

PRELIMINARY DRAINAGE REPORT

Residential Healthcare Facility

90th Street and Raintree Drive

Scottsdale, AZ 85260

Prepared For:



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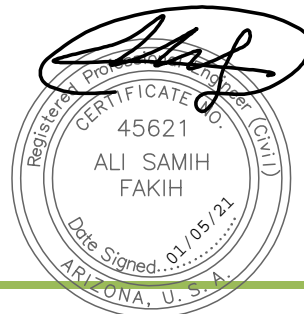
Case No.:

Plan Check No.: TBD

16-ZN-2020
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1. INTRODUCTION

This Preliminary Drainage Report represents the storm water analysis for the proposed Residential Healthcare Facility located in Scottsdale, Arizona. The purpose of this report is to provide the hydrologic and hydraulic analysis, required by the City of Scottsdale, to support the proposed site plan for said development. This report includes discussions and calculations defining the storm water management concepts for the collection and conveyance necessary to comply with the drainage requirements of the City of Scottsdale and Maricopa County. Preparation of this report has been completed in accordance with the requirements of the City of Scottsdale Design Standards & Policies Manual (DS&PM) 2018 ¹, and the Drainage Design Manuals for Maricopa County, Arizona, Volumes I² and Volume II³.

2. LOCATION AND PROJECT DESCRIPTION

2.1 LOCATION:

The subject property consists of land located at the northwest corner of 90th Street and Raintree Circle Drive in Scottsdale, AZ:

- A portion of the Northwest 1/4 of Section 7, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Scottsdale, Arizona.
- Parcel ID: Parcel 217-15-033; SFI Raintree Scottsdale LLC, Zoning R1-35

Refer to **FIGURE 1 - Vicinity Map** for the project's location with respect to major cross streets

2.2 EXISTING AND PROPOSED DEVELOPMENTS SURROUNDING THE SITE:

- South: The site is bound by Raintree Circle Drive with the following across as follows:

Parcel 217-15-952; The Robinson Group; Zoning is I-1

Parcel 217-15-953; Wood Trust Bank; Zoning is I-1

Parcel 217-15-954; Epstein Schneider; Zoning is I-1

Parcel 217-15-955; GHA Technologies, Inc; Zoning is I-1

Parcel 217-15-944; Loanpal; Zoning is C-2

- North: Parcel 217-15-036E; Alliance Defending Freedom. 217-15-036J; Vanguard. Zoning is I-1.
- East: Directly adjacent is 90th Street. Across is a residential development; Zoning is R1-7
- West: Parcel 217-15-035A; Undeveloped; Zoning is I-1; Raintree & Pima Self Storage Partners LLC.

2.3 EXISTING SITE DESCRIPTION:

The project area includes approximately 203,311 sqft. (4.67 acres) of land designated as R1-35 zoning. The existing site consists of an undeveloped parcel. Per Topographic Survey prepared by AW Land Surveying LLC, a majority of the site slopes from northwest to southeast, while the western most portion flows from northeast to southwest at approximately 1.0%. Elevation varies from approximately 1480.66 at the northwest corner to approximately 1476.82 at the southeast corner.

Refer to **FIGURE 2** attached for an aerial map of the site.

2.4 PROPOSED SITE DEVELOPMENT:

The proposed development consists of a new residential healthcare facility with 3 and 4 story components, parking, and a common area with a pool. Refer to **Appendix III** - Preliminary Grading Plan for site layout.

2.5 FLOOD HAZARD ZONE:

FIRM Map Number 04013C1760L dated October 16, 2013 indicates the site is designated as Zone "X-Shaded", corresponding to 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.

Refer to **FIGURE 3** for the current FIRM map.

3. EXISTING DRAINAGE CONDITIONS

3.1 OFF-SITE DRAINAGE PATTERNS

The topographic survey and city quarter section maps, **FIGURES 4 and 5**, provide the following information for offsite drainage:

- **North:**
 - Parcels 217-15-036E and 217-15-036J are developed sites that retain their onsite runoff. The existing curb and gutter along the northwest of the property line and the existing retention basin along the northeast of the property boundary maintain runoff from northern parcels and do not affect the proposed site.
 - There is an existing 24" RGRCP storm pipe discharging onto the northeast corner of the site via a headwall (EX HW-1). This system appears to convey runoff from 90th Street and restricted discharge for a retention basin from the Raintree Corporate Center approximately 650' north. The flow discharging to the site is currently unknown. According to the Scottsdale Corporate Center, Phase 2 Grading Plan, CASE #86-DR-87, the existing 24" pipe has a slope of 0.005 ft/ft, assuming full capacity of the pipe, the maximum flow discharging to the site is 16 cfs.
- **West:**
 - There is a ridgeline within the west portion of the subject property that directs flows northeast to southwest prohibiting runoff from the western adjacent parcel from entering the site.

- **South:**
 - There is an elevation difference of +/- 3 feet from north to south throughout the site, as such, offsite drainage from the southern parcel does not affect the site.
- **East:**
 - There is an existing catch basin at 90th Street that drains to the property, approximately 60' north of the southeast corner of the site. A second catch basin is located across 90th Street. According to the Storm QS map, both basins are connected by a pipe of unknown size and material and discharge onsite through the existing headwall, EX HW-2. The calculated runoff from 90th Street was determined using the rational method based on the estimated drainage area. Refer to **Appendix II** for Existing Conditions Drainage Area Map.

Table 1: Offsite Flows Summary		
Headwall ID	Description	Flow (CF)
EX-HW-1	24" RCP capturing runoff from north parcels	16.00
EX-HW-2	24" RCP capturing runoff from 90th Street	6.20
	TOTAL:	22.20

The offsite runoff from the north and from 90th Street exit the site through a headwall located near the southeast corner of the site, EX HW-3. Considering runoff from the offsite flows specified above and including an additional flow of 3.4 cfs from drainage area EX-1, the estimated flow, Q_{out} , leaving EX. HW-3 is 25.60 cfs. Refer to **Appendix II** for Offsite Existing Conditions Drainage Area Map.

3.2 ON-SITE DRAINAGE PATTERNS

The site is currently undeveloped and from northwest to southeast at approximately 0.5%. Elevation varies from approximately 1480.66 at the northwest corner to approximately 1476.82 at the southeast corner. All existing on-site runoff is assumed to sheet flow following the natural slope of the land to the southeast and is captured by HO-1 and HO-2.

4. PROPOSED STORM WATER MANAGEMENT

4.1 DESIGN INTENT:

The entirety of the site is proposed as commercial use with a runoff coefficient of 0.86. On-site drainage will be captured by five catch basins and curb-openings directing flows to two above-ground retention basins. All on-site runoff will be directed to an underground CMP storage system located in the northeastern portion of the site. Three proposed drywells will treat and precipitate captured stormwater runoff within 36 hours.

Refer to **Appendix II** for **Proposed Conditions Drainage Area Map**.

The site will be self-retaining for the 100-year, 2-hr storm event. Existing offsite drainage patterns will remain unchanged. Flows from Existing Headwall 1 (EX-HW-1) and Existing Headwall 2 (EX-HW-2) will be rerouted to the existing storm drain manhole (EX-MH-2) on the northwest corner of 90th Street and Raintree Circle Drive via a 24" storm pipe.

Refer **Appendix III** for **Preliminary Grading and Drainage Plan**.

4.2 DESIGN STORM REQUIREMENTS:

In accordance with The City of Scottsdale requirements, stormwater storage for a 100-year 2-hour storm event is required.

4.3 LAND CHARACTERISTICS:

The proposed development consists of a multi-story commercial building with a main drive and minor landscape areas along the perimeter. Based on the DS&PM, the weighted runoff coefficient for a 100-year storm event used is as follows:

- C=0.86 for commercial and industrial areas

HYDROLOGIC ANALYSIS: The hydrologic analysis is determined using the procedures in The City of Scottsdale Design Standards & Policies Manual and the Drainage Design Manual for Maricopa County, Arizona, Volume I. The Rational Method was utilized to compute the on-site peak discharges. The Rational Method equation is displayed as shown below:

$$Q=C_{wt}IA$$

Where:

- C_{wt} = The runoff coefficient relating runoff to rainfall
- I = Average rainfall intensity in inches/hour, lasting for T_c
- T_c = The time of concentration (Using Five minutes for the developed areas)
- A = The contributing drainage area in acres
- Q = Estimated peak discharge at inlet point, cfs.

Refer to the **Proposed Conditions Drainage Area Map** and Calculations in **Appendix II**.

4.4 STORMWATER RETENTION:

Based on a topographic survey there is no retention provided in existing conditions. Per the above calculations, the proposed development storage requirements for the 100-yr, 2-hr storm event are shown below. A combination of underground stormwater storage tanks and open retention basins will be employed to retain the required stormwater volume. The proposed underground stormwater system and surface retention basins will be equalized to combine their storage capacity and integrate their hydraulic performance. In the case of the open retention basins, risers will be installed at the top elevation of each basin to direct any excess water volume towards the underground storage tanks and prevent flooding from events exceeding their storage capacity.

4.4.1 STORAGE REQUIRED:

Stormwater storage required for the 100-year, 2-hour event is calculated in accordance with The City of Scottsdale- DS&PM. Required Retention (Acre-Feet) $V_R = (P/12)*A*C$

Where: P= 100 yr 2 hr precipitation in inches (Ref: Isopluvial from DS&PM, Appendix 4-1D, pg.11 and NOAA Atlas 14 table). Refer to **Appendix I** for rainfall data.

Based on the weighted runoff coefficient (C-value) identified in Section 4.3, the following retention is required:

Basin A (Open Retention and Underground Storage): 4.67 ac @ Cwt= 0.86

- 100-yr 2-hr.:

$$V_R = 2.27/12 * 4.67 * 0.86 = \mathbf{0.76 \text{ ac.ft. (33,106 c.f.) REQUIRED STORAGE}}$$

4.4.2 STORAGE PROVIDED:

Retention Basin A (Combination Open & Underground Retention):

The proposed retention (Retention Basin A) consists of two open retention basins and two 10-ft diameter corrugated metal pipes, all connected with equalizer pipes.

- The proposed volume for the open retention was calculated using the area-sum method based on design contours.
- Storage volume of underground piping is calculated using $V_p = \pi(R^2) * L$. Table 2 summarizes the calculated volume provided and volume required and verifies that proposed basins are adequate to store the required volume for the 100-yr, 2-hr storm event. Refer to Appendix II for Proposed Storage Calculations.

Table 2:

Proposed Retention Basin Summary					
Basin	TYPE	Vp	Vptotal	Vr	
(ID)	(--)	(CF)	(CF)	(CF)	
Basin A	Basin A1	OPEN	6,712	34,498	33,106
	Basin A2	OPEN	1,083		
	Basin A3	UG	26,704		

4.4.3 STORMWATER DISCHARGE:

For Basins with no direct bleed-off available, Drywells are proposed for the on-site storage facilities to dispose of the stormwater within thirty-six (36) hours. The calculation is as follows:

- Minimum percolating rate of a drywell (for planning purposes) = 0.1 cfs
- Volume to be drained in 36 hours = 0.1 cfs * 36 hours * 3600 sec/hour = 12,960 cf = 0.298 acre-feet.
- Basin A retention provided = 34,498 cf
Therefore, 34,498 cf / 12,960 cf per drywell = 2.66= 3 drywells required.
- The drywells are to be installed according to FCDMC guidelines.

4.5 ADEQ WATER QUALITY REQUIREMENTS

The total disturbed area of this site is approximately 4.67 acres. The Arizona Department of Environmental Quality requires that any site disturbance over one acre is required to submit an NOI. An NOI will be submitted to ADEQ for this site prior to approval of construction documents as site disturbance for this project exceeds one acre.

