Plan # _____
Case # 16-ZN-2022
Q-S # _____
[X] Accepted
[ ] Corrections
N.Baronas 5/11/2023
Reviewed By Date

# PRELIMINARY DRAINAGE REPORT

# Headwaters Scottsdale
# SEC of 100th Street and Frank Lloyd Wright Boulevard

**Prepared for:**

Headwater Group
5265 S Rio Grande Ste 201
Littleton, CO 80120

Prepared by:

Kimley»Horn

291753000
November 2022
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16-ZN-2022
4/5/2023

# Headwaters Scottsdale

## PRELIMINARY DRAINAGE REPORT

SEC of 100th St and

Frank Lloyd Wright Boulevard

**MARCH 2023**

Prepared By:

Kimley»Horn

16-ZN-2022
4/5/2023

Kimley»Horn

# CONTENTS


Contents ..... i

1 Introduction ..... 1

1.1 Project Description ..... 1

1.2 Site Location ..... 1

1.3 Purpose ..... 1

1.4 Objectives ..... 1

2 Description of Existing Drainage Conditions and Characteristics ..... 2

2.1 Existing On-Site Drainage Conditions ..... 2

2.2 Existing Off-site Drainage Conditions ..... 2

2.3 Context Relative to Adjacent Projects and Improvements ..... 2

2.4 FEMA Flood Hazard Areas ..... 2

3 Proposed Drainage Plan ..... 3

3.1 General Description ..... 3

3.2 Future Conditions ..... 3

3.3 Storm Water Storage Requirements ..... 3

3.4 Proposed Drainage Structures or Special Drainage Facilities ..... 4

3.5 Project Phasing ..... 4

4 Special Conditions ..... 5

4.1 404 Discussion ..... 5

4.2 Storm Water Quality ..... 5

5 Data Analysis Methods ..... 6

5.1 Hydrologic Procedures, Parameter Selection, and Assumptions ..... 6

5.2 Hydraulic Procedures, Methods, Parameter Selection, and Assumptions ..... 6

5.3 Storm Water Storage Calculation Methods and Assumptions ..... 7

6 Conclusion ..... 8

6.1 Overall Project ..... 8

7 References ..... 9





16-ZN-2022
4/5/2023

## List of Tables

Table 1: On-site Retention Volume

## List of Figures in Appendix (Exhibits)

Figure 1: Existing Conditions Topographic Map

Figure 2: Context Aerial plan

Figure 3: Site Basin Deliniation

Figure 4: Preliminary Grading and Drainage Plan

## List of Appendices

A Site Location Map and Legal Description

B FEMA Federal Insurance Rate Map (FIRM)

C Hydrologic Calculations

D Existing Conditions

E Basin Delineation

F Preliminary Grading and Drainage

G Context Aerial Plan

H Flow Master Results



16-ZN-2022
4/5/2023

# 1 INTRODUCTION

## 1.1 PROJECT DESCRIPTION

Headwaters is proposing to build a 184,624 square foot building and five 3,861 square foot cottage buildings at 13850 North Frank Lloyd Wright Boulevard for a minimal residential heathcare development.

## 1.2 SITE LOCATION

The proposed minimal residential heathcare development encompasses approximately 6.71 net acres in a portion of the Southwest Quarter of Section 8 and a Portion of the Northeast Quarter of Section 17, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian in Maricopa County, Arizona. The site address is 13850 North Frank Lloyd Wright Boulevard, and the APN for the parcels are 217-26-953 and 217-26-954. More specifically, the Headwaters development is bounded by Frank Lloyd Wright Boulevard to the north, Belmont Village Senior Living to the east, single-family residential to the south, and 100th Street to the west (See Appendix A for Site Location Map and Legal Descriptions).

## 1.3 PURPOSE

This preliminary drainage report is intended to be the drainage guideline for development to take place for the minimal residential heathcare development and fulfill the City of Scottsdale drainage requirements. It describes the means and methods by which the storm water associated with the site will be handled post-development.

## 1.4 OBJECTIVES

This preliminary report provides a drainage plan for the proposed development that will meet the drainage standards and guidelines of the City of Scottsdale and the Flood Control District of Maricopa County (FCDMC). In particular, the report will demonstrate the following:

1. The project will designate on-site retention area requirements for the 100-year, 2-hour storm event and ensure that the retention tanks are drained within 36 hours.

2. Drainage facilities will be designed such that 100-year, 2-hour post-development flow is collected and conveyed in such a manner as to not cause damage to buildings and property



16-ZN-2022
4/5/2023

# 2 DESCRIPTION OF EXISTING DRAINAGE CONDITIONS AND CHARACTERISTICS

## 2.1 EXISTING ON-SITE DRAINAGE CONDITIONS

The site is currently an undeveloped vacant land. The north side of the subject parcel is currently bounded by Frank Lloyd Wright Boulevard. The east side of the is bounded by Belmont Village Senior Living. The south side is bounded by existing single family residential. The west is bounded by 100th Street.

The general topography of the site and surrounding areas is steep sloping terrain from the northeast to the southwest at a slope of approximately 2-2.5%. Storm water currently sheet flows across the site to the southwest to the existing on-site temporary surface retention area. Off-site flow from Frank Lloyd Wright Boulevard is captured by an existing catch basin and piped to a temporary retention basin. See Appendix D for Existing Conditions Topographic Map. The site outfalls at the southwest corner via storm drain pipe to a sidewalk pipe opening to the south.

## 2.2 EXISTING OFF-SITE DRAINAGE CONDITIONS

From field observation, site survey topography, and review of storm drain as-built drawings, no off-site flow from 100th Street will affect the site, but off-site flow from Frank Lloyd Wright Boulevard is anticipated to affect the site. The flow on Frank Lloyd Wright comes onto our site through an existing on grade 22-foot catch basin.

