FINAL SEWER REPORT

The Triangle

7120 E. Indian School Road
Scottsdale, AZ 85251

FINAL Basis of Design Report

☐ APPROVED

☑ APPROVED AS NOTED

☐ REVISE AND RESUBMIT

CITY OF SCOTTSDALE

SCOTTSDALE WATER
9379 E San Salvador Dr.
Scottsdale, AZ 85258

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 ldillon DATE 7/12/2021

Conform to following stipulations and address comments below and herein in the submitted improvement plans:

1) Stipulation: all newly proposed above and below ground structures are to provide 6ft clearance from the public sewer. To ensure this 6ft clearance a 13ft public utility easement shall be dedicated on the entire eastern frontage. The east side easement shall only be encroached with a building overhang located vertically 19 feet or more above the easement.

2) Stipulation: Where underground garage abuts any easement or ROW sail nails shall not protrude into the easement or ROW.

Prepared For:

Gensler

2575 E. Camelback Rd Suite 175
Phoenix, AZ 85016
Phone: 602-523-4900

Registered Professional Engineer (Civil)
CERTIFICATE NO.
45621
ALI SAMIH FAKIH
Date Signed 06/15/21
ARIZONA, U. S. A.

Prepared by:

SEG

Sustainability Engineering Group
8280 E. Gelding Drive, Suite 101
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Project Number: 200504
Revision Date: June 25, 2020 (Rezoning)
Revision Date: August 28, 2020 (Rezoning)
Revision Date: October 16, 2020 (Rezoning)
Revision Date: June 15, 2021 (DRB)

Case No.: 10-ZN-2020 **Plan Check No.: TBD**

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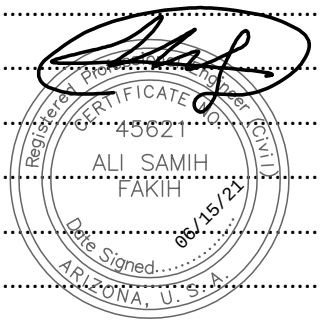

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1. INTRODUCTION

1.1 SUMMARY OF PROPOSED DEVELOPMENT:

The proposed development consists of a mixed residential use with commercial amenities located north of Indian School Road and south of 3rd Avenue between Marshall Way and Scottsdale Road in Scottsdale Arizona. An existing inn and several commercial buildings will be razed. The lot area is 144,173 square feet (3.31 acres) per the A.L.T.A. surveys. The proposed structures will have a maximum of seven floors and include a maximum of 190 residential units, 168 hotel rooms, a 4,000 square foot restaurant, 14,000 square feet of miscellaneous retail/fitness/clubhouse amenities and two pools.

1.2 REPORT INTENT:

This report is provided to support the proposed development and evaluate the existing and proposed wastewater demands compliant to the City's 2017 DS+PM (ref. 2) and the projects impact to the area's wastewater collection system along Indian School Road east to the Miller Road sewer trunk line.

1.3 SITE AND LEGAL DESCRIPTION:

The project property consists of three land parcels located in SE ¼ of Section 22, Township 2 North, Range 4 East of the Gila and Salt River Base and Meridian, Maricopa County, with the following Assessor Parcel Numbers:

- 173-50-108A, 173-50-034 and 173-50-117B

Refer to **FIGURE 1** for a vicinity map of the project's location with respect to major cross streets.

2. DESIGN DOCUMENTATION

2.1 DESIGN COMPLIANCE:

The proposed sewer system is designed to meet the criteria of the City of Scottsdale ("the City") Water Resources Department, the Arizona Department of Environmental Quality ("ADEQ"), and Maricopa County Environmental Services Department ("MCESD").

2.2 PROCEDURES, POLICIES AND METHODOLOGIES:

The general methodology used to evaluate the wastewater infrastructure consists of utilizing the DS+PM unit demands for onsite flows and monitoring flows in offsite sewer mains at two locations as requested by the City's Water Resources Department. Additional area flows for projects recently or in the process of being approved by the City have been provided by City staff and will be added to the monitored flows. Sewer pipe hydraulic capacities will be analyzing to assure conformance to the City's DS+PM criteria.

2.3 SOFTWARE ACKNOWLEDGEMENT:

Bentley FlowMaster® Version 8i is the computer software used for analyzing sewer hydraulics.

3. EXISTING CONDITIONS

3.1 ZONING & LAND USE:

The overall project parcel is zoned D/OC-2 PBD DO-Type 2. Land uses consist of a motel and commercial/retail/office activities.

3.2 EXISTING TOPOGRAPHY, VEGETATION AND LANDFORM FEATURES:

The site has approximately five feet of fall from 3rd Avenue to Indian School Road in a south east direction. The site is covered with building and paved parking with only minor landscaping. Refer to **FIGURE 2** for an aerial of the overall project existing conditions.

FIRM Map Number 04013C2235L dated October 16, 2013, indicates this site is designated as Zone "X". As such, it is defined as areas outside of the 0.2% annual chance of flooding. Refer to **FIGURE 3** for an excerpt from the FIRM.

3.3 EXISTING SEWER MAINS:

City of Scottsdale Q-S 17-44 includes the proposed development. Q-S 17-45, 17-46 and 16-45 are included to reference the downstream system being evaluated for capacity. Existing sewer lines consist of:

- an 8" vitreous clay pipe (VCP) running north-south along the west and east property lines,
- a 10" vitreous clay pipe (VCP) under Indian School Road from the site and connecting to
- a 15" vitreous clay pipe (VCP) under Miller Road flowing south and connecting to a 24" sewer trunk line near 2nd Street.

