----	PH1-2
3	Rational	1.998	1	10	1,199	----	----	----	PH1-3
4	Rational	0.826	1	10	495	----	----	----	PH1-1
5	Rational	5.885	1	10	3,531	----	----	----	PH2-1
6	Combine	11.97	1	10	7,184	1, 2, 3, 5	----	----	Combined Flows for CLC Phase 1 an
FRC-CLC-PH1.gpw					Return Period: 10 Year			Wednesday, 04 / 12 / 2017	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

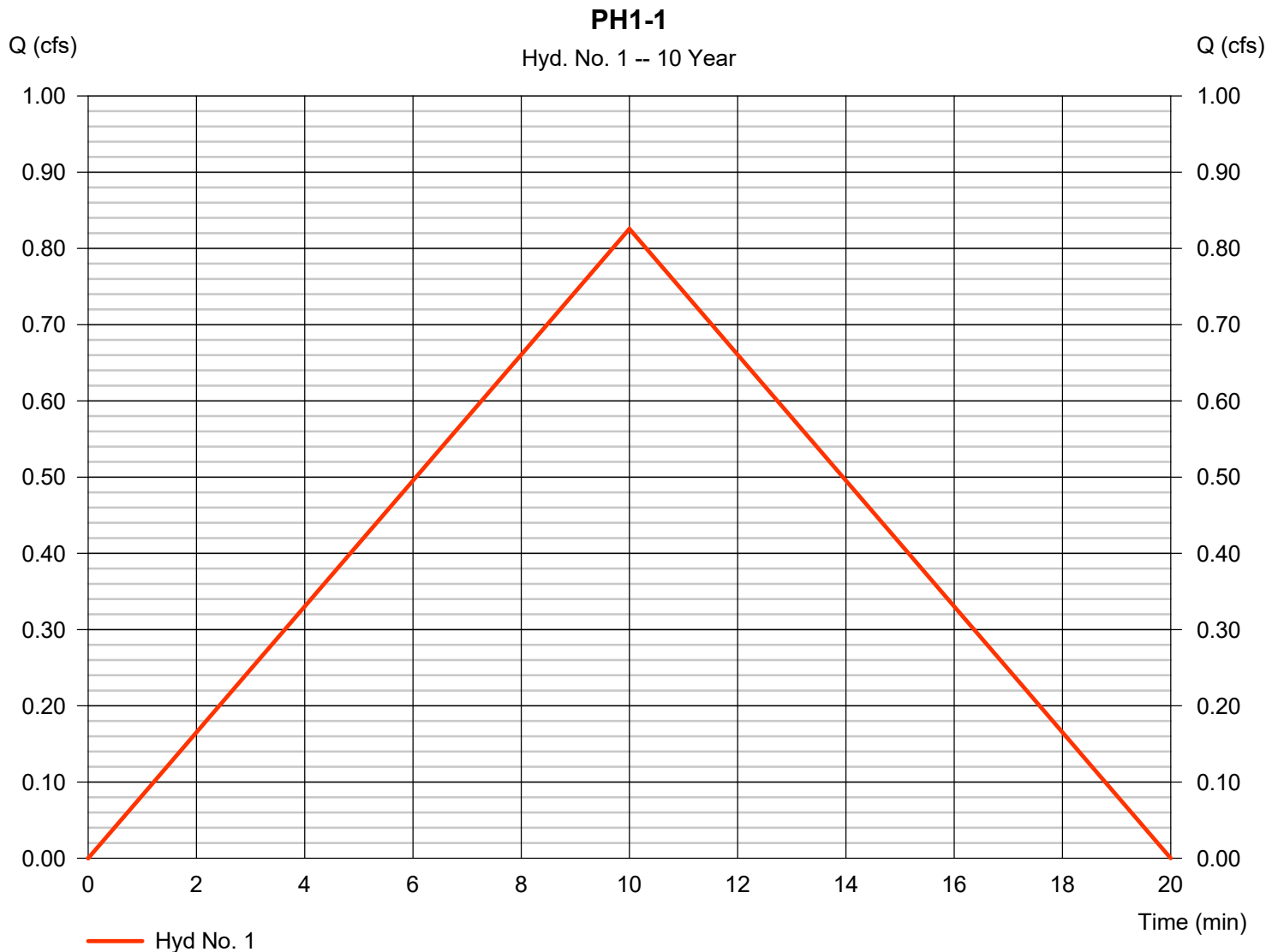
Wednesday, 04 / 12 / 2017

Hyd. No. 1

PH1-1

Hydrograph type	= Rational	Peak discharge	= 0.826 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 495 cuft
Drainage area	= 0.340 ac	Runoff coeff.	= 0.65*
Intensity	= 3.736 in/hr	Tc by User	= 10.00 min
IDF Curve	= Paradise Valley.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.110 x 0.95) + (0.230 x 0.50)] / 0.340



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description	
1	Rational	1.014	1	10	608	----	----	----	PH1-1	
2	Rational	4.010	1	10	2,406	----	----	----	PH1-2	
3	Rational	2.453	1	10	1,472	----	----	----	PH1-3	
4	Rational	1.014	1	10	608	----	----	----	PH1-1	
5	Rational	7.227	1	10	4,336	----	----	----	PH2-1	
6	Combine	14.70	1	10	8,822	1, 2, 3, 5	----	----	Combined Flows for CLC Phase 1 an	
FRC-CLC-PH1.gpw					Return Period: 25 Year			Wednesday, 04 / 12 / 2017		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

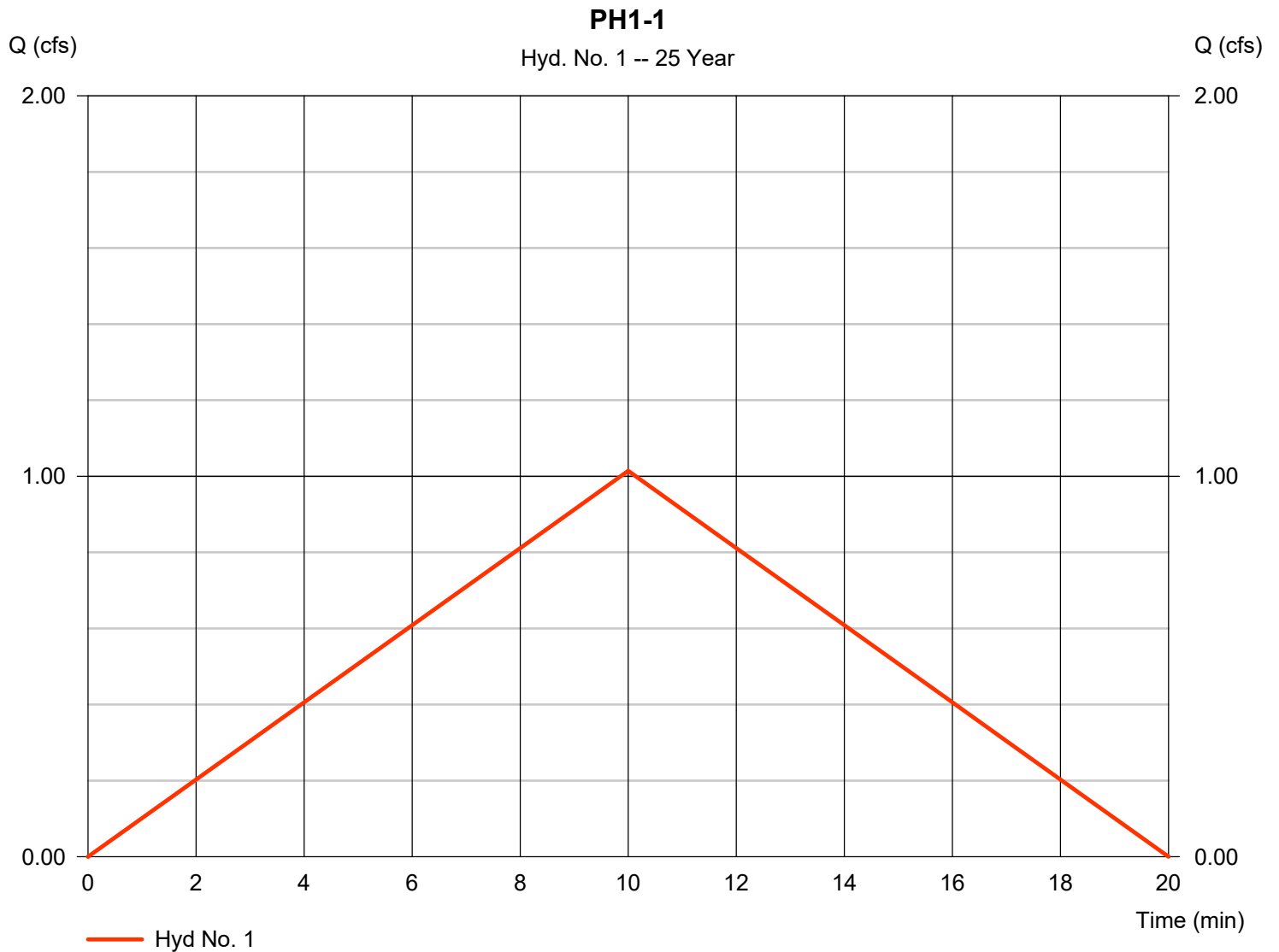
Wednesday, 04 / 12 / 2017

Hyd. No. 1

PH1-1

Hydrograph type	= Rational	Peak discharge	= 1.014 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 608 cuft
Drainage area	= 0.340 ac	Runoff coeff.	= 0.65*
Intensity	= 4.588 in/hr	Tc by User	= 10.00 min
IDF Curve	= Paradise Valley.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.110 x 0.95) + (0.230 x 0.50)] / 0.340



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description	
1	Rational	1.156	1	10	694	----	----	----	PH1-1	
2	Rational	4.572	1	10	2,743	----	----	----	PH1-2	
3	Rational	2.796	1	10	1,678	----	----	----	PH1-3	
4	Rational	1.156	1	10	694	----	----	----	PH1-1	
5	Rational	8.238	1	10	4,943	----	----	----	PH2-1	
6	Combine	16.76	1	10	10,057	1, 2, 3, 5	----	----	Combined Flows for CLC Phase 1 an	
FRC-CLC-PH1.gpw					Return Period: 50 Year			Wednesday, 04 / 12 / 2017		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

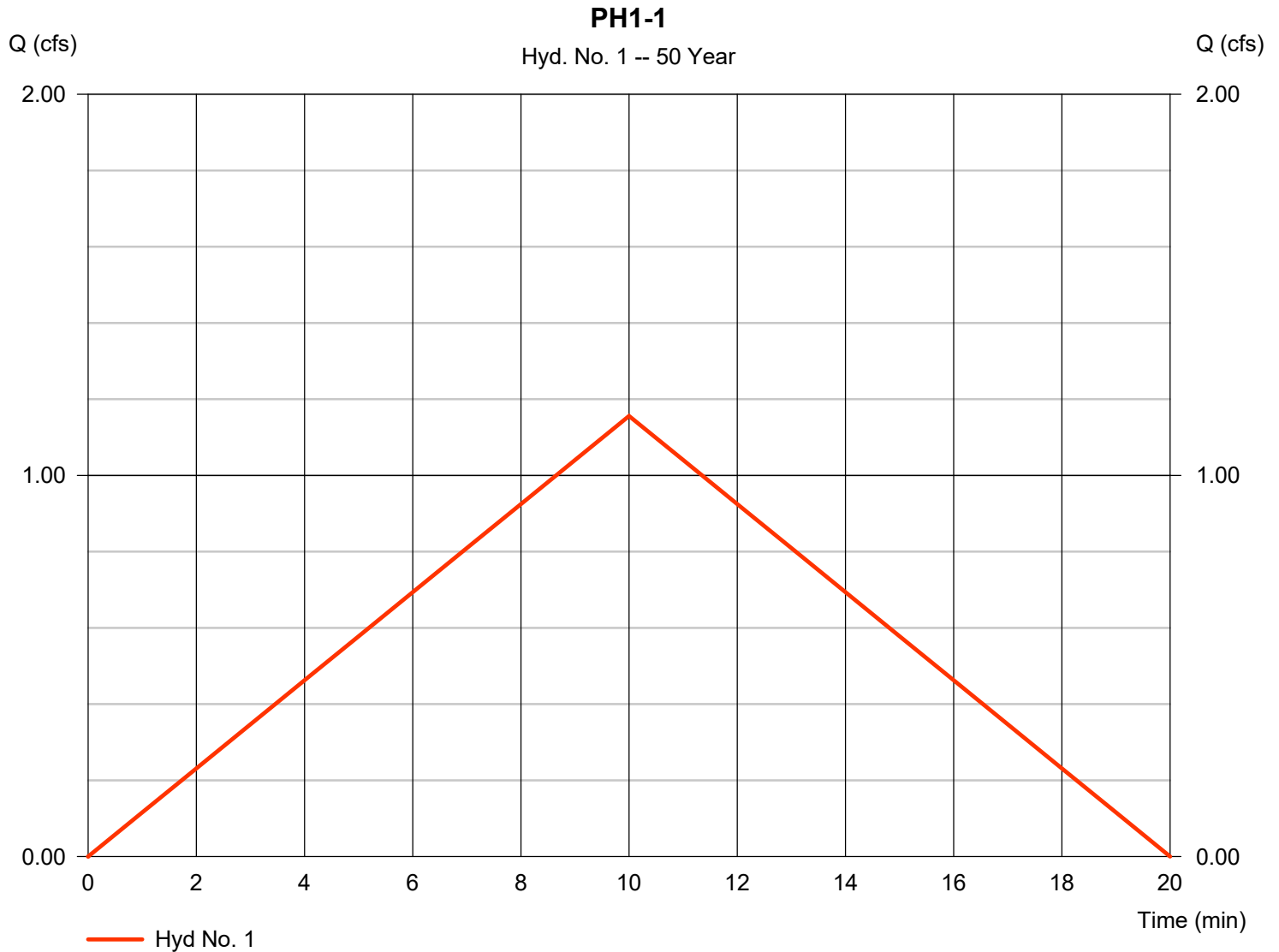
Wednesday, 04 / 12 / 2017

Hyd. No. 1

PH1-1

Hydrograph type	= Rational	Peak discharge	= 1.156 cfs
Storm frequency	= 50 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 694 cuft
Drainage area	= 0.340 ac	Runoff coeff.	= 0.65*
Intensity	= 5.231 in/hr	Tc by User	= 10.00 min
IDF Curve	= Paradise Valley.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.110 x 0.95) + (0.230 x 0.50)] / 0.340



