Drainage Reports

Abbreveated Water & Sewer Need Reports

Water Study

Wastewater Study

Stormwater Waiver Application

PRELIMINARY DRAINAGE REPORT

FOR

Perimeter Center Commons

17300 N. Perimeter Dr.,

Scottsdale, AZ 85255

APNs: 215-07-218, 215-07-001D

Prepared for:

Perimeter Center Commons, LLC

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Contact: David Kross

Plan #

Case # 7-DR-2018

Q-S #

[X] Accepted

[ ] Corrections

MR 5/14/18

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REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
38775
MIKE A.
JACKSON
Date Signed 04/23/2018
ARIZONA, U.S.A.

EXPIRES 3/31/2021

7-DR-2018
04/24/18

April 23, 2018

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EXPIRES 3/31/2021

INTRODUCTION

The purpose of this report is to indicate the methods used and to provide discussion of the proposed Perimeter Center Commons (the Site) stormwater drainage. The Site is currently undeveloped desert land within an existing masterplan commercial/retail development area. The proposed improvements include connection to an existing driveway and parking located south of the Site. New facilities include parking and a 24,128 SF office commercial building west of Perimeter Drive and north of Hartford Drive in Scottsdale, AZ. This report will indicate how the storm water generated on the subject property is addressed and how it complies with the City of Scottsdale drainage requirements.

The project Site is generally located north of Bell Rd. and east of Hayden Rd. inside the LOOP 101 in Scottsdale, Arizona. The site is bounded by Sonoran Corporate Center to the north, Cachet Homes to the South, and an existing regional drainage channel adjacent to Hartford Dr. The existing drainage channel is designed to capture existing and proposed development runoff for the project Site. The existing zoning associated with the Site is Industrial Park (I-1) and the total property area is approximately 2.38 acres. Refer to Vicinity Map (Figure 1) for a general graphical representation of the Site location.

DESCRIPTION OF EXISITNG DRAINAGE CONDITIONS AND CHARACTERISTICS

The current Site is part of a drainage masterplan and generally slopes from north to south with an elevation variance of approximately 4.0'. There is currently a small mounded area that bisects the property and directs runoff to the southwest and southeast corners of the property. The study area is situated within a fully developed area and no offsite flows are expected to enter the Site. In the existing conditions, the site drains to the parcel to the south where runoff is routed through existing parking areas to curb openings and ultimately to an existing regional drainage channel. This flow pattern will be maintained in the proposed conditions. The western half of the site collects runoff in an existing improved drainage ditch. This ditch connects to the existing regional drainage channel. The regional drainage channel routes westerly and southerly to the regional offsite basin for storage. No local storage is required or provided for the parcel. The existing regional system is covered in the *Master Drainage Report for Scottsdale Perimeter Center*, prepared by Collar, Williams, & White Engineering (CWW Engineering), dated January 1989. The master report anticipated a future development with 85% impervious surface are for this project site. This project has a 15% open space requirement so the planned development will not exceed the 85% impervious. Excerpts from this study are included in **Appendix 4**. The last page of the attached excerpts indicates the input and output summaries from the modeling in the master report, including the assumption of 85% impervious used for the runoff curve number. Additionally, the second sentence of the third paragraph of Article B.1. Storm Water Storage Facilities notes:

"...These basins are specifically intended to mitigate the need for on-site storage within the Core South project area."

The 17 Three Hundred development is within the area discussed in the report by CWW and the basins discussed in the report were constructed; therefore, the development 17 Three Hundred at 17300 Perimeter Drive does not need to provide on-site storage.

FEMA FLOOD ZONE / FIRM MAP

This project resides in a Zone "AO" area as noted on the FEMA / FIRM Map #04013C1320L dated October 16, 2013. This is considered a special flood hazard area with inundation by the 1% annual chance flood, and flood depths of 1 to 3 feet average depth determined. For areas of alluvial fan flooding, velocities also determined. Per the FIRM Map, flow depths of 1' and

velocity of 3 feet per second are anticipated on the project Site. A firmette of this map (Figure 2) is attached in **Appendix 1**.