Off-site flows for stormwater from Frank Lloyd Wright Blvd were determined using City of Scottsdale topography. Based on the rational method the drainage watershed has a 13.5 cfs for the 100-year peak flow. The offsite curb opening was analyzed using flow master to determine the actual flow that would affect the site. Using the discharge for the entire drainage area, the existing slopes of the road and gutter it was determined that 68.28% of the flow will go to the curb opening and 31.72% would bypass the catch basin. This analysis determined that the actual flow going to the curb opening is 9.22 cfs and 4.28 cfs will bypass the curb opening. See Appendix H for the Flow Master results.

## 2.3 CONTEXT RELATIVE TO ADJACENT PROJECTS AND IMPROVEMENTS

The site is located north of the existing single-family residential development, west of 100th Street, south of Frank Lloyd Wright Boulevard and east of Belmont Village Senior Living. See Appendix G for Context Aerial of the site.

## 2.4 FEMA FLOOD HAZARD AREAS

The site is located in Flood Zone “X” according to the Flood Insurance Rate Map 4013C1780L, dated October 16, 2013. Zone “X” is designated by FEMA as “areas of 0.2% annual chance floor; areas of 1% annual chance floor with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.”



16-ZN-2022
4/5/2023

# 3 PROPOSED DRAINAGE PLAN

## 3.1 GENERAL DESCRIPTION

The minimal residential heathcare development proposes to retain the 100-year, 2-hour storm event as outlined by the City of Scottsdale Drainage Guidelines. The 100-year, 2-hour storm will be retained in an underground retention tank located on the site. Due to the depth of the proposed underground retention tank, the stormwater will be disposed of using five drywells.

In the analysis of the proposed drainage conditions the following items are considered:

- Area Types (asphaltic pavement, building, and desert landscaping)
- Magnitude of areas
- Slopes
- Storm Drain
- Retention Tank

## 3.2 FUTURE CONDITIONS

No future drainage impacts are anticipated for the site due to the stormwater flow on Frank Lloyd Wright Boulevard already being accounted for and the fully developed area that surrounds the site.

## 3.3 STORM WATER STORAGE REQUIREMENTS

The on-site surface retention tank has been designed to retain the off-site runoff from Frank Lloyd Wright Boulevard and on-site runoff volume associated with the 100-year, 2-hour storm. The volume for the retention of Frank Llyod Wright was calculated by taking the flow captured percentage of the peak 100-year flow and applying it to the percent of drainage area of the contributing basin that would enter the site. 100$^{th}$ Street right-of-way drainage adjacent to the site is not included in the on-site hydraulic sub-areas due to the flow being kept in the road.

On-site retention volume will be provided by a 10’ underground surface retention tank located along the west and north side of the site.

The high-water elevation of the tank has been designed to minimize the damage to site improvements such as paving, structures, utilities, walls, landscape, signs and lights.

The following Table 1 summarizes the retention basin name, type, total contributing area to the basin, runoff coefficient for the contributing area and the required and provided retention volume.



16-ZN-2022
4/5/2023

**Table 1: On-site Retention Volume**

| Basin | Land Use | Runoff Coefficient | Drainage Area (ac) | Required Volume (ac-ft) | Provided Volume (ac-ft) | Surplus |
|---|---|---|---|---|---|---|
| UG1 | Landscaping | 0.45 | 1.28 | 0.11 | | |
| | Parking/Building | 0.95 | 7.04 | 1.28 | | |
| Total | | | 8.32 | 1.39 | 1.39 | 0.00 |

The on-site retention tank is designed such that the 100-year, 2-hour runoff volume is disposed of within 36 hours. The on-site retention tank will drain the storm water volume via five proposed drywells on-site in the required 36 hours. See in Appendix E for Basin Delineation and Appendix F for Preliminary Grading and Drainage Plan.

## 3.4 PROPOSED DRAINAGE STRUCTURES OR SPECIAL DRAINAGE FACILITIES

A retention tank is proposed at the northeast corner of the site to accommodate site-generated storm water for the 100-year, 2-hour storm event. Five proposed drywells located on the underground retention tank and dispose of the storm water. The final design will include a drainage easement to be dedicated to the City of Scottsdale for the proposed underground retention tank.

## 3.5 PROJECT PHASING

This project will be constructed in a single phase.



16-ZN-2022
4/5/2023

# 4 SPECIAL CONDITIONS

## 4.1 404 DISCUSSION

No 404/Jurisdictional Washes are anticipated to be located on-site.

## 4.2 STORM WATER QUALITY

The multifamily development will not be using any potential contaminants on site.



16-ZN-2022
4/5/2023

# 5 DATA ANALYSIS METHODS

## 5.1 HYDROLOGIC PROCEDURES, PARAMETER SELECTION, AND ASSUMPTIONS

Hydrologic calculations for the site will be performed using the rational equation in the FCDMC Drainage Design Manual Volume I, which is limited to drainage areas of up to 160 acres.

For on-site analysis of the minimal residential heathcare development, the site was sub-divided into four sub-basins consisting of the parking lot, landscaping, building, and Frank Lloyd Wright Boulevard. For each sub-basin, the Rational equation will be used to calculate the peak flow at each concentration point for each basin. Appendix E identifies the drainage subbasins for the proposed development. See Appendix C for the hydrologic calculations.

## 5.2 HYDRAULIC PROCEDURES, METHODS, PARAMETER SELECTION, AND ASSUMPTIONS

The site is divided into four sub-basins that drain into an on-site underground retention tank. See Appendix E for sub-basin boundaries and concentration points associated with each drainage basin.

All flows for proposed conditions were determined using the rational method as outlined by the Drainage Design Manual by Maricopa County Flood Control District. Due to the small nature of the watersheds for the individual sub-basins, a minimum time of concentration of five minutes was assumed. All of the drainage basins assume runoff coefficients of 0.95 (building/pavement) and 0.45 (landscape). The peak flows at the sub-basin concentration points will be calculated using the Rational equation.

The following criteria will be used to size the proposed pipes for on-site storm water conveyance and disposal:

- A maximum allowable 100-year ponding depth of 6 inches above the catch basin grate.
- A minimum of 12 inches of freeboard between the 100-year ponding depth and the building finish floor elevation.
- A maximum allowable 10-year ponding depth of 6 inches to contain all storm water runoff within the parking field.
- For the storm drain analysis, the tailwater condition for the 100-year event was assumed to be the depth of storage; the 10-year tailwater condition was assumed to be at the crown of the pipe.
- HGL's will be analyzed and provided with the final drainage report.
- Flow in and out both on-site and off-site will be provided with the final drainage report.