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	1.300	1	10	780	----	----	----	PH1-1
2	Rational	5.140	1	10	3,084	----	----	----	PH1-2
3	Rational	3.144	1	10	1,887	----	----	----	PH1-3
4	Rational	1.300	1	10	780	----	----	----	PH1-1
5	Rational	9.263	1	10	5,558	----	----	----	PH2-1
6	Combine	18.85	1	10	11,309	1, 2, 3, 5	----	----	Combined Flows for CLC Phase 1 an
FRC-CLC-PH1.gpw					Return Period: 100 Year			Wednesday, 04 / 12 / 2017	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

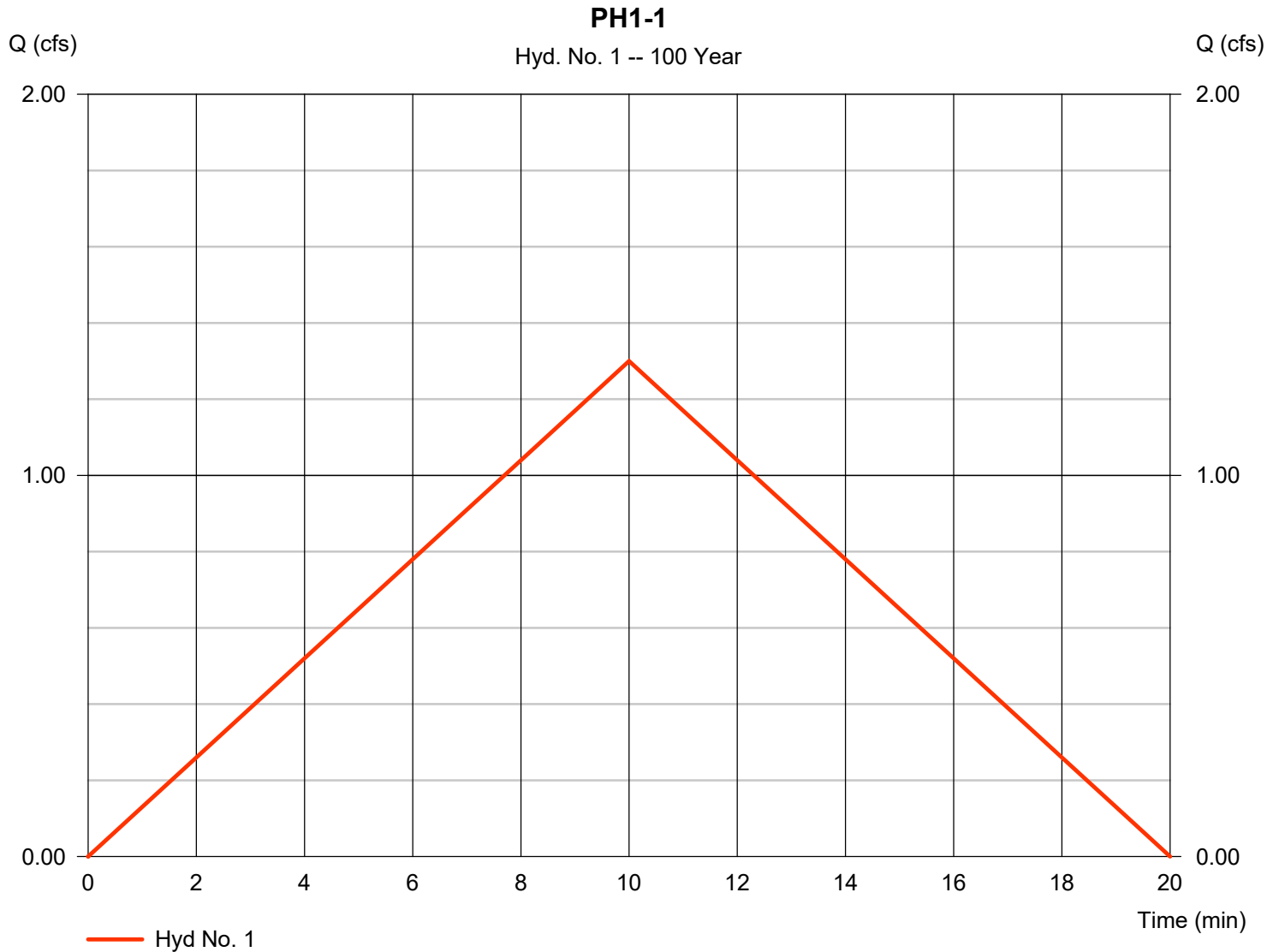
Wednesday, 04 / 12 / 2017

Hyd. No. 1

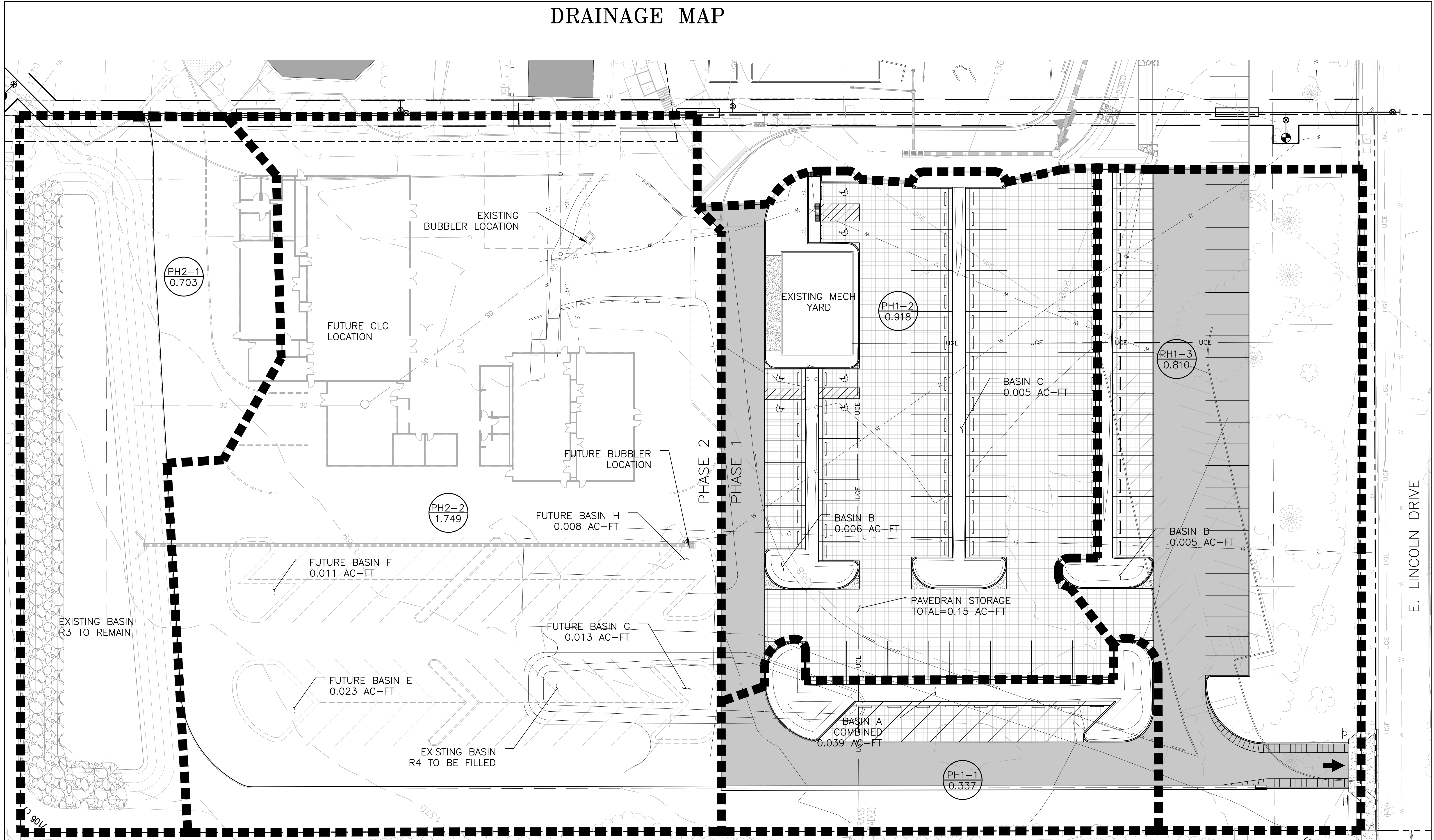
PH1-1

Hydrograph type	= Rational	Peak discharge	= 1.300 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 780 cuft
Drainage area	= 0.340 ac	Runoff coeff.	= 0.65*
Intensity	= 5.881 in/hr	Tc by User	= 10.00 min
IDF Curve	= Paradise Valley.IDF	Asc/Rec limb fact	= 1/1

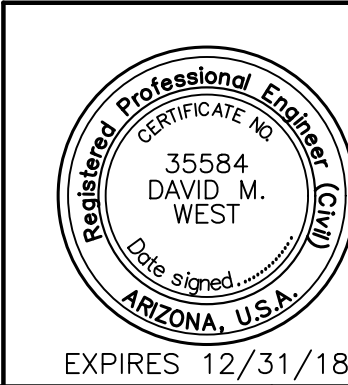
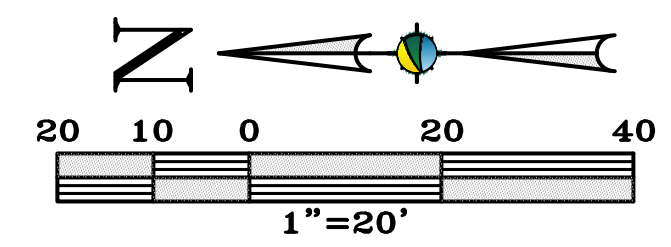
* Composite (Area/C) = [(0.110 x 0.95) + (0.230 x 0.50)] / 0.340



DRAINAGE MAP



COMMUNITY LIFE CENTER PARKING - PHASE 1



HELM

14040 N. CAVE CREEK ROAD
PHOENIX, AZ 85020
(928) 533-3305

DRAWN	DMW	REVISED
DESIGN	DMW	
CHECK	DMW	
DATE	7/11/17	
JOB	1602001	
SHEET NO.		1
FIGURE 1		

APPENDIX B
COE & VAN LOO REPORTS

September 29, 2015
Revised November 20, 2015

NEW CHURCH FRANCISCAN RENEWAL CENTER

Paradise Valley & Maricopa County, Arizona

Prepared for:
Franciscan Renewal Center
5802 East Lincoln Drive
Scottsdale, AZ 85253
480.948.7460

Prepared by:
Coe & Van Loo Consultants, Inc.
4550 N 12th Street
Phoenix, AZ 85014
Contact: Name
602.264.6831

Job #: 1-01-0199206



FINAL DRAINAGE REPORT

**Final Drainage Report
For
New Church Franciscan Renewal Center**

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	2
1.1. Scope.....	2
1.2. Site Location	2
1.3. Proposed Development	2
1.4. Regulatory Jurisdiction	2
2.0 EXISTING CONDITIONS.....	3
3.0 MANAGEMENT OF OFF-SITE RUNOFF.....	3
4.0 MANAGEMENT OF ON-SITE RUNOFF	3
5.0 FLOOD ZONE INFORMATION.....	5
6.0 SUMMARY AND CONCLUSIONS	5
REFERENCES	6

Figures

- Figure 1 Location Map
- Figure 2 Flood Insurance Rate Map (FIRM)

Appendices

- Appendix A NOAA Atlas 14 Data
- Appendix B Rational Method Calculations
- Appendix C Grate, Catch Basin & Storm Drain Calculations
- Appendix D Retention Basin, Rip-rap, Scupper and Drywell Calculations
- Appendix E Excerpts from the Master Drainage Report (Detention Basins) for the Franciscan Renewal Center

Plate

- Plate 1 Drainage Map



1.0 INTRODUCTION

1.1. Scope

Coe & Van Loo, Consultants, Inc. (CVL) has been contracted by Franciscan Renewal Center to provide engineering services in support of the proposed new church (the site). The purpose of this report is to provide hydrologic and drainage design information for the proposed improvements.