PROPOSED DRAINAGE PLAN

Based on the proposed grading, the Site has been divided into 4 new drainage areas labeled in this report as drainage areas W-1, W-2, E-1 and E-2. Refer to Figure 3 found in **Appendix 1** for a graphical representation of the proposed drainage area boundaries, discharge locations and outfall provisions.

The proposed Finished Floor is to be set at an elevation of 1564.50 ft. This was established in order to maintain a finished floor elevation 1 foot above the Base Flood Elevation, which means the finished floor must be 2 feet above the high adjacent grade (HAG). Based upon our analysis of as-builts of the area from 1989 obtained from the City of Scottsdale, the HAG is 1560.75 (1929 datum). The datum conversion for this area yielded an elevation difference of 1.73 feet, which put the HAG at 1562.48 (1988 datum). Based upon this the minimum finished floor elevation is 1564.48. We set the design finished floor at 1564.50. A graphical representation of the HAG depicted on the as-built plan is included as **Figure 4**.

From the finished floor, the site is designed to slope away from the building and through the parking lot to the west and south. Further description is provided below.

Drainage area W-1 and W-2 include open space areas and parking lot, as well as the majority of the building footprint. Areas W-1 and W-2 have been designed to convey runoff to an open space area via curb opening and spillway along the western property line. This flow will ultimately discharge south to the existing channel along Hartford Drive. Drainage area E-1 will similarly discharge from the site via curb opening, but to the east. This area predominately consists of parking area adjacent to the building, open space areas, and a portion sidewalks adjacent to the building. Drainage area E-2 is also located at the eastern side of the development and will sheet flow south through the adjacent southern property ultimately discharging to the channel along Hartford Drive.

Two existing drainage areas south of the building, EX-W and EX-E have already been considered as part of the development to the south. Since the southern property 17200 N. Perimeter Dr. has been developed, the property line has been adjusted, however, when approved the two existing drainage areas EX-W and EX-E were accounted for as part of the southern development. Additionally, Drainage E-2 has been considered with EX-E as part of the proposed development to the south and the curb openings to the south are adequately sized to combined existing and proposed discharge.

DATA ANALYSIS METHODS

The 100-year 2-hour storm event peak flow computations included in this report are based on the Rational Method and the procedure described in the City of Scottsdale Design Standards and Policies Manual and the design standards and methodologies developed by the Flood Control District of Maricopa County.

The following table provides a summary of the criteria that has been assumed for the hydrologic analysis.

Discharge point	Area Total (ft.2)1	Area Total (ac)	Runoff Coefficient "C"	Min time of Concentration (min.)	Precipitation Intensity 10yr (in./hr.)	Precipitation Intensity 100yr (in./hr.)	10-Year Peak Discharge (cfs)	100-Year Peak Discharge (cfs)
W-1	21,107.00	0.48	0.9	5	4.96	7.78	2.16	3.39
W-2	29,086.00	0.67	0.9	5	4.96	7.78	2.98	4.68
EX-W	81,466.00	1.87	0.9	5	4.96	7.78	8.35	13.10
E-1	8,035.00	0.18	0.9	5	4.96	7.78	0.82	1.29
E-2**	19,865.00	0.46	0.9	5	4.96	7.78	2.04	3.19
EX-E**	61,795.00	1.42	0.9	5	4.96	7.78	6.33	9.93
**Drainage Areas E-2 and EX-E are combined for a total runoff of 13.12 CFS								

For scour protection, inlets and outlets at all proposed drainage structures will be provided with riprap areas. The median riprap stone size (D50) is proposed to be 6-inch with a riprap layer thickness equal to 14 inches.

SWPPP

The project site is more than 2.0 acres almost all of which will be disturbed, therefore an ADEQ NOI certification, a set of SWPPP plans, and a SWPPP booklet will be submitted with the Improvement Plan submittal.

