



PRELIMINARY WASTEWATER REPORT
FOR
PHOENIX COUNTRY DAY SCHOOL
PERFORMING ARTS CENTER

PARADISE VALLEY, ARIZONA

Prepared For:
ADM Group Inc.
2100 West 15th Street
Tempe, AZ 85281
Phone: (480) 285-3800

Prepared By:
HILGARTWILSON, LLC
2141 E. Highland Avenue, Suite 250
Phoenix, AZ 85016
Phone: (602) 490-0535
Fax: (602) 368-2436



September 2023
HW Project No. 1648.02

KIVA: XX-XXXX

Prepared For:

	<u>9/18/2023</u>
ADM Group, Inc. 2100 West 15 th Street Tempe, AZ 85281	Date

Prepared and Submitted By:

	<u>9/18/2023</u>
Zac Sharp HILGARTWILSON 2141 E Highland Avenue, Suite 250 Phoenix, AZ 85016	Date

City of Phoenix Approvals:

Planning and Development Director	Date
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Water Services Director	Date
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1.0 INTRODUCTION

1.1 Background and Project Location

Phoenix Country Day School Performing Arts Center (the Project) is a proposed performing arts school building within the overall existing Phoenix Country Day School (PCDS) campus, located south of Stanford Drive and west of 40th Street in the Town of Paradise Valley (the Town), Arizona. The Project occupies approximately 20.4 acres in a portion of Section 13, Township 2 North, Range 3 East of the Gila and Salt River Meridian. Figure 1 in Appendix A provides a vicinity map for the Project and the overall PCDS campus. It is estimated that approximately 800 students are enrolled at the PCDS campus.

1.2 General Description

The Project will consist of a single performing arts school building with a footprint of approximately 18,250 square feet, parking areas, and landscaped areas. The performing arts building will replace an existing parking lot, adding to the 13 existing buildings within the PCDS campus. The PCDS campus and surrounding area generally drain south and east at approximately 1.3 percent towards the Echo Canyon Wash. The wastewater infrastructure for the Project will be owned and operated by the City of Phoenix.

1.3 Purpose of Report

The purpose of this Preliminary Wastewater Report (Report) is to identify and evaluate the proposed wastewater system infrastructure required for serving the Project in accordance with the *Design Standards Manual for Water and Wastewater Systems* (City of Phoenix, 2021). This Report discusses the existing wastewater infrastructure within the Project vicinity and identifies anticipated average daily wastewater flows and peak wastewater flows generated by the Project. It also identifies anticipated sewer main sizes and alignments and presents results from a hydraulic analysis of the proposed wastewater infrastructure.

2.0 DESIGN CRITERIA

2.1 City of Phoenix Design Criteria

The proposed wastewater system infrastructure for the Project has been prepared and evaluated consistent with the City's current design criteria as identified in the *Design Standards Manual for Water and Wastewater Systems* (City of Phoenix, 2021). A summary of the design criteria established for the Project is provided in Table 1 below.

TABLE 1 WASTEWATER SYSTEM DESIGN CRITERIA ¹			
Category		Value	Unit
Average Daily Flow			
	Schools	20	gpd/Student
Peaking Factors			
	Harmon's Equation – $PF = 1+14/(4+P^{1/2})$	P = Population (in thousands)	
System Layout			
	Minimum Sewer Depth of Cover ²	7.0	ft
	Minimum Pipe Diameter	8	inches
	Maximum Manhole Spacing (dia. < 15")	400	ft
	Manhole Invert Drop (45° - 90°)	0.1'	Drop across manhole
Minimum Pipe Slopes			
	8-inch	0.00380	ft/ft
System Performance			
	Manning's Roughness Coefficient (n)	0.013	
	Minimum Velocity	2.1	fps
	Sewer Capacity Ratio (d/D, max at peak flow)	0.75	
<u>Notes:</u> 1. Design criteria based on the <i>Design Standards Manual for Water and Wastewater Systems</i> (City of Phoenix, 2021). 2. Or sufficient depth to serve the ultimate drainage area to include serviceable areas outside of the development project.			

3.0 WASTEWATER FLOWS

3.1 Land Use

The Project will consist of a single additional school building and open space uses. Table 2 shows the anticipated land use and density for the Project.