Storm drain calculations and profiles shall be provided in the final drainage report.



16-ZN-2022
4/5/2023

## 5.3 STORM WATER STORAGE CALCULATION METHODS AND ASSUMPTIONS

Storm water storage requirements were calculated per City of Scottsdale and Flood Control District of Maricopa County design standards. The standard formula for determining the required storage volumes for the 100-year, 2-hour storm is as follows:

*Equation 2: Standard Formula for On-Site Storage Requirement*

$$V_R = CPA/12$$

Where:

$V_R$ = storage volume required (acre-feet)

C = weighted runoff coefficient

P = precipitation depth for 100-year, 2-hour event = 2.30 inches

A = contributing drainage area to basin (acres)



16-ZN-2022
4/5/2023

# 6 CONCLUSION

## 6.1 OVERALL PROJECT

Based on the results of this preliminary drainage report, the following can be concluded:

- Based on the current Flood Insurance Rate Map, the minimal residential heathcare development is located in the zone “X”.
- Underground retention tank will be provided to detain the post-development 100-year, 2-hour storm water.
- Underground retention tank will drain within 36 hours via five proposed on-site drywells.
- Storm drainage systems consisting of catch basins and storm drain pipe are provided to collect and convey drainage to the retention tank.
- Building finish floor elevation is at least fourteen inches above the ultimate site outfall elevation.
- A drainage easement for the surface retention tank will be dedicated with the final improvement plans and drainage report.

This preliminary drainage report is intended to provide a level of assurance that the minimal residential heathcare development will adhere to all appropriate reviewing agency guidelines with respect to drainage and flood protection.



16-ZN-2022
4/5/2023

# 7 REFERENCES


1. Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map (FIRM) of Maricopa County, Arizona and Incorporated Areas, Map Number 04013C1780 L*, October 16, 2013.

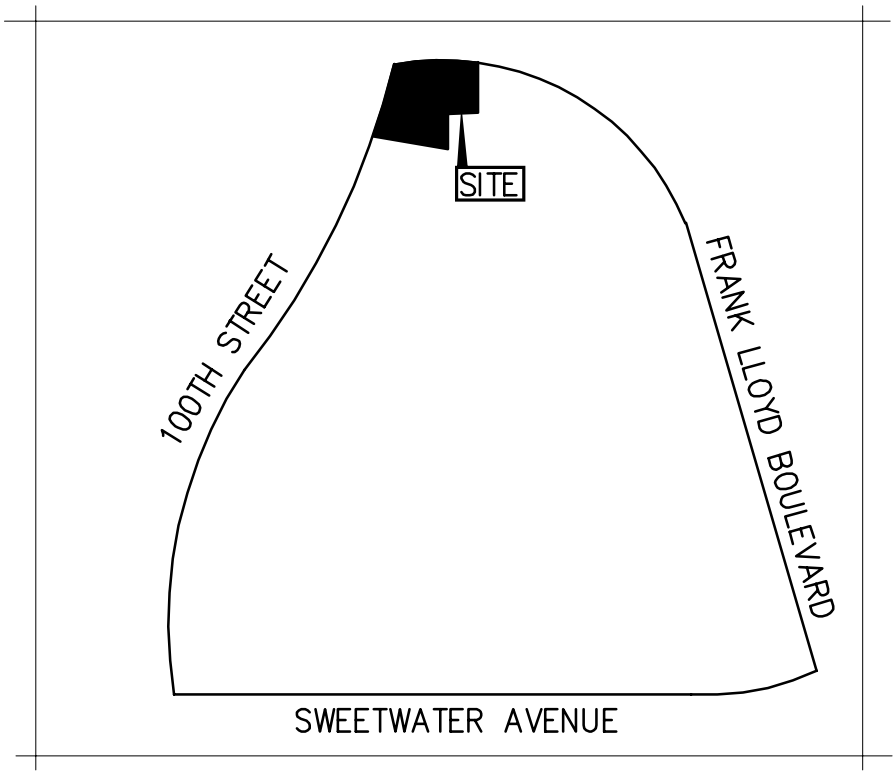
2. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Hydrology Volume,* February, 2011.

3. Flood Control District of Maricopa County (FCDMC), *Drainage Design Manual for Maricopa County, Hydrology Volume,* February, 2011.



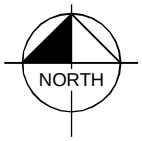

16-ZN-2022
4/5/2023

# Appendix A – Site Location Map and Legal Descriptions




# VICINITY MAP

CITY OF SCOTTSDALE
N.T.S.

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XREFS:

Kimley»Horn

# ***LEGAL DESCRIPTION***

PARCEL 1:
LOTS 1 AND 2 OF FRANK LLOYD WRIGHT 100, ACCORDING TO THE PLAT OF RECORD IN THE OFFICE OF THE COUNTY RECORDER OF MARICOPA COUNTY, ARIZONA IN BOOK 1039 OF MAPS, PAGE 38.

PARCEL 2:
ALL EASEMENTS BENEFITTING THE LAND AS SET FORTH ON THE FINAL PLAT RECORDED IN THE OFFICE OF THE COUNTY RECORDER OF MARICOPA COUNTY, ARIZONA IN BOOK 1039 OF MAPS, PAGE 38.

PARCEL 3:
ALL EASEMENTS BENEFITTING THE LAND AS SET FORTH IN CROSS DRAINAGE EASEMENT AGREEMENT RECORDED IN THE OFFICE OF THE COUNTY RECORDER OF MARICOPA COUNTY, ARIZONA AS RECORDING NO. 2010–1100929 OF OFFICIAL RECORDS.

