

Drainage Report

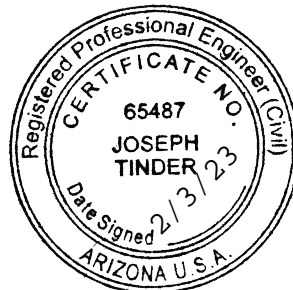
Villas At The Gin

SEC of W. Edison Road & Estrella Parkway
Maricopa, AZ 85139

PREPARED BY:

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February 3, 2023



Exp. 12/31/23



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- Villas at the Gin – Retention Calculations
- Villas at the Gin – Sub-catchment Retention Volume

Introduction

The proposed Villas at the Gin project is located on an approximate 10.188 acre parcel located at the southeast corner of Edison Road and Estrella Parkway in Maricopa, AZ. The Project consists of construction of an apartment complex, including six (x6) apartment buildings, a clubhouse, and a pool. See Location Map below for project location:



Figure 1 Location Map

1.1 Existing Site Conditions

The subject property is currently undeveloped land, but appears to have been pre-graded for development. The land is currently very flat with slopes less than 1%. There are three drainage easements along the west and north property lines which currently contain 2 retention basins at along the west side of the site and a large box culvert at the northeast corner of the site. The existing retention basins along the west portion of the site has been previously designed to take off-site runoff from the Estrella Parkway per the City of Maricopa Edison Road Industrial Park project dated 3/15/16 (city project No. 35029). The retention volume for the basins were obtained from Sheet GD04 (32 of 84) of said plan set and were noted to be 0.06 acre-ft (2,614 CF) and 0.03 acre-ft (1,307 CF) for the southwest and northwest retention basins, respectively.

1.2 FEMA Information

According to the FEMA Flood Insurance Rate Map (FIRM), shown in the Appendix with the Project location outlined the property falls into a Zone “AO” with a depth of 1 foot across the north half of the property, and a depth of 2 foot across the south half of the property. Base flood elevation lines across the existing railroad to the south of the site range from 1163 feet to 1165 feet.

1.3 Proposed Site Conditions

The proposed project intends to add six total multifamily housing buildings with a central clubhouse and pool. Parking for the development will wrap around the perimeter of the site. Fill will be added to the middle of the site to raise up the proposed building finish floor elevations such that runoff from the buildings will be directed to the perimeter parking area. Runoff to catch basins in the parking lot will be routed to underground detention systems consisting of 10-foot diameter CMP. Additionally, the greenbelt (Onsite Basin #1) will be depressed to provide significant volume of stormwater retention at the center of the site to supplement storage from both offsite and onsite sources.

1.4 Purpose of Report

The purpose of this report is to document and demonstrate that the proposed construction of the Project meets the requirements of the City of Maricopa and the Pima County Drainage Design Manual.

2.0 Hydrology

2.1 Proposed Storm Water Drainage

The project will be required to retain the 100year, 2-hour flow. The required retention was determined by using the equation $V_r = C * A * (P/12)$

C = Runoff Coefficient for each Subcatchment (Weighted Average, 0.95 for impervious, 0.40 for pervious)

A = Area of Subcatchment

P = 2.27 inches

$V_r = C * A * (P/12)$

To meet this volume requirement, the site will contain multiple runs of 10’ diameter CMP located below the drive lanes. To meet the dissipation requirement of 36 hours, drywells will be connected to each underground storage system. Utilizing a dissipation rate of 0.1 CFS for each drywell, a total of 10

drywells will be provided. Supporting calculations for each sub-catchment are provided at the end of this report.

The retention volume for the half road width of Estrella Parkway was provided in the drawings for City Project No. 35029. Tributary area was also recalculated using the topographic survey as a means of verifying the required retention. The larger of the calculated required retention volume and the assumed retention volume per the City Project No. 35029 was utilized for the required retention volume of the respective basins.

2.2 Summary

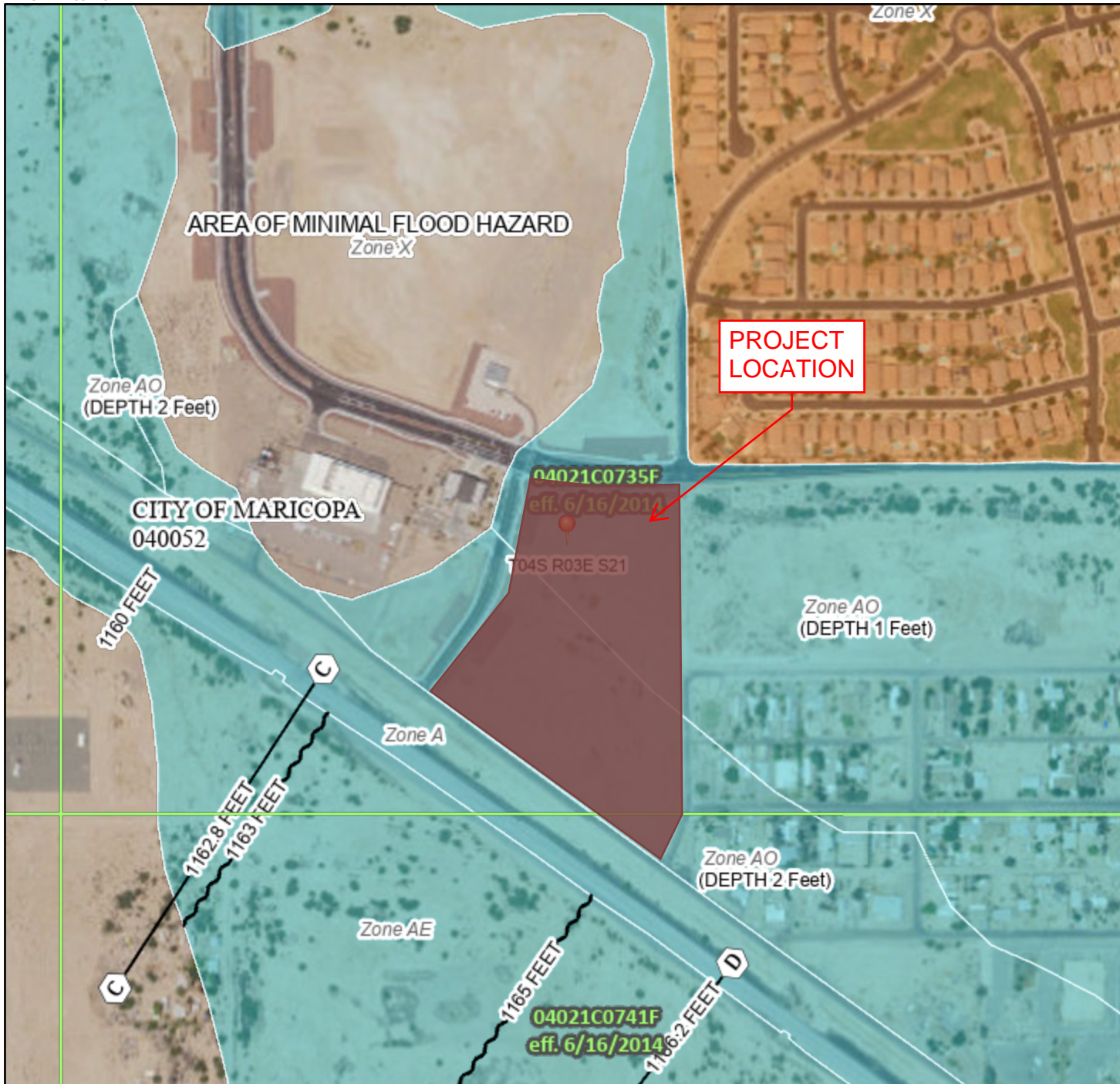
Based on this report and the Civil Improvements Plan, the proposed construction of the Project meets the requirements of the City of Maricopa and the Pima County Drainage Ordinance.

Additional supporting documents have been provided in the Appendix.

National Flood Hazard Layer FIRMMette



112°3'47"W 33°4'8"N



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 Water Surface Elevation |
| | | 17.5 Coastal Transect |
| | | 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 |



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 **5/31/2022 at 10:59 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.



