CITY OF SCOTTSDALE

Drainage Reports

HUNTER
ENGINEERING
CIVIL AND SURVEY

Preliminary Drainage Report
For
Platinum Storage
8585 E. Princess Drive
Scottsdale, Arizona

Registered Professional Engineer (Civil)
CERTIFICATE NO.
63946
GRANT D.
HIRNEISE
Date Signed 9/14/20
ARIZONA U.S.A.

September 2020

Prepared by:
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10450 North 74th Street, #200
Scottsdale, AZ 85258

7-DR-2020
9/17/2020

Preliminary Drainage Report
For
Platinum Storage
8585 E. Princess Drive
Scottsdale, Arizona

Prepared For:

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H.E. Project No. PLAT003

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ENGINEERING

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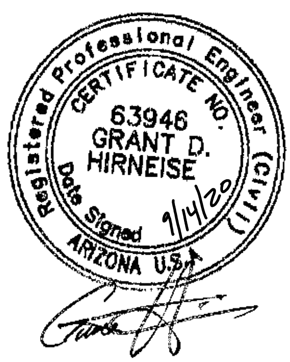


1.0 INTRODUCTION

This Preliminary Drainage Report has been prepared under a contract from Platinum Construction, Owner/Developer of the Platinum Storage site. The purpose of this report is to provide a drainage analysis, required by the City of Scottsdale, to support this development. Preparations of this report has been done in accordance with the procedures detailed in the City of Scottsdale *Design Standards and Policies Manual* (Reference 1).

This development is located at the southwest corner of Princess Drive and Pima Road. The site is specifically located in the Southeast Quarter of Section 36, Township 4 North, Range 4 East of The Gila and Salt River Base and Meridian, Maricopa County, Arizona. Figure 1 in Appendix A illustrates the location of the project site in relation to the City of Scottsdale street system.

On-site improvements include a new storage building with associated parking, utilities, drainage facilities and landscaped areas. The proposed site is bound by Princess Drive to the north, Pima Road to the east, and the Princess Medical Center facilities to the south and west. Access to the site will be provided by existing driveways located on Princess Drive and Pima Road.

2.0 EXISTING DRAINAGE CONDITIONS

In its current condition, the subject lot lies within a partially developed parcel within The Princess Medical Center. The existing terrain includes natural vegetation such as shrubs and short grass. The project site drains primarily from the northeast to the southwest at an average slope of 2%. See the Conceptual Grading and Drainage Plan located in the back pocket of this report for reference.

2.1 FEMA FLOOD CLASSIFICATION

The current FEMA Flood Insurance Rate Map (FIRM) for this area, map number 04013C1320L (Revision date October 16, 2013), shows the entire project is in shaded flood Zone AO. Shaded Zone AO is defined as, “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.” The Flood depth specified by FEMA for this area is 1 foot with velocities of 3 fps. A copy of the current FIRM Panel is provided in Appendix A, Figure 2.

2.2 ONSITE DRAINAGE CONDITIONS

The Princess Medical Center has existing drainage infrastructure which includes catch basins, storm drain pipe, drainage channels and regional retention. The stormwater runoff is collected from landscape and pavement areas via sheet flow and directed to existing catch basins and storm drain piping, outletting into the existing drainage channel located along Anderson Drive to the south of the project site. This channel drains to the west and into an existing retention basin located within the T.P.C. Scottsdale Golf Course. Retention volume for the existing Princess Medical Center development is all provided within the T.P.C. Scottsdale Golf Course.

2.3 OFFSITE DRAINAGE CONDITIONS

This project falls within the Pinnacle Peak South Area Drainage Master Study. The scope of the study includes the use of two separate hydrologic methods to evaluate the entire project area. A HEC-1 evaluation/analysis was performed on the eastern portion of the watershed, covering an area of approximately 18 square miles. The HEC-1 model was divided into to two models covering the south and north portions of the McDowell Mountains and the Reata Pass Wash watershed. A FLO-2D evaluation/analysis was performed on the western portion of the watershed, considered to be much more distributary in nature and requiring more detail. This analysis covers the area from the base of the McDowell Mountains (Thompson Peak Parkway) to Scottsdale Road from Jomax Road to the Reach 11 Dikes. According to the FLO-2D model, the Average flow across the site is 150.59 cfs. This was found by drawing orthogonal cross sections across the FLO-2D model and adding up the cells to estimate the flows. FLO-2D Sections and a Summary Table of results are included in back pocket of this report.

3.0 PROPOSED DRAINAGE CONCEPT

The proposed drainage concept is presented in three parts: on-site drainage conveyance, off-site drainage conveyance, and storm water retention. These three sections make up sections 3.1, 3.2 and 3.3 respectively.

3.1 ON-SITE DRAINAGE CONVEYANCE

Pursuant to the Princess Medical Center Drainage Report, Section III (Appendix D), the on-site storm water runoff for this project will be conveyed via overland flow into existing catch basins, outletting into an existing drainage channel along Anderson Drive to the south of the project site. This channel drains to the west and into an existing retention basin located within the T.P.C. Scottsdale Golf Course. See the Conceptual Grading and Drainage Plan located in the back pocket of this report for more information.

3.2 OFF-SITE DRAINAGE CONVEYANCE

According to the FLO-2D model, approximately 150.59 CFS enters the site from the northeast corner at the intersection of Pima Road and Princess Drive. However, the FLO-2D model does not take into account any of the existing curbs in the intersection. Using the existing topography of the site and FlowMaster by Haestad Methods, approximately 34.34 CFS of the total 150.59 CFS is diverted by Pima Road and 62.47 CFS of the total 150.59 CFS is diverted by Princess Drive. Average sections and flows used for the FlowMaster calculations can be found in the FLO-2D Sections exhibit in the back pocket. See Appendix B, Drainage Calculations, for results of the FlowMaster calculations in addition to the below assumptions for the program:

- Existing slopes and elevations were used for the model.
- Street capacity flows were determined by the depth of the FlowMaster results, I.E. roads reached the maximum capacity once the depth of flow exceeded the depth of the curb and adjacent sidewalk.

Given the street capacity flows of 34.34 CFS for Pima Road and 62.47 CFS for Princess Drive, only 53.78 CFS actually reaches the site. Once onsite, flows fan out and bypass the existing building to the southwest of the site. Additional sections and average flow rates around the existing building were calculated according to the FLO-2D model, see the FLO-2D Sections exhibit in the back pocket of this report. According to the model, an average of 48.80 CFS bypasses the existing building to the west and an average of 112.73 CFS bypasses the existing building to the east.

Since the FLO-2D model does not take into account the existing curbs or street capacity for Pima Road or Princess Drive, average flow rates around the existing buildings were calculated as a proportion of the total flow coming on to the site. Therefore, approximately 30% of the flow (or 16.13 CFS) bypass the existing building to the west and approximately 70% of the flow (or 37.65 CFS) bypass the existing building to the east.

Offsite flows will be diverted around the proposed building and maintain the existing flow patterns of the site. Refer to the FLO-2D Proportional Sections exhibit in the back pocket of this report showing how the building will proportionally split the offsite flows in a similar fashion to existing. Sections were taken of the west and east sides of the existing building to demonstrate that this project will not adversely impact the existing building. According to the FlowMaster results located in Appendix B, approximately 23 CFS at a flow depth of 0.39 feet can bypass the existing west side of the building without overtopping the existing curbs, well above the 30% of flow (16.13 CFS) that comes here in the existing condition. Similarly, approximately 49 CFS at a flow depth of 0.50 feet can bypass the existing east side of the building without overtopping the existing curbs, well above the 70% of flow (37.65 CFS) that comes here in the existing condition.

3.3 STORM WATER RETENTION

On-site retention will not be provided with this project as retention is already provided within the T.P.C. Scottsdale Golf Course. Stormwater runoff will sheet flow across the site and be conveyed into the existing drainage system constructed with the Princess Medical Center development. The existing drainage system was designed and calculated with our proposed site as fully developed. Because the existing system was designed under full development standards our project will not be increasing the volume required to the T.P.C. Golf Course. Refer to the Princess Medical Center Drainage Report, Section III (Appendix D) and the Final Drainage Report for Scottsdale Perimeter Center (Appendix C) for existing regional retention volumes and calculations.

4.0 LOWEST FLOOR ELEVATION

Since the project site is located in a FEMA FIRM area Flood Hazard Zone AO, the required lowest floor elevation for the development is to be set a minimum of 2-ft above the highest adjacent grade (HAG) within the building envelope. The HAG within the proposed building envelope is 1582.00 and the lowest floor elevation has therefore been set to 1584.00. The proposed basement elevations are approximately 1560± and 1570± and will be dry floodproofed up to 2 feet above the HAG. Refer to Grading and Drainage plan located in the back pocket of this report for reference.

5.0 CONCLUSIONS

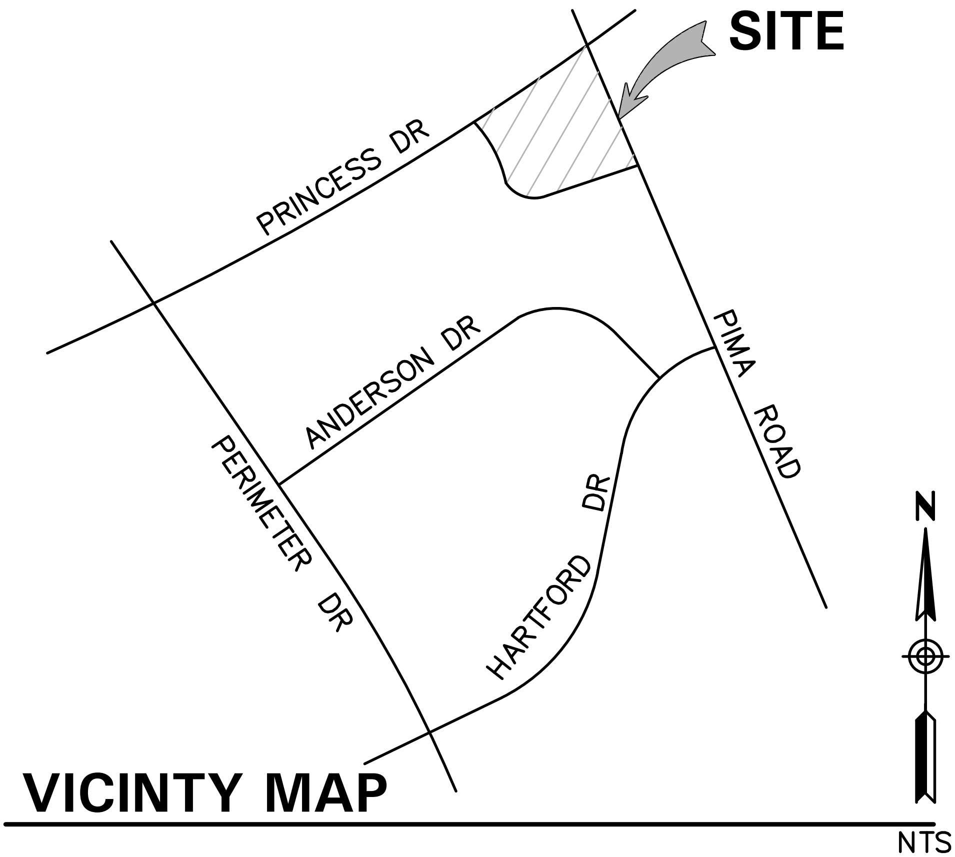
Based on the results of this study, it can be concluded that:

- Stormwater retention is already provided within the T.P.C. Scottsdale Golf Course per the Princess Medical Center Drainage Report and the Final Drainage Report for Scottsdale Perimeter Center (Appendix C and D).
- Off-site flows effecting the site will be conveyed around the building and released in a similar fashion as the existing condition.
- All stormwater will sheet flow across the site into the existing storm drain system which outlets into an existing channel located along the north side of Anderson Drive, south of the project site.
- To meet the design criteria of the Zone AO flood plain, the building lowest floor elevation will be set to a minimum of two feet above the highest adjacent grade elevation within the proposed building envelope. Additionally, the basement elevations will be dry floodproofed up to 2 feet above the HAG.

6.0 REFERENCES

1. *City of Scottsdale Design Standards & Policies Manual, January 2018.*
2. *Collar, Williams & White Engineering. Final Drainage Report for Scottsdale Perimeter Center, April 1989.*
3. *CMX, LLC. Princess Medical Center Drainage Report, May 2002.*

APPENDIX A
FIGURES



VICINITY MAP
FIGURE 1

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PORTION OF PANEL SHOWING SITE
FIGURE 2

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

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

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

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.

U.S. DEPARTMENT OF HOMELAND SECURITY

MAP NUMBER 04013C1320L

MAP REVISED OCTOBER 16, 2013

Federal Emergency Management Agency

MAP LEGEND

FIRM PANEL

7-DR-2020

9/17/2020

APPENDIX B
DRAINAGE CALCULATIONS

Hydrologic Design Data Record
Weir Calculation Sump Condition

Project: PLAT003   Calc'd By: GH

Date: 9/14/2020   Chck'd By: GH

Location:	**CP1**			Area:	0.15	acres
Runoff Coefficient:		0.90		Time of Conc, Tc:	5	min
Frequency	**2**	**10**	**25**	**50**	**100**	**Years**
Intensity	3.08	4.99	6.11	6.95	7.82	in/hr
Discharge	**0.42**	**0.67**	**0.82**	**0.94**	**1.06**	cf/sec
Weir Calculations - $Q=C_w*L*d^{1.5}$ - [Eq 3.13 MC Hydraulics Aug 15, 2013 ED.]						
Flow	Clogging Factor, C	Weir Coef, C_w	Allowable Depth, ft	Length Required	Length Provided	Ponding (ft)
Q_{100}	80%	3.00	0.50	1.24	7.00	**0.16**
Q_{10}	80%	3.00	0.50	0.79	7.00	**0.12**

Location:	**CP2**			Area:	0.14	acres
Runoff Coefficient:		0.90		Time of Conc, Tc:	5	min
Frequency	**2**	**10**	**25**	**50**	**100**	**Years**
Intensity	3.08	4.99	6.11	6.95	7.82	in/hr
Discharge	**0.39**	**0.63**	**0.77**	**0.88**	**0.99**	cf/sec
Weir Calculations - $Q=C_w*L*d^{1.5}$ - [Eq 3.13 MC Hydraulics Aug 15, 2013 ED.]						
Flow	Clogging Factor, C	Weir Coef, C_w	Allowable Depth, ft	Length Required	Length Provided	Ponding (ft)
Q_{100}	80%	3.00	0.50	1.16	7.00	**0.15**
Q_{10}	80%	3.00	0.50	0.74	7.00	**0.11**

Hydrologic Design Data Record
Grated Catch Basin Sump Condition

Project: PLAT003 Calc'd By: GH
Date: 9/14/2020 Chck'd By: GH

Location:	EX CB1			Area:	0.60	acres
Runoff Coefficient:		0.90	Time of Conc, Tc:		5	min
Frequency	**2**	**10**	**25**	**50**	**100**	**Years**
Intensity	3.08	4.99	6.11	6.95	7.82	in/hr
Discharge	**1.66**	**2.69**	**3.30**	**3.75**	**4.22**	cf/sec

Weir Calculations - $Q=C_w*P*d^{1.5}$ - [Eq 3.11 MC Hydraulics Aug 15, 2013 ED.]

Flow	Clogging Factor, C	Weir Coef, C_w	Allowable Depth, ft	Grate Perimeter P	Ponding (ft)
Q_{100}	50%	3.00	0.50	11.84	**0.38**
Q_{10}	50%	3.00	0.50	11.84	**0.28**

Orifice Calculations - Q=CO*Ag*(2gd)0.5 - [Eq 3.22 MC Hydraulics Aug 15, 2013 ED.]

Flow	Clogging Factor, C	Weir Coef, C_o	Allowable Depth, ft	Grate Area, A (ft)	Ponding (ft)
Q_{100}	50%	0.67	0.50	5.42	**0.08**
Q_{10}	50%	0.67	0.50	5.42	**0.03**

Location:	EX CB2			Area:	1.21	acres
Runoff Coefficient:		0.90	Time of Conc, Tc:		5	min
Frequency	**2**	**10**	**25**	**50**	**100**	**Years**
Intensity	3.08	4.99	6.11	6.95	7.82	in/hr
Discharge	**3.35**	**5.43**	**6.65**	**7.57**	**8.52**	cf/sec

Weir Calculations - $Q=C_w*P*d^{1.5}$ - [Eq 3.11 MC Hydraulics Aug 15, 2013 ED.]

Flow	Clogging Factor, C	Weir Coef, C_w	Allowable Depth, ft	Grate Perimeter P	Ponding (ft)
Q_{100}	50%	3.00	0.50	11.84	**0.61**
Q_{10}	50%	3.00	0.50	11.84	**0.45**

Orifice Calculations - Q=CO*Ag*(2gd)0.5 - [Eq 3.22 MC Hydraulics Aug 15, 2013 ED.]

Flow	Clogging Factor, C	Weir Coef, C_o	Allowable Depth, ft	Grate Area, A (ft)	Ponding (ft)
Q_{100}	50%	0.67	0.50	5.42	**0.34**
Q_{10}	50%	0.67	0.50	5.42	**0.14**

Location:	EX CB3			Area:	0.61	acres
Runoff Coefficient:		0.90	Time of Conc, Tc:		5	min
Frequency	**2**	**10**	**25**	**50**	**100**	**Years**
Intensity	3.08	4.99	6.11	6.95	7.82	in/hr
Discharge	**1.69**	**2.74**	**3.35**	**3.82**	**4.29**	cf/sec

Weir Calculations - $Q=C_w*P*d^{1.5}$ - [Eq 3.11 MC Hydraulics Aug 15, 2013 ED.]

Flow	Clogging Factor, C	Weir Coef, C_w	Allowable Depth, ft	Grate Perimeter P	Ponding (ft)
Q_{100}	50%	3.00	0.50	11.84	**0.39**
Q_{10}	50%	3.00	0.50	11.84	**0.29**

Orifice Calculations - Q=CO*Ag*(2gd)0.5 - [Eq 3.22 MC Hydraulics Aug 15, 2013 ED.]

Flow	Clogging Factor, C	Weir Coef, C_o	Allowable Depth, ft	Grate Area, A (ft)	Ponding (ft)
Q_{100}	50%	0.67	0.50	5.42	**0.09**
Q_{10}	50%	0.67	0.50	5.42	**0.04**

Pima Road
Worksheet for Gutter Section

Project Description	
Worksheet	Pima Road
Type	Gutter Sectio
Solve For	Discharge

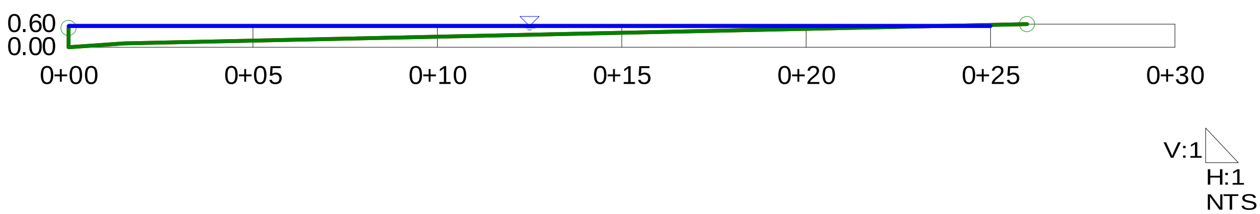
Input Data		
Channel Slope	010000	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slo	0.056	ft/ft
Road Cross Slop	0.020	ft/ft
Spread	25.00	ft
Mannings Coeffic	0.013	

Results		
Discharge	34.34	cfs
Flow Area	6.3	ft^2
Depth	0.55	ft
Gutter Depress	0.6	in
Velocity	5.46	ft/s

Cross Section
Cross Section for Gutter Section

Project Description	
Worksheet	Pima Road
Type	Gutter Sectio
Solve For	Discharge

Section Data		
Channel Slope	010000	ft/ft
Discharge	34.34	cfs
Gutter Width	1.50	ft
Gutter Cross Slo	0.056	ft/ft
Road Cross Slop	0.020	ft/ft
Spread	25.00	ft
Mannings Coeffic	0.013	



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Princess Road
Worksheet for Gutter Section

Project Description	
Worksheet	Princess Ro:
Type	Gutter Sectio
Solve For	Discharge

Input Data		
Channel Slope	020000	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slo	0.056	ft/ft
Road Cross Slop	0.020	ft/ft
Spread	27.50	ft
Mannings Coeffic	0.013	

Results		
Discharge	52.47	cfs
Flow Area	7.6	ft²
Depth	0.60	ft
Gutter Depress	0.6	in
Velocity	8.22	ft/s

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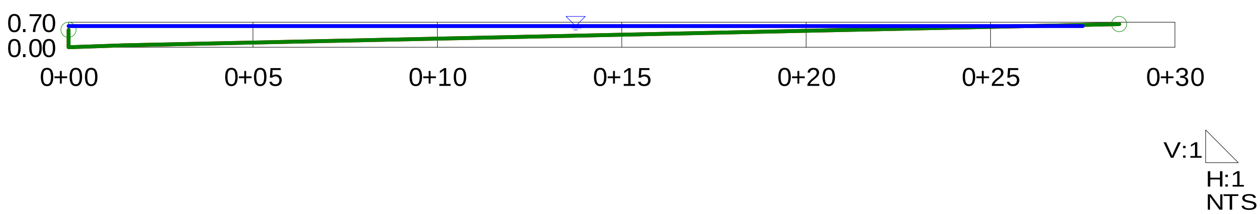
Cross Section
Cross Section for Gutter Section

Project Description	
Worksheet	Princess Ro:
Type	Gutter Sectic
Solve For	Discharge

Section Data		
Channel Slope	020000	ft/ft
Discharge	62.47	cfs
Gutter Width	1.50	ft
Gutter Cross Slo|	0.056	ft/ft
Road Cross Slop	0.020	ft/ft
Spread	27.50	ft
Mannings Coeffic	0.013	



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Existing Building - West
Worksheet for Gutter Section

Project Description	
Worksheet	Existing Building - W
Type	Gutter Section
Solve For	Spread

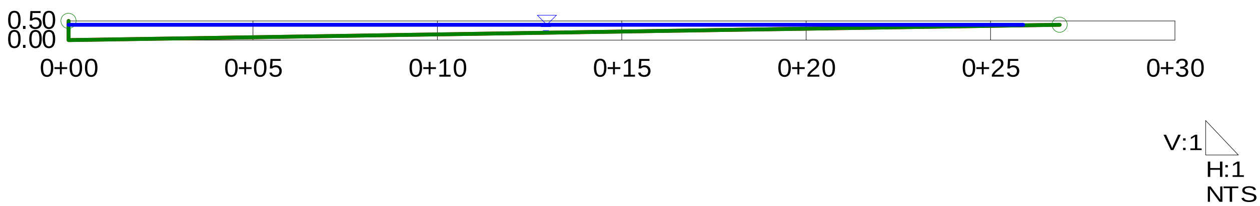
Input Data		
Channel Slope	010000	ft/ft
Discharge	23.00	cfs
Gutter Width	0.00	ft
Gutter Cross Slop	0.000	ft/ft
Road Cross Slop	0.015	ft/ft
Mannings Coeffic	0.013	

Results		
Spread	25.87	ft
Flow Area	5.0	ft²
Depth	0.39	ft
Gutter Depress	0.0	in
Velocity	4.58	ft/s

Cross Section
Cross Section for Gutter Section

Project Description	
Worksheet	Existing Building - W
Type	Gutter Section
Solve For	Spread

Section Data		
Channel Slope	010000	ft/ft
Discharge	23.00	cfs
Gutter Width	0.00	ft
Gutter Cross Slo|	0.000	ft/ft
Road Cross Slop	0.015	ft/ft
Spread	25.87	ft
Mannings Coeffic	0.013	



Existing Building - East
Worksheet for Gutter Section

Project Description	
Worksheet	Existing Building - Ea
Type	Gutter Section
Solve For	Spread

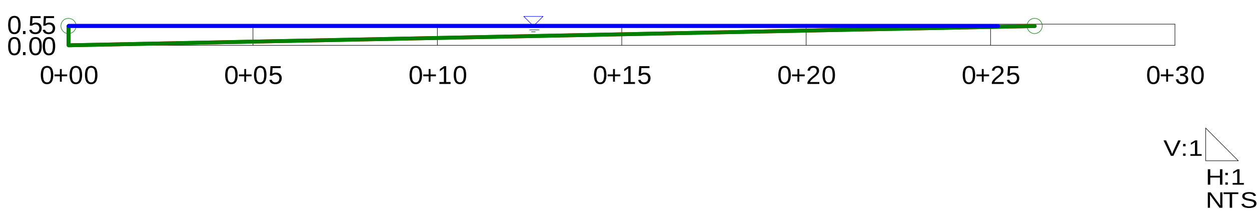
Input Data		
Channel Slope	020000	ft/ft
Discharge	49.00	cfs
Gutter Width	0.00	ft
Gutter Cross Slop	0.000	ft/ft
Road Cross Slop	0.020	ft/ft
Mannings Coeffic	0.013	

Results		
Spread	25.20	ft
Flow Area	6.4	ft²
Depth	0.50	ft
Gutter Depress	0.0	in
Velocity	7.72	ft/s

Cross Section
Cross Section for Gutter Section

Project Description	
Worksheet	Existing Building - Ea
Type	Gutter Section
Solve For	Spread

Section Data		
Channel Slope	020000	ft/ft
Discharge	49.00	cfs
Gutter Width	0.00	ft
Gutter Cross Slop	0.000	ft/ft
Road Cross Slop	0.020	ft/ft
Spread	25.20	ft
Mannings Coeffic	0.013	



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West Channel
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	West Channel
Flow Element	Trapezoidal Cha
Method	Manning's Formı
Solve For	Channel Depth

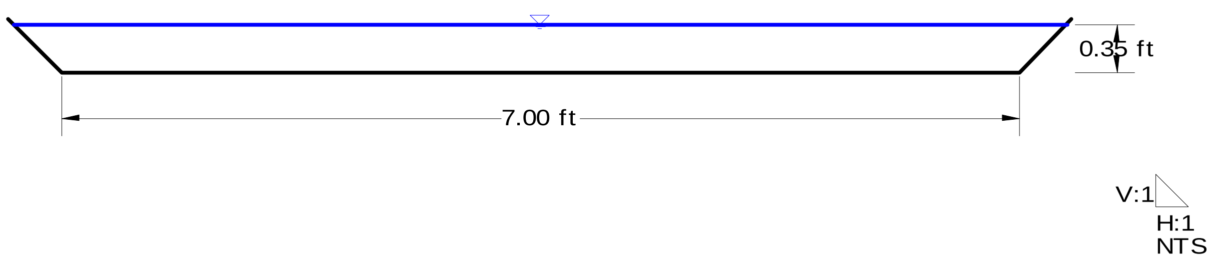
Input Data		
Mannings Coeffic	0.013	
Channel Slope	014000	ft/ft
Left Side Slope	1.00	H : V
Right Side Slope	1.00	H : V
Bottom Width	7.00	ft
Discharge	16.13	cfs

Results		
Depth	0.35	ft
Flow Area	2.6	ft²
Wetted Perim	7.98	ft
Top Width	7.69	ft
Critical Depth	0.53	ft
Critical Slope	0.003334	ft/ft
Velocity	6.32	ft/s
Velocity Head	0.62	ft
Specific Enerç	0.97	ft
Froude Numb	1.94	
Flow Type	Supercritical	

Cross Section
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	West Channel
Flow Element	Trapezoidal Cha
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Channel Slope	014000	ft/ft
Depth	0.35	ft
Left Side Slope	1.00	H : V
Right Side Slope	1.00	H : V
Bottom Width	7.00	ft
Discharge	16.13	cfs



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East Channel
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	East Channel
Flow Element	Trapezoidal Cha
Method	Manning's Formı
Solve For	Channel Depth

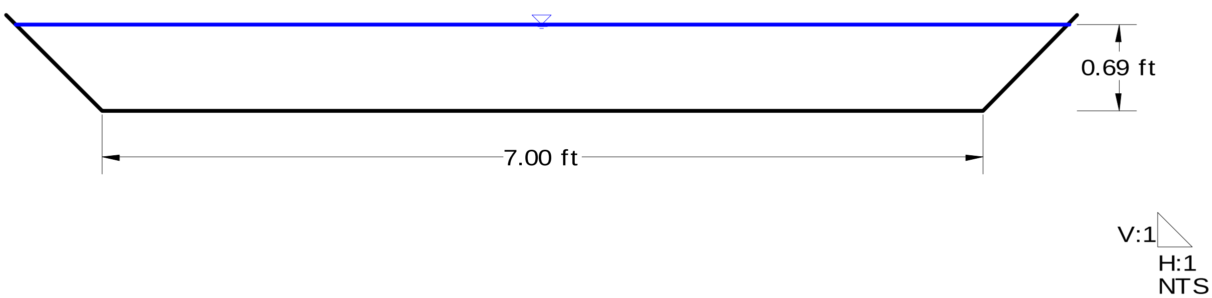
Input Data		
Mannings Coeffic	0.013	
Channel Slope	007700	ft/ft
Left Side Slope	1.00	H : V
Right Side Slope	1.00	H : V
Bottom Width	7.00	ft
Discharge	37.65	cfs

Results		
Depth	0.69	ft
Flow Area	5.3	ft²
Wetted Perim	8.95	ft
Top Width	8.38	ft
Critical Depth	0.92	ft
Critical Slope	0.002933	ft/ft
Velocity	7.09	ft/s
Velocity Head	0.78	ft
Specific Energ	1.47	ft
Froude Numb	1.57	
Flow Type	Supercritical	

Cross Section
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	East Channel
Flow Element	Trapezoidal Cha
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Channel Slope	007700	ft/ft
Depth	0.69	ft
Left Side Slope	1.00	H : V
Right Side Slope	1.00	H : V
Bottom Width	7.00	ft
Discharge	37.65	cfs



APPENDIX C
FINAL DRAINAGE REPORT FOR
SCOTTSDALE PERIMETER CENTER

FINAL DRAINAGE REPORT
FOR
SCOTTSDALE PERIMETER CENTER
PHASE ONE
C.W.W. JOB NO. 880932

PREPARED FOR:
WESTCOR COMPANY
11411 NORTH TATUM BOULEVARD
PHOENIX, ARIZONA 85028

SUBMITTED BY:
COLLAR, WILLIAMS & WHITE ENGINEERING
2702 NORTH 44TH STREET, SUITE 100-A
PHOENIX, ARIZONA 85008

JANUARY 1989

Registered Professional Engineer (Civil)
CERTIFICATE NO.
13493
ROBERT E.
MOHNING
Date Signed
ARIZONA, U.S.A.

TABLE OF CONTENTS

Registered Professional Engineer (Civil)
CERTIFICATE NO.
13493
ROBERT E.
MOHNING
1-24-89
U.S.A.

7-DR-2020
9/17/2020

I. INTRODUCTION

The Scottsdale Perimeter Center is located just west of the proposed Outer Loop between Bell Road and Union Hills Drive and east of 83rd Street. Phase One encompasses improvements along Bell Road, 86th Street and Hayden Road in the southern portion of the Perimeter Center (Figure 1).

By legal description, Phase One lies in a portion of the south half of Section 36, Township 4 North, Range 3 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

II. MASTER DRAINAGE STUDY

Collar, Williams & White Engineering (CWW) completed the Master Drainage Report for Scottsdale Perimeter Center in January of 1988 (revised, June, July of 1988 and January 1989). The study, along with the Grading and Drainage Master Plan, gives a thorough description of the existing drainage conditions and includes data from other related drainage studies. The Master Drainage Study states that under present conditions the subject site would receive part of the 100 year peak discharge of over 6,800 cfs. This runoff would be spread out over a large area "and thus classified as a sheet flow condition". The average depth of flow across the area will be about 1 foot.

The Outer Loop Highway is proposed to be built as an elevated section and will eliminate the sheet flow runoff condition which presently exists by diverting the flows into a detention basin.

The Master Plan calls for the construction of numerous grass lined drainage channels to collect on-site runoff and route it through the Scottsdale Perimeter Center.

III. OFF-SITE DRAINAGE

As stated previously and in the Master Drainage Study, under existing drainage conditions the 100 year off-site peak flow entering the site is over 6800 cfs, occurring as sheet flow about 1 foot deep. Construction of the Outer Loop Highway is expected to reduce this peak through detention of flows upstream of the Highway. The Perimeter Center site will then be subject to an ultimate off-site peak discharge of 722 cfs from the detention basin plus 300± cfs from an adjacent State Land parcel at Pima Road (northeast of the Outer Loop). This off-site drainage is proposed to be routed in a future concrete-lined channel that will be at the eastern edge of the site and therefore does not affect Phase One.

It must be pointed out that the drainage improvements for Phase One are designed to handle on-site flows only. If a major off-site event were to occur before the Outer Loop detention system is in place, there is a possibility that the Phase One drainage improvements will be damaged and/or will fail.

IV. ON-SITE DRAINAGE

A. Streets

The Rational Method was used to calculate 100 year peak flows in the streets. These flows are all generated from within the street right-of-way. A C factor of 0.45 was used for pervious areas based on a B soil with 20% desert cover. The flows and concentration points are shown on the drainage map (Figure 2). The time of concentration calculations and peak discharge worksheets are included in Appendix I.

Catch basins were spaced to ensure that street flow stays within the top of curb for the 100 year event, both on continuous grades and in sag locations.

Flow will be picked up by both curb opening inlets and slotted drains and directed by storm drains to either a channel or culvert. The calculations for inlet capacity and storm drain capacity are included in Appendix II.

B. Channels

The 100 year peak flows from onsite drainage were computed using the HEC-1 model for the Master Drainage Study. These flows did not include flow contribution from the southern half of Bell Road. The flows from the southern half of Bell Road were added to these flows and they were then used to size the grass-lined channels for Phase One (Figure 2). A Mannings n of .027 was used. The channel hydraulic calculations are in Appendix III. During the 100 year peak flow, all channels are at subcritical flow except Channel Q which is at supercritical flow. The required freeboard for all channels is at least 1 foot except for Channel V which is at least 1.6 feet.

C. Culverts

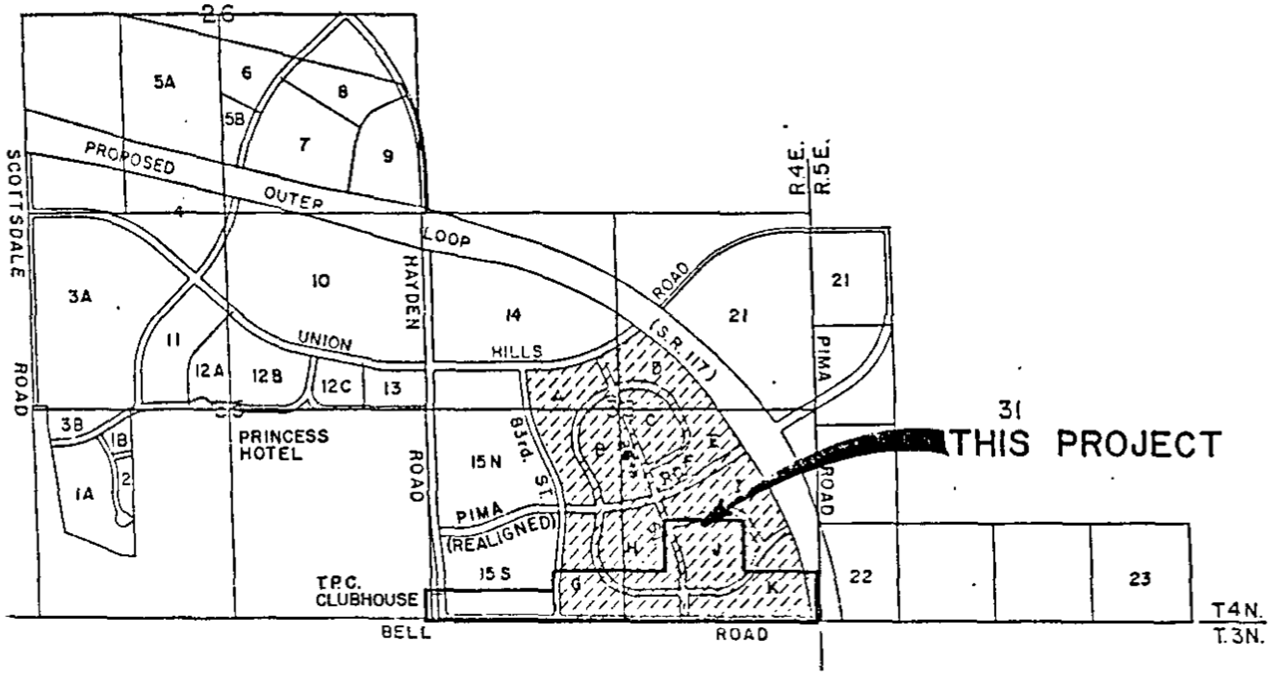
There are three culverts proposed for Phase One that will take flows in the grass lined channels under roads (Figure 2).

The 100 year peak flows from onsite drainage that are in the Master Drainage Report with the addition of flows from the southern half of Bell Road (as mentioned above) were used to size the three culverts. The inlet and outlet control calculations are in Appendix III. The channels will be lined with concrete at both the entrances and exits of the culverts to prevent scouring.

D. Desiltation Basins

There will be several berms constructed in Phase One (see Grading and Drainage Plans) that are designed to detain water to enable sediment to drop out before entering the grass lined channels. These desiltation basins will provide enough storage for the on-site runoff generated from a 100 year, 1 hour storm. The basins will be drained into adjacent channels by bleed-off pipes. The pipes are designed to allow the basins to drain within a 36 hour period. The desiltation basin storage volume and drainage calculations are in Appendix III.

Spillways will be provided to allow a level of protection if the basins were to become full due to off-site flows entering the site. To prevent scouring, the spillway will be gunite lined and the channels in the vicinity of the spillway outfalls will be lined with a landscape fabric.



VICINITY MAP
N.T.S.

Figure 1

7-DR-2020
9/17/2020

APPENDIX I

TIME OF CONCENTRATION CALCULATIONS

AND

PEAK DISCHARGE WORKSHEETS

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N. 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 1 OF 4
CALCULATED BY J. G. DATE 12-29-88
CHECKED BY DATE
SCALE

Tc's for CP's

POOR QUALITY ORIGINAL

CP 1 - Bell Rd. Sta. 26+70

L = 530', Ave. Weighted S = 0.48%, Area = 530 X 55 = 0.67 ac

Ave. Q = CIA = .78(7.3).34 = 1.9 cfs, n = .015, $z = \frac{1}{.02} = 50$

$$\text{Ave. } d = \left(\frac{Q \cdot n}{0.56\, z\, S^{1/2}}\right)^{3/8} = \left(\frac{1.9(.015)}{0.56(50)(.0048)^{1/2}}\right)^{3/8} = 0.2 \text{ ft}$$

$$\text{Ave. } V = \frac{1.12}{n} S^{1/2} d^{2/3} = \frac{1.12}{.015}(.0048)^{1/2}(0.2)^{2/3} = 1.8 \text{ fps}$$

530' @ 1.8 fps = 4.9 min   Use 10 minute minimum (A+B)

CP 2 - Bell Rd. Sta 34+70

Two lengths: 605' @ 0.4% and 540' @ Ave. Slope of 1.15%

L_1 = 540' Ave. S = 1.15%; Area = 540'x55 = 0.68 ac.