PARCEL 4:
ALL EASEMENTS BENEFITTING THE LAND AS SET FORTH IN DECLARATION OF COVENANTS, CONDITIONS AND RESTRICTIONS AND RECIPROCAL EASEMENT AGREEMENT RECORDED IN THE OFFICE OF THE COUNTY RECORDS OF MARICOPA COUNTY, ARIZONA AS RECORDING NO. 2010–1100559 OF OFFICIAL RECORDS.

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# Appendix B –FEMA Flood Insurance Rate Map (FIRM)

# National Flood Hazard Layer FIRMette

FEMA

111°52'7"W 33°36'58"N

111°51'30"W 33°36'28"N

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

1:6,000

*Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020*

## 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 11/9/2022 at 1:19 PM 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.

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4/5/2023

# Appendix C – Hydrologic Calculations

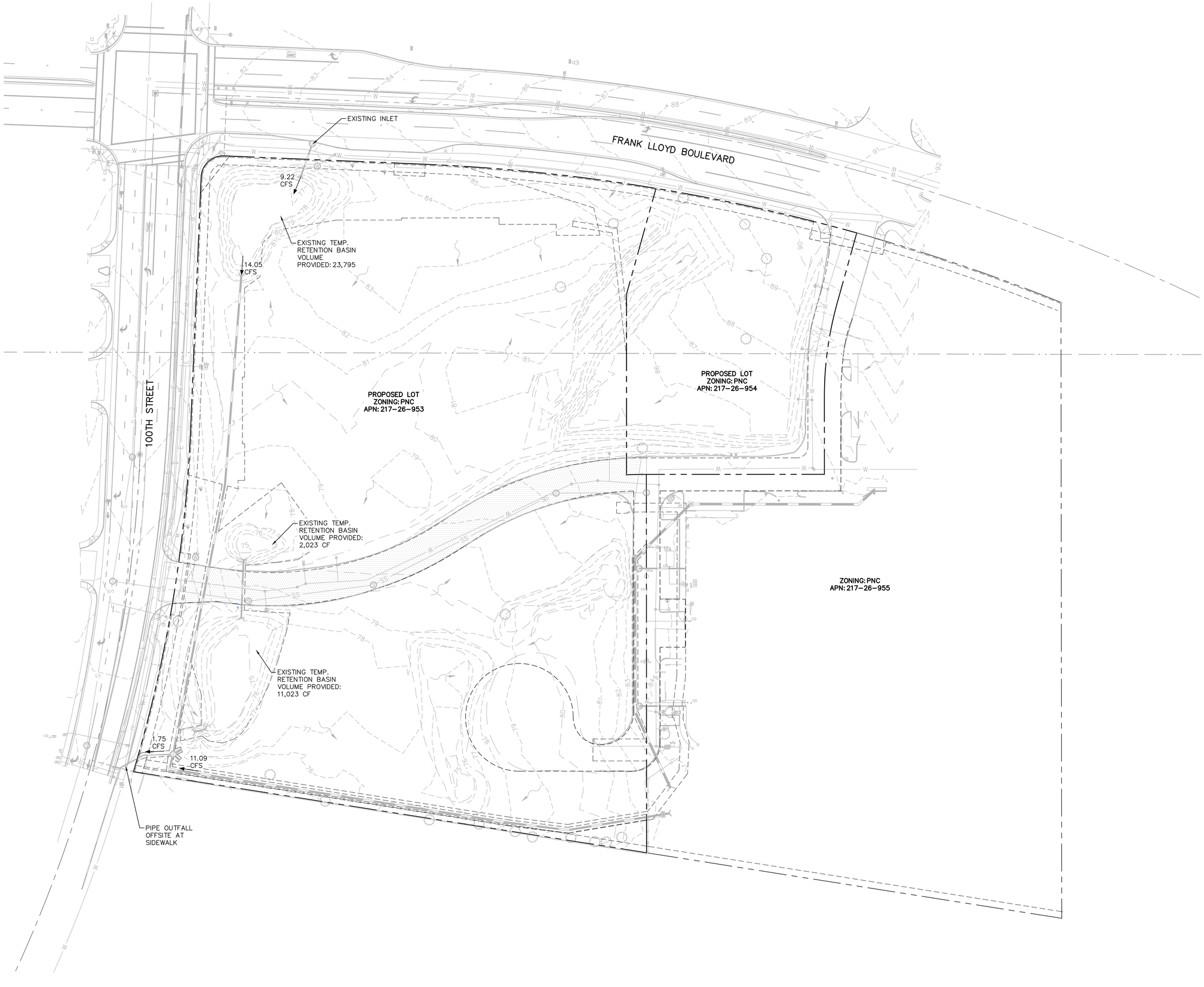
| Overall Retention Summary | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Drainage Area | Land Use | Area [A] | | Runoff Coefficient [C] | Rainfall Intensity (I) | Required Storage ($V_{REQ}$ = C*I*A/12) | | Detention Basin |
| | | sf | ac | | in | cf | ac-ft | |
| 5 | Pavement/Building | 70,265 | 1.613 | 0.95 | 2.30 | 12,794 | 0.294 | UG1 |
| 10 | Landscaping | 31,744 | 0.729 | 0.45 | 2.30 | 2,738 | 0.063 | UG1 |
| 15 | Landscaping | 23,912 | 0.549 | 0.45 | 2.30 | 2,062 | 0.047 | UG1 |
| 20 | Pavement/Building | 236,503 | 5.429 | 0.95 | 2.30 | 43,063 | 0.989 | UG1 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| **Total** | | **362,425** | **8.320** | **-** | **-** | **60,658** | **1.393** | |

| Basin | Land Use | Runoff Coefficient | Drainage Area (sf) | Required Volume (cf) | Provided Volume (cf) | Surplus (cf) |
|---|---|---|---|---|---|---|
| UG1 | Landscaping | 0.45 | 55,656 | 4,800 | | |
| | Pavement/Building | 0.95 | 306,768 | 55,857 | | |
| | | | 362,425 | 60,658 | 60,711 | 54 |

| Underground Retention Summary | | | | | |
|---|---|---|---|---|---|
| Retention Basin | Required Volume | Diameter | Required | Provided | Provided |
| | cf | ft | lf | lf CMP | cf |
| UG1 | 60,658 | 10 | 773 | 773 | 60,711 |

| Drywell Summary | | | | |
|---|---|---|---|---|
| Retention Basin | Volume | Percolation Rate | Drywells Required | Drain Time |
| | cf | cfs | ea | hr |
| UG1 | 60,711 | 0.10 | 5 | 34 |

# Appendix D – Existing Conditions




NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

Kimley»Horn

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1001 West Southern Avenue, Unit 131
Mesa, AZ 85210 (480) 207-2666

EXISTING CONDITIONS

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XREFS: xVF
THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

# Appendix E – Basin Delineation

LEGEND

DRAINAGE BASIN LINE

10 BASIN CALL OUT

NORTH

GRAPHIC SCALE IN FEET

0 30 60 120

Kimley-Horn and Associates, Inc.

