HONOR HEALTH SHEA PARKING STRUCTURE

Drainage Basis of Design Report

1124070

Prepared For: Lamar Johnson Collaborative

November 8, 2024

DIBBLE

HONOR HEALTH SHEA
PARKING STRUCTURE

Drainage Basis of Design Report

9003 E Shea Blvd, Scottsdale, AZ

1124070

Prepared For: Lamar Johnson Collaborative
Brian Dolan
Lamar Johnson Collaborative
4300 E Camelback Road
Phoenix, Arizona 85018

November 8, 2024

Adrian Carvajal, PE
Senior Project Manager
Dibble & Associates Consulting Engineers, Inc., dba Dibble

Table of Contents

List of Figures

List of Tables

Appendices

1. INTRODUCTION

This report presents a preliminary drainage plan for the City of Scottsdale as a part of the Honor Health Shea Parking Garage project. The purpose of this report is to provide analysis and results for the existing and proposed drainage concept at the site. The Honor Health Shea Parking Structure site will impact approximately 2.5 acres of the approximate 14.29 acre site and is fully developed with a hospital complex and associated parking areas. The Honor Health Shea Parking Structure project includes the demolition of an existing parking lot for the construction of a five-story parking structure. This report provides the on-site drainage analysis for the project.

The project is located on the east side of 90th Street, between Shea Boulevard and Mountain View Road, in the northeast quadrant of Township 3 North, Range 5 East, Section 30. This site has an Assessor's Parcel Numbers (APNs) of 217-36-020 and 217-36-021A. See **Figure 1** for a location map.

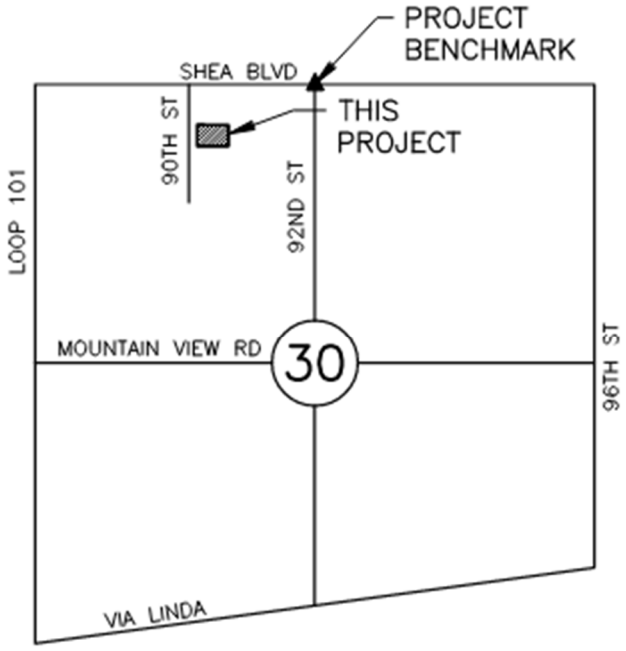


Figure 1 – VICINITY MAP

2. EXISTING CONDITIONS

The site is located in a FEMA Zone 'X', defined as "areas of 0.2% annual chance flood: areas of 1% annual chance of flood with average depth less than 1 foot or areas less than 1 square mile: and areas protected by levees from 1% annual chance of flood." This hazard designation is considered minimal, and flood insurance is not federally mandated. The FEMA Flood Insurance Rate Map (FIRM) panel for this area is provided in **Appendix A**.

There is an existing drainage channel along the east side of the hospital building and campus. The parking garage site is located on the south side of campus and west of the drainage channel. The west portion of the site drains west to a landscape zone along 90th Street through turned CMU blocks in the site screen wall. Any water that overtops this landscape zone outfalls to 90th Street. The east portion of the site drains south to four drywells within the parking lot limits. Any water that overtops these drywells flows east to the existing drainage channel. The access road from the east drains to the existing storm drain system which flows east to the existing drainage channel.

3. DESIGN CRITERIA

This project is designed consistent with standards set forth in the 2018 City of Scottsdale *Design Standards and Policies Manual* and the Flood Control District of Maricopa County (FCDMC) Drainage Design Manual for Maricopa County Volume I Hydrology (2018) and Volume II Hydraulics (2018) with exceptions noted herein.

Examples of specific design criteria for various design elements are provided in the following sections:

3.1 Rainfall

National Oceanic and Atmospheric Administration (NOAA) Atlas 14 values are used for this project. Rainfall precipitation values obtained directly from the NOAA Atlas 14 Precipitation Data Frequency Server. NOAA Atlas 14 rainfall depths and intensities may be found in **Appendix B**.

3.2 Finished Floors

Building finished floors will be placed a minimum 12-inches above emergency outfall elevations of adjacent retention facility or high-water elevation and a positive drainage flow path will be provided through the site around all buildings. The existing hospital building finish floor elevation is 1365.70. The new parking structure finish floor elevation is also set to 1365.70.

3.3 Storm Runoff Conveyance

Storm runoff will be conveyed through the site via a combination of surface flow, drain basin inlets & storm drain pipe. Site storm drain pipes & inlets will be designed to convey the 10-year design storm. The 100-year flow rate to existing catch basins will not be increased.

3.4 Surface Retention Basin

Site retention has been analyzed from both pre vs post and first flush perspectives. The proposed site reduces the impervious area compared to the existing site. Therefore, the first flush storm water volume governs the design. The site retention has been designed to retain the first flush storm event with a precipitation depth of 0.5-inches.

- The maximum side slope of retention basins will be 4:1.
- The finish floor elevation of structures must be at least 1 foot above the retention basin water surface elevation of the 100-yr, 2-hr storm event.

- The design of all storm water storage facilities shall be such that the stored runoff shall be disposed of or evacuated completely from the facility within 36 hours.
- Retention basins greater than 1 foot of ponding depth from the 100-yr 2-hr storm event require a minimum of one drywell for storm water disposal.