Refer to **FIGURE 4** for the referenced COS sewer Q-S Maps.

3.4 FLOW MONITORING:

Flow monitoring was performed on the 10" Indian School Road sewer just west of Miller Road (manhole #73). The data includes 17 days and three weekends between June 24th and July 10th, 2020. The location and flow data are included in **APPENDIX I**.

3.5 ADDITIONAL AREA FLOWS TO BE INCLUDED:

Scottsdale has approved, or is reviewing, reports for projects that may eventually contribute additional sewer flows to the Indian School and Miller Roads sewer systems.

The following projects are proposed to flow into the 10" Indian School Road :

- The Triangle
- Craftsman Court
- The Marquee (partial)

For reference, wastewater flow from the following potential developments is being directed to the 24" sewer trunk line in Miller Road and are not being evaluated in this report:

- Safari, Phase II
- Blue Sky
- City Center
- Water View
- DC Hotel
- The Mint
- The Maya
- Winfield Scott Hotel
- The Marquee (partial)
- The Gentry (Phase 2)

4. PROPOSED CONDITIONS

4.1 SITE PLAN:

The property is proposed to be re-developed to include residential apartment and hotel use with supporting commercial, office and retail facilities. Development will include relocated drive entrances from both Indian School Road and 3rd Avenue. A new pedestrian crossing is proposed at 3rd Avenue connecting the project to Craftsman Court. A new pedestrian crossing is also proposed across Indian School Road west of the western driveway with a pedestrian refuge area in the median.

4.2 PROPOSED SEWER SYSTEM:

Sanitary sewer service will be provided by connections to the existing 8" VCP sewer lines along the west and east drives fronting the property. Grease interceptors will be installed for any proposed food service uses. See **APPENDIX II** for a site plan/utility plan.

4.3 SEWER REQUIREMENTS:

The City's design standards govern pipe hydraulics. Sewer should be designed to provide 2.5 fps full flow velocity while not exceeding 15 fps. The design depth over diameter (d/D) ratio of the pipe is 0.65 for pipes 12" and smaller. The d/D ratio may be bumped to 0.80 when accounting for backwash from proposed pools. Service lines will be a minimum 6" diameter at 1% minimum slope.

The Triangle site will propose additional easement along the eastern boundary to extend the existing water and sewer easement from 8' to 13'. Refer to **FIGURE 5** – Proposed Easement Exhibit.

4.4 MAINTENANCE RESPONSIBILITIES:

The on-site sewer service lines will be private and maintained by the property owner. Any grease interceptors provided will be owned and maintained by the property owner.

5. SEWER SYSTEM COMPUTATIONS

5.1 ONSITE SEWER DEMANDS:

The proposed development at the site consists of residential apartment units including a community pool, a private pool and commercial/office/retail facilities. The associated DS+PM demands along with the peaking factors are shown in Table 1 below. Note: only one pool is included in the demand calculation as they will not be backwashed at the same time. A summary of the total sewer demands for The Triangle site are presented below in Table 2.

Table 1: COS DESIGN CRITERIA BY DEMAND TYPE

Land Use	Average Day Demand (gpd)	Unit	Design Peaking Factor
High Density Residential	140	per unit	4.5
Hotel	380	per room	4.5
Restaurant	1.2	per sq. ft.	6
Retail amenities	0.5	per sq. ft.	3
Pool Backwash	144,000	per pool	n/a

Table 2: ONSITE SEWER DEMAND CALCULATIONS PER DS+PM

Land Use	Count	Unit	ADD per Unit (gpd)	Avg. Day Demand (gpm)	Peak Demand (gpm)
B-1 Hotel	168	Rooms	380	44.3	199.5
B-1 Restaurant	4,000	Sq. Ft.	1.2	3.3	20.0
B-2/3 High Density Residential	180	Units	140	17.5	78.8
B-4 Townhomes	2	Units	140	0.2	0.9
B-5 Townhomes	2	Units	140	0.2	1.2
B-6 Townhomes	6	Units	140	0.6	1.8
Ex - Retail amenities	14,000	Sq. Ft.	0.5	4.9	14.6
Pool Backwash	1	EA	144,000	100.0	100.0
			Totals	171.0	416.6

The proposed 6" sewer service lines per **APPENDIX I** have a full flow capacity of 251.8 gpm each. Splitting the flow from The Triangle, 50/50, results in 208.3 gpm to each of the 8" pipes along the west and east property lines. It should be noted two services are proposed to each of the 8" pipes.

5.2 SOFTWARE ANALYSIS:

Bentley FlowMaster® Version 8i is the computer software tool used in this study.
Analysis input parameters included the following:

1. Pipe diameters (inches)
2. Pipes slopes
3. System demands (gpm)
4. Piping is PVC Manning's N-Values (n = 0.013)

Output parameters included but were not limited to:

1. Flow rate (gpm)
2. Velocities (fps)
3. Percent Full (d/D)

5.3 OFFSITE SEWER DEMANDS:

8" Sewer Lines Adjacent to The Triangle's Property Lines:

COS Water Resources staff has provided a 74-gpm existing flow in the Indian School Road sewer system just east of The Triangle site and recommends a 60/40 (east/west) split in evaluating the proposed impact to the two 8" sewers adjacent to The Triangle site. Table 3 summarizes the offsite and onsite sewer demands in the two 8" sewer pipe. Flow from the Triangle site's six buildings was split 50/50.