TABLE 2 LAND USE AND DENSITY			
Land Use		Area (ac)	Population (Students)
Performing Arts Building	Schools	0.6	800
Grand Total	-	0.6	800

3.2 Wastewater Flow Calculations

Anticipated wastewater flows for the Project have been calculated in accordance with the design criteria listed in Table 1 and the land use listed in Table 2. A summary of the wastewater flows is presented in Table 3. Table B.1 in Appendix B presents more detailed wastewater flow calculations for the Project.

TABLE 3 FLOW SUMMARY					
Phase	Average Daily Flow		Peaking Factor	Peak Daily Flow	
	gpd	gpm		gpd	gpm
Performing Arts Building	16,000	11.1	3.9	61,766	42.9

4.0 WASTEWATER SYSTEM INFRASTRUCTURE

4.1 Existing Wastewater System Infrastructure

Existing wastewater infrastructure immediately adjacent to the Project has been identified from the City of Phoenix Quarter Section maps, which show an 8-inch gravity sewer main within Stanford Drive that flows east to 40th Street, then south within 40th Street, upsizing to a 12-inch sewer main, which ultimately outfalls to an existing 21-inch gravity main flowing west in Camelback Road. There is existing wastewater infrastructure, including a lift station within the PCDS campus which serve the existing buildings.

4.2 Proposed Wastewater System Improvements

The proposed wastewater system infrastructure for the Project will consist of a private onsite sewer that will connect to the existing 8-inch gravity sewer main within Stanford Drive, shown in Appendix C. Alternatively, the Project may tie-in to existing wastewater infrastructure within the PCDS campus, provided that existing facilities prove adequate capacity and no adverse impacts occur as a result of development. The final design of the Project shall document evaluate and document the chosen alternative, and demonstrate that the proposed improvements and all downstream wastewater infrastructure provides adequate capacity to manage wastewater flows generated by the proposed building.

A sewer capacity analysis was completed to ensure there is adequate capacity for the Project. Table B.1 and B.2 in Appendix B presents the wastewater flow calculations and sewer capacity analysis for the Project. A proposed sewer connection to Stanford Drive was analyzed to demonstrate there is sufficient capacity to convey the anticipated peak flows downstream. The proposed sewer was analyzed at a minimum slope of 0.0038 ft/ft, and can convey the 61,766 gpd (42.9 gpm) peak flow with a depth/diameter (d/D) ratio of 24.2%. The full pipe capacity at the minimum design slope is 482,747 gpd (335.2 gpm). Gravity sewers will be designed to ensure the normal depth of flow within the pipe does not exceed 75% of the pipe diameter during peak flow conditions.

4.3 Wastewater System Phasing

The Project is anticipated to be developed in a single phase. In the event that the improvements are constructed in multiple phases, the downstream mains required to serve any given phase will be constructed simultaneously with said phase and will be sized for ultimate build-out conditions.

5.0 CONCLUSIONS

The proposed wastewater system discussed in this report will adequately serve the Project. This report has determined that:

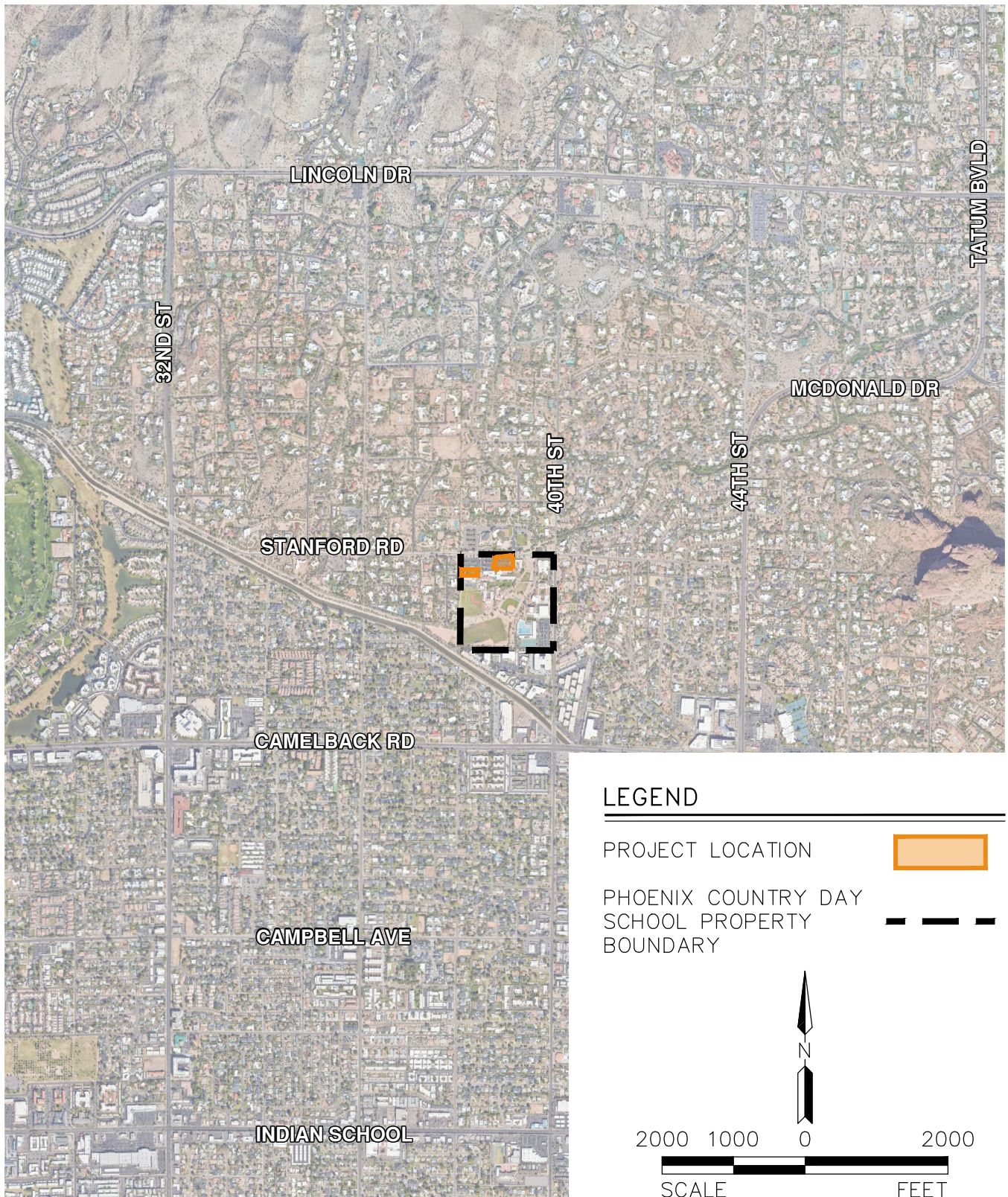
- The projected average daily flow and peak flow generated by the Project are 16,000 gpd (11.1 gpm) and 61,766 gpd (42.9 gpm), respectively.
- The proposed onsite wastewater improvements will consist of a gravity sewer main that will convey wastewater flows to the existing, offsite 8-inch sewer main within Stanford Drive. Alternatively, the Project may connect to existing onsite wastewater infrastructure, to be detailed at final design of the Project.
- The proposed wastewater collection system meets the City of Phoenix design criteria listed in Table 1 of this report.
- The hydraulic model results in Appendix B show that the proposed sewer mains have sufficient capacity to convey the anticipated wastewater flows from the Project.

6.0 REFERENCES

City of Phoenix Water Services Department (2021). *Design Standards Manual for Water and Wastewater Systems*. 2021, Phoenix, AZ.

APPENDIX A

FIGURES



PROJ.NO.: 1648
 DATE: SEP 2023
 SCALE: 1" = 2,000'
 DRAWN BY: DM
 CHECKED BY: BB

PHOENIX COUNTRY DAY SCHOOL
 PERFORMING ARTS CENTER
 TOWN OF PARADISE VALLEY
FIG 1: VICINITY MAP


HILGARTWILSON
 2141 E. HIGHLAND AVE., STE. 250
 PHOENIX, AZ 85016
 P: 602.490.0535 / F: 602.368.2436

APPENDIX B

TABLES

September 2023

Land Use	Gross Area (ac)	Population (Students)	Average Daily Flow		Peaking Factor	Peak Daily Flow	
			(gpd)	(gpm)		(gpd)	(gpm)
Schools	0.6	800	16,000	11.1	3.86	61,766	42.9
Grand Total	0.6	800	16,000	11.1	3.9	61,766	42.9

Notes:

1. Design Criteria listed below is based on City of Phoenix's 2021 Design Standards Manual for Water and Wastewater systems.
2. Per the Arizona Administrative Code Title 18-Chapter 9 (ADEQ, 2017).