5. FLOOD SAFETY FOR DWELLINGS

5.1 FINISHED FLOOR ELEVATIONS

This project lies in an "X-Shaded" Flood Zone. The ultimate outfall elevation for the site is 1479.72 and is located at the southeast corner of the site. Therefore, the proposed building finished floor elevations will be set a minimum of 12 inches above the 100-year high-water elevation of any adjacent streets and drainage paths. This will ensure that finished floor elevations will be set sufficiently above the 100-year water level so as to not be in danger of flooding during a 100 yr-2hr storm event.

6. CONCLUSIONS

6.1 OVERALL PROJECT:

1. The finish floor elevations will be designed a minimum of 12 inches above the 100-year water surface in adjacent streets and drainage paths and a minimum of 14 inches above the low top of curb of the lot.
2. All on-site storm water will be retained on-site and is provided for the 100-year, 2-hour storm event with discharge within 36-hours. A combination of equalized underground tanks and open retention basins will be used to store the required stormwater volume.

6.2 PROJECT PHASING:

This project will be constructed in a single phase.

7. WARNING AND DISCLAIMER OF LIABILITY

GRADING & DRAINAGE

APPENDIX 4-1C

GRADING & DRAINAGE LANGUAGE

WARNING AND DISCLAIMER OF LIABILITY

The City's Stormwater and Floodplain Management Ordinance is intended to minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding. The Stormwater and Floodplain Management Ordinance identifies floodplains, floodways, flood fringes and special flood hazard areas. However, a property outside these areas could be inundated by floods. Also, much of the city is a dynamic flood area; floodways, floodplains, flood fringes and special flood hazard areas may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY

The flood protection provided by the Stormwater and Floodplain Management Ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by constructed or natural causes. The Stormwater and Floodplain Management Ordinance does not create liability on the part of the city, any officer or employee thereof, or the federal, state or county government for any flood damages that result from reliance on the Ordinance or any administrative decision lawfully made thereunder.

Compliance with the Stormwater and Floodplain Management Ordinance does not ensure complete protection from flooding. Flood-related problems such as natural erosion, streambed meander, or constructed obstructions and diversions may occur and have an adverse effect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above.

Plan Check # _____

Owner _____

Date _____

From City of Scottsdale DPSM-2018. Page 219

8. REFERENCES

1. *Design Standards & Policies Manual, City of Scottsdale – January 2018*
2. *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology, Flood Control District of Maricopa County, Fourth Edition, December 14, 2018*
3. *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics, Flood Control District of Maricopa County, December 14, 2018*



FIGURE 1 – Vicinity Map

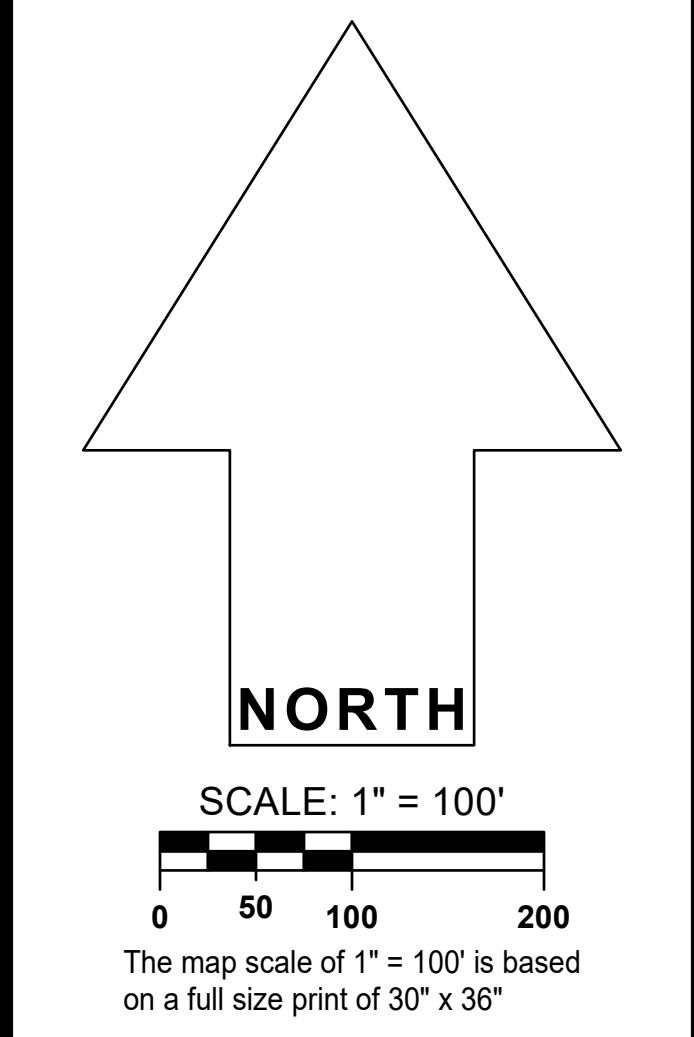
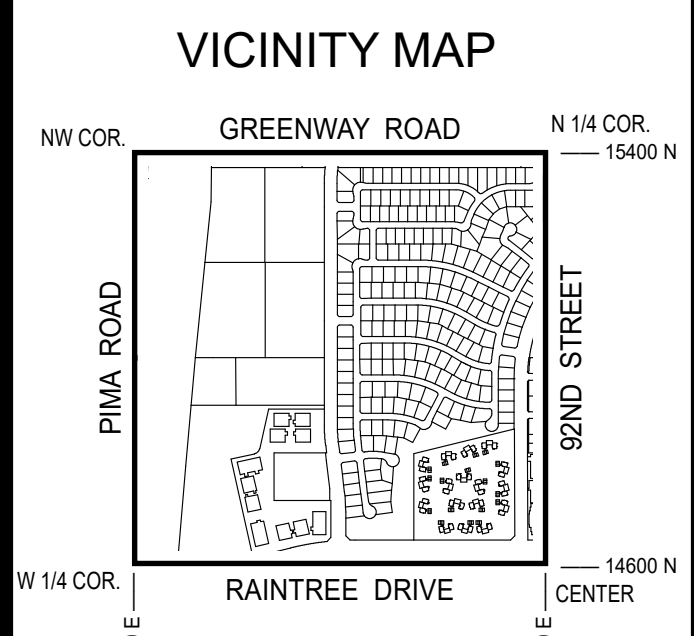


FIGURE 2 - Aerial

GENERAL NOTES:

- THIS IS A COMPUTER GENERATED DRAWING. FOR ANY REVISIONS PLEASE CONTACT THE CITY OF SCOTTSDALE GIS DEPARTMENT AT (480) 312-7792.
- THE SECTION LINE BEARING AND DISTANCES ARE BASED ON THE CITY OF SCOTTSDALE GPS SURVEY OF SEPTEMBER, 1991. BEARINGS ARE NAD 83 GRID AND DISTANCES ARE FLATTENED TO GROUND. WHERE NO CORNER WAS FOUND THE DIMENSIONS ARE GIVEN TO CALCULATED SECTION CORNERS AND ARE NOTED AS 'CALCULATED' ON THE MAP.

LEGEND:
FIGURE 4



STORM WATER
QUARTER SECTION MAP
34-49
NW 1/4 SEC. 7 T3N R5E

FIGURE 4

CITY OF SCOTTSDALE
SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

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THE CITY OF SCOTTSDALE

34-48

05-JUL-20



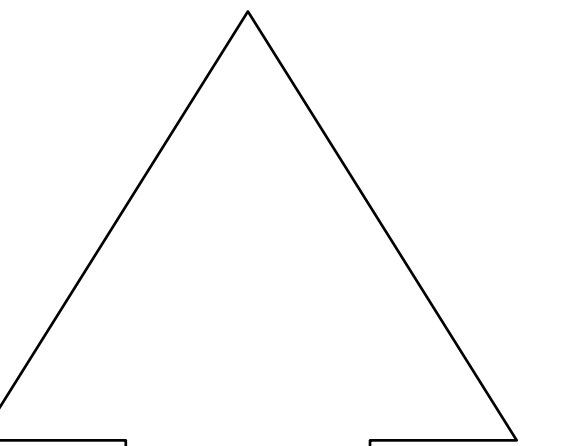
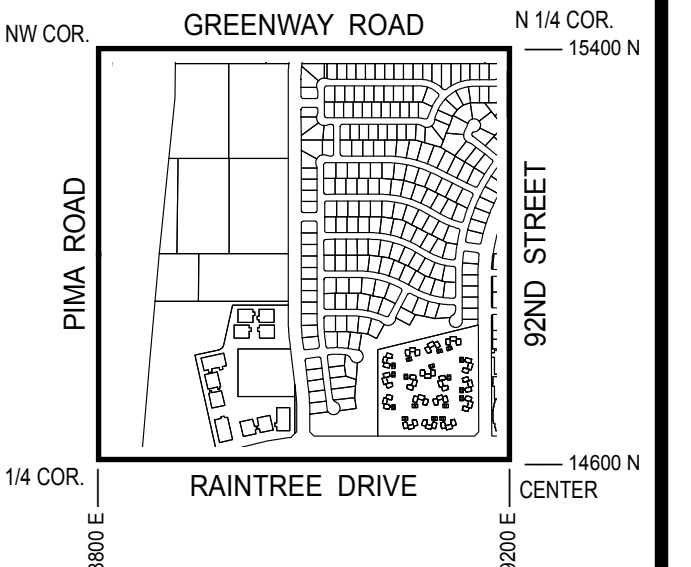
34-50

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LEGEND:

VICINITY MAP



NORTH

SCALE: 1" = 100'



The map scale of 1" = 100' is based on a full size print of 30" x 36"

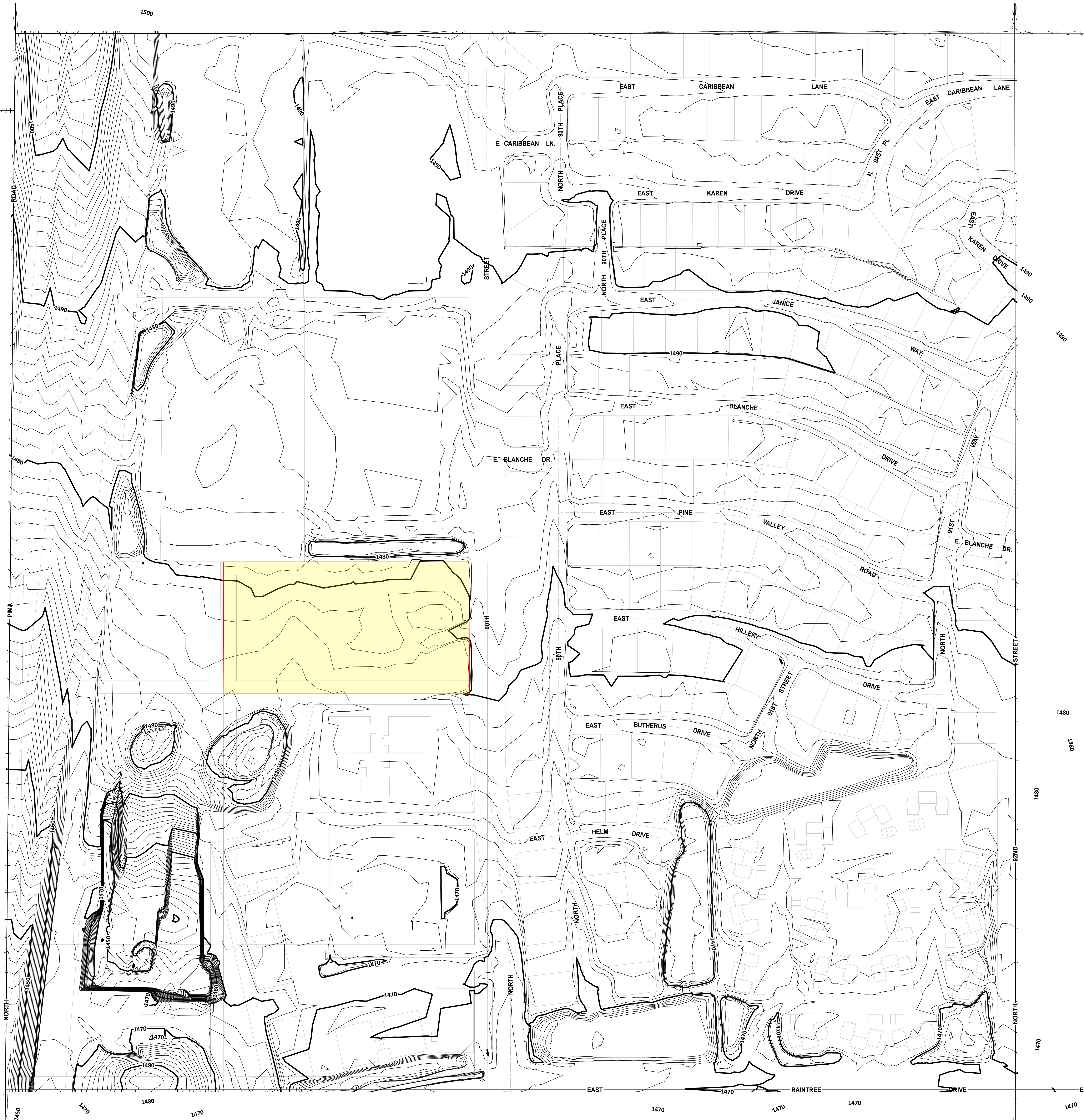
CONTOUR
QUARTER SECTION MAP

34-49

NW 1/4 SEC. 7 T3N R5E

FIGURE 5

CITY OF SCOTTSDALE
SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251



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THE CITY OF SCOTTSDALE

34-48

28-APR-14



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APPENDIX I

Rainfall Data



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 & aeriels](#)