NOAA Atlas 14, Volume 1, Version 5
Location name: Maricopa, Arizona, USA*
Latitude: 33.0639°, Longitude: -112.0579°
Elevation: 1165.5 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

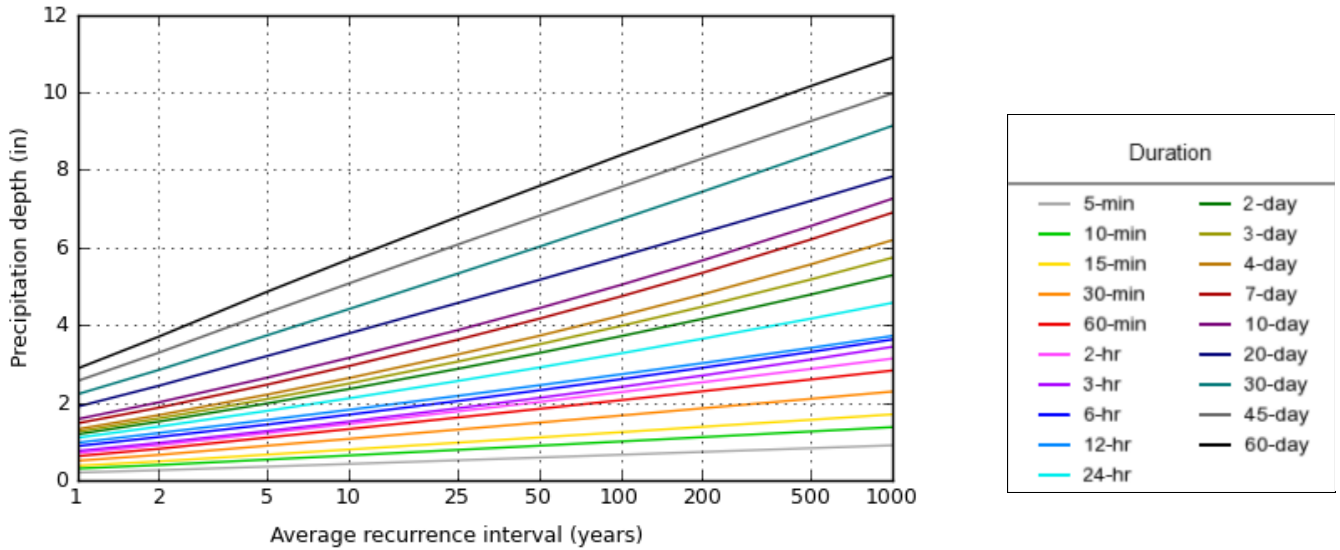
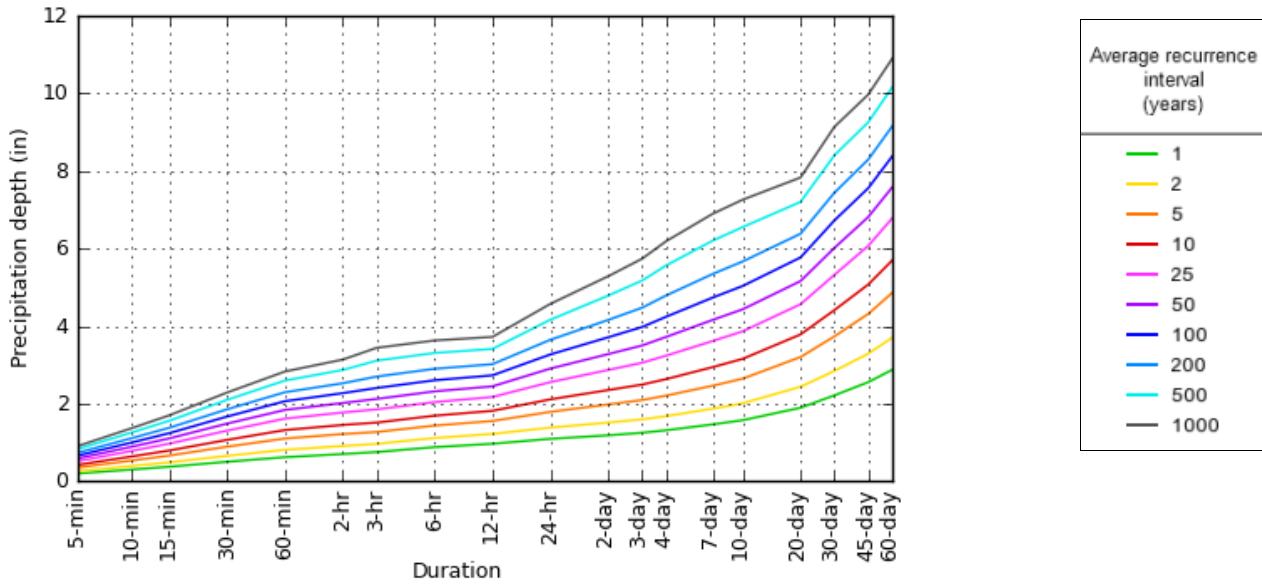
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.197 (0.166-0.238)	0.257 (0.218-0.311)	0.350 (0.294-0.421)	0.419 (0.351-0.501)	0.513 (0.423-0.610)	0.584 (0.476-0.693)	0.656 (0.525-0.777)	0.729 (0.574-0.863)	0.825 (0.634-0.979)	0.899 (0.676-1.07)
10-min	0.300 (0.253-0.362)	0.392 (0.332-0.473)	0.532 (0.448-0.640)	0.638 (0.533-0.763)	0.781 (0.643-0.929)	0.889 (0.724-1.06)	0.998 (0.798-1.18)	1.11 (0.874-1.31)	1.26 (0.964-1.49)	1.37 (1.03-1.63)
15-min	0.372 (0.313-0.448)	0.485 (0.411-0.586)	0.660 (0.555-0.794)	0.790 (0.661-0.946)	0.967 (0.797-1.15)	1.10 (0.897-1.31)	1.24 (0.990-1.47)	1.38 (1.08-1.63)	1.56 (1.20-1.85)	1.70 (1.27-2.02)
30-min	0.500 (0.421-0.603)	0.653 (0.553-0.790)	0.889 (0.747-1.07)	1.07 (0.891-1.27)	1.30 (1.07-1.55)	1.48 (1.21-1.76)	1.67 (1.33-1.97)	1.85 (1.46-2.19)	2.10 (1.61-2.49)	2.29 (1.72-2.72)
60-min	0.619 (0.521-0.746)	0.809 (0.684-0.977)	1.10 (0.925-1.32)	1.32 (1.10-1.58)	1.61 (1.33-1.92)	1.84 (1.50-2.18)	2.06 (1.65-2.44)	2.29 (1.81-2.71)	2.60 (1.99-3.08)	2.83 (2.13-3.37)
2-hr	0.700 (0.599-0.828)	0.908 (0.778-1.08)	1.22 (1.04-1.44)	1.45 (1.23-1.71)	1.77 (1.48-2.08)	2.02 (1.66-2.36)	2.27 (1.84-2.65)	2.53 (2.01-2.95)	2.87 (2.22-3.37)	3.14 (2.38-3.70)
3-hr	0.751 (0.644-0.891)	0.962 (0.828-1.15)	1.27 (1.08-1.51)	1.51 (1.28-1.78)	1.85 (1.55-2.17)	2.12 (1.75-2.48)	2.40 (1.94-2.82)	2.70 (2.14-3.16)	3.11 (2.39-3.65)	3.44 (2.57-4.06)
6-hr	0.878 (0.767-1.02)	1.11 (0.976-1.30)	1.43 (1.25-1.67)	1.69 (1.46-1.96)	2.04 (1.74-2.34)	2.32 (1.94-2.66)	2.60 (2.15-2.99)	2.90 (2.34-3.33)	3.31 (2.60-3.81)	3.63 (2.78-4.20)
12-hr	0.965 (0.854-1.10)	1.22 (1.08-1.40)	1.55 (1.37-1.77)	1.81 (1.59-2.06)	2.17 (1.88-2.46)	2.45 (2.10-2.77)	2.73 (2.30-3.10)	3.02 (2.50-3.43)	3.41 (2.76-3.91)	3.72 (2.94-4.29)
24-hr	1.09 (0.983-1.21)	1.38 (1.25-1.54)	1.79 (1.62-1.99)	2.11 (1.90-2.34)	2.55 (2.28-2.82)	2.90 (2.58-3.20)	3.27 (2.88-3.60)	3.65 (3.19-4.03)	4.16 (3.60-4.61)	4.57 (3.91-5.07)
2-day	1.18 (1.07-1.31)	1.51 (1.37-1.68)	1.98 (1.79-2.20)	2.35 (2.11-2.60)	2.87 (2.56-3.17)	3.28 (2.91-3.62)	3.71 (3.28-4.10)	4.16 (3.64-4.61)	4.79 (4.14-5.32)	5.29 (4.53-5.90)
3-day	1.25 (1.13-1.38)	1.59 (1.44-1.77)	2.09 (1.89-2.32)	2.49 (2.25-2.76)	3.05 (2.74-3.37)	3.50 (3.12-3.87)	3.98 (3.52-4.39)	4.47 (3.92-4.94)	5.17 (4.48-5.73)	5.74 (4.92-6.38)
4-day	1.31 (1.19-1.46)	1.68 (1.52-1.86)	2.21 (2.00-2.44)	2.63 (2.38-2.91)	3.24 (2.91-3.57)	3.72 (3.32-4.11)	4.24 (3.76-4.68)	4.79 (4.21-5.28)	5.56 (4.82-6.15)	6.19 (5.31-6.87)
7-day	1.47 (1.33-1.62)	1.87 (1.70-2.07)	2.46 (2.23-2.72)	2.94 (2.66-3.24)	3.62 (3.25-3.98)	4.16 (3.71-4.58)	4.74 (4.20-5.22)	5.35 (4.70-5.89)	6.20 (5.38-6.84)	6.90 (5.93-7.61)
10-day	1.57 (1.43-1.74)	2.01 (1.83-2.22)	2.64 (2.40-2.91)	3.15 (2.86-3.47)	3.86 (3.48-4.25)	4.43 (3.97-4.88)	5.03 (4.47-5.54)	5.67 (5.00-6.24)	6.55 (5.71-7.22)	7.26 (6.26-8.01)
20-day	1.89 (1.72-2.08)	2.44 (2.22-2.68)	3.20 (2.91-3.51)	3.78 (3.44-4.15)	4.56 (4.13-5.00)	5.16 (4.65-5.65)	5.77 (5.18-6.33)	6.38 (5.70-6.99)	7.20 (6.37-7.92)	7.83 (6.88-8.63)
30-day	2.21 (2.02-2.41)	2.84 (2.60-3.10)	3.73 (3.42-4.06)	4.41 (4.03-4.80)	5.32 (4.83-5.78)	6.02 (5.44-6.53)	6.72 (6.05-7.31)	7.44 (6.65-8.09)	8.40 (7.45-9.16)	9.14 (8.05-9.99)
45-day	2.55 (2.33-2.80)	3.29 (2.99-3.60)	4.32 (3.93-4.71)	5.07 (4.61-5.53)	6.07 (5.50-6.61)	6.81 (6.15-7.42)	7.56 (6.80-8.24)	8.30 (7.42-9.06)	9.26 (8.23-10.1)	9.97 (8.82-10.9)
60-day	2.87 (2.61-3.15)	3.70 (3.36-4.05)	4.86 (4.41-5.31)	5.70 (5.17-6.22)	6.78 (6.14-7.40)	7.58 (6.84-8.27)	8.38 (7.54-9.15)	9.15 (8.20-10.0)	10.2 (9.05-11.1)	10.9 (9.66-12.0)

