

WASTEWATER BASIS OF DESIGN REPORT

FOR THE
NEW RECTORY BUILDING
SCOTTSDALE, AZ

At
St. Bernard of Clairvaux Catholic Church
10755 North 124th Street
Scottsdale, Arizona 85259

Case No. 866-PA-2020

For
The Roman Catholic Diocese of Phoenix
400 East Monroe Street
Phoenix, AZ 85004

FINAL Basis of Design Report

- APPROVED
- APPROVED AS NOTED
- REVISE AND RESUBMIT



Disclaimer: If approved; the approval is granted under the condition that the final construction documents submitted for city review will match the information herein. Any subsequent changes in the water or sewer design that materially impact design criteria or standards will require re-analysis, re-submittal, and approval of a revised basis of design report prior to the plan review submission.; this approval is not a guarantee of construction document acceptance. For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY RSacks

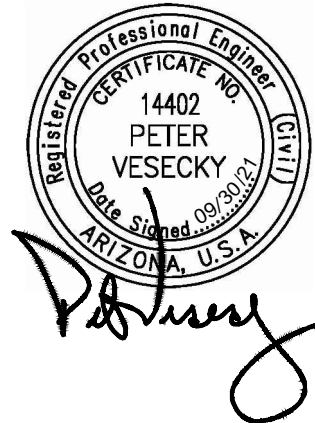
DATE 10/6/2021

For Submittal to:
City of Scottsdale
17 E. Indian School Rd.
Scottsdale, AZ 85251

Prepared by:



8502 E. Via de Ventura, Suite 101
Scottsdale, AZ 85258



September 30, 2021

Job No. 20004

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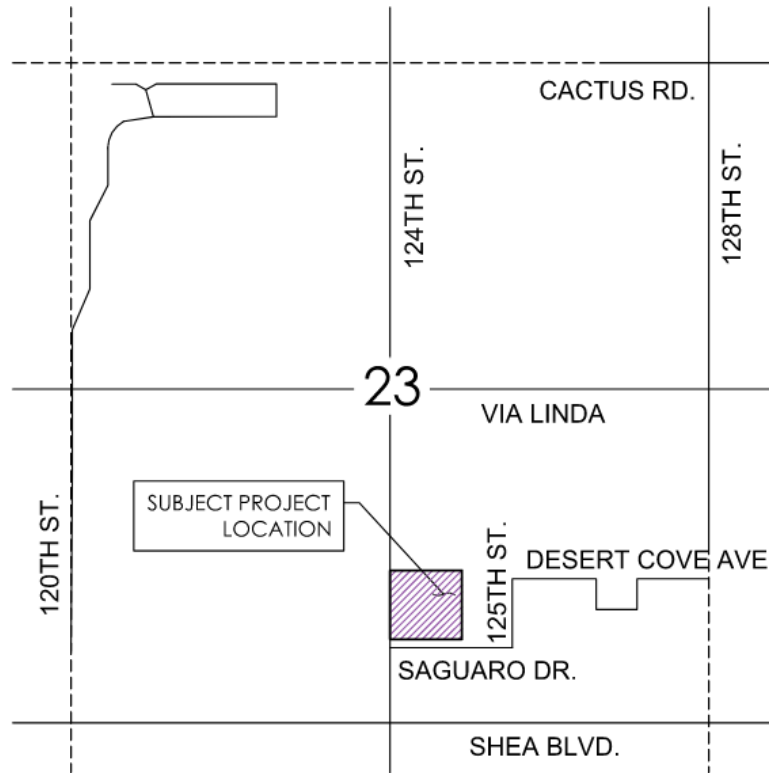
1 Introduction

This Sewer Basis of Design Report is for the New Rectory Building at the St. Bernard of Clairvaux Catholic Church (herein after referred to as the Project) and has been prepared by VESPRO, per the direction of Brent Maupin Engineering & Design as part of the submittal process to the City of Scottsdale (COS). It is the intent of this report to document the anticipated wastewater generation from the project site. In addition, this report will document the infrastructure requirements to serve the subject property with wastewater services.

The Church property consists of approximately 8.94 acres (389,619 sf excluding right-of-way). The Project Site consists of approximately 0.45 acres (18,300 square feet), excluding the adjacent street right-of-way, and is undeveloped open space. COS QS Map 29-58 was used to determine the sewer main information shown in Appendix A.

2 Site Location

The Project site is located at 10755 N 124th St Scottsdale, AZ 85259.



**T-3-N, R-5-E
VICINITY MAP**
N.T.S.

Figure 1. Vicinity Map

The project is located within a portion of the southeast quarter of Section 23, Township 3 North, Range 5 East of the Gila and Salt River Baseline and Meridian, Maricopa County, Arizona.