Ave. Q = .78(7.3).34 = 1.9 cfs, Ave. d = 0.17', Ave. V = 2.5 fps

540' @ 2.5 fps = 3.6 min

L_2 = 605', S = 0.4%, Total Area = (605'X55') + 0.68 ac = 1.45 ac

Ave. Q = .78(7.3)1.07 = 6.1 cfs, Ave. d = 0.3[illegible]', Ave. V = 2.2 fps

605' @ 2.2 fps = 4.6 min   Total = 4.6 + 3.6 = 8.2 min

Use 10 minute minimum for A+B

7-DR-2020
9/17/2020

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB: Perimeter Center Phase 1
SHEET NO. 2 OF 4
CALCULATED BY: J.B. DATE: 12-29-88
CHECKED BY: DATE:
SCALE:

Tc's for CP's (cont'd)

CP3 - Bell Rd. Sta. 44+00

L = 1600', Ave. S = 0.41%, Area = 1600' x 55' = 2.0 ac.

Ave. Q = 0.78(7.3)1 = 5.7 cfs, Ave. d = 0.31', Ave. V = 2.2 fps

1600' @ 2.2 fps = 12.1 minutes

CP4 - Loop Rd. Sta. 13+50

Streets have 20.5' half-width and 2% cross slope

Ave. weighted slope = 0.95%, L = 1743 ft

Ave. Q = CIA = .81(7.3)1.6 ≅ 9.5 cfs ≈ 4.2 cfs each side street

Ave. d = 0.24', Ave. V = 2.8 ft/s

1743' @ 2.8 ft/s = 10.4 min.

7-DR-2020
9/17/2020

FORM 204-1

Collar, Williams & White Engineering Consulting Engineers and Land Surveyors 2702 N 44TH ST., SUITE 100A PHOENIX, ARIZONA 85008 PHONE: (602) 957-3350	
JOB NO.	

JOB Perimeter Center Phase 1

SHEET NO. 3 OF 4

CALCULATED BY J.D. DATE 1-10-89

CHECKED BY ______ DATE ______

SCALE ______

Tc's for CP's (cont'd)

CP-5 - 84th Way - Sta. 16+00 (east side of street)

L = 845' on Loop Rd., S = 0.96%, S_x = 2%, z = 50

Ave. Q per side of street = CIA = .81(7.3).34 = 2 cfs

Ave. d = .18', Ave. V = 2.36 ft/s, 845' @ 2.36 ft/s = 6 minutes

L = 600' on 84th Way; Ave. S = 1.15%, S_x = 2%, z = 50

Ave. Q = $\frac{15.5 + 11}{2}$ = 13 cfs, Ave d = 0.36'; Ave. V = 4 ft/s

600' @ 4 ft/s = 2.5 min., Total = 6 + 2.5 = 8.5 min.

Use 10 minute minimum

CP-6 - 84th Way - Sta. 16+00 (west side of street)

L = 1050', Ave. wtd. S = 1.30%, S_x = 2%; z = 50

Ave. Q = CIA = .84(7.3).54 = 3.3 cfs

Ave. d = 0.21', Ave V. = 3 ft/s, 1050' @ 3 ft/s = 5.8 min.

Use 10 minute minimum

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N. 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 4 OF 4
CALCULATED BY J.B. DATE 1-11-89
CHECKED BY DATE
SCALE

Tc's for CP's (con'td)

CP7 - Loop Rd. Sta. 10+60 (north side of street)

Have 2.9 cfs flowby from CP5 w/ $T_c = 8.5$ min, $L = 200'$

Ave. $S = 1.15\%$, Ave $S_x = 1\%$, Ave $z = 100$, Ave. $d = 0.17'$

Ave. $V = 2.45$ ft/s, 200 ft @ 2.45 ft/s = 1.4 ft

$T_c = 8.5 + 1.4 = 9.9$ minutes use 10 minute minimum

CP8 - 84th Way Sta. 11+70 (east side of street)

Have 0.5 cfs flow by from CP4 (south side) w/ $T_c = 10.4$ min
and 1.1 cfs flowby from CP7

$L = 490$ ft, Ave. $S = 1.0\%$, Ave $S_x = 1.4\%$, Ave. $z = 71$

Ave. $Q = .8(6).23 + 0.5 + 1.1 = 2.7$ cfs, Ave. $d = 0.18'$

Ave. $V = 2.4$ ft/s, 490 ft. @ 2.3 fps = 3.4 min.

$T_c = 10.4 + 3.4 = 13.8$ min.

or use 1.1 cfs flow by from CP7 w/ $T_c = 9.9$ min (no 0.5 cfs + CP4 flowby)

$L = 230$ ft., Ave $S = 1.6\%$, Ave. $S_x = 1.1\%$, Ave. $Z = 91$

Ave. $Q = .8(7).23 + 1.1 = 2.4$ cfs, Ave. $d = 0.14'$

Ave. $V = 2.5$ ft/s, 230 ft @ 2.5 fps = 1.5 min

$T_c = 9.9 + 1.5 = 11.4$ min.

[illegible]

FORM 204-1

7-DR-2020
9/17/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. ?30932 Station CP 1 (A+B)

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	0.44	acres
	A_2	0.[illegible]	acres
	A_3		acres
Drainage Length		530	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.48	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

0.67 [illegible]

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	Minimum 10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1	0.75	– [illegible]
	C_2	0.45	– [illegible]
	C_3		
Weighted Runoff Coefficient	C	0.[illegible]	
Peak Discharge $Q_p = C_iA$ =		3.[illegible]	cfs

Computed by [illegible] Date [illegible]-77

20-2003 2/76 (FORMERLY 20-2903)

7-DR-2020
9/17/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP2A

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.77	acres
	A_2		acres
	A_3		acres
Drainage Length		1145	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.4 and 1.15	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	Minimum 10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1		
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.77	
Peak Discharge $Q_p = C_{IA}$ =		10.[illegible]	cfs

Computed by [illegible] Date [illegible]

20-2003 2/76 (FORMERLY 20-29031)

7-DR-2020
9/17/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP 2B

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.36	acres
	A_2		acres
	A_3		acres
Drainage Length		805	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.4 & 0.83	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	Minimum 10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1		
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.78	
Peak Discharge $Q_p = C_iA$ =		7.7	cfs

Computed by [illegible signature] Date 12-20-88

20-2003 2/76 (FORMERLY 20-2903)

7-DR-2020
9/17/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP3A

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.45	acres
	A_2	1.30	acres
	A_3		acres
Drainage Length			feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

} 2.75

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	12.1	minutes
Rainfall Intensity	i	6.7	inches/hour
Runoff Coefficient	C_1	0.78	
	C_2	0.83	
	C_3		
Weighted Runoff Coefficient	C	0.80	
Peak Discharge $Q_p = C_iA$ =		14.7	cfs

Computed by [illegible] Date 1-5-89

20-2003 2-76 (FORMERLY 20-29031)

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP3B

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.19	acres } 1.72
	A_2	0.53	acres
	A_3		acres
Drainage Length		160	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.40 + 0.53	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	12	minutes
Rainfall Intensity	i	6.7	inches/hour
Runoff Coefficient	C_1	0.95	- pavement
	C_2	0.45	- soil B, 20% desert cover
	C_3		
Weighted Runoff Coefficient	C	0.79	
Peak Discharge $Q_p = C_iA$ =		9.1	cfs

Computed by [illegible] Date [illegible]

20-2003 2/75 (FORMERLY 20-2903)

7-DR-2020
9/17/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP4

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	3.14	acres
	A_2		acres
	A_3		acres
Drainage Length		1743	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		Ave. 0.95	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	10.4	minutes
Rainfall Intensity	i	7.1	inches/hour
Runoff Coefficient	C_1		
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.81	(51'@.95+19'@.45)
Peak Discharge $Q_p = C_iA$ =		18.1	cfs

Computed by J.K. Date 1-10-89

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP 5

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.36	acres
	A_2	0.44	acres
	A_3	0.72	acres
Drainage Length		1445	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		1.15 + 0.96	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

2.52

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	Minimum 10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1	0.85	
	C_2	0.76	
	C_3	0.84	
Weighted Runoff Coefficient	C	0.84	
Peak Discharge $Q_p = C_{iA}$ =		15	cfs

Computed by C. P. Date 1-10-89

20-2003 2/76 (FORMERLY 20-2903)

7-DR-2020
9/17/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP6

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.08	acres
	A_2		acres
	A_3		acres
Drainage Length		1050	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		1.134	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	Minimum 10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1		
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.84	
Peak Discharge $Q_p = C_iA$ =		6.6	cfs

Computed by Q.T. Date 1-10-89

20-2003 2/76 (FORMERLY 20-2903)

7-DR-2020
9/17/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Prose..

Project No. 880932 Station CP7

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	0.21	acres } 0.42
	A_2	0.21	acres
	A_3		acres
Drainage Length		360	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.5	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1	0.[illegible]	
	C_2	0.[illegible]	
	C_3		
Weighted Runoff Coefficient	C	[illegible]	
Peak Discharge $Q_p = C_iA$ =		[illegible]	cfs

[illegible]

Computed by [illegible] Date [illegible]

10/10

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP 8

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	0.21	acres } 0.45
	A_2	0.24	acres
	A_3		acres
Drainage Length		260	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.5	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	13.8	minutes
Rainfall Intensity	i	6.3	inches/hour
Runoff Coefficient	C_1	0.91	
	C_2	0.70	
	C_3		
Weighted Runoff Coefficient	C	0.80	
Peak Discharge $Q_p = C_iA$ =		2.3	cfs

Add 0.5 [illegible] 1.1 [illegible]

Computed by C.L. Date [illegible] -88

20-2003 2/75
(FORMERLY 20-29031)

7-DR-2020
9/17/2020

APPENDIX II

STREET INLET CAPACITY CALCULATIONS

AND

SLOTTED DRAIN PIPE CAPACITY CALCULATIONS

AND

STORM DRAIN PIPE CAPACITY CALCULATIONS

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N. 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB: Perimeter Center Phase 1
SHEET NO. 1 OF 9
CALCULATED BY: J.D. DATE: 1-9-89
CHECKED BY: DATE:
SCALE:

Inlet Capacity Calculations

CP1 A+B - Bell Rd. Sta. 26+70, sump condition

$Q = 3.8$ cfs per side, allowable depth at sag $= 6'' = 0.5'$, $S = 0.4\%$

Use 1-5.5' curb opening inlet, effective Length $(Le) = 5.5/1.25 = 4.4'$

Fig. 3-47: $h = 5''$, $a = 2''$, $d/h = 1.2$, $Q/L = 1.05$, $Q_{cap} = 1.05(4.4) = 4.6$ cfs OK

Result: 1-5.5' curb opening inlet at sag location

CP2 A - Bell Rd. Sta. 34+70, sump condition, $Q = 10.1$ cfs

Use 1-5.5' curb opening inlet → capacity = 4.6 cfs (from CP1)

Need to pick up additional $10.1 - 4.6 = 5.5$ cfs

Use 1-20' section of slotted drain, $Le = 20/1.5 = 13.33'$

Effective depth at center $(d_e) = 0.5 - (.0052 \times 13) = 0.43'$

Capacity of slotted drain $= \dfrac{Le\, d_e^{0.5}}{1.401} = 6.2$ cfs

Total Capacity $= 6.2 + 4.6 = 10.8$ cfs OK

Result: 1-5.5' curb opening inlet at sag
20' of slotted drain

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Inlet Capacity Calculations (cont'd)

CP2B - Bell Rd. Sta 34+70, sump condition, $Q = 7.7$ cfs

Allowable d = 6", Use 1-3.5' curb opening inlet, $L_e = 3.5/1.25 = 2.8'$

h = 5", d/h = [illegible], $Q/L = 1.05 \rightarrow Q_{cap} = 2.8(1.05) = 2.9$ cfs

Use 1-20' section slotted drain, $Q_{cap} = 6.2$ cfs (from CP2A)

Total capacity $= 6.2 + 2.9 = 9.1$ cfs OK

Result: 1-3.5' curb opening inlet at sag location
20' of slotted drain " " "

CP3A - Bell Rd. Sta. 44+00, sump, $Q = 14.7$ cfs

Use 1-3.5' curb opening inlet, $Q_{cap} = 2.9$ cfs (from CP2B)

Use 2-20' sections of slotted drain, One on each side

d_e on [illegible] side of curb opening (S = 0.4%) $= 0.5 - (.004 \times 12) = 0.45'$

d_e on [illegible] side of curb opening (S = 0.53%) $= 0.5 - (.0053 \times 12) = 0.44'$

Q_{cap} [illegible] $= \frac{[illegible]\ d_e^{0.5}}{.401} = \frac{13.33\ (0.45)^{0.5}}{.401} = 6.4$ cfs, Q_{cap} [illegible] $= 6.3$ cfs

Total Capacity $= 6.3 + 6.4 + 2.9 = 15.6$ cfs OK

Result: 1-3.5' curb opening inlet [illegible]
2-20' slotted drain [illegible] either side of curb opening

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Inlet Capacity Calculations (cont'd)

CP3B - Bell Rd. Sta. 43+90, sump condition, Q = 9.1 cfs

Allowable depth at sag = 0.23' before begins flowing west

Use 1 - 3.5' curb opening inlet, effective L = 3.5/1.25 = 2.8'

$d/h = .23/.417 = 0.55$, $Q/L = 0.35 \rightarrow Q = 2.8(.35) = 1$ cfs

Use 2 - 20' sections of slotted drain, one on each side

d_e on west side of curb opening (S = 0.4%) = 0.23 - (.004 x 12) = .18'

d_e on east side of curb opening (S = 0.6%) = 0.23 - (.006 x 12) = .16'

$Q_{cap(west)} = \frac{13.33\,(.18)^{0.5}}{1.401} = 4.0$ cfs, $Q_{cap(east)} = 3.8$ cfs

Total Capacity = 4 + 3.8 + 1 = 8.8 cfs OK

Flowby = 9.1 - 8.8 = 0.3 cfs

Result: 1 - 3.5' curb opening inlet at sag location
1 - 20' slotted drain on either side of curb opening
Flowby = 0.3 cfs

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Inlet Capacity Calculations (cont'd)

CP4 - Loop Road Sta. 13+50 - continuous grade

$Q = 18.1$ cfs, $S = 0.48\%$, $S_x = 2.0\%$, $z = 50$

North side of street will be filled to centerline (0.41')
due to larger contributing area than South side of street

North side: $d = 0.41'$, $Q = 12$ cfs

60' of slotted drain, $L_e = 60/1.5 = 40'$

$L_r = 54.0'$, $L_a/L_r = 40/54 = 0.74$; $Q_a/Q_d = 0.915$

$Q_{intercepted} = .915(12) = 11$ cfs

1 - 3.5' of curb opening, $L_e = 3.5/1.25 = 2.8'$

$Q = 12 - 11 = 1$ cfs, $d = 0.16'$, $Q/L_a = 0.11 \rightarrow L_a = 1/.11 = 9.1'$

$a/d = .17/.16 = 1.04$, $L/L_a = 2.8/9.1 = 0.31$; $Q/Q_a = 0.41 \rightarrow Q = 0.4$ cfs

Total Q intercepted $= 11 + 0.4 = 11.4$ cfs

Flowby $= 12 - 11.4 = 0.6$ cfs

Result: 1-3.5' curb opening in an on continuous grade
60' of slotted drains upstream of catch basin
Flowby of 0.6 cfs

Inlet Capacity Calculations (cont'd)

CP4-southside: $Q = 18.1 - 12 = 6.1$ cfs, $d = 0.32'$

40' of slotted drain, $L_e = 26.7$, $L_r = 40.9'$

$L_a/L_r = 26.7/40.9 = 0.65$, $Q_a/Q_d = 0.86 \rightarrow Q_a = 0.86(6.1) = 5.2$ cfs

1-3.5' curb opening, $L_e = 2.8'$, $Q = 6.1 - 5.2 = 0.9$ cfs

$d = 0.16'$, $Q/L_a = 0.11 \rightarrow L_a = .9/.11 = 8.2'$, $a/d = 1.04$

$L/L_a = 2.8/8.2 = 0.34$, $Q/Q_a = 0.45 \rightarrow Q = .45(.9) = 0.4$ cfs

Total Q intercepted $= 5.2 + 0.4 = 5.6$ cfs

Flowby $= 6.1 - 5.6 = 0.5$ cfs

Result: 1-3.5' curb opening inlet on continuous grade
40' of slotted drains upslope of catch basin
Flowby of 0.5 cfs

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Inlet Capacity Calculations (cont'd)

CP5 - 84th Way Sta. 15+80 - east side, continous grade

$Q = 15.5$ cfs, $S = 1.134\%$, $S_x = 2\%$, $Z = 50$

60' of slotted drain, $L_e = 60/1.5 = 40'$, $L_r = 78.4'$

$L_a/L_r = 40/78.4 = 0.51$, $Q_a/Q_d = 0.74 \rightarrow Q_o = 15.5(.74) = 11.5$ cfs

1 - 5.5' curb opening, $L_e = 5.5/1.25 = 4.4'$

$Q = 15.5 - 11.5 = 4$ cfs, $d = 0.23'$, $Q/L_a = 0.16 \rightarrow L_a = 4/.16 = 25'$

[illegible] $= 0.73$, $L/L_a = 4.4/25 = 0.18$, $Q/Q_a = 0.28 \rightarrow Q_i = 1.1$ cfs

Total Q intercepted $= 1.1 + 11.5 = 12.6$ cfs

Flow by $= 15.5 - 12.6$ 2.9 cfs

Result: 1-5.5' curb opening inlet on continous grade
60' of slotted drains upslope of catch basin
Flow by of 2.9 cfs

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Inlet Capacity Calculations (cont'd)

CP6 – 84th Way Sta. 15+80 - west side, continuous grade

$Q = 6.6$ cfs, $S = 1.134\%$, $S_x = 2\%$, $z = 50$

40' of slotted drain, $L_e = 40/1.5 = 26.7'$, $L_r = 54.4'$

$L_a/L_r = 26.7/54.4 = 0.49$, $Q_a/Q_t = 0.72 \rightarrow Q_a = 6.6(.72) = 4.8$ cfs

Flowby = 6.6 - 4.8 = 1.8 cfs

Result: 40' of slotted drain on continuous grade
Flow by of 1.8 cfs

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Inlet Capacity Calculations (cont'd)

CP7 - Loop Rd. Sta. 10+60 - north side, sump condition

$Q = 5.4$ cfs, $S_x = .5\%$, d allowed before crosses centerline $= 0.1'$

Use 1-3.5' curb opening inlet, $L_e = 3.5/1.25 = 2.8'$

$h = 5''$, $d/h = .1/.42 = 0.24$, $Q/L = 0.1 \rightarrow Q_i = 2.8(.1) = 0.3$ cfs

Use 1-20.0' section of slotted drain, Ave. d at middle of drain $= 0.1 - (12 \times .004) = .05'$, $L_e = 20/1.5 = 13.33$

$Q = \frac{L\,d^{0.5}}{1.401} = 2.1$ cfs, Total $Q = 2.1 + .3 = 2.4$ cfs

Since begin to get flow over centerline at 2.4 cfs will have depth at gutter larger than 0.1 ft. Must balance depth so Q in inlet and Q weiring over centerline add up to 5 cfs. Centerline acts as 1-sloped weir with 200:1 side slopes. With depth at centerline of 0.9' get about 1.1 cfs weir flow.

For 3.5' curb opening inlet $d/h = .19/.42 = 0.45$

$Q/L = 0.26 \rightarrow Q = .26(2.8) = 0.7$ cfs

For 20' slotted drain, Ave. $d = 0.14'$, $Q = \frac{13.33(.14)^{0.5}}{1.401} = 3.6$ cfs

Total Interception $= 3.6 + 0.7 = 4.3$ cfs

[illegible]

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Inlet Capacity Calculations (cont'd)

CP8 - 84th Way Sta. 11+70 - east side, continous grade

$Q = 3.9$ cfs, $S = 1.18\%$, $S_x = 1.5\%$, $z = 67$

60' of slotted drain, $Le = 60/1.5 = 40'$, $Lr = 55.1'$

$La/Lr = 40/55.1 = 0.73$, $Qa/Qd = 0.91 \rightarrow Q_a = 3.6$ cfs

Q intercepted = 3.6 cfs

Flow by = 3.9 - 3.6 = 0.3 cfs

Result: 60' of slotted drain on continuous grade
Flow by = 0.3 cfs

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Slotted Drain Pipe Capacity Calculations

$$Q_{capacity} = A \frac{1.486}{n} R^{2/3} S^{\frac{1}{2}}$$

$$Q_{cap}(18'') = 1.77 \frac{1.486}{.013} (0.375)^{2/3} S^{\frac{1}{2}} = 105\ S^{\frac{1}{2}}$$

$$Q_{cap}(24'') = 3.14 \frac{1.486}{.015} (0.5)^{2/3} S^{\frac{1}{2}} = 196.1\ S^{\frac{1}{2}}$$

$$Q_{cap}(30'') = 4.91 \frac{1.486}{.017} (0.625)^{2/3} S^{\frac{1}{2}} = 313.7\ S^{\frac{1}{2}}$$

Manning's n values are for Standard Corrugated Steel Pipe with 2 2/3 X 1/2 inch hellical corrugations from Handbook of Steel Drainage and Highway Construction Products, American Iron and Steel Institute, 1983.

CP2A 1-20', S = 0.52 %, Q = 6.2 cfs → 18"

CP2B 1-20', S = 0.52 %, Q = 6.2 cfs → 18"

CP3A 2-20', S = 0.4 % + 0.53 %, Q = 6.4 [illegible] → 18" for both

CP3B 2-20', S = 0.4 % + 0.6 %, Q = 4.0 cfs → 18" for both

CP4 (center) 3-20', S = 0.48 %, Q = 5, 8 + 11 cfs → 1-18" + 2-24"

CP4 (corner) 2-20', S = 0.48 %, Q = 3 + 5.[illegible] → 18" for both

[illegible] 3-20', S = [illegible]34 %, Q = 5, 9 + 11.5 cfs → [illegible]-18" + 1-24"

CP6 [illegible]-20', S = 1.134 %, Q = 3 + 4.7 [illegible] → 18" for both

[illegible] 1-20', S = 0.4 %, Q = 3.[illegible] → 18"

[illegible]2 3-20', S = 1.12 [illegible], Q = [illegible], 2.8 + 3.9 → [illegible]8 for all 3

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Storm Drain Capacity Calculations

CP 1 - Bell Rd. Sta. 26+70, Combine flows from A+B

Water Surface Elevation in channel at drain outfall = 41.2

Gutter grade at catch basin = 42.29

Allowable Total Head = 42.29 - 41.2 = 1.09 ft

North side of Bell: Q = 7.6 cfs, D = 1.5', n = .013 (RCP)

$A = \pi \frac{D^2}{4} = 1.77 \text{ ft}^2$, $V = \frac{Q}{A} = \frac{7.6}{1.77} = 4.29 \text{ ft/s}$, $L = 25'$

$$H = \left(1.5 + \frac{185 n^2 L}{D^{4/3}}\right)\frac{V^2}{2g} = \left(1.5 + \frac{185(.013)^2 25}{1.5^{4/3}}\right)\frac{4.29^2}{2g} = 0.56'$$

South side of Bell: Q = 3.8 cfs, D = 1.5', L = 77'

$A = \pi \frac{1.5^2}{4} = 1.77 \text{ ft}^2$, $V = \frac{3.8}{1.77} = 2.15 \text{ ft/s}$

H = 0.21'

Total Head = 0.56 + 0.21 = 0.77'   OK

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Storm Drain Capacity Calculations (cont'd)

CP2A - Bell Rd. Sta. 34+70 North side, Q = 10.1 cfs

Slope of hydraulic grade in culvert = $\frac{4.8-3.65}{110}$ = 1.05%

Hydraulic grade at drain outfall = 42.5 - (15 x .0105) = 42.34

Gutter grade at low point of slotted drain = 43.60

Allowable Head = 43.60 - 0.5 - 42.34 = 0.76 ft

D = 1.5', A = 1.77 ft², V = 5.71 ft/s, L = 4', n = .013 (RCP)

H = .80 ft OK - since peak in storm drain will occur before peak in culvert occurs.

CP2B - Bell Rd. Sta. 34+70 South side, Q = 7.7 cfs

Hydraulic grade at drain outfall = 42.5 - (96 x .0105) = 41.49

Allowable Head = 43.60 - 0.5 - 41.49 = 1.61 ft

D = 1.5', V = 4.35 ft/s, L = 4' → H = 0.46 ft OK

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Storm Drain Capacity Calculations (Cont'd)

CP3 - Bell Rd. Sta. 44+00, Combine flows from A+B

Water surface elevation in channel at drain outfall = 45.46

Gutter grade at low point of slotted drain = 46.97

Allowable Total Head = 46.97 - 0.5 - 45.46 = 1.01 ft

South side of Bell: Q = 8.8 cfs, Use 1-2'Ø pipe (RCP)

n = .013, A = 3.14 ft², V = 2.8 ft/s, L = 102'

H = 0.34'

North side of Bell: Q = 23.5 cfs, Use 1-3'Ø pipes (RCP)

n = .013, A = 7.07 ft², V = 3.32 ft/s, L = 20'

H = 0.28'

Total H = 0.28 + 0.34 = 0.62 ft OK

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Storm Drain Capacity Calculations (Cont'd)

CP4 - Loop Rd. Sta 13+50, Combine flows from N+S

Water Surface Elevation in channel at drain outfall = 51.1

Gutter grade at low point of slotted drain = 53.05

Allowable Total Head = 53.05 - .5 - 51.1 = 1.45 ft.

South side of street: Q = 5.6 cfs, Use 1 - 1.5' Ø RCP

n = .013, A = 1.77 ft², V = 3.16 ft/s, L = 42 ft

H = 0.35'

North side of street: Q = 17 cfs, Use 1 - 2' Ø RCP

n = .013, A = 3.14 ft², V = 5.41 ft/s, L = 32 ft

H = 0.86'

Total H = 0.35 + 0.86 = 1.21 ft OK

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Storm Drain Capacity Calculations (cont'd)

CP5 - 84th Way Sta. 15+80 (east side)

Water surface elevation in channel at drain outfall = 52.0

Gutter grade at low point of slotted drain = 53.59

Allowable Head = 53.59 - 0.5 - 52.0 = 1.09 ft.

Q = 12.6 cfs, Use 1 - 2' Ø RCP, n = .013

A = 3.14 ft², V = 4.01 ft/s, L = 30 ft.

H = 0.47 ft. OK

CP6 - 84th Way Sta. 15+80 (west side)

Slope of hydraulic grade in culvert $\frac{4.0-3.1}{90}$ = 1.0%

Hydraulic grade at drain outfall = 50.44 - (.01 x 80) = 49.64

Gutter grade at low point of slotted drain = 53.59

Allowable Head = 53.59 - 0.5 - 49.64 = 3.45 ft

Q = 4.8 cfs, Use 1 - 1.5' Ø RCP, n = .013

A = 1.77 ft², V = 2.71 ft/s, L = 120 ft.

H = 0.42 ft. OK

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Storm Drain Capacity Calculations (cont'd)

CP7 - Loop Rd. Sta. 10+60 (north side)

Water surface elevation in channel at drain outfall = 50.94

Gutter grade at low point of slotted drain = 51.86

Allowable Total Head = 51.86 - 0.5 - 50.94 = 0.42 ft

Q = 4.3 cfs, Use 1-1.5' Ø RCP

n = .013, A = 1.77 ft², V = 2.43 ft/s, L = 29 ft

H = 0.19 ft OK

CP8 - 54th Way Sta. 11+70 (east side)

Slope of hydraulic grade in culvert $\frac{3.46 - 2.6}{110}$ = 0.78%

Hydraulic grade at drain outfall = 45.46 - (.0078 x 20) = 45.30

Gutter grade at low point of slotted drain = 48.19

Allowable Head = 48.19 - 0.5 - 45.30 = 2.39 ft

Q = 3.6 cfs, Use 1-1.5' Ø RCP, n = .013

A = 1.77 ft², V = 2.03 ft/s, L = 55 ft

H = 0.20 ft OK

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APPENDIX III

CHANNEL HYDRAULIC CALCULATIONS

AND

CULVERT HYDRAULIC CALCULATIONS

AND

DESILTATION BASIN CALCULATIONS

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS
CHANNEL P

DISCHARGE IS = 149 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .0048 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 24.17 FT
AREA IS = 32.51 SQ FT
WETTED PERIMETER IS = 24.67 FT
HYDRAULIC RADIUS IS = 1.32 FT
NORMAL DEPTH IS = 2.02 FT
VELOCITY IS = 4.58 FPS
FROUDE NUMBER IS = .7

Required Freeboard (h_f) for subcritical flow

$$h_f = 0.20\,d + \frac{V^2}{64.4}$$

$$= 0.20(2.02) + \frac{4.58^2}{64.4}$$

$$= .73'$$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS
CHANNEL P

DISCHARGE IS = 149 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .01 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 21.49 FT
AREA IS = 24.88 SQ FT
WETTED PERIMETER IS = 21.91 FT
HYDRAULIC RADIUS IS = 1.14 FT
NORMAL DEPTH IS = 1.69 FT
VELOCITY IS = 5.99 FPS
FROUDE NUMBER IS = .98

Subcritical

$h_f = .90'$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS
CHANNEL Q

DISCHARGE IS = 119 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .0134 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 19.19 FT
AREA IS = 19.02 SQ FT
WETTED PERIMETER IS = 19.53 FT
HYDRAULIC RADIUS IS = .97 FT
NORMAL DEPTH IS = 1.4 FT
VELOCITY IS = 6.26 FPS
FROUDE NUMBER IS = 1.11

For supercritical flow:

$$h_f = 0.25\,d$$

$$= 0.25(1.4)$$

$$= 0.35'$$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS

CHANNEL R

DISCHARGE IS = 325 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .004 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 32.43 FT
AREA IS = 61.72 SQ FT
WETTED PERIMETER IS = 33.18 FT
HYDRAULIC RADIUS IS = 1.86 FT
NORMAL DEPTH IS = 3.05 FT
VELOCITY IS = 5.27 FPS
FROUDE NUMBER IS = .67

Subcritical

$h_f = 1.0$ ft

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS

CHANNEL T

DISCHARGE IS = 167 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .004 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 25.86 FT
AREA IS = 37.78 SQ FT
WETTED PERIMETER IS = 26.41 FT
HYDRAULIC RADIUS IS = 1.43 FT
NORMAL DEPTH IS = 2.23 FT
VELOCITY IS = 4.42 FPS
FROUDE NUMBER IS = .64

Subcritical

$h_f = .75'$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS

CHANNEL T

DISCHARGE IS = 167 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .0087 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 22.78 FT
AREA IS = 28.43 SQ FT
WETTED PERIMETER IS = 23.24 FT
HYDRAULIC RADIUS IS = 1.22 FT
NORMAL DEPTH IS = 1.85 FT
VELOCITY IS = 5.87 FPS
FROUDE NUMBER IS = .93

Subcritical

$h_f = .91'$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS
CHANNEL U

DISCHARGE IS = 203 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .004 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 27.6 FT
AREA IS = 43.61 SQ FT
WETTED PERIMETER IS = 28.2 FT
HYDRAULIC RADIUS IS = 1.55 FT
NORMAL DEPTH IS = 2.45 FT
VELOCITY IS = 4.65 FPS
FROUDE NUMBER IS = .65

Subcritical

$h_f = .83'$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS
CHANNEL V

DISCHARGE IS = 1026 CFS
BOTTOM WIDTH IS = 16 FT
SLOPE IS = .0035 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 52.3 FT
AREA IS = 154.93 SQ FT
WETTED PERIMETER IS = 53.41 FT
HYDRAULIC RADIUS IS = 2.9 FT
NORMAL DEPTH IS = 4.54 FT
VELOCITY IS = 6.62 FPS
FROUDE NUMBER IS = .68

Subcritical

$h_f = 1.6'$

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS
CHANNEL W

DISCHARGE IS = 146 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .0025 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 26.74 FT
AREA IS = 40.68 SQ FT
WETTED PERIMETER IS = 27.32 FT
HYDRAULIC RADIUS IS = 1.49 FT
NORMAL DEPTH IS = 2.34 FT
VELOCITY IS = 3.59 FPS
FROUDE NUMBER IS = .51

Subcritical

$h_f = 0.67'$ Use 1 foot

ARIZONA DEPARTMENT OF TRANSPORTATION

CULVERT EXTENSION COMPUTATION RECORD

PROJECT: Perimeter Center　　　DESIGNER: J.D.

STATION: ______　　　DATE: 1-12-89

HYDROLOGIC AND CHANNEL INFORMATION

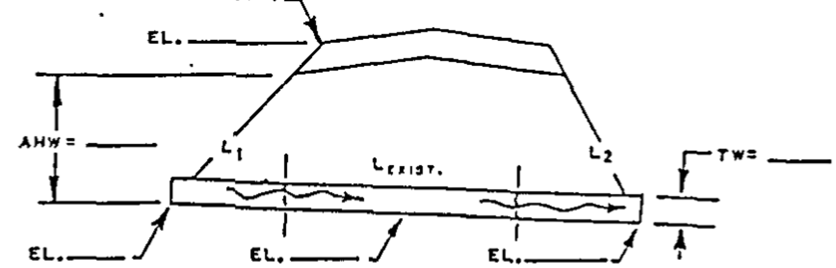
DRAINAGE AREA: ______

Q_1= ______　　TW_1= ______

Q_2= ______　　TW_2= ______

(Q_1 = DESIGN DISCHARGE, SAY Q_{25})
(Q_2 = CHECK DISCHARGE, SAY Q_{50})

SKETCH



S_{O1} = ______　　L_1 = ______

$S_{O\,EXIST.}$ = ______　　$L_{EXIST.}$ = ______

S_{O2} = ______　　L_2 = ______

$L/100\ S_O$ = ______

MEAN STREAM VELOCITY = ______

Culvert #	CULVERT DESCRIPTION: SIZE	CULVERT DESCRIPTION: ENTR. TYPE	Q	CAP. CHART HW	HEADWATER COMPUTATION: INLET CONT.: HW/D	INLET CONT.: HW	OUTLET CONTROL ($HW = H + h_o - LS_o$): K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROL HW	OUTLET VELOCITY	COST	DHW ELEV.	COMMENTS
1	QUAD CBC	10 X 4	1348	337 EA Q/B=33.7	1.38	5.5	110	1.7	3.3	3.65	3.0	3.65	0.55	4.8	5.5				Sta. 35+00 Bell Rd.
9	SINGLE CBC	10X4	268	Q/B=26.8	1.12	4.5	90	1.03	2.8	3.4	3.1	3.4	0.45	4.0	4.5				Sta. 14+60 84th Wy
12	SINGLE CBC	10X3	176	Q/B=17.6	1.13	3.4	110	0.8	2.2	2.6	2.45	3.1	0.44	3.46	3.46				Sta. 10+85 84th Way

SUMMARY AND RECOMMENDATIONS

CBC's have 45° wingwalls and rounded edges (K_e = 0.2)

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N. 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 1 OF 4
CALCULATED BY J.Q. DATE 1-16-89
CHECKED BY DATE
SCALE

De-Siltation Basin Calculations - Storage Volumes

Parcel G - West Basin

Spillway Elevation (S.E.) = 47.0, Available Storage (A.S.) = 3,878 yd^3

Onsite Drainage Area (DA) = 16.0 acres, C factor = 0.45

Volume of onsite water from a 100 yr. - 1 hr storm (V)

$$V = \left[\left(\frac{2.66 \text{ in/hr}}{12 \text{ in/ft}}\right)(16 \text{ acres})\left(\frac{43{,}560 \text{ ft}^2/\text{acre}}{27 \text{ ft}^3/\text{yd}^3}\right)\right]0.45 = 2{,}575 \text{ yd}^3 \text{ OK}$$

Parcel G - East Basin - S.E. = 49.0, A.S. = 1,400 yd^3

D.A. = 3.6 yd^3, V = 580 yd^3 OK

Parcel J - West Basin - S.E. = 62.5, A.S. = 2,028 yd^3

D.A. = 5.1 ac., V = 821 yd^3 OK

Parcel J - East Basin - S.E. 59.0, A.S. = 2,169 yd^3

D.A. = 8.2 ac., V = 1,320 yd^3 OK

Parcel K - West Basin - S.E. = 52.0, A.S. = 1,570 yd^3

D.A. = 2.1 ac., V = 338 yd^3 OK

Parcel K - East Basin - S.E. = 53.65, A.S. = 3233 yd^3

D.A. = 2.5 ac., V = 338 yd^3 OK

7-DR-2020
9/17/2020

De-Siltation Basin Calculations - Drainage Calcs

Drain inlets will be 12" Ø CMP - 1 foot riser with 10" O.C. and staggered small ($\frac{1}{2}$" to $1\frac{1}{2}$") diameter holes.

Drain pipe will be 8" diameter PVC, n = .012.