WARNING AND DISCLAIMER OF LIABILITY

Refer to **Appendix 5** for a copy of the Warning & Disclaimer of Liability form.

CONCLUSION

This project has been designed to conform to the City of Scottsdale DSPM and will match the pre-existing drainage patterns. Proposed drainage improvements will include discharge points sized for the 100-year, 2-hour storm event. The majority of the proposed improvements will either sheet flow east or west, however the southern portion of the site will sheet flow south though the existing development discharge points (City of Scottsdale Plan check number 844-16). The existing discharge outfall to the channel along Hartford Drive is sized to accommodate the increased flow from the proposed development. It is also expected no adverse impacts to the offsite downstream properties are anticipated as a result of the proposed improvements.

REFERENCES

City of Scottsdale, Design Standards & Policies Manual, January 2010.

Flood Control District of Maricopa County. Drainage Design Manual for Maricopa County, Arizona, Volume 1. August 15, 2013.

Flood Control District of Maricopa County. Drainage Design Manual for Maricopa County, Arizona, Volume 2. August 15, 2013.

CWW Engineering. Master Drainage Report for Scottsdale Perimeter Center, January 1989

Appendix 1: Figures

possible updated or additional flood hazard information.

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

The **projection** used in the preparation of this map was Arizona State Plane Central zone (FIPSZONE 0202). The **horizontal datum** was NAD 83 HARN, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. Map users wishing to obtain flood elevations referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29) may use the following Maricopa County website application: http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm

This web tool allows users to obtain point-specific datum conversion values by zooming in and hovering over a VERTCON checkbox on the layers menu on the left side of the screen. The VERTCON grid referenced in this web application was also used to convert existing flood elevations from NGVD 29 to NAVD 88.

To obtain current **elevation**, description, and/or location information for National Geodetic Survey bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at http://www.ngs.noaa.gov. To obtain information about Geodetic Densification and Cadastral Survey bench marks produced by the Maricopa County Department of Transportation, please visit the Flood Control District of Maricopa County website at http://www.fcd.maricopa.gov/Maps/gismaps/apps/gdacs/application/index.cfm.

Base map information shown on this FIRM was derived from multiple sources. Aerial imagery was provided in digital format by the Maricopa County Department of Public Works, Flood Control District. The imagery is dated October 2009 to November 2009. Additional National Agricultural Imagery Program (NAIP) imagery was provided by the Arizona State Land Department (ALRIS) and is dated 2007. The coordinate system used for the production of the digital FIRM is State Plane Arizona Central NAD83 HARN, International Feet.

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

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

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

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

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

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 12
- 6000000 M — 5000-foot grid ticks: Arizona State Plane coordinate system, central zone (FIPSZONE 0202), Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES

Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
December 3, 1982 — September 30, 1985 — July 16, 2001 — September 30, 2005
October 16, 2013 - to add base flood elevation, to add special flood hazard areas, to incorporate previously issued letters of map revision, to add roads and road names, to update corporate limits, to change floodway, to advance suffix, to change base flood elevations, and to add floodway.