3 Site Description

The existing Church Property and Project Site is zoned as R1-43 ELS.

The Church Property consists of approximately 8.94 acres (excluding right-of-way). The Project Site consists of approximately 0.45 acres (18,300 square feet). The new Rectory Building will be constructed on an area of the property that was left undeveloped. The overall Church Site

topography, is graded to drain to catch basin inlets located on the north and south sides of church site. Cross slopes vary throughout the property.

4 Wastewater System

4.1 Existing Wastewater System

The attached utility plan, WS01 included as Exhibit 1, shows an existing 10-inch sewer main sloping from north to south along 124th Street, as per the COS Sewer Quarter Section Map 29-58, included in **Appendix A**. The sewer line servicing the property connects to this sewer line and extends into the property to provide sewer service to the Church, classrooms/office, and Social Hall.

4.2 Wastewater System Design Criteria

The anticipated wastewater generation from the additional building was analyzed to determine if the wastewater system will provide adequate service capacity, using criteria from Chapter 7 in the COS 2018 Design Standards and Policy Manual (DSPM). Velocity of flows in sewer lines shall be in the range of 2.5 feet per second and 10.0 feet per second when flowing full. A Manning's roughness coefficient, "n" value of 0.013 is used for the proposed pipe materials. Minimum slope per Plumbing Code requirements for both a 6-inch and 8-inch line are 1/8-inch per foot (1.0%) and 1/16-inch per foot (0.52%) respectively. Please refer to **Appendix B**, for excerpts related to design criteria.

4.3 Proposed Wastewater System

The existing sewer system for the Church is connected to the sewer line in 124th Street and extends into the site to provide service to the Church, classrooms/offices, and Social Hall. This line has a stub on the service line to the Social Hall to accept sewer from the Rectory. Sewer from the Rectory The Rectory provides two bedrooms for Priests and three bedrooms for occasional visitors. Since the COS 2018 DSPM does not provide projections for sewer for this type of a facility, the Arizona Administrative Code Title 18 Chapter 9 is utilized to determine wastewater flow estimates. For residential use, the criteria is 300 GPD for one to two bedroom residences and 150 GPD for each additional bedroom. Since three of the bedrooms only have occasional occupancy, it is conservatively assumed that two of the bedrooms will have full occupancy and therefore the projected estimated wastewater flow from the Rectory is 600 GPD. The Average Daily Flow (ADF) using and the corresponding peaking factor is 4.5.

The anticipated site wastewater generation is provided in Table 1 below.

Table.1

Building (ID)	Bedrooms	Domestic Wastewater Flow			
		Average (gpd Rectory)	Average Day (gpd)	Peak Flow (gpd)	(gpm)
Rectory	5*	600	600	2700	1.9

*Two bedrooms are occupied by Priests and three bedrooms are for occasional visitors. Therefore, it is conservatively assumed that two bedrooms have full occupancy.

Table 2 below documents the estimated capacity for a 6-inch and 8-inch sewer line.

Table.2

Sewer Line Full Flow Capacity

$$Q=A(1.486/n)(R^{2/3})(S^{1/2})$$

$$V = (1.49/n)(R^{2/3})(S^{1/2})$$

COS Engineering Design Criteria

Sewer Main Size (in)	Area (A) (sf)	n	Hydraulic Radius (R) (ft)	Min Slope (S)* (ft/ft)	Q _{CAPACITY} (cfs) (gpm)		Velocity (V) (ft/sec)
6	0.20	0.013	0.13	0.011	0.57	255	2.9
8	0.35	0.013	0.17	0.0052	0.87	390	2.5

*Minimum slope per COS Engineering Design Criteria and International Plumbing Coded 2018

The anticipated site peak wastewater generation is 1.9 gpm; therefore, the proposed 6-inch onsite sewer line is adequately sized to convey the Project's anticipated wastewater flow rate into the existing sewer line that discharges into the 10-inch main line along 124th St.

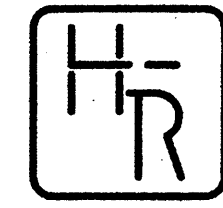
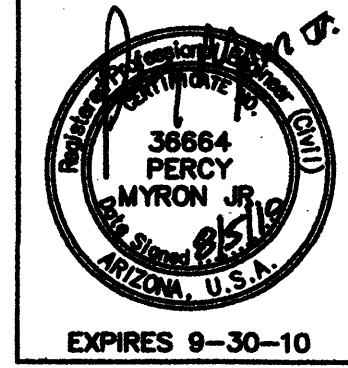
5 Conclusions

The proposed Rectory addition to the Church Campus development has been designed in accordance with the COS 2018 Design Standards and Policies Manual utilizing wastewater flow estimates based on Arizona Administrative Code Title 18 Chapter 9, since the COS 2018 DSPM does not identify flows for this type of facility. The proposed private sewer line described in this Sewer Basis of Design Report was designed to collect and convey the wastewater for both Average Day and Peak flow conditions. The proposed and existing 6-inch sewer line, that connects to the 10" public sewage infrastructure, have the capacities to provide sufficient capacity and velocities, using Manning's equation for uniform flow.