1.2. Site Location

The site is located within a portion of the Town of Paradise Valley jurisdiction and a portion of Maricopa County jurisdiction, Arizona. The Center is bounded on the north by East Cactus Wren Road and private land owners, on the south by East Lincoln Drive, on the west by private land owners, and on the east by private land owners (see Figure 1). In addition, the site is located in the southeast quarter of the northwest quarter of Section 9, Township 2 North, Range 4 East of the Gila and Salt River Meridian. The new church is located approximately in the south-central portion of the Center property.

1.3. Proposed Development

The new church will be constructed in coordination with the other phases of the site, specifically the permanent Offsite Detention Basins. The first phase consisted of the construction of the Assisi Lodging Building that was approved and completed in March 2015. The second phase includes the construction of the permanent detention basins. The New Church phase includes the construction of new buildings, access roads, and parking areas throughout the site.

1.4. Regulatory Jurisdiction

The Drainage Report has been prepared and the site will be designed in accordance with the current versions of the Maricopa County Drainage Policies and Standards (Reference 3), Drainage Design Manuals for Maricopa County, Volume 1 – Hydrology (Reference 1) and Volume 2 – Hydraulics (Reference 2) and Section 1205 of the Maricopa County Zoning Ordinance.

In addition and based on a meeting with the Maricopa County Building Department that took place on January 8, 2013, it was agreed to:

- Design the site on pre-developed versus post-developed flow conditions by reducing the impact of the offsite flow and detaining it upstream at the north edge of the site and therefore reducing the post developed peak flows downstream.
- It was also agreed that first flush would be addressed with each phase of development.

2.0 EXISTING CONDITIONS

The site is a church campus, which slopes generally southeasterly. The existing on-site runoff that emerges from the church facilities and open areas flows in a southeasterly direction to the east property line near the south end of the site. The on-site runoff is not retained. The offsite runoff flows proceed through the site as sheetflow and not through any conveyance systems. All flows discharge towards the adjacent private properties to the east.

3.0 MANAGEMENT OF OFF-SITE RUNOFF

The off-site runoff impacting the site is from the mountains located on the north side of the site. The off-site area is covered with open space, residential houses and local streets. The off-site watershed areas were delineated using the 2 foot contours obtained from FCDMC. The total watershed area is less than 160 acres, hence the Maricopa County's Rational Method along with NOAA Atlas 14 precipitation values were used to determine the flows (see Appendix A). The summary of offsite flows entering the property and mitigation via offsite detention basins is shown in Appendix E.

4.0 MANAGEMENT OF ON-SITE RUNOFF

All retained water in Offsite Basin R3 will be discharged within 36 hours through a 12" diameter bleed off pipe with a 24"x24" bubble-up structure on the downstream end as shown in Plate 1 – Drainage Map. Offsite Basin R4 retains one foot of water and will not require bleed off pipes or Drywells. Both of these basins protect the new church site from 100-year offsite flows.

Onsite stormwater generated south of Offsite Basin R3 and east of Offsite Basin R4 flows towards the proposed west parking lot for the new church. These flows are calculated anticipating future build-out of parking areas west of the church as shown in Plate 1 – Drainage Map. Portions of the total area affecting the west side of the church either drains into Offsite Basin R4 or into the low area near the south property line at Lincoln Drive. Additionally, portions of the total area southeast of Offsite Basin R4 are not anticipated for paving in the future. The C values for these areas are shown in the table in Appendix B and on Plate 1.

Collection of onsite stormwater (defined in this report as the water generated from the areas west of the church to the property line and the church site itself) will be accomplished via a grate in the west parking lot, a catch basin south of the church, area drains along the east side of the church and storm drain. Grate-inlet (GR-1) and catch basin (CB-1) calculations including clogging factors were performed adjacent to the west side of the new church to determine how much flow bypasses the parking lot grate (located in an inverted crown). Bypass flow is intercepted from the parking lot by a catch basin located at the south side of the new church. The storm drain will outfall into Onsite Basin R-C east of the church (see Appendix C for inlet capacity and storm drain calculations and Plate 1). Flow from Subbasin A and B will drain to GR-1. Flows from Subbasin C will drain into Basin R-A, overflow from R-A and bypass flows from GR-1 will drain to CB-1 (see Appendix D for Retention Basin calculations (pre versus post). Flows from Subbasin D will drain to R-B and R-C. Overtopping flows from R-B drain to R-C. Flows generated from the church building itself (2 cfs total) are intercepted by area drains located in landscaped areas around the church and connected by laterals to the proposed storm drain running west to east along the south side of the church building and into Basin R-C. Retention Basins R-A, R-B and R-C drain in 36 hrs via drywells (see Appendix D).

5.0 FLOOD ZONE INFORMATION

The Maricopa County, Arizona and Incorporated Areas, Flood Insurance Rate Map (FIRM), Community-Panel Number 04013C1765L, Map Revised October 16, 2013 (Reference 5), indicates the subject site falls within Zone X (see Figure 2).

Zone X within the project area is defined as "Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood". Therefore, coordination with FEMA is not required.

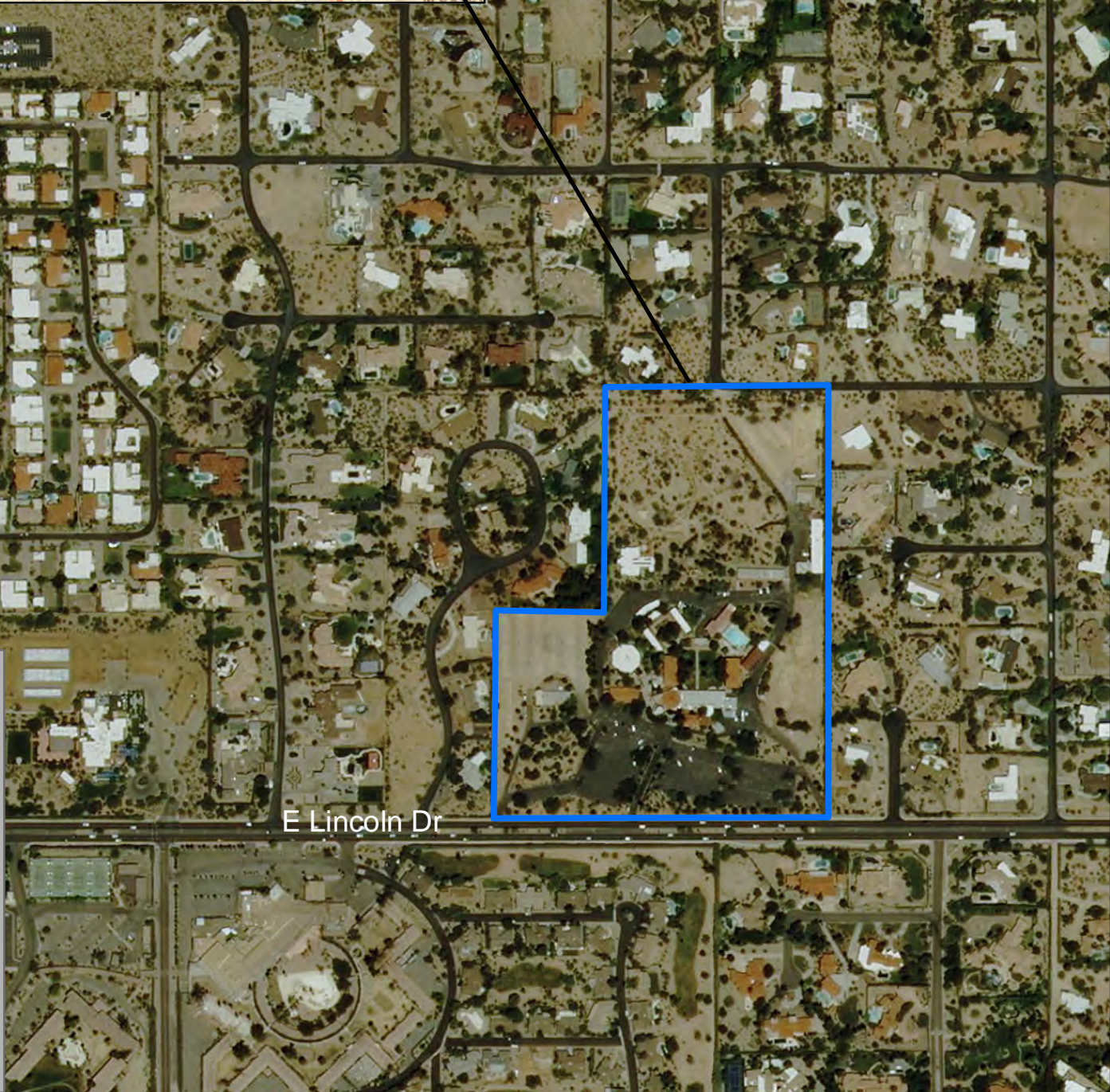
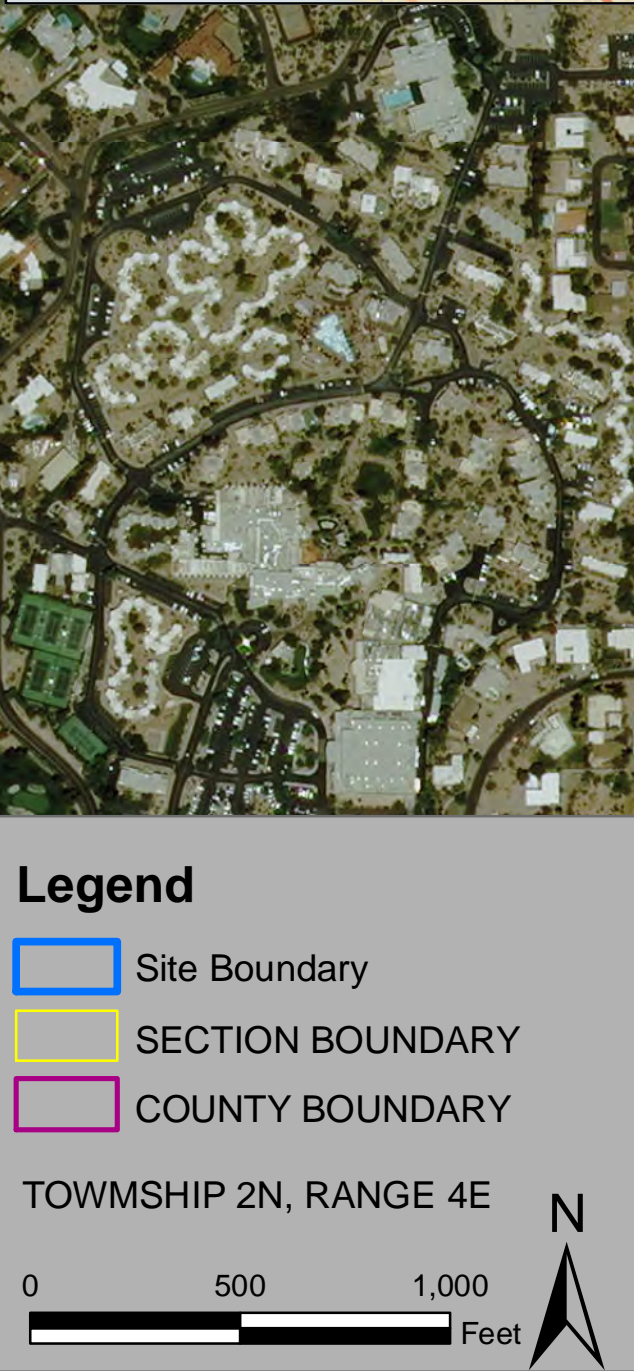
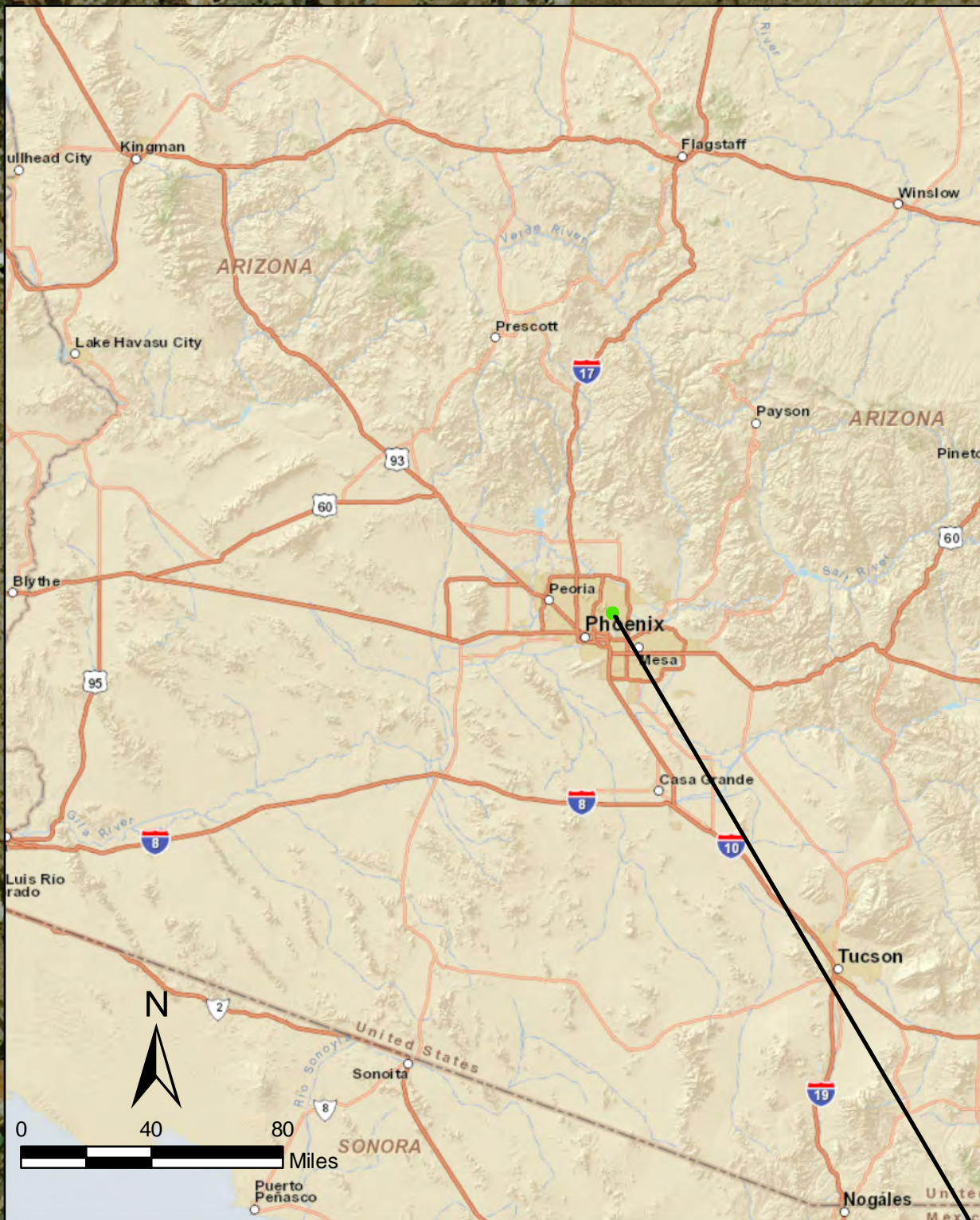
6.0 SUMMARY AND CONCLUSIONS