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	0.194 (0.161-0.238)	0.253 (0.212-0.310)	0.341 (0.283-0.417)	0.410 (0.338-0.498)	0.501 (0.406-0.607)	0.571 (0.458-0.686)	0.643 (0.506-0.772)	0.714 (0.554-0.856)	0.811 (0.613-0.974)	0.885 (0.655-1.06)
10-min	0.295 (0.245-0.362)	0.385 (0.322-0.472)	0.520 (0.431-0.634)	0.623 (0.514-0.758)	0.762 (0.618-0.924)	0.868 (0.696-1.05)	0.978 (0.771-1.18)	1.09 (0.842-1.30)	1.24 (0.933-1.48)	1.35 (0.997-1.62)
15-min	0.366 (0.304-0.448)	0.478 (0.399-0.585)	0.644 (0.533-0.786)	0.772 (0.637-0.940)	0.945 (0.766-1.15)	1.08 (0.863-1.30)	1.21 (0.955-1.46)	1.35 (1.04-1.62)	1.53 (1.16-1.84)	1.67 (1.24-2.01)
30-min	0.492 (0.409-0.603)	0.643 (0.538-0.788)	0.868 (0.718-1.06)	1.04 (0.858-1.27)	1.27 (1.03-1.54)	1.45 (1.16-1.74)	1.63 (1.29-1.96)	1.81 (1.41-2.18)	2.06 (1.56-2.48)	2.25 (1.67-2.70)
60-min	0.609 (0.506-0.746)	0.796 (0.665-0.976)	1.07 (0.889-1.31)	1.29 (1.06-1.57)	1.57 (1.28-1.91)	1.79 (1.44-2.16)	2.02 (1.59-2.43)	2.25 (1.74-2.69)	2.55 (1.93-3.06)	2.78 (2.06-3.35)
2-hr	0.713 (0.600-0.853)	0.923 (0.780-1.11)	1.23 (1.03-1.46)	1.46 (1.21-1.74)	1.78 (1.47-2.11)	2.02 (1.64-2.39)	2.27 (1.81-2.67)	2.52 (1.98-2.97)	2.86 (2.19-3.36)	3.12 (2.34-3.69)
3-hr	0.790 (0.666-0.969)	1.01 (0.855-1.25)	1.32 (1.11-1.62)	1.57 (1.30-1.91)	1.91 (1.56-2.31)	2.19 (1.77-2.63)	2.47 (1.96-2.96)	2.77 (2.16-3.31)	3.17 (2.40-3.80)	3.50 (2.59-4.20)
6-hr	0.953 (0.818-1.13)	1.20 (1.03-1.43)	1.53 (1.31-1.82)	1.80 (1.52-2.12)	2.16 (1.80-2.54)	2.44 (2.00-2.85)	2.73 (2.21-3.18)	3.03 (2.41-3.54)	3.43 (2.66-4.01)	3.75 (2.84-4.39)
12-hr	1.07 (0.922-1.26)	1.35 (1.16-1.59)	1.70 (1.46-2.00)	1.98 (1.68-2.32)	2.35 (1.98-2.75)	2.64 (2.20-3.07)	2.94 (2.41-3.41)	3.24 (2.62-3.76)	3.63 (2.87-4.24)	3.94 (3.06-4.63)
24-hr	1.25 (1.10-1.44)	1.59 (1.40-1.83)	2.05 (1.79-2.36)	2.41 (2.11-2.78)	2.93 (2.54-3.36)	3.33 (2.86-3.82)	3.75 (3.19-4.31)	4.19 (3.53-4.81)	4.80 (3.97-5.52)	5.29 (4.31-6.10)
2-day	1.35 (1.18-1.56)	1.72 (1.50-1.99)	2.26 (1.96-2.60)	2.68 (2.33-3.08)	3.27 (2.82-3.76)	3.74 (3.19-4.29)	4.23 (3.58-4.87)	4.75 (3.98-5.47)	5.46 (4.51-6.31)	6.04 (4.91-7.01)
3-day	1.45 (1.28-1.67)	1.86 (1.63-2.13)	2.45 (2.14-2.80)	2.92 (2.55-3.34)	3.59 (3.11-4.10)	4.13 (3.55-4.71)	4.70 (4.01-5.38)	5.31 (4.48-6.09)	6.16 (5.12-7.08)	6.85 (5.63-7.91)
4-day	1.56 (1.38-1.78)	1.99 (1.76-2.27)	2.64 (2.32-3.00)	3.17 (2.78-3.60)	3.91 (3.41-4.45)	4.52 (3.92-5.14)	5.17 (4.44-5.89)	5.87 (4.99-6.70)	6.85 (5.74-7.84)	7.66 (6.34-8.81)
7-day	1.76 (1.54-2.02)	2.25 (1.97-2.58)	2.98 (2.61-3.41)	3.58 (3.12-4.09)	4.43 (3.84-5.06)	5.12 (4.41-5.85)	5.86 (5.01-6.71)	6.66 (5.63-7.64)	7.78 (6.48-8.96)	8.70 (7.16-10.1)
10-day	1.91 (1.68-2.18)	2.45 (2.15-2.79)	3.24 (2.84-3.69)	3.88 (3.39-4.41)	4.79 (4.16-5.44)	5.52 (4.76-6.27)	6.30 (5.40-7.17)	7.13 (6.05-8.13)	8.30 (6.94-9.50)	9.25 (7.64-10.6)
20-day	2.36 (2.09-2.69)	3.05 (2.69-3.46)	4.03 (3.55-4.57)	4.78 (4.19-5.42)	5.79 (5.06-6.57)	6.58 (5.72-7.47)	7.39 (6.39-8.41)	8.22 (7.06-9.38)	9.34 (7.94-10.7)	10.2 (8.61-11.8)
30-day	2.78 (2.44-3.15)	3.57 (3.15-4.06)	4.72 (4.16-5.35)	5.60 (4.92-6.33)	6.78 (5.93-7.67)	7.70 (6.70-8.71)	8.64 (7.48-9.78)	9.61 (8.26-10.9)	10.9 (9.29-12.4)	11.9 (10.1-13.6)
45-day	3.24 (2.87-3.67)	4.18 (3.70-4.73)	5.52 (4.88-6.24)	6.52 (5.75-7.37)	7.85 (6.89-8.87)	8.86 (7.75-10.0)	9.90 (8.60-11.2)	10.9 (9.45-12.4)	12.3 (10.5-14.1)	13.4 (11.4-15.4)
60-day	3.60 (3.20-4.07)	4.66 (4.13-5.25)	6.14 (5.44-6.91)	7.22 (6.38-8.14)	8.64 (7.61-9.74)	9.71 (8.51-11.0)	10.8 (9.40-12.2)	11.9 (10.3-13.4)	13.3 (11.4-15.1)	14.3 (12.2-16.4)

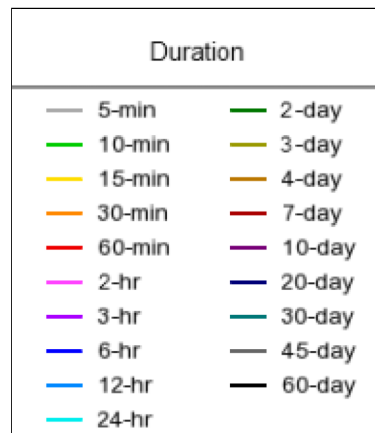
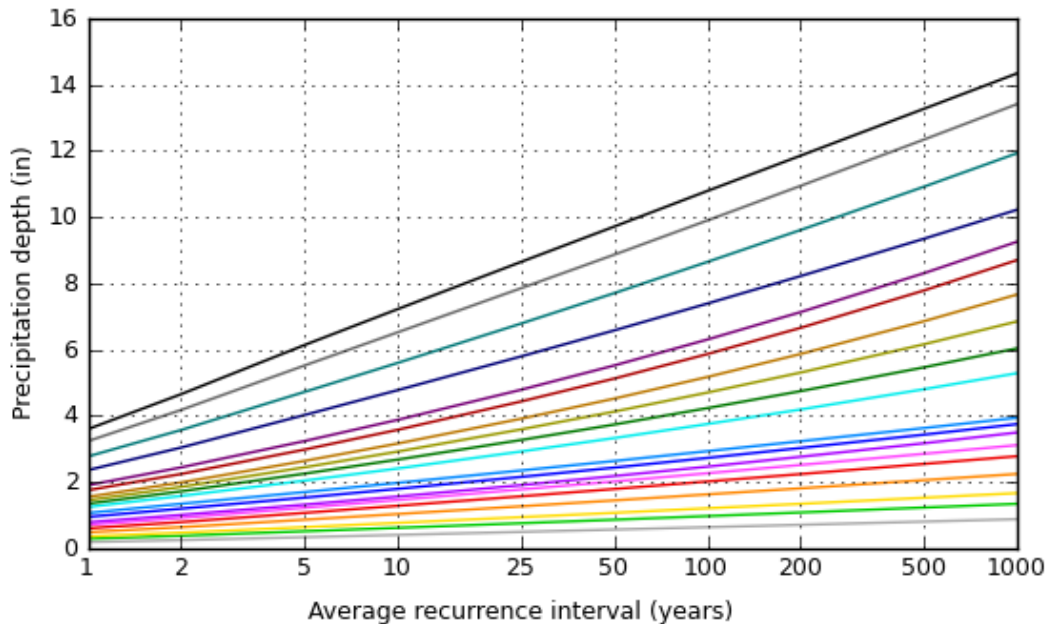
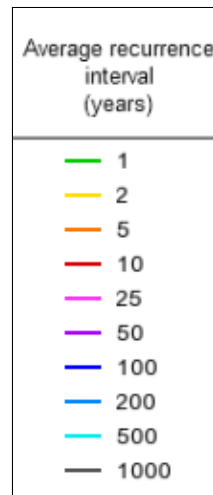
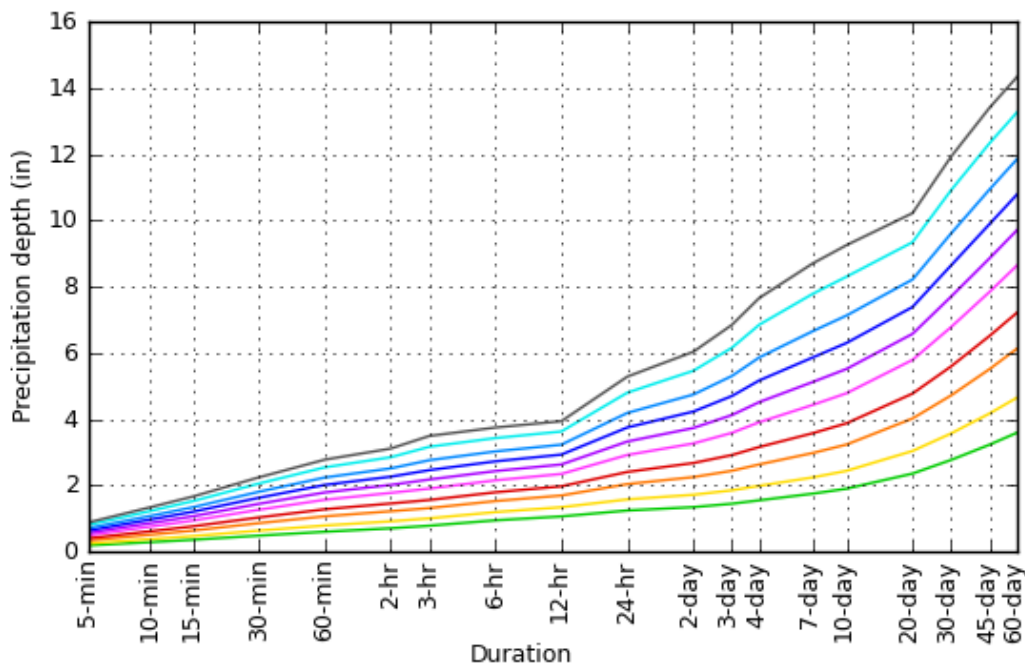
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average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