6 References

- i. Arizona Administrative Code, *Title 18, Environmental Quality, Chapter 9, Dept. of Environmental Quality Water Pollution Control*, December 31, 2005.
- ii. City of Scottsdale, , *Design Standards and Policy Manual*, 2018
- iii. International Council Code, *International Plumbing Code*, 2018

Appendix A
As-Built Plans



HESS - ROUNTREE, INC.
CONSULTING ENGINEERS & LAND SURVEYORS
9831 SOUTH 51ST STREET, SUITE C110
PHOENIX, ARIZONA 85044 (480)496-0244

DES: **PMJ** DRN: **DLR** CKD: **PMJ** JOB NO. **0910-02**

DOMESTIC WATER LINE THRUST BLOCK NOTE:

ALL THRUST BLOCKS SHALL BE PER M.A.G. S.D. NO. 380. ALL THRUST BLOCKS SHALL BE CONSTRUCTED OF M.A.G. CLASS C CONCRETE. FOR ALL ON-SITE DOMESTIC WATER LINE, THRUST BLOCKS SHALL BE INSTALLED AT ALL CHANGES IN DIRECTION AS AT TEES AND BENDS, CHANGES IN SIZE AS AT REDUCERS, STOPS AS AT DEAD ENDS AND VALVES. THRUST BLOCK SIZING AND INSTALLATION SHALL FOLLOW IAPMO INSTALL STANDARD 8-82 OF THE ARIZONA STATE PLUMBING CODE WHICH IS BASED ON THE 94 UPC WITH AMENDMENTS.

PRIVATE FIRE LINE THRUST BLOCK NOTE:

ALL THRUST BLOCKS SHALL BE CONSTRUCTED OF M.A.G. CLASS C CONCRETE. FOR ALL PRIVATE FIRE LINE THRUST BLOCKS THE AREA OF BEARING FACE SHALL BE PER NFPA-24. THE FOLLOWING CHART IS FROM NFPA-24.

PIPE SIZE (IN.)	TEES (SQ.FT.)	PLUGS (SQ.FT.)	CAPS (SQ.FT.)	90° BEND (SQ.FT.)	45° BEND (SQ.FT.)	HYDRANTS (SQ.FT.)
4	2	2	2	2	4	6
6	5	5	5	5	10	15
8	8	8	8	8	16	24
10	13	13	13	13	26	39
12	18	18	18	18	36	54
14	25	25	25	25	50	75
16	32	32	32	32	64	96

PRIVATE FIRE LINE CONSTRUCTION NOTES:

- CONNECT TO EXISTING 4" FIRE LINE WITH A 4" - 90° BEND. FIELD VERIFY ELEVATION AND LOCATION PRIOR TO CONSTRUCTION.
- INSTALL 4" DUCTILE IRON PIPE FIRE LINE WITH POLYWRAP (AWWA C-900, CLASS 350) INCLUDING ALL NECESSARY AND APPROPRIATE BENDS, FITTINGS, CONCRETE THRUST BLOCKS, ETC.
- CONNECT TO BUILDING FIRE PROTECTION SYSTEM WITH NECESSARY AND APPROPRIATE FITTINGS.
- SAWCUT, REMOVE AND REPLACE EXISTING CONCRETE SIDEWALK TO THE NEAREST JOINT (MAG STANDARD DETAIL NO. 230). SAWCUT, REMOVE AND REPLACE EXISTING RAMP, LANDING AND CURB IN KIND.
- REMOVE EXISTING 4" FIRE LINE AND DISPOSE OF LEGALLY OFFSITE. FIELD VERIFY ELEVATION AND LOCATION PRIOR TO CONSTRUCTION.
- INSTALL 4" - 90° BEND.
- INSTALL 4" - 45° BEND.
- VERTICALLY REALIGN NEW WATER LINE TO HAVE A MINIMUM 2' SEPARATION BETWEEN BOTTOM OF NEW SEWER LINE AND TOP OF NEW FIRE LINE (MAG STANDARD DETAIL NO. 381). INSTALL PER MAG STANDARD DETAIL NO. 404-1, -2 AND MAG SPECIFICATION SECTION 610.5.5 FOR EXTRA PROTECTION.