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

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

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

PANEL 1320L

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

PANEL 1320 OF 4425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

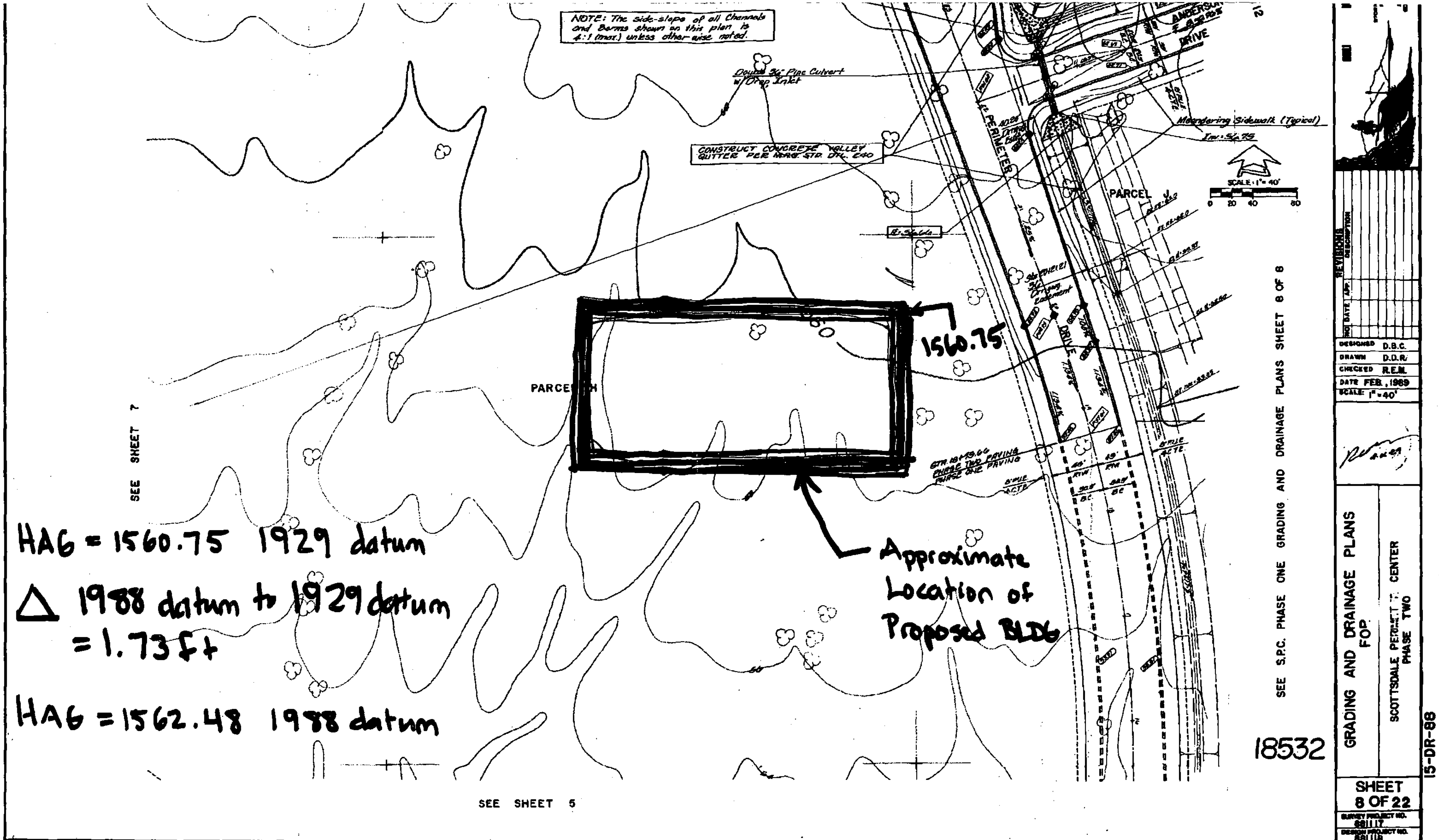
COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1320	L
PHOENIX, CITY OF	040051	1320	L
SCOTTSDALE, CITY OF	045012	1320	L