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PF graphical

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

Latitude: 33.6220°, Longitude: -111.8880°



[Back to Top](#)

Maps & aerials

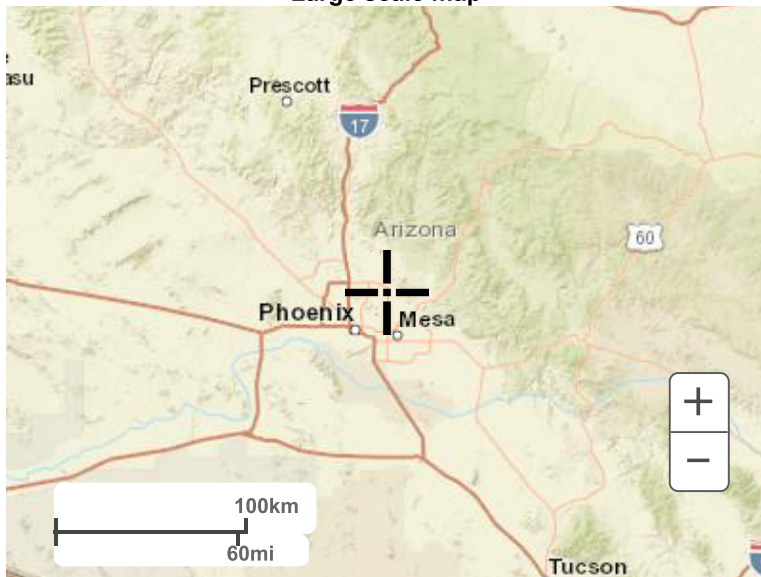
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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 & aeriels](#)

PF tabular

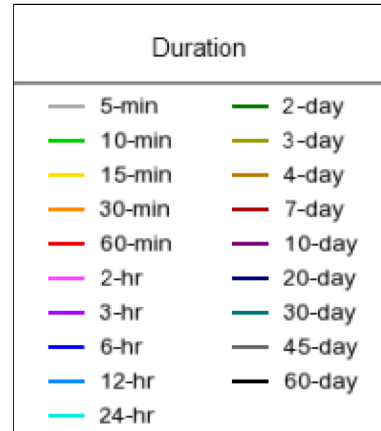
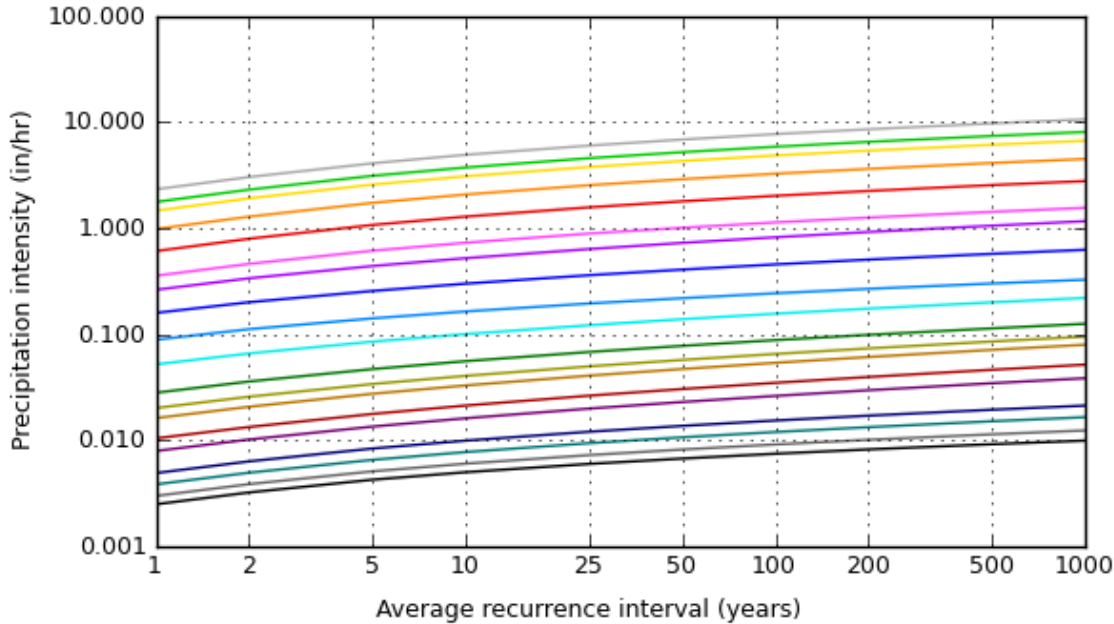
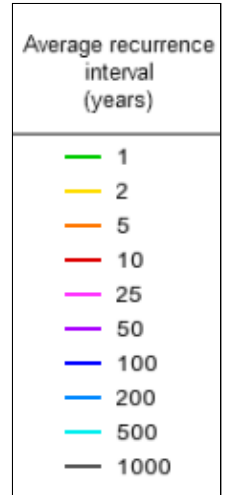
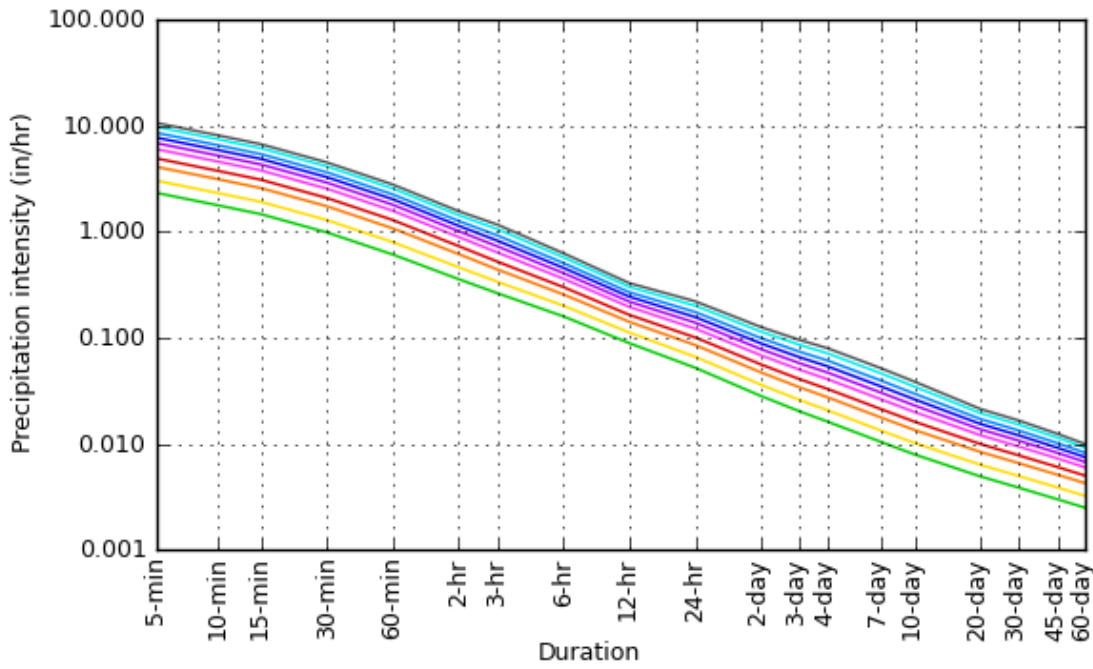
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.33 (1.93-2.86)	3.04 (2.54-3.72)	4.09 (3.40-5.00)	4.92 (4.06-5.98)	6.01 (4.87-7.28)	6.85 (5.50-8.23)	7.72 (6.07-9.26)	8.57 (6.65-10.3)	9.73 (7.36-11.7)	10.6 (7.86-12.8)
10-min	1.77 (1.47-2.17)	2.31 (1.93-2.83)	3.12 (2.59-3.80)	3.74 (3.08-4.55)	4.57 (3.71-5.54)	5.21 (4.18-6.27)	5.87 (4.63-7.05)	6.52 (5.05-7.82)	7.41 (5.60-8.90)	8.08 (5.98-9.72)
15-min	1.46 (1.22-1.79)	1.91 (1.60-2.34)	2.58 (2.13-3.14)	3.09 (2.55-3.76)	3.78 (3.06-4.58)	4.30 (3.45-5.18)	4.85 (3.82-5.83)	5.39 (4.18-6.46)	6.12 (4.62-7.35)	6.68 (4.94-8.03)
30-min	0.984 (0.818-1.21)	1.29 (1.08-1.58)	1.74 (1.44-2.12)	2.08 (1.72-2.53)	2.54 (2.06-3.09)	2.90 (2.33-3.49)	3.27 (2.57-3.92)	3.63 (2.81-4.35)	4.12 (3.11-4.95)	4.50 (3.33-5.41)
60-min	0.609 (0.506-0.746)	0.796 (0.665-0.976)	1.07 (0.889-1.31)	1.29 (1.06-1.57)	1.57 (1.28-1.91)	1.79 (1.44-2.16)	2.02 (1.59-2.43)	2.25 (1.74-2.69)	2.55 (1.93-3.06)	2.78 (2.06-3.35)
2-hr	0.356 (0.300-0.426)	0.462 (0.390-0.553)	0.614 (0.516-0.732)	0.730 (0.607-0.870)	0.890 (0.733-1.05)	1.01 (0.820-1.19)	1.14 (0.906-1.34)	1.26 (0.990-1.48)	1.43 (1.10-1.68)	1.56 (1.17-1.84)
3-hr	0.263 (0.222-0.323)	0.337 (0.285-0.415)	0.440 (0.370-0.539)	0.522 (0.434-0.635)	0.636 (0.521-0.769)	0.728 (0.588-0.874)	0.822 (0.652-0.987)	0.921 (0.718-1.10)	1.06 (0.799-1.26)	1.17 (0.861-1.40)
6-hr	0.159 (0.137-0.189)	0.201 (0.172-0.239)	0.256 (0.218-0.303)	0.300 (0.254-0.354)	0.361 (0.301-0.423)	0.407 (0.334-0.476)	0.456 (0.369-0.532)	0.506 (0.402-0.592)	0.573 (0.444-0.669)	0.627 (0.474-0.733)
12-hr	0.089 (0.077-0.105)	0.112 (0.096-0.132)	0.141 (0.121-0.166)	0.164 (0.140-0.192)	0.195 (0.164-0.228)	0.219 (0.182-0.255)	0.244 (0.200-0.283)	0.269 (0.217-0.312)	0.302 (0.238-0.352)	0.327 (0.254-0.385)
24-hr	0.052 (0.046-0.060)	0.066 (0.058-0.076)	0.085 (0.075-0.099)	0.101 (0.088-0.116)	0.122 (0.106-0.140)	0.139 (0.119-0.159)	0.156 (0.133-0.180)	0.175 (0.147-0.201)	0.200 (0.166-0.230)	0.220 (0.180-0.254)
2-day	0.028 (0.025-0.032)	0.036 (0.031-0.041)	0.047 (0.041-0.054)	0.056 (0.048-0.064)	0.068 (0.059-0.078)	0.078 (0.066-0.089)	0.088 (0.075-0.101)	0.099 (0.083-0.114)	0.114 (0.094-0.132)	0.126 (0.102-0.146)
3-day	0.020 (0.018-0.023)	0.026 (0.023-0.030)	0.034 (0.030-0.039)	0.041 (0.035-0.046)	0.050 (0.043-0.057)	0.057 (0.049-0.065)	0.065 (0.056-0.075)	0.074 (0.062-0.085)	0.086 (0.071-0.098)	0.095 (0.078-0.110)
4-day	0.016 (0.014-0.019)	0.021 (0.018-0.024)	0.028 (0.024-0.031)	0.033 (0.029-0.037)	0.041 (0.036-0.046)	0.047 (0.041-0.054)	0.054 (0.046-0.061)	0.061 (0.052-0.070)	0.071 (0.060-0.082)	0.080 (0.066-0.092)
7-day	0.010 (0.009-0.012)	0.013 (0.012-0.015)	0.018 (0.016-0.020)	0.021 (0.019-0.024)	0.026 (0.023-0.030)	0.030 (0.026-0.035)	0.035 (0.030-0.040)	0.040 (0.033-0.045)	0.046 (0.039-0.053)	0.052 (0.043-0.060)
10-day	0.008 (0.007-0.009)	0.010 (0.009-0.012)	0.013 (0.012-0.015)	0.016 (0.014-0.018)	0.020 (0.017-0.023)	0.023 (0.020-0.026)	0.026 (0.022-0.030)	0.030 (0.025-0.034)	0.035 (0.029-0.040)	0.039 (0.032-0.044)
20-day	0.005 (0.004-0.006)	0.006 (0.006-0.007)	0.008 (0.007-0.010)	0.010 (0.009-0.011)	0.012 (0.011-0.014)	0.014 (0.012-0.016)	0.015 (0.013-0.018)	0.017 (0.015-0.020)	0.019 (0.017-0.022)	0.021 (0.018-0.024)
30-day	0.004 (0.003-0.004)	0.005 (0.004-0.006)	0.007 (0.006-0.007)	0.008 (0.007-0.009)	0.009 (0.008-0.011)	0.011 (0.009-0.012)	0.012 (0.010-0.014)	0.013 (0.011-0.015)	0.015 (0.013-0.017)	0.017 (0.014-0.019)
45-day	0.003 (0.003-0.003)	0.004 (0.003-0.004)	0.005 (0.005-0.006)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.012)	0.011 (0.010-0.013)	0.012 (0.011-0.014)
60-day	0.002 (0.002-0.003)	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.004-0.006)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.007 (0.007-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.008-0.011)