1. On-site storm water runoff affecting the new church from Subbasins A and B are collected in Retention Basin R-A via three scuppers (SC-1, SC-2, SC-3) and by a grate in the west parking lot.
2. A catch basin inlet (CB-1) intercepts bypass flow from Retention Basin R-A and GR-1.
3. Flow from the church building (D-1) are captured by area drains in the landscape areas around the church and routed to the stormdrain then to Retention Basin R-C.
4. Flows from Subbasin D (D2 and D3) sheet flow through the parking lot and drain into retention basins R-B and R-C via scuppers.
5. The proposed 100-year peak flow from onsite and offsite leaving the site (includes future phases) is equal or less than the current 100-year peak discharge (see Appendix E).
6. Offsite flows are detained in Offsite Basins R3 and R4. Therefore offsite flows coming from outside the Franciscan property will not affect the new church site.
7. A bubble-up structure drains Offsite Basin R3 at a rate that does not increase peak onsite flows affecting the new church site.

REFERENCES

1. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology*, February 2011.
2. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics*, January 1996 (Effective).
3. Flood Control District of Maricopa County (FCDMC), *Drainage Policies and Standards for Maricopa County, Arizona*, January 2007 (Effective).
4. Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map (FIRM), Maricopa County, Arizona, and Incorporated Areas, Community Panel Number 04013C1765L*, Map Revised October 16, 2013.
5. Coe & Van Loo Consultants Inc., *Master Drainage Report (Retention Basins) for Franciscan Renewal Center*, September 2015.

FIGURES



LOCATION MAP

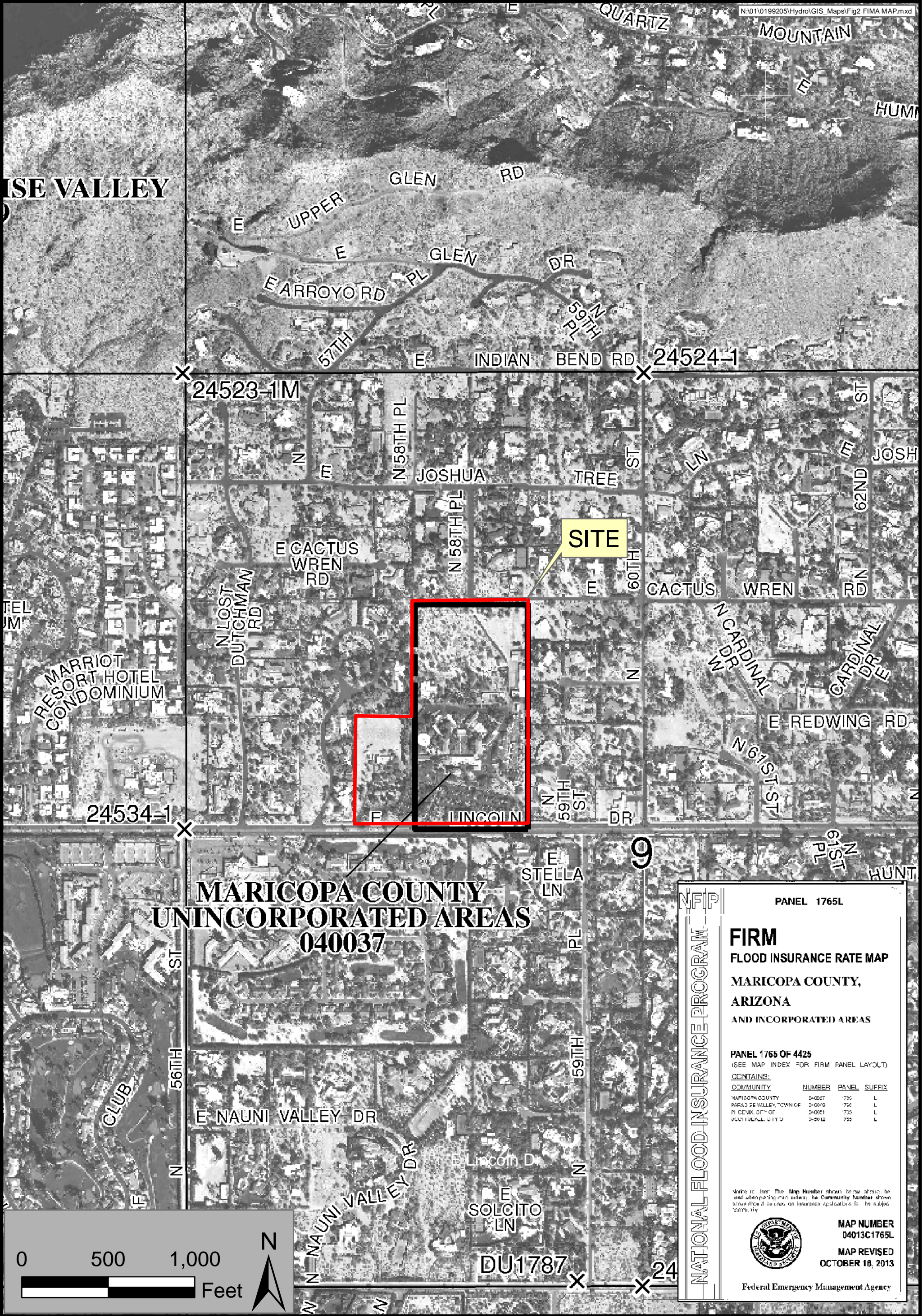
FRANCISCAN RENEWAL CENTER

JOB NO.
01-0199205

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

COE & VAN LOO
PLANNING · ENGINEERING · LANDSCAPE ARCHITECTURE

FIGURE 1
05/20/2015



**MARICOPA COUNTY
UNINCORPORATED AREAS
040037**

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1765L


**FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY,
ARIZONA
AND INCORPORATED AREAS**

PANEL 1765 OF 4425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

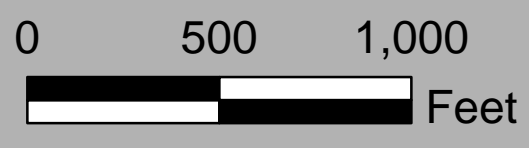
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	736	L
PARADISE VALLEY TOWN OF	040019	736	L
THE CITY OF PHOENIX	040051	735	L
SUNBELT CITY OF	040012	725	L

Notes to User: The Map Number shown below should be used when ordering maps. The Community Number shown above should be used on insurance applications. It is subject to change.

 **MAP NUMBER
04013C1765L**
**MAP REVISED
OCTOBER 18, 2013**

Federal Emergency Management Agency



FLOOD INSURANCE RATE MAP

FRANCISCAN RENEWAL CENTER

JOB NO.
01-0199205

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

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FIGURE 2
05/20/2015

APPENDICES

APPENDIX A

NOAA Atlas 14 Data



NOAA Atlas 14, Volume 1, Version 5
Location name: Paradise Valley, Arizona, US*
Latitude: 33.5382°, Longitude: -111.9562°
Elevation: 1440 ft*
 * source: Google Maps



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](#)

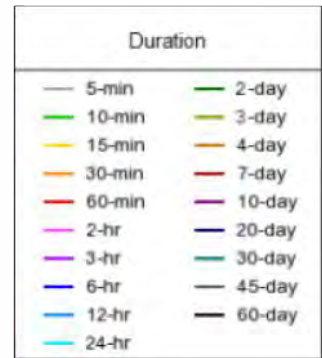
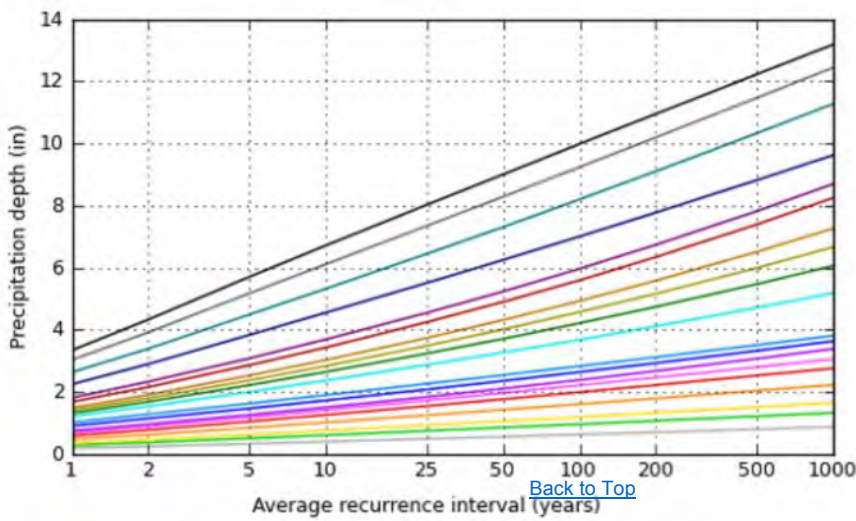
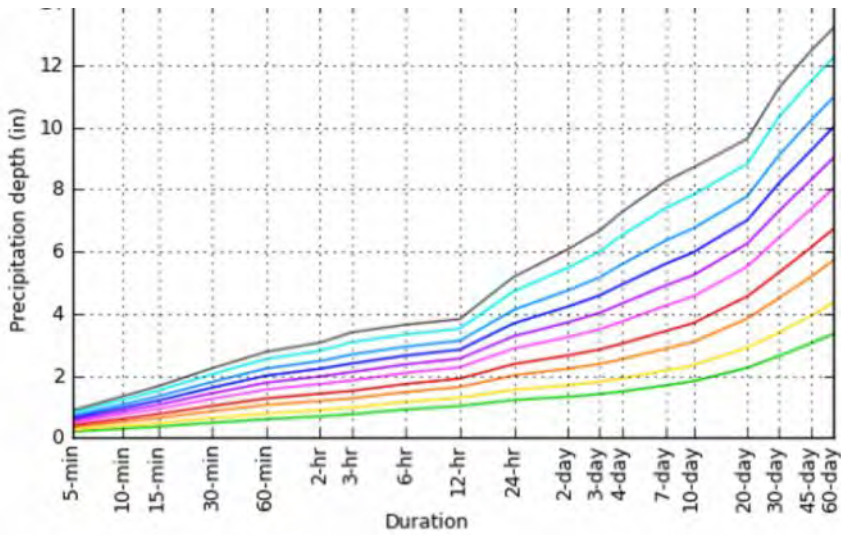
PF tabular