4. STUDY APPROACH & METHODOLOGY

Based on the proposed conditions and existing ground surrounding the project site, a proposed Grading & Drainage Plan was created to illustrate drainage areas that would be affecting the site. This drainage plan is shown in **Appendix C**.

The discharge into each proposed storm drain is calculated by the following formula:

$$Q = C * i * A$$

where:
Q = *peak discharge (cubic feet per second)*
C = *weighted runoff coefficient*
i = *rainfall intensity (inch/hour)*
A = *drainage area (acre)*
Min Tc = 5 (min)

Required retention volume is calculated by the following formula:

$$V_R = C\left(\frac{P}{12}\right)A$$

where:
$V_R = retention\ volume\ required\ (cubic\ feet)$
$C = weighted\ runoff\ coefficient$
$P = first\ flush\ rainfall\ depth\ (inches)$
$A = drainage\ area\ (square\ feet)$

Number of drywells required is calculated by the following formula:

$$No.\ of\ Drywells = \frac{V_P}{rT} * \frac{1\ hr}{3600\ s}$$

where:
$V_P = retention\ volume\ provided\ (cubic\ feet)$
$r = percolation\ rate\ (cubic\ feet\ per\ second, assumed\ value\ 0.10)$
$T = allowable\ drain\ time\ (hrs, required\ value\ 36)$

Drainage time is calculated by the following formula:

$$t = \left(\frac{V_{P1}}{r_1} + \frac{V_{P2}}{r_2}\right) * \frac{1}{d} * \frac{1\ hr}{3600\ s}$$

$t = drainage\ time\ (hrs)$
$V_P = retention\ volume\ provided\ (cubic\ feet)$
$r = percolation\ rate\ (cubic\ feet\ per\ second, assumed\ value\ 0.2)$
$d = number\ of\ drywells$

Refer to **Appendix D** for Drainage Calculations.

5. PROPOSED DRAINAGE CONDITIONS

The Honor Health Shea Parking Structure project includes a new building and associated site improvements. Refer to the Drainage Area Maps provided in **Appendix C**.

Drainage Area A includes the west portion of the parking garage roof as well as the north, south, and west side of the project site. All stormwater located within Drainage Area A is conveyed via surface drainage and storm drain piping to the proposed Retention basin A north of the parking garage. A dual chamber drywell is needed to drain this basin within 36 hours. Drainage Area A outfalls to the west into 90th Street.

A pre-vs.-post versus first flush analysis was done to determine which of the two controls. The greater of the two will be used to design the retention system.

See Table 1 below for Proposed Retention Volume Summary. Refer to **Appendix D** for drainage calculations.

Table 1 - Proposed Retention Volume Summary

Retention Basin ID	Drainage Area	Weighted Coefficient (First Flush)	Pre vs Post Volume Required	First Flush Volume Required	Volume Provided	Drywells	Drain Time
A	120,005 sqft	1.0	657 cf	5,000 cf	5,133 cf	1	13.9 hrs

In addition to retaining the first flush, a Q100 analysis was completed comparing the existing and proposed conditions.

In the existing condition, the catch basin at the north end of the site receives 3.8 cfs from the intersection at the main driveway along with a portion of parking lot along the north end of the project area. In the proposed condition, the north parking lot is now replaced with a retention basin. The Q100 flow from the main driveway intersection is reduced to 2 cfs while the added overflow from the retention basin is 0.3 cfs, totaling 2.3 cfs. This is a reduction of 1.5 cfs to the existing northern catch basin. Refer to **Appendix D** for peak flow calculations.

6. CONCLUSIONS

New drainage improvements were analyzed in this report to verify the demands of the project. Proposed storm drain infrastructure at the Honor Health Shea Parking Structure will be able to convey storm water runoff generated by first flush storm event while maintaining standards set by the City of Scottsdale Storm Water Drainage System Design Manual and Flood Control District of Maricopa County (FCDMC) Drainage Design Manual. Applicable City of Scottsdale and Flood Control District requirements have been satisfied.

7. REFERENCES

Flood Control District of Maricopa County, Engineering Division, *Drainage Design Manual for Maricopa County, Arizona Volume I, Hydrology*. December, 2018.

Flood Control District of Maricopa County, Engineering Division, *Drainage Design Manual for Maricopa County, Arizona Volume II, Hydraulics*. December, 2018.