Table 3 - 8" SEWER LINES ADJACENT TO PEG SCOTTSDALE

	Ex Flow (gpm)	PEG site (gpm)	Total Flow (gpm)	Depth (in)	Velocity (fps)	d/D
West line	29.6	208.3	237.9	3.3	3.9	0.41
East line	44.4	208.3	252.7	3.4	4	0.43
Allowable			505.8	5.2	4.7	0.65

As described in Section 3.5, wastewater from Craftsman Court and The Triangle will enter the Indian School Road 10" pipe via the existing 8" sewers adjacent to The Triangle site. Partial flow from The Marquee will enter the 10" Indian School Road sewer at Buckboard. Table 4 accounts for an allowable flow reduction based on the distance of a project from the monitored manhole with a maximum allowable reduction of ten percent.

Table 4: ADDED FLOWS TO THE 10" INDIAN SCHOOL RD MONITORED RESULTS

Project	Peak Flow (gpm)	Distance to Point of Analysis* (mi)	Allowable Reduction (%)	Resulting Peak Flow (gpm)
The Triangle (W/ Pool Backwash)	416.6	0.5	5.0	395.8
Craftsman Court	4.0	0.7	7.0	3.7
The Marquee	166.5	0.8	8.0	153.2
Monitored Manhole	128.8	0.0	0.0	128.8
			Total Peak Flow	681.5

* Analysis point is monitored manhole on Indian School Road west of Miller Road

These flows within the 10" Indian School Road sewer line have been verified by COS Water Operations staff to discharge into the 24" sewer trunk line at Miller Road.

Referring to **APPENDIX III,** Table 5 summarizes flow hydraulics in the Indian School Road sewer line with and without The Triangle pool backwash.

incorrect, there is a section of 15" sewer where flows discharge prior to the 24" . Note: the 15" section is analyzed on next page.

Table 5 - 10" INDIAN SCHOOL ROAD LINE HYDRAULIC CAPACITY AT MONITORED MH

Scenario	Sewer Demand (gpm)	n-value	Slope (ft/ft)	Depth (in)	d/D	Velocity (fps)	Available Capacity (gpm)
Peak Flow w/ Pool - Table 3	698.1	0.013	0.0049	8.3	0.83	3.2	-
d/D=0.8 Capacity	-	0.013	0.0049	8.0	0.80	3.2	672.8
Peak Flow w/o Pool - Table 3	603.1	0.013	0.0049	7.2	0.73	3.2	-
d/D=0.65 Capacity	-	0.013	0.0049	6.5	0.65	3.1	520.7

(1) Pool flow = 95 gpm with 5% reduction for distance from monitored manhole

ok good

The Atwell Report for Gentry on the Green monitored a peak existing flow of 127.5 gpm at the intersection of N. Parkway Avenue and Indian School Road in December 2018 and a calculated rezoned/entitled flow of 0.998 mgd (693 gpm). The entitled flow will be carried to the Miller Road intersection and added to the 698.1 gpm flow from west of the intersection (per Table 4) to evaluate impacts to the existing 15" pipes at 1391.1 gpm prior to connecting with the 24" trunk line in Miller Road.

Typo? 698 is value from zoning case BOD, Table 4 states here 681.5gpm

The referenced 15" pipes were surveyed on June 10, 2021, and the invert, length and slope information provided as **FIGURE 4A**. Table 6 represents the hydraulics of the Miller Road 15" pipe and first reach of 24" pipe (see **APPENDIX III**).

Calc:681.5+693= 1,374 gpm

Table 6 - MILLER ROAD LINE HYDRAULIC CAPACITY SOUTH OF INDIAN SCHOOL

Scenario	Sewer Demand (gpm)	n-value	Slope (ft/ft)	Depth (in)	d/D	Velocity (fps)	Available Capacity (gpm)
MH A to B	1391.1	0.013	0.0439	4.9	0.33	9.0	6534
MH B to C	1391.1	0.013	0.0065	8.3	0.56	4.4	2514
South of MH C	-	0.013	0.0085	-	0.70	7.4	10,069

Recalculated as 0.55 with revised flow of 1,374gpm. Acceptable d/D.

Note: d/D=0.94 not valid max. Design max is @ d/D=0.70

6. SUMMARY

6.1 SUMMARY OF PROPOSED SEWER IMPROVEMENTS:

- Onsite and offsite sewer mains were evaluated in accordance with City of Scottsdale's design standards and policies[2] and direction received from COS Water Resources staff.
- The allowable d/D criteria are slightly exceeded.
- Backwater valves will be installed on any service line where the upstream manhole is higher than the finish floor of the building being served.
- Privately owned and maintained grease interceptors will be installed to serve all food preparation facilities.

6.2 PROJECT SCHEDULE:

The infrastructure and buildings are proposed to be constructed in a single phase.

7 SUPPORTING MAPS

7.1 SITE UTILITY PLAN

Refer to Utility Plan in **APPENDIX II.**

8 REFERENCES

1. *COS QS Sewer Plan number 17-45*
2. *City of Scottsdale Design Standards & Policies Manual, 2017 (Chapter 7 – Sewer)*