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	0.189 (0.158-0.231)	0.247 (0.208-0.302)	0.335 (0.279-0.408)	0.403 (0.334-0.488)	0.494 (0.402-0.596)	0.564 (0.454-0.676)	0.635 (0.502-0.760)	0.707 (0.550-0.845)	0.805 (0.609-0.963)	0.879 (0.652-1.05)
10-min	0.287 (0.240-0.352)	0.377 (0.316-0.460)	0.511 (0.425-0.621)	0.613 (0.508-0.743)	0.752 (0.612-0.907)	0.859 (0.690-1.03)	0.967 (0.764-1.16)	1.08 (0.837-1.29)	1.23 (0.927-1.47)	1.34 (0.992-1.60)
15-min	0.357 (0.298-0.436)	0.467 (0.392-0.570)	0.633 (0.527-0.770)	0.761 (0.629-0.921)	0.932 (0.759-1.12)	1.07 (0.856-1.28)	1.20 (0.947-1.43)	1.34 (1.04-1.60)	1.52 (1.15-1.82)	1.66 (1.23-1.99)
30-min	0.481 (0.401-0.587)	0.628 (0.528-0.768)	0.852 (0.710-1.04)	1.02 (0.847-1.24)	1.26 (1.02-1.51)	1.43 (1.15-1.72)	1.61 (1.28-1.93)	1.80 (1.40-2.15)	2.05 (1.55-2.45)	2.23 (1.66-2.68)
60-min	0.595 (0.497-0.727)	0.778 (0.654-0.950)	1.06 (0.878-1.28)	1.27 (1.05-1.54)	1.55 (1.27-1.87)	1.77 (1.43-2.13)	2.00 (1.58-2.39)	2.23 (1.73-2.66)	2.53 (1.92-3.03)	2.76 (2.05-3.31)
2-hr	0.689 (0.584-0.824)	0.892 (0.757-1.07)	1.19 (1.01-1.42)	1.42 (1.19-1.69)	1.74 (1.43-2.05)	1.97 (1.61-2.33)	2.22 (1.78-2.61)	2.47 (1.95-2.90)	2.80 (2.16-3.30)	3.06 (2.31-3.63)
3-hr	0.757 (0.639-0.917)	0.970 (0.823-1.18)	1.27 (1.07-1.54)	1.51 (1.26-1.82)	1.85 (1.52-2.20)	2.11 (1.72-2.51)	2.39 (1.91-2.84)	2.68 (2.10-3.18)	3.08 (2.34-3.66)	3.40 (2.53-4.05)
6-hr	0.912 (0.785-1.08)	1.15 (0.997-1.37)	1.48 (1.27-1.74)	1.73 (1.48-2.03)	2.08 (1.75-2.43)	2.36 (1.95-2.74)	2.64 (2.16-3.07)	2.93 (2.35-3.42)	3.33 (2.60-3.88)	3.64 (2.78-4.25)
12-hr	1.02 (0.890-1.20)	1.29 (1.12-1.51)	1.64 (1.41-1.90)	1.91 (1.64-2.21)	2.27 (1.93-2.62)	2.55 (2.14-2.94)	2.84 (2.35-3.27)	3.13 (2.56-3.61)	3.52 (2.80-4.08)	3.82 (2.99-4.46)
24-hr	1.22 (1.06-1.43)	1.55 (1.35-1.82)	2.01 (1.74-2.37)	2.37 (2.05-2.79)	2.88 (2.47-3.38)	3.27 (2.79-3.84)	3.69 (3.13-4.33)	4.12 (3.46-4.84)	4.71 (3.91-5.53)	5.19 (4.26-6.11)
2-day	1.32 (1.15-1.54)	1.69 (1.47-1.97)	2.22 (1.93-2.59)	2.65 (2.29-3.08)	3.24 (2.79-3.77)	3.72 (3.18-4.31)	4.22 (3.58-4.90)	4.74 (3.99-5.51)	5.48 (4.56-6.38)	6.07 (5.00-7.08)
3-day	1.41 (1.23-1.64)	1.80 (1.57-2.09)	2.38 (2.06-2.76)	2.84 (2.46-3.30)	3.49 (3.01-4.05)	4.02 (3.43-4.66)	4.58 (3.88-5.31)	5.17 (4.35-6.00)	6.00 (4.98-6.96)	6.67 (5.49-7.76)
4-day	1.49 (1.30-1.73)	1.91 (1.67-2.22)	2.53 (2.20-2.93)	3.03 (2.62-3.51)	3.74 (3.22-4.34)	4.32 (3.69-5.00)	4.93 (4.19-5.71)	5.59 (4.70-6.49)	6.51 (5.41-7.54)	7.27 (5.98-8.44)
7-day	1.69 (1.46-1.97)	2.16 (1.87-2.52)	2.87 (2.47-3.34)	3.44 (2.96-4.00)	4.25 (3.63-4.94)	4.90 (4.17-5.69)	5.60 (4.73-6.50)	6.35 (5.31-7.39)	7.40 (6.11-8.61)	8.25 (6.75-9.61)
10-day	1.82 (1.58-2.11)	2.33 (2.02-2.71)	3.09 (2.67-3.58)	3.70 (3.19-4.28)	4.55 (3.90-5.25)	5.24 (4.47-6.03)	5.97 (5.06-6.89)	6.74 (5.67-7.78)	7.83 (6.50-9.03)	8.70 (7.15-10.1)
20-day	2.25 (1.97-2.59)	2.90 (2.53-3.34)	3.84 (3.35-4.42)	4.55 (3.95-5.23)	5.52 (4.77-6.33)	6.25 (5.39-7.17)	7.01 (6.01-8.06)	7.78 (6.63-8.95)	8.82 (7.45-10.2)	9.63 (8.07-11.1)
30-day	2.64 (2.29-3.03)	3.40 (2.96-3.91)	4.49 (3.90-5.15)	5.33 (4.62-6.11)	6.45 (5.56-7.39)	7.31 (6.28-8.37)	8.20 (7.02-9.38)	9.11 (7.75-10.4)	10.3 (8.73-11.8)	11.3 (9.45-12.9)
45-day	3.04 (2.66-3.48)	3.92 (3.44-4.49)	5.18 (4.53-5.92)	6.11 (5.34-6.99)	7.35 (6.39-8.40)	8.29 (7.18-9.47)	9.24 (7.96-10.6)	10.2 (8.75-11.7)	11.5 (9.76-13.2)	12.4 (10.5-14.3)
60-day	3.35 (2.95-3.81)	4.33 (3.81-4.93)	5.71 (5.02-6.49)	6.72 (5.89-7.64)	8.03 (7.02-9.12)	9.00 (7.84-10.2)	9.99 (8.65-11.4)	11.0 (9.46-12.5)	12.2 (10.5-14.0)	13.2 (11.2-15.1)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical



[Back to Top](#)

Maps & aeriels

NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Tue Jun 30 15:31:36 2015

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

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[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[Office of Hydrologic Development](#)
1325 East West Highway
Silver Spring, MD 20910

APPENDIX B

Rational Method Calculations

SUMMARY OF RATIONAL METHOD PEAK FLOW HYDROLOGY
Franciscan Renewal Center - New Church

CP Concentration Point	Sub- basin Area (ac)	Water Course Length ft	High Elevation ft	Low Elevation ft	C Weighted Runoff Coefficient			i Intensity (in/hr)			Tc Time of Concentration (min)			Q Peak Flow Rate (cfs)		
					Return Period			Return Period			Return Period			Return Period		
					10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year
A (to GR-1)	2.28	461	1371	1367	0.74	0.89	0.92	2.9	4.2	5	17.4	15	14.1	5	9	10
B+C (to SC-1,2,3 & CB-1)	1.17	240	1368	1367	0.52	0.62	0.65	3	4.5	5.2	15.9	13.6	12.8	2	3	4
D-1 (to area drains)	0.39	140	1367.6	1367	0.95	0.95	0.95	3.4	5.1	6	11.8	10.2	9.6	1	2	2
D-2 (to SC-4)	1.05	370	1367.2	1364.8	0.95	0.95	0.95	2.9	4.2	5	17.5	15.1	14.3	3	4	5
D-3 (to SC-5)	0.77	196	1366	1364.6	0.95	0.95	0.95	3.5	5.2	6	11.7	10	9.4	3	4	4

Reference: Drainage Design Manual for Maricopa County, Hydrology, February 10, 2011

Notes:

$T_c = \text{Time of concentration} = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$ (Equation 3.2, Papadakis and Kazan equation, 1987)

L = Length of the longest flow path, miles.

S = Watercourse slope, feet/mile.

$K_b = \text{Watershed resistance coefficient} = m \log_{10} A + b$, where A= drainage area in acres, m and b values from (Table 3.1).

Q = Peak discharge = C*I*A, cfs. (Equation 3.1)

i = Average rainfall intensity, in in/hr, lasting for a T_c . Determined using the I-D-F curve from the NOAA Atlas 14 PRECIPITATION FREQUENCY ESTIMATES

C = Runoff coefficient (see Appendix D).

APPENDIX C

Grate, Catch Basin & Storm Drain Calculations

Worksheet for Grate GR-1

Project Description

Solve For Efficiency

Input Data

Roughness Coefficient	0.016
Slope	0.25 %
Left Side Slope	2.00 %
Right Side Slope	2.00 %
Bottom Width	2.0 ft
Discharge	10.0 ft ³ /s
Grate Width	2.0 ft
Grate Length	9.0 ft
Grate Type	P-50 mm (P-1-7/8")
Clogging	50 %

Options

Grate Flow Option Exclude None

Results

Efficiency	70.69 %
Intercepted Flow	7.1 ft ³ /s
Bypass Flow	2.9 ft ³ /s
Flow Area	6.7 ft ²
Wetted Perimeter	36.7 ft
Top Width	36.6 ft
Velocity	1.5 ft/s
Splash Over Velocity	12.3 ft/s
Frontal Flow Factor	1.00
Side Flow Factor	0.67
Grate Flow Ratio	0.10
Active Grate Length	4.5 ft
Critical Depth	0.28 ft
Critical Slope	0.0070 ft/ft
Froude Number	0.62
Flow Type	Subcritical
Specific Energy	0.38 ft
Velocity Head	0.03 ft
Depth	0.35 ft

Cross Section for Grate GR-1

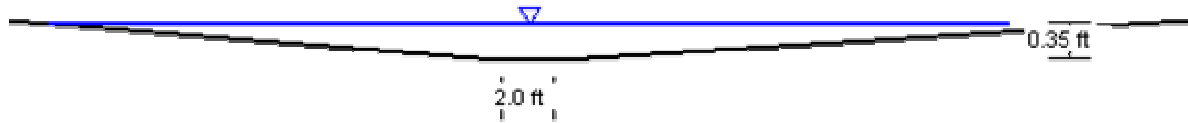
Project Description

Solve For Efficiency

Input Data

Roughness Coefficient		0.016
Slope		0.25 %
Left Side Slope		2.00 %
Right Side Slope		2.00 %
Bottom Width		2.0 ft
Discharge		10.0 ft ³ /s
Efficiency		70.69 %
Grate Width		2.0 ft
Grate Length		9.0 ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging		50 %

Cross Section Image



V: 4
H: 1

Worksheet for Catchbasin CB-1

Project Description

Solve For Efficiency

Input Data

Discharge	6.9	ft ³ /s
Slope	0.25	%
Gutter Width	1.42	ft
Gutter Cross Slope	0.059	ft/ft
Road Cross Slope	0.020	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	12.00	ft
Local Depression	2.00	in
Local Depression Width	1.42	ft

Results

Efficiency	92.43	%
Intercepted Flow	6.4	ft ³ /s
Bypass Flow	0.5	ft ³ /s
Spread	19.1	ft
Depth	0.44	ft
Flow Area	3.7	ft ²
Gutter Depression	0.055	ft
Total Depression	0.22	ft
Velocity	1.9	ft/s
Equivalent Cross Slope	0.05207	ft/ft
Length Factor	0.76	
Total Interception Length	15.76	ft

Messages

Notes

Size on plans accounts for 1.25 clogging factor per County Requirements.

Cross Section for Catchbasin CB-1

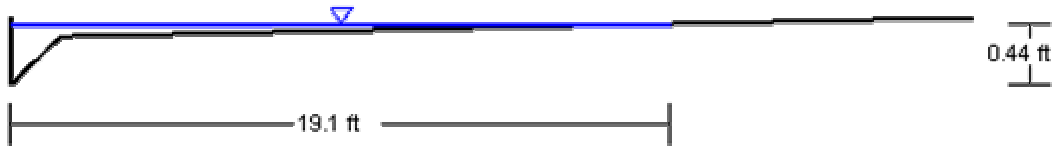
Project Description

Solve For Efficiency

Input Data

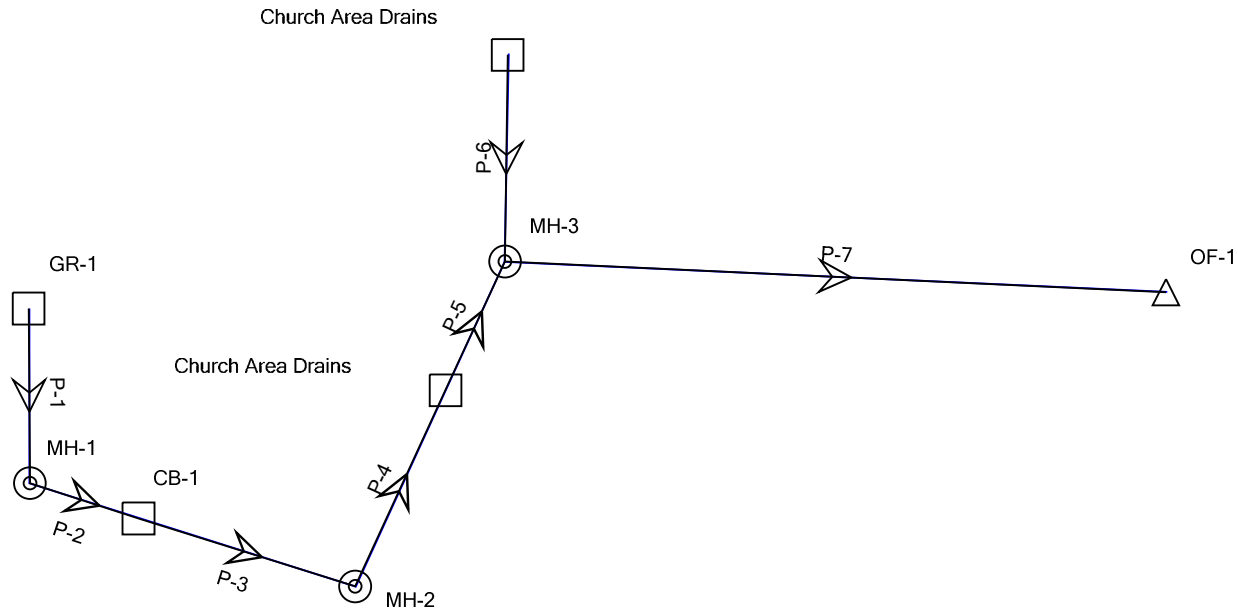
Discharge	6.9	ft ³ /s
Slope	0.25	%
Gutter Width	1.42	ft
Gutter Cross Slope	0.059	ft/ft
Road Cross Slope	0.020	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	1.42	ft
Efficiency	92.43	%
Curb Opening Length	12.00	ft