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

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PF graphical

PDS-based intensity-duration-frequency (IDF) curves
 Latitude: 33.6220°, Longitude: -111.8880°



[Back to Top](#)

Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

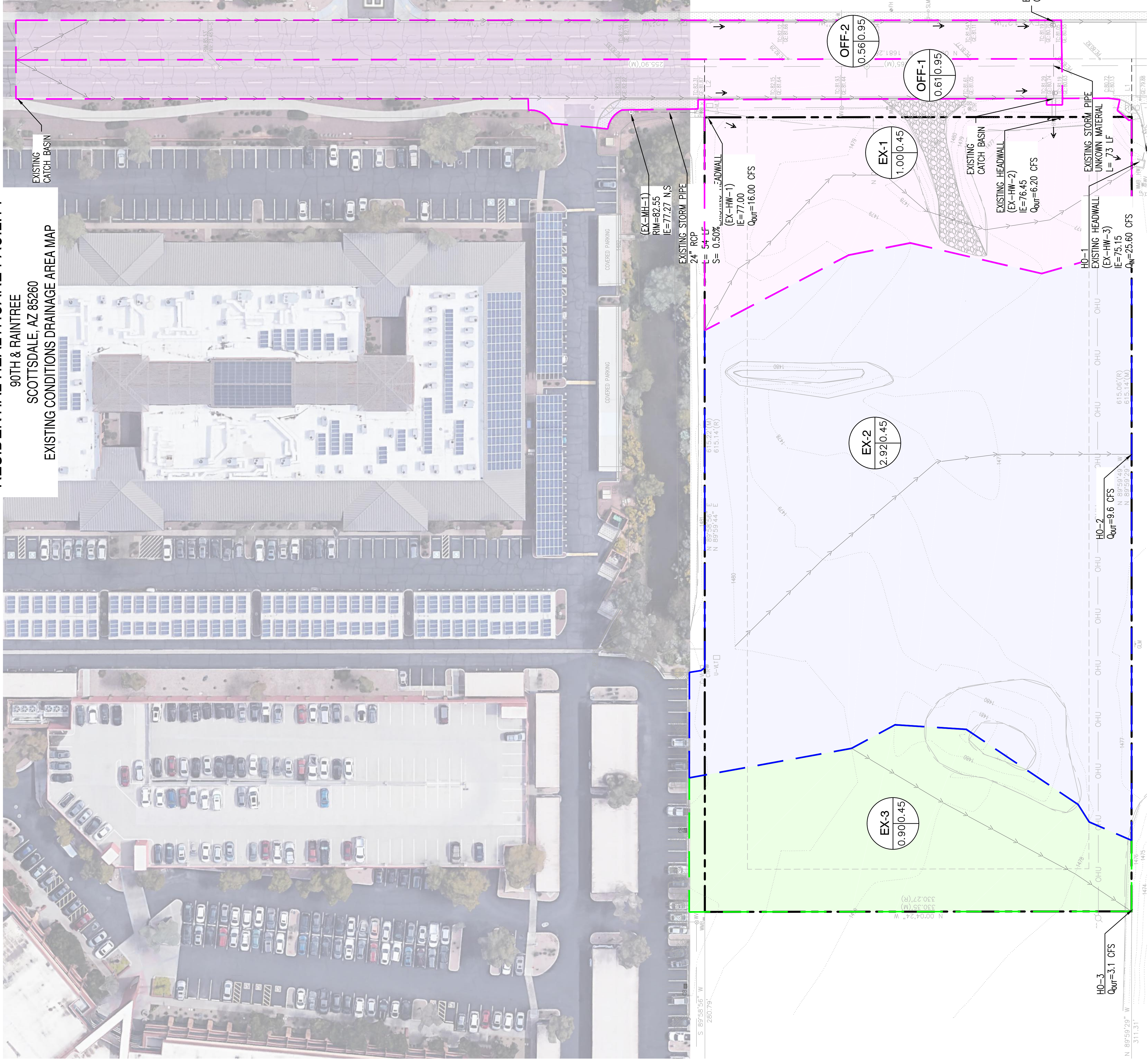


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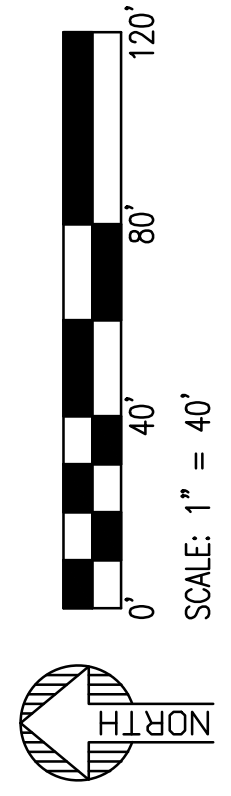
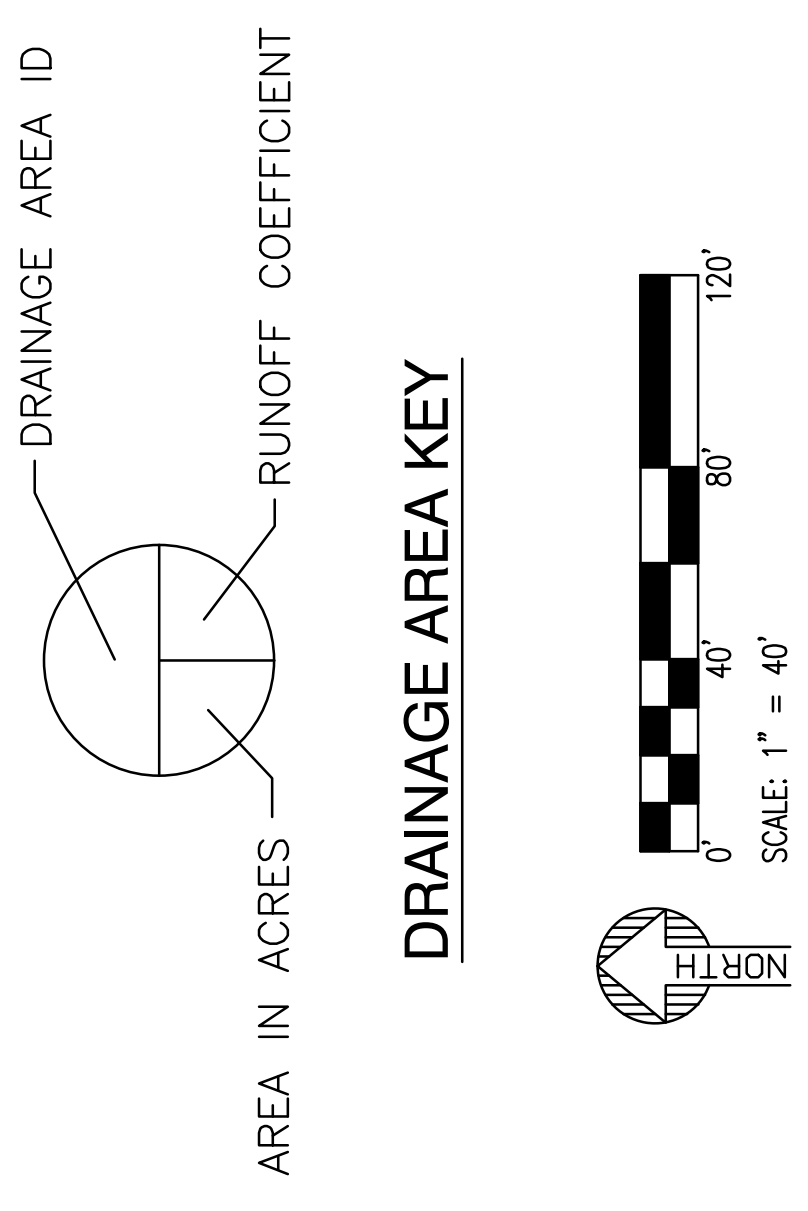
APPENDIX II