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7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

BASIN DELINEATION

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XREFS: XBM XVF XUT

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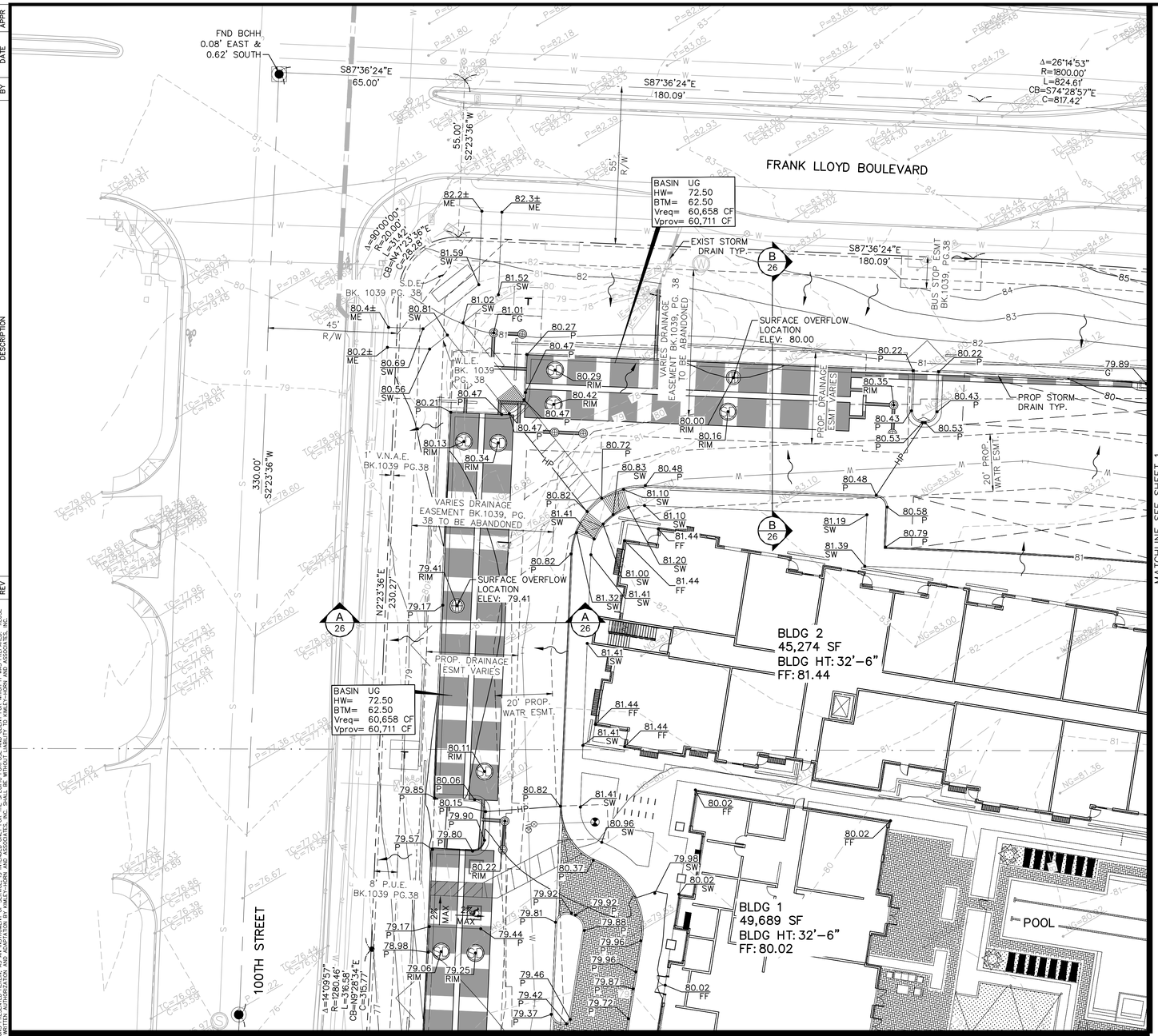
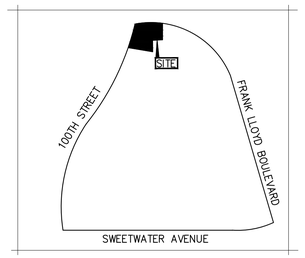
# Appendix F – Preliminary Grading and Drainage




VICINITY MAP
CITY OF SCOTTSDALE
N.T.S.