FIGURES

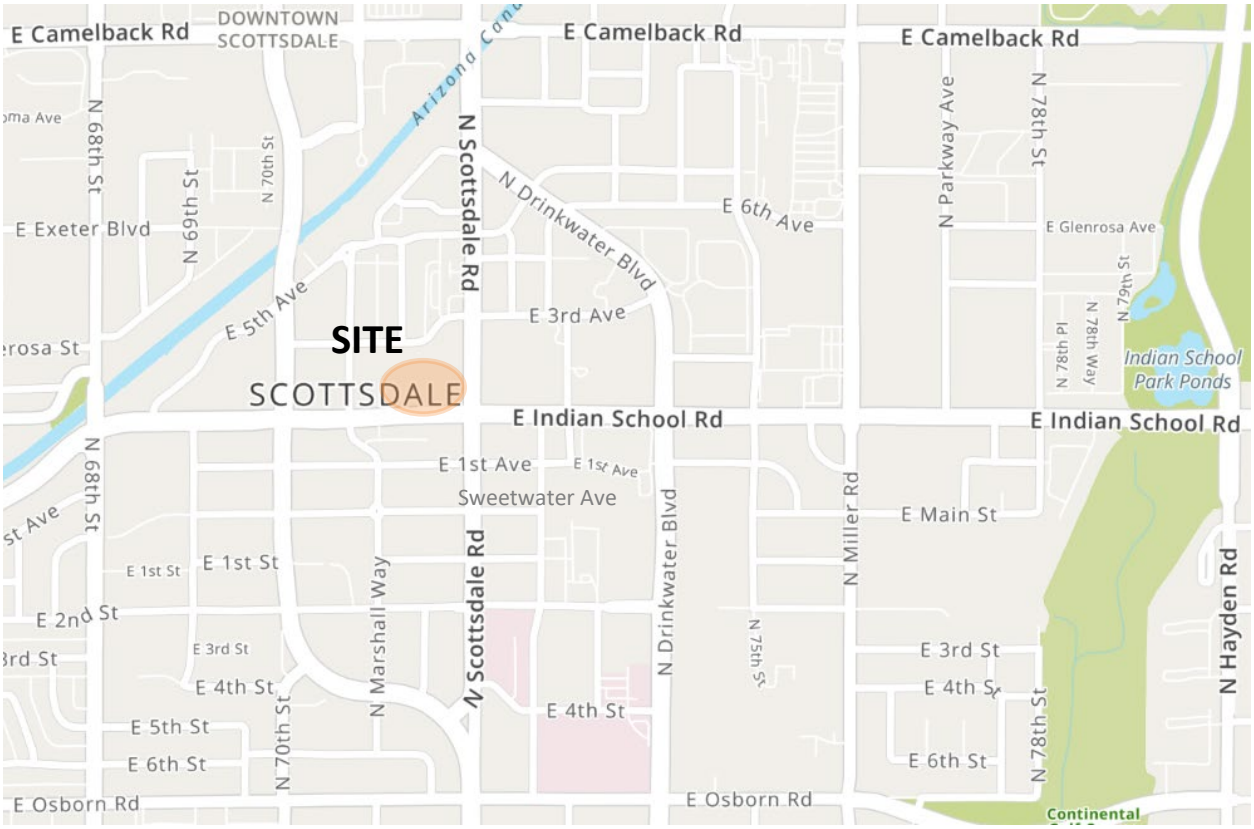

FIGURE 1 – Vicinity Map

FIGURE 2 - Aerial

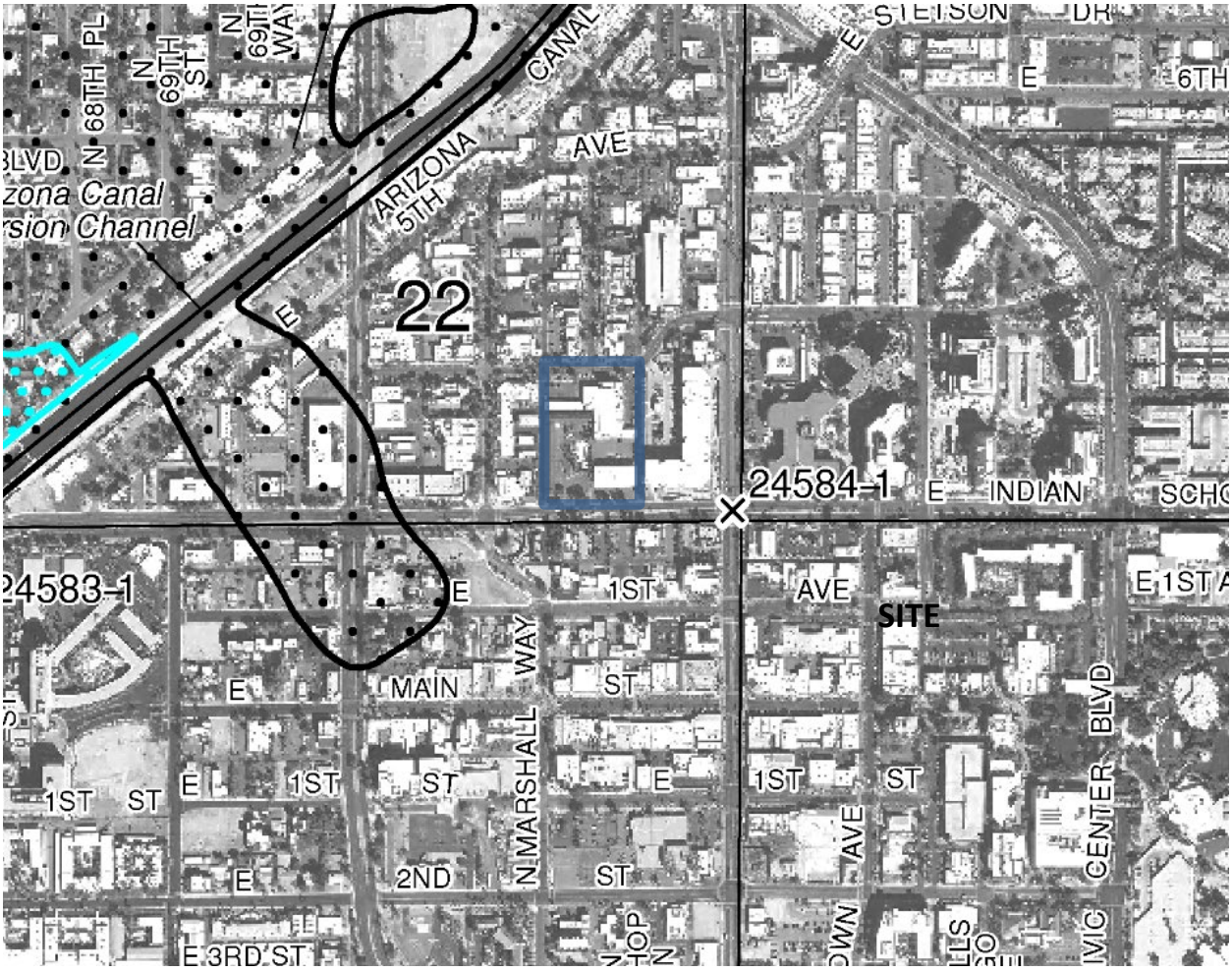

FIGURE 3 – FEMA FIRM

Excerpt from 04013C2235L

GENERAL NOTES:

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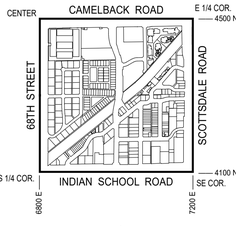
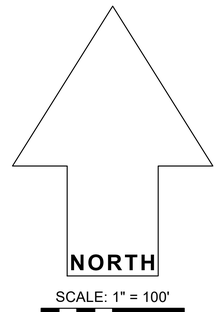
- THE SECTION LINE BEARING AND DISTANCES ARE BASED ON THE CITY OF SCOTTSDALE GPS SURVEY OF SEPTEMBER, 1991. BEARINGS ARE NAD 83 GRID AND DISTANCES ARE FLATTENED TO GROUND. WHERE NO CORNER WAS FOUND THE DIMENSIONS ARE GIVEN TO CALCULATED SECTION CORNERS AND ARE NOTED AS 'CALCULATED' ON THE MAP.

LEGEND:

- Cleanout
- Lift Station (LS)
- Manhole (S)
- Non-GPS Point
- Plug
- Sewer Service Point
- Sewer Tap Point
- Sewer Valve
- Treatment Plant
- Sewer Main - Gravity
- Sewer Main - Force (Force)
- Sewer Main - Private

VICINITY MAP





The map scale of 1" = 100' is based on a full size print of 30" x 36"