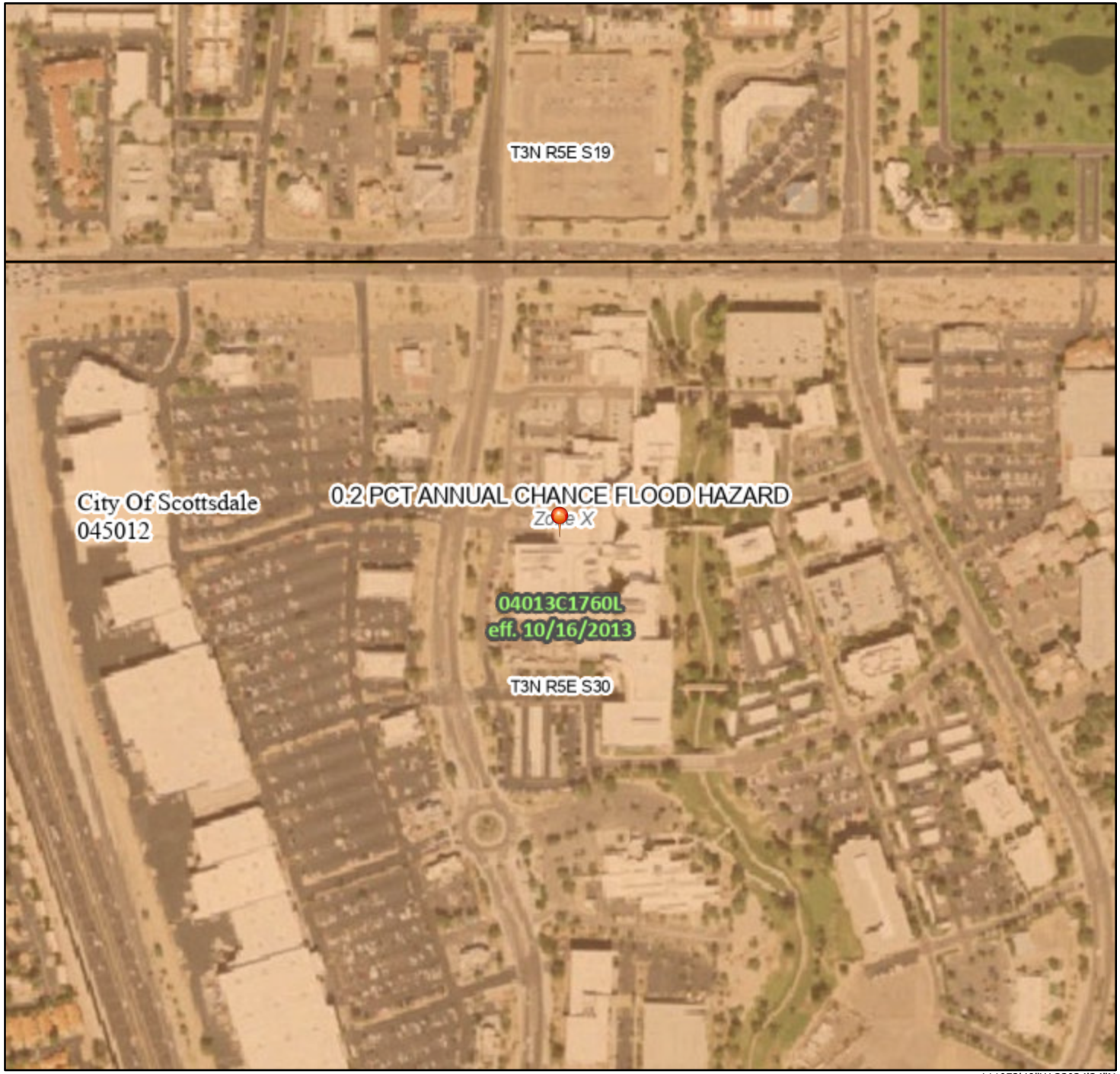
City of Scottsdale Public Works. *Design Standards & Policies Manual*. 2018.

Appendix A - FEMA Flood Insurance Rate Map

National Flood Hazard Layer FIRMette

FEMA

111°53'26"W 33°35'4"N



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

1:6,000

111°52'49"W 33°34'34"N

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/27/2024 at 10:40 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Appendix B – NOAH Atlas 14 Rainfall Information