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

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PF graphical

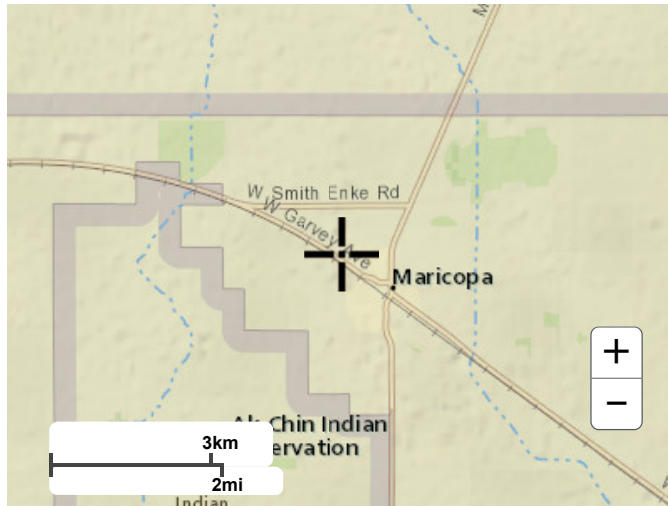
PDS-based depth-duration-frequency (DDF) curves
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Maps & aerials

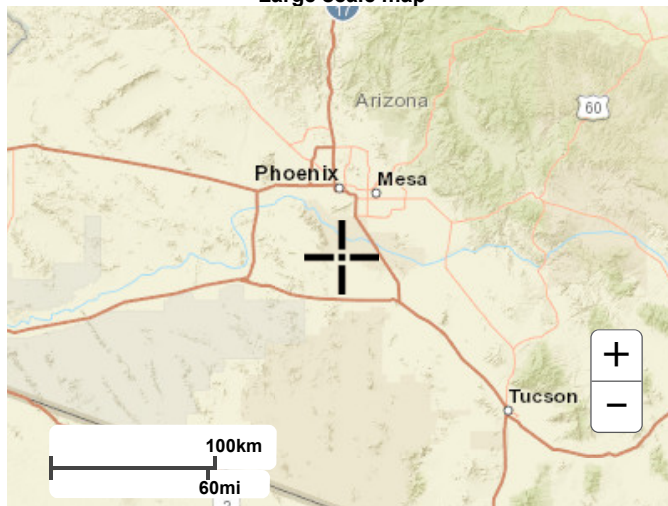
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