SEWER

QUARTER SECTION MAP

17-44

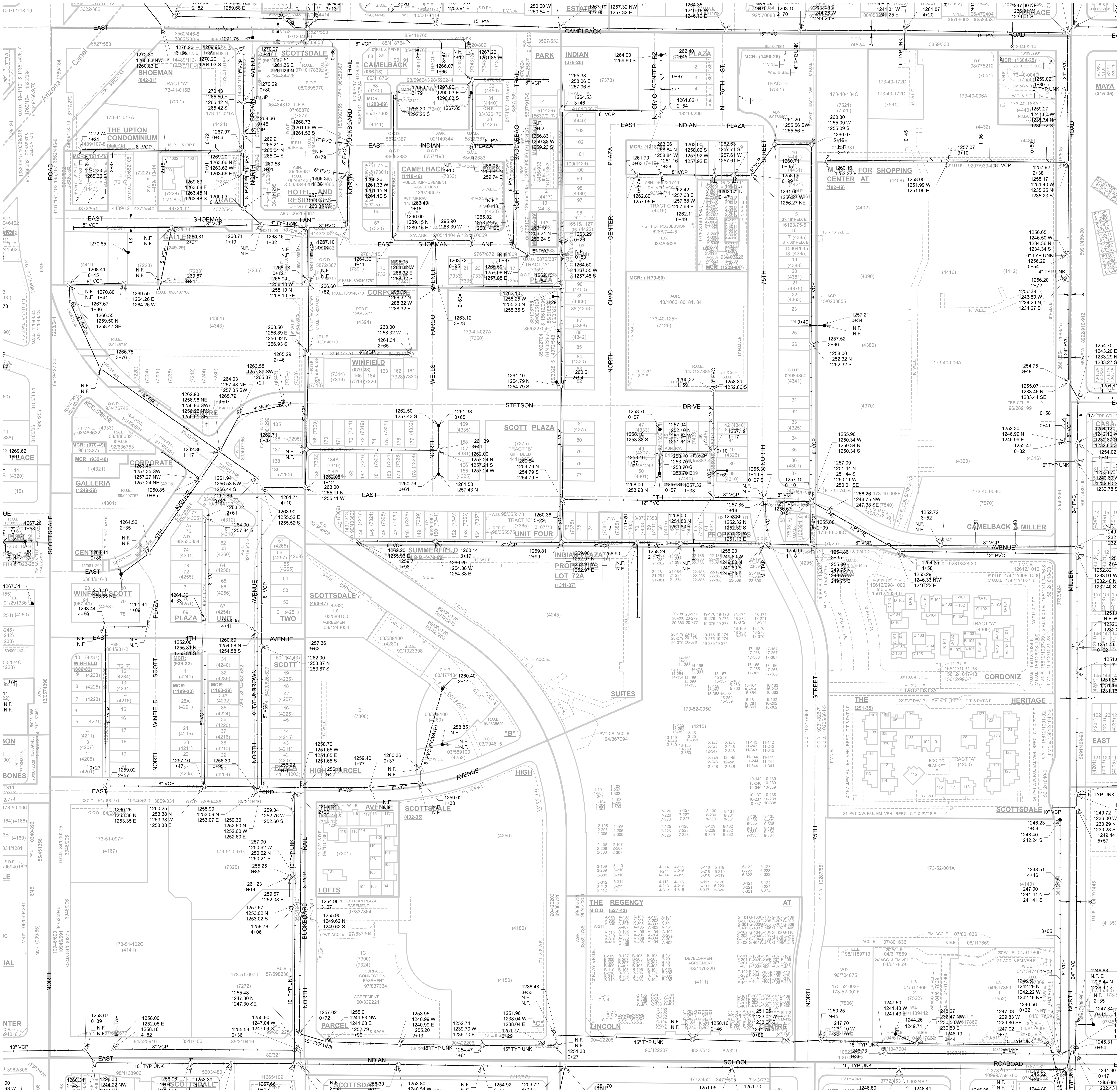
SE 1/4 SEC. 22 T2N R4E

FIGURE 4

CITY OF SCOTTSDALE
SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

18-45

17-44



17-46

16-45

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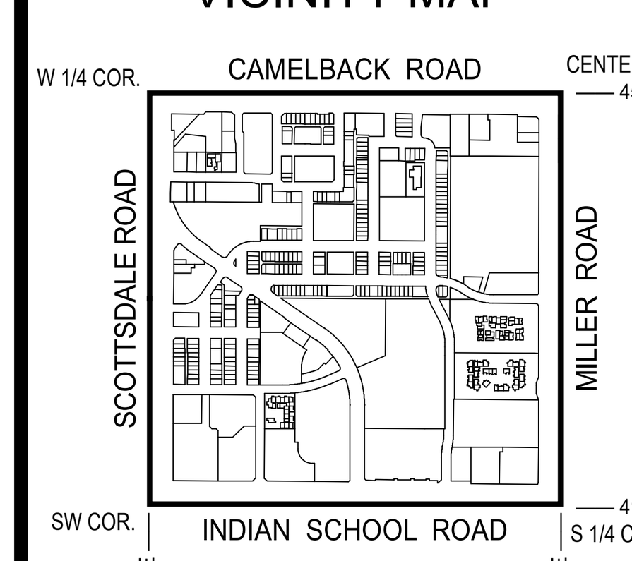

NORTH

SCALE: 1" = 100'

0 50 100 200

The map scale of 1" = 100' is based on a full size print of 30" x 36"

SEWER

QUARTER SECTION MAP

17-45

SW 1/4 SEC. 23 T2N R4E

FIGURE 4

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

N O T I C E

THIS DOCUMENT IS PROVIDED FOR GENERAL INFORMATION PURPOSES ONLY. THE CITY OF SCOTTSDALE DOES NOT WARRANT ITS ACCURACY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE. IT SHOULD NOT BE RELIED UPON WITHOUT FIELD VERIFICATION.

THE CITY OF SCOTTSDALE

26-APR-20

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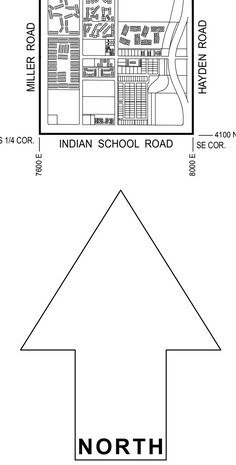
VICINITY MAP



SCALE: 1" = 100'

0 50 100 200

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SEWER

QUARTER SECTION MAP

17-46

SE 1/4 SEC. 23 T2N R4E

FIGURE 4

CITY OF SCOTTSDALE
SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

08-DEC-19

17-45

16-44

16-46

15-45

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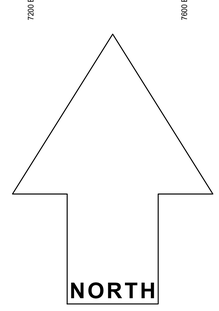
Existing Sewer

Street	Sewer (ID)	Size (inch)	Slope (ft/ft)
ISR	A	10	0.006
	B	10	0.006
	C	10	0.0049
	D	10	0.0049
	E	10	0.0049
	F	10	0.0049
	G	10	0.0049
	H	10	0.0049
	I	10	0.0049
	J	15	UNKNOWN
Miller Rd	K	15	UNKNOWN
	L	24	0.0085