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

NATIONAL FLOOD INSURANCE PROGRAM

MAP NUMBER
04013C1320L

MAP REVISED
OCTOBER 16, 2013


NOTE: The side-slope of all Channels and Berms shown on this plan is 4:1 (max.) unless other-wise noted.
Double 36" Pipe Culvert w/ Drop Inlet
CONSTRUCT CONCRETE VALLEY GUTTER PER MAG STD. DTL. 240
Meandering Sidewalk (Typical)
PERIMETER
DRIVE
PARCEL
SCALE: 1" = 40'
0 20 40 80
1560.75
PARCEL H
Approximate Location of Proposed BLDG
HAG = 1560.75 1929 datum
△ 1988 datum to 1929 datum = 1.73 ft
HAG = 1562.48 1988 datum
SEE SHEET 7
SEE SHEET 5
SEE S.P.C. PHASE ONE GRADING AND DRAINAGE PLANS SHEET 8 OF 8
PHASE TWO PAVING
PHASE ONE PAVING
18532
REVISIONS
DESIGNED D.B.C.
DRAWN D.D.R.
CHECKED R.E.M.
DATE FEB. 1989
SCALE: 1" = 40'
GRADING AND DRAINAGE PLANS FOP
SCOTTSDALE PERIMETER CENTER PHASE TWO
SHEET 8 OF 22
15-DR-88

