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CASE FILE
CIVIL AND SURVEY

Prelim

Basis of Design Report
Sanitary Sewer
For
Primrose School
NWC Bell Road & Thompson Peak Parkway
Scottsdale, Arizona

EXPIRES: 9/30/18

OK for MD CASE.
Address redlines +
Resubmit as Final
Report.
Doug Mann 10.19.16

July 2016

Prepared by:
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Scottsdale, AZ 85258

13-MD-2016
10/07/16

BASIS OF DESIGN REPORT
SANITARY SEWER
FOR

PRIMROSE SCHOOL

NWC BELL ROAD & THOMPSON PEAK PARKWAY
SCOTTSDALE, ARIZONA

PREPARED FOR

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H.E. PROJECT NO.: PRIM001

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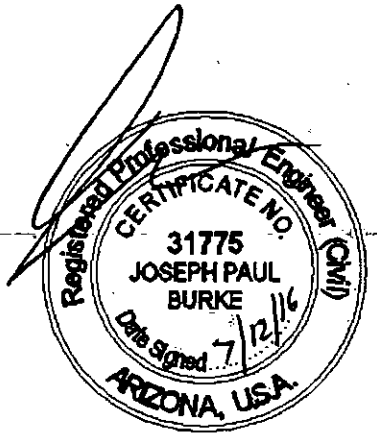


1.0 INTRODUCTION

This sewer report has been prepared under a contract from Bigsister, LLC, developer for the Primrose School project. The purpose of this report is to provide a sewer analysis, as required by the City of Scottsdale, to support this development. This report has been prepared according to the procedures detailed in Chapter 7 of the City of Scottsdale's Design Standards & Policies Manual dated January 2010.

The project is located on a proposed pad site within the existing Wingate Crossing commercial development located at the NWC of Bell Road and Thompson Peak Parkway within the City of Scottsdale, Maricopa County, Arizona. A new parcel will be created for this project. The proposed parcel is bordered by existing paved parking and retail/commercial development to the north and east, an existing bank to the south and residential multi-family development to the west. The site is specifically located within the a portion of Section 32, Township 4 North, Range 5 East, of the Gila and Salt River Base and Meridian. Figure 1, in Appendix A, illustrates the location of the project site in relation to the City of Scottsdale street system.

The project consists of the development of an approximate 11,800 SF building on approximate 1.46 acre parcel. The development will be for a stand-alone private school/daycare facility with parking, landscaping and utilities.

2.0 EXISTING SITE CONDITIONS

The site is currently an un-developed dirt pad site within an existing commercial development. The site has supporting parking, access and utilities. The topography of the site and surrounding area has a grade slope from the northeast to the southwest at an approximate 2% to 5% slope toward E. Bell Road.

3.0 EXISTING SEWER COLLECTION SYSTEM

This site and the entire Wingate Crossing development discharges its sanitary sewer to an existing privately owned 8-inch gravity sewer main within the development. No offsite upstream sewer flow enters this development. The 8-inch main flows through Wingate Crossing to an existing multi-family residential development entitled Villas Altozano. The sewer remains an 8-inch diameter and continues west through the residential development to E. Bell Road then continues west in E. Bell Road to N. 96th Street and eventually to the City of Scottsdale wastewater treatment facility.

4.0 PROPOSED SANITARY SEWER SYSTEM

This development proposes to connect into the existing privately owned 8-inch gravity sewer line onsite. There is an existing 8-inch sewer stub located on the east side of the project site. However, the invert elevation of the sewer stub and the main line at this location is too high to service the proposed building. Therefore, the building sewer line will need to be extended south to the same 8-inch sewer line further downstream where the 8-inch main invert is low enough to allow the building sewer to connect via gravity.

According to the calculations provided in Appendix B, the proposed building will have an estimated Average Daily Flow of 5,400 GPD and a Peak Hour Flow of 22.8 GPM. No other buildings are proposed with this development. Wastewater flows were calculated in accordance with the City of Scottsdale Design Standards and Policy Manual (Reference 1). Refer to Appendix B for pipe capacity calculations for the proposed sewer pipe. All sanitary sewer pipe material for this project has been designated as PVC SDR-35. All fittings are to also be PVC.

Trenching and bedding details for this project are to be per MAG Standard Specifications Section 601. Trench width above the installed pipe may be as wide as necessary to properly brace/install the work. Bedding, backfill and compaction shall be installed per MAG Standard Specification 601.4.