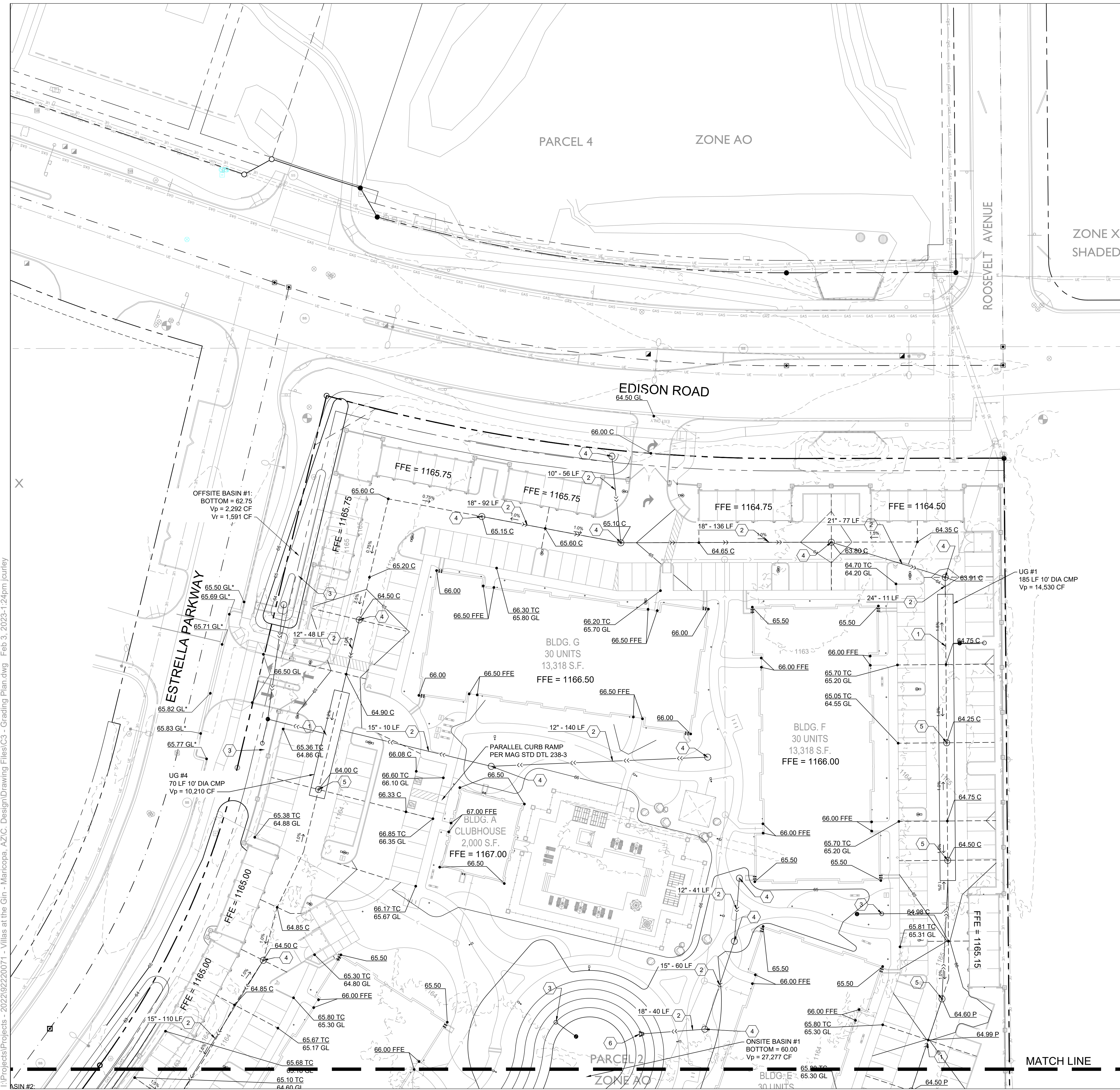


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- STORM DRAIN CONSTRUCTION NOTES**
- 10' DIAMETER CMP UNDERGROUND STORAGE. LENGTH PER PLAN.
 - HDPE STORM SEWER. SIZE AND LENGTH PER PLAN. BEDDING AND BACKFILL PER MAG SPEC 601.
 - INSTALL MAXWELL PLUS DUAL CHAMBER DRYWELL, OR APPROVED EQUAL.
 - INSTALL CATCH BASIN TYPE 'F' PER MAG STD DTL 535.
 - INSTALL CMP RISER WITH AREA GRATE.
 - INSTALL HDPE FLARED END SECTION.

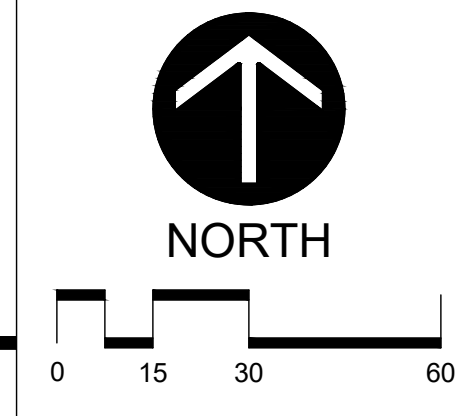
- GRADING NOTES**
- Tree protection consisting of snow fence or safety fence installed at the drip line shall be in place prior to beginning any grading or demolition work at the site.
 - All elevations with an asterisk (*) shall be field verified. If elevations vary significantly, notify the Engineer for further instructions.
 - Grades shown in paved areas represent finish elevation.
 - Restore all disturbed areas with 4" of good quality topsoil and seed.
 - All construction shall be performed in accordance with state and local standard specifications for construction.

LEGEND

- 950 --- EXISTING CONTOURS
- 950 --- PROPOSED CONTOURS - MAJOR INTERVAL
- 949 --- PROPOSED CONTOURS - MINOR INTERVAL
- GRADE BREAK LINE
- 2.0% --- GRADE SLOPE

SPOT ABBREVIATIONS:

- TC - TOP OF CURB
- GL - GUTTER LINE
- B - BITUMINOUS
- C - CONCRETE
- EO - EMERGENCY OVERFLOW
- TW - TOP OF WALL
- BW - BOTTOM OF WALL (F/G)
- (*) - EXISTING TO BE VERIFIED



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CONSTRUCTION SOLUTIONS COMPANY

VILLAS AT THE GIN
 20405 E. ESTRELLA PARKWAY
 MARICOPA, ARIZONA 85139

Project: **DRP REVIEW**

date: 12/16/22

issued for:

revision no.:	date:	
1	COMMENTS or Q.A. REVIEW	XXXXXX
2	COMMENTS	XXXXXX
3	COMMENTS	XXXXXX
4	COMMENTS	XXXXXX

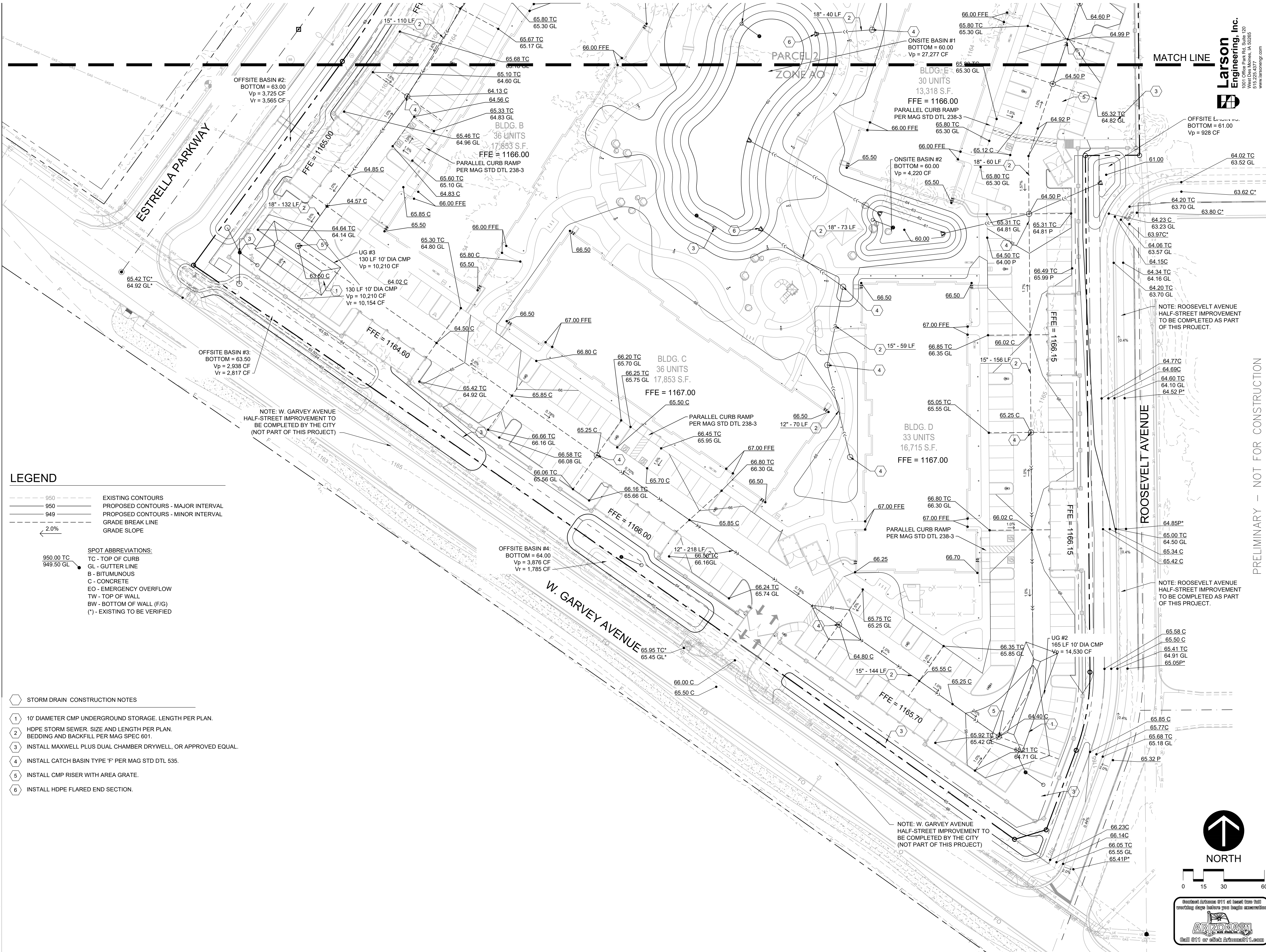
job no.: 21-178

sheet title:
GRADING AND DRAINAGE PLAN - NORTH

sheet no.:
C3.1



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LEGEND

- 950 --- EXISTING CONTOURS
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- 949 --- PROPOSED CONTOURS - MINOR INTERVAL
- --- GRADE BREAK LINE
- 2.0% --- GRADE SLOPE