Cross Section Image



V: 4
H: 1

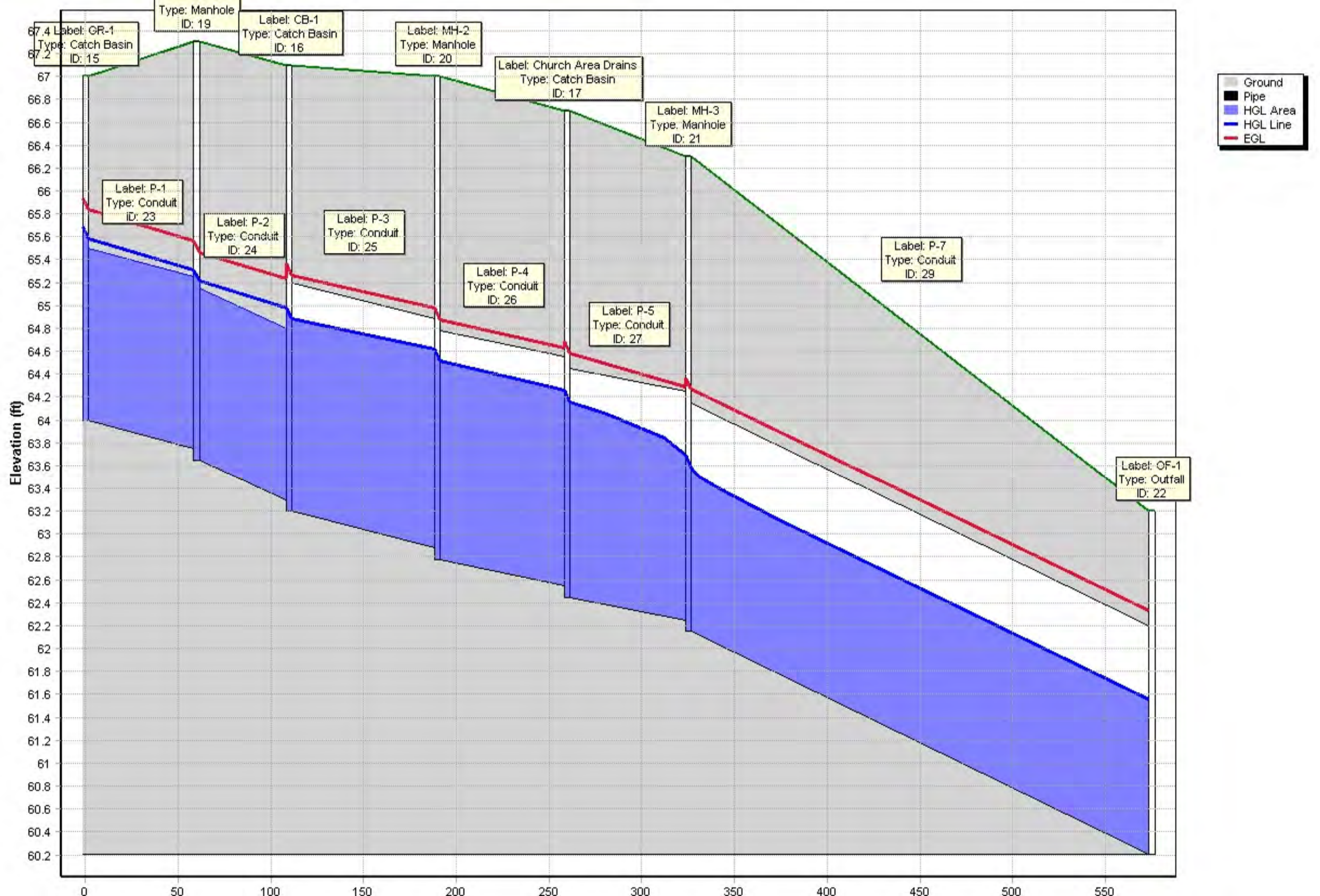
Print Preview

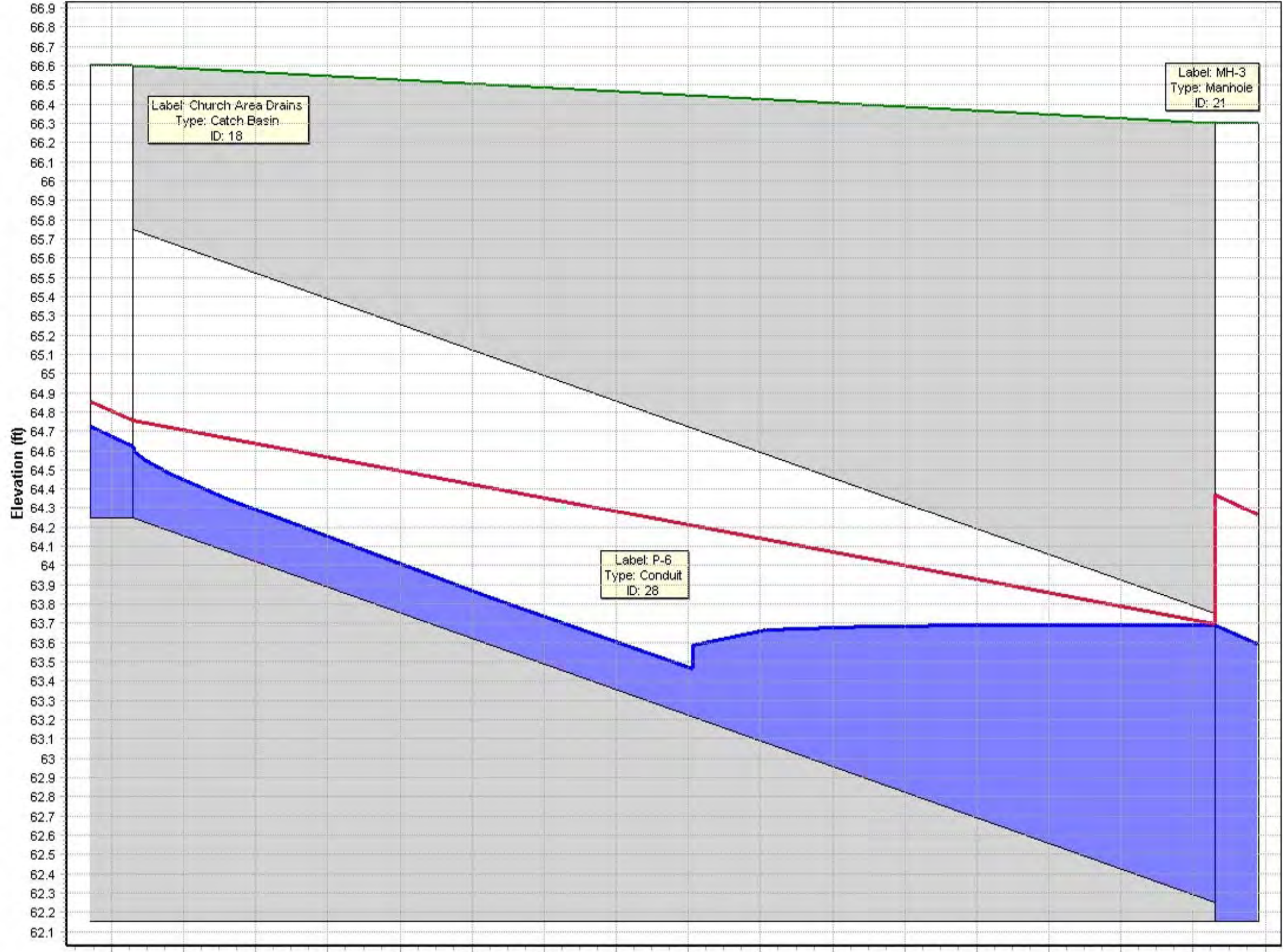


FlexTable: Conduit Table (New Church FRC.stc)

Current Time: 0.000 min

Label	Start Node	Stop Node	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Length (ft)	Slope (Calculated) (ft/ft)	Conduit Shape	Material	Manning's n	Diam eter (in)	Flow (ft ³ /s)	Capacity (Full Flow) (ft ³ /s)	Velocity (Average) (ft/s)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)
P-1	GR-1	MH-1	64.00	63.75	60.0	0.004	Circular Pipe	Concrete	0.013	18.0	7.10	6.78	4.02	67.00	67.30	65.59	65.31	1.50	2.05
P-2	MH-1	CB-1	63.65	63.30	50.0	0.007	Circular Pipe	Concrete	0.013	18.0	7.10	8.79	4.02	67.30	67.10	65.21	64.98	2.15	2.30
P-3	CB-1	MH-2	63.20	62.88	80.0	0.004	Circular Pipe	Concrete	0.013	24.0	14.00	14.31	5.19	67.10	67.00	64.88	64.62	1.90	2.12
P-4	MH-2	Church Area Drains	62.78	62.55	70.0	0.003	Circular Pipe	Concrete	0.013	24.0	14.00	12.97	4.46	67.00	66.70	64.52	64.26	2.22	2.15
P-5	Church Area Drains	MH-3	62.45	62.25	65.0	0.003	Circular Pipe	Concrete	0.013	24.0	15.00	12.55	4.77	66.70	66.30	64.16	63.69	2.25	2.05
P-6	Church Area Drains	MH-3	64.25	62.25	78.0	0.026	Circular Pipe	Concrete	0.013	18.0	1.00	16.82	5.22	66.60	66.30	64.62	63.69	0.85	2.55
P-7	MH-3	OF-1	62.15	60.20	250.0	0.008	Circular Pipe	Concrete	0.013	24.0	16.00	19.98	7.07	66.30	63.20	63.59	61.55	2.15	1.00





- Ground
- Pipe
- HGL Area
- HGL Line
- EGL

APPENDIX D

Retention Basin, Rip-rap, Scupper and Drywell Calculations

Franciscan Renewal Center - New Church
Post On-site Runoff Coefficient Factor Calculation

	Subbasin ¹	A ³	B	C	D
	TOT AREA (ac.)	2.28	0.66	0.51	2.21
C value ²	0.95	2.12	-	0.51	2.21
	0.65	0.15	0.66	-	-
	Weighted C	0.92	0.65	0.95	0.95

Notes:

1. See Plate 1 - Drainage Map
2. From Table 3.2, Hydrology Manual, FCDMC.
 C = 0.95 - average 100-yr value for 'Pavement and Rooftops' (P)
 C = 0.65 - average 100-yr value for 'Low Density Residential' (LDR)
3. A portion of Subbasin A has a C value of 0.65
4. Weighted C (for post retention)

Pre On-site Runoff Coefficient Factor Calculation

	Subbasin ¹	A	B	C	D
	TOT AREA (ac.)	2.28	0.66	0.51	2.21
C value ²	0.95	-	-	-	-
	0.65	2.28	0.66	0.51	2.21
	Weighted C	0.65	0.65	0.65	0.65

Notes:

1. See Plate 1 - Drainage Map
2. From Table 3.2, Hydrology Manual, FCDMC.
 C = 0.65 - average 100-yr value for 'Low Density Residential'

Summary of Onsite Retention Basins
Franciscan Renewal Center - New Church

Retention ⁽¹⁾ Sub-Watershed ID	Drainage Area A (acres)	Runoff ⁽²⁾ Coefficient C	Precipitation ⁽³⁾ P (inches)	Volume ⁽⁴⁾ Required V _{req} (acre-ft)	Volume Provided ⁽⁵⁾				
					Retention Basin ⁽⁶⁾ ID	Depth D (ft)	Area A _{BOTT} (acres)	Area A _{TOP} (acres)	Total V _P (acre-ft)
C (pre)	0.51	0.65	2.22	0.061	R-A ⁽⁷⁾	1.0	0.0075	0.0250	0.016
C (post)	0.51	0.95	2.22	0.090					
C (first-flush)	0.51	1.00	0.500	0.021					
Sub-Total				0.028					0.016
A+B+C+D (pre)	5.66	0.65	2.22	0.681	R-B & R-C ⁽⁸⁾	3.0	0.051	0.132	0.276
A+B+C+D (post)	5.66	0.90	2.22	0.937					
A+B+C+D (first-flush)	5.66	1.00	0.500	0.236					
Sub-Total				0.257					0.276
TOTAL				0.285					0.292

Reference: Drainage Policies and Standards for Maricopa County, Arizona, Draft January 2013.
Drainage Design Manual for Maricopa County, Arizona, Hydrology, August, 2013.