GRADING AND DRAINAGE NOTES

## GRADING LEGEND

- PROPERTY LINE
- EXISTING EASEMENT LINE
- PROPOSED EASEMENT LINE
- HP — HIGH POINT
- PROPOSED LANDSCAPE SWALE
- 81 — PROPOSED CONTOUR
- 81 — EXISTING CONTOUR
- PROPOSED FLOW ARROW
- 07.10 P — PROPOSED PAVEMENT SPOT ELEVATION
- 07.10 SW — PROPOSED SIDEWALK SPOT ELEVATION
- 07.10 LS — PROPOSED LANDSCAPE SPOT ELEVATION
- EXISTING SURVEY SPOT ELEVATION

## NOTES

1. ADD 1400' TO ELEVATIONS.
2. ADD 0.5' TO PAVEMENT (P) ELEVATIONS FOR TOP OF CURB ELEVATIONS FOR VERTICAL CURBS.
3. ALL SPOT ELEVATIONS ARE FINISHED GRADE PAVEMENT (P), GUTTER/GRATE (G), TOP OF CURB (TC), OR SIDEWALK (SW) ELEVATIONS UNLESS OTHERWISE NOTED.
4. CONTRACTOR SHALL USE SPOT ELEVATIONS, PROPOSED CONTOURS, AND SLOPES TO ESTABLISH GRADES.
5. SIDEWALK CROSS SLOPE SHALL NOT EXCEED 2% AND LONGITUDINAL SLOPE SHALL NOT EXCEED 5%.
6. REFER TO LANDSCAPE PLANS FOR SLOPE TREATMENT.
7. ALL FILL SLOPES SHALL BE COMPACTED TO 95% RELATIVE DENSITY.
8. REFER TO BUILDING ARCHITECTURE AND STRUCTURAL PLANS FOR EXACT BUILDING FOUNDATION THICKNESS CHANGES.
9. ALL PIPE CONNECTIONS SHALL BE WATER TIGHT.

## RETENTION CALCULATIONS

| | VOLUME REQUIRED | VOLUME PROVIDED |
|---|---|---|
| UG 1 | 1.39 AC FT (60,658 CF) | 1.39 AC FT (60,711 CF) |

## DISPOSAL CALCULATIONS

| | DISPOSAL VOLUME | DISPOSAL RATE | DISPOSAL TIME | DRYWELLS NEEDED |
|---|---|---|---|---|
| UG 1 | 60,711 CF | 0.10 CFS | 34 HRS | 5 |

1. SEE DRAINAGE REPORT FOR DRAINAGE CALCULATIONS.

## EARTHWORKS

| ITEM DESCRIPTION | QUANTITY | UNIT |
|---|---|---|
| CUT (RAW) TO FINAL GRADE | 9,108 | CY |
| FILL (RAW) TO FINAL GRADE | 7,877 | CY |
| NET (CUT) | 1,231 | CY |

NOTE: THE QUANTITIES LISTED ON THIS SHEET ARE APPROXIMATE AND ARE AN ESTIMATE ONLY. THE CONTRACTOR SHALL MAKE IS OWN DETERMINATION OF THE QUANTITIES INVOLVED AND SHALL BASE HIS BID ON HIS OWN ESTIMATE.

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

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Mesa, Arizona 85210 (480)207-2666
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HEADWATERS SCOTTSDALE
# GRADING AND DRAINAGE PLAN
SCOTTSDALE, ARIZONA

PROJECT No. 291753000
SCALE (H):1"=20'
SCALE (V):NONE
DRAWN BY: AMF
DESIGN BY: AMF
CHECK BY: STM
DATE: 03/15/2023

Registered Professional Engineer (Civil)
CERTIFICATE NO.
47183
STERLING
MARGETTS
Date Signed 03/15/23
ARIZONA, USA
Expires 12/31/23

GD.dwg

GD1
1 OF 4 SHEETS

APPR | DATE | BY | DESCRIPTION | REV

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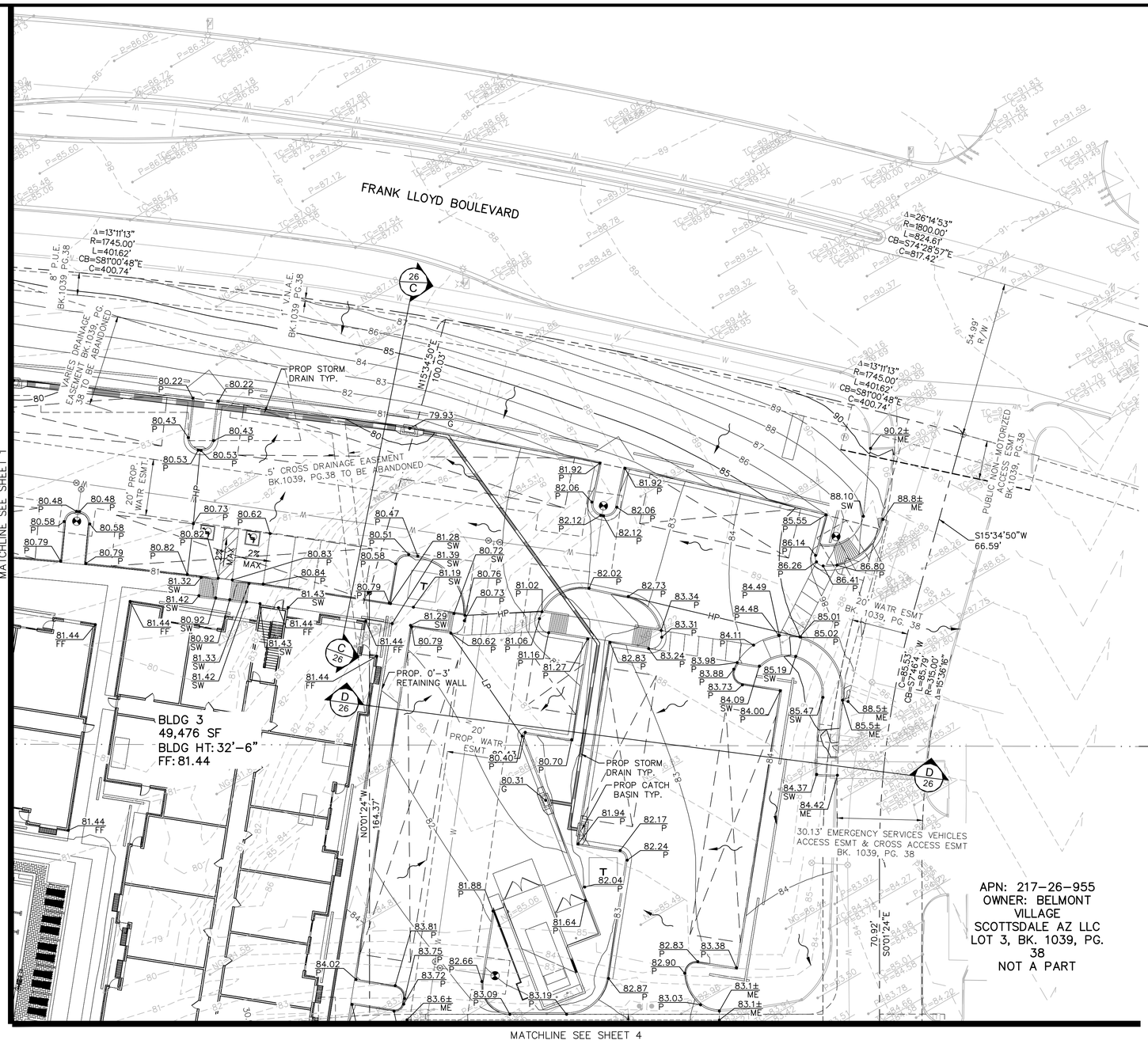