Calculations do not included future capacity for any future extensions or existing downstream sewer capacity beyond the development. The City of Scottsdale shall approve the point of connection to the existing sewer.

5.0 CONCLUSIONS

Based on the results of this study, it can be concluded that:

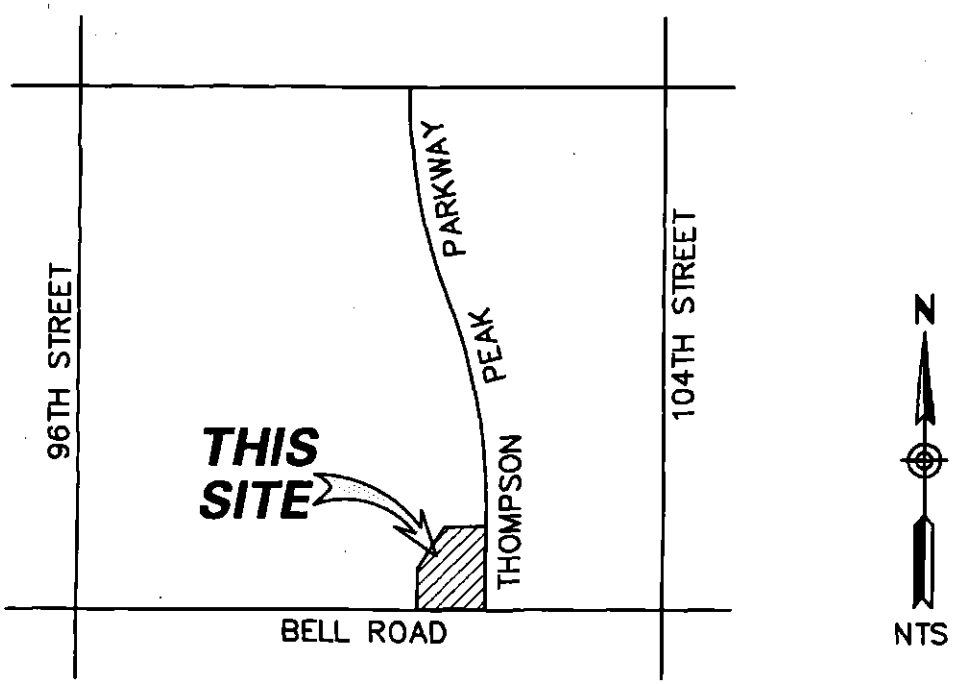
- The proposed sewer system is adequate to service the development.

6.0 REFERENCES

1) *City of Scottsdale Design Standards & Policies Manual*, January 2010.

Add comment on converting ex portion of sewer to public stds.

APPENDIX A
FIGURES



VICINITY MAP
FIGURE 1

APPENDIX B
CALCULATIONS

Project: PRIMROSE SCHOOL
Project No.: PRIM001
City: SCOTTSDALE, AZ
Date: 7/12/2016

PROJECTED MAXIMUM SANITARY SEWER LOADS

Land Use	Total # of Students	Average Day Sewer Demands in Gallons Figure 7.1-2		Peaking Factor Figure 7.1-2	Average Daily Flow gpd	Average Daily Flow gpm	Peak Flow gpm
School (without caffeteria)	180	30	per student	6	5,400	3.8	22.8
Sub-Total	**180**				**5,400**	**3.8**	**22.8**

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Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Discharge

Input Data		
Mannings Coeffic	0.010	
Channel Slope	010000	ft/ft
Depth	1.00	ft
Diameter	12.0	in

Results		
Discharge	2,079	gal/mir
Flow Area	0.8	ft²
Wetted Perime	3.14	ft
Top Width	0.00	ft
Critical Depth	0.90	ft
Percent Full	100.0	%
Critical Slope	0.008844	ft/ft
Velocity	5.90	ft/s
Velocity Head	0.54	ft
Specific Energ	1.54	ft
Froude Numbe	0.00	
Maximum Disc	2,236	gal/mir
Discharge Full	2,079	gal/mir
Slope Full	0.010000	ft/ft
Flow Type	Subcritical	

Primrose School, Windgate Crossing
PRIM001
Scootsdale, AZ

Dia (in)	A (SF)	P (FT)	n value	slope	V full (FT/S)	Q full (GPM)	Q actual (GPM)	% Full	Q @ d/D = 0.5 (GPM)	d/D
6.00	0.196	1.570	0.013	0.010	2.84	249.96	22.80	9%	107.71	<0.5
4.00	0.087	1.047	0.013	0.020	3.06	119.73	0.00	0%	35.90	<0.5

Chapter 7

WASTEWATER

7

This chapter provides ordinance, policy, and standards establishing design criteria for constructing and modifying water systems to be owned and operated by the city. It provides guidance on agreements, design report preparation, transmission and distribution systems, fire protection and final plans preparation.