Flow Factors:

School Average Daily Flow 20 gpd/student

Peaking Factors:

Peak Daily Flow (Harmons Equat $Q_{peak} = Q_{ave} * [1 + 14 / (4 + P^{1/2})]$ P = Population (in thousands)

Table B.2 - Sewer Capacity Calculations

Project: Phoenix Country Day School Performing Arts Center

Paradise Valley, Arizona

September, 2023



Performing Arts Center:	16,000	gpd
Total Average Day Flow:	16,000	gpd
Peaking Factor:	3.86	
Total Peak Flow:	61,766	gpd
Pipe Parameters:		
Sewer Diameter (D):	8	in.
Manning's n-value (n):	0.013	
Slope (S):	0.0038	ft/ft
Hydraulic Radius (R):	0.095	ft (part full pipe)
Hydraulic Radius (R):	0.167	ft (full pipe; R=D/4)
Manning's Equation: $V = (1.486/n) * R^{(2/3)} * S^{(1/2)}$		
Velocity (V, part full pipe):	1.47	fps
Velocity (V, full pipe):	2.14	fps
Depth/Diameter (d/D):	24.2%	
% Capacity (Flow/Capacity, Q/Q _{full}):	12.8%	
$Q = (1.49/n) * A * R^{(2/3)} * S^{(1/2)}$		
Pipe Capacity (Full Flow):	0.75	cfs
	482,747	gpd
Capacity (Excess Design):	420,948	gpd

Depth/Diameter (d/D) is less than 75% under peak flow conditions, therefore adequate capacity is available.

*Notes:

- 1) Design criteria are based on the *City of Phoenix Design Standards Manual for Water and Wastewater Systems* (City of Phoenix, 2021).

APPENDIX C

EXCERPTS

PRELIMINARY UTILITY PLAN
PHOENIX COUNTRY DAY SCHOOL
PARADISE VALLEY, ARIZONA

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 13, TOWNSHIP 2 NORTH, RANGE 3 EAST
OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA

ENGINEER

HILGARTWILSON
2141 E. HIGHLAND AVENUE, SUITE 250
PHOENIX, ARIZONA 85016
PHONE: (602) 490-0535
FAX: (602) 368-2436
CONTACT: ZACH HILGART, PE
EMAIL: ZHILGART@HILGARTWILSON.COM

ARCHITECT

ADM GROUP
2100 W 15TH STREET
TEMPE ARIZONA 85281
CONTACT: BEN BARCON
PHONE: (602) 339-8386

BASIS OF BEARING

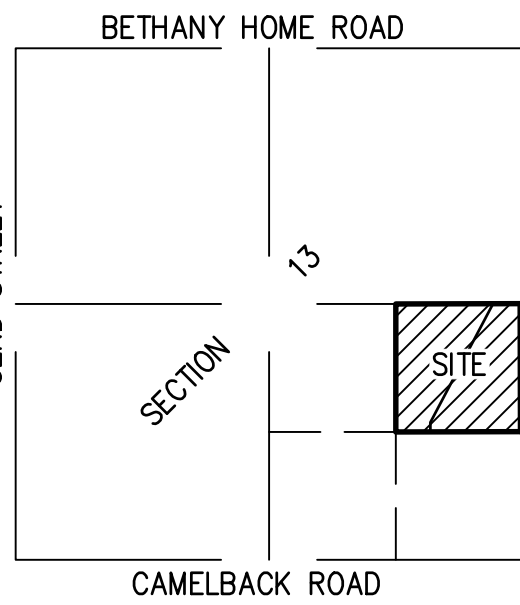
BASIS OF BEARING IS S00°15'38"W ALONG THE EAST LINE OF THE
SOUTHEAST QUARTER OF SECTION 13, TOWNSHIP 2 NORTH, RANGE 3 EAST
OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA,
BETWEEN THE MONUMENTS AS SHOWN HEREON.

OWNER

PHOENIX COUNTRY DAY SCHOOL
3901 E STANFORD DR
PARADISE VALLEY, ARIZONA 85253

SITE PLAN

APN: 170-09-001B
EXISTING ZONING: SUP
NET AREA: 108,010 SF
GROSS AREA: 108,010 SF
DISTURBED AREA:



VICINITY MAP
NOT TO SCALE

HILGARTWILSON
HAS JOINED COLLIER'S ENGINEERING & DESIGN
2141 E. HIGHLAND AVE., STE. 250 | P: 602.490.0535 / F: 602.368.2436
PHOENIX, AZ 85016
www.hilgartwilson.com

PHOENIX COUNTRY DAY SCHOOL

3901 E STANFORD DRIVE
PARADISE VALLEY, ARIZONA

PRELIMINARY UTILITY PLAN

HILGARTWILSON

PROJ NO.: 1648

DATE: SEP 2023

SCALE: 1" = 20'

DRAWN: HW

DESIGNED: HW

APPROVED: ZH

DWG. NO.