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.5787°, Longitude: -111.8857°
Elevation: 1364 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	**0.187** (0.156-0.230)	**0.244** (0.204-0.300)	**0.330** (0.273-0.405)	**0.397** (0.327-0.485)	**0.487** (0.394-0.592)	**0.556** (0.445-0.672)	**0.627** (0.492-0.756)	**0.698** (0.539-0.841)	**0.795** (0.598-0.958)	**0.869** (0.641-1.05)
10-min	**0.285** (0.237-0.350)	**0.371** (0.311-0.457)	**0.503** (0.416-0.616)	**0.604** (0.497-0.738)	**0.741** (0.599-0.901)	**0.845** (0.677-1.02)	**0.954** (0.749-1.15)	**1.06** (0.821-1.28)	**1.21** (0.911-1.46)	**1.32** (0.975-1.60)
15-min	**0.353** (0.293-0.434)	**0.461** (0.385-0.567)	**0.623** (0.516-0.764)	**0.749** (0.616-0.914)	**0.918** (0.743-1.12)	**1.05** (0.839-1.27)	**1.18** (0.929-1.43)	**1.32** (1.02-1.59)	**1.50** (1.13-1.81)	**1.64** (1.21-1.98)
30-min	**0.475** (0.395-0.584)	**0.620** (0.519-0.763)	**0.840** (0.695-1.03)	**1.01** (0.830-1.23)	**1.24** (1.00-1.50)	**1.41** (1.13-1.71)	**1.59** (1.25-1.92)	**1.77** (1.37-2.14)	**2.02** (1.52-2.43)	**2.21** (1.63-2.66)
60-min	**0.588** (0.489-0.723)	**0.768** (0.642-0.944)	**1.04** (0.860-1.27)	**1.25** (1.03-1.52)	**1.53** (1.24-1.86)	**1.75** (1.40-2.11)	**1.97** (1.55-2.38)	**2.20** (1.70-2.64)	**2.50** (1.88-3.01)	**2.73** (2.01-3.30)
2-hr	**0.689** (0.580-0.826)	**0.890** (0.753-1.07)	**1.19** (0.997-1.42)	**1.41** (1.18-1.69)	**1.73** (1.42-2.05)	**1.96** (1.59-2.33)	**2.21** (1.76-2.61)	**2.45** (1.92-2.90)	**2.79** (2.14-3.30)	**3.04** (2.28-3.62)
3-hr	**0.764** (0.642-0.935)	**0.978** (0.826-1.20)	**1.28** (1.08-1.57)	**1.52** (1.26-1.85)	**1.86** (1.52-2.24)	**2.12** (1.71-2.55)	**2.40** (1.90-2.88)	**2.69** (2.10-3.22)	**3.09** (2.34-3.70)	**3.41** (2.52-4.09)
6-hr	**0.919** (0.788-1.09)	**1.16** (0.996-1.38)	**1.48** (1.27-1.76)	**1.74** (1.47-2.05)	**2.09** (1.75-2.45)	**2.37** (1.94-2.76)	**2.65** (2.15-3.09)	**2.94** (2.34-3.44)	**3.34** (2.59-3.90)	**3.66** (2.77-4.28)
12-hr	**1.02** (0.880-1.20)	**1.28** (1.11-1.51)	**1.62** (1.40-1.90)	**1.89** (1.61-2.20)	**2.24** (1.90-2.61)	**2.52** (2.11-2.92)	**2.80** (2.31-3.25)	**3.09** (2.52-3.58)	**3.47** (2.76-4.05)	**3.77** (2.94-4.42)
24-hr	**1.19** (1.05-1.36)	**1.51** (1.33-1.73)	**1.95** (1.72-2.24)	**2.30** (2.02-2.63)	**2.78** (2.43-3.18)	**3.16** (2.74-3.61)	**3.56** (3.06-4.07)	**3.97** (3.38-4.53)	**4.54** (3.81-5.18)	**4.99** (4.14-5.72)
2-day	**1.28** (1.13-1.47)	**1.64** (1.44-1.88)	**2.14** (1.88-2.45)	**2.54** (2.23-2.91)	**3.10** (2.70-3.54)	**3.55** (3.06-4.05)	**4.02** (3.44-4.59)	**4.51** (3.83-5.15)	**5.19** (4.35-5.94)	**5.73** (4.74-6.58)
3-day	**1.37** (1.21-1.57)	**1.75** (1.54-2.00)	**2.30** (2.02-2.63)	**2.74** (2.40-3.13)	**3.37** (2.93-3.83)	**3.86** (3.34-4.40)	**4.40** (3.77-5.00)	**4.95** (4.22-5.64)	**5.73** (4.82-6.54)	**6.36** (5.29-7.27)
4-day	**1.46** (1.29-1.66)	**1.86** (1.64-2.13)	**2.46** (2.16-2.80)	**2.94** (2.58-3.34)	**3.63** (3.16-4.12)	**4.18** (3.62-4.74)	**4.77** (4.11-5.41)	**5.40** (4.60-6.13)	**6.28** (5.29-7.13)	**7.00** (5.84-7.97)
7-day	**1.63** (1.44-1.87)	**2.09** (1.84-2.39)	**2.76** (2.42-3.16)	**3.31** (2.89-3.78)	**4.08** (3.54-4.65)	**4.70** (4.05-5.35)	**5.36** (4.59-6.10)	**6.06** (5.15-6.92)	**7.05** (5.91-8.04)	**7.85** (6.52-8.98)
10-day	**1.77** (1.56-2.02)	**2.26** (1.99-2.58)	**2.98** (2.62-3.40)	**3.57** (3.12-4.06)	**4.38** (3.82-4.97)	**5.04** (4.36-5.70)	**5.73** (4.93-6.50)	**6.46** (5.52-7.33)	**7.49** (6.31-8.50)	**8.32** (6.94-9.44)
20-day	**2.18** (1.92-2.48)	**2.80** (2.47-3.18)	**3.70** (3.26-4.20)	**4.38** (3.85-4.96)	**5.29** (4.63-5.99)	**5.99** (5.23-6.78)	**6.71** (5.82-7.60)	**7.44** (6.42-8.44)	**8.42** (7.21-9.57)	**9.17** (7.79-10.4)
30-day	**2.55** (2.25-2.89)	**3.28** (2.90-3.72)	**4.32** (3.81-4.89)	**5.11** (4.50-5.77)	**6.18** (5.41-6.98)	**7.00** (6.10-7.89)	**7.84** (6.81-8.83)	**8.69** (7.51-9.79)	**9.84** (8.43-11.1)	**10.7** (9.12-12.1)
45-day	**2.95** (2.62-3.34)	**3.81** (3.38-4.30)	**5.02** (4.44-5.66)	**5.92** (5.22-6.68)	**7.10** (6.24-8.00)	**7.98** (7.00-9.00)	**8.88** (7.75-10.0)	**9.78** (8.49-11.0)	**11.0** (9.45-12.4)	**11.9** (10.2-13.5)
60-day	**3.27** (2.91-3.68)	**4.22** (3.75-4.75)	**5.55** (4.93-6.24)	**6.52** (5.78-7.34)	**7.78** (6.87-8.74)	**8.71** (7.67-9.80)	**9.64** (8.46-10.9)	**10.6** (9.22-11.9)	**11.8** (10.2-13.3)	**12.6** (10.9-14.3)

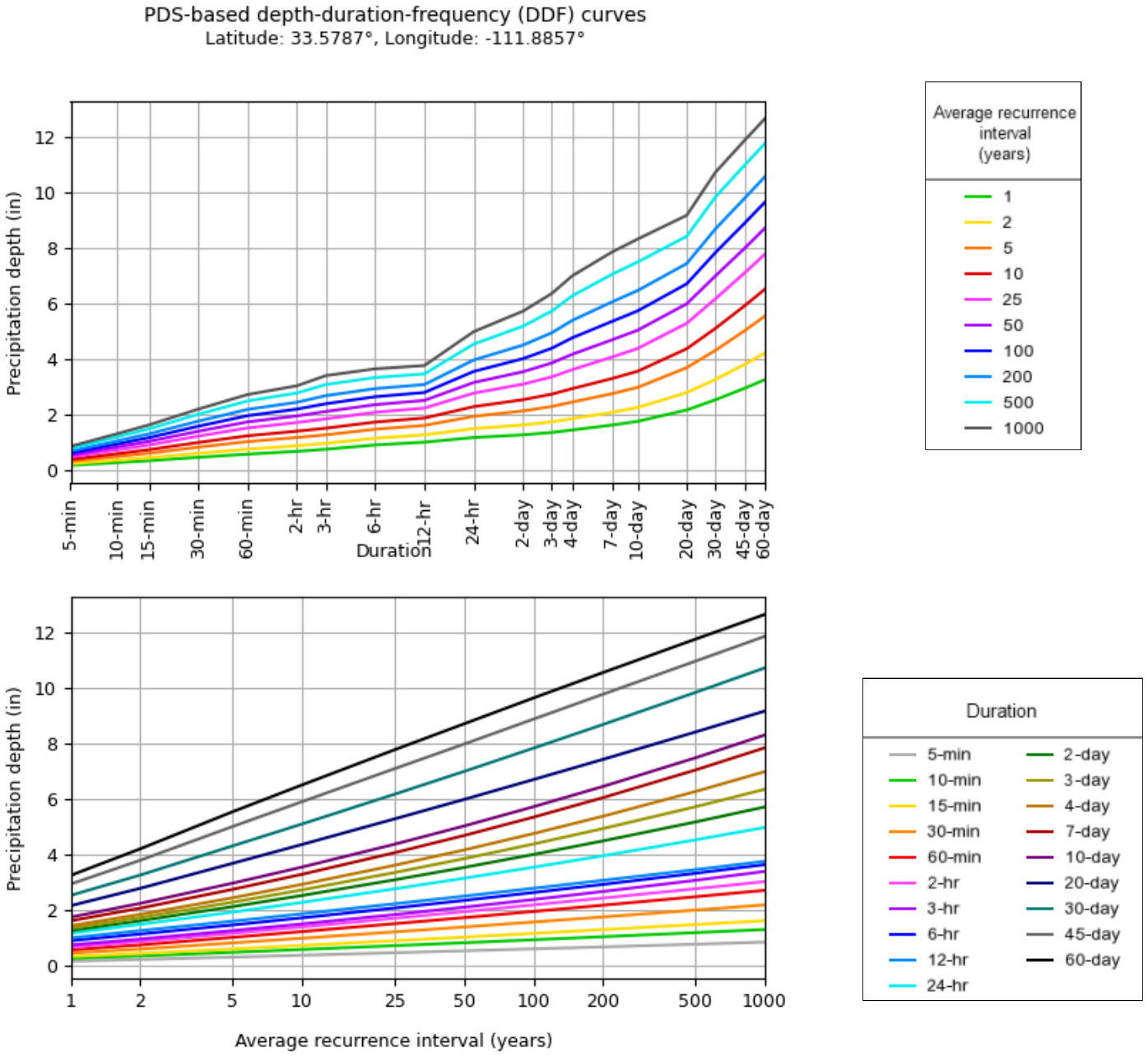
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Back to Top