VICINITY MAP



SEWER

QUARTER SECTION MAP

16-45

NW 1/4 SEC. 26 T2N R4E

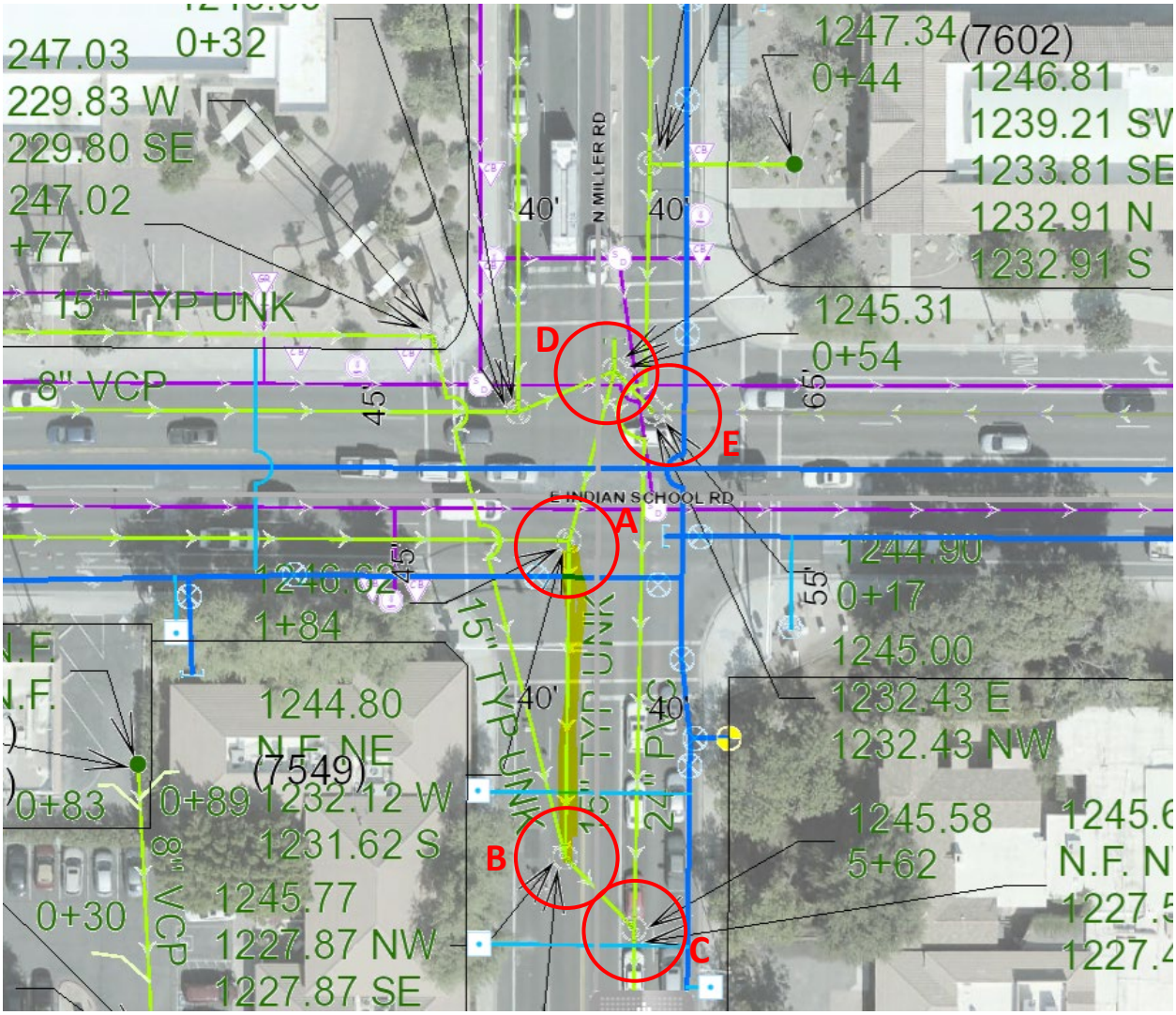
FIGURE 4

CITY OF SCOTTSDALE

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS

3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

26-APR-20



MH	Rim	Inverts		Pipe Reach	Length	Slope
E	1246.49	E & NW	1233.9			
D	1246.6	SE 1233.6	S 1232.7	E-D	17.6’	0.017’/’
A	1246.5	N, W & S	1232.1	D-A	53.4’	0.028’/’
B	1245.7	N & SE	1227.8	A-B	96.8’	0.0439’/’
C	1245.7	N & S	1227.6	B-C	30.9’	0.0065’/’

FIGURE 4A - Indian School /Miller Roads Manhole Survey

THE TRIANGLE

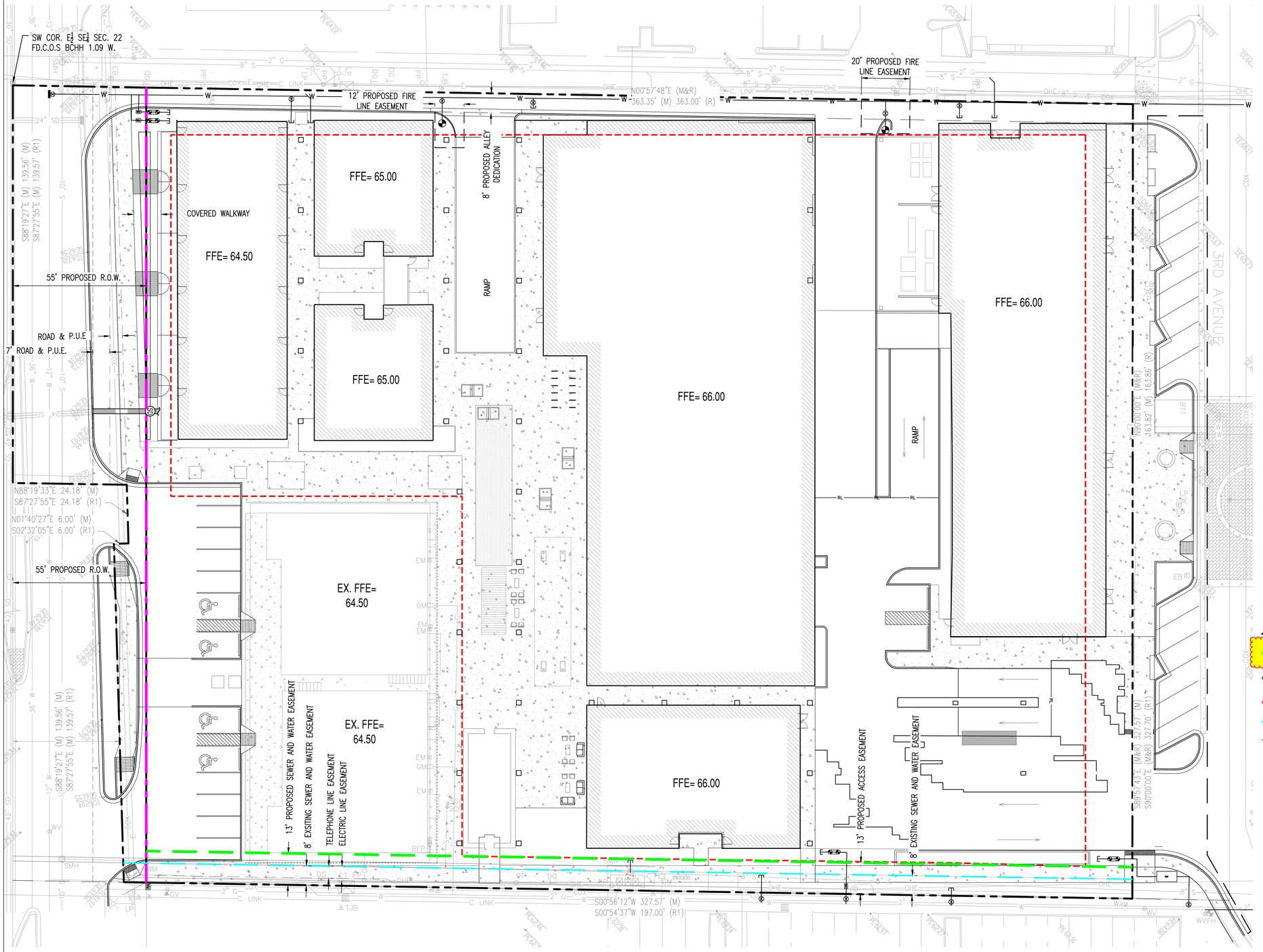
7120 E. INDIAN SCHOOL ROAD SCOTTSDALE, AZ 85251