Parcel G - West Basin - Volume = 2,575 yd^3

Inlet capacity: Inlet elev. = 44.5, Spillway elev. = 47.0

$$\text{Ave. Head} = \frac{47.0 - 44.5}{2} = 1.25 \text{ ft.}, \quad \frac{H}{R} = \frac{1.25}{0.5} = 2.5$$

$Q = C 2\pi R H^{3/2}$, when $\frac{H}{R} > 2$, $C = 1$ (Design of Small Dams)

$$\text{Ave. } Q = 2\pi(0.5)(1.25)^{3/2} = 4.4 \text{ cfs}$$

Drain pipe capacity: Pipe slope $= \frac{42.83 - 39.16}{65} = 5.65\%$

$$A = \pi\frac{D^2}{4} = \pi\frac{\left(\frac{8}{12}\right)^2}{4} = 0.35 \text{ ft}^2, \quad P = 2\pi r = 2\pi\left(\frac{4}{12}\right) = 2.09 \text{ ft.}$$

$$R = \frac{A}{P} = \frac{.35}{2.09} = 0.17 \text{ ft.}$$

$$V = \frac{1.486}{n} R^{2/3} S^{1/2} = \frac{1.486}{.012}(0.17)^{2/3}(.0565)^{1/2} = 8.9 \text{ ft/s}$$

$$Q = VA = 8.9(0.35) = 3.1 \text{ ft}^3/s$$

Use minimum Q: 3.1 ft^3/s, Time required to drain:

$$T = \frac{2575 \text{ yd}^3}{3.1 \frac{ft^3}{s} \times \left(\frac{1 \text{ yd}}{3 \text{ ft}}\right)^3 \times \frac{3600 s}{1 \text{ hr}}} = 6.2 \text{ hrs.} \quad \underline{\text{OK}}$$

FORM 204-1

7-DR-2020
9/17/2020

Collar, Williams & White Engineering Consulting Engineers and Land Surveyors 2702 N 44TH ST, SUITE 100A PHOENIX, ARIZONA 85008 PHONE: (602) 957-3350 JOB NO.	JOB Perimeter Center Phase 1 SHEET NO. 3 OF 4 CALCULATED BY J.R. DATE 1-17-89 CHECKED BY DATE SCALE

De-Siltation Basin Calculations - Drainage Calcs (cont'd)

Parcel G - East Basin - Volume = 580 yd^3

Inlet capacity: Inlet elev. = 47.0, Spillway elev. = 49.0

Ave. Head (H) = $\frac{49.0 - 47.0}{2}$ = 1.0 ft., $\frac{H}{R}$ = 2

Ave. $Q = 2\pi(0.5)(1)^{3/2} = 3.14$ cfs

Drain pipe capacity: Pipe slope = $\frac{45.33 - 40.26}{60}$ = 8.45%

V = 10.9 fps, Q = 10.9(0.35) = 3.8 cfs

Minimum Q = 3.14 cfs → T = 1.4 hrs. OK

Parcel J - West Basin - Volume = 821 yd^3

Inlet capacity: Inlet elev. = 60.0, Spillway elev. = 62.5

Ave. H = 1.25 ft, $\frac{H}{R}$ = 2.5, Ave. Q = 4.4 cfs

Drain pipe capacity: Pipe slope = $\frac{58.33 - 54.07}{90}$ = 4.74%

V = 8.2 fps, Q = 2.9 cfs

Minimum Q = 2.9 cfs → T = 2.1 hrs. OK

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N. 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 4 OF 4
CALCULATED BY J.B. DATE 1-17-89
CHECKED BY DATE
SCALE

De-Siltation Basin Calculations - Drainage Calcs (cont'd)

Parcel J - East Basin - Volume = 1,320 yd^3

Inlet capacity: Inlet elev. = 56.0, Spillway elev. = 59.0

Ave. H = 1.5 ft, $\frac{H}{D}$ = 3.0, Ave. Q = 5.77 cfs

Drain pipe capacity: Pipe slope = $\frac{54.33-51.41}{65}$ = 4.5%

V = 8.0 fps, Q = 2.8 cfs → T = 3.5 hrs. OK

Parcel K - West Basin - Volume = 338 yd^3

Inlet capacity: Inlet elev. = 50.0, Spillway elev. = 52.0

Ave. H = 1 ft., $\frac{H}{D}$ = 2, Ave. Q = 3.14 cfs

Drain pipe capacity: Pipe slope = $\frac{48.33-43.92}{52}$ = 8.5%

V = 11 fps, Q = 3.85 cfs, Min Q = 3.14 cfs → T = 0.8 hrs. OK

Parcel K - East Basin - Volume = 3138 yd^3 (2-drains)

Inlet capacity: Inlet elev. = 52.0, Spillway elev. = 53.65

Ave. H = 0.83 ft., $\frac{H}{D}$ = 1.65, C = 1.3 → Ave. Q = 3.1 x 2 pipes = 6.2 cfs

Drain pipe capacities: Pipe slopes = $\frac{50.33-46.16}{53}$ = 7.9%, $\frac{50.33-49.54}{41}$ = 1.9%

V = 10.6 + 5.2 fps, Q = 3.7 + 1.8 cfs → Combined Q = 5.5 cfs

Minimum Q = 5.5 cfs → T = 4.3 hrs. OK

FORM 204-1

7-DR-2020
9/17/2020

APPENDIX D
PRINCESS MEDICAL CENTER DRAINGE REPORT

PRINCESS MEDICAL CENTER
SWC PRINCESS DRIVE & PIMA FREEWAY (LOOP 101)
SCOTTSDALE, ARIZONA

PRELIMINARY DRAINAGE REPORT

Prepared by:
CMX, L.L.C.
1515 E. Missouri, Suite 115
Phoenix, Arizona 85014
Phone: 602-279-8436

Registered Professional Engineer (Civil)
CERTIFICATE NO.
16980
RONALD W.
HILGART, JR.
Date Signed
ARIZONA, U.S.A.

May 20, 2002
Project No. 6730

7-DR-2020
9/17/2020

TABLE OF CONTENTS

I. PROJECT DESCRIPTION

Princess Medical Center is a proposed 7.5-acre project located on the southwest corner of Princess Drive and the Pima Freeway (Loop 101) in Scottsdale, Arizona. It is a parcel located within the SCOTTSDALE PERIMETER CENTER master planned area. The site is undeveloped and slopes approximately 10 feet from northeast to southwest. An existing drainage channel is located along the south property line.

Onsite improvements consist of three medical buildings, parking and landscape areas, water, fire and sewer services and drainage facilities.

Offsite improvements including paving, grading, storm drain, water and sewer were constructed with the Scottsdale Perimeter Center infrastructure. Two new driveway entrances will be constructed with this project.

II. OFFSITE DRAINAGE

The construction of the Pima Freeway and existing improvements in Princess Drive and Anderson Drive including a greenbelt drainage channel on the south side of the project will prevent offsite drainage from entering this project. The properties to the east and west drain away from this site and do not impact it. The existing drainage channel on the south side collects runoff from this site and carries it to the central retention facility located within the golf course.

Stormwater runoff from the Pima Freeway consists of the adjacent frontage road draining through an existing curb opening. A small grader ditch along a portion of the east property line of this site will collect frontage road stormwater and carry it to the southeast corner where it will be combined with additional drainage from the expressway.

III. ONSITE DRAINAGE

No stormwater retention is being provided with this project. 100-year, 2-hour retention for the SCOTTSDALE PERIMETER CENTER, including this site, has been provided within the T.P.C. Scottsdale Golf Course. See the master drainage report for Scottsdale Perimeter Center prepared by Collier, Williams and White (Rick Engineering) for details.

All stormwater for this project will drain to the south property line and be directed into the existing drainage channel along Anderson Drive. This channel drains to the west and into an existing retention basin within the golf course. See the preliminary grading and drainage plan in Appendix A for additional details.

IV. FLOOD PLAIN DESIGNATION

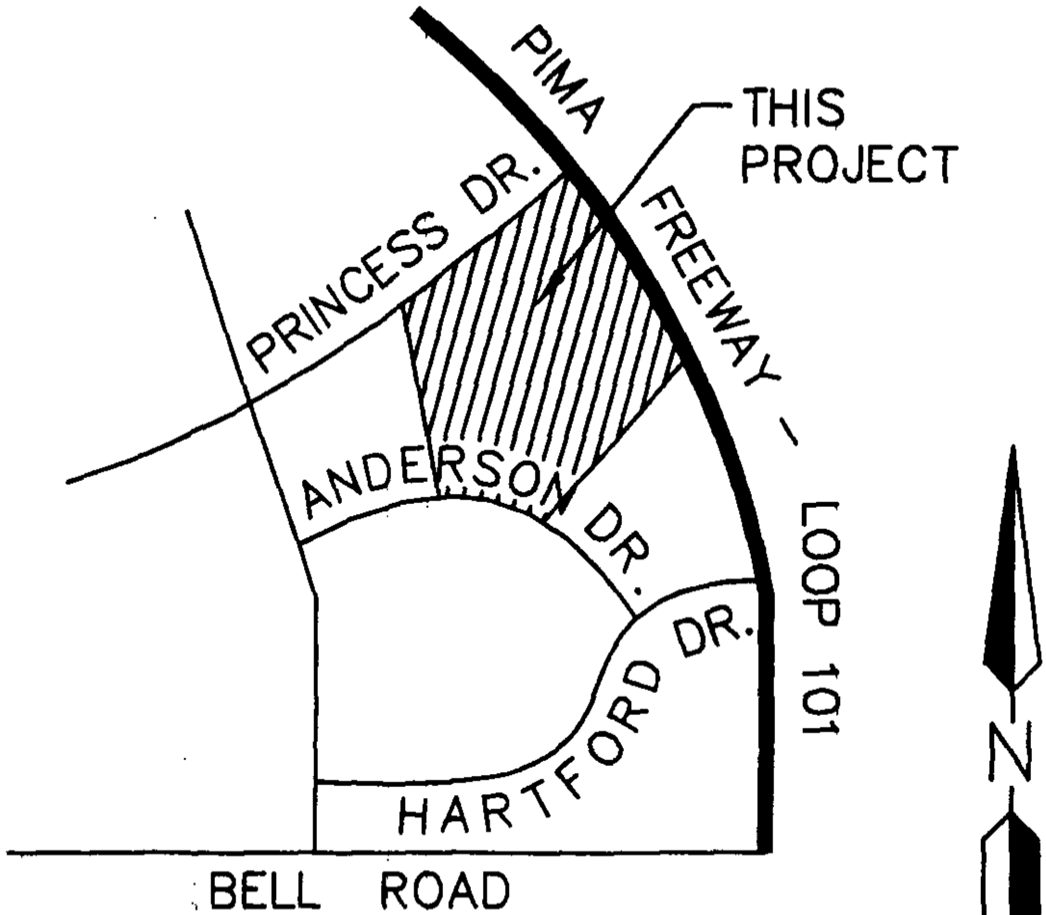
This site is located with a Zone AO flood plain according to the FEMA Flood insurance map (Panel 04013C1245F) dated September 30, 1995. Zone AO is defined by FEMA as having a flood depth of 1 foot and an average velocity of 3 cubic feet per second. To conform to FEMA and the City of Scottsdale Floodplain requirements, the finish floors have been elevated a minimum of 1 foot above the surrounding finish grade.

V. Conclusions

- Offsite drainage impacting this site will be limited to flows from the adjacent freeway frontage road. This will be carried in a grader ditch along the east property line and combined with other flows in the greenbelt channel along the south side of this project.

- Onsite drainage will flow into the greenbelt channel along the south side of this project. No onsite stormwater retention is being provided per the Master Drainage Report for the Scottsdale Perimeter Center.

- To meet the design criteria for a Zone AO flood plain designation, the building finish floor elevations (1580.00) have been set at a minimum of one foot above the highest adjacent grade (1579.00). The site outfall is at an elevation of 1575.00.



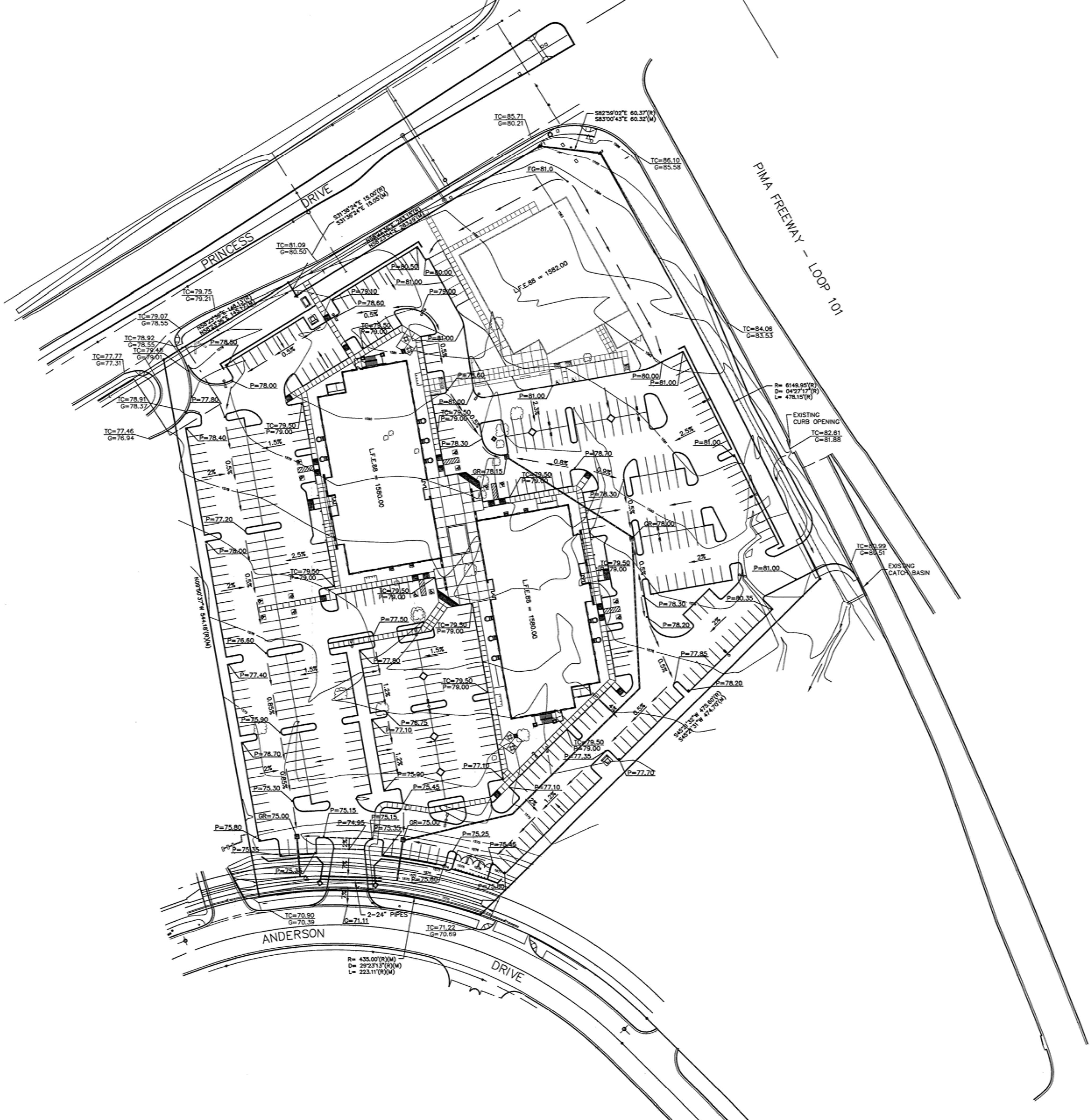
VICINITY MAP

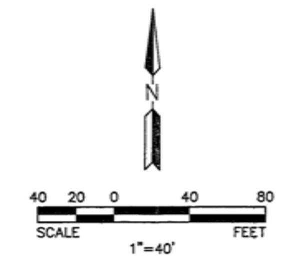
N.T.S.

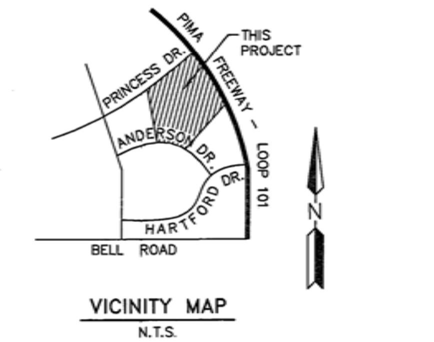
EXHIBIT A

APPENDIX A

PRELIMINARY GRADING & DRAINAGE PLAN







VICINITY MAP

N.T.S.

BENCH MARK:

CITY OF SCOTTSDALE ALUMINUM CAP IN HANDHOLE WEST OF HAYDEN IN GOLF COURSE, BELL ROAD ALIGNMENT. ELEVATION = 1542.865 (NAD 88 DATUM)

LEGEND:

1581	EXISTING CONTOUR
P=	FINISH PAVEMENT ELEVATION
TC=	FINISH TOP OF CURB ELEVATION
G=	FINISH GUTTER GRADE
GR=	TOP OF GRATE ELEVATION
FG=	FINISH GRADE ELEVATION
LFE88=	LOWEST FINISH FLOOR ELEVATION (NAD 88 DATUM)
2%	DIRECTION & SLOPE OF DRAINAGE
	STORM DRAIN PIPE
	CATCH BASIN

STORM WATER RETENTION:

100-YEAR, 2-HOUR STORMWATER RETENTION FOR THE SCOTTSDALE PERIMETER CENTER, INCLUDING THIS SITE, HAS BEEN PROVIDED WITHIN THE T.P.C. SCOTTSDALE GOLF COURSE. SEE THE MASTER DRAINAGE REPORT PREPARED BY COLLIER, WILLIAMS AND WHITE (RICK ENGINEERING) FOR DETAILS.

CMX GROUP INC.
1515 E. MISSOURI, SUITE 115
PHOENIX, ARIZONA 85014
PHONE: (602)279-8436

PROJECT ENGINEER: RONALD W. HILGART, JR.
AZ. REG. NO. 16980

PROJECT COORDINATION: GEORGE C. SWARSTAD

PRINCESS MEDICAL CENTER

SWC PRINCESS DRIVE & LOOP 101
SCOTTSDALE, ARIZONA

PRELIMINARY GRADING & DRAINAGE PLAN

CMX
1515 E. MISSOURI STE. 115
PHOENIX, AZ 85014
PHONE: (602) 279-8436
FAX: (602) 265-1191

CMX PROJ. 6730	DATE: 05-20-02
DESIGNED: G.S.	DRAWN: D.L.
REV.	

7-DR-2020
9/17/2020

APPENDIX E
REFERENCE INFORMATION

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.6458°, Longitude: -111.8938°
Elevation: 1581.56 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	0.197 (0.163-0.242)	0.257 (0.215-0.315)	0.347 (0.287-0.424)	0.416 (0.342-0.507)	0.509 (0.412-0.617)	0.579 (0.464-0.698)	0.652 (0.512-0.784)	0.724 (0.560-0.869)	0.822 (0.620-0.988)	0.896 (0.662-1.08)
10-min	0.300 (0.249-0.368)	0.391 (0.327-0.480)	0.528 (0.437-0.645)	0.633 (0.521-0.771)	0.773 (0.626-0.939)	0.881 (0.705-1.06)	0.992 (0.780-1.19)	1.10 (0.852-1.32)	1.25 (0.943-1.50)	1.37 (1.01-1.64)
15-min	0.371 (0.308-0.456)	0.485 (0.405-0.595)	0.655 (0.541-0.800)	0.785 (0.645-0.956)	0.959 (0.776-1.16)	1.09 (0.874-1.32)	1.23 (0.967-1.48)	1.37 (1.06-1.64)	1.55 (1.17-1.87)	1.69 (1.25-2.04)
30-min	0.500 (0.415-0.614)	0.653 (0.546-0.802)	0.881 (0.729-1.08)	1.06 (0.869-1.29)	1.29 (1.05-1.57)	1.47 (1.18-1.77)	1.66 (1.30-1.99)	1.84 (1.42-2.21)	2.09 (1.57-2.51)	2.28 (1.68-2.74)
60-min	0.619 (0.514-0.759)	0.809 (0.675-0.992)	1.09 (0.902-1.33)	1.31 (1.08-1.59)	1.60 (1.29-1.94)	1.82 (1.46-2.19)	2.05 (1.61-2.46)	2.28 (1.76-2.73)	2.59 (1.95-3.11)	2.82 (2.08-3.40)
2-hr	0.724 (0.609-0.868)	0.936 (0.790-1.13)	1.25 (1.05-1.49)	1.48 (1.23-1.77)	1.81 (1.48-2.15)	2.05 (1.66-2.43)	2.30 (1.84-2.72)	2.56 (2.01-3.01)	2.90 (2.22-3.42)	3.16 (2.37-3.74)
3-hr	0.799 (0.672-0.979)	1.02 (0.864-1.26)	1.34 (1.12-1.64)	1.59 (1.32-1.93)	1.93 (1.58-2.33)	2.21 (1.78-2.65)	2.49 (1.98-3.00)	2.80 (2.18-3.35)	3.20 (2.42-3.84)	3.53 (2.61-4.24)
6-hr	0.962 (0.826-1.14)	1.21 (1.04-1.45)	1.55 (1.32-1.83)	1.82 (1.53-2.14)	2.18 (1.82-2.56)	2.46 (2.02-2.88)	2.76 (2.23-3.21)	3.06 (2.43-3.58)	3.46 (2.68-4.05)	3.78 (2.86-4.43)
12-hr	1.09 (0.939-1.28)	1.37 (1.18-1.61)	1.73 (1.48-2.03)	2.01 (1.72-2.35)	2.39 (2.02-2.79)	2.68 (2.24-3.12)	2.99 (2.45-3.47)	3.29 (2.67-3.82)	3.70 (2.92-4.31)	4.01 (3.11-4.70)
24-hr	1.27 (1.12-1.47)	1.62 (1.42-1.87)	2.09 (1.83-2.42)	2.47 (2.15-2.85)	3.00 (2.59-3.45)	3.41 (2.93-3.92)	3.85 (3.27-4.43)	4.31 (3.61-4.95)	4.94 (4.08-5.69)	5.44 (4.43-6.29)
2-day	1.39 (1.21-1.60)	1.77 (1.55-2.04)	2.32 (2.02-2.67)	2.76 (2.39-3.17)	3.37 (2.90-3.87)	3.86 (3.29-4.43)	4.38 (3.70-5.03)	4.91 (4.11-5.67)	5.66 (4.66-6.55)	6.26 (5.08-7.28)
3-day	1.49 (1.31-1.71)	1.91 (1.68-2.19)	2.52 (2.20-2.88)	3.01 (2.63-3.44)	3.70 (3.21-4.23)	4.26 (3.67-4.87)	4.86 (4.14-5.56)	5.49 (4.63-6.30)	6.38 (5.30-7.34)	7.10 (5.82-8.22)
4-day	1.60 (1.41-1.83)	2.05 (1.81-2.34)	2.72 (2.39-3.09)	3.26 (2.86-3.71)	4.04 (3.52-4.59)	4.67 (4.04-5.31)	5.35 (4.59-6.09)	6.07 (5.15-6.94)	7.10 (5.94-8.14)	7.94 (6.56-9.15)
7-day	1.81 (1.59-2.08)	2.31 (2.03-2.65)	3.08 (2.70-3.52)	3.70 (3.23-4.22)	4.59 (3.97-5.23)	5.31 (4.57-6.06)	6.08 (5.19-6.95)	6.91 (5.84-7.93)	8.09 (6.74-9.32)	9.06 (7.44-10.5)
10-day	1.97 (1.73-2.25)	2.52 (2.22-2.88)	3.35 (2.94-3.81)	4.01 (3.51-4.57)	4.96 (4.31-5.63)	5.72 (4.94-6.50)	6.54 (5.60-7.45)	7.41 (6.28-8.46)	8.64 (7.22-9.90)	9.64 (7.95-11.1)
20-day	2.44 (2.16-2.78)	3.15 (2.78-3.58)	4.17 (3.67-4.73)	4.95 (4.34-5.61)	6.01 (5.25-6.81)	6.83 (5.94-7.75)	7.68 (6.64-8.74)	8.55 (7.34-9.76)	9.74 (8.26-11.2)	10.7 (8.96-12.3)
30-day	2.87 (2.53-3.26)	3.70 (3.26-4.20)	4.89 (4.31-5.54)	5.81 (5.10-6.57)	7.04 (6.15-7.97)	8.00 (6.96-9.05)	8.99 (7.77-10.2)	10.0 (8.59-11.3)	11.4 (9.67-12.9)	12.4 (10.5-14.2)
45-day	3.36 (2.98-3.81)	4.34 (3.84-4.91)	5.74 (5.08-6.49)	6.79 (5.98-7.67)	8.18 (7.18-9.25)	9.25 (8.08-10.5)	10.3 (8.97-11.7)	11.5 (9.87-13.0)	12.9 (11.0-14.8)	14.1 (11.9-16.2)
60-day	3.74 (3.32-4.23)	4.85 (4.30-5.47)	6.40 (5.66-7.21)	7.53 (6.65-8.49)	9.03 (7.94-10.2)	10.2 (8.88-11.5)	11.3 (9.83-12.8)	12.4 (10.8-14.1)	13.9 (12.0-15.9)	15.1 (12.8-17.3)

[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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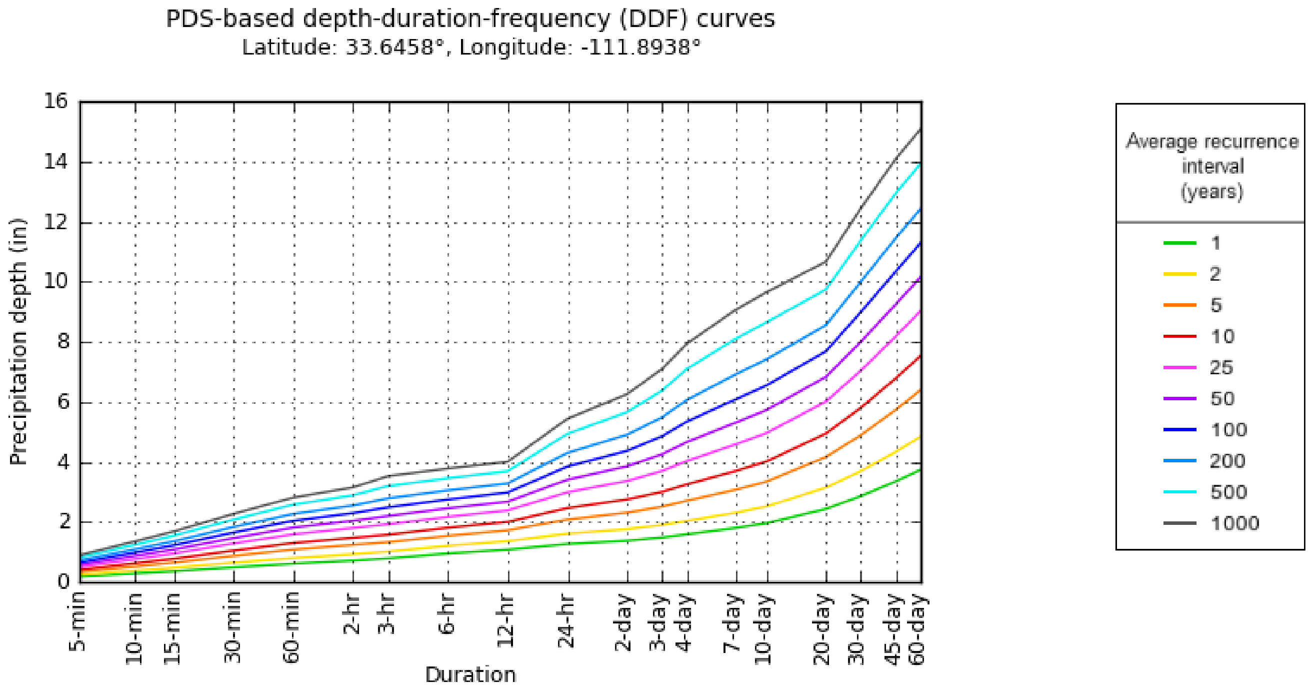
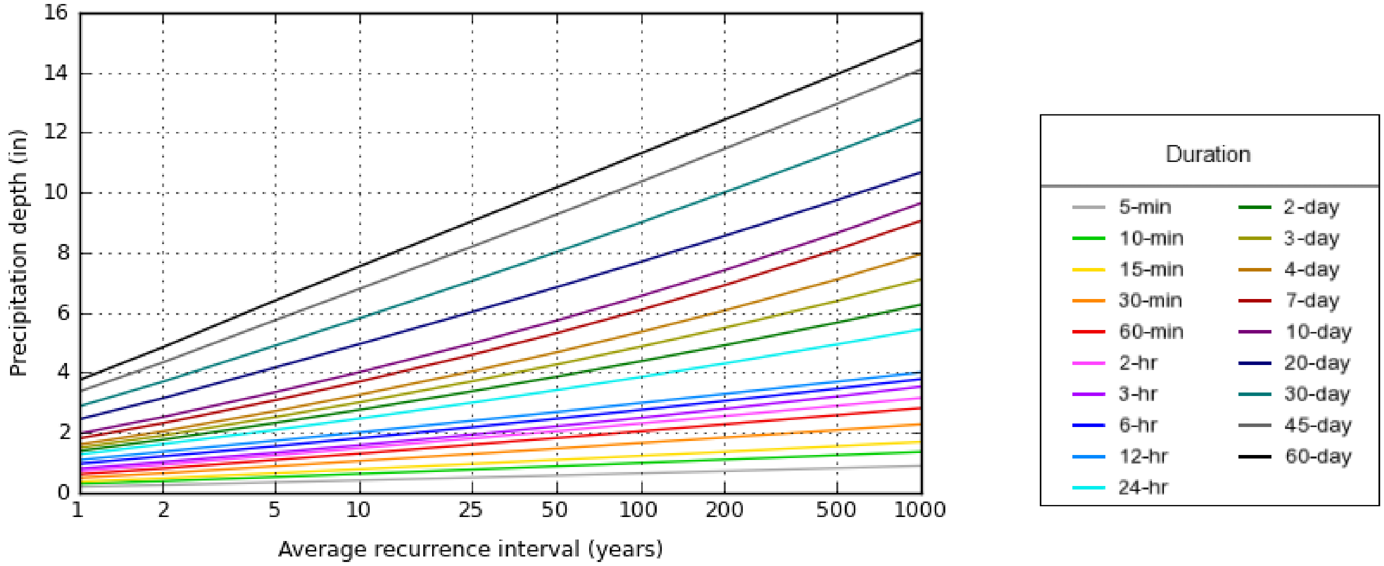
PF graphical

7-DR-2020
9/17/2020





NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Thu Apr 23 16:07:25 2020

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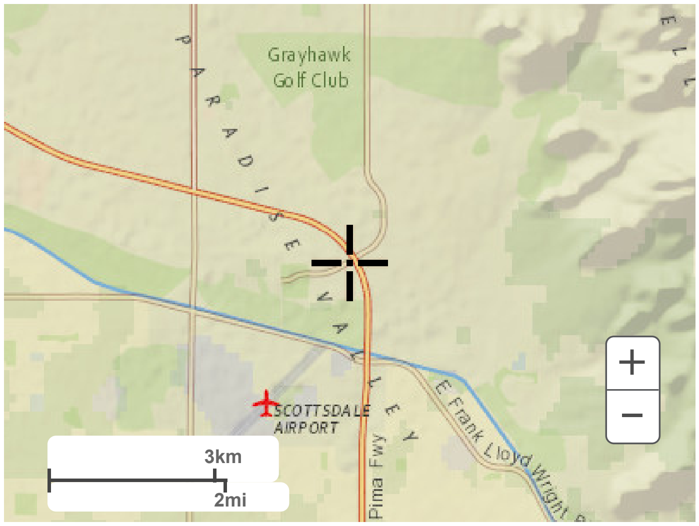
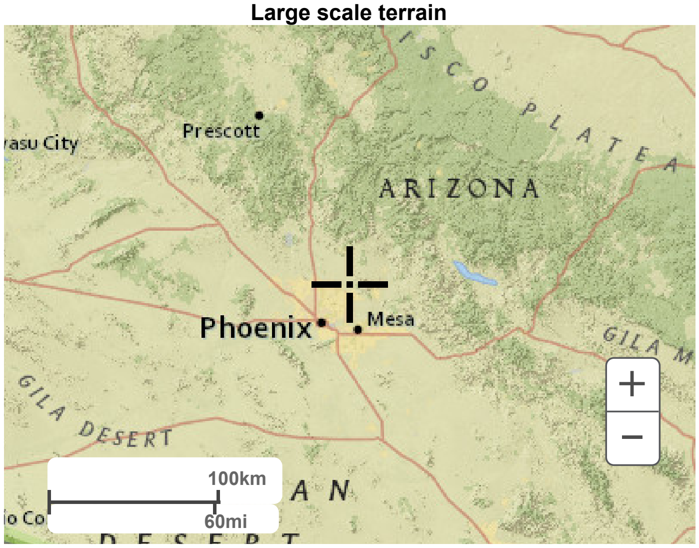
Maps & aerials

Small scale terrain

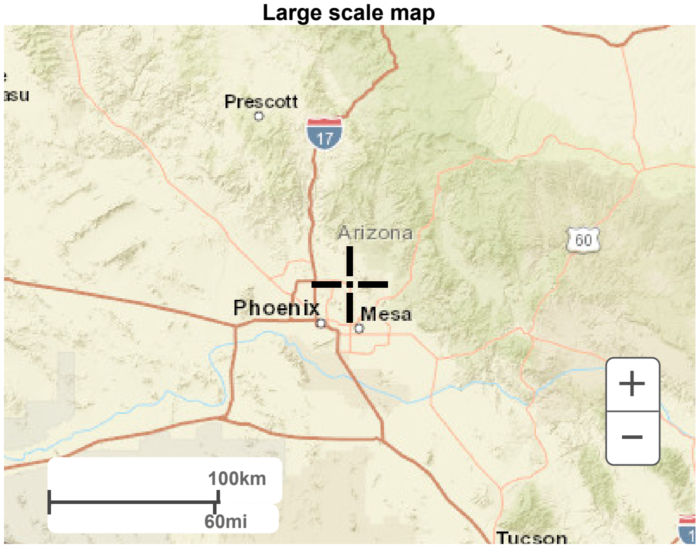
7-DR-2020
9/17/2020



Large scale terrain

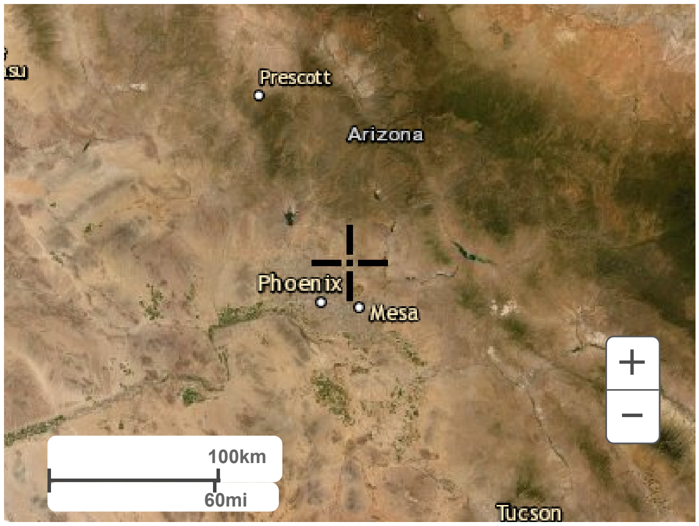


Large scale map



Large scale aerial

7-DR-2020
9/17/2020



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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