DOMESTIC WATER LINE CONSTRUCTION NOTES:

- CONNECT TO EXISTING WATER LINE WITH NECESSARY AND APPROPRIATE FITTINGS. FIELD VERIFY SIZE AND LOCATION OF EXISTING WATER LINE PRIOR TO START OF CONSTRUCTION. NOTIFY ENGINEER OF ANY DISCREPANCIES.
- INSTALL 2" GATE VALVE WITH VALVE BOX AND COVER (MAG STANDARD DETAIL NO. 391-1, TYPE 'C').
- INSTALL 2" P.V.C. (SCHEDULE 40 WITH SOLVENT WELD JOINTS) WATER LINE, INCLUDING ALL NECESSARY BENDS, TEES, FITTINGS, AND THRUST BLOCKS.
- CONNECT TO BUILDING DOMESTIC WATER LINE WITH NECESSARY AND APPROPRIATE FITTINGS. SEE PLUMBING DRAWINGS FOR EXACT LOCATION.
- REMOVE EXISTING 2" WATER LINE AND DISPOSE OF LEGALLY OFFSITE.

PRIVATE SANITARY SEWER LINE CONSTRUCTION NOTES:

- CONNECT TO EXISTING SEWER LINE WITH NECESSARY AND APPROPRIATE FITTINGS. FIELD VERIFY SIZE AND LOCATION OF EXISTING SEWER LINE PRIOR TO START OF CONSTRUCTION. NOTIFY DESIGN CIVIL ENGINEER OF ANY DISCREPANCIES FOR POSSIBLE REDESIGN.
- INSTALL 4" P.V.C. SEWER LINE.
- INSTALL SEWER CLEANOUT. (SEE DETAIL ON SHEET C-1).
- CONNECT TO BUILDING OR GREASE INTERCEPTOR SEWER LINE WITH NECESSARY AND APPROPRIATE FITTINGS. SEE PLUMBING DRAWINGS FOR EXACT LOCATION.
- INSTALL GREASE INTERCEPTOR. SEE PLUMBING DRAWINGS FOR DETAILS.
- SAWCUT, REMOVE AND REPLACE EXISTING A.C. PAVEMENT (MAG STANDARD DETAIL NO. 200, T-TOP WITH FULL DEPTH 1/2 SACK CONCRETE SLURRY BACKFILL).
- INSTALL 4" DUCTILE IRON PIPE (CLASS 350) WITH POLYWRAP. INSTALL FOR EXTRA PROTECTION PER MAG STANDARD DETAIL NO. 404-1, -2 AND PER MAG SPECIFICATION SECTION 610.5.5.
- SAWCUT, REMOVE AND REPLACE EXISTING CONCRETE SIDEWALK TO THE NEAREST JOINT (MAG STANDARD DETAIL NO. 230).
- SEE PLUMBING PLANS FOR TWO WAY CLEANOUT DETAILS.