Calculations

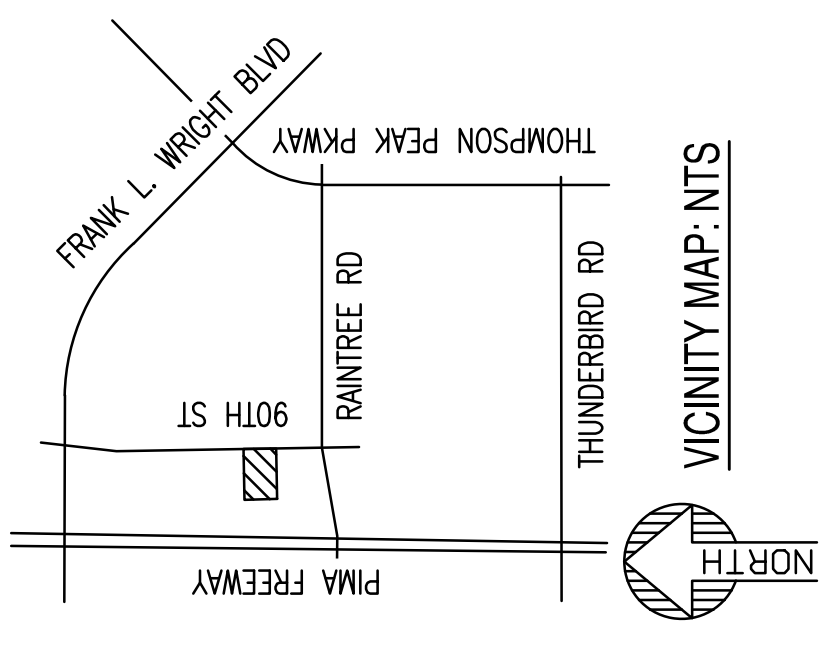
RESIDENTIAL HEALTHCARE FACILITY
 90TH & RAIN TREE
 SCOTTSDALE, AZ 85260
EXISTING CONDITIONS DRAINAGE AREA MAP



- LEGEND**
- PROPERTY LINE
 - DRAINAGE AREAS CONTRIBUTING TO HO-1
 - DRAINAGE AREAS CONTRIBUTING TO HO-2
 - DRAINAGE AREAS CONTRIBUTING TO HO-3
 - FLOW ARROW
 - EXISTING STORM MANHOLE
 - EXISTING HEADWALL
 - EXISTING STORM DRAIN PIPE



NOTE: STORM DRAIN MANHOLE RIM AND INVERTS OBTAINED FROM C.O.S. OS #34-49 AND SCOTTSDALE CORPORATE CENTER PHASE II GRADING PLAN #36286



SEG
 SUSTAINABILITY
 ENGINEERING
 GROUP

8280 E. GELDING DRIVE SUITE 101, SCOTTSDALE, ARIZONA 85260
 WWW.AZSEG.COM TEL. 480.588.7226 FAX 480.259.3534

PRELIMINARY
 NOT FOR
 CONSTRUCTION

PROJECT	RESIDENTIAL HEALTH CARE FACILITY
LOCATION	N 90TH ST & RAIN TREE
DRAWN	KA
DESIGNED	KA
DC	SC
CA	
PROJ. MGR.	
DATE:	9/24/2020
ISSUED FOR:	REZONING
REVISION NO.:	
DATE:	
SHEET TITLE:	EXISTING CONDITIONS DRAINAGE AREA MAP
JOB NO.:	200626
PAGE NO.:	1 OF 1

ID	Sub Basin Data					Sub Basin Hydrology Summary						
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01												
OFF-1	0.6	798	0.00	0.00	21.0	0.042	1.0	1.4	1.8	2.3	2.7	3.1
							Q (cfs) C	0.95	0.95	0.95	0.95	0.95
							CA (ac)	0.53	0.53	0.53	0.53	0.53
							Volume (ac-ft)	0.0348	0.0410	0.0478	0.0526	0.0570
							Tc (min)	16	12	11	11	10
							i (in/hr)	1.86	3.38	4.32	5.07	5.84
OFF-2	0.6	798	0.00	0.00	21.0	0.042	1.0	1.4	1.8	2.3	2.7	3.1
							Q (cfs) C	0.95	0.95	0.95	0.95	0.95
							CA (ac)	0.53	0.53	0.53	0.53	0.53
							Volume (ac-ft)	0.0348	0.0410	0.0478	0.0526	0.0570
							Tc (min)	16	12	11	11	10
							i (in/hr)	1.86	3.38	4.32	5.07	5.84
EX-1	1.0	334	0.00	0.00	29.2	0.040	1.0	1.4	1.7	2.1	2.8	3.4
							Q (cfs) C	0.37	0.37	0.37	0.42	0.45
							CA (ac)	0.37	0.37	0.37	0.42	0.45
							Volume (ac-ft)	0.0143	0.0197	0.0220	0.0278	0.0319
							Tc (min)	8	6	6	5	5
							i (in/hr)	2.57	4.54	5.74	6.67	7.64
EX-2	2.9	490	1,480.00	1,477.00	32.3	0.037	2.6	3.7	4.6	5.9	7.8	9.6
							Q (cfs) C	0.37	0.37	0.37	0.42	0.45
							CA (ac)	1.08	1.08	1.08	1.23	1.31
							Volume (ac-ft)	0.0435	0.0537	0.0716	0.0889	0.1042
							Tc (min)	9	8	7	6	6
							i (in/hr)	2.40	3.46	5.47	6.38	7.31
EX-3	0.9	344	1,481.00	1,478.00	46.0	0.040	0.9	1.3	1.6	2.0	2.6	3.1
							Q (cfs) C	0.37	0.37	0.37	0.42	0.45

* Non default value

(stSubBasRat.rpt)

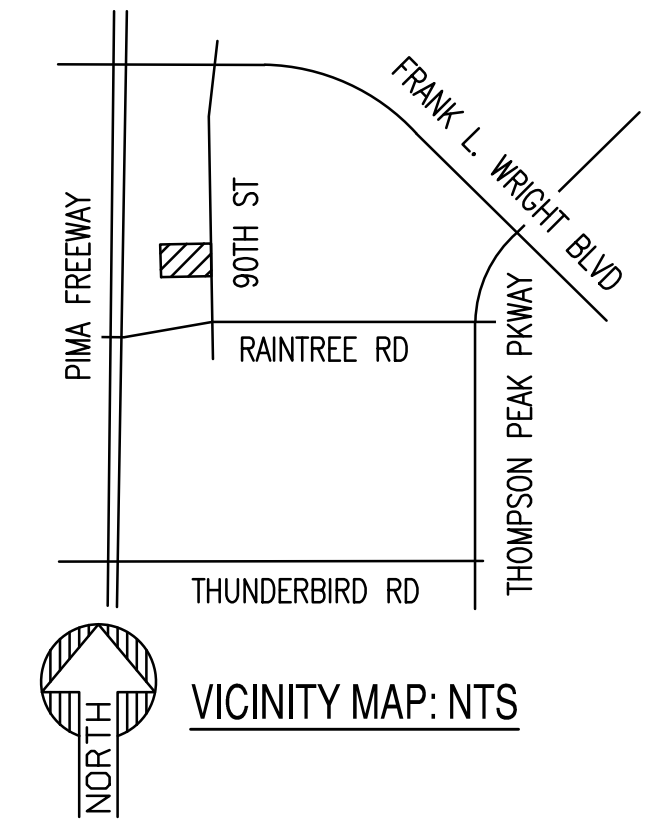
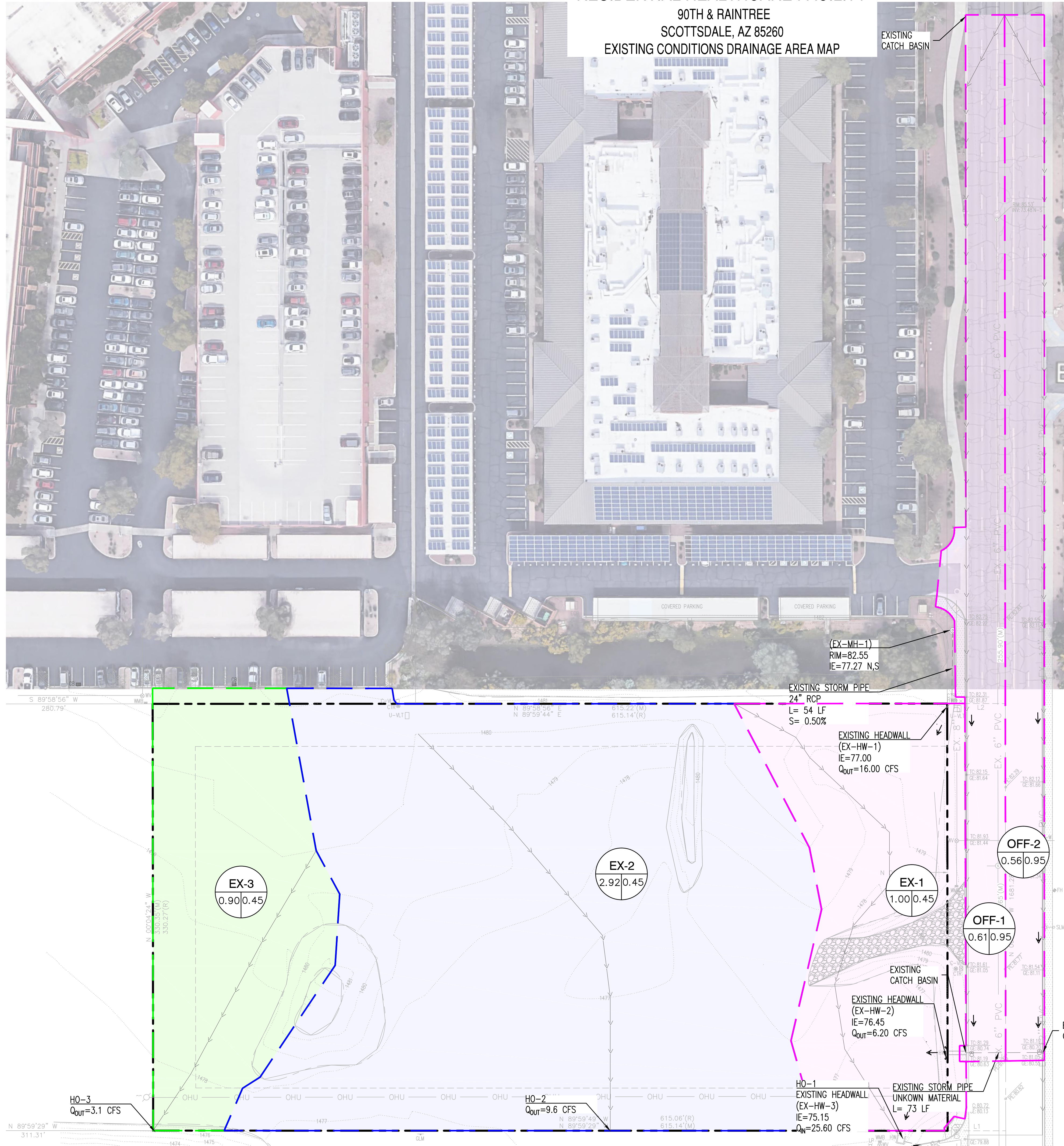
ID	Sub Basin Data				Sub Basin Hydrology Summary							
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
							0.33	0.33	0.33	0.33	0.38	0.41
							0.0113	0.0141	0.0159	0.0184	0.0239	0.0285
							7	6	5	5	5	5
							2.72	3.86	4.77	5.96	6.82	7.68
							CA (ac)					
							Volume (ac-ft)					
							Tc (min)					
							i (in/hr)					