SCOTTSDALE PERIMETER CENTER PHASE TWO · GRADING AND DRAINAGE PLANS · SHEET 8 OF 22

FIGURE 4: HIGH ADJACENT GRADE

Appendix 2: NOAA 14 Precipitation Values

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.6426°, Longitude: -111.8976°
Elevation: 1561.25 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	2.35 (1.94-2.88)	3.07 (2.57-3.76)	4.14 (3.42-5.05)	4.96 (4.08-6.04)	6.06 (4.92-7.36)	6.90 (5.53-8.32)	7.78 (6.12-9.35)	8.64 (6.70-10.4)	9.82 (7.40-11.8)	10.7 (7.92-12.9)
10-min	1.79 (1.48-2.19)	2.33 (1.95-2.86)	3.14 (2.60-3.85)	3.77 (3.11-4.59)	4.61 (3.74-5.59)	5.26 (4.21-6.32)	5.92 (4.66-7.11)	6.58 (5.09-7.88)	7.47 (5.63-8.97)	8.15 (6.02-9.80)
15-min	1.48 (1.22-1.81)	1.93 (1.61-2.36)	2.60 (2.15-3.18)	3.12 (2.57-3.80)	3.81 (3.09-4.62)	4.34 (3.48-5.23)	4.89 (3.85-5.88)	5.44 (4.21-6.52)	6.17 (4.66-7.42)	6.73 (4.98-8.10)
30-min	0.994 (0.826-1.22)	1.30 (1.09-1.59)	1.75 (1.45-2.14)	2.10 (1.73-2.56)	2.57 (2.08-3.11)	2.92 (2.34-3.52)	3.29 (2.59-3.96)	3.66 (2.83-4.39)	4.16 (3.14-4.99)	4.53 (3.35-5.45)
60-min	0.615 (0.511-0.754)	0.804 (0.671-0.985)	1.08 (0.897-1.32)	1.30 (1.07-1.58)	1.59 (1.29-1.93)	1.81 (1.45-2.18)	2.04 (1.60-2.45)	2.27 (1.75-2.72)	2.57 (1.94-3.09)	2.81 (2.08-3.38)
2-hr	0.360 (0.302-0.430)	0.464 (0.392-0.558)	0.618 (0.520-0.738)	0.736 (0.611-0.877)	0.898 (0.738-1.06)	1.02 (0.826-1.20)	1.14 (0.912-1.35)	1.27 (0.996-1.49)	1.44 (1.10-1.70)	1.57 (1.18-1.86)
3-hr	0.264 (0.223-0.324)	0.339 (0.287-0.417)	0.443 (0.372-0.541)	0.525 (0.436-0.638)	0.640 (0.524-0.772)	0.732 (0.592-0.878)	0.826 (0.656-0.991)	0.926 (0.723-1.11)	1.06 (0.804-1.27)	1.17 (0.867-1.40)
6-hr	0.160 (0.137-0.190)	0.202 (0.173-0.240)	0.257 (0.220-0.304)	0.302 (0.255-0.355)	0.362 (0.302-0.425)	0.409 (0.337-0.478)	0.458 (0.371-0.533)	0.509 (0.404-0.594)	0.576 (0.446-0.672)	0.629 (0.476-0.735)
12-hr	0.090 (0.077-0.105)	0.113 (0.097-0.133)	0.142 (0.122-0.167)	0.166 (0.141-0.194)	0.197 (0.166-0.230)	0.221 (0.184-0.257)	0.246 (0.202-0.285)	0.271 (0.220-0.314)	0.304 (0.240-0.355)	0.330 (0.256-0.387)
24-hr	0.053 (0.046-0.061)	0.067 (0.059-0.078)	0.086 (0.075-0.100)	0.102 (0.089-0.118)	0.123 (0.107-0.142)	0.141 (0.120-0.162)	0.159 (0.134-0.183)	0.177 (0.148-0.204)	0.203 (0.167-0.234)	0.224 (0.182-0.259)
2-day	0.028 (0.025-0.033)	0.036 (0.032-0.042)	0.048 (0.041-0.055)	0.057 (0.049-0.065)	0.069 (0.059-0.079)	0.079 (0.067-0.091)	0.089 (0.075-0.103)	0.100 (0.084-0.116)	0.116 (0.095-0.134)	0.128 (0.103-0.149)
3-day	0.020 (0.018-0.023)	0.026 (0.023-0.030)	0.034 (0.030-0.039)	0.041 (0.036-0.047)	0.051 (0.044-0.058)	0.058 (0.050-0.066)	0.066 (0.056-0.076)	0.075 (0.063-0.086)	0.087 (0.072-0.100)	0.097 (0.079-0.112)
4-day	0.016 (0.014-0.019)	0.021 (0.019-0.024)	0.028 (0.025-0.032)	0.033 (0.029-0.038)	0.041 (0.036-0.047)	0.048 (0.041-0.054)	0.055 (0.047-0.062)	0.062 (0.053-0.071)	0.073 (0.061-0.083)	0.081 (0.067-0.093)
7-day	0.011 (0.009-0.012)	0.014 (0.012-0.016)	0.018 (0.016-0.021)	0.022 (0.019-0.025)	0.027 (0.023-0.031)	0.031 (0.027-0.035)	0.036 (0.030-0.041)	0.040 (0.034-0.046)	0.047 (0.039-0.054)	0.053 (0.043-0.061)
10-day	0.008 (0.007-0.009)	0.010 (0.009-0.012)	0.014 (0.012-0.016)	0.016 (0.014-0.019)	0.020 (0.018-0.023)	0.023 (0.020-0.027)	0.027 (0.023-0.030)	0.030 (0.026-0.035)	0.035 (0.029-0.040)	0.039 (0.032-0.045)
20-day	0.005 (0.004-0.006)	0.006 (0.006-0.007)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.012 (0.011-0.014)	0.014 (0.012-0.016)	0.016 (0.014-0.018)	0.017 (0.015-0.020)	0.020 (0.017-0.023)	0.022 (0.018-0.025)
30-day	0.004 (0.003-0.004)	0.005 (0.004-0.006)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.010 (0.008-0.011)	0.011 (0.009-0.012)	0.012 (0.011-0.014)	0.014 (0.012-0.015)	0.015 (0.013-0.018)	0.017 (0.014-0.019)
45-day	0.003 (0.003-0.003)	0.004 (0.003-0.004)	0.005 (0.005-0.006)	0.006 (0.005-0.007)	0.007 (0.007-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.011)	0.010 (0.009-0.012)	0.012 (0.010-0.013)	0.013 (0.011-0.015)
60-day	0.003 (0.002-0.003)	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.008 (0.007-0.010)	0.009 (0.008-0.011)	0.010 (0.009-0.012)

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

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

Please refer to NOAA Atlas 14 document for more information.