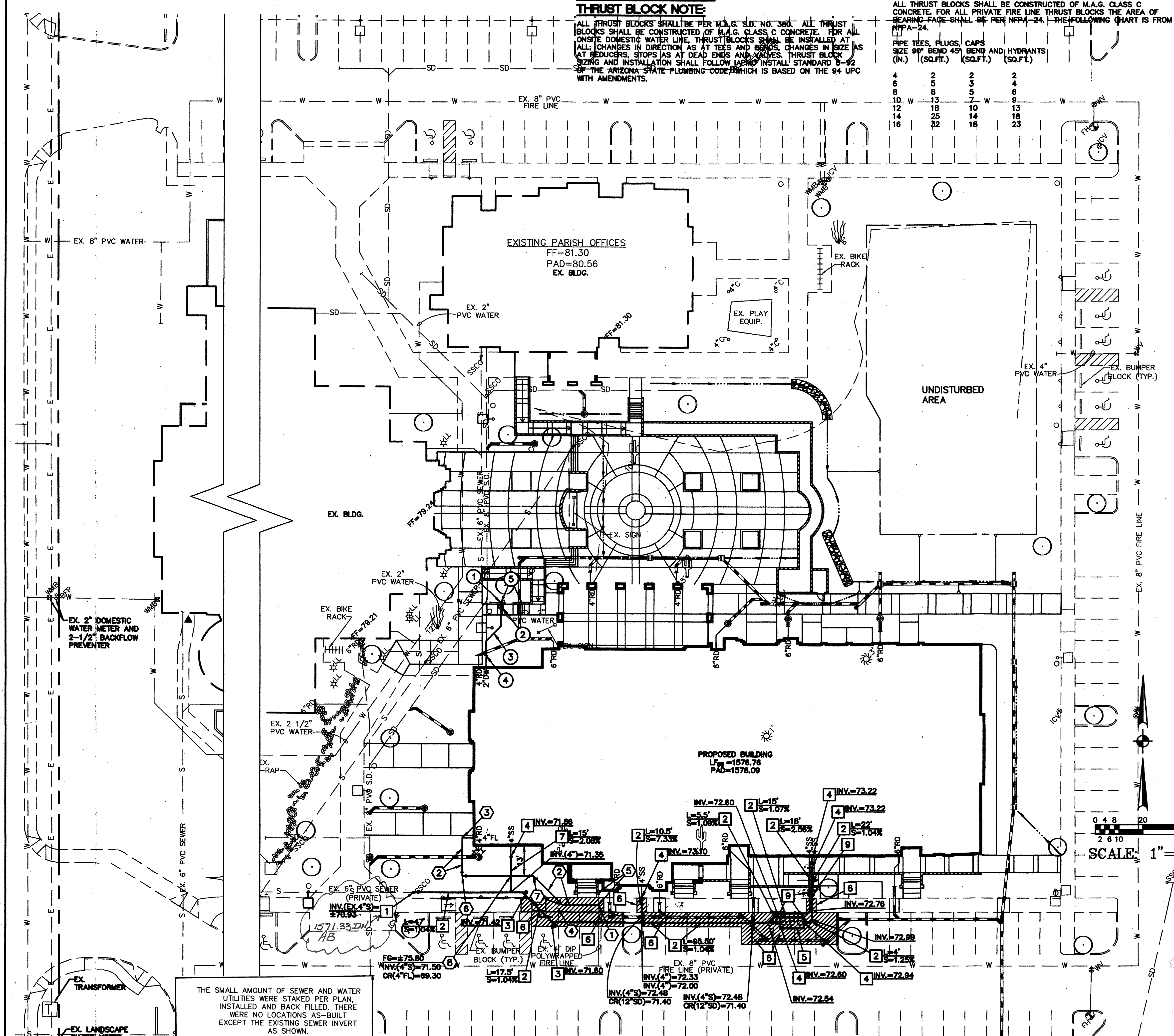
GENERAL WATER LINE NOTES:

- MINIMUM COVER OVER ALL WATER LINES SHALL BE THREE FEET (3'), DEPTH SHALL BE INCREASED AS NECESSARY TO PROVIDE 12" MINIMUM CLEARANCE FROM OTHER UTILITIES. DIP DOMESTIC WATER LINE AS NECESSARY TO GO BELOW FIRE LINE WITH MINIMUM 12-INCH SEPARATION BETWEEN PIPES. DO NOT PLACE DOMESTIC WATER LINE UNDER FIRE LINE GATE VALVES OR FIRE LINE UNDER DOMESTIC WATER LINE GATE VALVES.
- THE CONTRACTOR SHALL OBTAIN ALL NECESSARY CONSTRUCTION PERMITS. OWNER WILL PAY FOR PERMITS.
- THE CONTRACTOR SHALL COORDINATE ALL NECESSARY INSPECTIONS WITH THE STATE AND CITY FIRE MARSHAL'S OFFICES.
- ALL GATE VALVES SHALL BE CONNECTED TO ADJACENT FITTINGS.
- DUCTILE IRON PIPE (PRESSURE CLASS 350) SHALL MEET MAG AND CITY OF SCOTTSDALE REQUIREMENTS AND SHALL BE WRAPPED IN HIGH DENSITY POLYETHYLENE PER MAG SPECIFICATION SECTION 610.

PRIVATE DOMESTIC WATER, PRIVATE SANITARY SEWER AND PRIVATE FIRE LINE PLAN

ST. BERNARD OF CLAIRVAUX CATHOLIC CHURCH		
DRAWING STATUS	SHEET	OF
2ND CITY SUBMITTAL SET	5	6
DATE: 8/5/10		C-5

CALL THE OFFICE OR
602-263-1100
1-800-STAKE-IT
(OFFICE IN ARIZONA COUNTY)



THE SMALL AMOUNT OF SEWER AND WATER UTILITIES WERE STAKED PER PLAN, INSTALLED AND BACK FILLED. THERE WERE NO LOCATIONS AS-BUILT EXCEPT THE EXISTING SEWER INVERT AS SHOWN.

PLAN CHECK NO. 1453-10-2, CASE NO. 38-DR-2010, 1-HE-2009, 18-MF-2010, 3124-10

Appendix B

Wastewater System Evaluation Criteria

calculations to the Water Resources Department for permission to use extra-strength pipe, special bedding specifications, or alternative construction methods. The Water Resources Department must accept the request in writing prior to Plan Review's approval of the final plans.