PU01

SHT. 2 OF

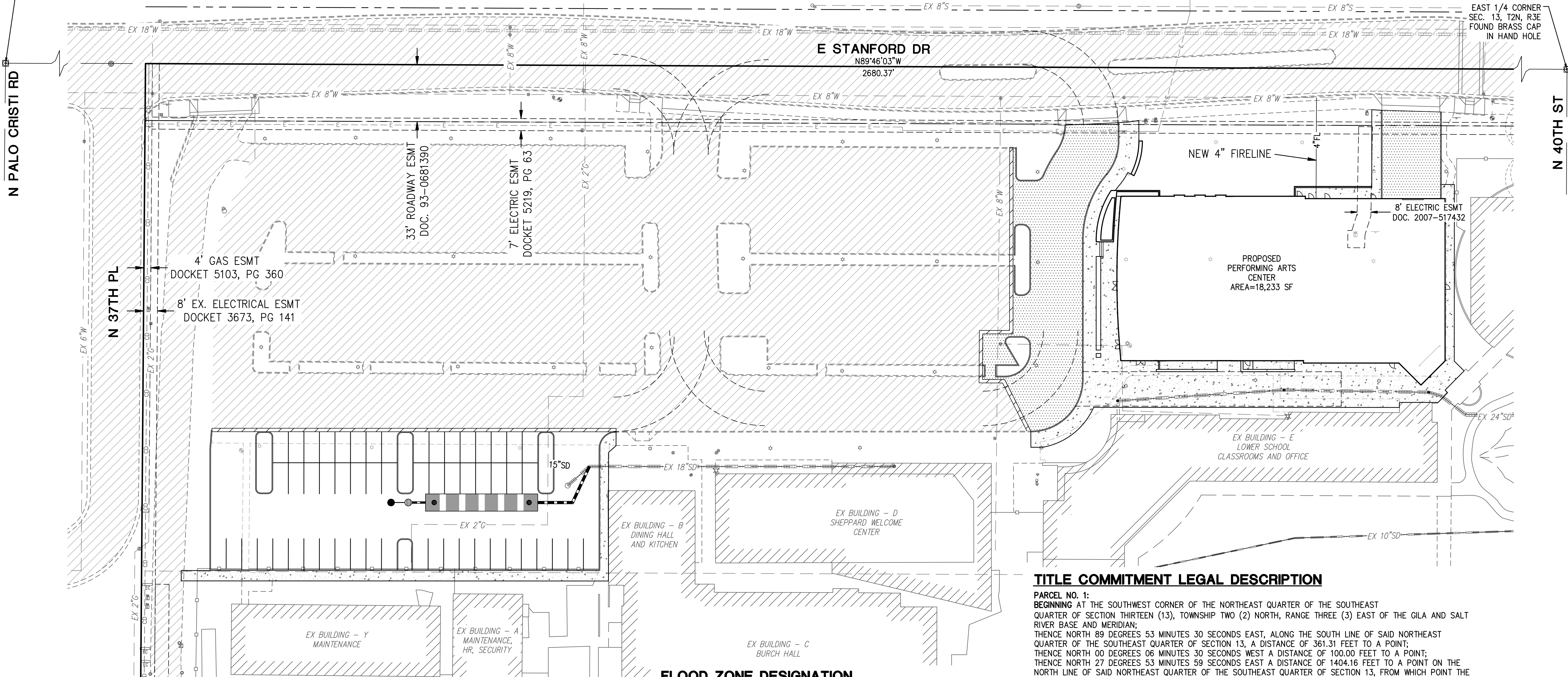


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CENTER OF
SEC. 13, T2N, R3E
FOUND TOWN OF
PARADISE VALLEY
BRASS CAP IN HAND
HOLE DOWN 0.5'

30 0 30 60
SCALE: 1" = 30'