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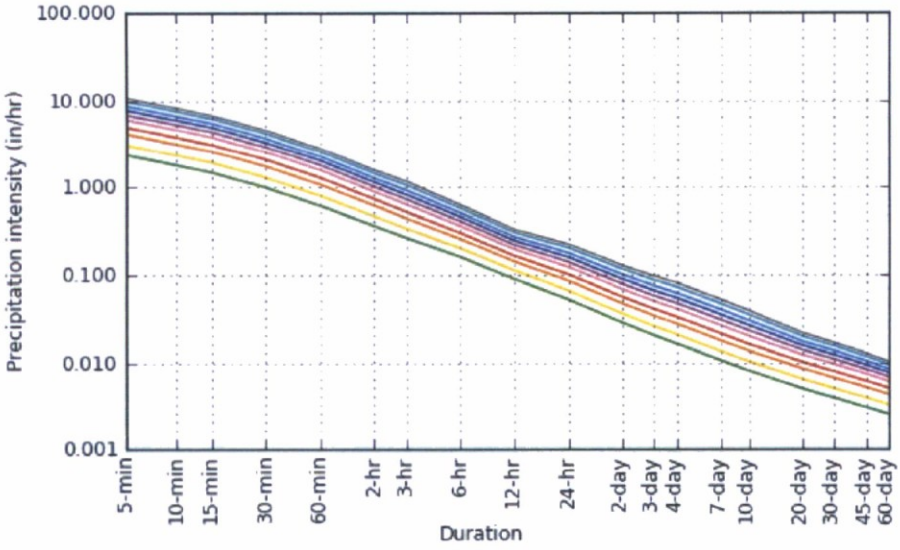
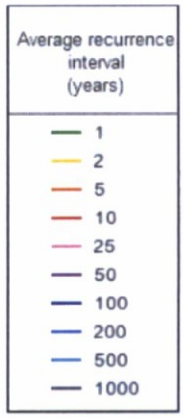
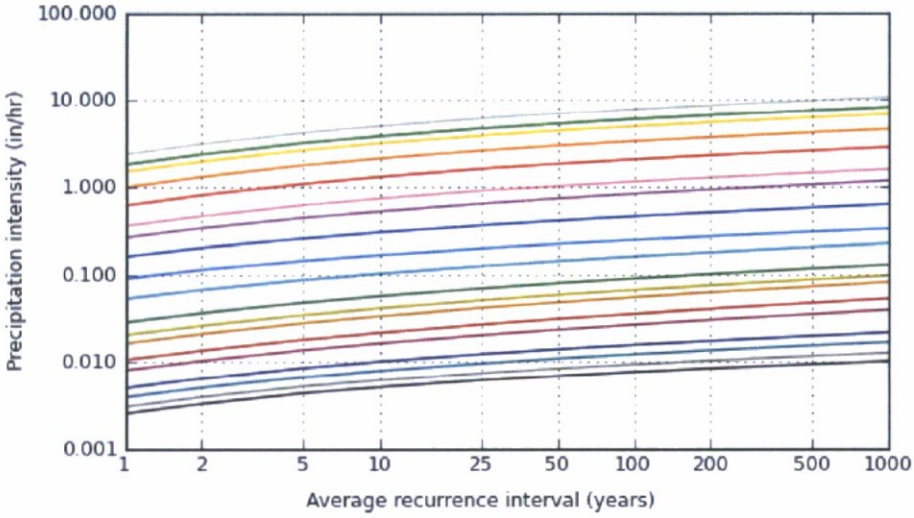
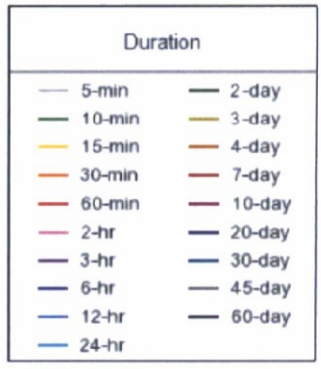
PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 33.6426°, Longitude: -111.8976°