Ensure that all types of pipe material used in design have established ASTM, ANSI, AWWA or NSF standards of manufacture or seals of approval and are designated for use with wastewater.

SYSTEM LAYOUT

7-1.402

Generally, SS lines constructed along a street grid should be aligned parallel to, and south or west of the street centerline. Lines should not cross the street centerline except in cases where curvilinear roadway alignments are encountered.

Public SS lines within commercial, industrial or multi-family developments must be located within drive aisles a minimum of 6 feet from any structure. Public SS lines will be located within tracts and/or sewer line easements. No private utilities are allowed longitudinally within a sewer line easement.

Curvilinear SS lines are not allowed. Developments with numerous curved streets should be discussed with the Water Resources Department to decide whether the city will consider a design report with water and sewer layouts in accordance with the following criteria:

- A. Water and SS lines will be placed under the paved section of the roadway within the area, from back-of-curb to back-of-curb.
- B. SS lines must maintain a minimum of 6-foot horizontal clearance to dry utilities per COS Standard Detail No. 2401.
- C. SS manholes are to be located at the approximate center of the drive lane.
- D. The water line and SS line shall run parallel to each other with 6 feet of separation between the pipe walls. Lines may cross the street centerline.
- E. Deflections in the SS line through manholes shall be designed to nominal fitting angles within standard tolerances and will occur at the same locations where the water line is deflected. Refer to Section 6-1.402 for related water system criteria.

DESIGN FLOWS

7-1.403

A. Residential

SS lines 8 to 12 inches in diameter will be designed using 100 gallons per capita per day (gpcpd) and a peaking factor of 4.

SS lines larger than 12 inches in diameter will be designed using 105 gpcpd and a peaking factor developed from "Harmon's Formula":

$$Q_{max} = Q_{avg} \times [1 + (14 / (4 + P^{1/2}))]$$

$$P = \text{Population} / 1,000$$

Residential densities are to assume 2.5 persons per dwelling unit. Multifamily densities exceeding 22 dwelling units per acre can assume 1.7 to 2.2 persons per unit.

B. Commercial and Industrial

Wastewater flows for uses other than those listed below shall be based upon known regional or accepted engineering reference sources approved by the Water Resources Department.

LAND USE	DEMAND (gpd)	DESIGN PEAKING FACTOR
<i>Commercial/Retail</i>	0.5 per sq. ft.	3
<i>Office</i>	0.4 per sq. ft.	3
<i>Restaurant</i>	1.2 per sq. ft.	6
<i>High Density Condominium (Condo)</i>	140 per unit	4.5
<i>Resort Hotel (includes site amenities)</i>	380 per room.	4.5
<i>School: without cafeteria</i>	30 per student	6
<i>School: with cafeteria</i>	50 per student	6
<i>Cultural</i>	0.1 per sq. ft.	3
<i>Clubhouse for Subdivision</i>	100 per patron x 2	4.5
<i>Golf Course</i>	patrons per du per day	
<i>Fitness Center/ Spa/ Health club</i>	0.8 per sq. ft.	3.5

FIGURE 7-1.2 AVERAGE DAY SEWER DEMAND IN GALLONS PER DAY & PEAKING FACTORS BY LAND USE

HYDRAULIC DESIGN

7-1.404

No public SS lines will be less than 8 inches in diameter unless permission is received in writing from the Water Resources Department.

SS lines shall be designed and constructed to give mean full flow velocities equal to or greater than 2.5 fps, based upon Manning’s Formula, using an “n” value of 0.013.

To prevent abrasion and erosion of the pipe material, the maximum velocity will be limited to 10 fps at estimated peak flow. Where velocities exceed this maximum figure, submit a hydraulic analysis along with construction recommendations to the Water Resources Department for consideration. In no case will velocities greater than 15 fps be allowed.

Actual velocities shall be analyzed for minimum, average day and peak day design flow conditions for each reach of pipe.

The SS system shall be designed to achieve uniform flow velocities through consistent slopes. Abrupt changes in slope shall be evaluated for hydraulic jump.

The depth to diameter ratio (d/D) for gravity SS pipes 12 inches in diameter and less shall not exceed 0.65 in the ultimate peak flow condition. This d/D ratio includes an allowance for system infiltration and inflow.

The d/D for gravity drains greater than 12 inches diameter shall not exceed 0.70 for the ultimate peak flow condition. This d/D includes an allowance for system infiltration and inflow.

Measures to mitigate hydrogen sulfide shall be analyzed at manhole drops, abrupt changes in pipe slope or direction and at changes in pipe diameter.