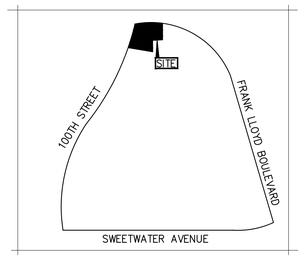


VICINITY MAP
CITY OF SCOTTSDALE
N.T.S.

## GRADING AND DRAINAGE NOTES

### GRADING LEGEND

- PROPERTY LINE
- EXISTING EASEMENT LINE
- PROPOSED EASEMENT LINE
- HP — HIGH POINT
- PROPOSED LANDSCAPE SWALE
- 81 — PROPOSED CONTOUR
- 81 — EXISTING CONTOUR
- PROPOSED FLOW ARROW
- 07.10 P — PROPOSED PAVEMENT SPOT ELEVATION
- 07.10 SW — PROPOSED SIDEWALK SPOT ELEVATION
- 07.10 LS — PROPOSED LANDSCAPE SPOT ELEVATION
- EXISTING SURVEY SPOT ELEVATION
- P=68.92 — PROPOSED GRADE BY MASTER DEVELOPER

### NOTES

1. ADD 1400' TO ELEVATIONS.
2. ADD 0.5' TO PAVEMENT (P) ELEVATIONS FOR TOP OF CURB ELEVATIONS FOR VERTICAL CURBS.
3. ALL SPOT ELEVATIONS ARE FINISHED GRADE PAVEMENT (P), GUTTER/GRATE (G), TOP OF CURB (TC), OR SIDEWALK (SW) ELEVATIONS UNLESS OTHERWISE NOTED.
4. CONTRACTOR SHALL USE SPOT ELEVATIONS, PROPOSED CONTOURS, AND SLOPES TO ESTABLISH GRADES.
5. SIDEWALK CROSS SLOPE SHALL NOT EXCEED 2% AND LONGITUDINAL SLOPE SHALL NOT EXCEED 5%.
6. REFER TO LANDSCAPE PLANS FOR SLOPE TREATMENT.
7. ALL FILL SLOPES SHALL BE COMPACTED TO 95% RELATIVE DENSITY.
8. REFER TO BUILDING ARCHITECTURE AND STRUCTURAL PLANS FOR EXACT BUILDING FOUNDATION THICKNESS CHANGES.
9. ALL PIPE CONNECTIONS SHALL BE WATER TIGHT.

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

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1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

Kimley»Horn
1001 West Southern Avenue, Suite 131
Mesa, Arizona 85210 (480)207-2666
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# HEADWATERS SCOTTSDALE
# GRADING AND DRAINAGE PLAN
SCOTTSDALE, ARIZONA

| | |
|---|---|
| PROJECT No. | 291753000 |
| SCALE (H): | 1"=20' |
| SCALE (V): | NONE |
| DRAWN BY: | AMF |
| DESIGN BY: | AMF |
| CHECK BY: | STM |
| DATE: | 03/15/2023 |

Registered Professional Engineer
CERTIFICATE NO.
47183
STERLING MARGETTS
Date Signed 03/15/23
ARIZONA, USA
Expires 12/31/23

GD.dwg

GD2
2 OF 4 SHEETS

| REV | DESCRIPTION | BY | DATE | APPR |
|---|---|---|---|---|

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MATCHLINE SEE SHEET 1

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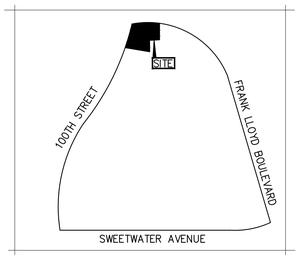


VICINITY MAP
CITY OF SCOTTSDALE
N.T.S.

## GRADING AND DRAINAGE NOTES

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HEADWATERS SCOTTSDALE
# GRADING AND DRAINAGE PLAN
SCOTTSDALE, ARIZONA

| |
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| PROJECT No. 291753000 |
| SCALE (H):1"=20' |
| SCALE (V):NONE |
| DRAWN BY: AMF |
| DESIGN BY: AMF |
| CHECK BY: STM |
| DATE: 03/15/2023 |

Registered Professional Engineer (Civil)
CERTIFICATE NO.
47183
STERLING MARGETTS
Date Signed 03/15/23
ARIZONA, USA
Expires 12/31/23

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GD3
3 OF 4 SHEETS

APPR | DATE | BY | DESCRIPTION | REV

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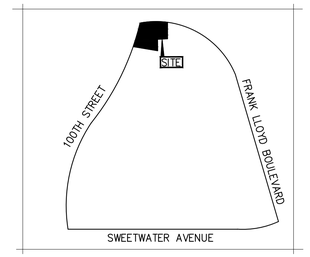
MATCHLINE SEE SHEET 2




VICINITY MAP
CITY OF SCOTTSDALE
N.T.S.