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.6458°, Longitude: -111.8938°
Elevation: 1581.56 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	**2.36** (1.96-2.90)	**3.08** (2.58-3.78)	**4.16** (3.44-5.09)	**4.99** (4.10-6.08)	**6.11** (4.94-7.40)	**6.95** (5.57-8.38)	**7.82** (6.14-9.41)	**8.69** (6.72-10.4)	**9.86** (7.44-11.9)	**10.8** (7.94-13.0)
10-min	**1.80** (1.49-2.21)	**2.35** (1.96-2.88)	**3.17** (2.62-3.87)	**3.80** (3.13-4.63)	**4.64** (3.76-5.63)	**5.29** (4.23-6.37)	**5.95** (4.68-7.16)	**6.61** (5.11-7.94)	**7.51** (5.66-9.02)	**8.19** (6.05-9.86)
15-min	**1.48** (1.23-1.82)	**1.94** (1.62-2.38)	**2.62** (2.16-3.20)	**3.14** (2.58-3.82)	**3.84** (3.10-4.66)	**4.37** (3.50-5.26)	**4.92** (3.87-5.92)	**5.46** (4.23-6.56)	**6.20** (4.68-7.46)	**6.77** (5.00-8.15)
30-min	**1.00** (0.830-1.23)	**1.31** (1.09-1.60)	**1.76** (1.46-2.15)	**2.11** (1.74-2.57)	**2.58** (2.09-3.13)	**2.94** (2.35-3.54)	**3.31** (2.60-3.98)	**3.68** (2.85-4.42)	**4.18** (3.15-5.02)	**4.56** (3.36-5.49)
60-min	**0.619** (0.514-0.759)	**0.809** (0.675-0.992)	**1.09** (0.902-1.33)	**1.31** (1.08-1.59)	**1.60** (1.29-1.94)	**1.82** (1.46-2.19)	**2.05** (1.61-2.46)	**2.28** (1.76-2.73)	**2.59** (1.95-3.11)	**2.82** (2.08-3.40)
2-hr	**0.362** (0.304-0.434)	**0.468** (0.395-0.562)	**0.623** (0.522-0.744)	**0.742** (0.615-0.885)	**0.904** (0.742-1.07)	**1.02** (0.831-1.21)	**1.15** (0.918-1.36)	**1.28** (1.00-1.51)	**1.45** (1.11-1.71)	**1.58** (1.19-1.87)
3-hr	**0.266** (0.224-0.326)	**0.341** (0.288-0.419)	**0.445** (0.374-0.545)	**0.528** (0.438-0.642)	**0.643** (0.526-0.777)	**0.735** (0.594-0.884)	**0.830** (0.658-0.998)	**0.931** (0.725-1.11)	**1.07** (0.807-1.28)	**1.18** (0.869-1.41)
6-hr	**0.161** (0.138-0.191)	**0.203** (0.174-0.241)	**0.259** (0.221-0.306)	**0.303** (0.256-0.357)	**0.364** (0.304-0.427)	**0.411** (0.338-0.481)	**0.460** (0.373-0.537)	**0.511** (0.406-0.597)	**0.578** (0.448-0.676)	**0.632** (0.478-0.739)
12-hr	**0.090** (0.078-0.106)	**0.114** (0.098-0.134)	**0.144** (0.123-0.168)	**0.167** (0.142-0.195)	**0.199** (0.167-0.232)	**0.223** (0.186-0.259)	**0.248** (0.203-0.288)	**0.273** (0.221-0.317)	**0.307** (0.242-0.358)	**0.333** (0.258-0.390)
24-hr	**0.053** (0.047-0.061)	**0.067** (0.059-0.078)	**0.087** (0.076-0.101)	**0.103** (0.090-0.119)	**0.125** (0.108-0.144)	**0.142** (0.122-0.163)	**0.160** (0.136-0.184)	**0.179** (0.151-0.206)	**0.206** (0.170-0.237)	**0.227** (0.185-0.262)
2-day	**0.029** (0.025-0.033)	**0.037** (0.032-0.043)	**0.048** (0.042-0.056)	**0.057** (0.050-0.066)	**0.070** (0.060-0.081)	**0.080** (0.069-0.092)	**0.091** (0.077-0.105)	**0.102** (0.086-0.118)	**0.118** (0.097-0.136)	**0.130** (0.106-0.152)
3-day	**0.021** (0.018-0.024)	**0.027** (0.023-0.030)	**0.035** (0.031-0.040)	**0.042** (0.036-0.048)	**0.051** (0.045-0.059)	**0.059** (0.051-0.068)	**0.068** (0.058-0.077)	**0.076** (0.064-0.088)	**0.089** (0.074-0.102)	**0.099** (0.081-0.114)
4-day	**0.017** (0.015-0.019)	**0.021** (0.019-0.024)	**0.028** (0.025-0.032)	**0.034** (0.030-0.039)	**0.042** (0.037-0.048)	**0.049** (0.042-0.055)	**0.056** (0.048-0.063)	**0.063** (0.054-0.072)	**0.074** (0.062-0.085)	**0.083** (0.068-0.095)
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** (0.024-0.031)	**0.032** (0.027-0.036)	**0.036** (0.031-0.041)	**0.041** (0.035-0.047)	**0.048** (0.040-0.055)	**0.054** (0.044-0.062)
10-day	**0.008** (0.007-0.009)	**0.011** (0.009-0.012)	**0.014** (0.012-0.016)	**0.017** (0.015-0.019)	**0.021** (0.018-0.023)	**0.024** (0.021-0.027)	**0.027** (0.023-0.031)	**0.031** (0.026-0.035)	**0.036** (0.030-0.041)	**0.040** (0.033-0.046)
20-day	**0.005** (0.004-0.006)	**0.007** (0.006-0.007)	**0.009** (0.008-0.010)	**0.010** (0.009-0.012)	**0.013** (0.011-0.014)	**0.014** (0.012-0.016)	**0.016** (0.014-0.018)	**0.018** (0.015-0.020)	**0.020** (0.017-0.023)	**0.022** (0.019-0.026)
30-day	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.010** (0.009-0.011)	**0.011** (0.010-0.013)	**0.012** (0.011-0.014)	**0.014** (0.012-0.016)	**0.016** (0.013-0.018)	**0.017** (0.015-0.020)
45-day	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.006** (0.006-0.007)	**0.008** (0.007-0.009)	**0.009** (0.007-0.010)	**0.010** (0.008-0.011)	**0.011** (0.009-0.012)	**0.012** (0.010-0.014)	**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** (0.006-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.009** (0.007-0.010)	**0.010** (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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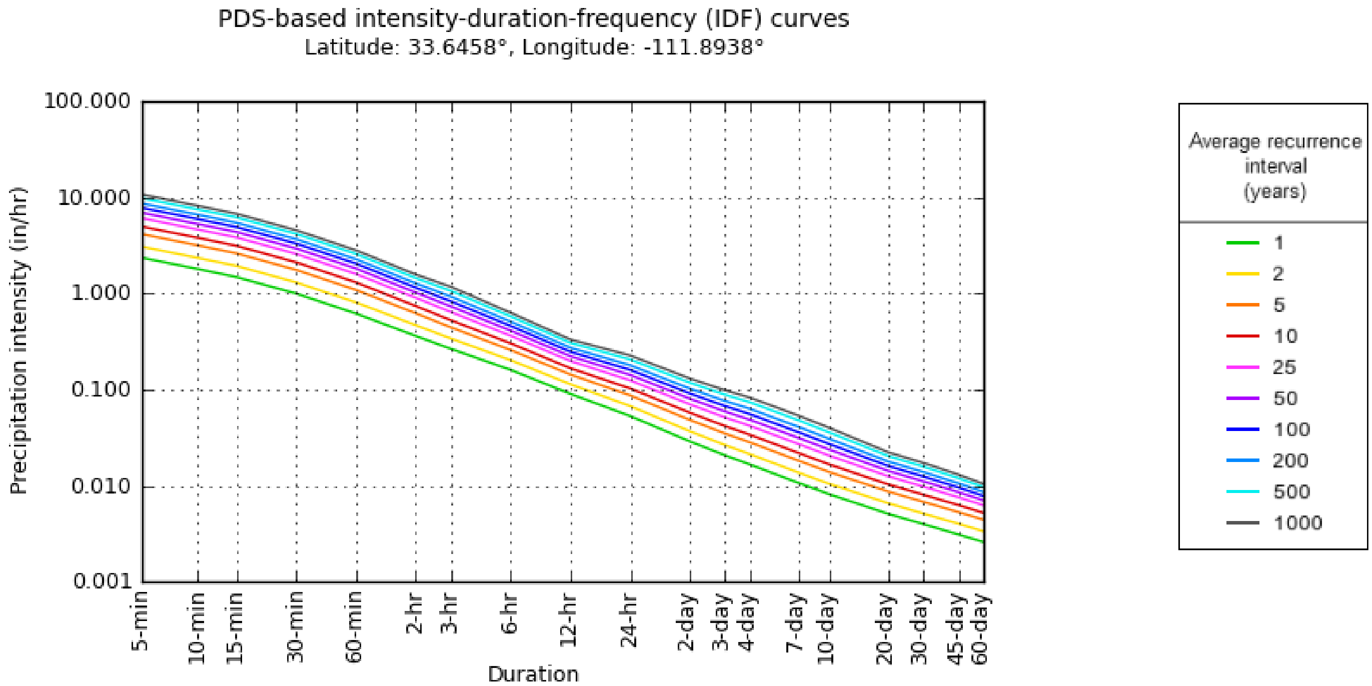
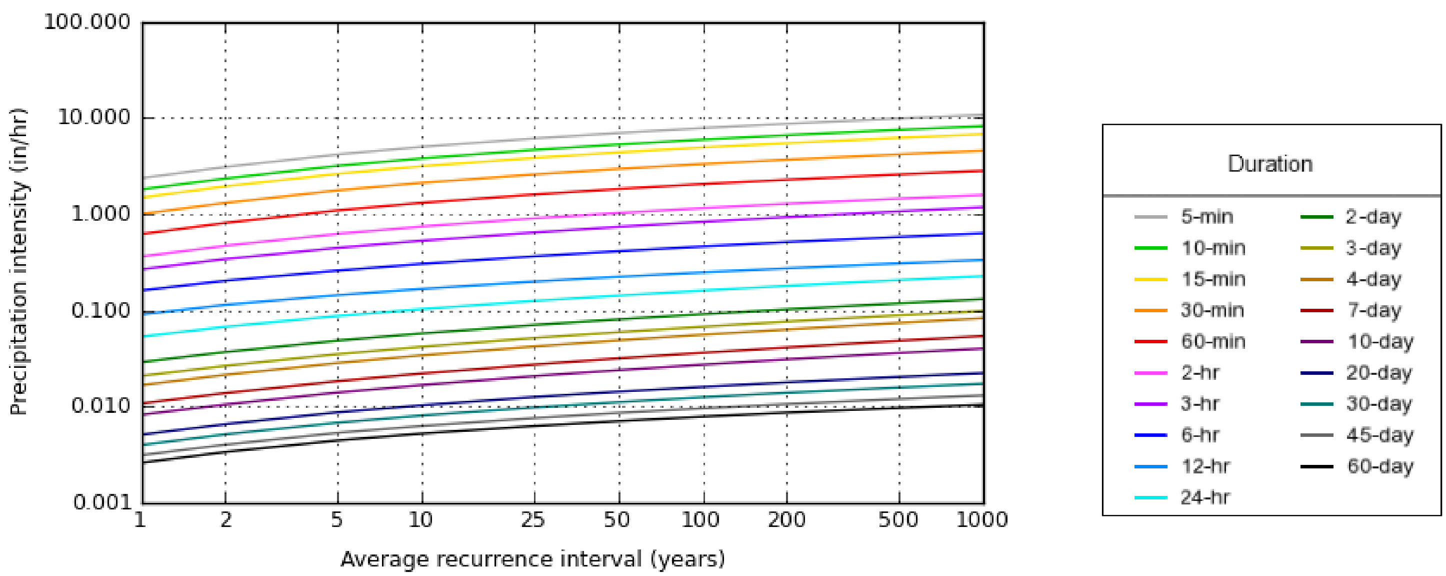
PF graphical

7-DR-2020
9/17/2020





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Maps & aerials

Small scale terrain

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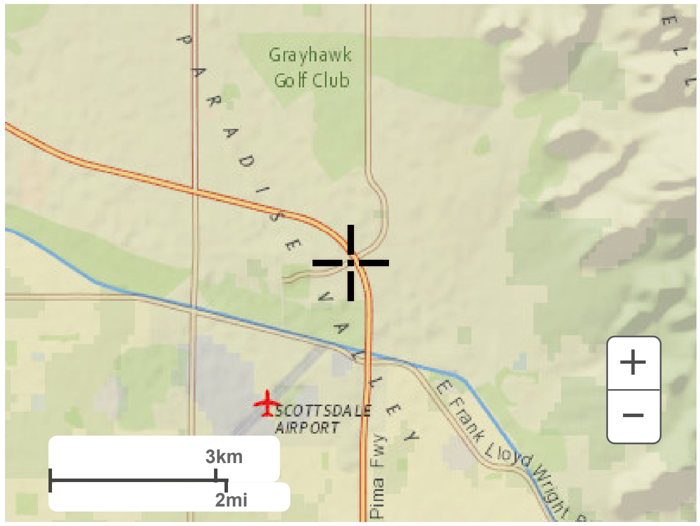
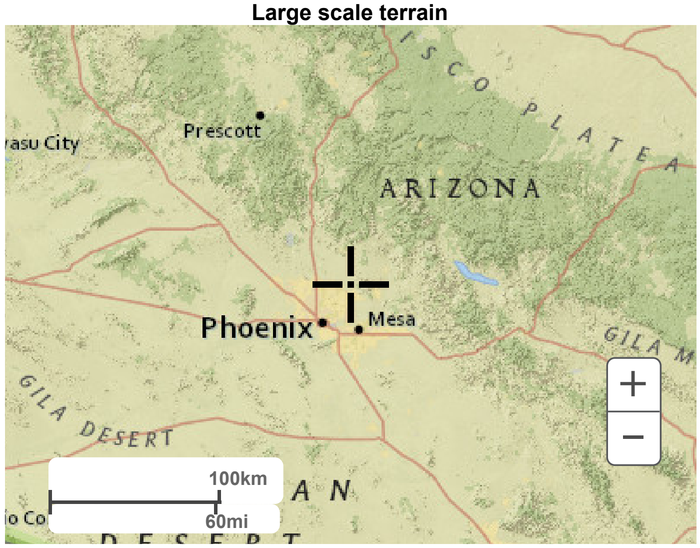
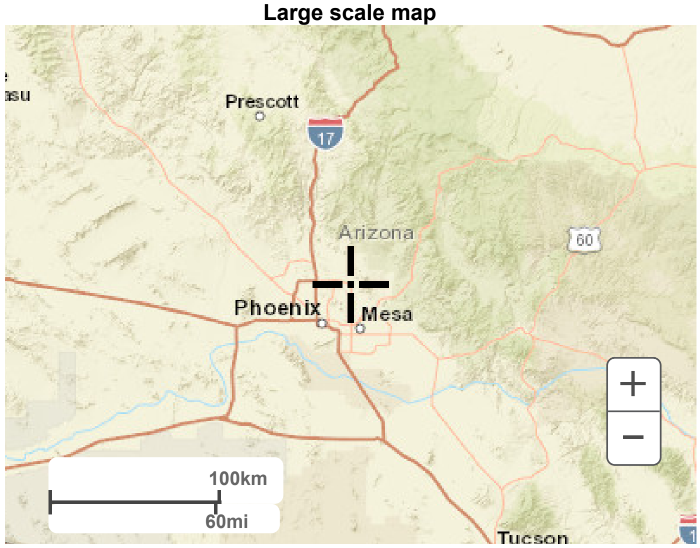


Large scale terrain

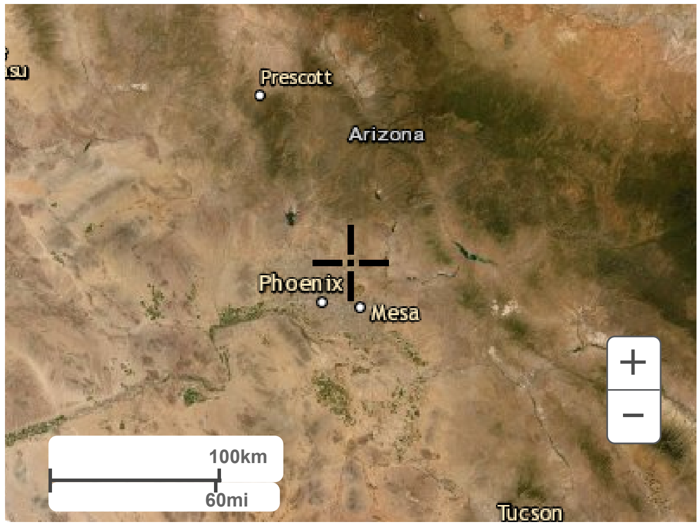


Large scale map



Large scale aerial

7-DR-2020
9/17/2020



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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

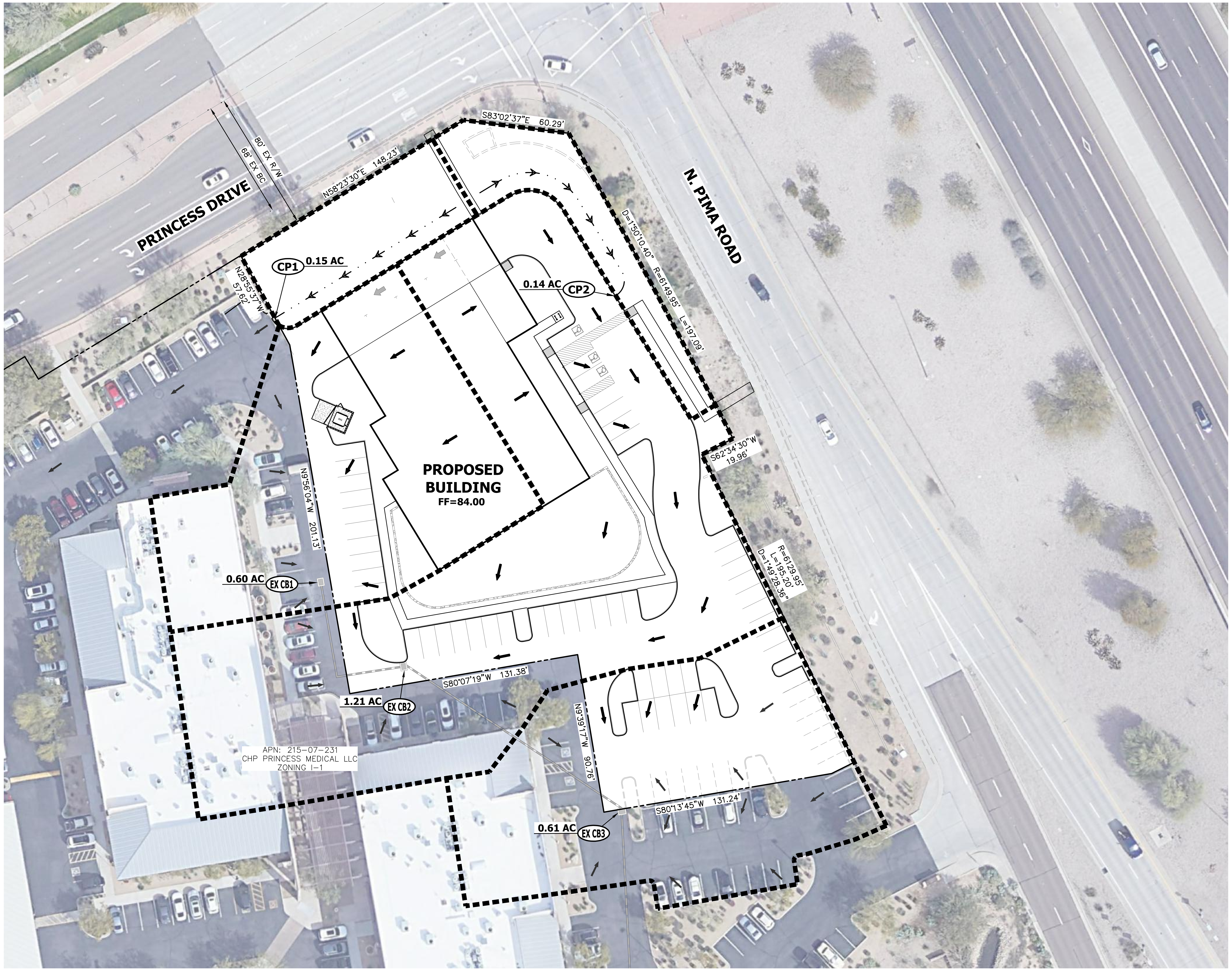
Disclaimer

7-DR-2020
9/17/2020

BACK POCKET

DRAINAGE EXHIBIT 'A'
FOR
PLATINUM STORAGE
8585 E. PRINCESS DRIVE
SCOTTSDALE, ARIZONA 85255

PARCEL 1 AS SHOWN ON THE LAND DIVISION PLAT "PRINCESS MEDICAL CENTER", IN SOUTHEAST QUARTER OF SECTION 36, TOWNSHIP 4 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.



VICINITY MAP

LEGEND

	EXISTING STORM LINE
	PROPOSED FLOW ARROW
	DRAINAGE AREA BOUNDARY
CB 0.00 AC	CATCH BASIN AREA
CP 0.00 AC	CATCH POINT AREA

0' 30' 60'
1" = 30'

NO.	DATE	REVISION	BY

PURPOSE: PRELIM SITE PLAN

DESIGN BY: GDH
DRAWN BY: GDH
CHECKED BY: GDH

HUNTER ENGINEERING CIVIL AND SURVEY
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986

PRELIMINARY PLANS – NOT FOR CONSTRUCTION

DRAINAGE EXHIBIT 'A' FOR PLATINUM STORAGE SWC PIMA AND PRINCESS SCOTTSDALE, ARIZONA

CONTACT ARIZONA 811 AT LEAST 2 FULL WORKING DAYS BEFORE YOU BEGIN EXCAVATION
ARIZONA811
CALL 811 OR CLICK ARIZONA811.COM

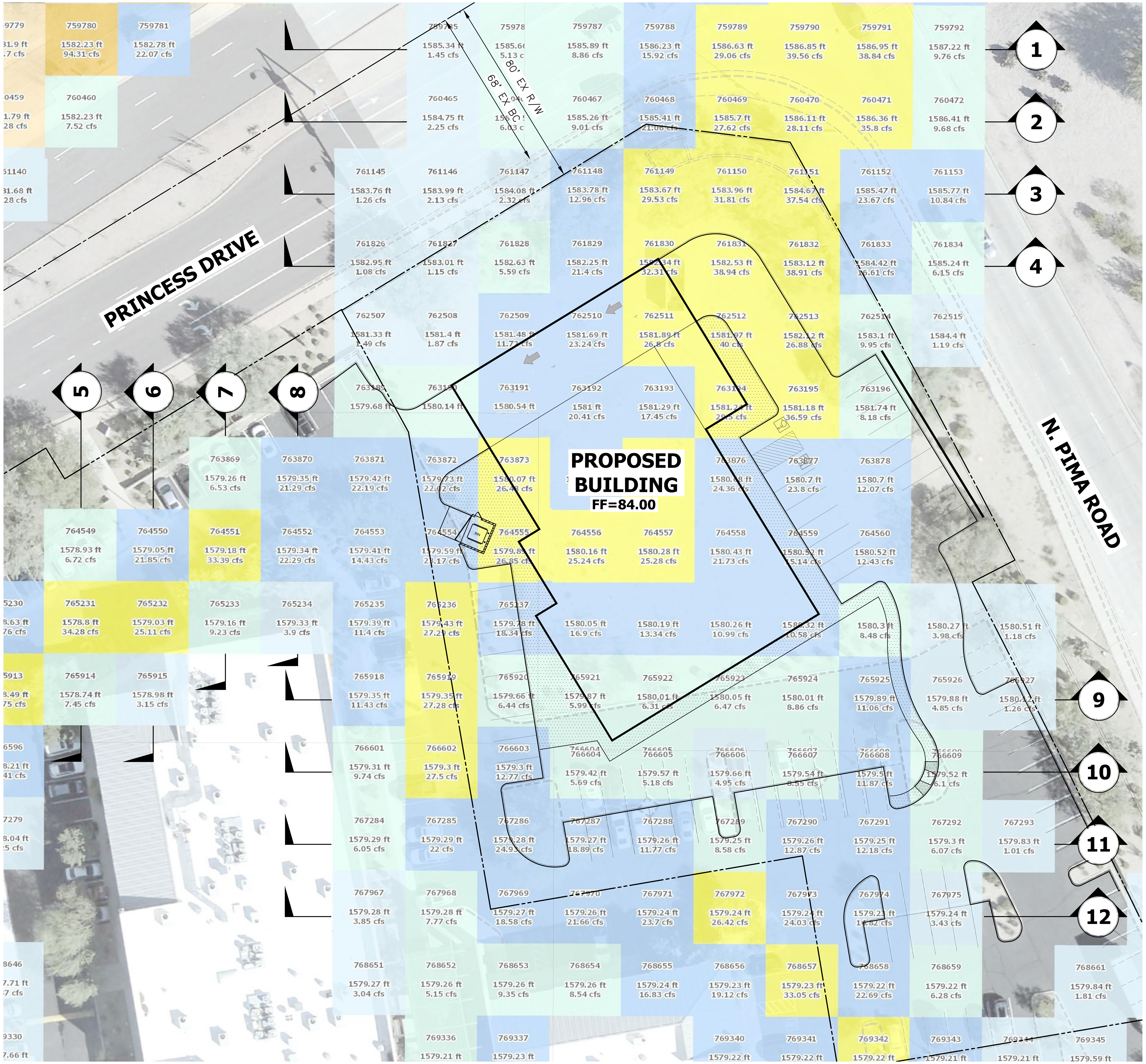
THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

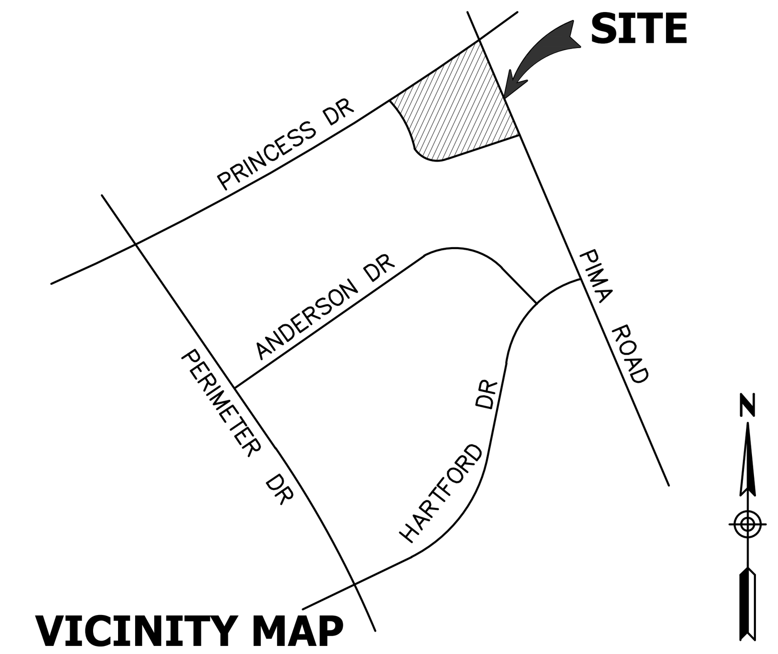
HE JOB NO.: PLAT003

SCALE 1" = 30'

SHEET EX 'A'

7-DR-2020
9/17/2020





VICINITY MAP

FLO-2D - FLOW COMING FROM NORTH OF SITE

CROSS SECTION	CFS	AVERAGE WATER SURFACE ELEVATION
1	148.58	1586.34
2	139.56	1585.63
3	152.06	1584.37
4	162.14	1583.17
AVG	150.59	1584.88

FLO-2D - FLOW NORTH OF EXISTING BUILDING

CROSS SECTION	CFS	AVERAGE WATER SURFACE ELEVATION
5	48.45	1578.82
6	50.11	1579.02
7	49.15	1579.20
8	47.48	1579.34
AVG	48.80	1579.10

FLO-2D - FLOW EAST OF EXISTING BUILDING

CROSS SECTION	CFS	AVERAGE WATER SURFACE ELEVATION
9	89.95	1579.82
10	92.35	1579.46
11	124.35	1579.33
12	144.26	1579.25
AVG	112.73	1579.46

0' 20' 40'
1" = 20'

NO.	DATE	REVISION	BY

PURPOSE:
PRELIMINARY REVIEW

DESIGN BY: GDH
DRAWN BY: GDH
CHECKED BY: GDH

HUNTER
ENGINEERING
CIVIL AND SURVEY
10450 NORTH 74TH STREET,
SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986

FLO-2D SECTIONS FOR PLATINUM STORAGE SWC PIMA AND PRINCESS SCOTTSDALE, ARIZONA

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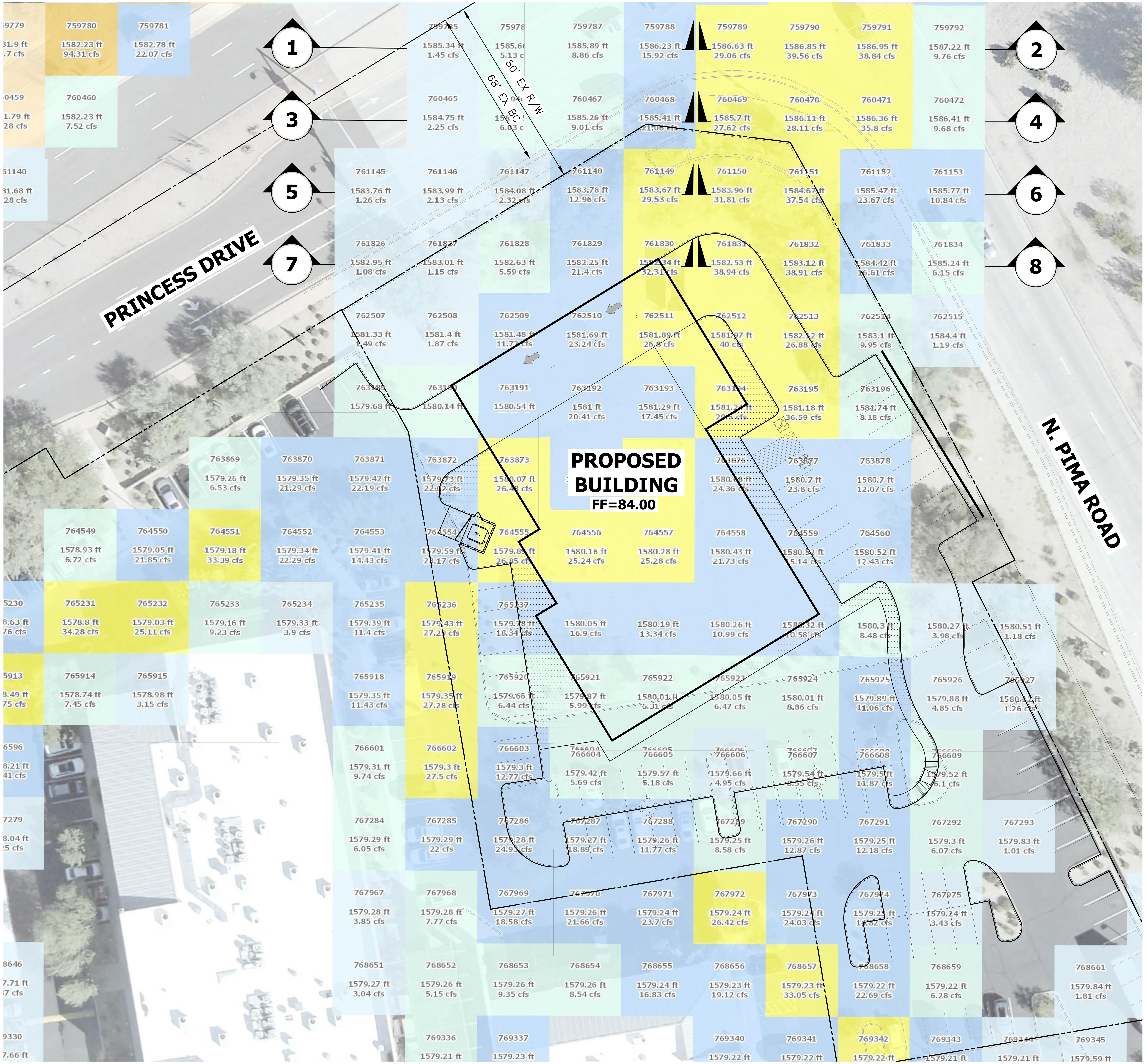
HE JOB NO.:
PLAT003

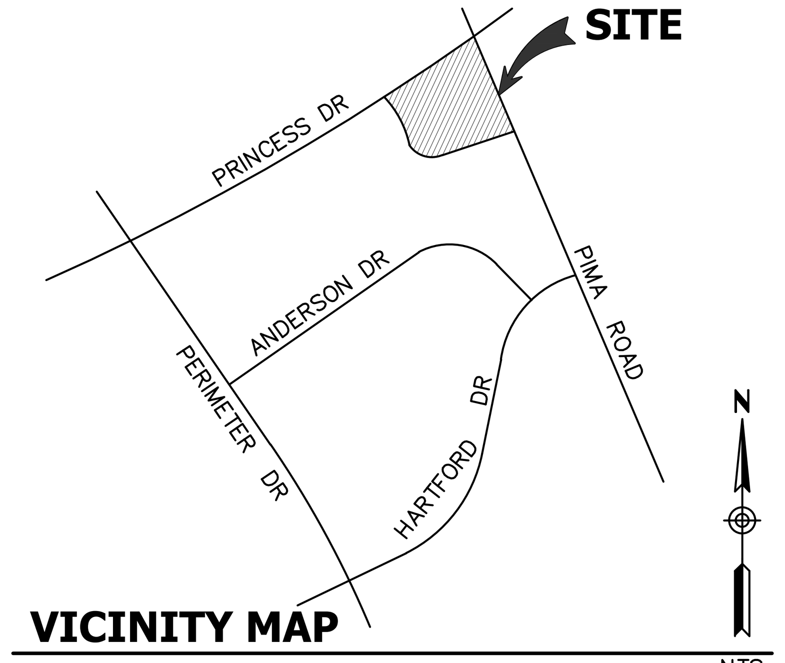
SCALE
1" = 20'

SHEET
1

1 OF 1

7-DR-2020
9/17/2020





VICINITY MAP

NTS

FLO-2D - FLOW COMING FROM NORTH OF SITE

CROSS SECTION	CFS	PROPORTIONAL FLOW PERCENT
1	31.36	21%
2	117.22	79%
SUBTOTAL	148.58	100%
3	38.35	27%
4	101.21	73%
SUBTOTAL	139.56	100%
5	48.20	32%
6	103.86	68%
SUBTOTAL	152.06	100%
7	61.53	38%
8	100.61	62%
SUBTOTAL	162.14	100%
AVERAGE	150.59	

NOTE: AVERAGE FLO–2D FLOW IS 150.59 CFS COMING AT THE BUILDING FROM THE NORTH. GIVEN THE LOCATION OF THE NEC OF THE BUILDING, APPROXIMATELY:

- 30% OF THE FLOW HEADS WEST AROUND THE BUILDING ≈ 45 CFS
- 70% OF THE FLOW HEADS EAST AROUND THE BUILDING ≈ 105 CFS

0' 20' 40'
1" = 20'

NO.	DATE	REVISION	BY

PURPOSE: PRELIMINARY REVIEW

DESIGN BY: GDH
DRAWN BY: GDH
CHECKED BY: GDH

HUNTER ENGINEERING
CIVIL AND SURVEY
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986

FLO-2D PROPORTIONAL SECTIONS FOR PLATINUM STORAGE SWC PIMA AND PRINCESS SCOTTSDALE, ARIZONA

THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

HE JOB NO.: PLAT003

SCALE 1" = 20'

SHEET 1

HUNTER
ENGINEERING

CIVIL AND SURVEY

Preliminary Drainage Report
For
Platinum Storage
8585 E. Princess Drive
Scottsdale, Arizona

Registered Professional Engineer (Civil)
CERTIFICATE NO.
63946
GRANT D.
HIRNEISE
Date Signed 5/11/20
ARIZONA U.S.A.

May 2020

Prepared by:
Hunter Engineering, Inc.
10450 North 74th Street, #200
Scottsdale, AZ 85258

7-DR-2020
5/29/2020

Preliminary Drainage Report
For
Platinum Storage
8585 E. Princess Drive
Scottsdale, Arizona

Prepared For:

Platinum Construction
1450 TL Townsend Drive, #100
Rockwall, TX 75032

Prepared By:

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H.E. Project No. PLAT003

HUNTER
ENGINEERING

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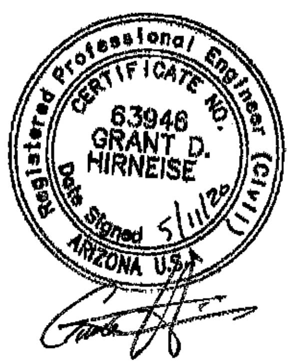


1.0 INTRODUCTION

This Preliminary Drainage Report has been prepared under a contract from Platinum Construction, Owner/Developer of the Platinum Storage site. The purpose of this report is to provide a drainage analysis, required by the City of Scottsdale, to support this development. Preparations of this report has been done in accordance with the procedures detailed in the City of Scottsdale *Design Standards and Policies Manual* (Reference 1).

This development is located at the southwest corner of E. Princess Drive and N. Pima Road. The site is specifically located in the Southeast Quarter of Section 36, Township 4 North, Range 4 East of The Gila and Salt River Base and Meridian, Maricopa County, Arizona. Figure 1 in Appendix A illustrates the location of the project site in relation to the City of Scottsdale street system.

On-site improvements include a new storage building with associated parking, utilities, drainage facilities and landscaped areas. The proposed site is bound by Princess Drive to the north, N. Pima Road to the east, and the Princess Medical Center facilities to the south and west. Access to the site will be provided by existing driveways located on E. Princess Drive and N. Pima Road.

2.0 EXISTING DRAINAGE CONDITIONS

In its current condition, the subject lot lies within a partially developed parcel within The Princess Medical Center. The existing terrain includes natural vegetation such as shrubs and short grass. The project site drains primarily from the northeast to the southwest at an average slope of 2%. See the Conceptual Grading and Drainage Plan located in the back pocket of this report for reference.

2.1 FEMA FLOOD CLASSIFICATION

The current FEMA Flood Insurance Rate Map (FIRM) for this area, map number 04013C1320L (Revision date October 16, 2013), shows the entire project is in shaded flood Zone AO. Shaded Zone AO is defined as, "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." The Flood depth specified by FEMA for this area is 1 foot with velocities of 3 fps. A copy of the current FIRM Panel is provided in Figure 2, Appendix A.

2.2 ONSITE DRAINAGE CONDITIONS

The Princess Medical Center has existing drainage infrastructure which includes catch basins, storm drain pipe, drainage channels and regional retention. The stormwater runoff is collected from landscape and pavement areas via sheet flow and directed to existing catch basins and storm drain piping, outletting into the existing drainage channel located adjacent to Anderson Drive to the south of the project. The existing drainage channel ultimately outlets within the T.P.C. Scottsdale Golf Course to the southwest of the site. Retention volume for the existing Princess Medical Center development is all provided within the T.P.C. Scottsdale Golf Course.

2.3 OFFSITE DRAINAGE CONDITIONS

This project falls within the Pinnacle Peak South Area Drainage Master Study. The scope of the study includes the use of two separate hydrologic methods to evaluate the entire project area. A HEC-1 evaluation/analysis was performed on the eastern portion of the watershed, covering an area of approximately 18 square miles. The HEC-1 model was divided into to two models covering the south and north portions of the McDowell Mountains and the Reata Pass Wash watershed. A FL0-2D evaluation/analysis was performed on the western portion of the watershed, considered to be much more distributary in nature and requiring more detail. This analysis covers the area from the base of the McDowell Mountains (Thompson Peak Parkway) to Scottsdale Road from Jomax Road to the Reach 11 Dikes. The Average flow across the site is 159.18 cfs. This was found by drawing orthogonal cross sections across the FLO-2D model and adding up the cells to estimate the flows. Cross Sections and a Summary Table of results are included in back pocket of this report.

3.0 PROPOSED DRAINAGE CONCEPT

The proposed drainage concept is presented in three parts: on-site drainage conveyance, off-site drainage conveyance, and storm water retention. These three sections make up sections 3.1, 3.2 and 3.3 respectively.

3.1 ON-SITE DRAINAGE CONVEYANCE

Pursuant to the Princess Medical Center Drainage Report, Section III (Appendix D), the on-site storm water runoff for this project will be conveyed via overland flow into existing catch basins, outletting into an existing drainage channel along Anderson Drive to the south of the project site. See the Conceptual Grading and Drainage Plan located in the back pocket of this report for more information.

3.2 OFF-SITE DRAINAGE CONVEYANCE

Off-site flows that enter the site from the northeast will be diverted around the building by a proposed concrete channel that conveys the flow from the northeast corner of the site onto the existing parking lot of the Princess Medical Center. This proposed concrete channel simply facilitates the off-site flows around the building and releases the flows in a similar fashion as the current condition. Channel calculations are located in Appendix B of this report.

3.3 STORM WATER RETENTION

On-site retention will not be provided with this project as retention is already provided within the T.P.C. Scottsdale Golf Course. Stormwater runoff will sheet flow across the site and be conveyed into the existing drainage system constructed with the Princess Medical Center development. The existing drainage system was designed and calculated with our proposed site as fully developed. Because the existing system was designed under full development standards our project will not be increasing the volume required to the T.P.C. Golf Course. Refer to the Princess Medical Center Drainage Report, Section III (Appendix D) and the Final Drainage Report for

Scottsdale Perimeter Center (Appendix C) for existing regional retention volumes and calculations.

4.0 LOWEST FLOOR ELEVATION

Since the project site is located in a FEMA FIRM area Flood Hazard Zone AO, the required lowest floor elevation for the development is to be set a minimum of 2-ft above the highest adjacent grade (HAG) within the building envelope. The HAG within the proposed building envelope is 1582.00 and the lowest floor elevation has therefore been set to 1584.00. Refer to Grading and Drainage plan located in the back pocket of this report for reference.

5.0 CONCLUSIONS

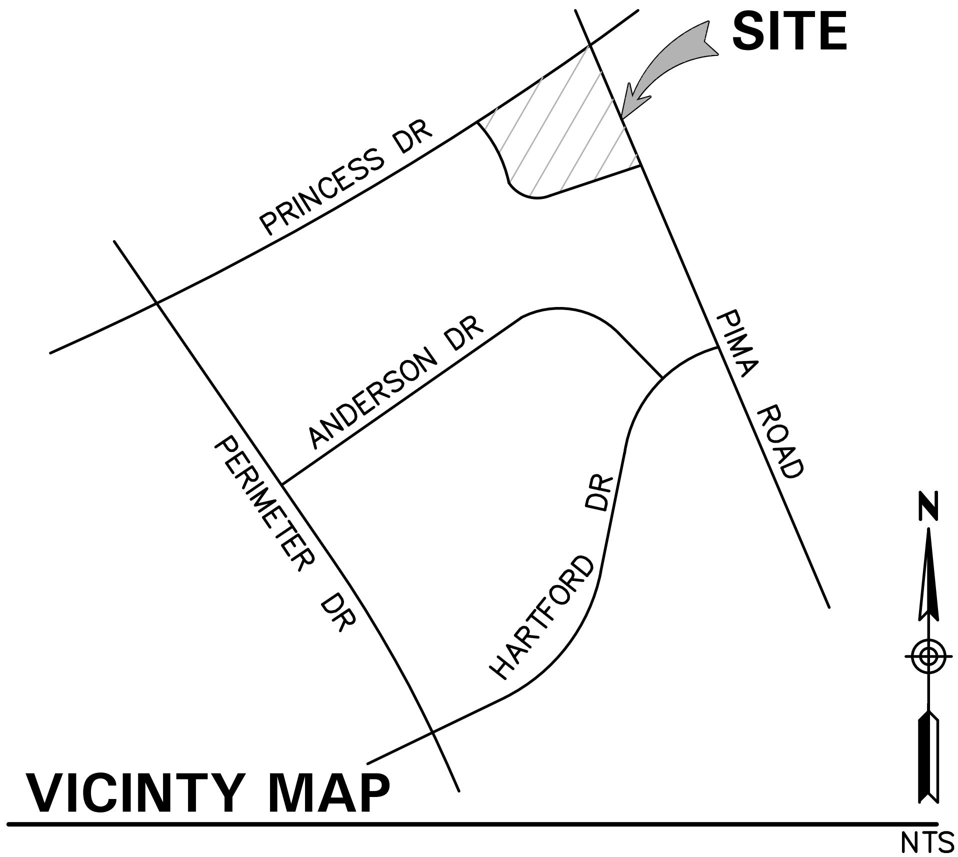
Based on the results of this study, it can be concluded that:

- Stormwater retention is already provided within the T.P.C. Scottsdale Golf Course per the Princess Medical Center Drainage Report and the Final Drainage Report for Scottsdale Perimeter Center (Appendix C and D).
- Off-site flows effecting the site will be conveyed around the building by a proposed concrete channel and released in a similar fashion as the existing condition.
- All stormwater will sheet flow across the site into the existing storm drain system which outlets into an existing channel located along the north side of Anderson Drive, south of the project site.
- To meet the design criteria of the Zone AO flood plain, the building lowest floor elevation will be set to a minimum of two feet above the highest adjacent grade elevation within the proposed building envelope.