PF graphical



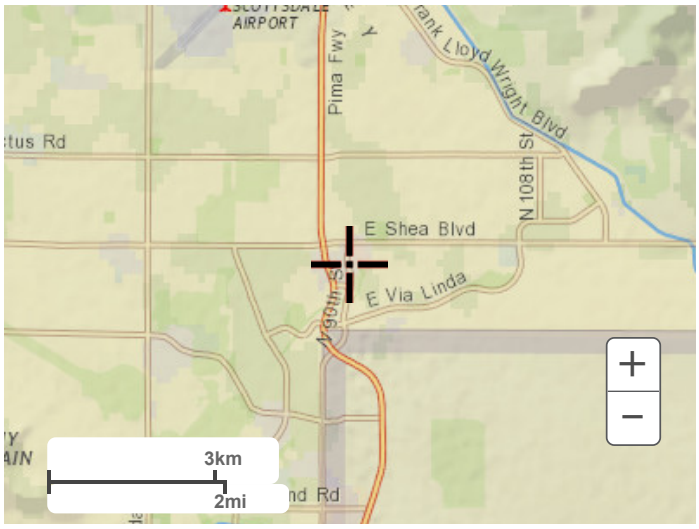
NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Tue Aug 27 16:13:55 2024

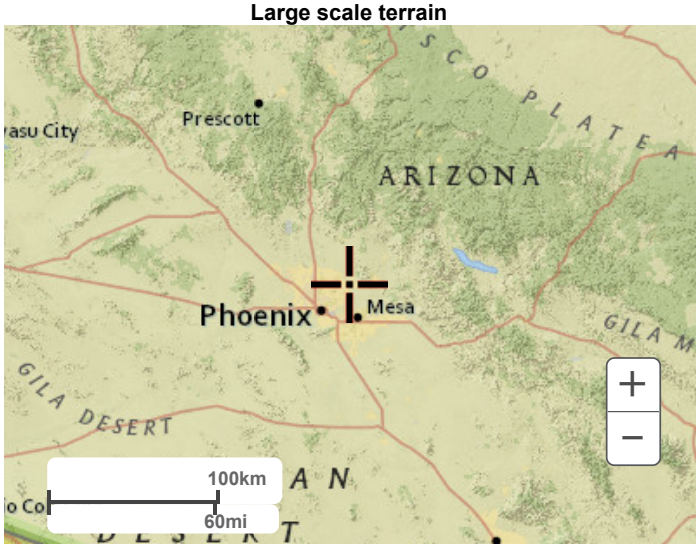
Back to Top

Maps & aerials

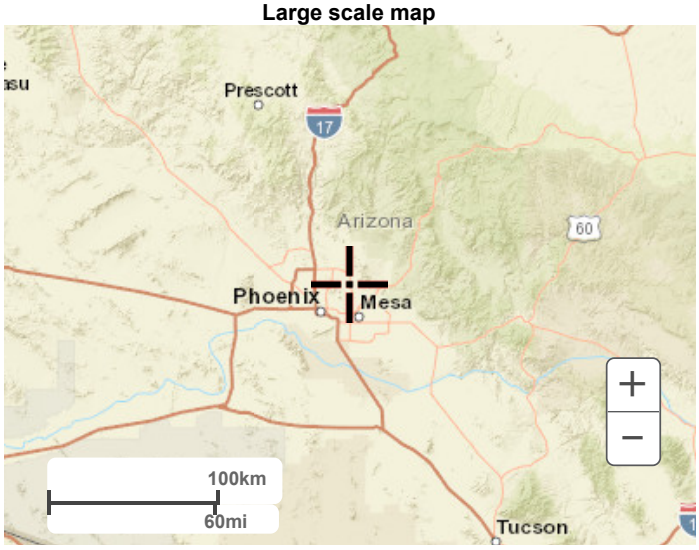
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

Back to Top

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

Appendix C – Drainage Area Maps

LEGEND

- EXST ASPHALT PAVEMENT
- EXST LANDSCAPE
- EXST RIPRAP
- EXST SIDEWALK
- EXST PAVERS
- EXST BUILDING

DESERT LANDSCAPING C VALUE = 0.45
DESERT LANDSCAPING AREA = 9,579 SF
PAVEMENT BUILDING C VALUE = 0.95
PAVEMENT & BUILDING = 101,154 SF