Notes:

1. Sub-basin delineations per Drainage Map (Plate 1).
2. 100-year C-Value of 0.65 for pre 'LDR' and 0.945 for post 'P' (per Table 3.2, Hydrology Manual, FCDMC)
3. Estimated 100-year, 2-hour precipitation depth, P= 2.22 inches per NOAA 14 PRECIPITATION FREQUENCY ESTIMATES.
4. $V_{req} = A \times C \times (P/12) =$ volume required for retention in acre-ft.
5. $V_P = D \times (A_{TOP} + A_{BOTT})/2 =$ retention volume provided in acre-ft.
6. Proposed retention basins; retention basin R-B includes sump and basin.
7. Proposed retention basin R-A overflows to Catchbasin CB-1
8. Proposed retention basin R-B overflow/weirflows to R-C.

Franciscan Renewal Center - Proposed Conditions

Scupper Size Verification and Riprap Sizing Calculations - per Maricopa County

Blue = required inputs

(assume b and d until Qc is close to Qk)

ID	Unit Discharge q = Q/W (cfs/ft)	Width (wetted area/flow depth) W (ft)	Drop Slope S ₀ (S _f) (ft/ft)	Known Q Q _k (cfs)	Calculated Q Q _c (cfs)	Manning's 'n' 'n' ()	Flow Area b*d (ft)	Hydraulic Radius R (ft)	Scupper Width	Flow Depth in Scupper	Riprap Size		Riprap Layer Thickness	
									Top Width (of flow) b (ft)	Flow Depth (Manning's) d (ft)	Calculated d ₅₀ (ft)	Provided d ₅₀ (in)	T (in)	
SC-1	0.68	2.0	0.17	1.3	1.3	0.069	0.4	0.19	2.0	0.23	0.33	3.9	6.0	12.0
SC-2	0.67	2.0	0.17	1.3	1.3	0.069	0.5	0.19	2.0	0.23	0.32	3.9	6.0	12.0
SC-3	0.67	2.0	0.17	1.3	1.3	0.069	0.5	0.19	2.0	0.23	0.32	3.9	6.0	12.0
SC-4	1.25	4.0	0.17	5.0	5.0	0.069	1.3	0.28	4.0	0.33	0.45	5.4	6.0	12.0
SC-5	1.00	4.0	0.17	4.0	4.0	0.069	1.1	0.25	4.0	0.29	0.40	4.8	6.0	12.0

Sloped Drop Structure/Rock Chute

(Riprap Sizing, Equation 6.41 and 6.42 from FCDMC Volume II, Hydraulics Manual, 2013, page 6-55)

$$d_{50} = 2.12q^{0.529} S_0^{0.794} \quad 0.02 < S_0 < 0.10 \quad (6.41)$$

$$d_{50} = 0.69q^{0.529} S_0^{0.307} \quad 0.1 \leq S_0 \leq 0.4 \quad (6.42)$$

where:

- d₅₀ = the median diameter (ft),
- q = unit discharge (cfs/ft), (discharge divided by the width where the width is defined as the wetted area divided by the flow depth and the flow depth can be the Manning's equation-based normal depth or the maximum flow depth from HEC-RAS), and
- S₀ = channel bed slope (ft/ft).

It should be noted that these two equations are for loose riprap on the slope of the structure. For downstream of the sloped drop structure, the equation above for [Downstream of Grade Control/Drop Structure](#) should be used. The thickness for the riprap layer on the slope should be at least 2d₅₀. A granular filter should be used beneath the riprap layer. The design for rock chutes and downstream energy dissipators can be found in [Lorenz et al. \(2000\)](#).

Notes:

- Equations include a safety factor of 1.5; Layer thickness (T) = 2*d₅₀.
- Rip-rap layer requires filter fabric.
- 4 cfs from Sub-watersheds B+C divided between three scuppers into R-A

Calculated Q = 1.486/n*A*R^(2/3)S_f^(1/2) (or from HEC-RAS, obtain b and d)
where S_f = S₀; assume rectangular channel

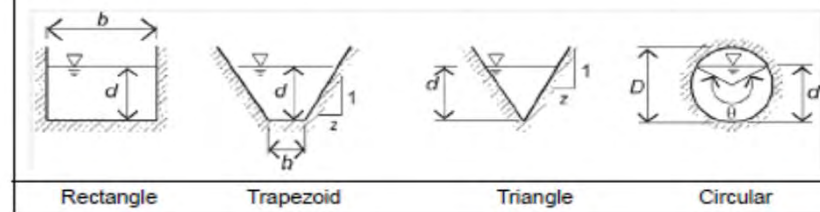
TABLE 6.1
ELEMENTS OF CHANNEL SECTIONS
(1)

Channel Section	Area	Wetted Perimeter	Hydraulic Radius	Top Width
Rectangle	bd	b + 2d	$\frac{bd}{b + 2d}$	b
Trapezoid	b + zd ²	$b + 2d\sqrt{z^2 + 1}$	$\frac{bd + zd^2}{b + 2d\sqrt{z^2 + 1}}$	b + 2zd
Triangle	zd ²	$2d\sqrt{z^2 + 1}$	$\frac{zd}{2\sqrt{z^2 + 1}}$	2zd
Circular < 1/2 full (2)	$\frac{D^2}{8}(\frac{\pi\theta}{180} - \sin\theta)$	$\frac{\pi D\theta}{360}$		D sin θ or $2\sqrt{d(D-d)}$
Circular > 1/2 full (3)	$\frac{D^2}{8}(2\pi - \frac{\pi\theta}{180} + \sin\theta)$	$\frac{\pi D(360 - \theta)}{360}$	$(\frac{45D}{\pi(360 - \theta)})^*$ $(2\pi - \frac{\pi\theta}{180} + \sin\theta)$	D sin θ or $2\sqrt{d(D-d)}$

(1) After USDA Soil Conservation Service ES-33 (NRCS), 1956.

(2) θ = 4 sin⁻¹ √d/D Insert θ in degrees

(3) θ = 4 cos⁻¹ √d/D Insert θ in degrees



**Franciscan Church
Retention Basin Drywell Calculations**

Retention Basin ID ⁽¹⁾	Volume Required ⁽¹⁾ (acre-ft)	Volume Required ⁽¹⁾ (ft ³)	Flowrate Required to Drain Basin Within 36 Hours ⁽²⁾ (cfs)	Drywell Flowrate Capacity ⁽³⁾ (cfs)	Number of Drywells Required ⁽⁴⁾	Number of Drywells Provided ⁽⁵⁾
R-A	0.016	697	0.01	0.07	1	1
R-B	0.276	12,023	0.09	0.07	2	2
R-C	0.276	12,023	0.09	0.07	2	2
Total					4	4

Notes:

1. Volume Required To be Drained By Drywell.
2. Flowrate Required To Drain Basin Within 36 Hours = (Volume Required To Be Drain By Drywell) / (36 x 3600).
3. Per vicinity percolation testing, percolation rate is 0.34 cfs. Value de-rated by 5 per County requirements for clay soils. Drywell Flowrate will be verified at time of construction and drywells added to satisfy requirements.
4. Total number of drywells required = (Flowrate Required to Drain Basin within 36 Hours) / (Drywell Flowrate Capacity)
5. Initially one drywell will be installed to check the actual flowrate of drywell. Calculations will be revised with the new flowrates and accordingly to the City of Phoenix Standards.
The amount of drywells needed may change due to revised flow rate.

The watermark for drainage solutions.®



October 28, 2015

A.R. Mays Construction
6900 E. Indian School Road, Suite 210
Scottsdale, AZ 85251
ATTN: Joel Canchola

Re:
SWC Lincoln Dr. & 56th Street
Paradise Valley, AZ
Job15#: 10-002
Percolation Test Results for Drywell # 1

Dear Joel Canchola,

Pursuant to your request, we have performed a constant head percolation test on the Drainage System at the above referenced location.

The test on Drywell No. 1 commenced on 10/27/15 at 1:35 PM and was completed at 2:35 PM the same day with a total volume flow of 9,423 GAL. The average percolation rate for the well over the last fifteen minutes of the test is 0.34 cubic feet per second.

If you have any questions or require additional information, please do not hesitate to contact me.

Regards,

A handwritten signature in black ink, appearing to read 'Rob Morales'.

Rob Morales
Sales Engineer
Torrent Resources, Inc.

RM/jb

Torrent Resources Incorporated
1509 East Elwood Street
Phoenix Arizona 85040-1391

phone 602-268-0785
fax 602-268-0820

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AZ Lic. ROC070465 A, ROC047067 B-4; ADWR 363
CA Lic. 528080 A, C-42, HAZ
NV Lic. 0035350 A - NM Lic. 90504 GF04

An evolution of McGuckin Drilling

APPENDIX E

Excerpts of the Master Drainage Report for the Franciscan Renewal Center

April 2, 2015
2nd Revision: July 13, 2015
3rd Revision: August 18, 2015
4th Revision: September 18, 2015

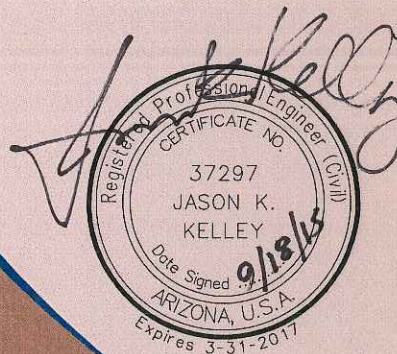
FRANCISCAN RENEWAL CENTER

Paradise Valley & Maricopa County, Arizona

Prepared for:
Franciscan Renewal Center
5802 E. Lincoln Drive
Scottsdale, AZ 85253
(480) 948-7460

Prepared by:
Coe & Van Loo Consultants, Inc.
4550 N 12th Street
Phoenix, AZ 85014
602.264.6831

Job #: 1.01.0199206



MASTER DRAINAGE REPORT

**Master Drainage Report
for
Franciscan Renewal Center**

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
1.1. Scope.....	1
1.2. Site Location	1
1.3. Proposed Development.....	1
1.4. Regulatory Jurisdiction	1
2.0 EXISTING CONDITIONS.....	2
3.0 MANAGEMENT OF OFF-SITE RUNOFF.....	3
3.1. Off-site Hydrology.....	3
4.0 MANAGEMENT OF ON-SITE RUNOFF	4
4.1. On-site Hydrology	4
5.0 FLOOD ZONE INFORMATION.....	5
6.0 SUMMARY AND CONCLUSIONS	6
REFERENCES	7

Figures

- Figure 1 Location Map
- Figure 2 Flood Insurance Rate Map (FIRM)
- Figure 3 Existing Impervious Area
- Figure 4 Proposed Impervious Areas

Appendices

- Appendix A NOAA Atlas 14 Data
- Appendix B On-site C factor calculations
- Appendix C Rational Calculations and Off-site C factor weighting
- Appendix D Detention Basin Volume and Rip-Rap Calculations
- Appendix E First Flush and Excerpts of the Franciscan Renewal Assisi Building Drainage Report

Plates

- Plate 1 Offsite Watershed Map
- Plate 2 Onsite Drainage Map



3.0 MANAGEMENT OF OFF-SITE RUNOFF

3.1. Off-site Hydrology

The off-site runoff impacting the site is from the mountains located on the north side of the site. The off-site area is covered with open space, residential houses and local streets. The off-site watershed areas were delineated using the 2 foot contours obtained from FCDMC. The total watershed area is less than 160 acres, hence the Maricopa County's Rational Method along with NOAA Atlas 14 precipitation values were used to determine the flows. The summary of offsite flows entering the subject site is shown in Appendices A & C.

The proposed conditions for off-site stormwater management consist of detention basins sized to attenuate the calculated off-site flows (see Appendix D). The design parameters for the basins are in accordance with the FCDMC standards (Reference 1).

As shown on Plate 2, the proposed Basins R1 and R2 are located in the northwest corner of the site to collect the off-site flow from the off-site sub-basin OFF2. These two retention basins collectively capture the entire flow. Basin R3 is proposed at the west end of the site to collect the off-site flow from the off-site sub-basins OFF3 and OFF4.

4.0 MANAGEMENT OF ON-SITE RUNOFF

4.1. On-site Hydrology

Basin R4 is proposed to collect onsite flows at the southwest area of the site (P-ON-3) (see Figure 4). Remaining on-site flow will drain towards the southeast corner of the site to point B (area ON2), and to the northeast through Point A (area ON1) as shown in Plate 2. Hydro flow has been used to simulate the flow under current conditions and proposed conditions at point A and point B and the runoff coefficient under proposed conditions is calculated to include all future phases of development (see Appendix B and Figures 3 & 4). A summary table for results is included on Plate 2. See CVL's grading plans for details of construction.

All retained water in basins R1, R2 and R3 will be discharged within 36 hours through a 12" diameter bleed off pipe with a 6" orifice opening on the upstream end as shown in the grading improvement plans prepared by CVL.

Basin R4 will retain one foot of water and will not require bleed off pipes or Drywells.