4. The water line and sanitary sewer line will run parallel to each other, with 9 feet of separation to the pipes' centerline in order to maintain 6 feet of clearance at manholes.
5. Deflections in the sanitary sewer line shall be designed to nominal fitting angles within standard tolerances and will occur at the same locations where the water line is deflected.

See Section 6-1.302 for related water system criteria.

DESIGN FLOWS

7-1.403

A. Residential

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

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

$$Q_{max} = Q_{avg}\,[1+14 / (4+P1/2)]$$

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

Residential densities are to assume 2.5 persons per dwelling unit, apartment or town home.

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.

AVERAGE DAY SEWER DEMANDS		
Land Use	**Demand**	**Peaking Factor**
Commercial/Retail	0.5 per sq. ft.	3
Office	0.4 per sq. ft.	3
Restaurant	1.2 per sq. ft.	6
High Density Condominium	140 per room	4.5
Resort Hotel (includes site amenities)	380 per room	4.5
School: without cafeteria	30 per student	6
School: with cafeteria	50 per student	6
Cultural	0.1 per sq. ft.	3

FIGURE 7.1-2 AVERAGE DAY SEWER DEMAND IN GALLONS

HYDRAULIC DESIGN

7-1.404

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

Sanitary sewer lines should be designed and constructed to give mean full flow velocities of not less than 2.5 fps, based upon Manning's Formula, using an "*n*" value of 0.013.

Conversely, 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, the engineer will be required to 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 will be analyzed under peak flow conditions for each reach of pipe.

Generally, the sanitary sewer system will be designed to achieve uniform flow velocities through consistent slopes. Abrupt changes in slope should be evaluated for hydraulic jump.

The depth to diameter (d/D) ratio for gravity sanitary sewer pipes 12 inches in diameter and less should be no greater than 0.65 in the ultimate peak flow condition. The d/D ratio for gravity drains greater than 12 inches diameter should be no greater than 0.70 for the ultimate peak flow condition.

Mitigation of hydrogen sulfide will be analyzed in the design report and be provided for in the design of the system.

7-1.405 MANHOLES AND CLEAN OUTS

Manholes in city streets should be located near the center of the inside traffic lane, rather than on or near the line separating traffic lanes. Manholes should not be located in bike trails, equestrian trails, sidewalks, crosswalks or wash crossings. Manholes are required at all changes of grade, pipe size, pipe material or alignment and at distances not to exceed those shown below:

Pipe Diameter (inches)	**Maximum Manhole** Spacing (feet)
8 – 15	500
18 – 30	600
36 – 60	800
Over 60	1,300

FIGURE 7.1-3 MANHOLE SPACING

A. Manhole Base

Manhole bases are to be cast in place. The flow channel through the manhole should be steel trowel finished to conform in shape and slope to that of the sanitary sewer pipe. The manhole shelf should be brush or broom finished, with a slope of 1 inch per foot. The manhole bottom should be filleted to prevent solids depositions and channeled to ensure satisfactory flow to the lower invert.

B. Manhole Sections and Cones

All manhole sections and cones should be the precast concrete as detailed in the MAG Standard Detail No. 420, deleting the manhole steps and/or cast in anchors for steps, see www.ScottsdaleAZ.gov/design/COSMAGSupp. If a manhole is more than 10-feet deep or the line is 15-inches in diameter or larger, the manhole shall be 5-feet in diameter. Manhole depth shall be defined as the distance from the design rim elevation to the lowest invert elevation.

C. Manhole Covers

Manhole covers are to be per MAG Standard Detail No. 424 and COS Standard Detail No. 2421, see www.ScottsdaleAZ.gov/design/COSMAGSupp.

D. Manhole Linings

Manholes will be lined or coated at the junction of a force main, when constructed on sanitary sewer lines 15 inches in diameter or larger or in other design situations where corrosive conditions are anticipated. Manholes receiving wastewater from force mains and ejector lines must be lined. Manholes requiring linings or coatings shall be noted on the final plans.

E. Intersecting Lines within Manholes

Manholes are required for all lines intersecting at angles other than 180 degrees, a change in slope, a change in pipe size or a change in pipe material. The manhole must have a minimum