Cw=(C1*A1+C2*A2)/(A1+A2)
Cw=0.91

0' 10' 20' 40'
SCALE: 1"=20'

CLAYCO
THE ART & SCIENCE OF BUILDING
4300 EAST CAMELBACK STE 300
PHOENIX, AZ 85018
PH 602.833.6050

Lamar Johnson Collaborative
4300 EAST CAMELBACK STE 300
PHOENIX, AZ 85018
PH 602.833.6050

DIBBLE
3020 E CAMELBACK ROAD, SUITE 201
PHOENIX, ARIZONA 85016
PH 602.957.1155

NOT FOR CONSTRUCTION

HONORHEALTH SHEA GARAGE

HonorHealth
9003 E. Shea Blvd. Scottsdale, AZ 85260
Development Review

DRAWING ISSUE

#	DESCRIPTION	DATE
	SCHEMATIC DESIGN	06/21/24
	DESIGN DEVELOPMENT	08/23/24

BUILDING MAP

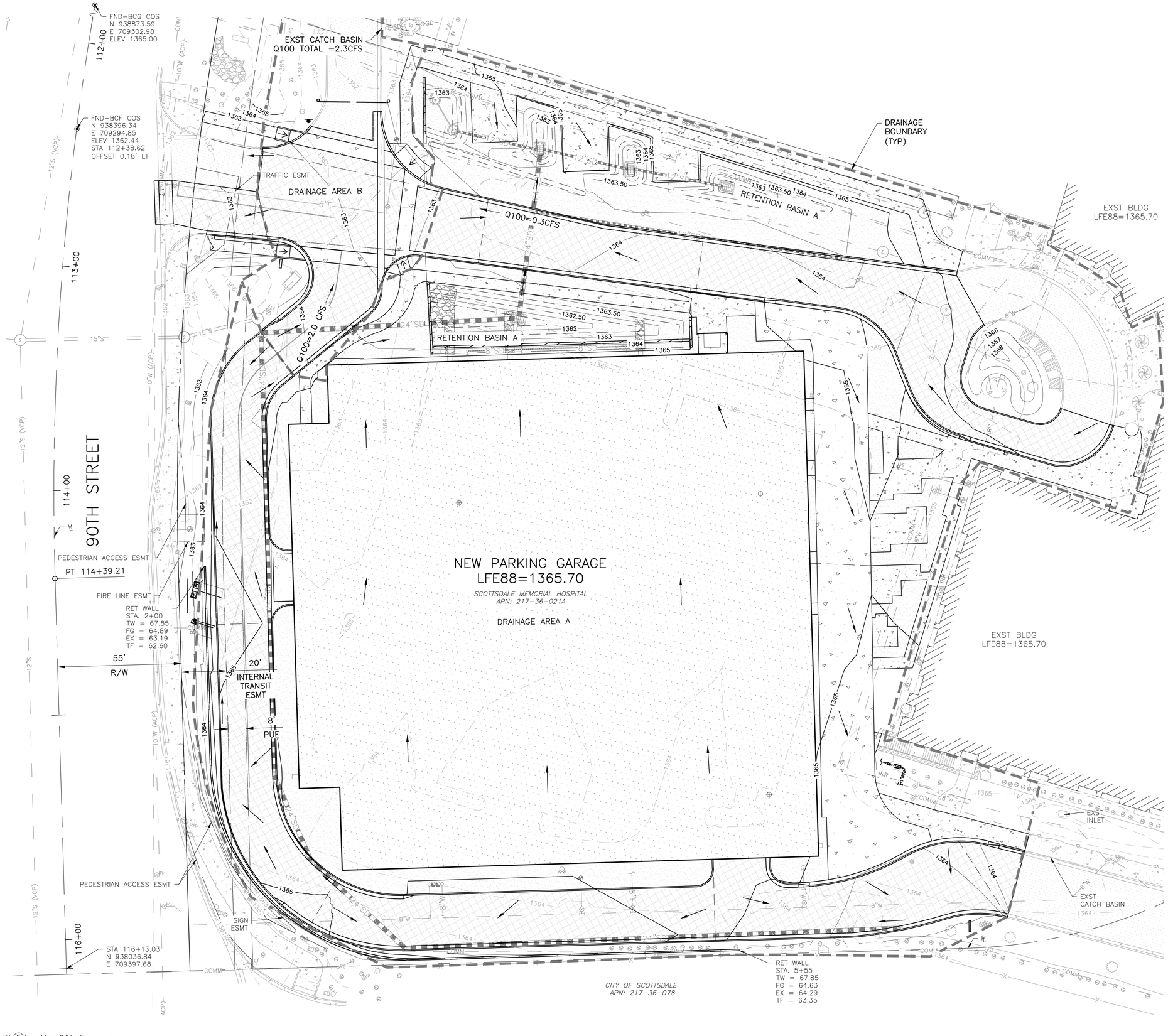
DRAWING TITLE
EXISTING DRAINAGE MAP

DRAWING NO.
PRE1.0

Job # 008229

CASE NO.: SS-PA-2024 PLAN CHECK NO.:

9/19/2024 11:35:35 AM FILE:J:\2024\112407\0_HH_Shea_Parking_Structure\CAD\24070_PRE_GAD_MAP.dwg DATE:11/8/2024 TIME:4:02 PM (by:zachary.jurkovic)



LEGEND

- NEW ASPHALT PAVEMENT
- NEW LANDSCAPE
- NEW RIPRAP
- NEW SIDEWALK
- NEW CONCRETE PAVEMENT
- NEW BUILDING

DESERT LANDSCAPING C VALUE = 0.45
DESERT LANDSCAPING AREA = 3,243 SF
PAVEMENT BUILDING C VALUE = 0.95
PAVEMENT & BUILDING = 116,762 SF