- SPOT ABBREVIATIONS:**
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NORTH
0 15 30 60



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consultant: LEI PROJECT #92220071

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project: **CONSTRUCTION SOLUTIONS COMPANY**
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MARI COPA, ARIZONA 85139

date:	12/16/22
issued for:	DRP REVIEW
revision no.:	date:
1 COMMENTS or Q.A. REVIEW	XXXXXX
2 COMMENTS	XXXXXX
3 COMMENTS	XXXXXX
4 COMMENTS	XXXXXX
job no.:	21-178

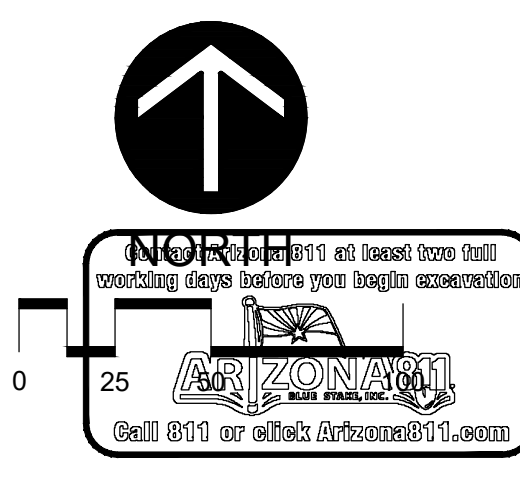
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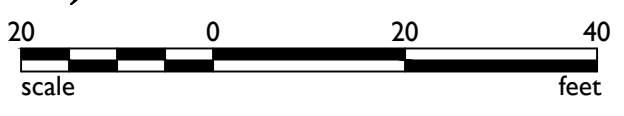
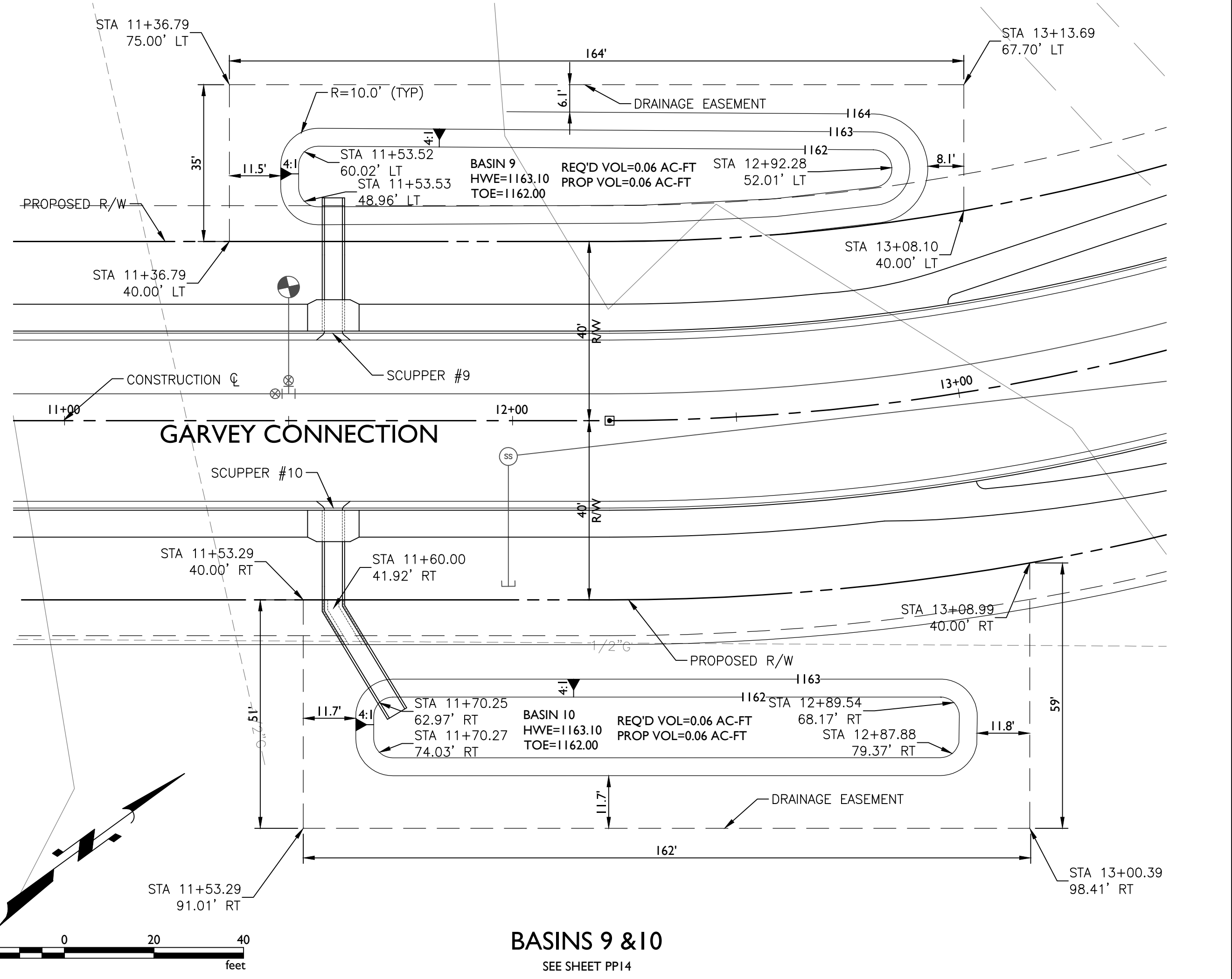
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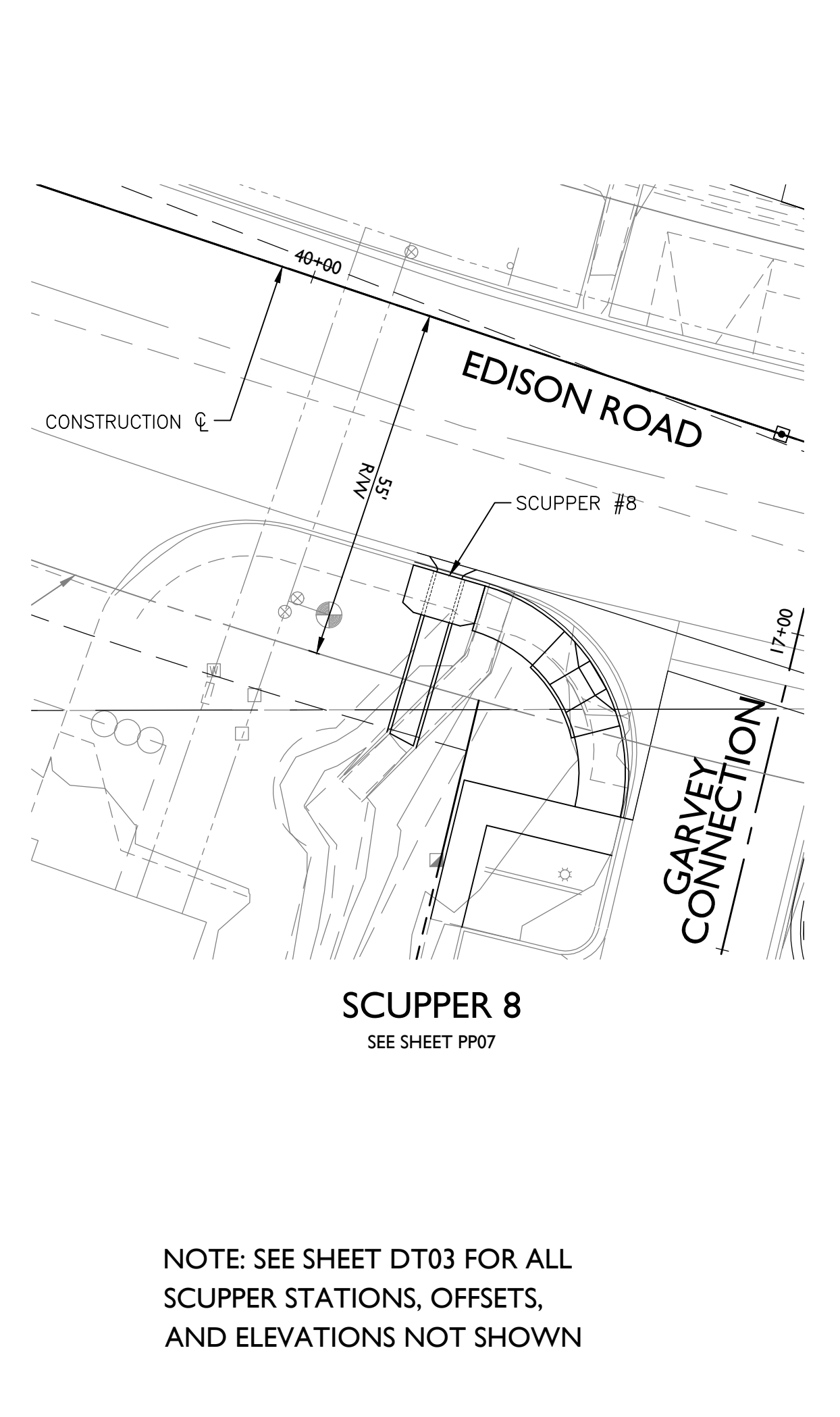
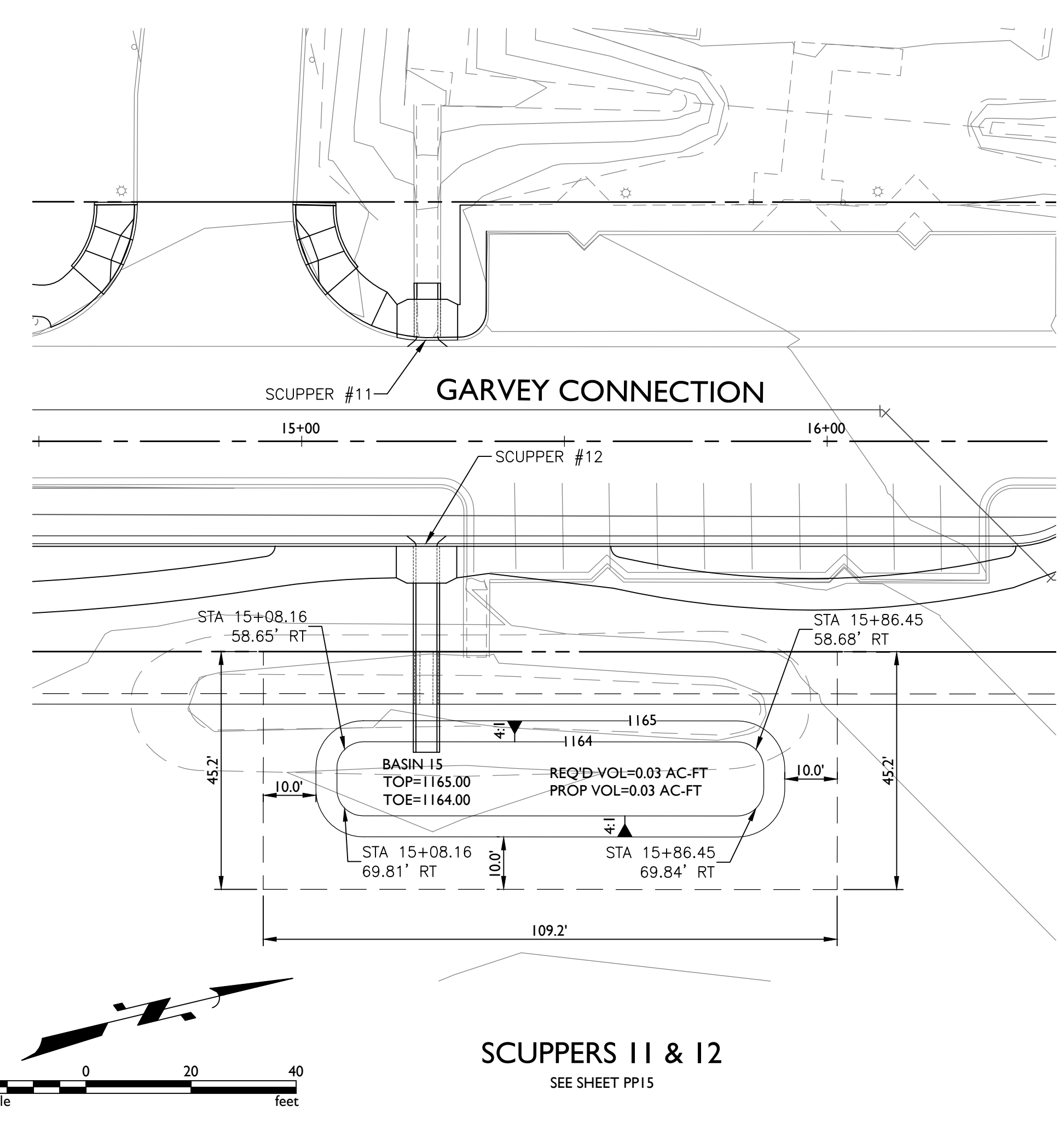