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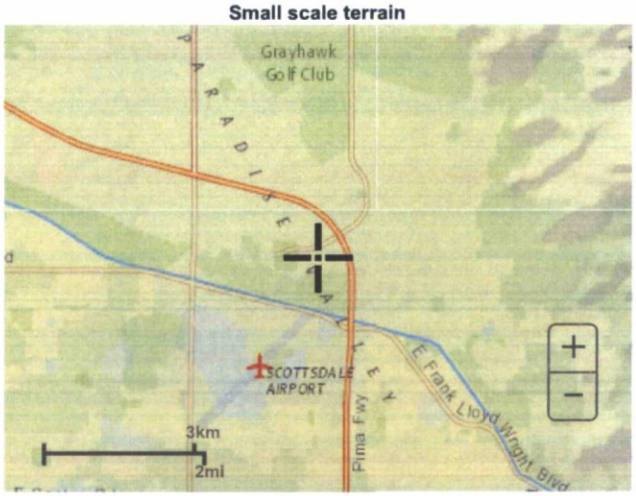
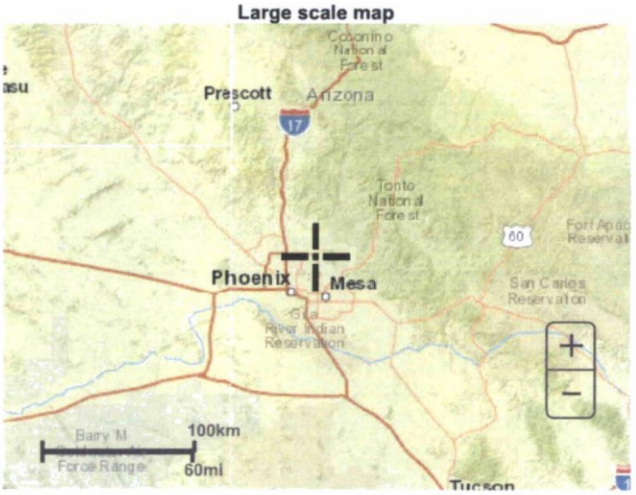
Maps & aerials

Small scale terrain

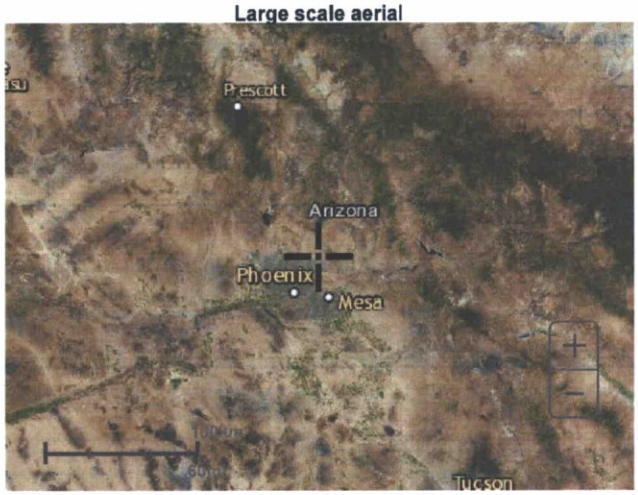


Large scale terrain

Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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Appendix 3: Drainage Calculations

Discharge point	Area Total (ft.2)1	Area Total (ac)	Runoff Coefficient "C"	Min time of Concentration (min.)	Precipitation Intensity 10yr (in./hr.)	Precipitation Intensity 100yr (in./hr.)	10-Year Peak Discharge (cfs)	100-Year Peak Discharge (cfs)
W-1	21,107.00	0.48	0.9	5	4.96	7.78	2.16	3.39
W-2	29,086.00	0.67	0.9	5	4.96	7.78	2.98	4.68
EX-W	81,466.00	1.87	0.9	5	4.96	7.78	8.35	13.10
E-1	8,035.00	0.18	0.9	5	4.96	7.78	0.82	1.29
E-2**	19,865.00	0.46	0.9	5	4.96	7.78	2.04	3.19
EX-E**	61,795.00	1.42	0.9	5	4.96	7.78	6.33	9.93
**Drainage Areas E-1 and EX-E are combined for a total runoff of 13.12 CFS								

Appendix 4: Excerpts from Master Drainage Study