Major Basin ID: 01

* Non default value

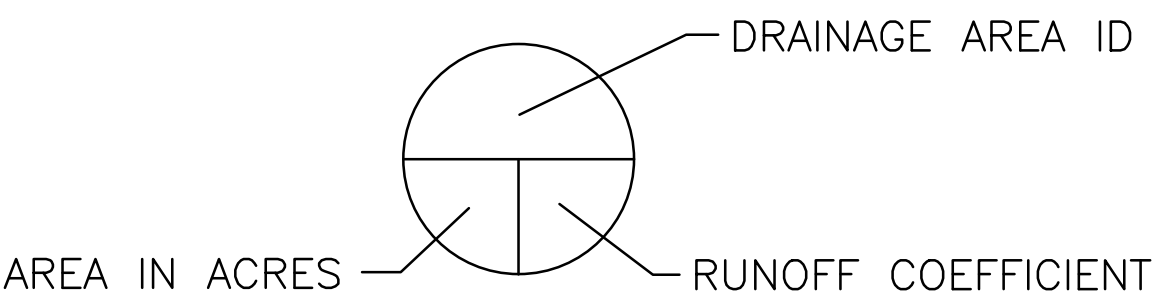
RESIDENTIAL HEALTHCARE FACILITY

90TH & RAINTREE
SCOTTSDALE, AZ 85260
EXISTING CONDITIONS DRAINAGE AREA MAP

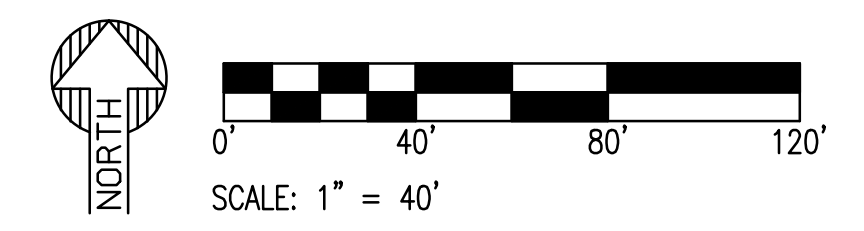


LEGEND

- PROPERTY LINE
- DRAINAGE AREAS CONTRIBUTING TO HO-1
- DRAINAGE AREAS CONTRIBUTING TO HO-2
- DRAINAGE AREAS CONTRIBUTING TO HO-3
- ← FLOW ARROW
- ⊙ EXISTING STORM MANHOLE
- ⌋ EXISTING HEADWALL
- EXISTING STORM DRAIN PIPE



DRAINAGE AREA KEY

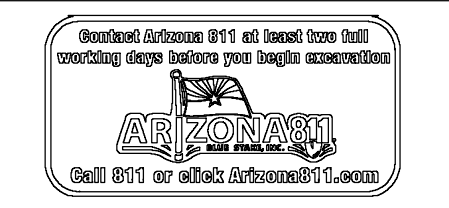


NOTE: STORM DRAIN MANHOLE RIM AND INVERTS OBTAINED FROM C.O.S. QS #34-49 AND SCOTTSDALE CORPORATE CENTER PHASE II GRADING PLAN #36286

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CONSTRUCTION



8280 E. GELDING DRIVE SUITE 101, SCOTTSDALE, ARIZONA 85260
WWW.AZSEG.COM TEL. 480.588.7226 FAX. 480.259.3534



PROJECT RESIDENTIAL HEALTH CARE FACILITY	LOCATION N 90TH ST & RAINTREE CIRCLE DR
DRAWN: KA	9/24/2020
DESIGNED: KA	9/24/2020
QC: SC	9/22/2020
DATE: 12/29/2020	
ISSUED FOR: REZONING	

REVISION NO.:	DATE:

JOB NO.:	200626
SHEET TITLE:	EXISTING CONDITIONS DRAINAGE AREA MAP

PAGE NO.:	1 OF 1
SHEET NO.:	

LOCATION: Z:\SHARED\PROJECTS\GREYSTAR\RESIDENTIAL HEALTHCARE-90TH ST & RAINTREE-SCOTTSDALE-200626\11 CAD (SEG)\11.2 ENTITLEMENT-PLANNING\EX-DAM.DWG SAVED BY: KENYA AMINA DATE: 12/29/2020

THIS DRAWING IS AN INSTRUMENT OF SERVICE AND THE PROPERTY OF SUSTAINABILITY ENGINEERING GROUP, AND SHALL REMAIN THEIR PROPERTY. THE USE OF THIS DRAWING SHALL BE RESTRICTED TO THE ORIGINAL SITE FOR WHICH IT IS PREPARED AND PUBLICATION THEREOF IS EXPRESSLY LIMITED TO SUCH USE.

Provided Storage Calculations

BASIN A1					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
76.5	573			0.00	Bottom
		1.00	1,063.99		
77.5	1,555			1,063.99	
		1.00	2,149.61		
78.5	2,744			3,213.60	
		1.00	3,498.26		
79.5	4,253			6,711.85	Top

BASIN A2					
ELEV.	AREA	DEPTH	AVG V	SUM V	COMMENT
(FT)	(SF)	(FT)	(CF)	(CF)	
76.50	128			0.00	Bottom
		1.00	309.76		
77.50	492			309.76	
		1.00	773.03		
78.50	1,054			1,082.79	Top

UG Storage ID	Diameter (FT)	Length (FT)	Volume (CF)
A3	10	170	13,352
A4	10	170	13,352

Existing 24in RGRCP

Project Description	
Friction Method	Manning
	Formula
Solve For	Discharge
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Results	
Discharge	16.00 cfs
Flow Area	3.1 ft ²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	17.3 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	5.09 ft/s
Velocity Head	0.40 ft
Specific Energy	2.40 ft
Froude Number	(N/A)
Maximum Discharge	17.21 cfs
Discharge Full	16.00 cfs
Slope Full	0.005 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	50.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	17.3 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

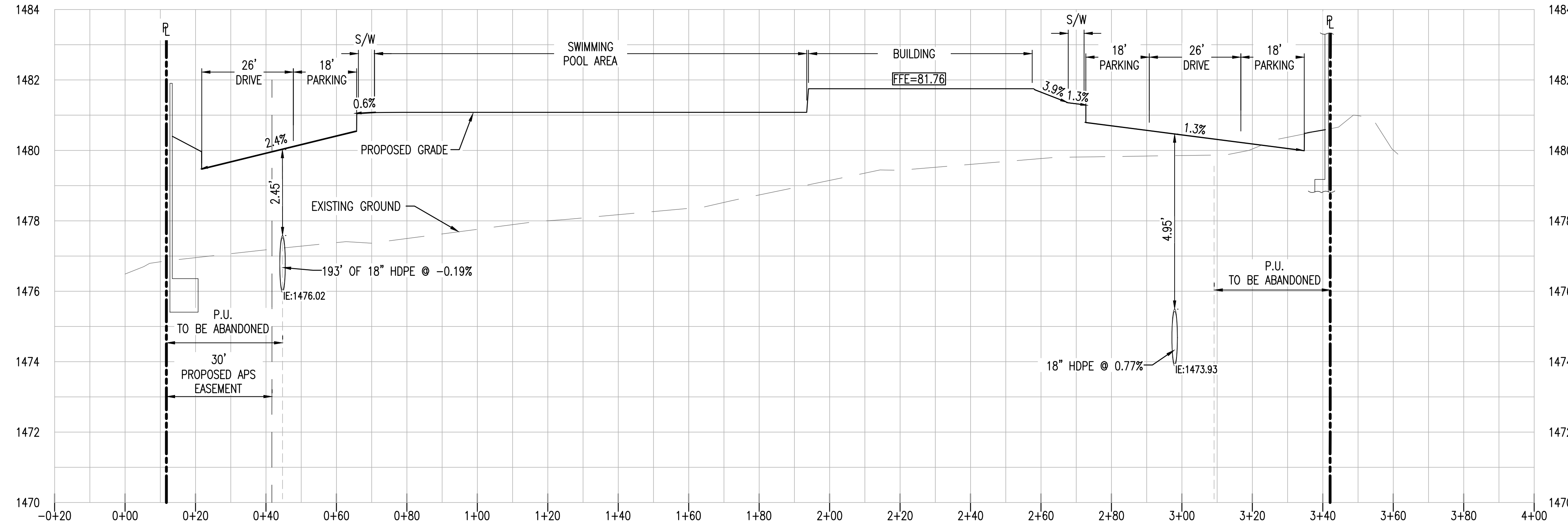
APPENDIX III

Preliminary Grading and Drainage Plans

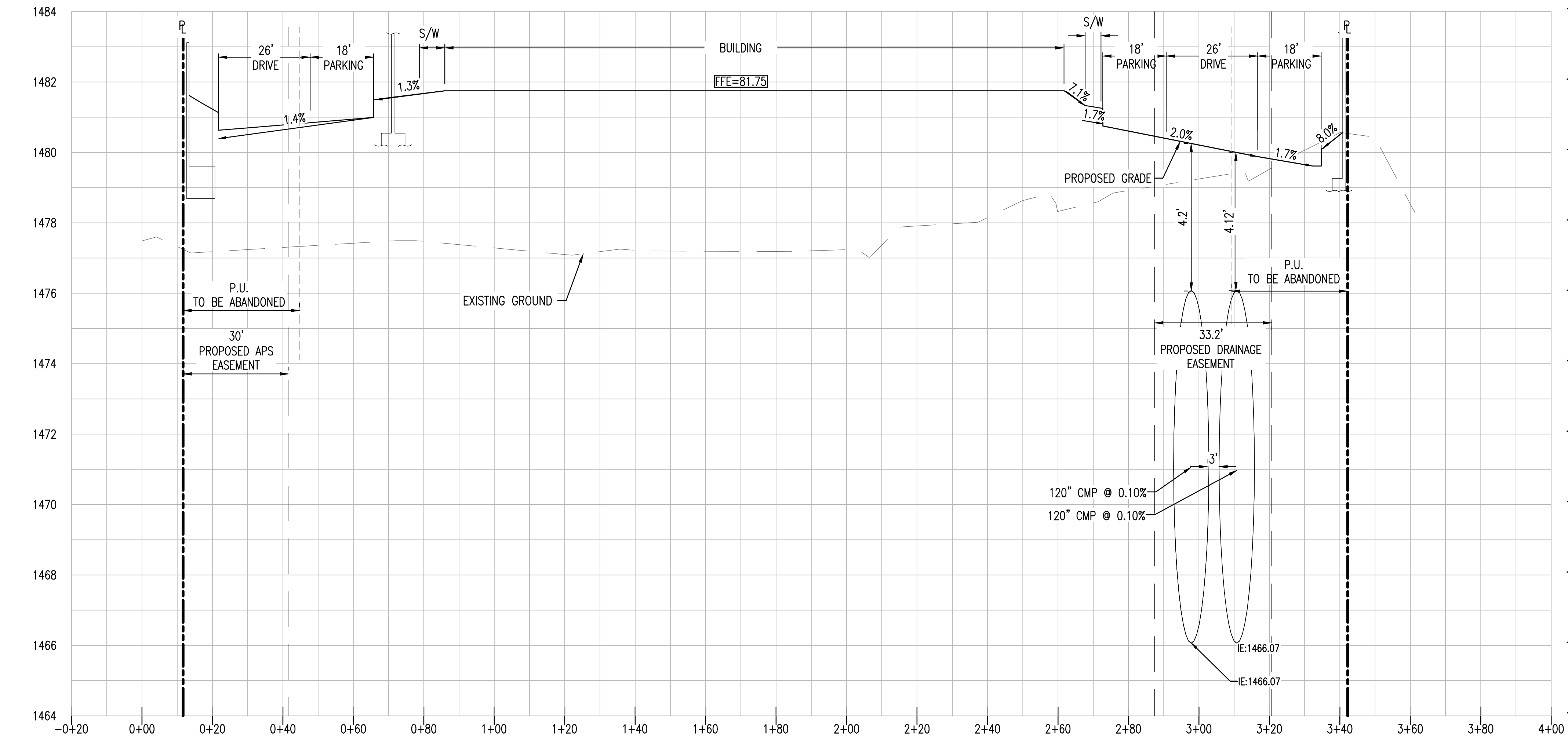
DATE: 12/29/2020

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SECTION A-A (C3.00)
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'