Cw=(C1*A1+C2*A2)/(A1+A2)
Cw=0.94

0' 10' 20' 40'
SCALE: 1"=20'

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com

CLAYCO
THE ART & SCIENCE OF BUILDING
4300 EAST CAMELBACK STE 300
PHOENIX, AZ 85018
Ph 602.833.6050

Lamar Johnson Collaborative
4300 EAST CAMELBACK STE 300
PHOENIX, AZ 85018
Ph 602.833.6050

DIBBLE
3020 E CAMELBACK ROAD, SUITE 201
PHOENIX, ARIZONA 85016
Ph 602.957.1155

NOT FOR CONSTRUCTION

HONORHEALTH SHEA GARAGE

HonorHealth
9003 E. Shea Blvd. Scottsdale, AZ 85260
Development Review

DRAWING ISSUE

#	DESCRIPTION	DATE
	SCHEMATIC DESIGN	06/21/24
	DESIGN DEVELOPMENT	08/23/24

BUILDING MAP

DRAWING TITLE
PROPOSED DRAINAGE MAP

DRAWING NO.
PRO1.0

Job # 008229

CASE NO. 599-PA-2024 PLAN CHECK NO.

9/10/2024 11:25:35 AM FILE:J:\2024\112470_HH_Shea_Parking_Structure\CAD\24070_POST_CAD_MAP.dwg DATE:11/8/2024 TIME:4:03 PM (by:zachary.jenkins)

Appendix D – Drainage Calculations

HH Shea Parking Garage

DIBBLE PROJECT NO. 1124070

ON-SITE DRAINAGE CALCULATIONS

DES: ZDL

DATE: 2024-1108

HYDROLOGY CALCULATIONS

DRAINAGE AREA	TOTAL AREA [SF]	DESERT LANDSCAPING [SF]	PAVEMENT & BUILDING [SF]	WEIGHTED COEFFICIENT	*RAINFALL DEPTH [IN]	VOLUME REQUIRED [CF]
		0.45	0.95			
PRE CONSTRUCTION 100-YEAR, 2-HOUR						
A	120,005	9,579	101,154	0.91	2.21	20,040
					TOTAL	**20,040**
POST CONSTRUCTION 100-YEAR, 2-HOUR						
A	120,005	3,243	116,762	0.94	2.21	20,697
					TOTAL	**20,697**
					PRE VS POST	**657**

FIRST FLUSH

DRAINAGE AREA	TOTAL AREA [SF]	RUNOFF COEFFICIENT	RAINFALL DEPTH [IN]	VOLUME REQUIRED [CF]
A	120,005	1.00	0.50	**5,000**

First flush is greater than Pre vs Post. First flush value is used.

* NOAA Atlas 14 Rainfall depth obtained from www.nws.noaa.gov

ON-SITE RETENTION BASIN VOLUME CALCULATIONS

BASIN ELEV [FT]	AREA [SF]	DEPTH [FT]	INCREMENTAL VOLUME [CF]	CUMULATIVE VOLUME [CF]	DRYWELLS [EA]	**DRAIN TIME [HR]
Basin B						
1,363.5	3,243	2.0	2,283	**3,120**		
1,362.5	1,323	1.0	837	837		
1,361.5	351	N/A	N/A	N/A		

UNDERGROUND RETENTION VOLUME CALCULATIONS

DRAINAGE AREA	PIPE DIAMETER [FT]	VOLUME PER FT [CF/FT]	PIPE LENGTH [FT]	TOTAL VOLUME [CF]
1	2	3.14	686	**2,155**

TOTAL				**5,275**	**1**	**13.9**

**Assumed Drywell Percolation Rate [CFS]: 0.10

$$No.\,of\ Drywells\ Required = \frac{Volume\ Required\ [CF]}{Percolation\ Rate\ [CFS]} * \frac{1\ hour}{3600\ seconds} * \frac{1}{Allowable\ Drain\ Time\ [hrs]}$$

HYDROLOGIC DESIGN DATA RECORD - RATIONAL METHOD

Project: HH Shea Parking Garage
Project No: 1124070

Concentration Point: Existing Catch Basin
Existing Condition

Design Data:

		Design Frequency						
		2	5	10	25	50	100	Year
Drainage Areas:	A_1	0.50	0.50	0.50	0.50	0.50	0.50	Acres
	A_2	0.05	0.05	0.05	0.05	0.05	0.05	Acres
	A_3	-	-	-	-	-	-	Acres
Total Drainage Area	A	0.55	0.55	0.55	0.55	0.55	0.55	Acres
Drainage Length		303.00	303.00	303.00	303.00	303.00	303.00	Feet
Elevations:								
Top of Drainage Area		1365.63	1365.63	1365.63	1365.63	1365.63	1365.63	Feet
Bottom of Drainage Area		1361.40	1361.40	1361.40	1361.40	1361.40	1361.40	Feet
Drainage Area Slope		1.40	1.40	1.40	1.40	1.40	1.40	%
Hydrologic Soil Group		A	A	A	A	A	A	

Design Computations:

		Design Frequency						
		2	5	10	25	50	100	Year
Time of Concentration	T_c	5.55	5.00	5.00	5.00	5.00	5.00	Min
Rainfall Intensity	i	2.85	3.96	4.76	5.84	6.67	7.52	In/Hr
Runoff Coefficients:	C_1	0.85	0.85	0.85	0.94	0.95	0.95	
	C_2	0.40	0.40	0.40	0.44	0.48	0.50	
	C_3	-	-	-	-	-	-	
Weighted Runoff Coefficient	C_W	0.81	0.81	0.81	0.89	0.91	0.91	
Peak Discharge $Q_P = C_W I A$		1.3	1.8	2.1	2.9	3.3	3.8	cfs

Volume Computations:	2	5	10	25	50	100	Year
Volume $V = C_W P_{2hr} A$	0.03	0.04	0.05	0.07	0.08	0.09	ac-ft

Computed by:

Date:

Notes:

1. Runoff coefficients for 25-, 50- and 100-year storm frequencies were derived using adjustment factors of 1.10, 1.20 and 1.25, respectively, applied to the 2-10 year values with an upper limit of 0.95.