LEGEND

- | | | | |
|--|------------------------------|--|--------------------------------|
| | FOUND BRASS CAP IN HAND HOLE | | EX. WROUGHT IRON FENCE |
| | FOUND BRASS CAP FLUSH | | EX. ELECTRIC METER |
| | BOUNDARY LINE | | EX. ELECTRIC JUNCTION BOX |
| | EASEMENT LINE | | EX. ELECTRIC TRANSFORMER |
| | CENTER LINE | | EX. ELECTRIC PULL BOX |
| | RIGHT OF WAY LINE | | EX. BOLLARD LIGHT |
| | TC= TOP OF CURB | | EX. LIGHT POLE |
| | C= CONCRETE | | EX. AIR CONDITIONER UNIT |
| | P= PAVEMENT | | EX. FLAG POLE |
| | G= GUTTER | | EX. TELEPHONE PEDESTAL |
| | GR= GRATE | | EX. IRRIGATION CONTROL VALVE |
| | FF= FINISHED FLOOR | | EX. FIRE DEPARTMENT CONNECTION |
| | FG= FINISHED GRADE | | EX. FIRE HYDRANT |
| | PUE PUBLIC UTILITY EASEMENT | | EX. WATER VALVE |
| | CL CENTERLINE | | EX. GAS VALVE |
| | R/W RIGHT OF WAY | | EX. SANITARY SEWER MANHOLE |
| | (1000) CONTOUR (EX.) | | EX. SEWER CLEAN OUT |
| | 1000 CONTOUR (PROPOSED) | | PROPOSED FLOW ARROW |

FLOOD ZONE DESIGNATION

THE FOLLOWING FLOOD PLAIN DESIGNATION AND ASSOCIATED COMMENTS ARE COPIED DIRECTLY FROM THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) WEBSITE. HILGARTWILSON, LLC AND THE UNDERSIGNED REGISTERED PROFESSIONAL LAND SURVEYOR MAKE NO STATEMENT AS TO THE ACCURACY OR COMPLETENESS OF THE FOLLOWING FLOOD ZONE DESIGNATION STATEMENT.

A PORTION OF THE SUBJECT PROPERTY LIES WITHIN SHADED ZONE "X" WITH A DEFINITION OF: 0.2-PERCENT-ANNUAL-CHANCE FLOODPLAIN, AREAS OF 1-PERCENT-ANNUAL-CHANCE (BASE FLOOD) SHEET FLOW FLOODING WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT, AREAS OF BASE FLOOD STREAM FLOODING WITH A CONTRIBUTING DRAINAGE AREA OF LESS THAN 1 SQUARE MILE, OR AREAS PROTECTED FROM THE BASE FLOOD BY LEVEES. NO BFES OR DEPTHS ARE SHOWN IN THIS ZONE, AND INSURANCE PURCHASE IS NOT REQUIRED. DESIGNATION DETERMINED BY FEMA FLOOD ZONE MAP 04013C1765L, PANEL NUMBER 1765 OF 4425, EFFECTIVE DATE OCTOBER 16, 2013.

A PORTION OF THE SUBJECT PROPERTY LIES WITHIN ZONE "AE" WITH A DEFINITION OF: 1-PERCENT-ANNUAL-CHANCE FLOODPLAINS THAT ARE DETERMINED FOR THE FIS BY DETAILED METHODS OF ANALYSIS. IN MOST INSTANCES, BFES DERIVED FROM THE DETAILED HYDRAULIC ANALYSES ARE SHOWN AT SELECTED INTERVALS IN THIS ZONE. MANDATORY FLOOD INSURANCE PURCHASE REQUIREMENTS APPLY. AE ZONES ARE AREAS OF INUNDATION BY THE 1-PERCENT-ANNUAL-CHANCE FLOOD, INCLUDING AREAS WITH THE 2-PERCENT WAVE RUNUP, ELEVATION LESS THAN 3.0 FEET ABOVE THE GROUND, AND AREAS WITH WAVE HEIGHTS LESS THAN 3.0 FEET. THESE AREAS ARE SUBDIVIDED INTO ELEVATION ZONES WITH BFES ASSIGNED. THE AE ZONE WILL GENERALLY EXTEND INLAND TO THE LIMIT OF THE 1-PERCENT-ANNUAL-CHANCE STILLWATER FLOOD LEVEL (SWEL). DESIGNATION DETERMINED BY FEMA FLOOD ZONE MAP 04013C1765L, PANEL NUMBER 1765 OF 4425, EFFECTIVE DATE OCTOBER 16, 2013.