6.0 REFERENCES

1. *City of Scottsdale Design Standards & Policies Manual, January 2018.*
2. *Collar, Williams & White Engineering. Final Drainage Report for Scottsdale Perimeter Center, April 1989.*
3. *CMX, LLC. Princess Medical Center Drainage Report, May 2002.*

APPENDIX A
FIGURES



VICINITY MAP
FIGURE 1

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PORTION OF PANEL SHOWING SITE
FIGURE 2

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

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

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

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.

MAP NUMBER 04013C1320L

MAP REVISED OCTOBER 16, 2013

Federal Emergency Management Agency

MAP LEGEND

FIRM PANEL

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APPENDIX B
CALCULATIONS

Hydrologic Design Data Record
Weir Calculation Sump Condition

Project:	PLAT003	Calc'd By:	AS
Date:	4/29/2020	Chck'd By:	GH

Location:	**CP1**			Area:	0.42	acres
Runoff Coefficient:		0.90		Time of Conc, Tc:	5	min
Frequency	**2**	**10**	**25**	**50**	**100**	**Years**
Intensity	3.08	4.99	6.11	6.95	7.82	in/hr
Discharge	**1.16**	**1.89**	**2.31**	**2.63**	**2.96**	cf/sec
Weir Calculations - $Q=C_w*L*d^{1.5}$ - [Eq 3.13 MC Hydraulics Aug 15, 2013 ED.]						
Flow	Clogging Factor, C	Weir Coef, C_w	Allowable Depth, ft	Length Required	Length Provided	Ponding (ft)
Q_{100}	80%	3.00	0.50	3.48	4.00	**0.46**
Q_{10}	80%	3.00	0.50	2.22	4.00	**0.34**

Hydrologic Design Data Record
Grated Catch Basin Sump Condition

Project: PLAT003 Calc'd By: AS
Date: 4/29/2020 Chck'd By: GH

Location:	**EX CB1**			Area:	0.60	acres
Runoff Coefficient:		0.90	Time of Conc, Tc:		5	min
Frequency	**2**	**10**	**25**	**50**	**100**	**Years**
Intensity	3.08	4.99	6.11	6.95	7.82	in/hr
Discharge	**1.66**	**2.69**	**3.30**	**3.75**	**4.22**	cf/sec
Weir Calculations - Q=C_w*P*$d^{1.5}$ - [Eq 3.11 MC Hydraulics Aug 15, 2013 ED.]						
Flow	Clogging Factor, C	Weir Coef, C_w	Allowable Depth, ft	Grate Perimeter P	Ponding (ft)	
Q_{100}	50%	3.00	0.50	11.84	**0.38**	
Q_{10}	50%	3.00	0.50	11.84	**0.28**	
Orifice Calculations - Q=CO*Ag*(2gd)0.5 - [Eq 3.22 MC Hydraulics Aug 15, 2013 ED.]						
Flow	Clogging Factor, C	Weir Coef, C_o	Allowable Depth, ft	Grate Area, A (ft)	Ponding (ft)	
Q_{100}	50%	0.67	0.50	5.42	**0.08**	
Q_{10}	50%	0.67	0.50	5.42	**0.03**	

Location:	**EX CB2**			Area:	1.27	acres
Runoff Coefficient:		0.90	Time of Conc, Tc:		5	min
Frequency	**2**	**10**	**25**	**50**	**100**	**Years**
Intensity	3.08	4.99	6.11	6.95	7.82	in/hr
Discharge	**3.52**	**5.70**	**6.98**	**7.94**	**8.94**	cf/sec
Weir Calculations - Q=C_w*P*$d^{1.5}$ - [Eq 3.11 MC Hydraulics Aug 15, 2013 ED.]						
Flow	Clogging Factor, C	Weir Coef, C_w	Allowable Depth, ft	Grate Perimeter P	Ponding (ft)	
Q_{100}	50%	3.00	0.50	11.84	**0.63**	
Q_{10}	50%	3.00	0.50	11.84	**0.47**	
Orifice Calculations - Q=CO*Ag*(2gd)0.5 - [Eq 3.22 MC Hydraulics Aug 15, 2013 ED.]						
Flow	Clogging Factor, C	Weir Coef, C_o	Allowable Depth, ft	Grate Area, A (ft)	Ponding (ft)	
Q_{100}	50%	0.67	0.50	5.42	**0.38**	
Q_{10}	50%	0.67	0.50	5.42	**0.15**	

Location:	EX CB3			Area:	0.72	acres
Runoff Coefficient:		0.90	Time of Conc, Tc:		5	min
Frequency	**2**	**10**	**25**	**50**	**100**	**Years**
Intensity	3.08	4.99	6.11	6.95	7.82	in/hr
Discharge	**2.00**	**3.23**	**3.96**	**4.50**	**5.07**	cf/sec

Weir Calculations - Q=C_w*P*$d^{1.5}$ - [Eq 3.11 MC Hydraulics Aug 15, 2013 ED.]

Flow	Clogging Factor, C	Weir Coef, C_w	Allowable Depth, ft	Grate Perimeter P	Ponding (ft)
Q_{100}	50%	3.00	0.50	11.84	**0.43**
Q_{10}	50%	3.00	0.50	11.84	**0.32**

Orifice Calculations - Q=CO*Ag*(2gd)0.5 - [Eq 3.22 MC Hydraulics Aug 15, 2013 ED.]

Flow	Clogging Factor, C	Weir Coef, C_o	Allowable Depth, ft	Grate Area, A (ft)	Ponding (ft)
Q_{100}	50%	0.67	0.50	5.42	**0.12**
Q_{10}	50%	0.67	0.50	5.42	**0.05**

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Cha
Flow Element	Trapezoidal Cha
Method	Manning's Formu
Solve For	Channel Depth

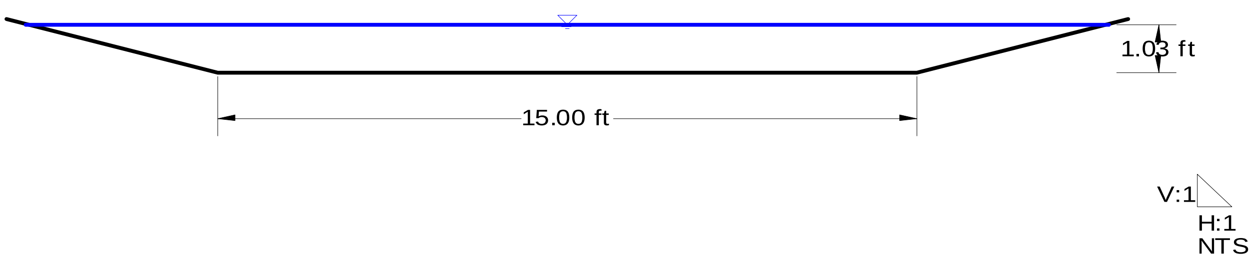
Input Data		
Mannings Coeffic	0.013	
Channel Slope	0.6400	%
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	15.00	ft
Discharge	159.18	cfs

Results		
Depth	1.03	ft
Flow Area	19.6	ft²
Wetted Perim	23.47	ft
Top Width	23.21	ft
Critical Depth	1.34	ft
Critical Slope	0.2457	%
Velocity	8.11	ft/s
Velocity Head	1.02	ft
Specific Energ	2.05	ft
Froude Numb	1.56	
Flow Type	Supercritical	

Cross Section
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Cha
Flow Element	Trapezoidal Cha
Method	Manning's Formu
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Channel Slope	0.6400	%
Depth	1.03	ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	15.00	ft
Discharge	159.18	cfs



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Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Input Data		
Mannings Coeffic	0.013	
Channel Slope	3.2500	
%Diameter	24.0	
in		

Results		
Depth	2.00	ft
Discharge	40.78	cfs
Flow Area	3.1	ft²
Wetted Perime	6.28	ft
Top Width	0.00	ft
Critical Depth	1.96	ft
Percent Full	100.0	%
Critical Slope	:.8977	%
Velocity	12.98	ft/s
Velocity Head	2.62	ft
Specific Energy	4.62	ft
Froude Numbe	0.00	
Maximum Disc	43.87	cfs
Discharge Full	40.78	cfs
Slope Full	:.2500	%
Flow Type	N/A	

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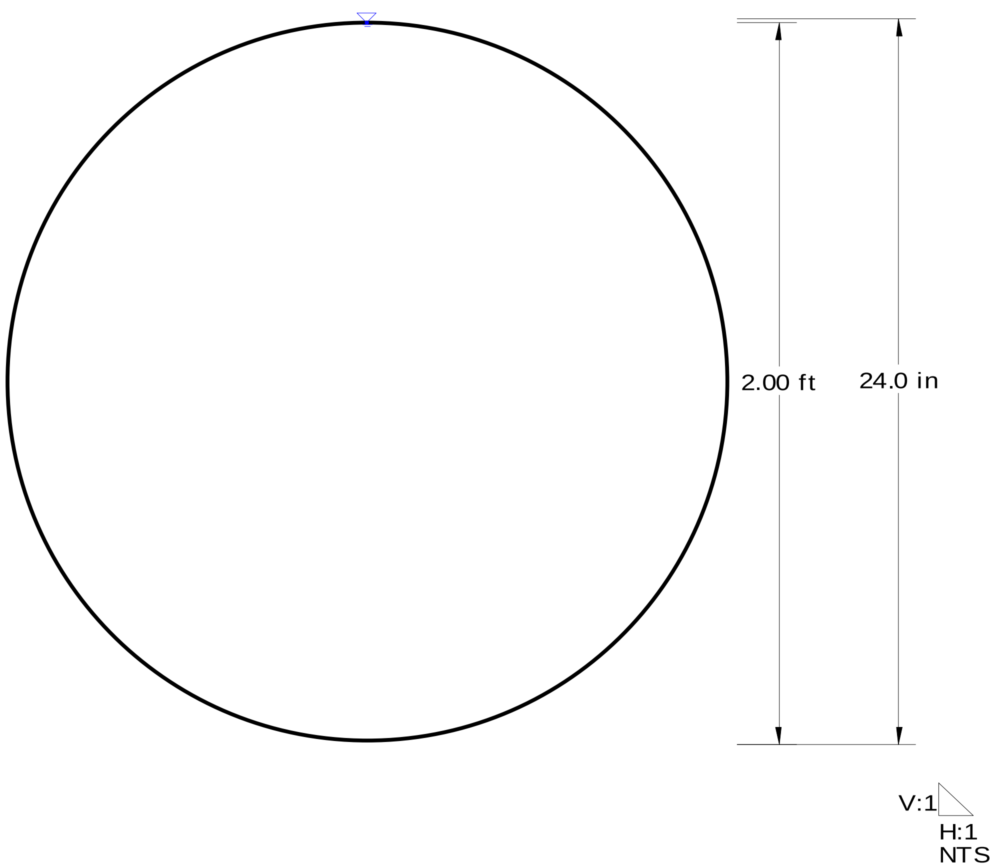
Cross Section
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Full Flow Capacit

Section Data		
Mannings Coeffic	0.013	
Channel Slope	3.2500	
Depth	2.00	ft
Diameter	24.0	in
Discharge	40.78	cfs



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APPENDIX C
FINAL DRAINAGE REPORT FOR
SCOTTSDALE PERIMETER CENTER

FINAL DRAINAGE REPORT
FOR
SCOTTSDALE PERIMETER CENTER
PHASE ONE
C.W.W. JOB NO. 880932

PREPARED FOR:
WESTCOR COMPANY
11411 NORTH TATUM BOULEVARD
PHOENIX, ARIZONA 85028

SUBMITTED BY:
COLLAR, WILLIAMS & WHITE ENGINEERING
2702 NORTH 44TH STREET, SUITE 100-A
PHOENIX, ARIZONA 85008

JANUARY 1989

Registered Professional Engineer (Civil)
CERTIFICATE NO.
13493
ROBERT E.
MOHNING
Date Signed 1-24-89
ARIZONA, U.S.A.

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EXHIBITS

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I. INTRODUCTION

The Scottsdale Perimeter Center is located just west of the proposed Outer Loop between Bell Road and Union Hills Drive and east of 83rd Street. Phase One encompasses improvements along Bell Road, 86th Street and Hayden Road in the southern portion of the Perimeter Center (Figure 1).

By legal description, Phase One lies in a portion of the south half of Section 36, Township 4 North, Range 3 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

II. MASTER DRAINAGE STUDY

Collar, Williams & White Engineering (CWW) completed the Master Drainage Report for Scottsdale Perimeter Center in January of 1988 (revised, June, July of 1988 and January 1989). The study, along with the Grading and Drainage Master Plan, gives a thorough description of the existing drainage conditions and includes data from other related drainage studies. The Master Drainage Study states that under present conditions the subject site would receive part of the 100 year peak discharge of over 6,800 cfs. This runoff would be spread out over a large area "and thus classified as a sheet flow condition". The average depth of flow across the area will be about 1 foot.

The Outer Loop Highway is proposed to be built as an elevated section and will eliminate the sheet flow runoff condition which presently exists by diverting the flows into a detention basin.

The Master Plan calls for the construction of numerous grass lined drainage channels to collect on-site runoff and route it through the Scottsdale Perimeter Center.

III. OFF-SITE DRAINAGE

As stated previously and in the Master Drainage Study, under existing drainage conditions the 100 year off-site peak flow entering the site is over 6800 cfs, occurring as sheet flow about 1 foot deep. Construction of the Outer Loop Highway is expected to reduce this peak through detention of flows upstream of the Highway. The Perimeter Center site will then be subject to an ultimate off-site peak discharge of 722 cfs from the detention basin plus 300± cfs from an adjacent State Land parcel at Pima Road (northeast of the Outer Loop). This off-site drainage is proposed to be routed in a future concrete-lined channel that will be at the eastern edge of the site and therefore does not affect Phase One.

It must be pointed out that the drainage improvements for Phase One are designed to handle on-site flows only. If a major off-site event were to occur before the Outer Loop detention system is in place, there is a possibility that the Phase One drainage improvements will be damaged and/or will fail.

IV. ON-SITE DRAINAGE

A. Streets

The Rational Method was used to calculate 100 year peak flows in the streets. These flows are all generated from within the street right-of-way. A C factor of 0.45 was used for pervious areas based on a B soil with 20% desert cover. The flows and concentration points are shown on the drainage map (Figure 2). The time of concentration calculations and peak discharge worksheets are included in Appendix I.

Catch basins were spaced to ensure that street flow stays within the top of curb for the 100 year event, both on continuous grades and in sag locations.

Flow will be picked up by both curb opening inlets and slotted drains and directed by storm drains to either a channel or culvert. The calculations for inlet capacity and storm drain capacity are included in Appendix II.

B. Channels

The 100 year peak flows from onsite drainage were computed using the HEC-1 model for the Master Drainage Study. These flows did not include flow contribution from the southern half of Bell Road. The flows from the southern half of Bell Road were added to these flows and they were then used to size the grass-lined channels for Phase One (Figure 2). A Mannings n of .027 was used. The channel hydraulic calculations are in Appendix III. During the 100 year peak flow, all channels are at subcritical flow except Channel Q which is at supercritical flow. The required freeboard for all channels is at least 1 foot except for Channel V which is at least 1.6 feet.

C. Culverts

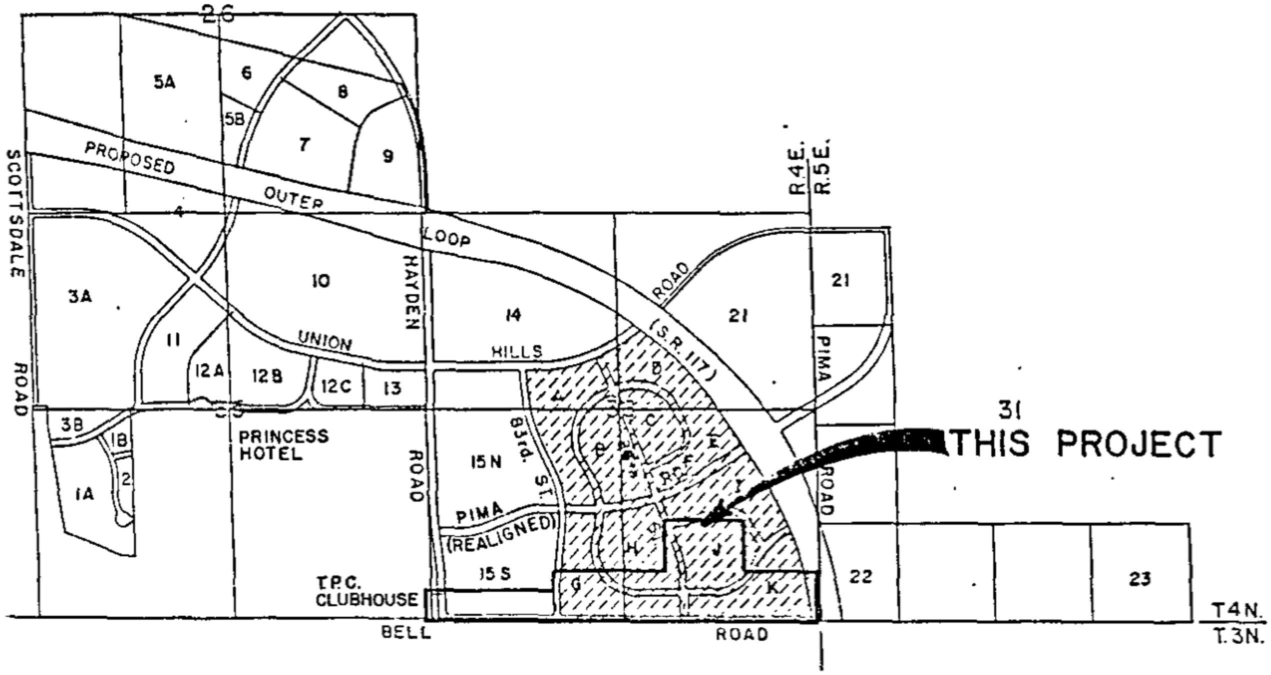
There are three culverts proposed for Phase One that will take flows in the grass lined channels under roads (Figure 2).

The 100 year peak flows from onsite drainage that are in the Master Drainage Report with the addition of flows from the southern half of Bell Road (as mentioned above) were used to size the three culverts. The inlet and outlet control calculations are in Appendix III. The channels will be lined with concrete at both the entrances and exits of the culverts to prevent scouring.

D. Desiltation Basins

There will be several berms constructed in Phase One (see Grading and Drainage Plans) that are designed to detain water to enable sediment to drop out before entering the grass lined channels. These desiltation basins will provide enough storage for the on-site runoff generated from a 100 year, 1 hour storm. The basins will be drained into adjacent channels by bleed-off pipes. The pipes are designed to allow the basins to drain within a 36 hour period. The desiltation basin storage volume and drainage calculations are in Appendix III.

Spillways will be provided to allow a level of protection if the basins were to become full due to off-site flows entering the site. To prevent scouring, the spillway will be gunite lined and the channels in the vicinity of the spillway outfalls will be lined with a landscape fabric.



VICINITY MAP
N.T.S.

Figure 1

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APPENDIX I

TIME OF CONCENTRATION CALCULATIONS

AND

PEAK DISCHARGE WORKSHEETS

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N. 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350
JOB NO.

JOB: Perimeter Center Phase 1
SHEET NO. 1 OF 4
CALCULATED BY: J. G. DATE: 12-29-88
CHECKED BY: DATE:
SCALE:

POOR QUALITY ORIGINAL

Tc's for CP's

CP 1 - Bell Rd. Sta. 26+70

L = 530', Ave. Weighted S = 0.48%, Area = 530 X 55 = 0.67 ac

Ave. Q = CIA = .78(7.3).34 = 1.9 cfs, n = .015, Z = $\frac{1}{.02}$ = 50

Ave. d = $\left(\frac{Q \cdot n}{0.56 Z S^{1/2}}\right)^{3/8} = \left(\frac{1.9(.015)}{0.56(50)(.0048)^{1/2}}\right)^{3/8}$ = 0.2 ft

Ave. V = $\frac{1.12}{n} S^{1/2} d^{2/3} = \frac{1.12}{.015}(.0048)^{1/2}(0.2)^{2/3}$ = 1.8 fps

530' @ 1.8 fps = 4.9 min Use 10 minute minimum (A+B)

CP 2 - Bell Rd. Sta 34+70

Two lengths: 605' @ 0.4% and 540' @ Ave. Slope of 1.15%

L₁ = 540' Ave. S = 1.15%, Area = 540'x55 = 0.68 ac.

Ave. Q = .78(7.3).34 = 1.9 cfs, Ave. d = 0.17', Ave. V = 2.5 fps

540' @ 2.5 fps = 3.6 min

L₂ = 605', S = 0.4%, Total Area = (605'X55') + 0.68 ac = 1.45 ac

Ave. Q = .78(7.3)1.07 = 6.1 cfs, Ave. d = 0.32', Ave. V = 2.2 fps

605' @ 2.2 fps = 4.6 min Total = 4.6 + 3.6 = 8.2 min

Use 10 minute minimum for A+B

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Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB Perimeter Center Phase 1

SHEET NO. 2 OF 4

CALCULATED BY J.B. DATE 12-29-88

CHECKED BY DATE

SCALE

Tc's for CP's (cont'd)

CP3 - Bell Rd. Sta. 44+00

L = 1600', Ave. S = 0.41%, Area = 1600' x 55' = 2.0 ac.

Ave. Q = 0.78(7.3)1 = 5.7 cfs, Ave. d = 0.31', Ave. V = 2.2 fps

1600' @ 2.2 fps = 12.1 minutes

CP4 - Loop Rd. Sta. 13+50

Streets have 20.5' half-width and 2% cross slope

Ave. weighted slope = 0.95%, L = 1743 ft

Ave. Q = CIA = .81(7.3)1.6 ≅ 9.5 cfs ≈ 4.2 cfs each side street

Ave. d = 0.24', Ave. V = 2.8 ft/s

1743' @ 2.8 ft/s = 10.4 min.

Tc's for CP's (cont'd)

CP-5 - 84th Way - Sta. 16+00 (east side of street)

L = 845' on Loop Rd., S = 0.96%, S_x = 2%, z = 50

Ave. Q per side of street = CIA = .81(7.3).34 = 2 cfs

Ave. d = .18', Ave. V = 2.36 ft/s, 845' @ 2.36 ft/s = 6 minutes

L = 600' on 84th Way, Ave. S = 1.15%, S_x = 2%, z = 50

Ave. Q = $\frac{15.5 + 11}{2}$ = 13 cfs, Ave d = 0.36', Ave. V = 4 ft/s

600' @ 4 ft/s = 2.5 min., Total = 6 + 2.5 = 8.5 min.

Use 10 minute minimum

CP-6 - 84th Way - Sta. 16+00 (west side of street)

L = 1050', Ave. wtd. S = 1.30%, S_x = 2%; z = 50

Ave. Q = CIA = .84(7.3).54 = 3.3 cfs

Ave. d = 0.21', Ave V. = 3 ft/s, 1050' @ 3 ft/s = 5.8 min.

Use 10 minute minimum

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Collar, Williams & White Engineering Consulting Engineers and Land Surveyors 2702 N. 44TH ST., SUITE 100A PHOENIX, ARIZONA 85008 PHONE: (602) 957-3350 JOB NO.	JOB: Perimeter Center Phase 1 SHEET NO. 4 OF 4 CALCULATED BY J.B. DATE 1-11-89 CHECKED BY DATE SCALE

Tc's for CP's (con'td)

CP7 - Loop Rd. Sta. 10+60 (north side of street)

Have 2.9 cfs flow by from CP5 w/ $T_c = 8.5$ min, $L = 200'$

Ave. $S = 1.15\%$, Ave $S_x = 1\%$, Ave $z = 100$, Ave. $d = 0.17'$

Ave. $V = 2.45$ ft/s, 200 ft @ 2.45 ft/s = 1.4 ft

$T_c = 8.5 + 1.4 = 9.9$ minutes use 10 minute minimum

CP8 - 84th Way Sta. 11+70 (east side of street)

Have 0.5 cfs flow by from CP4 (south side) w/ $T_c = 10.4$ min
and 1.1 cfs flow by from CP7

$L = 490$ ft, Ave. $S = 1.0\%$, Ave $S_x = 1.4\%$, Ave. $Z = 71$

Ave. $Q = .8(6).23 + 0.5 + 1.1 = 2.7$ cfs, Ave. $d = 0.18'$

Ave. $V = 2.4$ ft/s, 490 ft @ 2.3 fps = 3.4 min.

$T_c = 10.4 + 3.4 = 13.8$ min.

or use 1.1 cfs flow by from CP7 w/ $T_c = 9.9$ min (no 0.5 cfs CP4 flowby)

$L = 230$ ft, Ave $S = 1.6\%$, Ave. $S_x = 1.1\%$, Ave. $Z = 91$

Ave. $Q = .8(7).23 + 1.1 = 2.4$ cfs, Ave. $d = 0.14'$

Ave. $V = 2.5$ ft/s, 230 ft @ 2.5 ft/s = 1.5 min

$T_c = 9.9 + 1.5 = 11.4$ min.

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ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center phase 1

Project No. 330932 Station CP 1 (A+B)

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	0.44	acres } 0.67 acres
	A_2	0.23	acres
	A_3		acres
Drainage Length		530	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.48	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	Minimum 10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1	0.75	
	C_2	0.45	
	C_3		
Weighted Runoff Coefficient	C	0.72	
Peak Discharge $Q_p = C_{iA}$ =		3.7	cfs

Computed by ______ Date ______

T 20-2003 2/76 (FORMERLY 20-2903)

7-DR-2020
5/29/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP2A

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.77	acres
	A_2		acres
	A_3		acres
Drainage Length		1145	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.4 and 1.15	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	Minimum 10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1		
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.77	
Peak Discharge $Q_p = C_{IA}$ =		10.[illegible]	cfs

Computed by [illegible] Date [illegible]

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP 2 B

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.36	acres
	A_2		acres
	A_3		acres
Drainage Length		805	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.4 & 0.83	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	Minimum 10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1		
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.78	
Peak Discharge $Q_p = C_iA$ =		7.7	cfs

Computed by [illegible signature] Date 12-20-??

20-2003 2/76 (FORMERLY 20-2903)

7-DR-2020
5/29/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP3A

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.45	acres } 2.75
	A_2	1.30	acres
	A_3		acres
Drainage Length			feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	12.1	minutes
Rainfall Intensity	i	6.7	inches/hour
Runoff Coefficient	C_1	0.78	
	C_2	0.83	
	C_3		
Weighted Runoff Coefficient	C	0.80	
Peak Discharge $Q_p = C_iA$ =		14.7	cfs

Computed by [illegible] Date 1-5-89

7-DR-2020
5/29/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP3B

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.19	acres } 1.72
	A_2	0.53	acres
	A_3		acres
Drainage Length		160	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.40 + 0.53	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	10	minutes
Rainfall Intensity	i	6.7	inches/hour
Runoff Coefficient	C_1	0.95	- pavement
	C_2	0.45	- soil B, 20% desert cover
	C_3		
Weighted Runoff Coefficient	C	0.79	
Peak Discharge $Q_p = C_iA$ =		[illegible]	cfs

Computed by [illegible] Date [illegible]

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP4

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	3.14	acres
	A_2		acres
	A_3		acres
Drainage Length		1743	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		Ave. 0.95	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	10.4	minutes
Rainfall Intensity	i	7.1	inches/hour
Runoff Coefficient	C_1		
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.81	(51'@.95+19'@.45)
Peak Discharge $Q_p = C_iA$ =		18.1	cfs

Computed by J.L. Date 1-10-89

20-2003 2/76 (FORMERLY 20-2903)

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5/29/2020

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP 5

Name of Stream ______

DESIGN DATA

Design Frequency 100 years

Drainage Area A_1 1.36 acres

A_2 0.44 acres Σ 2.52

A_3 0.72 acres

Drainage Length 1445 feet

Elevation

Top of Drainage Area ______ feet

At Structure ______ feet

Drainage Area Slope 1.15 + 0.96 %

Precipitation

P = 6-hour ______ inches

P = 24-hour ______ inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour 2.66 inches

Time of Concentration Tc Minimum 10 minutes

Rainfall Intensity i 7.3 inches/hour

Runoff Coefficient C_1 0.8

C_2 0.96

C_3 0.84

Weighted Runoff Coefficient C 0.84

Peak Discharge $Q_p = C_{IA}$ = 15.5 cfs

Computed by C.A. Date 1-10-89

20-2003 2/76
(FORMERLY 20-2903)

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP6

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	1.08	acres
	A_2		acres
	A_3		acres
Drainage Length		1050	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		1.134	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	Minimum 10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1		
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.84	
Peak Discharge $Q_p = C_iA$ =		6.6	cfs

Computed by O.T. Date 1-10-87

20-2003 2/76 (FORMERLY 20-2903)

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______________ County: Maricopa

Location: Perimeter Center Prose...

Project No.: 880932 Station: CP7

Name of Stream ______________

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	0.21	acres } 0.42
	A_2	0.21	acres
	A_3		acres
Drainage Length		360	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.5	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	10	minutes
Rainfall Intensity	i	7.3	inches/hour
Runoff Coefficient	C_1	0.91	
	C_2	0.94	
	C_3		
Weighted Runoff Coefficient	C	0.925	
Peak Discharge $Q_p = C_iA$ =		2.5	cfs [illegible] 5.4 [illegible]

Computed by [illegible] Date [illegible]

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10/10

ARIZONA DEPARTMENT OF TRANSPORTATION

HYDROLOGIC DESIGN DATA RECORD

RATIONAL METHOD

LOCATION DATA

Highway ______ County Maricopa

Location Perimeter Center Phase 1

Project No. 880932 Station CP8

Name of Stream ______

DESIGN DATA

Design Frequency		100	years
Drainage Area	A_1	0.21	acres } 0.45
	A_2	0.24	acres
	A_3		acres
Drainage Length		260	feet
Elevation			
Top of Drainage Area			feet
At Structure			feet
Drainage Area Slope		0.5	%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		2.66	inches
Time of Concentration	Tc	13.8	minutes
Rainfall Intensity	i	6.3	inches/hour
Runoff Coefficient	C_1	0.91	
	C_2	0.70	
	C_3		
Weighted Runoff Coefficient	C	0.80	
Peak Discharge $Q_p = C_iA$ =		2.3	cfs

[illegible]

Computed by C.L. Date [illegible]-89

20-2003 2/75 (FORMERLY 20-29031)

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APPENDIX II

STREET INLET CAPACITY CALCULATIONS

AND

SLOTTED DRAIN PIPE CAPACITY CALCULATIONS

AND

STORM DRAIN PIPE CAPACITY CALCULATIONS

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N. 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB: Perimeter Center Phase 1
SHEET NO. 1 OF 9
CALCULATED BY J.D. DATE 1-9-89
CHECKED BY DATE
SCALE

Inlet Capacity Calculations

CP1 A+B - Bell Rd. Sta. 26+70, sump condition

$Q = 3.8$ cfs per side, allowable depth at sag $= 6'' = 0.5'$, $S = 0.4\%$

Use 1-5.5' curb opening inlet, effective Length $(L_e) = 5.5/1.25 = 4.4'$

Fig. 3-47: $h = 5''$, $a = 2''$, $d/h = 1.2$, $Q/L = 1.05$, $Q_{cap} = 1.05(4.4) = 4.6$ cfs OK

Result: 1-5.5' curb opening inlet at sag location

CP2 A - Bell Rd. Sta. 34+70, sump condition, $Q = 10.1$ cfs

Use 1-5.5' curb opening inlet $\rightarrow$ capacity = 4.6 cfs (from CP1)

Need to pick up additional $10.1 - 4.6 = 5.5$ cfs

Use 1-20' section of slotted drain, $L_e = 20/1.5 = 13.33'$

Effective depth at center $(d_e) = 0.5 - (.0052 \times 13) = 0.43'$

Capacity of slotted drain $= \dfrac{L_e\, d_e^{0.5}}{1.401} = 6.2$ cfs

Total Capacity $= 6.2 + 4.6 = 10.8$ cfs OK

Result: 1-5.5' curb opening inlet at sag
20' of slotted drain

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5/29/2020

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Inlet Capacity Calculations (cont'd)

CP2B - Bell Rd. Sta 34+70, sump condition, $Q = 7.7$ cfs

Allowable d = 6", Use 1-3.5' curb opening inlet, $L_e = 3.5/1.25 = 2.8'$

h = 5", [illegible], $Q/L = 1.05 \rightarrow Q_{cap} = 2.8(1.05) = 2.9$ cfs

Use 1-20' section slotted drain, $Q_{cap} = 6.2$ cfs (from CP2A)

Total capacity $= 6.2 + 2.9 = 9.1$ cfs OK

Result: 1 - 3.5' curb opening inlet at sag location
20' of slotted drain " " "

CP3A - Bell Rd. Sta. 44+00, sump, $Q = 14.7$ cfs

Use 1-3.5' curb opening inlet, $Q_{cap} = 2.9$ cfs (from CP2B)

Use 2-20' sections of slotted drain, one on each side

d_e on [illegible] side of curb opening (S = 0.4%) = 0.5 - (.004 × 12) = 0.45'

d_e on [illegible] side of curb opening (S = 0.53%) = 0.5 - (.0053 × 12) = 0.44'

$$Q_{[illegible]} = \frac{[illegible]\ d_e^{0.5}}{1.401} = \frac{13.33\,(0.45)^{0.5}}{1.401} = 6.4 \text{ cfs}, \quad Q_{cap(east)} = 6.3 \text{ cfs}$$

Total Capacity $= 6.3 + 6.4 + 2.9 = 15.6$ cfs OK

Result: 1 - 3.5' curb opening inlet [illegible]
2 - 20' slotted drain [illegible] of curb opening

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PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB	Perimeter Center Phase 1
SHEET NO. 3	OF 9
CALCULATED BY J.A.	DATE 1-9-89
CHECKED BY	DATE
SCALE	

Inlet Capacity Calculations (cont'd)

CP3B - Bell Rd. Sta. 43+90, sump condition, Q = 9.1 cfs

Allowable depth at sag = 0.23' before begins flowing west

Use 1 - 3.5' curb opening inlet, effective L = 3.5/1.25 = 2.8'

d/h = .23/.417 = 0.55, Q/L = 0.35 → Q = 2.8(.35) = 1 cfs

Use 2 - 20' sections of slotted drain, one on each side

de on west side of curb opening (S = 0.4%) = 0.23 - (.004x12) = .18'

de on east side of curb opening (S = 0.6%) = 0.23 - (.006x12) = .16'

$$Q_{cap(west)} = \frac{13.33\,(.18)^{0.5}}{1.401} = 4.0 \text{ cfs}, \quad Q_{cap(east)} = 3.8 \text{ cfs}$$

Total Capacity = 4 + 3.8 + 1 = 8.8 cfs OK

Flowby = 9.1 - 8.8 = 0.3 cfs

Result: 1 - 3.5' curb opening inlet at sag location
1 - 20' slotted drain on either side of curb opening
Flowby = 0.3 cfs

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5/29/2020

FORM 204-1

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Consulting Engineers and Land Surveyors
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PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350
JOB NO.

JOB: Perimeter Center Phase 1
SHEET NO. 4 OF 9
CALCULATED BY: J.D. DATE: 1-10-89
CHECKED BY: DATE:
SCALE:

Inlet Capacity Calculations (cont'd)

CP4 - Loop Road Sta. 13+50 - continuous grade

$Q = 18.1$ cfs, $S = 0.48\%$, $S_x = 2.0\%$, $z = 50$

North side of street will be filled to centerline (0.41') due to larger contributing area than South side of street

North side: $d = 0.41'$, $Q = 12$ cfs

60' of slotted drain, $L_e = 60/1.5 = 40'$

$L_r = 54.0'$, $L_a/L_r = 40/54 = 0.74$; $Q_a/Q_d = 0.915$

$Q_{intercepted} = .915(12) = 11$ cfs

1 - 3.5' of curb opening, $L_e = 3.5/1.25 = 2.8'$

$Q = 12 - 11 = 1$ cfs, $d = 0.16'$, $Q/L_a = 0.11 \rightarrow L_a = 1/.11 = 9.1'$

$Y/d = .167/.16 = 1.04$, $L/L_a = 2.8/9.1 = 0.31$; $Q/Q_a = 0.41 \rightarrow Q = 0.4$ cfs

Total Q intercepted $= 11 + 0.4 = 11.4$ cfs

Flowby $= 12 - 11.4 = 0.6$ cfs

Result: 1-3.5' curb opening in [illegible] on continuous grade
60' of slotted drains upstream of catch basin
Flowby of 0.6 cfs

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5/29/2020

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Consulting Engineers and Land Surveyors
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JOB NO.