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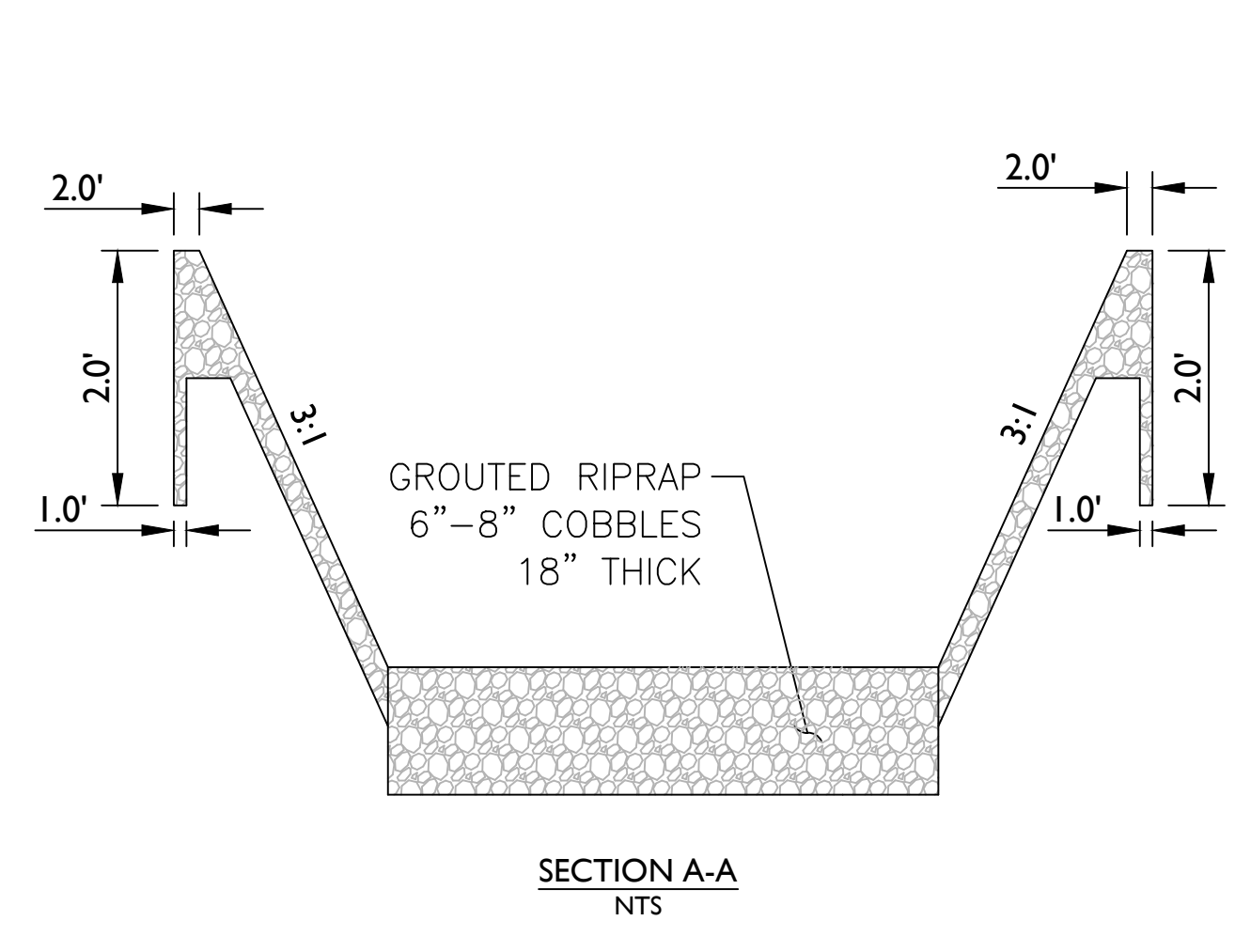
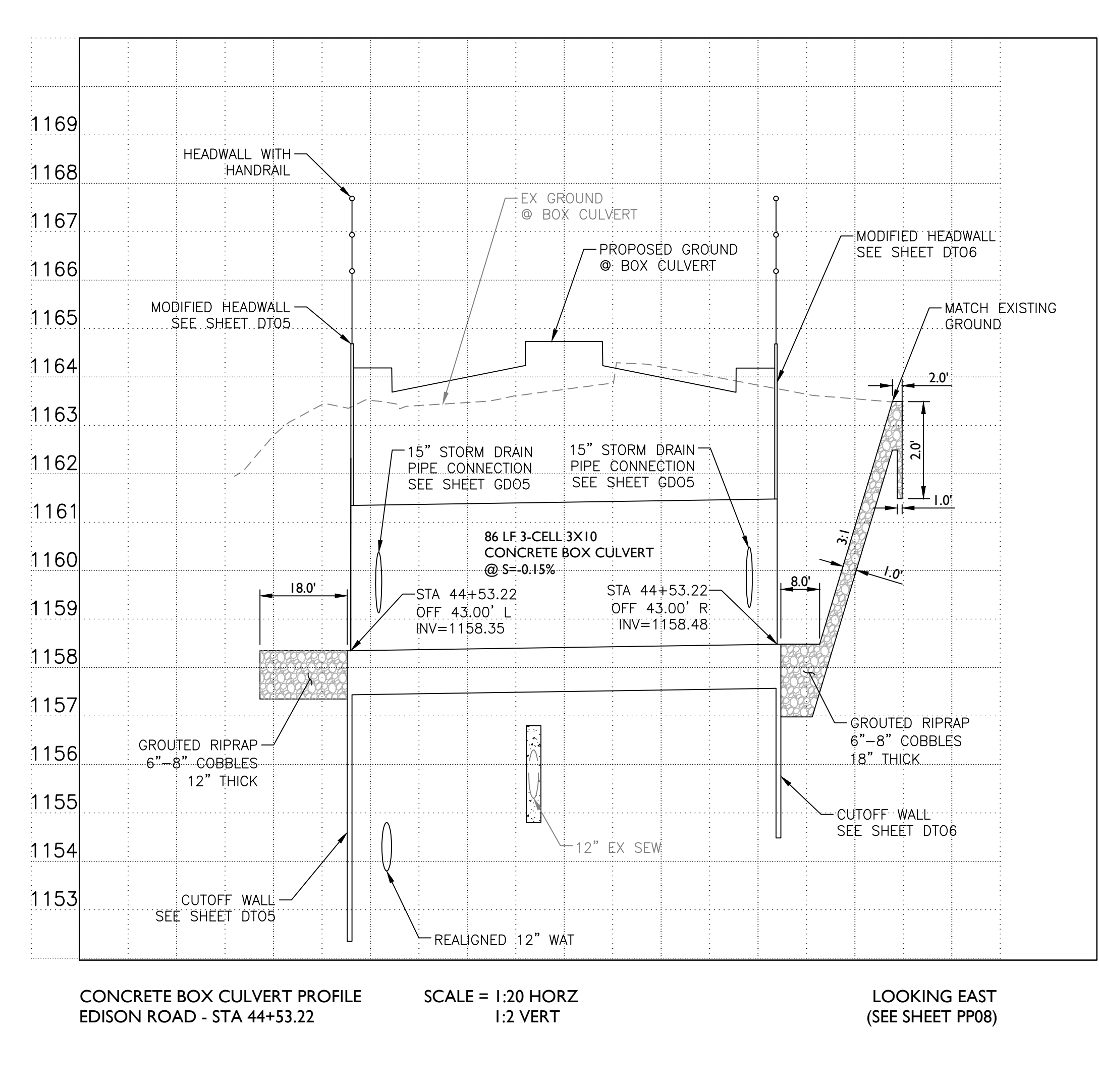
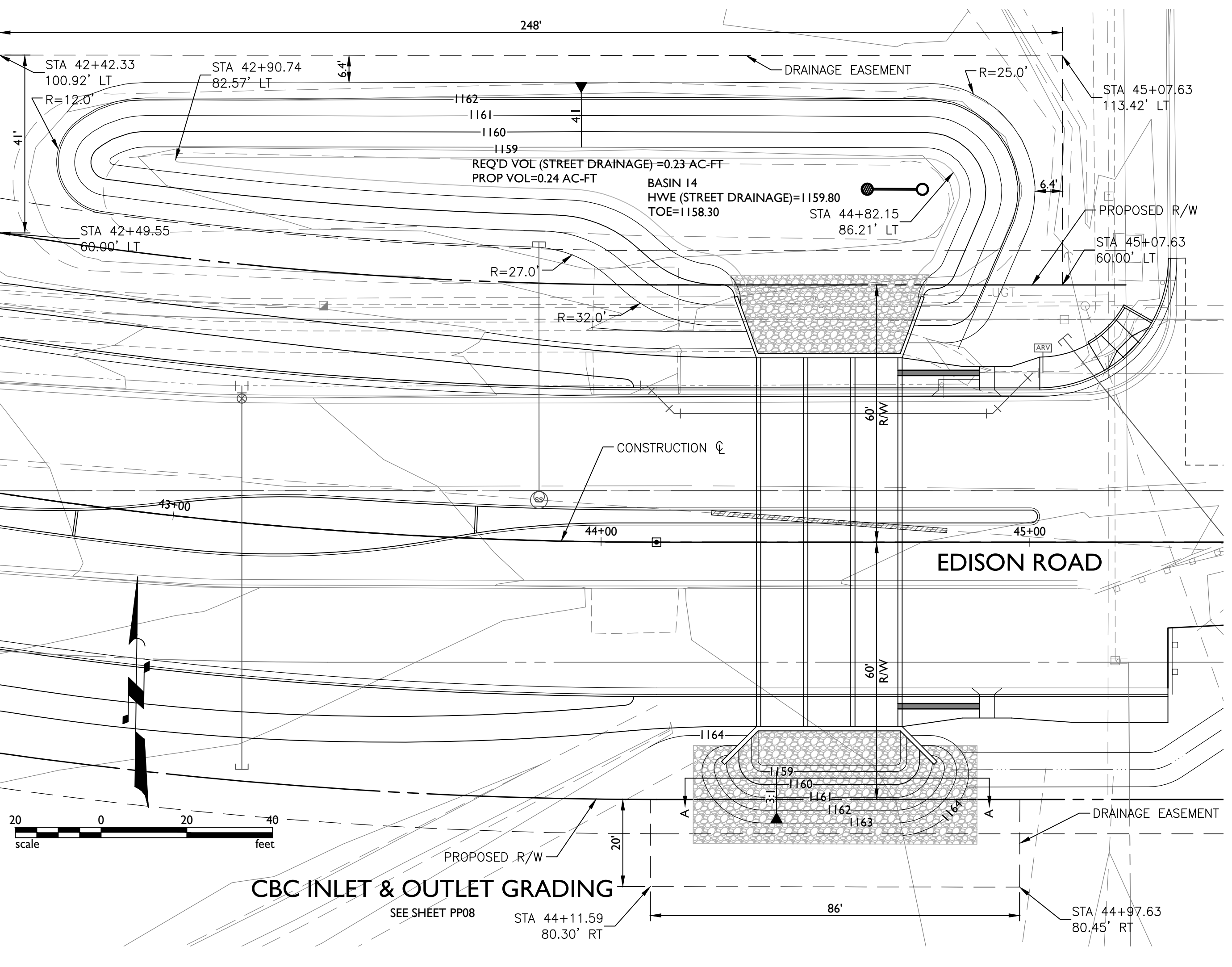