SECTION B-B (C3.00)
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

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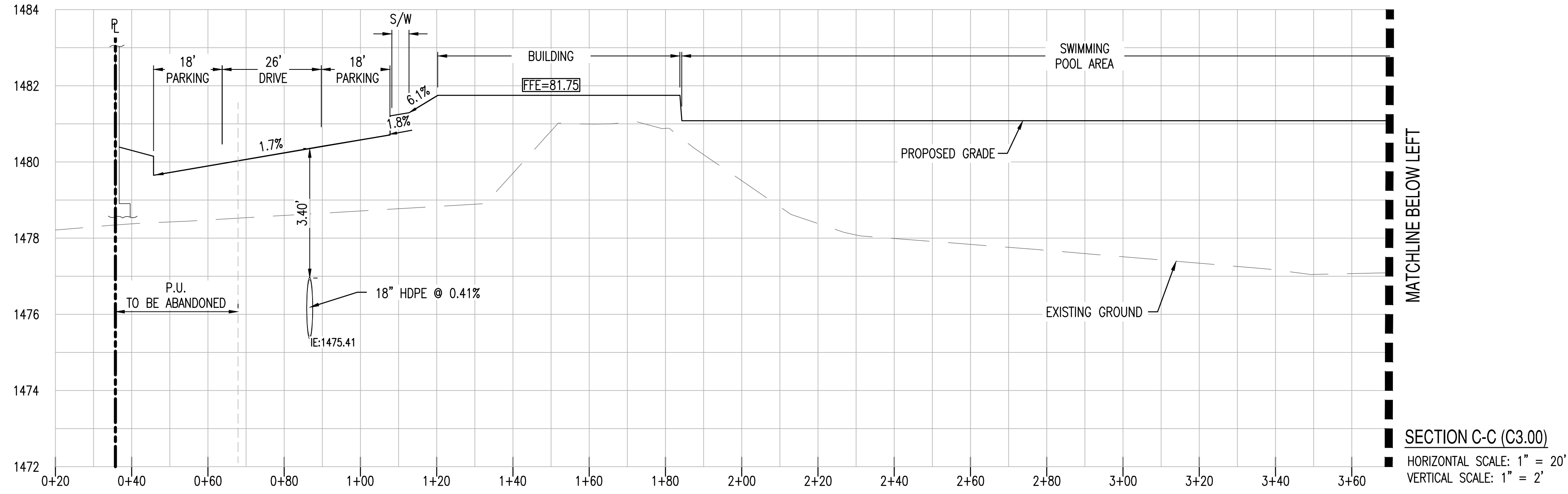
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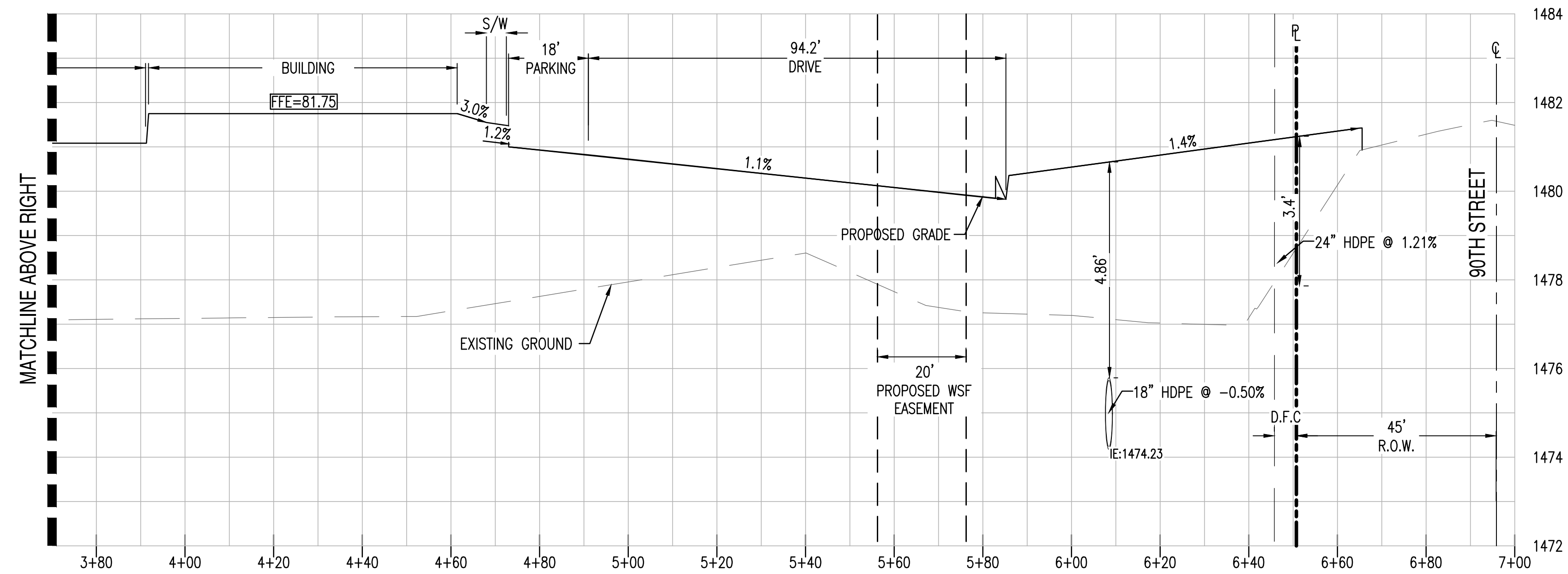
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SECTION C-C (C3.00)
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'



SECTION C-C (C3.00)
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

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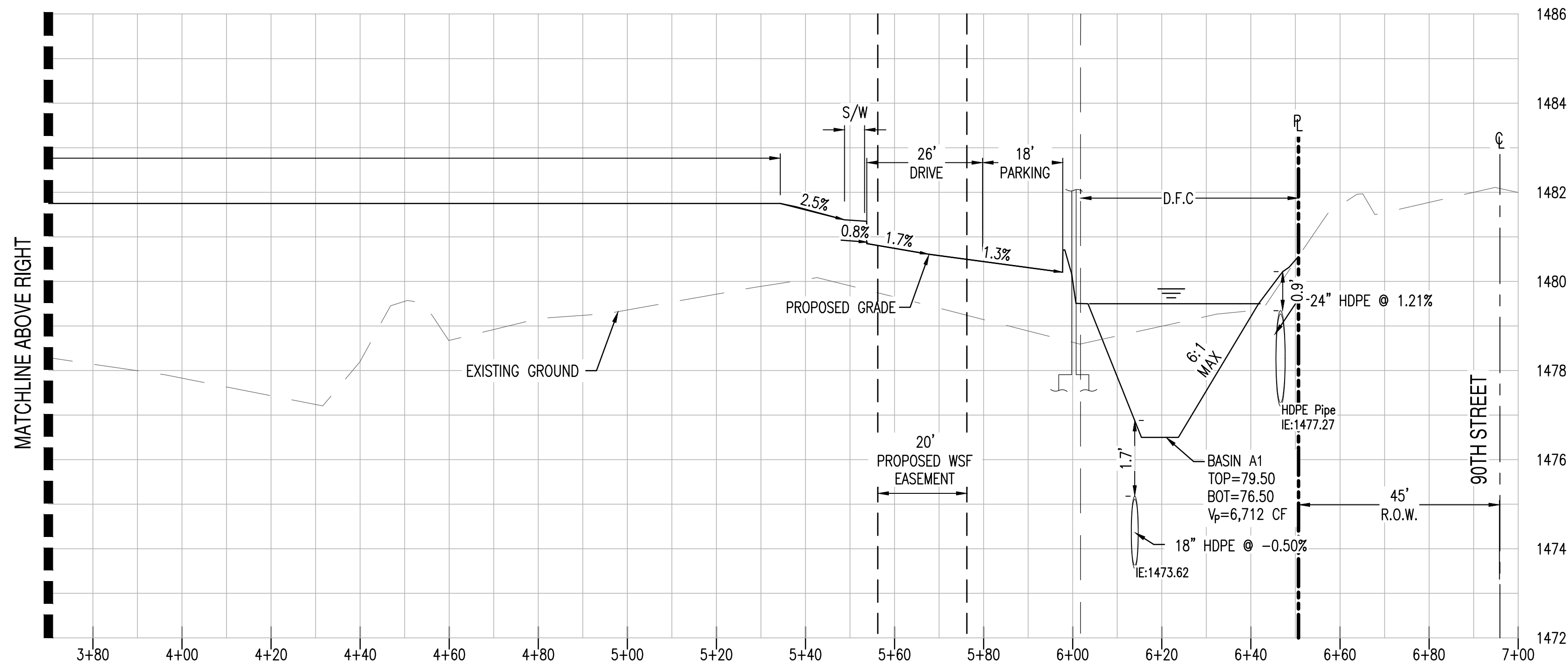
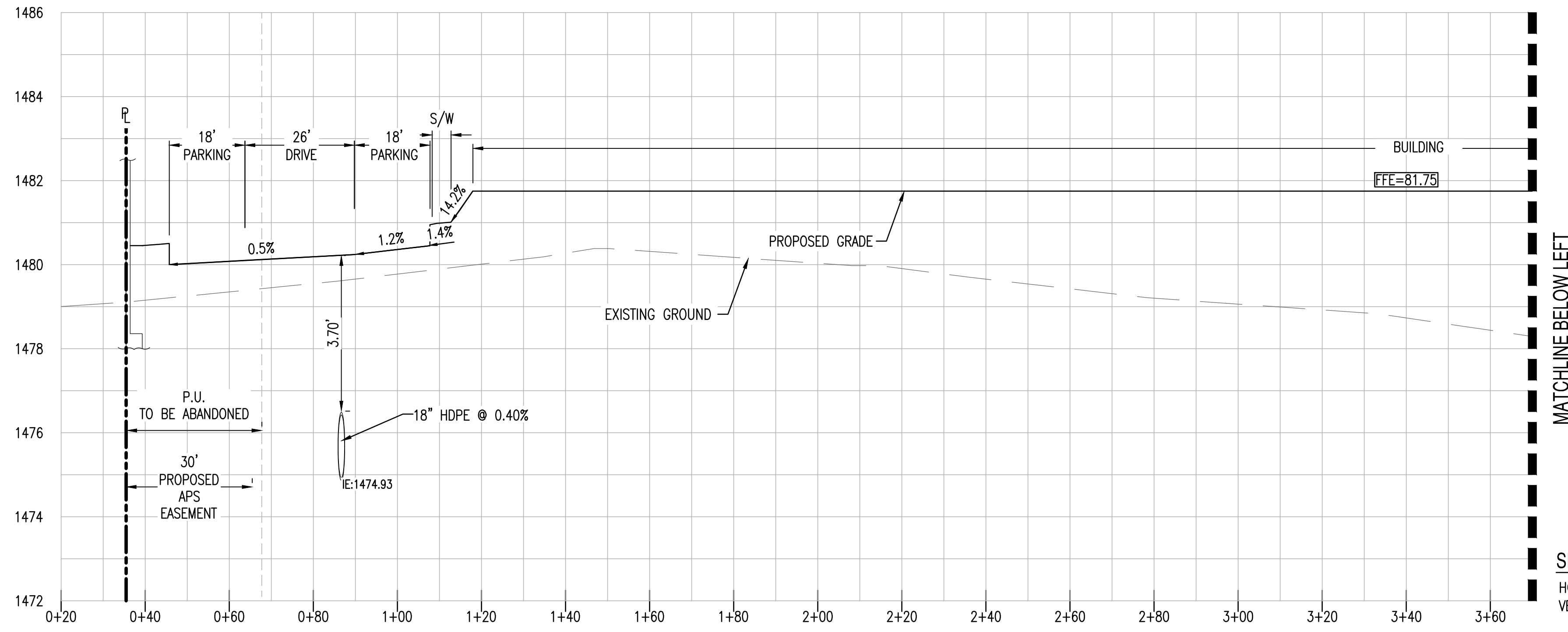
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