JOB: Perimeter Center Phase I
SHEET NO. 5 OF 9
CALCULATED BY J.B. DATE 1-10-89
CHECKED BY ______ DATE ______
SCALE ______

Inlet Capacity Calculations (cont'd)

CP4-southside: $Q = 18.1 - 12 = 6.1$ cfs, $d = 0.32'$

40' of slotted drain, $L_e = 26.7$, $L_r = 40.9'$

$L_a/L_r = 26.7/40.9 = 0.65$, $Q_a/Q_d = 0.86 \rightarrow Q_a = 0.86(6.1) = 5.2$ cfs

1-3.5' curb opening, $L_e = 2.8'$, $Q = 6.1 - 5.2 = 0.9$ cfs

$d = 0.16'$, $Q/L_a = 0.11 \rightarrow L_a = .9/.11 = 8.2'$, $q/d = 1.04$

$L/L_a = 2.8/8.2 = 0.34$, $Q/Q_a = 0.45 \rightarrow Q = .45(.9) = 0.4$ cfs

Total Q intercepted = 5.2 + 0.4 = 5.6 cfs

Flowby = 6.1 − 5.6 = 0.5 cfs

Result: 1-3.5' curb opening inlet on continuous grade
40' of slotted drains upslope of catch basin
Flowby of 0.5 cfs

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5/29/2020

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JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 6 OF 9
CALCULATED BY J.D. DATE 1-10-89
CHECKED BY DATE
SCALE

Inlet Capacity Calculations (cont'd)

CP5 - 84th Way Sta. 15+80 - east side, continous grade

$Q = 15.5$ cfs, $S = 1.134\%$, $S_x = 2\%$, $Z = 50$

60' of slotted drain, $L_e = 60/1.5 = 40'$, $L_r = 78.4'$

$L_a/L_r = 40/78.4 = 0.51$, $Q_a/Q_d = 0.74 \rightarrow Q_o = 15.5(.74) = 11.5$ cfs

1 - 5.5' curb opening, $L_e = 5.5/1.25 = 4.4'$

$Q = 15.5 - 11.5 = 4$ cfs ; $d = 0.23'$, $Q/L_a = 0.16 \rightarrow L_a = 4/.16 = 25'$

$a/d = .5/.23 = 0.73$, $L/L_a = 4.4/25 = 0.18$, $Q/Q_a = 0.28 \rightarrow Q_i = 1.1$ cfs

Total Q intercepted $= 1.1 + 11.5 = 12.6$ cfs

Flow by $= 15.5 - 12.6$ 2.9 cfs

Result: 1-5.5' curb opening inlet on continous grade
60' of slotted drains upslope of catch basin
Flow by of 2.9 cfs

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FORM 204-1

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N. 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350
JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 7 OF 9
CALCULATED BY J.B. DATE 1-16-89
CHECKED BY DATE
SCALE

Inlet Capacity Calculations (cont'd)

CP6 – 84th Way Sta. 15+80 - west side, continuous grade

$Q = 6.6$ cfs, $S = 1.134\%$, $S_x = 2\%$, $z = 50$

40' of slotted drain, $L_e = 40/1.5 = 26.7'$, $L_r = 54.4'$

$L_a/L_r = 26.7/54.4 = 0.49$, $Q_a/Q_d = 0.72 \rightarrow Q_a = 6.6(.72) = 4.8$ cfs

Flowby = 6.6 - 4.8 = 1.8 cfs

Result: 40' of slotted drain on continuous grade
Flowby of 1.8 cfs

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5/29/2020

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N 44TH ST, SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 8 OF 9
CALCULATED BY J.D. DATE 1-11-89
CHECKED BY DATE
SCALE

Inlet Capacity Calculations (cont'd)

CP7 - Loop Rd. Sta. 10+60 - north side, sump condition

$Q = 5.4$ cfs, $S_x = .5\%$, d allowed before crosses centerline = 0.1'

Use 1-3.5' curb opening inlet, $L_e = 3.5/1.25 = 2.8'$

$h = 5"$, $d/h = .1/.42 = 0.24$, $Q/L = 0.1 \rightarrow Q_i = 2.8(.1) = 0.3$ cfs

Use 1-20' section of slotted drain, Ave. d at middle of drain $= 0.1-(12 \times .004) = .05'$, $L_e = 20/1.5 = 13.33$

$Q = \frac{L_e d^{0.5}}{1.401} = 2.1$ cfs, Total $Q = 2.1 + .3 = 2.4$ cfs

Since begin to get flow over centerline at 2.4 cfs will have depth at gutter larger than 0.1 ft. Must balance depth so Q in inlet and Q weiring over centerline add up to 5 cfs. Centerline acts as V-shaped weir with 200:1 side slopes. With depth at centerline of 0.9' get about 1.1 cfs weir flow.

For 3.5' curb opening inlet $d/h = .19/.42 = 0.45$

$Q/L = 0.26 \rightarrow Q = .26(2.8) = 0.7$ cfs

For 20' slotted drain, Ave. $d = 0.14'$, $Q = \frac{13.33(.14)^{0.5}}{1.401} = 3.6$ cfs

Total Interception $= 3.6 + 0.7 = 4.3$ cfs

[illegible]

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JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 9 OF 9
CALCULATED BY J.A. DATE 1-11-89
CHECKED BY DATE
SCALE

Inlet Capacity Calculations (cont'd)

CP8 - 84th Way Sta. 11+70 - east side, continous grade

$Q = 3.9$ cfs, $S = 1.18\%$, $S_x = 1.5\%$, $z = 67$

60' of slotted drain, $Le = 60/1.5 = 40'$, $Lr = 55.1'$

$L_a/L_r = 40/55.1 = 0.73$, $Q_a/Q_d = 0.91 \rightarrow Q_a = 3.6$ cfs

Q intercepted = 3.6 cfs

Flow by = 3.9 - 3.6 = 0.3 cfs

Result: 60' of slotted drain on continuous grade
Flow by = 0.3 cfs

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JOB NO.

JOB: Perimeter Center Phase 1
SHEET NO. 1 OF 1
CALCULATED BY J.A. DATE 1-12-89
CHECKED BY ______ DATE ______
SCALE ______

Slotted Drain Pipe Capacity Calculations

$$Q_{capacity} = A \frac{1.486}{n} R^{2/3} S^{\frac{1}{2}}$$

$$Q_{cap}(18'') = 1.77 \frac{1.486}{.013} (0.375)^{2/3} S^{\frac{1}{2}} = 105 S^{\frac{1}{2}}$$

$$Q_{cap}(24'') = 3.14 \frac{1.486}{.015} (0.5)^{2/3} S^{\frac{1}{2}} = 196.1 S^{\frac{1}{2}}$$

$$Q_{cap}(30'') = 4.91 \frac{1.486}{.017} (0.625)^{2/3} S^{\frac{1}{2}} = 313.7 S^{\frac{1}{2}}$$

Manning's n values are for Standard Corrugated Steel Pipe with 2 2/3 x 1/2 inch hellical corrugations from Handbook of Steel Drainage and Highway Construction Products, American Iron and Steel Institute, 1983.

CP2A 1-20', S = 0.52%, Q = 6.2 cfs → 18"

CP2B 1-20', S = 0.52%, Q = 6.2 cfs → 18"

CP3A 2-20', S = 0.4% + 0.53%, Q = 6.4 [illegible] → 18" for both

CP3B 2-20', S = 0.4% + 0.6%, Q = 4.0 cfs → 18" for both

CP4 [illegible] 3-20', S = 0.48%, Q = 5.8 + 11 cfs → 1-18" + 2-24"

CP4 [illegible] 2-20', S = 0.48%, Q = 3 + 5.[illegible] → 18" for both

[illegible] 3-20', S = [illegible]34%, Q = 5.9 + 11.5 cfs → 2-18" + 1-24"

CP6 [illegible] 20', S = 1.134%, Q = 3 + 4.7 [illegible] → 18" for both

[illegible] 1-20', S = 0.4%, Q = 3.[illegible] → 18"

[illegible] 3-20', S = 1.12[illegible], Q = [illegible], 2.8 + 3.9 → [illegible] for all 3

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Storm Drain Capacity Calculations

CP 1 - Bell Rd. Sta. 26+70, Combine flows from A+B

Water Surface Elevation in channel at drain outfall = 41.2

Gutter grade at catch basin = 42.29

Allowable Total Head = 42.29 - 41.2 = 1.09 ft

North side of Bell: Q = 7.6 cfs, D = 1.5', n = .013 (RCP)

$A = \pi \frac{D^2}{4} = 1.77 ft^2$, $V = \frac{Q}{A} = \frac{7.6}{1.77} = 4.29$ ft/s, L = 25'

$H = \left(1.5 + \frac{185 n^2 L}{D^{4/3}}\right)\frac{V^2}{2g} = \left(1.5 + \frac{185(.013)^2 25}{1.5^{4/3}}\right)\frac{4.29^2}{2g} = 0.56'$

South side of Bell: Q = 3.8 cfs, D = 1.5', L = 77'

$A = \pi \frac{1.5^2}{4} = 1.77 ft^2$, $V = \frac{3.8}{1.77} = 2.15$ ft/s

H = 0.21'

Total Head = 0.56 + 0.21 = 0.77'   OK

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Storm Drain Capacity Calculations (cont'd)

CP2A - Bell Rd. Sta. 34+70 North side, Q = 10.1 cfs

Slope of hydraulic grade in culvert = $\frac{4.8-3.65}{110}$ = 1.05%

Hydraulic grade at drain outfall = 42.5 - (15 x .0105) = 42.34

Gutter grade at low point of slotted drain = 43.60

Allowable Head = 43.60 - 0.5 - 42.34 = 0.76 ft

D = 1.5', A = 1.77 ft², V = 5.71 ft/s, L = 4', n = .013 (RCP)

H = .80 ft OK - since peak in storm drain will occur before peak in culvert occurs.

CP2B - Bell Rd. Sta. 34+70 South side, Q = 7.7 cfs

Hydraulic grade at drain outfall = 42.5 - (96 x .0105) = 41.49

Allowable Head = 43.60 - 0.5 - 41.49 = 1.61 ft

D = 1.5', V = 4.35 ft/s, L = 4' → H = 0.46 ft OK

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JOB NO.

JOB Perimeter Center Phase 1

SHEET NO. 3 OF 6

CALCULATED BY J.R. DATE 1-9-89

CHECKED BY DATE

SCALE

Storm Drain Capacity Calculations (Cont'd)

CP3 - Bell Rd. Sta. 44+00, Combine flows from A+B

Water surface elevation in channel at drain outfall = 45.46

Gutter grade at low point of slotted drain = 46.97

Allowable Total Head = 46.97 - 0.5 - 45.46 = 1.01 ft

South side of Bell: Q = 8.8 cfs, Use 1-2'Ø pipe (RCP)

n = .013, A = 3.14 ft², V = 2.8 ft/s, L = 102'

H = 0.34'

North side of Bell: Q = 23.5 cfs, Use 1-3'Ø pipes (RCP)

n = .013, A = 7.07 ft², V = 3.32 ft/s, L = 20'

H = 0.28'

Total H = 0.28 + 0.34 = 0.62 ft OK

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JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 4 OF 6
CALCULATED BY J.D. DATE 1-10-89
CHECKED BY DATE
SCALE

Storm Drain Capacity Calculations (cont'd)

CP4 - Loop Rd. Sta 13+50, Combine flows from N + S

Water Surface Elevation in channel at drain outfall = 51.1

Gutter grade at low point of slotted drain = 53.05

Allowable Total Head = 53.05 - .5 - 51.1 = 1.45 ft.

South side of street: Q = 5.6 cfs, Use 1 - 1.5' Ø RCP

n = .013, A = 1.77 ft², V = 3.16 ft/s, L = 42 ft

H = 0.35'

North side of street: Q = 17 cfs, Use 1 - 2' Ø RCP

n = .013, A = 3.14 ft², V = 5.41 ft/s, L = 32 ft

H = 0.86'

Total H = 0.35 + 0.86 = 1.21 ft OK

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Storm Drain Capacity Calculations (cont'd)

CP5 - 84th Way Sta. 15+80 (east side)

Water surface elevation in channel at drain outfall = 52.0

Gutter grade at low point of slotted drain = 53.59

Allowable Head = 53.59 - 0.5 - 52.0 = 1.09 ft.

Q = 12.6 cfs, Use 1 - 2' Ø RCP, n = .013

A = 3.14 ft², V = 4.01 ft/s, L = 30 ft.

H = 0.47 ft. OK

CP6 - 84th Way Sta. 15+80 (west side)

Slope of hydraulic grade in culvert $\frac{4.0-3.1}{90}$ = 1.0%

Hydraulic grade at drain outfall = 50.44 - (.01 x 80) = 49.64

Gutter grade at low point of slotted drain = 53.59

Allowable Head = 53.59 - 0.5 - 49.64 = 3.45 ft

Q = 4.8 cfs, Use 1 - 1.5' Ø RCP, n = .013

A = 1.77 ft², V = 2.71 ft/s, L = 120 ft.

H = 0.42 ft. OK

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JOB NO.

JOB: Perimeter Center Phase 1

SHEET NO. 6 OF 6

CALCULATED BY: J.D. DATE: 1-11-89

CHECKED BY: DATE:

SCALE:

Storm Drain Capacity Calculations (cont'd)

CP7 - Loop Rd. Sta. 10+60 (northside)

Water surface elevation in channel at drain outfall = 50.94

Gutter grade at low point of slotted drain = 51.86

Allowable Total Head = 51.86 - 0.5 - 50.94 = 0.42 ft

Q = 4.3 cfs, Use 1 - 1.5' Ø RCP

n = .013, A = 1.77 ft², V = 2.43 ft/s, L = 29 ft

H = 0.19 ft OK

CP8 - 54th Way Sta. 11+70 (east side)

Slope of hydraulic grade in culvert $\frac{3.46 - 2.6}{110}$ = 0.78%

Hydraulic grade at drain outfall = 45.46 - (.0078 x 20) = 45.30

Gutter grade at low point of slotted drain = 48.19

Allowable Head = 48.19 - 0.5 - 45.30 = 2.39 ft

Q = 3.6 cfs, Use 1 - 1.5' Ø RCP, n = .013

A = [illegible], V = 2.03 ft/s, L = 55 ft

H = 0.20 ft OK

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APPENDIX III

CHANNEL HYDRAULIC CALCULATIONS

AND

CULVERT HYDRAULIC CALCULATIONS

AND

DESILTATION BASIN CALCULATIONS

7-DR-2020
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NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS
CHANNEL P

DISCHARGE IS = 149 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .0048 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 24.17 FT
AREA IS = 32.51 SQ FT
WETTED PERIMETER IS = 24.67 FT
HYDRAULIC RADIUS IS = 1.32 FT
NORMAL DEPTH IS = 2.02 FT
VELOCITY IS = 4.58 FPS
FROUDE NUMBER IS = .7

Required Freeboard (h_f) for subcritical flow

$$h_f = 0.20\,d + \frac{V^2}{64.4}$$

$$= 0.20(2.02) + \frac{4.58^2}{64.4}$$

$$= .73'$$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS
CHANNEL P

DISCHARGE IS = 149 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .01 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 21.49 FT
AREA IS = 24.88 SQ FT
WETTED PERIMETER IS = 21.91 FT
HYDRAULIC RADIUS IS = 1.14 FT
NORMAL DEPTH IS = 1.69 FT
VELOCITY IS = 5.99 FPS
FROUDE NUMBER IS = .98

Subcritical

$h_f = .90'$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS
CHANNEL Q

DISCHARGE IS = 119 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .0134 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 19.19 FT
AREA IS = 19.02 SQ FT
WETTED PERIMETER IS = 19.53 FT
HYDRAULIC RADIUS IS = .97 FT
NORMAL DEPTH IS = 1.4 FT
VELOCITY IS = 6.26 FPS
FROUDE NUMBER IS = 1.11

For supercritical flow:

$$h_f = 0.25\,d$$

$$= 0.25(1.4)$$

$$= 0.35'$$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS

CHANNEL R

DISCHARGE IS = 325 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .004 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 32.43 FT
AREA IS = 61.72 SQ FT
WETTED PERIMETER IS = 33.18 FT
HYDRAULIC RADIUS IS = 1.86 FT
NORMAL DEPTH IS = 3.05 FT
VELOCITY IS = 5.27 FPS
FROUDE NUMBER IS = .67

Subcritical

$h_f = 1.0$ ft

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS

CHANNEL T

DISCHARGE IS = 167 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .004 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 25.86 FT
AREA IS = 37.78 SQ FT
WETTED PERIMETER IS = 26.41 FT
HYDRAULIC RADIUS IS = 1.43 FT
NORMAL DEPTH IS = 2.23 FT
VELOCITY IS = 4.42 FPS
FROUDE NUMBER IS = .64

Subcritical

$h_f = .75'$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS

CHANNEL T

DISCHARGE IS = 167 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .0087 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 22.78 FT
AREA IS = 28.43 SQ FT
WETTED PERIMETER IS = 23.24 FT
HYDRAULIC RADIUS IS = 1.22 FT
NORMAL DEPTH IS = 1.85 FT
VELOCITY IS = 5.87 FPS
FROUDE NUMBER IS = .93

Subcritical

$h_f = .91'$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS

CHANNEL U

DISCHARGE IS = 203 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .004 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 27.6 FT
AREA IS = 43.61 SQ FT
WETTED PERIMETER IS = 28.2 FT
HYDRAULIC RADIUS IS = 1.55 FT
NORMAL DEPTH IS = 2.45 FT
VELOCITY IS = 4.65 FPS
FROUDE NUMBER IS = .65

subcritical

$h_f = .83'$ Use 1 foot

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS

CHANNEL V

DISCHARGE IS = 1026 CFS
BOTTOM WIDTH IS = 16 FT
SLOPE IS = .0035 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 52.3 FT
AREA IS = 154.93 SQ FT
WETTED PERIMETER IS = 53.41 FT
HYDRAULIC RADIUS IS = 2.9 FT
NORMAL DEPTH IS = 4.54 FT
VELOCITY IS = 6.62 FPS
FROUDE NUMBER IS = .68

subcritical

$h_f = 1.6'$

NORMAL DEPTH FOR TRAPEZOIDAL CHANNELS

CHANNEL W

DISCHARGE IS = 146 CFS
BOTTOM WIDTH IS = 8 FT
SLOPE IS = .0025 FT/FT
SIDE SLOPE (Z1) = 4
SIDE SLOPE (Z2) = 4
MANNING'S N = .027
TOP WIDTH IS = 26.74 FT
AREA IS = 40.68 SQ FT
WETTED PERIMETER IS = 27.32 FT
HYDRAULIC RADIUS IS = 1.49 FT
NORMAL DEPTH IS = 2.34 FT
VELOCITY IS = 3.59 FPS
FROUDE NUMBER IS = .51

subcritical

$h_f = 0.67'$ Use 1 foot

ARIZONA DEPARTMENT OF TRANSPORTATION

CULVERT EXTENSION COMPUTATION RECORD

PROJECT: Perimeter Center

STATION: ______

DESIGNER: J. D.

DATE: 1-12-89

HYDROLOGIC AND CHANNEL INFORMATION

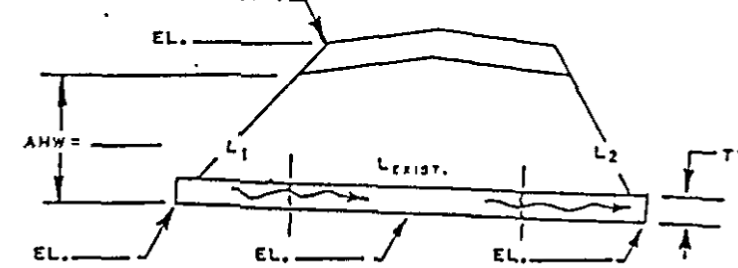
DRAINAGE AREA: ______

Q_1= ______ TW_1= ______

Q_2= ______ TW_2= ______

(Q_1 = DESIGN DISCHARGE, SAY Q_{25})
(Q_2 = CHECK DISCHARGE, SAY Q_{50})

SKETCH



S_{O_1} = ______ L_1 = ______

$S_{O_{EXIST.}}$ = ______ $L_{EXIST.}$ = ______

S_{O_2} = ______ L_2 = ______

L/100 S_O = ______

MEAN STREAM VELOCITY = ______

Culvert #	CULVERT DESCRIPTION SIZE	ENTR. TYPE	Q	CAP. CHART HW	HEADWATER COMPUTATION: INLET CONT. HW/D	HW	OUTLET CONTROL $HW = H + h_O - LS_O$: K_e L	H	d_c	$\frac{d_c + D}{2}$	TW	h_O	LS_O	HW	CONTROL HW	OUTLET VELOCITY	COST	OHW ELEV.	COMMENTS
1	QUAD CBC	10 X 4	1348	337 EA Q/B=33.7	1.38	5.5	110	1.7	3.3	3.65	3.0	3.65	0.55	4.8	5.5				Sta. 35+00 Bell Rd.
9	SINGLE CBC	10X4	268	Q/B=26.8	1.12	4.5	90	1.03	2.8	3.4	3.1	3.4	0.45	4.0	4.5				Sta. 14+60 84th Way
12	SINGLE CBC	10X3	176	Q/B=17.6	1.13	3.4	110	0.8	2.2	2.6	2.45	3.1	0.44	3.46	3.46				Sta. 10+85 84th Way

SUMMARY AND RECOMMENDATIONS

CBC's have 45° wingwalls and rounded edges (K_e = 0.2)

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JOB NO.

JOB: Perimeter Center Phase 1
SHEET NO. 1 OF 4
CALCULATED BY J.Q. DATE 1-16-89
CHECKED BY ______ DATE ______
SCALE ______

De-Siltation Basin Calculations - Storage Volumes

Parcel G - West Basin

Spillway Elevation (S.E.) = 47.0, Available Storage (A.S.) = 3,878 yd³

Onsite Drainage Area (DA) = 16.0 acres, C factor = 0.45

Volume of onsite water from a 100 yr. - 1 hr storm (V)

$$V = \left[\left(\frac{2.66 \text{ in/hr}}{12 \text{ in/ft}}\right)(16 \text{ acres})\left(\frac{43{,}560 \text{ ft}^2/\text{acre}}{27 \text{ ft}^3/\text{yd}^3}\right)\right]0.45 = 2{,}575 \text{ yd}^3 \text{ Ok}$$

Parcel G - East Basin - S.E. = 49.0, A.S. = 1,400 yd³
D.A. = 3.6 yd³, V = 580 yd³ Ok

Parcel J - West Basin - S.E. = 62.5, A.S. = 2,028 yd.³
D.A. = 5.1 ac., V = 821 yd³ Ok

Parcel J - East Basin - S.E. 59.0, A.S. = 2,169 yd³
D.A. = 8.2 ac., V = 1,320 yd³ Ok

Parcel K - West Basin - S.E. = 52.0, A.S. = 1,570 yd³
D.A. = 2.1 ac., V = 338 yd³ Ok

Parcel K - East Basin - S.E. = 53.65, A.S. = 3233 yd³
D.A. = 19.5 ac., V = 3,138 yd³ Ok

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JOB NO.

JOB Perimeter Center Phase 1
SHEET NO. 2 OF 4
CALCULATED BY J.A. DATE 1-16-89
CHECKED BY ______ DATE ______
SCALE ______

De-Siltation Basin Calculations - Drainage Calcs

Drain inlets will be 12" Ø CMP - 1 foot riser with 10" O.C. and staggerred small ($\frac{1}{2}$" to $1\frac{1}{2}$") diameter holes.

Drain pipe will be 8" diameter PVC, $n = .012$.

Parcel G - West Basin - Volume = 2,575 yd^3

Inlet capacity: Inlet elev. = 44.5, Spillway elev. = 47.0

$\text{Ave. Head} = \frac{47.0 - 44.5}{2} = 1.25 \text{ ft.}, \quad \frac{H}{R} = \frac{1.25}{0.5} = 2.5$

$Q = C 2\pi R H^{3/2}$, when $\frac{H}{R} > 2$, $C = 1$ (Design of Small Dams)

$\text{Ave. } Q = 2\pi(0.5)(1.25)^{3/2} = 4.4 \text{ cfs}$

Drain pipe capacity: $\text{Pipe slope} = \frac{42.83 - 39.16}{65} = 5.65\%$

$A = \pi \frac{D^2}{4} = \pi \frac{(\frac{8}{12})^2}{4} = 0.35 \text{ ft}^2, \quad P = 2\pi r = 2\pi(\frac{4}{12}) = 2.09 \text{ ft.}$

$R = \frac{A}{P} = \frac{.35}{2.09} = 0.17 \text{ ft.}$

$V = \frac{1.486}{n} R^{2/3} S^{1/2} = \frac{1.486}{.012}(0.17)^{2/3}(.0565)^{1/2} = 8.9 \text{ ft/s}$

$Q = VA = 8.9(0.35) = 3.1 \text{ ft}^3/s$

Use minimum Q: 3.1 ft^3/s, Time required to drain:

$T = \frac{2575 \text{ yd}^3}{3.1 \frac{ft^3}{s} \times \left(\frac{1 \text{ yd}}{3 \text{ ft}}\right)^3 \times \frac{3600 s}{1 \text{ hr}}} = 6.2 \text{ hrs.}$ OK

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JOB NO.	
JOB	Perimeter Center Phase 1
SHEET NO.	3 OF 4
CALCULATED BY	J.R. DATE 1-17-89
CHECKED BY	DATE
SCALE	

De-Siltation Basin Calculations - Drainage Calcs (cont'd)

Parcel G - East Basin - Volume = 580 yd^3

Inlet capacity: Inlet elev. = 47.0, Spillway elev. = 49.0

Ave. Head (H) = $\frac{49.0 - 47.0}{2} = 1.0$ ft., $\frac{H}{R} = 2$

Ave. $Q = 2\pi(0.5)(1)^{3/2} = 3.14$ cfs

Drain pipe capacity: Pipe slope = $\frac{45.33 - 40.26}{60} = 8.45\%$

V = 10.9 fps, Q = 10.9(0.35) = 3.8 cfs

Minimum Q = 3.14 cfs → T = 1.4 hrs. OK

Parcel J - West Basin - Volume = 821 yd^3

Inlet capacity: Inlet elev. = 60.0, Spillway elev. = 62.5

Ave. H = 1.25 ft, $\frac{H}{R} = 2.5$, Ave. Q = 4.4 cfs

Drain pipe capacity: Pipe slope = $\frac{58.33 - 54.07}{90} = 4.74\%$

V = 8.2 fps, Q = 2.9 cfs

Minimum Q = 2.9 cfs → T = 2.1 hrs. OK

7-DR-2020
5/29/2020

Collar, Williams & White Engineering
Consulting Engineers and Land Surveyors
2702 N. 44TH ST., SUITE 100A
PHOENIX, ARIZONA 85008
PHONE: (602) 957-3350

JOB NO.

JOB: Perimeter Center Phase 1
SHEET NO. 4 OF 4
CALCULATED BY: J.B. DATE: 1-17-89
CHECKED BY: DATE:
SCALE:

De-Siltation Basin Calculations - Drainage Calcs (cont'd)

Parcel J - East Basin - Volume = 1,320 yd^3

Inlet capacity: Inlet elev. = 56.0, Spillway elev. = 59.0

Ave. H = 1.5 ft, $\frac{H}{R}$ = 3.0, Ave. Q = 5.77 cfs

Drain pipe capacity: Pipe slope = $\frac{54.33-51.41}{65}$ = 4.5%

V = 8.0 fps, Q = 2.8 cfs ⟶ T = 3.5 hrs. OK

Parcel K - West Basin - Volume = 338 yd^3

Inlet Capacity: Inlet elev. = 50.0, Spillway elev. = 52.0

Ave. H = 1 ft., $\frac{H}{R}$ = 2, Ave. Q = 3.14 cfs

Drain pipe capacity: Pipe slope = $\frac{48.33-43.92}{52}$ = 8.5%

V = 11 fps, Q = 3.85 cfs, Min Q = 3.14 cfs ⟶ T = 0.8 hrs. OK

Parcel K - East Basin - Volume = 3138 yd^3 (2-drains)

Inlet capacity: Inlet elev. = 52.0, Spillway elev. = 53.65

Ave. H = 0.83 ft., $\frac{H}{R}$ = 1.65, C = 1.3 ⟶ Ave. Q = 3.1 x 2 pipes = 6.2 cfs

Drain pipe capacities: Pipe slopes = $\frac{50.33-46.16}{53}$ = 7.9%, $\frac{50.33-49.54}{41}$ = 1.9%

V = 10.6 + 5.2 fps, Q = 3.7 + 1.8 cfs ⟶ Combined Q = 5.5 cfs

Minimum Q = 5.5 cfs ⟶ T = 4.3 hrs. OK

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APPENDIX D
PRINCESS MEDICAL CENTER DRAINGE REPORT

PRINCESS MEDICAL CENTER
SWC PRINCESS DRIVE & PIMA FREEWAY (LOOP 101)
SCOTTSDALE, ARIZONA

PRELIMINARY DRAINAGE REPORT

Prepared by:
CMX, L.L.C.
1515 E. Missouri, Suite 115
Phoenix, Arizona 85014
Phone: 602-279-8436

Registered Professional Engineer (Civil)
CERTIFICATE NO.
16980
RONALD W.
HILGART, JR.
Date Signed
ARIZONA, U.S.A.

May 20, 2002
Project No. 6730

7-DR-2020
5/29/2020

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Registered Professional Engineer (Civil)
CERTIFICATE No.
16960
RONALD W.
HILGART, JR.
Date Signed
ARIZONA, U.S.A.

7-DR-2020
5/29/2020

I. PROJECT DESCRIPTION

Princess Medical Center is a proposed 7.5-acre project located on the southwest corner of Princess Drive and the Pima Freeway (Loop 101) in Scottsdale, Arizona. It is a parcel located within the SCOTTSDALE PERIMETER CENTER master planned area. The site is undeveloped and slopes approximately 10 feet from northeast to southwest. An existing drainage channel is located along the south property line.

Onsite improvements consist of three medical buildings, parking and landscape areas, water, fire and sewer services and drainage facilities.

Offsite improvements including paving, grading, storm drain, water and sewer were constructed with the Scottsdale Perimeter Center infrastructure. Two new driveway entrances will be constructed with this project.

II. OFFSITE DRAINAGE

The construction of the Pima Freeway and existing improvements in Princess Drive and Anderson Drive including a greenbelt drainage channel on the south side of the project will prevent offsite drainage from entering this project. The properties to the east and west drain away from this site and do not impact it. The existing drainage channel on the south side collects runoff from this site and carries it to the central retention facility located within the golf course.

Stormwater runoff from the Pima Freeway consists of the adjacent frontage road draining through an existing curb opening. A small grader ditch along a portion of the east property line of this site will collect frontage road stormwater and carry it to the southeast corner where it will be combined with additional drainage from the expressway.

III. ONSITE DRAINAGE

No stormwater retention is being provided with this project. 100-year, 2-hour retention for the SCOTTSDALE PERIMETER CENTER, including this site, has been provided within the T.P.C. Scottsdale Golf Course. See the master drainage report for Scottsdale Perimeter Center prepared by Collier, Williams and White (Rick Engineering) for details.

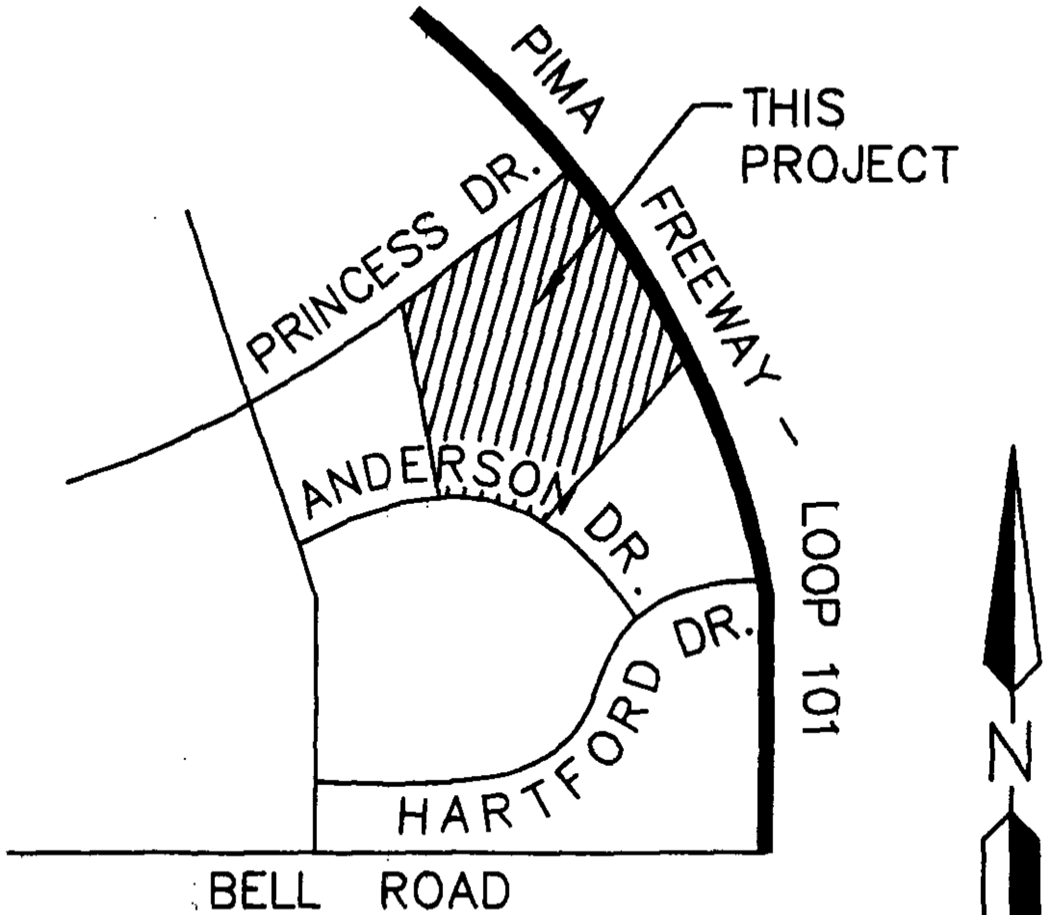
All stormwater for this project will drain to the south property line and be directed into the existing drainage channel along Anderson Drive. This channel drains to the west and into an existing retention basin within the golf course. See the preliminary grading and drainage plan in Appendix A for additional details.

IV. FLOOD PLAIN DESIGNATION

This site is located with a Zone AO flood plain according to the FEMA Flood insurance map (Panel 04013C1245F) dated September 30, 1995. Zone AO is defined by FEMA as having a flood depth of 1 foot and an average velocity of 3 cubic feet per second. To conform to FEMA and the City of Scottsdale Floodplain requirements, the finish floors have been elevated a minimum of 1 foot above the surrounding finish grade.

V. Conclusions

- Offsite drainage impacting this site will be limited to flows from the adjacent freeway frontage road. This will be carried in a grader ditch along the east property line and combined with other flows in the greenbelt channel along the south side of this project.
- Onsite drainage will flow into the greenbelt channel along the south side of this project. No onsite stormwater retention is being provided per the Master Drainage Report for the Scottsdale Perimeter Center.
- To meet the design criteria for a Zone AO flood plain designation, the building finish floor elevations (1580.00) have been set at a minimum of one foot above the highest adjacent grade (1579.00). The site outfall is at an elevation of 1575.00.



VICINITY MAP

N.T.S.

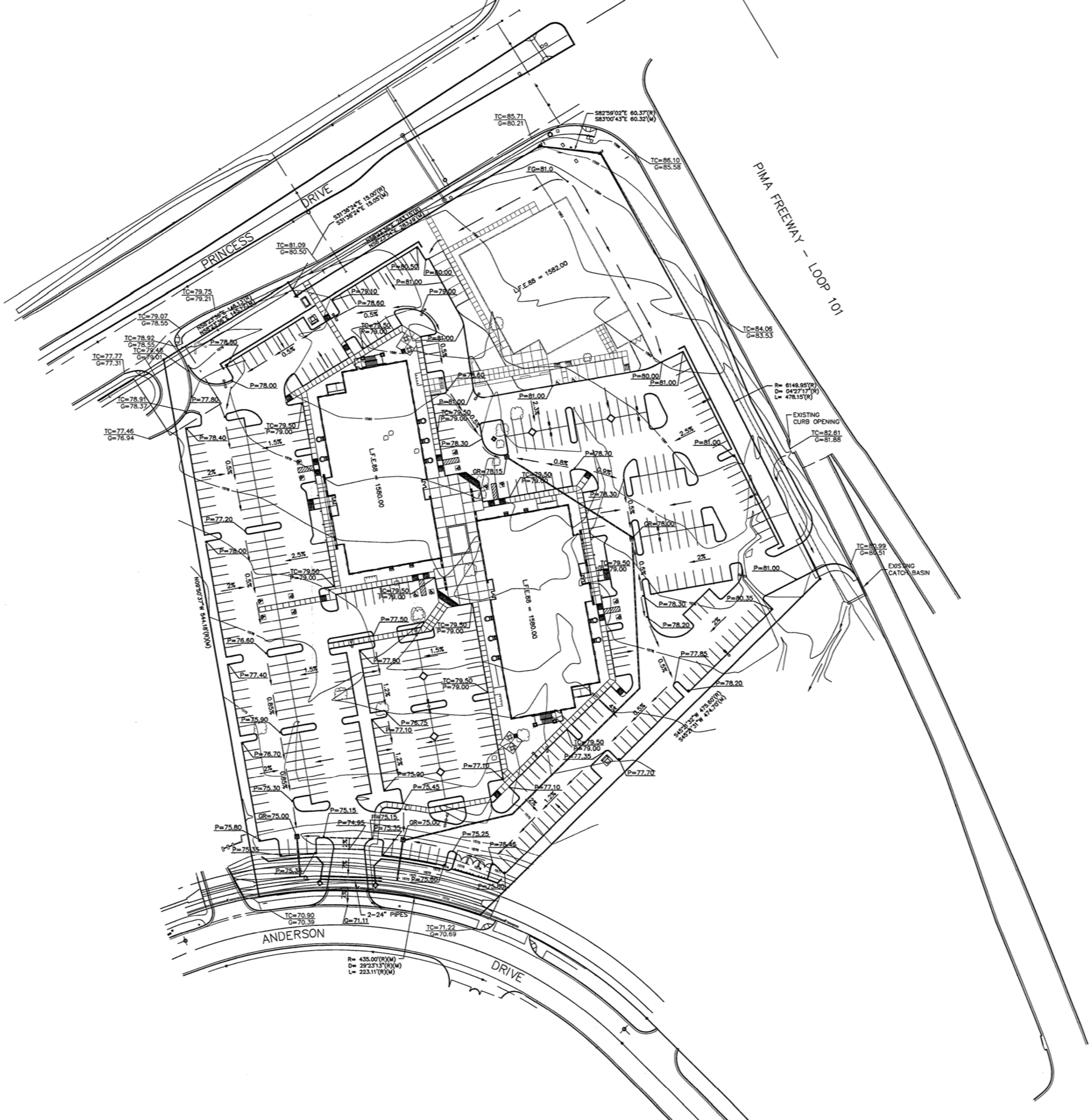
EXHIBIT A

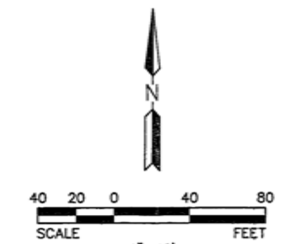
7-DR-2020
5/29/2020

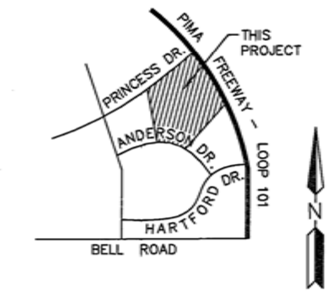
APPENDIX A

PRELIMINARY GRADING & DRAINAGE PLAN

7-DR-2020
5/29/2020







VICINITY MAP
N.T.S.

BENCH MARK:

CITY OF SCOTTSDALE ALUMINUM CAP IN HANDHOLE WEST OF HAYDEN IN GOLF COURSE, BELL ROAD ALIGNMENT. ELEVATION = 1542.865 (NAD 88 DATUM)

LEGEND:

—1581—	EXISTING CONTOUR
P=	FINISH PAVEMENT ELEVATION
TC=	FINISH TOP OF CURB ELEVATION
G=	FINISH GUTTER GRADE
GR=	TOP OF GRATE ELEVATION
FG=	FINISH GRADE ELEVATION
LFE88=	LOWEST FINISH FLOOR ELEVATION (NAD 88 DATUM)
2%	DIRECTION & SLOPE OF DRAINAGE
	STORM DRAIN PIPE
	CATCH BASIN

STORM WATER RETENTION:

100–YEAR, 2–HOUR STORMWATER RETENTION FOR THE SCOTTSDALE PERIMETER CENTER, INCLUDING THIS SITE, HAS BEEN PROVIDED WITHIN THE T.P.C. SCOTTSDALE GOLF COURSE. SEE THE MASTER DRAINAGE REPORT PREPARED BY COLLIER, WILLIAMS AND WHITE (RICK ENGINEERING) FOR DETAILS.