This master plan establishes a design of the site based on the criteria that the Post development flows leaving the site will be equal to or less than the pre-development flows (pre versus post) and each phase of development will provide first flush basins. The Franciscan Renewal Assisi Building was recently designed, approved, and constructed prior to the upstream basins with 100-year 2 hour retention. Now, as the proposed upstream basins will satisfy the Pre versus Post condition, CVL requests that the Franciscan Renewal Assisi Building Basins (R5-1 and R5-2) be changed to 1foot first flush basin (please refer to appendix E for R5-1 and R5-2 first flush calculations and excerpts of the Franciscan Renewal Assisi Building Drainage Report prepared by CVL)

**Franciscan Renewal Center
100-Year, 2-Hour Retention Basin Volume Calculations**

Retention ⁽¹⁾ Sub-Watershed ID	Drainage Area A (acres)	Runoff ⁽²⁾ Coefficient C	Precipitation ⁽³⁾ P (inches)	Volume ⁽⁴⁾ Required V _{req} (acre-ft)	Volume Provided ⁽⁵⁾				
					Retention Basin ⁽⁶⁾ ID	Depth D (ft)	Area A _{BOTT} (acres)	Area A _{TOP} (acres)	Total V _P (acre-ft)
OFF2	18.80	0.67	2.22	2.33	R1	3.0	0.28	0.58	1.29
					R2	3.0	0.19	0.48	1.00
OFF3+OFF4	6.33	0.53	2.22	0.62	R3	3.0	0.15	0.32	0.70
P-ON-3	0.40	0.8	2.22	0.06	R4	1.0	0.06	0.09	0.07
TOTAL	25.53			3.01					3.05

Reference: Drainage Policies and Standards for Maricopa County, Arizona, Draft January 2013.
Drainage Design Manual for Maricopa County, Arizona, Hydrology, February, 2011.

Notes:

1. Drainage sub-basin delineated per Drainage Map (Plate 1).
2. Weighted 100-year C-Value of 0.53 for residential areas and 0.95 for Infrastructure Roads
100-year runoff coefficients for portions of offsite from Table 3.2 and 3.3 for NHS and NMT landuses;
3. Estimated 100-year, 2-hour precipitation depth, P= 2.22 inches per
NOAA Atlas 14; For first flush basins, P= 1.0 inches.
4. $V_{req} = A \times C \times (P/12) =$ volume required for retention in acre-ft.
5. $V_P = D \times (A_{TOP} + A_{BOTT})/2 =$ retention volume provided in acre-ft.
6. Proposed retention basins.
7. Rainfall Intensity per hydrology calculations located in Appendix B, in/hr.

Weighted C coefficient:

	Area (ac)	Weighted C
OFF2	18.8	0.67
NMT	5.76	0.90
NHS	3.08	0.70
LDR	9.99	0.53

OFF1	22.8	0.71
NMT	9.35	0.90
NHS	4.34	0.70
LDR	9.07	0.53

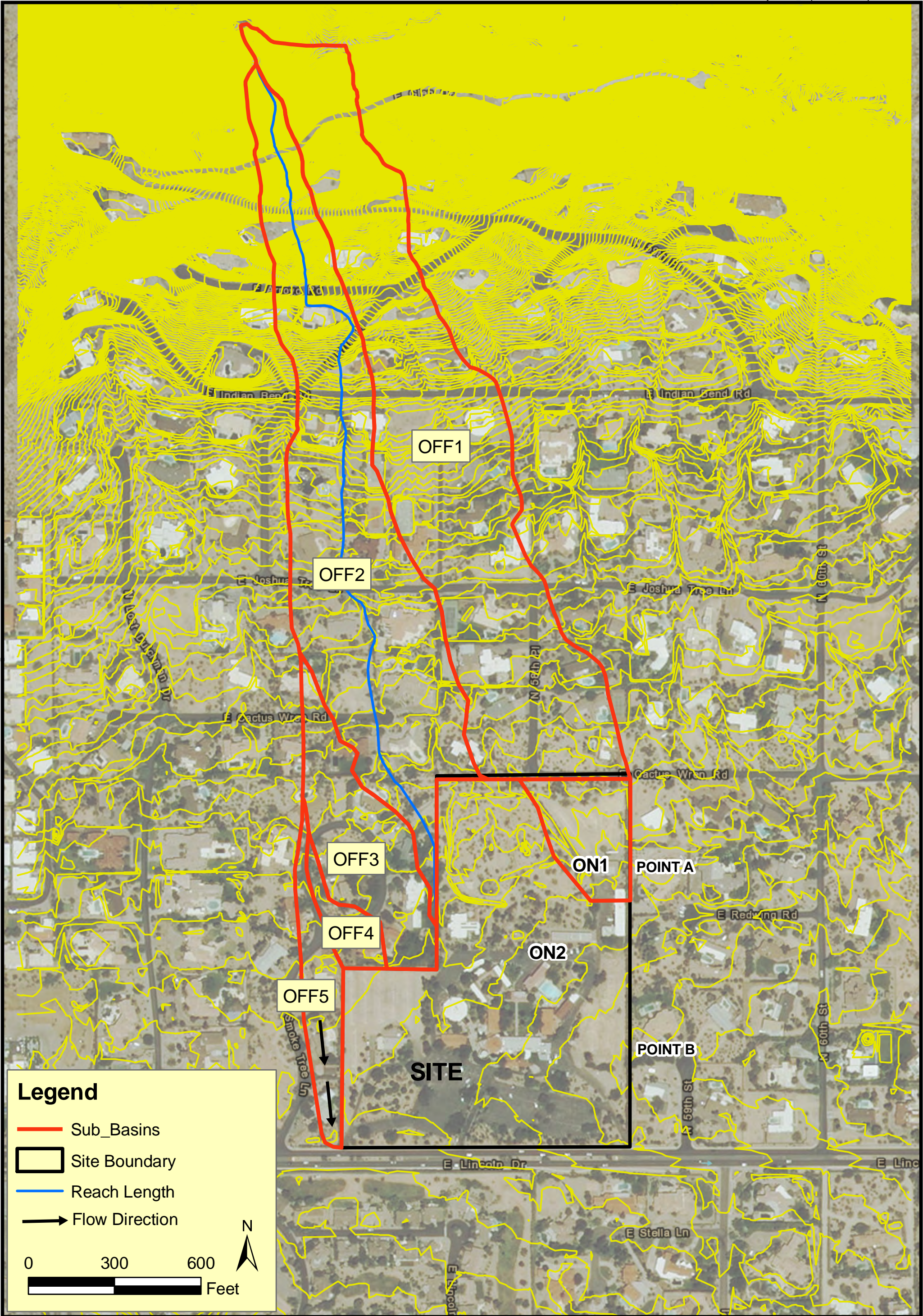
Notes: Areas from slope analysis in Civil3D (see Appendix C).
OFF1 for reference only - not used to size R1 or R2.

Franciscan Renewal Center
Bubbler Structure Percolation and Drain-down Time

Retention Basin ID	Bottom Area ⁽¹⁾ (ft ²)	Volume Required ⁽²⁾ (ft ³)	Percolation Rate ⁽³⁾ (in/hr)	Drain Time ⁽⁴⁾ (hr)
Basin R-3 Bubbler Box	36.0	206.4	1.9	35.5

Notes:

- (1) Area of well-graded AB layer below Bubbler Structure
- (2) Volume of Bubbler Pipe and Bubbler Structure with WSE at Grate Elev
 Pipe L = 245 ft; Pipe A = 0.79 sf; Pipe V = 193
 Bubbler Box Volume = 2*2*3.5 = 14 cf
 Total Volume Required = 206.4
- (3) Percolation rate of 3.8 inches/hour based on soil sampling in vicinity;
 Design Factor of 0.5 per Table 6.16, Policies and Standards.
- (4) Drain time per Eq. 6.17, Policies and Standards.



OFFSITE WATERSHED MAP

FRANSISCAN RENEWAL CENTER

JOB NO.
01-0199205

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

PLATE 1

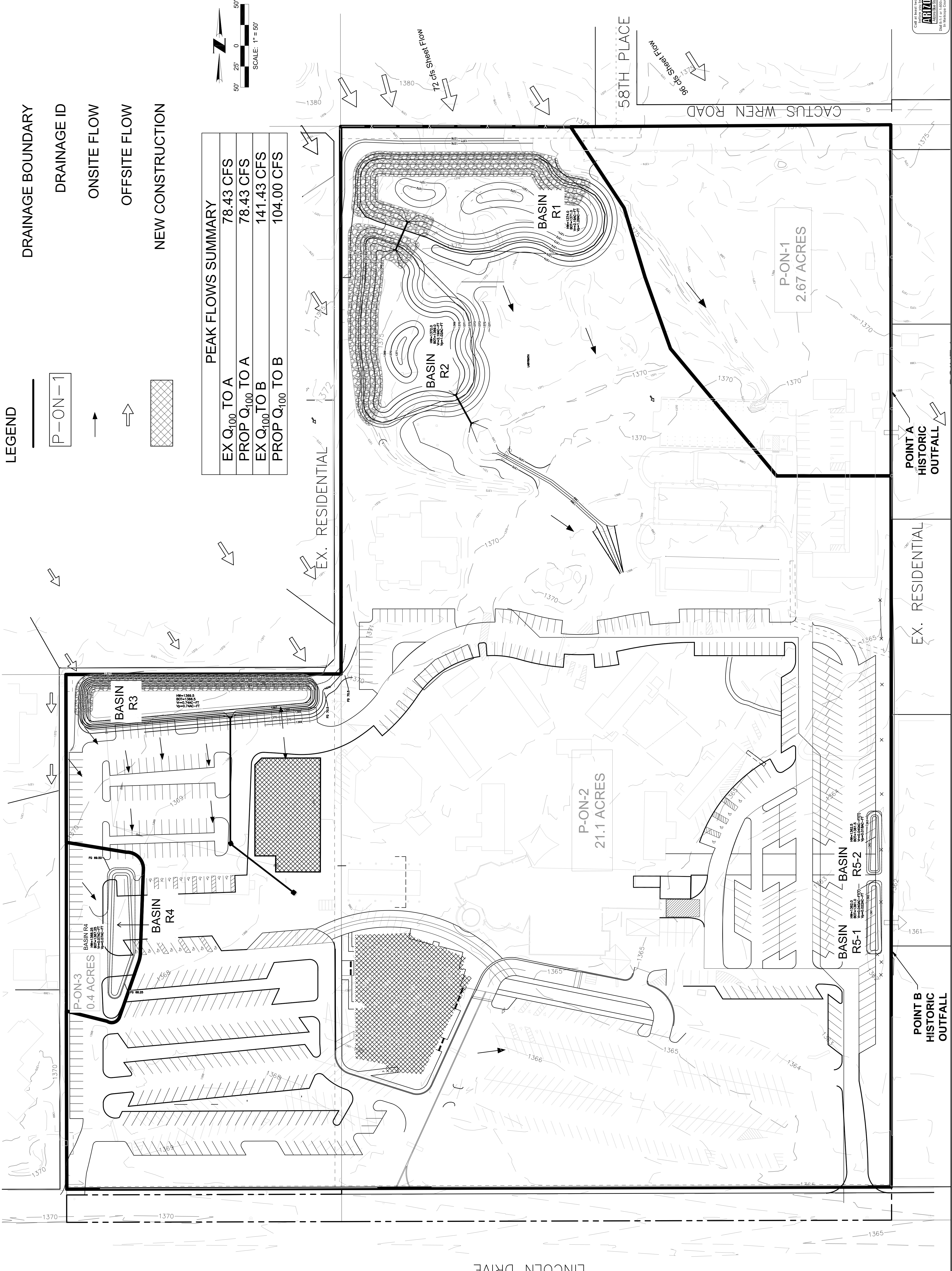
FRANCISCAN RENEWAL CENTER
 TOWN OF PARADISE VALLEY, ARIZONA

Coe & Van Loo Consultants, Inc.



ONSITE DRAINAGE MAP

NO.	REVISION	DATE



LEGEND

— DRAINAGE BOUNDARY

— P-ON-1

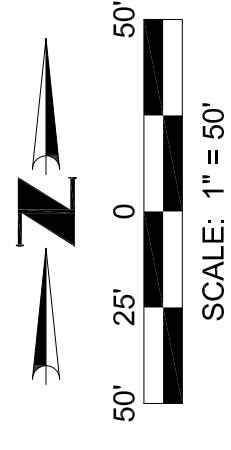
→ ONSITE FLOW

⇨ OFFSITE FLOW

▨ NEW CONSTRUCTION

PEAK FLOWS SUMMARY

EX Q ₁₀₀ TO A	78.43 CFS
PROP Q ₁₀₀ TO A	78.43 CFS
EX Q ₁₀₀ TO B	141.43 CFS
PROP Q ₁₀₀ TO B	104.00 CFS



POINT A
 HISTORIC
 OUTFALL

EX. RESIDENTIAL

POINT B
 HISTORIC
 OUTFALL

PLATE

ONSITE SUBBASIN TABLE		
I.D.	AREA	C
A	2.28 ac	0.92
B	0.66 ac	0.65
C	0.51 ac	0.95
D	2.21 ac	0.95
D1	0.39 ac	0.95
D2	1.05 ac	0.95
D3	0.77 ac	0.95

NOTE: SEE "APPENDIX D" FOR RETENTION VOLUME CALCULATIONS

- LEGEND**
- DRAINAGE BOUNDARY
 - A SUB-WATERSHED ID
 - ONSITE FLOW
 - R-A RETENTION BASIN ID
 - CB-1 / GR-1 CATCH BASIN / GRATE ID
 - SC-1 SCUPPER ID
 - SD-OUT STORMDRAIN OUTLET ID
 - ▬ STORM DRAIN