MANHOLES AND CLEAN OUTS

7-1.405

Manholes in city streets shall be located near the center of the inside traffic lane, rather than on or near the line separating traffic lanes. Manholes shall not be in bike trails, equestrian trails, sidewalks, crosswalks or wash crossings. Manholes are required at all

Exhibit 1

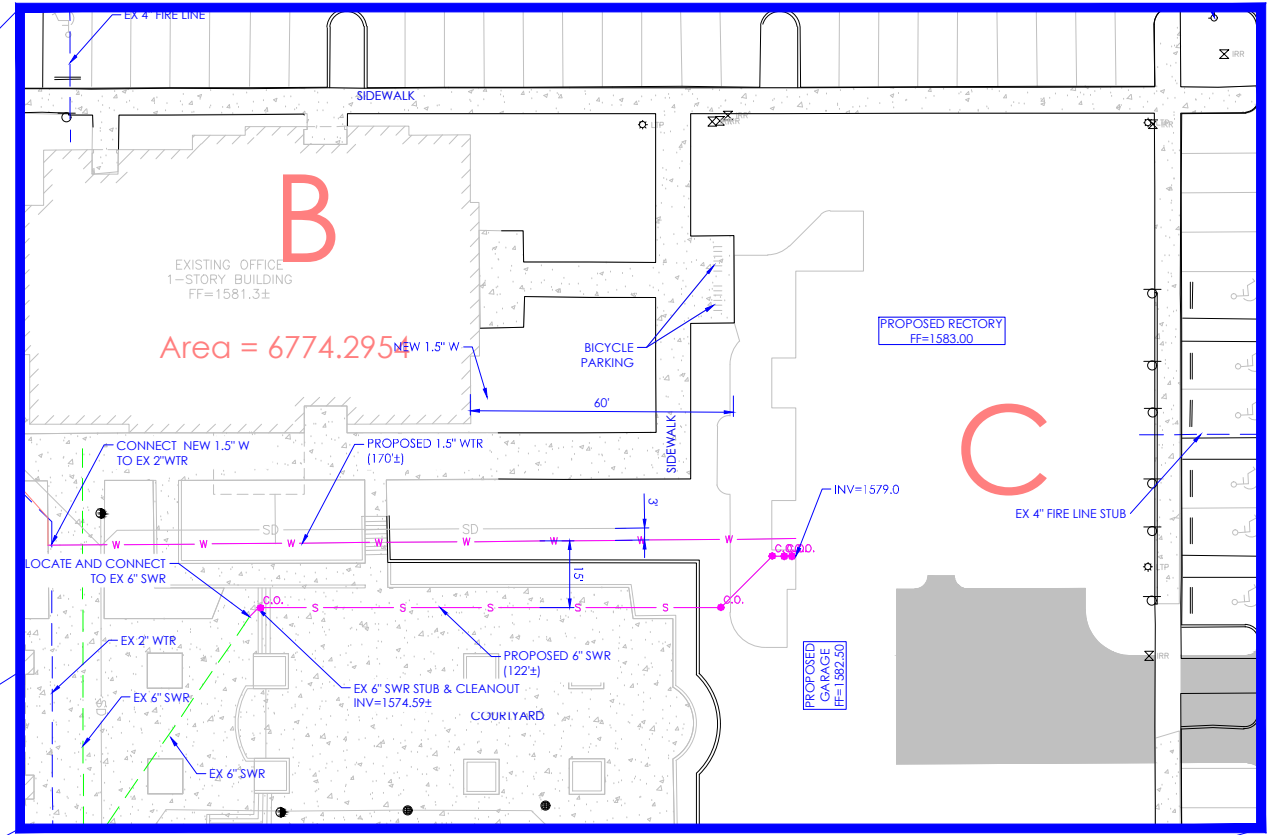
Proposed Water and Sewer Exhibit

NO.	DESCRIPTION

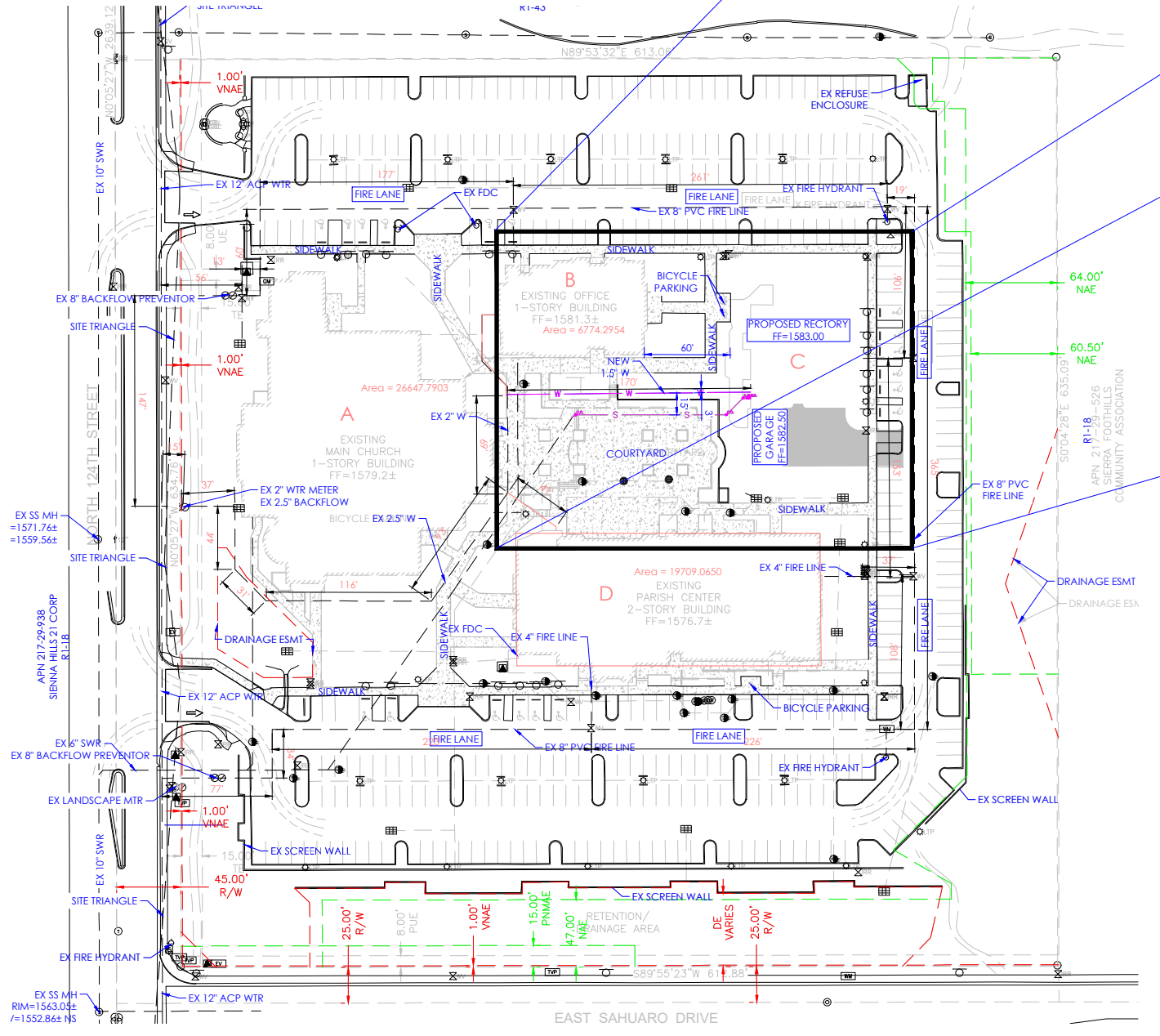
RECTORY ADDITION TO ST. BERNARD OF CLAIRVAUX CATHOLIC CHURCH
 10755 N. 124TH ST. - SCOTTSDALE, ARIZONA 85259
PROPOSED PRIVATE WATER AND SEWER MAP

PROJECT NO.:	20204
DRAWING DATE:	7/2021
DRAWN BY:	MFC
CHECKED BY:	PV
DRAWING SCALE:	AS SHOWN
DRAWING FILE:	EX 1 VSD.DWG

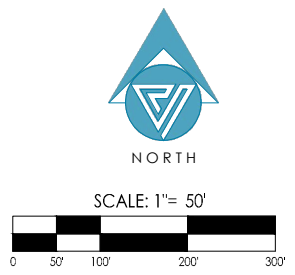
PRELIMINARY WATER & SEWER
EX-1
 1 of 1
 PLAN



WATER & SEWER CONNECTION DETAIL
 SCALE: 1"=20'



EXISTING SITE UTILITY MAP
 SCALE: 1"=50'



- LEGEND**
- - - EXISTING BOUNDARY LINE
 - - - EXISTING EASEMENT LINE
 - [FIRE LANE] DESIGNATED FIRE LANE
 - C.O. SANITARY SEWER CLEANOUT
 - S SEWER
 - W WATER

GENERAL NOTES

1. EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY AND WERE NOT SURVEYED OR FIELD VERIFIED BY THE ENGINEER.



O.S. PROJECT NO. 866-PA-2020 - KEY CODE 91728 - NEW PHASE TO 38-DR-2010