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NOTE: SEE SHEET DT03 FOR ALL SCUPPER STATIONS, OFFSETS, AND ELEVATIONS NOT SHOWN



Call at least two full working days before you begin excavation.

ARIZONA 811
Know What's Below

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EDISON ROAD INDUSTRIAL PARK

RETENTION BASIN GRADING & STORM DRAIN PROFILE SHEET			
DESIGNED BY	BAM	CITY PROJECT NO. 35029	
DRAWN BY	SAW	DRAWING NO.	G04
			SHEET 32 OF 84

Drainage Area:	Drainage Area - Description:											Drainage Area Captured (sf):								Retention Volume	Retention Volume	Drywells	Drawdown			
																				Provided - Vp (CF)	Req'd - Vr (CF)	Req'd	Time (Hrs)			
UG #1	PL 1	G1	G2	F2	F3	F4	E4					10726	611	611	611	611	611	611	0	0	0	0	14,530	14,392	2	19.99
Onsite Basin #2/Offsite Basin #4	PL 2	E3	D4	OS 5	OS 5B							2650	611	755	737	1231	0	0	0	0	0	0	5,148	5,983	1	16.62
UG #2	PL 3	D1	D3	C4								10404	755	755	809	0	0	0	0	0	0	0	12,959	12,722	1	35.34
UG #3	PL 4	B1	B2	B3	C3							6344	809	809	809	809	0	0	0	0	0	0	10,210	9,578	1	26.61
UG #4 + Offsite Basin #1	PL 5	A1	G3	G4	OS 1	OS 1B						6936	198	611	611	773	818	0	0	0	0	0	10,210	9,946	1	27.63
OS 1 + OS 1B + OS 2 + OS 2B + OS 3 + OS 4 + OS 4B	OS 2	OS 2B	OS 3	OS 4	OS 4B	OS 1	OS 1B					1671	1894	952	1222	1679	773	818	0	0	0	0	10,996	9,009	1	25.03
Onsite Basin #1	Greenbelt	A2	B4	C1	C2	D2	E1	E2	F1			9408	198	809	809	809	755	611	611	611	0	0	27,277	14,620	2	20.31

91,330 76,251

$Drywells\ Required^* = (R_r / Q) / (60 * 60 * 36)$

Where:

R_r = Retention Required (actual 100-year, 2 hour retention volume)

Q = Percolation rate per drywell = 0.1 cfs

Additional Design Notes

* Offsite Basin #1 shares drywell with UG #4

* UG #3 & Offsite Basin #2 and Offsite Basin #3 share a drywell

* Greenbelt (Onsite Basin #1), Onsite Basin #2, and Offsite Basin #4 share detention volume through equalizer pipe

Drainage Area:	Impervious	Pervious	C	Trib Area (SF)	d (in)	Safety Factor	Retention Volume (Vr - CF)
OS 1	4,300	-	0.95	4,300	2.27	1	773
OS 1B	1,500	5,800	0.59	7,300	2.27	1	818
OS 2	9,300	-	0.95	9,300	2.27	1	1,671
OS 2B	2,800	14,700	0.57	17,500	2.27	1	1,894
OS 3	5,300	-	0.95	5,300	2.27	1	952
OS 3A	1,900	16,100	0.55	18,000	2.27	1	1,864
OS 4	6,800	-	0.95	6,800	2.27	1	1,222
OS 4A	600	4,812	0.55	5,412	2.27	1	563
OS 4B	2,500	13,000	0.57	15,500	2.27	1	1,679
OS 5	4,100	-	0.95	4,100	2.27	1	737
OS 5B	1,900	9,400	0.58	11,300	2.27	1	1,231
A1	1,100	-	0.95	1,100	2.27	1	198
A2	1,100	-	0.95	1,100	2.27	1	198
B1	4,500	-	0.95	4,500	2.27	1	809
B2	4,500	-	0.95	4,500	2.27	1	809
B3	4,500	-	0.95	4,500	2.27	1	809
B4	4,500	-	0.95	4,500	2.27	1	809
C1	4,500	-	0.95	4,500	2.27	1	809
C2	4,500	-	0.95	4,500	2.27	1	809
C3	4,500	-	0.95	4,500	2.27	1	809
C4	4,500	-	0.95	4,500	2.27	1	809
D1	4,200	-	0.95	4,200	2.27	1	755
D2	4,200	-	0.95	4,200	2.27	1	755
D3	4,200	-	0.95	4,200	2.27	1	755
D4	4,200	-	0.95	4,200	2.27	1	755
E1	3,400	-	0.95	3,400	2.27	1	611
E2	3,400	-	0.95	3,400	2.27	1	611
E3	3,400	-	0.95	3,400	2.27	1	611
E4	3,400	-	0.95	3,400	2.27	1	611
F1	3,400	-	0.95	3,400	2.27	1	611
F2	3,400	-	0.95	3,400	2.27	1	611
F3	3,400	-	0.95	3,400	2.27	1	611
F4	3,400	-	0.95	3,400	2.27	1	611
G1	3,400	-	0.95	3,400	2.27	1	611
G2	3,400	-	0.95	3,400	2.27	1	611
G3	3,400	-	0.95	3,400	2.27	1	611
G4	3,400	-	0.95	3,400	2.27	1	611
PL 1	56,000	7,000	0.90	63,000	2.27	1	10,726
PL 2	10,800	7,500	0.77	18,300	2.27	1	2,650
PL 3	53,000	9,300	0.88	62,300	2.27	1	10,404
PL 4	32,300	5,700	0.88	38,000	2.27	1	6,344
PL 5	30,700	15,000	0.80	45,700	2.27	1	6,936
RANDOM CALCS	14,000	4,500	0.84	18,500	2.27	1	2,942
Greenbelt	18,300	64,700	0.60	83,000	2.27	1	9,408
Total:	351,900	177,512	0.876	529,412			80,029

Retention Required (R_r) = $C \times (P/12) \times A \times 1.1$

Where:

C = Weighted runoff coefficient = 0.90

P = 100-year 2-hour rainfall depth = 2.27 inches

A = Contributing Area (SF)

C =
0.95 Impervious
0.50 General Open Space
0.30 Grass Lawn