CMX GROUP INC.
1515 E. MISSOURI, SUITE 115
PHOENIX, ARIZONA 85014
PHONE: (602)279–8436

PROJECT ENGINEER: RONALD W. HILGART, JR.
AZ. REG. NO. 16980

PROJECT COORDINATION: GEORGE C. SWARSTAD

PRINCESS MEDICAL CENTER

SWC PRINCESS DRIVE & LOOP 101
SCOTTSDALE, ARIZONA

PRELIMINARY GRADING & DRAINAGE PLAN

CMX
1515 E. MISSOURI STE. 115
PHOENIX, AZ 85014
PHONE: (602) 279–8436
FAX: (602) 265–1191

CMX PROJ. 6730
DESIGNED: G.S.
REV.

7-DR-2020
5/29/2020

APPENDIX E
REFERENCE INFORMATION

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.6458°, Longitude: -111.8938°
Elevation: 1581.56 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	**0.197** (0.163-0.242)	**0.257** (0.215-0.315)	**0.347** (0.287-0.424)	**0.416** (0.342-0.507)	**0.509** (0.412-0.617)	**0.579** (0.464-0.698)	**0.652** (0.512-0.784)	**0.724** (0.560-0.869)	**0.822** (0.620-0.988)	**0.896** (0.662-1.08)
10-min	**0.300** (0.249-0.368)	**0.391** (0.327-0.480)	**0.528** (0.437-0.645)	**0.633** (0.521-0.771)	**0.773** (0.626-0.939)	**0.881** (0.705-1.06)	**0.992** (0.780-1.19)	**1.10** (0.852-1.32)	**1.25** (0.943-1.50)	**1.37** (1.01-1.64)
15-min	**0.371** (0.308-0.456)	**0.485** (0.405-0.595)	**0.655** (0.541-0.800)	**0.785** (0.645-0.956)	**0.959** (0.776-1.16)	**1.09** (0.874-1.32)	**1.23** (0.967-1.48)	**1.37** (1.06-1.64)	**1.55** (1.17-1.87)	**1.69** (1.25-2.04)
30-min	**0.500** (0.415-0.614)	**0.653** (0.546-0.802)	**0.881** (0.729-1.08)	**1.06** (0.869-1.29)	**1.29** (1.05-1.57)	**1.47** (1.18-1.77)	**1.66** (1.30-1.99)	**1.84** (1.42-2.21)	**2.09** (1.57-2.51)	**2.28** (1.68-2.74)
60-min	**0.619** (0.514-0.759)	**0.809** (0.675-0.992)	**1.09** (0.902-1.33)	**1.31** (1.08-1.59)	**1.60** (1.29-1.94)	**1.82** (1.46-2.19)	**2.05** (1.61-2.46)	**2.28** (1.76-2.73)	**2.59** (1.95-3.11)	**2.82** (2.08-3.40)
2-hr	**0.724** (0.609-0.868)	**0.936** (0.790-1.13)	**1.25** (1.05-1.49)	**1.48** (1.23-1.77)	**1.81** (1.48-2.15)	**2.05** (1.66-2.43)	**2.30** (1.84-2.72)	**2.56** (2.01-3.01)	**2.90** (2.22-3.42)	**3.16** (2.37-3.74)
3-hr	**0.799** (0.672-0.979)	**1.02** (0.864-1.26)	**1.34** (1.12-1.64)	**1.59** (1.32-1.93)	**1.93** (1.58-2.33)	**2.21** (1.78-2.65)	**2.49** (1.98-3.00)	**2.80** (2.18-3.35)	**3.20** (2.42-3.84)	**3.53** (2.61-4.24)
6-hr	**0.962** (0.826-1.14)	**1.21** (1.04-1.45)	**1.55** (1.32-1.83)	**1.82** (1.53-2.14)	**2.18** (1.82-2.56)	**2.46** (2.02-2.88)	**2.76** (2.23-3.21)	**3.06** (2.43-3.58)	**3.46** (2.68-4.05)	**3.78** (2.86-4.43)
12-hr	**1.09** (0.939-1.28)	**1.37** (1.18-1.61)	**1.73** (1.48-2.03)	**2.01** (1.72-2.35)	**2.39** (2.02-2.79)	**2.68** (2.24-3.12)	**2.99** (2.45-3.47)	**3.29** (2.67-3.82)	**3.70** (2.92-4.31)	**4.01** (3.11-4.70)
24-hr	**1.27** (1.12-1.47)	**1.62** (1.42-1.87)	**2.09** (1.83-2.42)	**2.47** (2.15-2.85)	**3.00** (2.59-3.45)	**3.41** (2.93-3.92)	**3.85** (3.27-4.43)	**4.31** (3.61-4.95)	**4.94** (4.08-5.69)	**5.44** (4.43-6.29)
2-day	**1.39** (1.21-1.60)	**1.77** (1.55-2.04)	**2.32** (2.02-2.67)	**2.76** (2.39-3.17)	**3.37** (2.90-3.87)	**3.86** (3.29-4.43)	**4.38** (3.70-5.03)	**4.91** (4.11-5.67)	**5.66** (4.66-6.55)	**6.26** (5.08-7.28)
3-day	**1.49** (1.31-1.71)	**1.91** (1.68-2.19)	**2.52** (2.20-2.88)	**3.01** (2.63-3.44)	**3.70** (3.21-4.23)	**4.26** (3.67-4.87)	**4.86** (4.14-5.56)	**5.49** (4.63-6.30)	**6.38** (5.30-7.34)	**7.10** (5.82-8.22)
4-day	**1.60** (1.41-1.83)	**2.05** (1.81-2.34)	**2.72** (2.39-3.09)	**3.26** (2.86-3.71)	**4.04** (3.52-4.59)	**4.67** (4.04-5.31)	**5.35** (4.59-6.09)	**6.07** (5.15-6.94)	**7.10** (5.94-8.14)	**7.94** (6.56-9.15)
7-day	**1.81** (1.59-2.08)	**2.31** (2.03-2.65)	**3.08** (2.70-3.52)	**3.70** (3.23-4.22)	**4.59** (3.97-5.23)	**5.31** (4.57-6.06)	**6.08** (5.19-6.95)	**6.91** (5.84-7.93)	**8.09** (6.74-9.32)	**9.06** (7.44-10.5)
10-day	**1.97** (1.73-2.25)	**2.52** (2.22-2.88)	**3.35** (2.94-3.81)	**4.01** (3.51-4.57)	**4.96** (4.31-5.63)	**5.72** (4.94-6.50)	**6.54** (5.60-7.45)	**7.41** (6.28-8.46)	**8.64** (7.22-9.90)	**9.64** (7.95-11.1)
20-day	**2.44** (2.16-2.78)	**3.15** (2.78-3.58)	**4.17** (3.67-4.73)	**4.95** (4.34-5.61)	**6.01** (5.25-6.81)	**6.83** (5.94-7.75)	**7.68** (6.64-8.74)	**8.55** (7.34-9.76)	**9.74** (8.26-11.2)	**10.7** (8.96-12.3)
30-day	**2.87** (2.53-3.26)	**3.70** (3.26-4.20)	**4.89** (4.31-5.54)	**5.81** (5.10-6.57)	**7.04** (6.15-7.97)	**8.00** (6.96-9.05)	**8.99** (7.77-10.2)	**10.0** (8.59-11.3)	**11.4** (9.67-12.9)	**12.4** (10.5-14.2)
45-day	**3.36** (2.98-3.81)	**4.34** (3.84-4.91)	**5.74** (5.08-6.49)	**6.79** (5.98-7.67)	**8.18** (7.18-9.25)	**9.25** (8.08-10.5)	**10.3** (8.97-11.7)	**11.5** (9.87-13.0)	**12.9** (11.0-14.8)	**14.1** (11.9-16.2)
60-day	**3.74** (3.32-4.23)	**4.85** (4.30-5.47)	**6.40** (5.66-7.21)	**7.53** (6.65-8.49)	**9.03** (7.94-10.2)	**10.2** (8.88-11.5)	**11.3** (9.83-12.8)	**12.4** (10.8-14.1)	**13.9** (12.0-15.9)	**15.1** (12.8-17.3)

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

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

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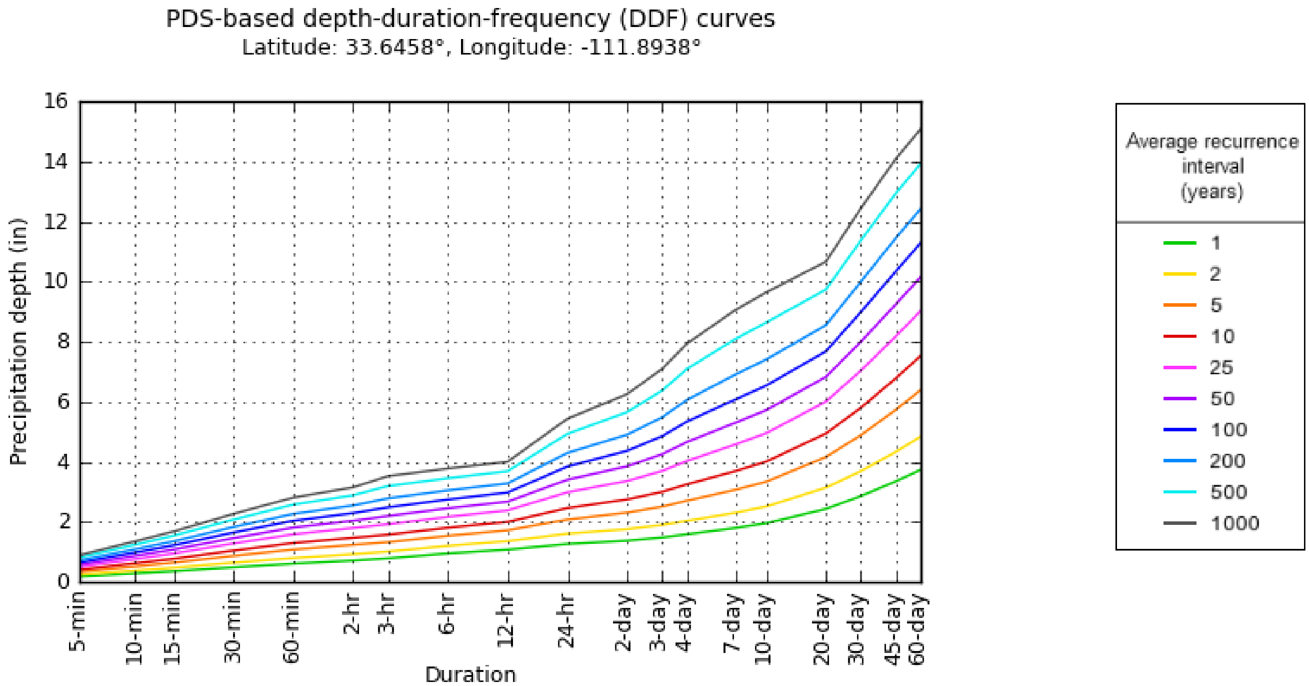
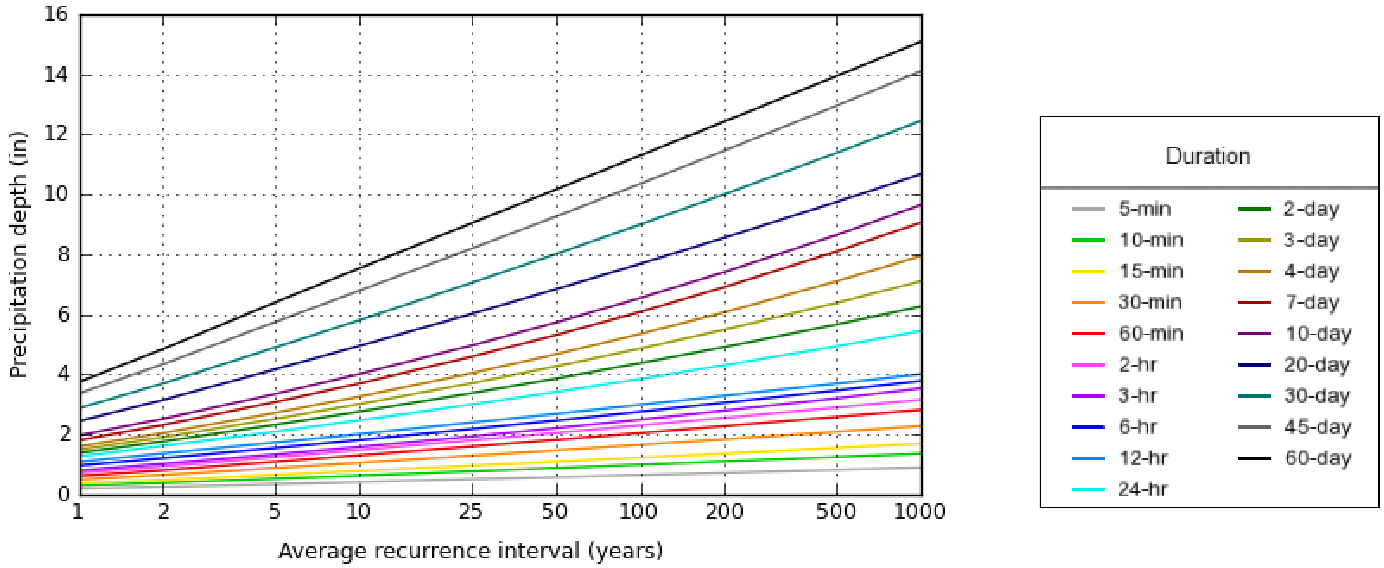
5/29/2020





NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Thu Apr 23 16:07:25 2020

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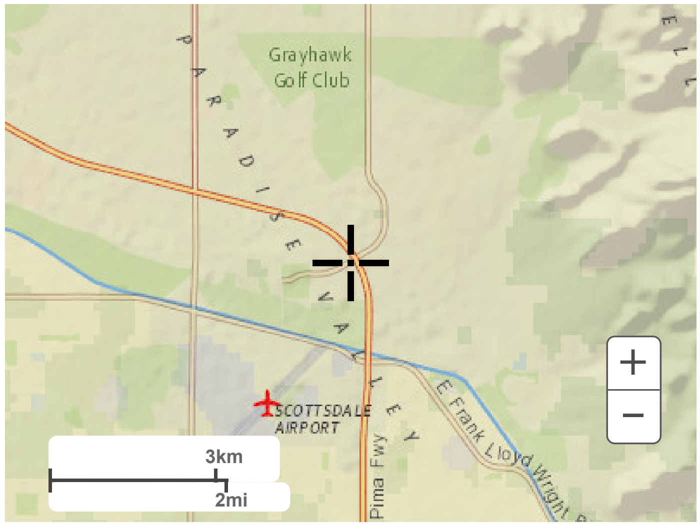
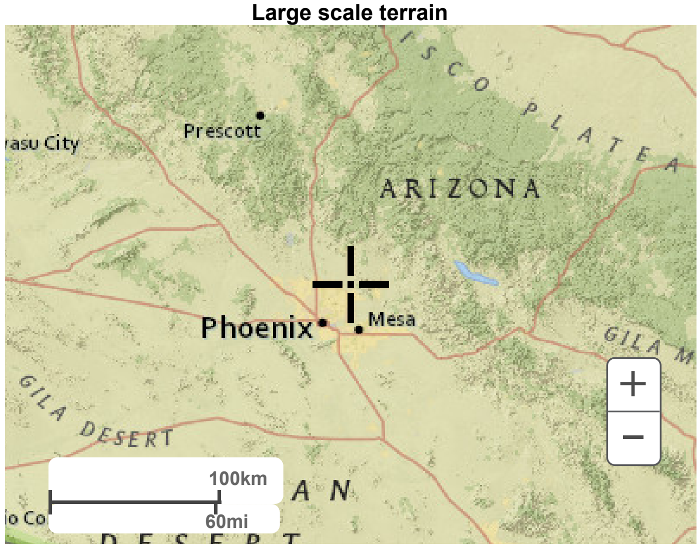
Maps & aerials

Small scale terrain

7-DR-2020
5/29/2020



Large scale terrain



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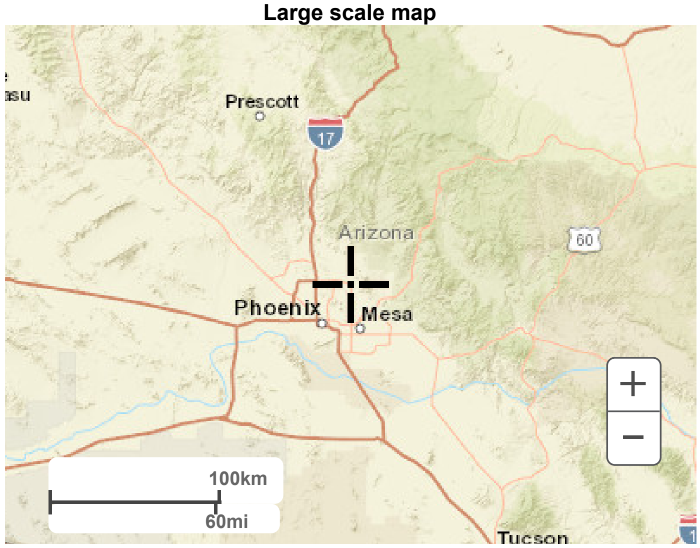
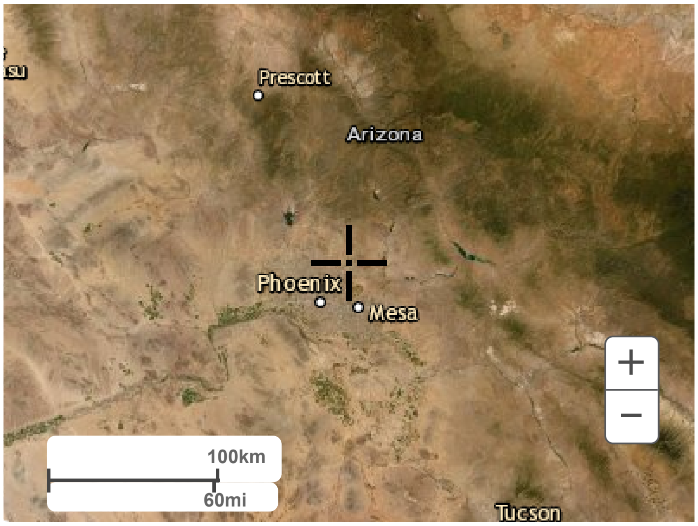


Large scale aerial

7-DR-2020
5/29/2020



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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

7-DR-2020
5/29/2020

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.6458°, Longitude: -111.8938°
Elevation: 1581.56 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	2.36 (1.96-2.90)	3.08 (2.58-3.78)	4.16 (3.44-5.09)	4.99 (4.10-6.08)	6.11 (4.94-7.40)	6.95 (5.57-8.38)	7.82 (6.14-9.41)	8.69 (6.72-10.4)	9.86 (7.44-11.9)	10.8 (7.94-13.0)
10-min	1.80 (1.49-2.21)	2.35 (1.96-2.88)	3.17 (2.62-3.87)	3.80 (3.13-4.63)	4.64 (3.76-5.63)	5.29 (4.23-6.37)	5.95 (4.68-7.16)	6.61 (5.11-7.94)	7.51 (5.66-9.02)	8.19 (6.05-9.86)
15-min	1.48 (1.23-1.82)	1.94 (1.62-2.38)	2.62 (2.16-3.20)	3.14 (2.58-3.82)	3.84 (3.10-4.66)	4.37 (3.50-5.26)	4.92 (3.87-5.92)	5.46 (4.23-6.56)	6.20 (4.68-7.46)	6.77 (5.00-8.15)
30-min	1.00 (0.830-1.23)	1.31 (1.09-1.60)	1.76 (1.46-2.15)	2.11 (1.74-2.57)	2.58 (2.09-3.13)	2.94 (2.35-3.54)	3.31 (2.60-3.98)	3.68 (2.85-4.42)	4.18 (3.15-5.02)	4.56 (3.36-5.49)
60-min	0.619 (0.514-0.759)	0.809 (0.675-0.992)	1.09 (0.902-1.33)	1.31 (1.08-1.59)	1.60 (1.29-1.94)	1.82 (1.46-2.19)	2.05 (1.61-2.46)	2.28 (1.76-2.73)	2.59 (1.95-3.11)	2.82 (2.08-3.40)
2-hr	0.362 (0.304-0.434)	0.468 (0.395-0.562)	0.623 (0.522-0.744)	0.742 (0.615-0.885)	0.904 (0.742-1.07)	1.02 (0.831-1.21)	1.15 (0.918-1.36)	1.28 (1.00-1.51)	1.45 (1.11-1.71)	1.58 (1.19-1.87)
3-hr	0.266 (0.224-0.326)	0.341 (0.288-0.419)	0.445 (0.374-0.545)	0.528 (0.438-0.642)	0.643 (0.526-0.777)	0.735 (0.594-0.884)	0.830 (0.658-0.998)	0.931 (0.725-1.11)	1.07 (0.807-1.28)	1.18 (0.869-1.41)
6-hr	0.161 (0.138-0.191)	0.203 (0.174-0.241)	0.259 (0.221-0.306)	0.303 (0.256-0.357)	0.364 (0.304-0.427)	0.411 (0.338-0.481)	0.460 (0.373-0.537)	0.511 (0.406-0.597)	0.578 (0.448-0.676)	0.632 (0.478-0.739)
12-hr	0.090 (0.078-0.106)	0.114 (0.098-0.134)	0.144 (0.123-0.168)	0.167 (0.142-0.195)	0.199 (0.167-0.232)	0.223 (0.186-0.259)	0.248 (0.203-0.288)	0.273 (0.221-0.317)	0.307 (0.242-0.358)	0.333 (0.258-0.390)
24-hr	0.053 (0.047-0.061)	0.067 (0.059-0.078)	0.087 (0.076-0.101)	0.103 (0.090-0.119)	0.125 (0.108-0.144)	0.142 (0.122-0.163)	0.160 (0.136-0.184)	0.179 (0.151-0.206)	0.206 (0.170-0.237)	0.227 (0.185-0.262)
2-day	0.029 (0.025-0.033)	0.037 (0.032-0.043)	0.048 (0.042-0.056)	0.057 (0.050-0.066)	0.070 (0.060-0.081)	0.080 (0.069-0.092)	0.091 (0.077-0.105)	0.102 (0.086-0.118)	0.118 (0.097-0.136)	0.130 (0.106-0.152)
3-day	0.021 (0.018-0.024)	0.027 (0.023-0.030)	0.035 (0.031-0.040)	0.042 (0.036-0.048)	0.051 (0.045-0.059)	0.059 (0.051-0.068)	0.068 (0.058-0.077)	0.076 (0.064-0.088)	0.089 (0.074-0.102)	0.099 (0.081-0.114)
4-day	0.017 (0.015-0.019)	0.021 (0.019-0.024)	0.028 (0.025-0.032)	0.034 (0.030-0.039)	0.042 (0.037-0.048)	0.049 (0.042-0.055)	0.056 (0.048-0.063)	0.063 (0.054-0.072)	0.074 (0.062-0.085)	0.083 (0.068-0.095)
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 (0.024-0.031)	0.032 (0.027-0.036)	0.036 (0.031-0.041)	0.041 (0.035-0.047)	0.048 (0.040-0.055)	0.054 (0.044-0.062)
10-day	0.008 (0.007-0.009)	0.011 (0.009-0.012)	0.014 (0.012-0.016)	0.017 (0.015-0.019)	0.021 (0.018-0.023)	0.024 (0.021-0.027)	0.027 (0.023-0.031)	0.031 (0.026-0.035)	0.036 (0.030-0.041)	0.040 (0.033-0.046)
20-day	0.005 (0.004-0.006)	0.007 (0.006-0.007)	0.009 (0.008-0.010)	0.010 (0.009-0.012)	0.013 (0.011-0.014)	0.014 (0.012-0.016)	0.016 (0.014-0.018)	0.018 (0.015-0.020)	0.020 (0.017-0.023)	0.022 (0.019-0.026)
30-day	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.010 (0.009-0.011)	0.011 (0.010-0.013)	0.012 (0.011-0.014)	0.014 (0.012-0.016)	0.016 (0.013-0.018)	0.017 (0.015-0.020)
45-day	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.007)	0.008 (0.007-0.009)	0.009 (0.007-0.010)	0.010 (0.008-0.011)	0.011 (0.009-0.012)	0.012 (0.010-0.014)	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 (0.006-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.009 (0.007-0.010)	0.010 (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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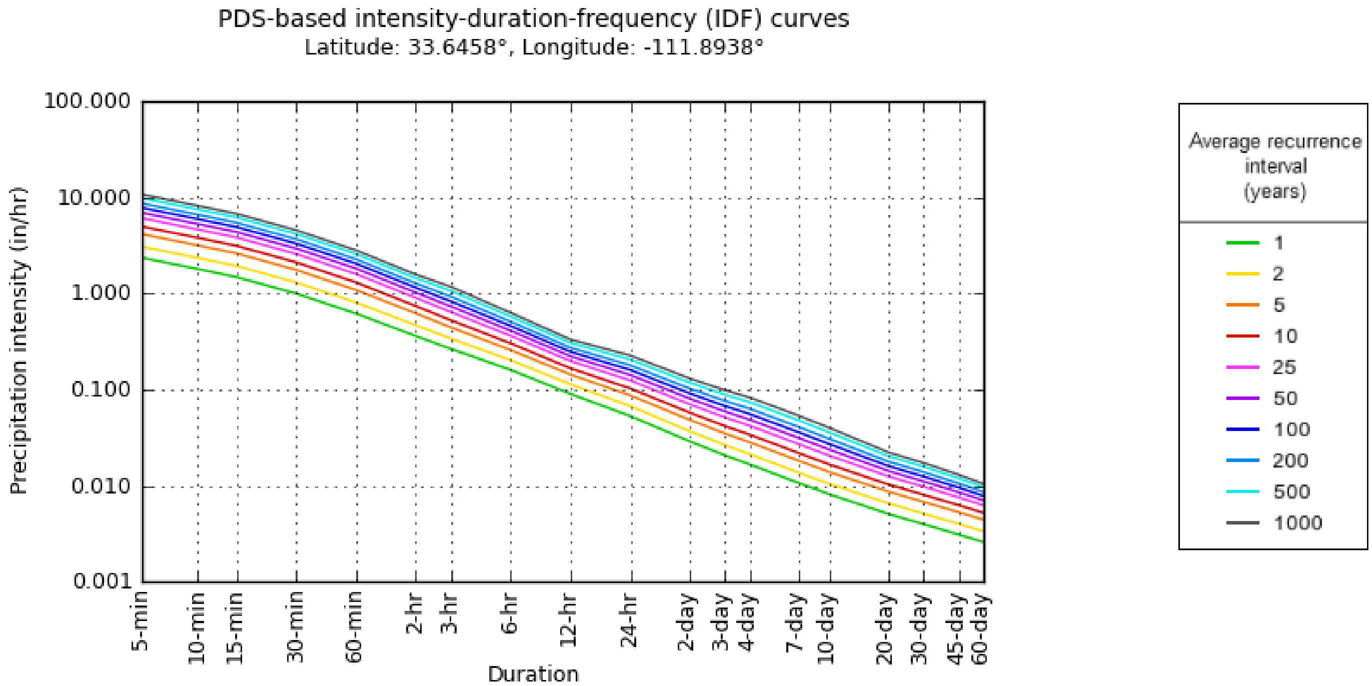
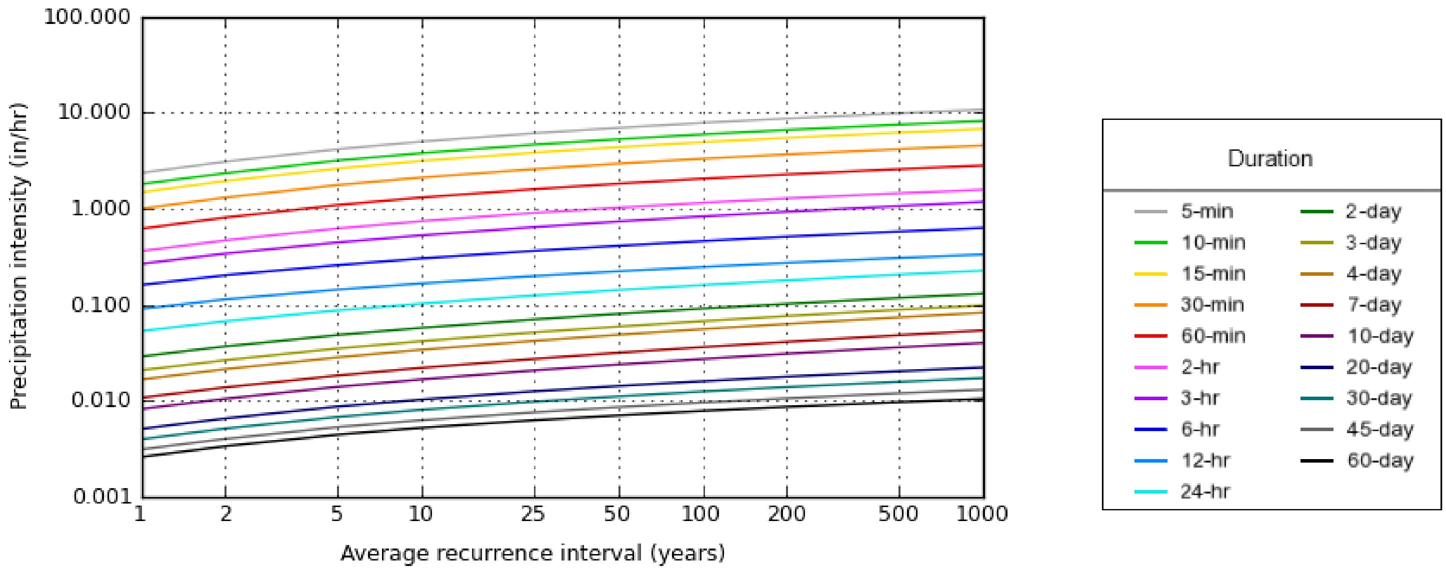
PF graphical

7-DR-2020
5/29/2020





NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Thu Apr 23 16:08:39 2020

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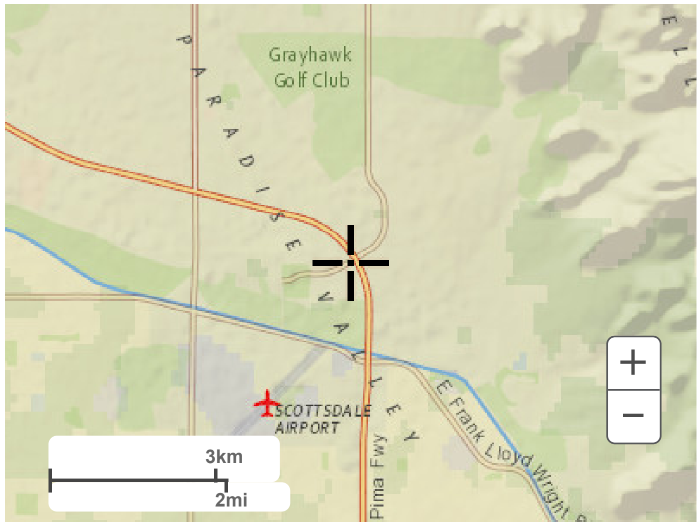
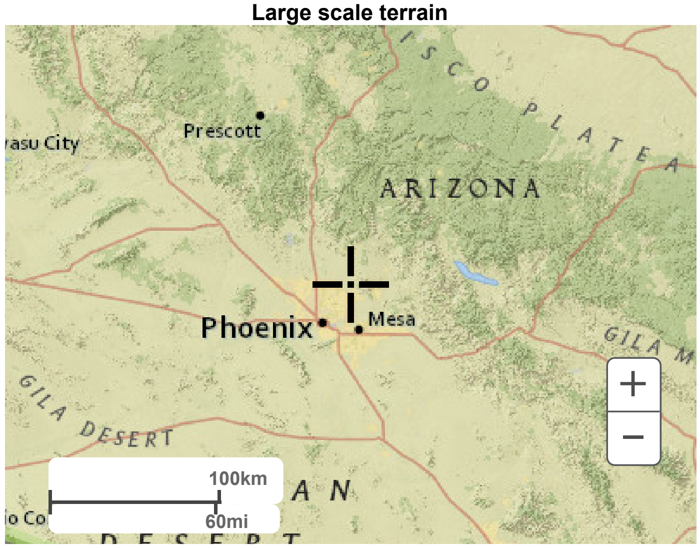
Maps & aerials

Small scale terrain

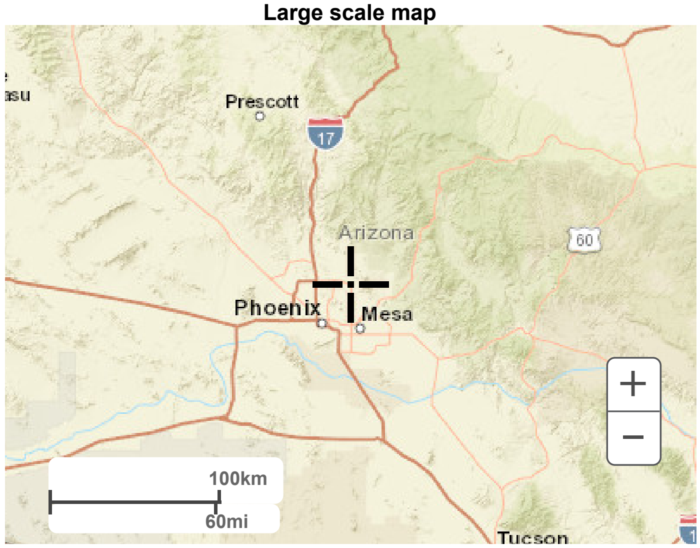
7-DR-2020
5/29/2020



Large scale terrain

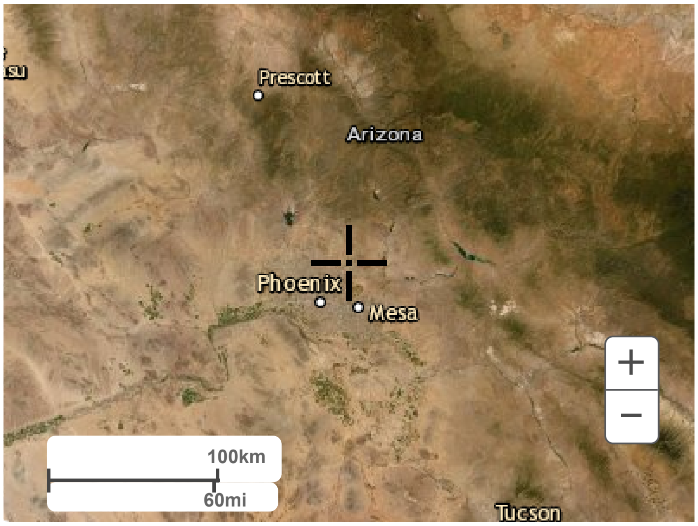


Large scale map



Large scale aerial

7-DR-2020
5/29/2020



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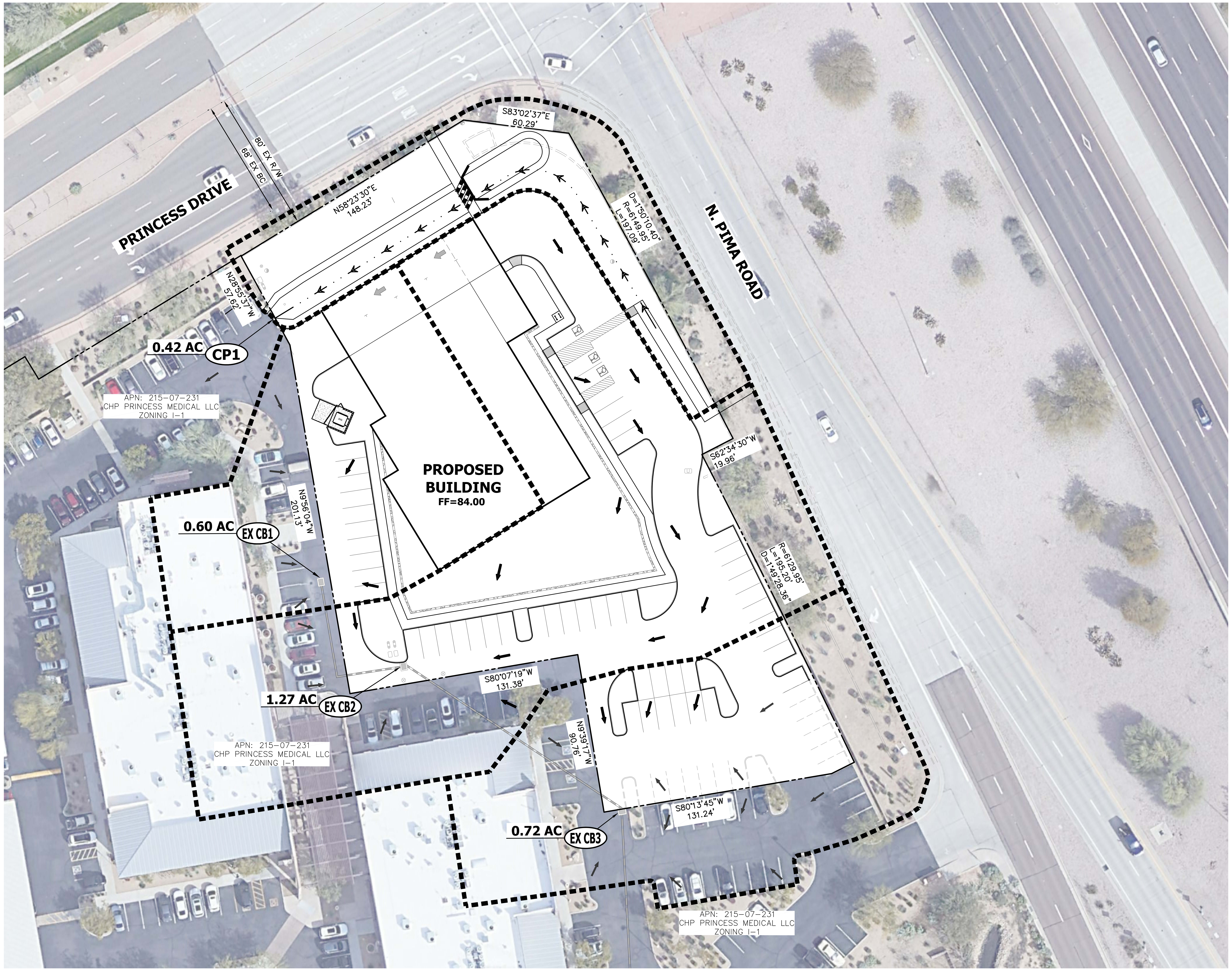
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

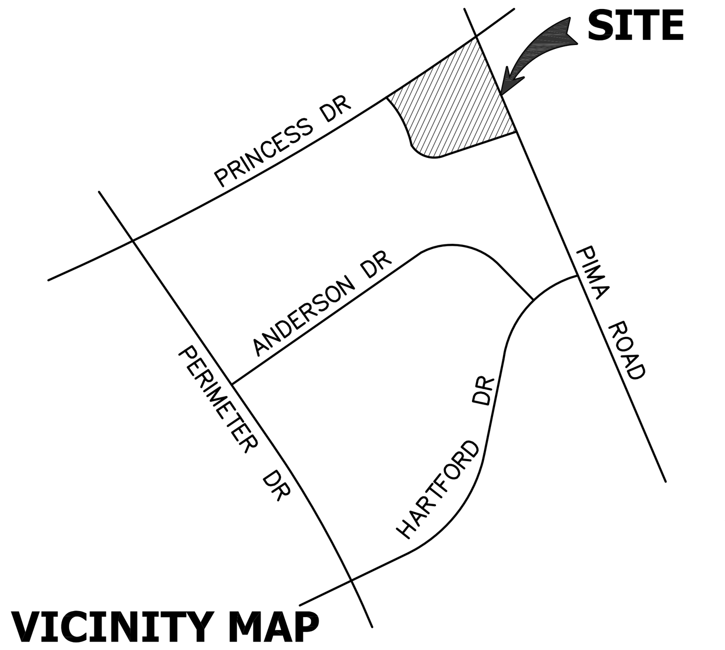
Disclaimer

7-DR-2020
5/29/2020

DRAINAGE EXHIBIT 'A'
FOR
PLATINUM STORAGE
8585 E. PRINCESS DRIVE
SCOTTSDALE, ARIZONA 85255

PARCEL 1 AS SHOWN ON THE LAND DIVISION PLAT "PRINCESS MEDICAL CENTER", IN SOUTHEAST QUARTER OF SECTION 36, TOWNSHIP 4 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.