2. The ranges of runoff coefficients shown for urban land uses were derived from lot coverage standards specified in the zoning ordinances for Maricopa County.

3. Runoff coefficients for urban land uses are for lot coverage only and do not include the adjacent street and rights-of-way, or alleys.

4. Values based on the NDR terrain class. Values should be increased for NHS and NMT terrain classes by the difference between NHS (or NMT) and the NDR C values, up to a maximum of 0.95. Engineering judgement should be used.

HYDROLOGIC DESIGN DATA RECORD - RATIONAL METHOD

Project: HH Shea Parking Garage
Project No: 1124070

Concentration Point: Existing Catch Basin
Proposed Condition - Area to Exst Catch Basin

Design Data:

		Design Frequency						
		2	5	10	25	50	100	Year
Drainage Areas:	A_1	0.25	0.25	0.25	0.25	0.25	0.25	Acres
	A_2	0.05	0.05	0.05	0.05	0.05	0.05	Acres
	A_3	-	-	-	-	-	-	Acres
Total Drainage Area	A	0.30	0.30	0.30	0.30	0.30	0.30	Acres
Drainage Length		167.00	167.00	167.00	167.00	167.00	167.00	Feet
Elevations:								
Top of Drainage Area		1364.47	1364.47	1364.47	1364.47	1364.47	1364.47	Feet
Bottom of Drainage Area		1361.40	1361.40	1361.40	1361.40	1361.40	1361.40	Feet
Drainage Area Slope		1.84	1.84	1.84	1.84	1.84	1.84	%
Hydrologic Soil Group		A	A	A	A	A	A	

Design Computations:

		Design Frequency						
		2	5	10	25	50	100	Year
Time of Concentration	T_c	5.00	5.00	5.00	5.00	5.00	5.00	Min
Rainfall Intensity	i	2.93	3.96	4.76	5.84	6.67	7.52	In/Hr
Runoff Coefficients:	C_1	0.85	0.85	0.85	0.94	0.95	0.95	
	C_2	0.40	0.40	0.40	0.44	0.48	0.50	
	C_3	-	-	-	-	-	-	
Weighted Runoff Coefficient	C_W	0.77	0.77	0.77	0.85	0.87	0.87	
Peak Discharge $Q_P = C_W I A$		0.7	0.9	1.1	1.5	1.8	2.0	cfs

Volume Computations:	2	5	10	25	50	100	Year
Volume $V = C_W P_{2hr} A$	0.02	0.02	0.03	0.04	0.04	0.05	ac-ft

Computed by:

Date:

Notes:

1. Runoff coefficients for 25-, 50- and 100-year storm frequencies were derived using adjustment factors of 1.10, 1.20 and 1.25, respectively, applied to the 2-10 year values with an upper limit of 0.95.

2. The ranges of runoff coefficients shown for urban land uses were derived from lot coverage standards specified in the zoning ordinances for Maricopa County.

3. Runoff coefficients for urban land uses are for lot coverage only and do not include the adjacent street and rights-of-way, or alleys.

4. Values based on the NDR terrain class. Values should be increased for NHS and NMT terrain classes by the difference between NHS (or NMT) and the NDR C values, up to a maximum of 0.95. Engineering judgement should be used.

HYDROLOGIC DESIGN DATA RECORD - RATIONAL METHOD

Project: HH Shea Parking Garage
Project No: 1124070

Concentration Point: Existing Catch Basin
Proposed Condition - Overtopping from Basin A

Design Data:

		Design Frequency						
		2	5	10	25	50	100	Year
Drainage Areas:	A_1	0.04	0.04	0.04	0.04	0.04	0.04	Acres
	A_2	-	-	-	-	-	-	Acres
	A_3	-	-	-	-	-	-	Acres
Total Drainage Area	A	0.04	0.04	0.04	0.04	0.04	0.04	Acres
Drainage Length		122.00	122.00	122.00	122.00	122.00	122.00	Feet
Elevations:								
Top of Drainage Area		1364.10	1364.10	1364.10	1364.10	1364.10	1364.10	Feet
Bottom of Drainage Area		1361.40	1361.40	1361.40	1361.40	1361.40	1361.40	Feet
Drainage Area Slope		2.21	2.21	2.21	2.21	2.21	2.21	%
Hydrologic Soil Group		A	A	A	A	A	A	

Design Computations:

		Design Frequency						
		2	5	10	25	50	100	Year
Time of Concentration	T_c	5.00	5.00	5.00	5.00	5.00	5.00	Min
Rainfall Intensity	i	2.93	3.96	4.76	5.84	6.67	7.52	In/Hr
Runoff Coefficients:	C_1	0.85	0.85	0.85	0.94	0.95	0.95	
	C_2	0.40	0.40	0.40	0.44	0.48	0.50	
	C_3	-	-	-	-	-	-	
Weighted Runoff Coefficient	C_W	0.85	0.85	0.85	0.94	0.95	0.95	
Peak Discharge $Q_P = C_W I A$		0.1	0.1	0.2	0.2	0.3	0.3	cfs

Volume Computations:	2	5	10	25	50	100	Year
Volume $V = C_W P_{2hr} A$	0.00	0.00	0.00	0.01	0.01	0.01	ac-ft

Computed by:

Date:

Notes:

1. Runoff coefficients for 25-, 50- and 100-year storm frequencies were derived using adjustment factors of 1.10, 1.20 and 1.25, respectively, applied to the 2-10 year values with an upper limit of 0.95.

2. The ranges of runoff coefficients shown for urban land uses were derived from lot coverage standards specified in the zoning ordinances for Maricopa County.

3. Runoff coefficients for urban land uses are for lot coverage only and do not include the adjacent street and rights-of-way, or alleys.

4. Values based on the NDR terrain class. Values should be increased for NHS and NMT terrain classes by the difference between NHS (or NMT) and the NDR C values, up to a maximum of 0.95. Engineering judgement should be used.