APN: 217-26-955
OWNER: BELMONT VILLAGE SCOTTSDALE AZ LLC
LOT 3, BK. 1039, PG. 38
NOT A PART

## GRADING AND DRAINAGE NOTES

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- Ex=13.68 MH=13.68 — EXISTING SURVEY SPOT ELEVATION
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HEADWATERS SCOTTSDALE
# GRADING AND DRAINAGE PLAN
SCOTTSDALE, ARIZONA

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| DRAWN BY: | AMF |
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| CHECK BY: | STM |
| DATE: | 03/15/2023 |

Registered Professional Engineer (Civil)
CERTIFICATE NO.
47183
STERLING MARGETTS
Date Signed 03/15/23
ARIZONA, U.S.A.
Expires 12/31/23

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GD1
4 OF 4 SHEETS

| REV | DESCRIPTION | BY | DATE | APPR |
|---|---|---|---|---|

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# Appendix G – Context Aerial Plan

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Phoenix, Arizona 85020 (602) 944-5500

# Appendix H – Flow Master Results

# Offsite Curb Opening on FLW

| Project Description | |
|---|---|
| Solve For | Efficiency |

| Input Data | |
|---|---|
| Discharge | 13.50 cfs |
| Slope | 0.016 ft/ft |
| Gutter Width | 1.50 ft |
| Gutter Cross Slope | 0.111 ft/ft |
| Road Cross Slope | 0.032 ft/ft |
| Roughness Coefficient | 0.015 |
| Curb Opening Length | 22.0 ft |
| Local Depression | 0.2 ft |
| Local Depression Width | 22.0 ft |

| Results | |
|---|---|
| Efficiency | 68.28 % |
| Intercepted Flow | 9.22 cfs |
| Bypass Flow | 4.28 cfs |
| Spread | 12.4 ft |
| Depth | 6.2 in |
| Flow Area | 2.6 ft² |
| Gutter Depression | 0.1 ft |
| Total Depression | 0.3 ft |
| Velocity | 5.27 ft/s |
| Equivalent Cross Slope | 0.036 ft/ft |
| Length Factor | 0.472 |
| Total Interception Length | 46.7 ft |



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4/5/2023

# Existing 18" Pipe N to S

| Project Description | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Full Flow Capacity |

| Input Data | |
|---|---|
| Roughness Coefficient | 0.010 |
| Channel Slope | 0.011 ft/ft |
| Normal Depth | 18.0 in |
| Diameter | 18.0 in |
| Discharge | 14.05 cfs |

| Results | |
|---|---|
| Discharge | 14.05 cfs |
| Normal Depth | 18.0 in |
| Flow Area | 1.8 ft² |
| Wetted Perimeter | 4.7 ft |
| Hydraulic Radius | 4.5 in |
| Top Width | 0.00 ft |
| Critical Depth | 16.6 in |
| Percent Full | 100.0 % |
| Critical Slope | 0.009 ft/ft |
| Velocity | 7.95 ft/s |
| Velocity Head | 0.98 ft |
| Specific Energy | 2.48 ft |
| Froude Number | (N/A) |
| Maximum Discharge | 15.11 cfs |
| Discharge Full | 14.05 cfs |
| Slope Full | 0.011 ft/ft |
| Flow Type | Undefined |

| 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 | 100.0 % |
| Downstream Velocity | Infinity ft/s |
| Upstream Velocity | Infinity ft/s |
| Normal Depth | 18.0 in |
| Critical Depth | 16.6 in |
| Channel Slope | 0.011 ft/ft |
| Critical Slope | 0.009 ft/ft |



16-ZN-2022
4/5/2023

# Existing 18" Pipe E to W

| Project Description | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Full Flow Capacity |

| Input Data | |
|---|---|
| Roughness Coefficient | 0.010 |
| Channel Slope | 0.007 ft/ft |
| Normal Depth | 18.0 in |
| Diameter | 18.0 in |
| Discharge | 11.09 cfs |

| Results | |
|---|---|
| Discharge | 11.09 cfs |
| Normal Depth | 18.0 in |
| Flow Area | 1.8 ft² |
| Wetted Perimeter | 4.7 ft |
| Hydraulic Radius | 4.5 in |
| Top Width | 0.00 ft |
| Critical Depth | 15.3 in |
| Percent Full | 100.0 % |
| Critical Slope | 0.006 ft/ft |
| Velocity | 6.28 ft/s |
| Velocity Head | 0.61 ft |
| Specific Energy | 2.11 ft |
| Froude Number | (N/A) |
| Maximum Discharge | 11.93 cfs |
| Discharge Full | 11.09 cfs |
| Slope Full | 0.007 ft/ft |
| Flow Type | Undefined |

| 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 | 100.0 % |
| Downstream Velocity | Infinity ft/s |
| Upstream Velocity | Infinity ft/s |
| Normal Depth | 18.0 in |
| Critical Depth | 15.3 in |
| Channel Slope | 0.007 ft/ft |
| Critical Slope | 0.006 ft/ft |



16-ZN-2022
4/5/2023

# Existing Bleed Off Pipe

| Project Description | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Full Flow Capacity |

| Input Data | |
|---|---|
| Roughness Coefficient | 0.010 |
| Channel Slope | 0.012 ft/ft |
| Normal Depth | 8.0 in |
| Diameter | 8.0 in |
| Discharge | 1.75 cfs |

| Results | |
|---|---|
| Discharge | 1.75 cfs |
| Normal Depth | 8.0 in |
| Flow Area | 0.3 ft² |
| Wetted Perimeter | 2.1 ft |
| Hydraulic Radius | 2.0 in |
| Top Width | 0.00 ft |
| Critical Depth | 7.3 in |
| Percent Full | 100.0 % |
| Critical Slope | 0.011 ft/ft |
| Velocity | 5.01 ft/s |
| Velocity Head | 0.39 ft |
| Specific Energy | 1.06 ft |
| Froude Number | (N/A) |
| Maximum Discharge | 1.88 cfs |
| Discharge Full | 1.75 cfs |
| Slope Full | 0.012 ft/ft |
| Flow Type | Undefined |

| 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 | 100.0 % |
| Downstream Velocity | Infinity ft/s |
| Upstream Velocity | Infinity ft/s |
| Normal Depth | 8.0 in |
| Critical Depth | 7.3 in |
| Channel Slope | 0.012 ft/ft |
| Critical Slope | 0.011 ft/ft |



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