VICINITY MAP

NTS

LEGEND

	EXISTING STORM LINE
	PROPOSED FLOW ARROW
	DRAINAGE AREA BOUNDARY
CB 0.00 AC	CATCH BASIN AREA
CP 0.00 AC	CATCH POINT AREA

N

0' 30' 60'

1" = 30'

NO.	DATE	REVISION	BY

PURPOSE: PRELIM SITE PLAN

DESIGN BY: GDH
DRAWN BY: GDH
CHECKED BY: GDH

HUNTER ENGINEERING
CIVIL AND SURVEY
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986

PRELIMINARY PLANS
–
NOT FOR CONSTRUCTION

DRAINAGE EXHIBIT 'A'
FOR
PLATINUM STORAGE
SWC PIMA AND PRINCESS
SCOTTSDALE, ARIZONA

CONTACT ARIZONA 811 AT LEAST 2 FULL WORKING DAYS BEFORE YOU BEGIN EXCAVATION
ARIZONA811
CALL 811 OR CLICK ARIZONA811.COM

THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

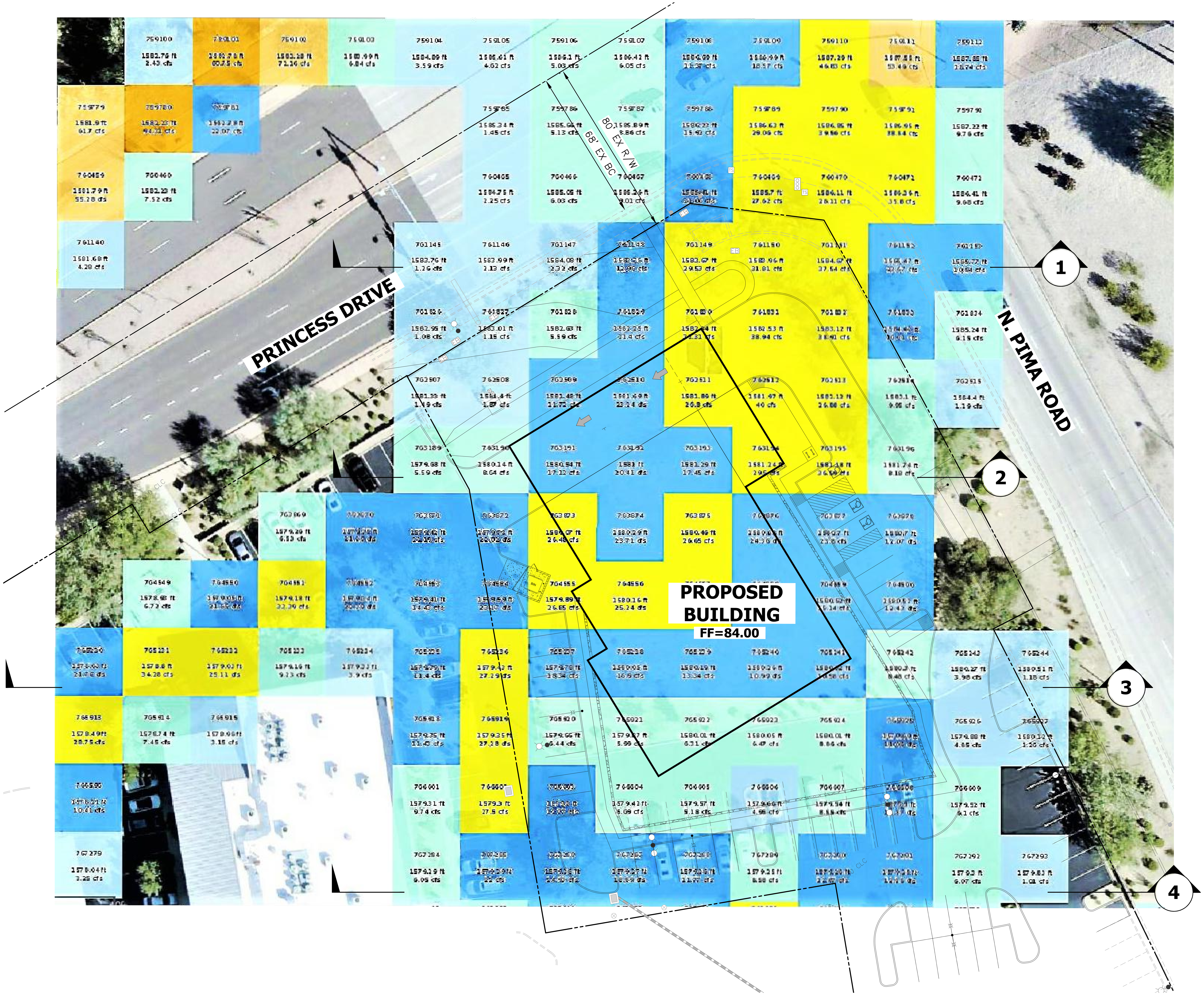
HE JOB NO.: PLAT003

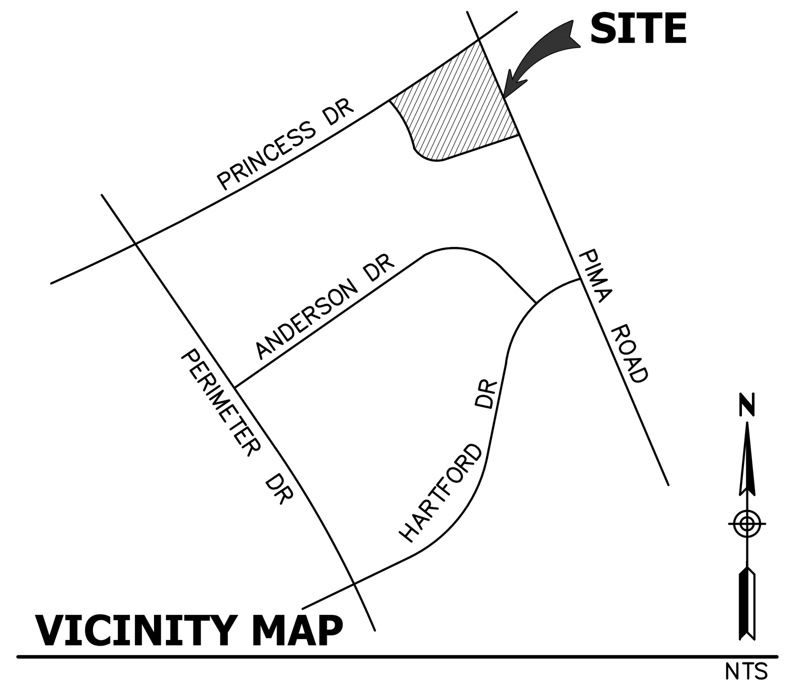
SCALE 1" = 30'

SHEET
EX 'A'

1 OF 1

7-DR-2020
5/29/2020





VICINITY MAP

NTS

FLO-2D RESULTS

CROSS SECTION	CFS	AVERAGE WATER SURFACE ELEVATION
1	152.06	1584.35±
2	143.48	1580.85±
3	216.76	1579.69±
4	124.41	1579.34±
AVG	159.18	1581.06±

NO.	DATE	REVISION	BY

PURPOSE: **PRELIMINARY REVIEW**

DESIGN BY: GDH
DRAWN BY: GDH
CHECKED BY: GDH

HUNTER ENGINEERING CIVIL AND SURVEY
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986

PRELIMINARY PLANS – NOT FOR CONSTRUCTION

CROSS SECTION AND SUMMARY TABLE FOR PLATINUM STORAGE SWC PIMA AND PRINCESS SCOTTSDALE, ARIZONA

THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

0' 20' 40'
1" = 20'

HE JOB NO.: PLAT003

SCALE 1" = 20'

SHEET 1

7-DR-2020
5/29/2020

CONCEPTUAL GRADING, DRAINAGE AND UTILITY PLAN
FOR
PLATINUM STORAGE
8585 E. PRINCESS DRIVE
SCOTTSDALE, ARIZONA 85255

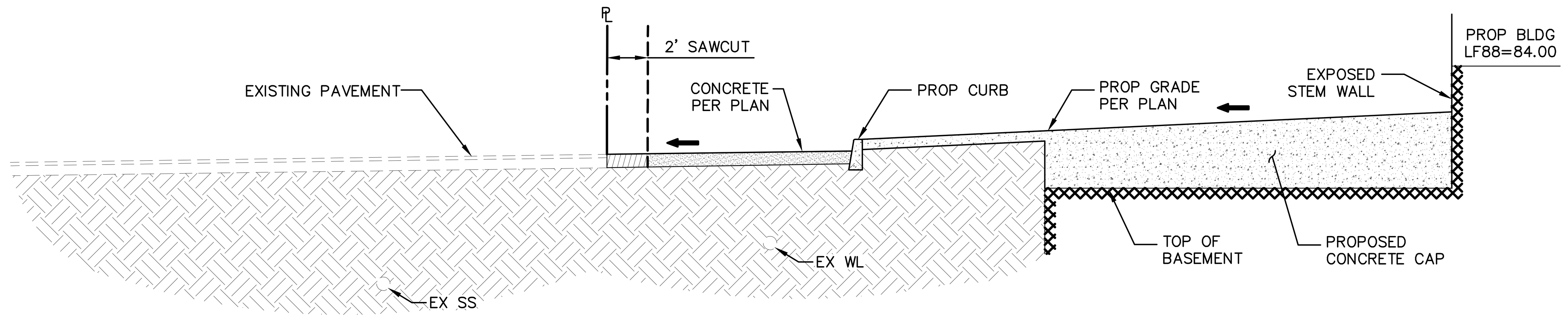
PARCEL 1 AS SHOWN ON THE LAND DIVISION PLAT "PRINCESS MEDICAL CENTER", IN SOUTHEAST QUARTER OF SECTION 36, TOWNSHIP 4 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.

SHEET INDEX

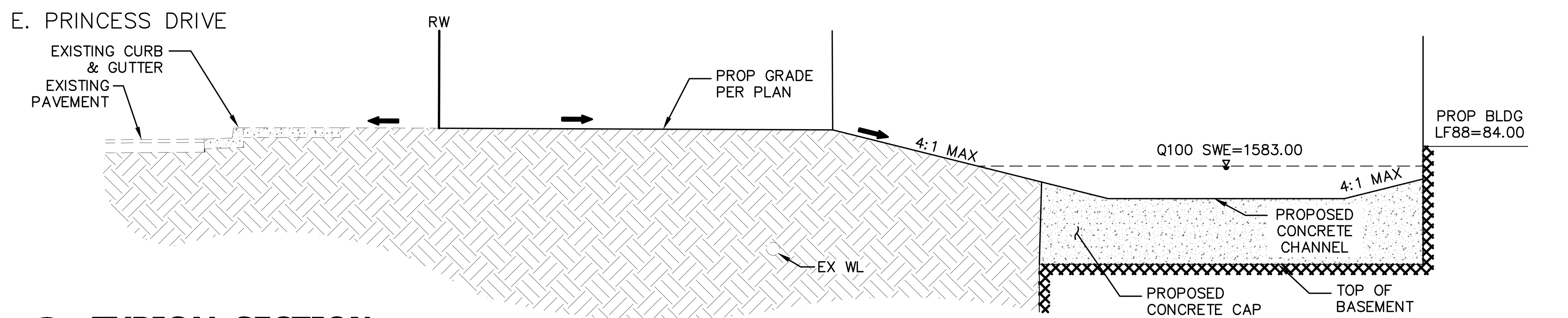
BENCHMARK
MCDOT BENCHMARK 6435, ELEVATION = 1595.25, NAVD'88.

ZONING
I-1

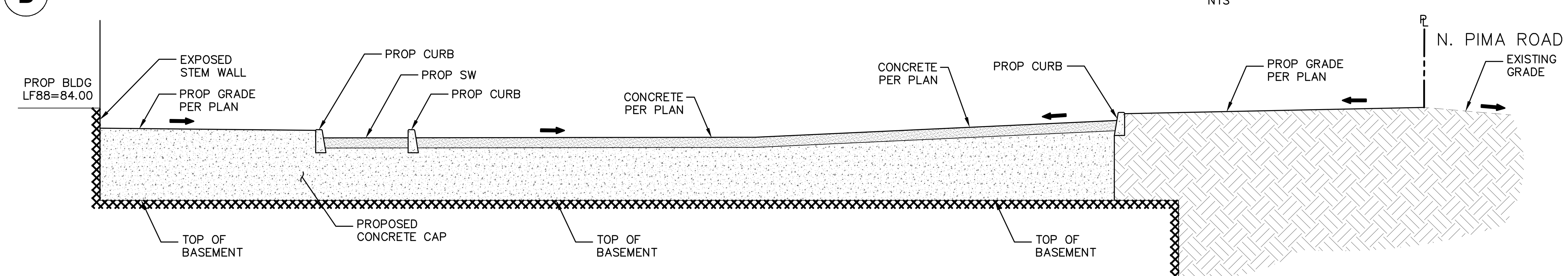
APN
215-07-212Z



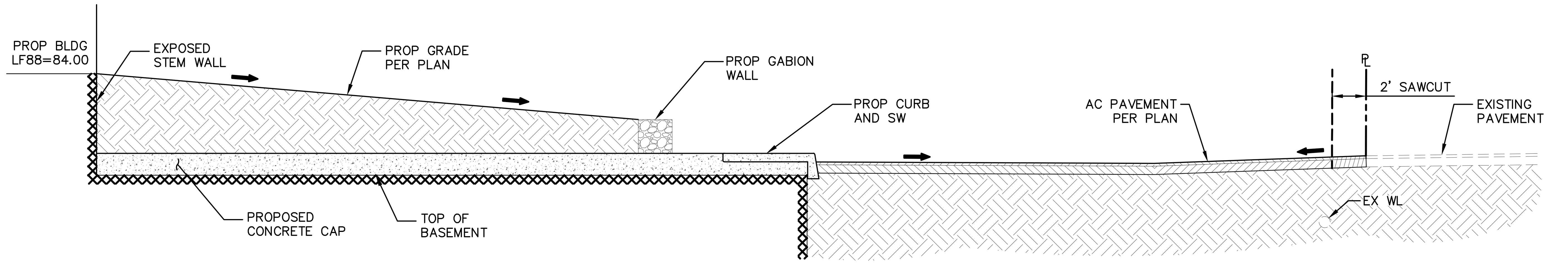
A TYPICAL SECTION
NTS



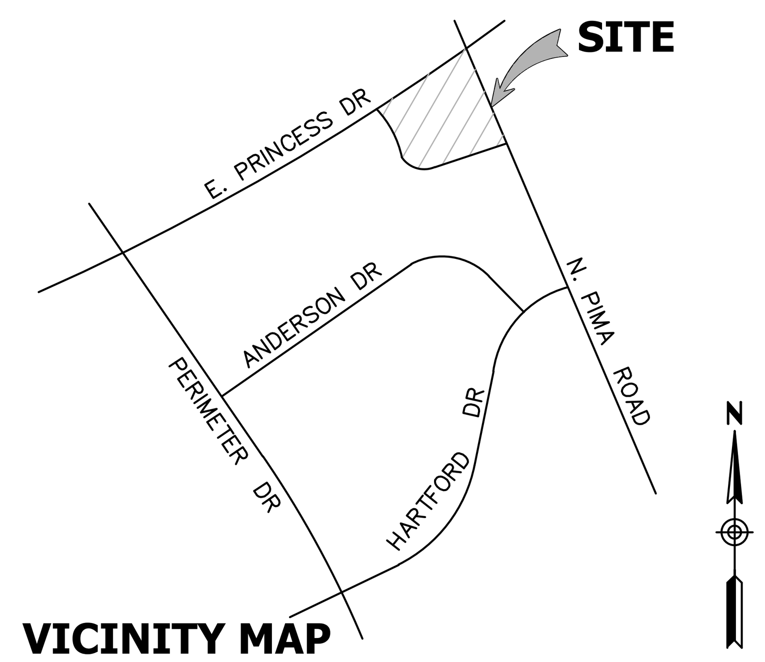
B TYPICAL SECTION
NTS



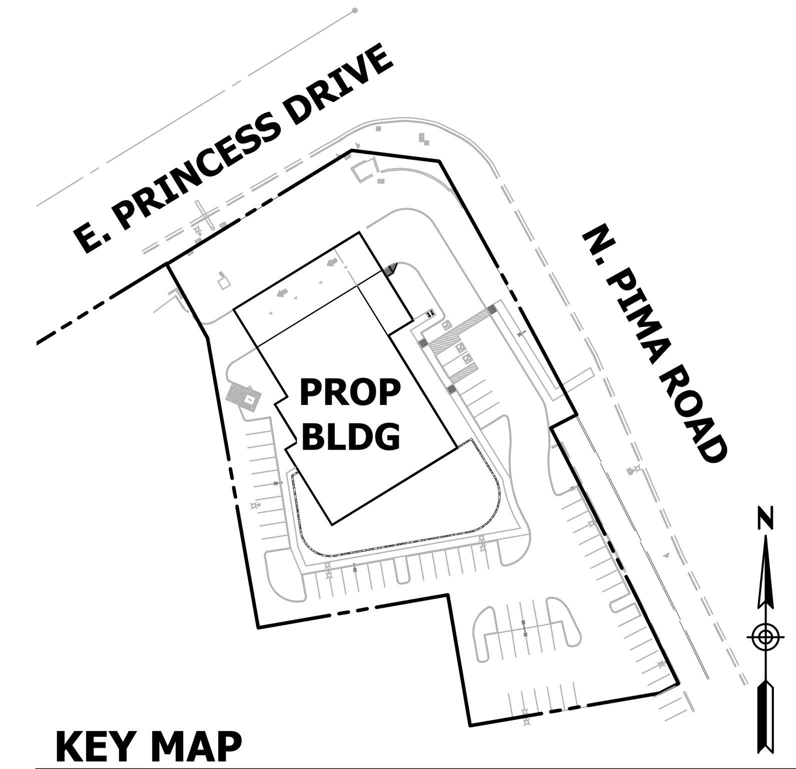
C TYPICAL SECTION
NTS



D TYPICAL SECTION
NTS



VICINITY MAP
NTS



KEY MAP
NTS

OWNER/DEVELOPER
PLATINUM CONSTRUCTION
1450 TL TOWNSEND DRIVE, SUITE 100
ROCKWALL, TX 75032
PHONE: (972) 722-2590
CONTACT: SHAWN VALK
EMAIL: SHAWNVALK@GMAIL.COM

CIVIL ENGINEER
HUNTER ENGINEERING, INC.
10450 N. 74TH STREET, SUITE 200
SCOTTSDALE, ARIZONA 85258
PHONE: (480) 991-3985
CONTACT: GRANT HIRNEISE, PE
EMAIL: GHIRNEISE@HUNTERENGINEERINGPC.COM

ARCHITECT
RKAA ARCHITECTS, INC.
2233 EAST THOMAS ROAD
PHOENIX, ARIZONA 85016
PHONE: (602) 955-3900
CONTACT: NEIL FEASER
EMAIL: NFEASER@RKAA.COM

BASIS OF BEARING
THE CENTERLINE OF PRINCESS DRIVE AS SHOWN ON THE PLAT OF 'PRINCESS MEDICAL CENTER' IN BOOK 808, PAGE28, M.C.R..

LEGAL DESCRIPTION
PARCEL NO. 1:

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 36, TOWNSHIP 4 NORTH, RANGE 4 EAST, OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:
COMMENCING AT THE CENTERLINE INTERSECTION OF HARTFORD DRIVE WITH ANDERSON DRIVE AS SHOWN ON THE MAP OF DEDICATION OF RIGHT OF WAY AND EASEMENTS FOR PERIMETER CENTER PHASE II, RECORDED IN BOOK 332 OF MAPS, PAGE 49 OF MARICOPA COUNTY RECORDS;
THENCE, NORTH 44°38'20" WEST, ALONG THE CENTERLINE OF SAID ANDERSON DRIVE, 52.69 FEET;
THENCE, NORTH 45°21'40" EAST, 35.00 FEET TO THE NORTHERLY RIGHT-OF-WAY OF SAID ANDERSON DRIVE;
THENCE, NORTH 44°38'20" WEST, ALONG SAID RIGHT-OF-WAY LINE, 242.01 FEET TO THE BEGINNING OF A CURVE WITH A RADIUS OF 435.00 FEET TO THE LEFT;
THENCE, NORTHWESTERLY, CONTINUING ALONG SAID RIGHT-OF-WAY LINE AND ALONG THE ARC OF SAID CURVE, THROUGH A CENTRAL ANGLE OF 55°12'17", FOR AN ARC DISTANCE OF 419.12 FEET TO THE BEGINNING OF A NON-TANGENT LINE;
THENCE, NORTH 09°50'37" WEST, 544.18 FEET TO THE SOUTHERLY RIGHT-OF-WAY LINE OF PRINCESS DRIVE;
THENCE, NORTH 58°23'36" EAST, ALONG SAID RIGHT-OF-WAY LINE, 146.13 FEET TO THE WESTERLY LINE OF TRACT 2 AS DESCRIBED IN 98-0751665, OF OFFICIAL RECORDS;
THENCE, SOUTH 31°36'24" EAST, ALONG SAID WESTERLY LINE, 15.00 FEET;
THENCE, NORTH 58°23'36" EAST, CONTINUING ALONG SAID WESTERLY LINE, 134.90 FEET TO THE TRUE POINT OF BEGINNING;
THENCE, CONTINUING ALONG SAID WESTERLY LINE, NORTH 58°23'36" EAST, 148.25 FEET;
THENCE, SOUTH 82°59'02" EAST, CONTINUING ALONG SAID WESTERLY LINE, 60.37 FEET TO THE BEGINNING OF A NON-TANGENT CURVE, THE CENTER OF WHICH BEARS SOUTH 60°31'04" WEST, 6149.95 FEET;
THENCE SOUTHEASTERLY, CONTINUING ALONG SAID WESTERLY LINE AND ALONG THE ARC OF SAID CURVE, THROUGH A CENTRAL ANGLE OF 01°50'12", FOR AN ARC DISTANCE OF 197.15 FEET TO THE BEGINNING OF A NON-TANGENT LINE;
THENCE, SOUTH 62°29'16" WEST, 20.00 FEET TO THE BEGINNING OF A NON-TANGENT CURVE, THE CENTER OF WHICH BEARS SOUTH 62°29'16" WEST, 6129.95 FEET;
THENCE SOUTHEASTERLY, ALONG THE ARC OF SAID CURVE, THROUGH A CENTRAL ANGLE OF 01°49'39", FOR AN ARC DISTANCE OF 195.51 FEET TO THE BEGINNING OF A NON-TANGENT LINE;
THENCE, SOUTH 63°21'27" WEST, 14.50 FEET;
THENCE, SOUTH 80°09'23" WEST, 131.89 FEET;
THENCE, NORTH 09°50'37" WEST, 91.00 FEET;
THENCE, SOUTH 60°09'23" WEST, 131.33 FEET;
THENCE, NORTH 09°50'37" WEST, 201.16 FEET;
THENCE, NORTH 28°32'02" WEST, 57.75 FEET TO THE NORTHERLY RIGHT-OF-WAY LINE OF PRINCESS DRIVE AND THE TRUE POINT OF BEGINNING.

EXCEPT ALL, GAS AND OTHER HYDROCARBON SUBSTANCES, HELIUM OR OTHER SUBSTANCES OF A GASEOUS NATURE, GEOTHERMAL RIESOURCES, COAL, METALS, MINERALS, FOSSILS, FERTILIZER OF EVERY NAME AND DESCRIPTION; AND
EXCEPT ALL MATERIALS WHICH MAY BE ESSENTIAL TO THE PRODUCTION OF FISSIONABLE MATERIAL AS RESERVED TO THE STATE OF ARIZONA IN THE PATENT TO SAID LAND.

ALSO KNOWNAS LOT 2, OF PRINCESS MEDICAL CENTER, ACCORDING TO THE PLAT OF RECORD IN THE OFFICE OF THE COUNTY RECORDER OF MARICOPA COUNTY, ARIZONA, RECORDED IN BOOK 808 OF MAPS, PAGE 28.

PARCEL NO. 2:

A NON EXCLUSIVE AND PERPETUAL EASEMENT FOR INGRESS AND EGRESS AS CREATED BY AMENDED AND RESTATED AUGUST 16, 2000 AS 2000-627683 OF OFFICIAL RECORDS.

CERTIFICATION:
"I HEREBY CERTIFY THAT THIS DESIGN IS BASED ON ACCURATE FIELD DATA WHICH HAS BEEN CHECKED IN THE FIELD WITHIN 180 DAYS PRIOR TO SUBMISSION FOR CITY APPROVAL."

BY: [signature] DATE 5/7/2020

FLOOD PLAIN DESIGNATION

COMMUNITY NUMBER	PANEL # PANEL DATE	SUFFIX	DATE OF FIRM (INDEX DATE)	FIRM ZONE	BASE FLOOD ELEVATION
04013C	1320 PANEL DATE 10/16/13	L	11/4/15	ZONE AO	THE FLOOD DEPTH SPECIFIED BY FEMA FOR THIS AREA IS 1 FOOT WITH VELOCITIES OF 3 FPS

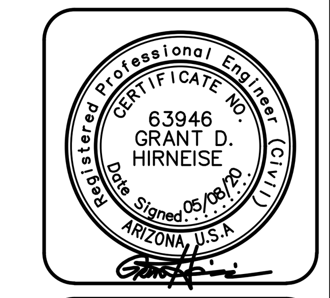
ENGINEER'S CERTIFICATION: THE LOWEST FLOOR ELEVATION(S) AND/OR FLOOD PROOFING ELEVATION(S) ON THIS PLAN ARE SUFFICIENTLY HIGH TO PROVIDE PROTECTION FROM FLOODING CAUSED BY A ONE-HUNDRED YEAR STORM, AND ARE IN ACCORDANCE WITH CITY OF SCOTTSDALE REVISED CODE, CHAPTER 37 – FLOODWAYS & FLOOD PLAINS ORDINANCE.

NO.	DATE	REVISION	BY

PURPOSE: 2ND CONCEPTUAL SUBMITTAL

DESIGN BY: AS
DRAWN BY: GM
CHECKED BY: GH

HUNTER ENGINEERING CIVIL AND SURVEY
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986



CONCEPTUAL COVER SHEET
FOR
PLATINUM STORAGE
8585 E. PRINCESS DRIVE
SCOTTSDALE, ARIZONA 85255

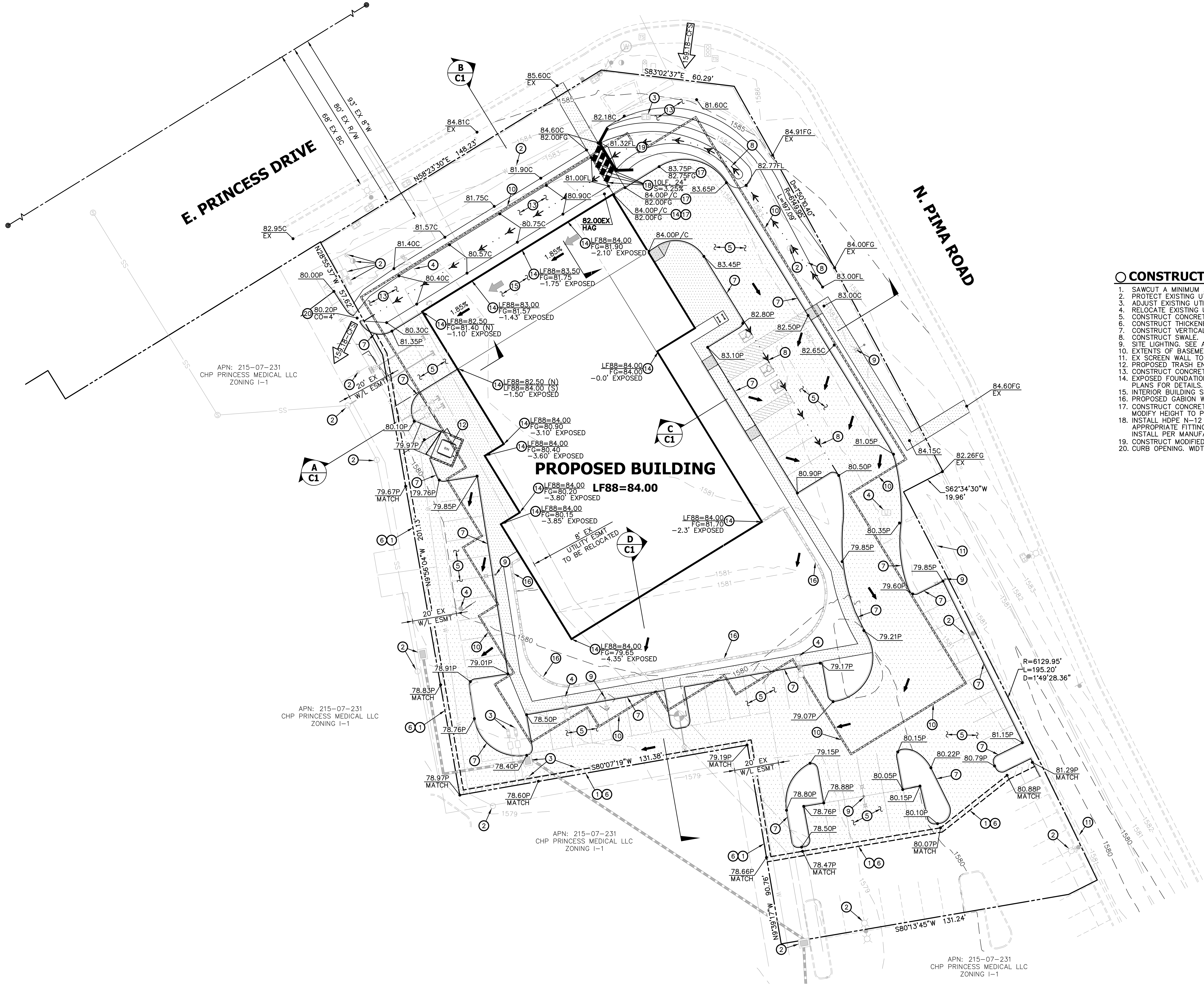
CONTACT ARIZONA 811 AT LEAST 2 FULL WORKING DAYS BEFORE YOU BEGIN EXCAVATION
ARIZONA811
CALL 811 OR CLICK ARIZONA811.COM

THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

PROJECT NAME: PLATINUM STORAGE

HE NO.: PLAT003
SCALE: NTS

SHEET: C1



CONSTRUCTION NOTES

1. SAWCUT A MINIMUM 2 FEET OF AC PAVEMENT. DISPOSE OF PER LOCAL CODES.
2. PROTECT EXISTING UTILITY IN PLACE.
3. ADJUST EXISTING UTILITY TO GRADE.
4. RELOCATE EXISTING UTILITY AND ASSOCIATED APPURTENANCES.
5. CONSTRUCT CONCRETE.
6. CONSTRUCT THICKENED EDGE.
7. CONSTRUCT VERTICAL CURB.
8. CONSTRUCT SWALE.
9. SITE LIGHTING. SEE ARCHITECTURAL PLANS FOR DETAILS.
10. EXTENTS OF BASEMENT.
11. EX SCREEN WALL TO REMAIN.
12. PROPOSED TRASH ENCLOSURE. SEE SITE PLAN FOR DETAILS.
13. CONSTRUCT CONCRETE DRAINAGE CHANNEL
14. EXPOSED FOUNDATION IN THIS AREA. SEE STRUCTURAL AND ARCHITECTURAL PLANS FOR DETAILS. FINISHED GRADE PER PLAN.
15. INTERIOR BUILDING SLOPE. FINISHED GRADE PER PLAN.
16. PROPOSED GABION WALL. SEE LANDSCAPE PLANS FOR DETAILS.
17. CONSTRUCT CONCRETE RETAINING CURB PER MAG STD DTL 222 TYPE 'A'. MODIFY HEIGHT TO PLAN ELEVATIONS. MAINTAIN 12-INCH BURY DEPTH.
18. INSTALL HDPE N-12 STORM DRAIN PIPE WITH H-20 LOADING AND APPROPRIATE FITTINGS PER PLAN. SIZE, LENGTH, AND SLOPE PER PLAN. INSTALL PER MANUFACTURERS SPECIFICATIONS.
19. CONSTRUCT MODIFIED 'U' TYPE HEADWALL PER MAG STD DTL 501-1.
20. CURB OPENING. WIDTH PER PLAN.

NO.	DATE	REVISION	BY

PURPOSE: 2ND CONCEPTUAL SUBMITTAL

DESIGN BY: AS
DRAWN BY: GM
CHECKED BY: GH

HUNTER ENGINEERING | CIVIL AND SURVEY
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986

Registered Professional Engineer, CERTIFICATE NO. 63946, GRANT D. HIRNEISE, (CIVIL), ARIZONA, U.S.A, Date Signed 05/08/20

CONCEPTUAL GRADING AND DRAINAGE PLAN FOR PLATINUM STORAGE 8585 E. PRINCESS DRIVE SCOTTSDALE, ARIZONA 85255

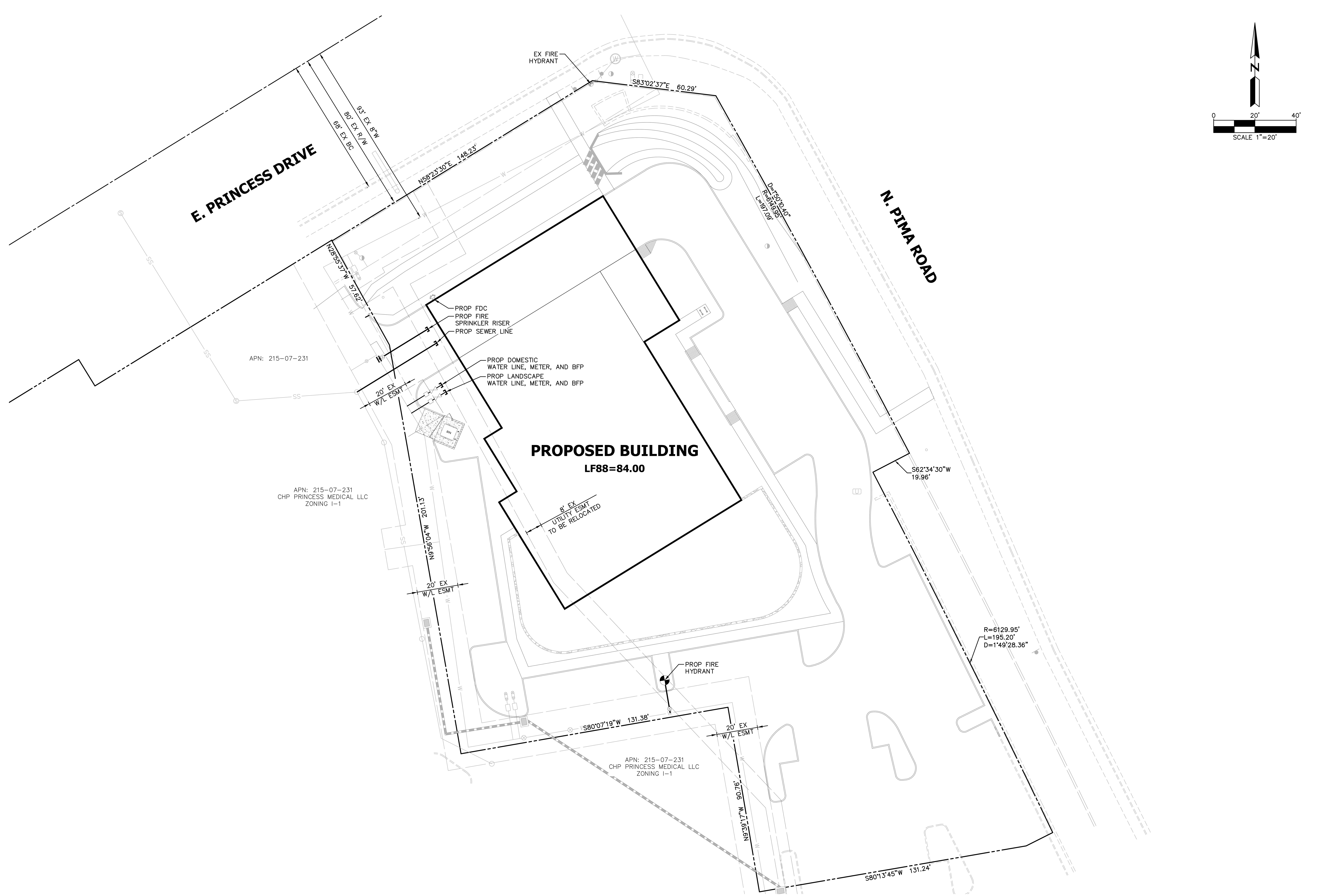
CONTACT ARIZONA 811 AT LEAST 2 FULL WORKING DAYS BEFORE YOU BEGIN EXCAVATION
ARIZONA811 BLUE STAKE, INC
CALL 811 OR CLICK ARIZONA811.COM

THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

PROJECT NAME: PLATINUM STORAGE

HE NO.: PLAT003
SCALE: 1"=20'

SHEET: C2



NO.	DATE	REVISION	BY

PURPOSE:
2ND CONCEPTUAL SUBMITTAL

DESIGN BY: **AS**
DRAWN BY: **GM**
CHECKED BY: **GH**

HUNTER ENGINEERING CIVIL AND SURVEY
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
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Registered Professional Engineer CERTIFICATE NO. 63946 GRANT D. HIRNEISE (Civil) Date Signed 05/08/20 ARIZONA, U.S.A.

CONCEPTUAL UTILITY PLAN FOR PLATINUM STORAGE 8585 E. PRINCESS DRIVE SCOTTSDALE, ARIZONA 85255

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PROJECT NAME:
PLATINUM STORAGE

HE NO.: PLAT003
SCALE: 1"=20'

SHEET:
C3