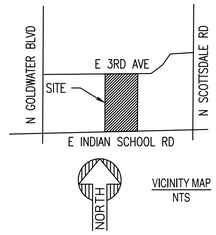
PROPOSED EASEMENT EXHIBIT

CIVIL ENGINEER:
SEG
8280 E. GELDING DR, SUITE #101
SCOTTSDALE, AZ 85260
480-588-7226
ATTN: ALI FAKIH

CLIENT:
PEG DEVELOPMENT
180 N. UNIVERSITY AVE
SUITE 200, PROVO UT 84601
801-655-1998
ATTN: MATT KRAMBULE

ARCHITECT:
GENSLER
2575 E. CAMELBACK RD
SUITE 175, PHOENIX AZ 85016
602-253-4900
ATTN: JOHANNA COLLINS





VICINITY MAP
NTS

No, not access easement. PUE. IS this an old figure? Subsequent figures show this is as a PUE.

PROPOSED LEGEND:

- PROPERTY LINE
- PROPOSED ACCESS EASEMENT
- PROPOSED WATER AND SEWER EASEMENT
- UNDERGROUND PARKING
- EXISTING WATER EASEMENT
- PROPOSED R.O.W.

NORTH

0' 20' 40' 60'

SCALE: 1" = 20'

6/19/2020 3:38:59 PM

THE TRIANGLE

7120 E INDIAN SCHOOL RD,
SCOTTSDALE, AZ 85251

- CASE PRE-APP NUMBER -
63-PA-2020

Gensler
2575 E Camelback Road
Suite 175
Phoenix, AZ 85016
United States
Tel 602.523.4900
Fax 602.523.4949

SYDNOR
4806 N 78TH Place
Scottsdale, AZ 85251
United States
Tel 480.206.4593

SEG
8280 E. GELDING DRIVE
Suite 101
Scottsdale, AZ 85260
United States
Tel 480.588.7226

△ Date	Description
10/16/20	Resubmittal

Seal / Signature

NOT FOR CONSTRUCTION

Project Name
3RD AVENUE+INDIAN SCHOOL ROAD - SCOTTSDALE, AZ

Project Number
200504 (SEG)

Description
PROPOSED EASEMENT EXHIBIT

Scale
As indicated

FIGURE 5

APPENDIX I

Monitored Sewer Flow Report

Indian School/Miller Road Survey

Flow Monitoring Site Report

Project Number: SL861 SEG Engineering

Site Location & Traffic Control

Site reference ID: QS16-45, MH 73

Monitoring Address: On Indian School, 100 yards East of 75th St., East bound fast lane

Traffic Control Requirements: YES, provided by Action Barricade Company

Site Structure / Channel/Pipe

Installation structure: 4ft. Manhole, Brick

Structure Size/dimensions: 4’ with ring and cover

Rim to pipe invert: 157.675”

Flow configuration: Pipe

Flow Direction: East

Main Pipe size inches: 10”

Type of Pipe: VCP

Scum line: 4”

Pipe/Channel Condition: Intact

Inside the pipe: Reasonably clean

Lateral Pipe(s): No

Logger Sensors Monitoring

Meters/Loggers: FL900

Sensor: Flo-Dar (AV) noninvasive

Units Measurement:

GPM (gallons per minute)
GPD (gallons per day)
Level (inches)
Velocity FPS (feet per second)

Data logging intervals (minutes and or Hours): 5 minute intervals

Remote monitoring: N/A

Flow Monitoring Site Report – SEG Engineering

Duration of monitoring Days: Nine (9) day, including two (2) weekends

Data Start Date/Zulu Time: 06-24-2020, 13:00

Data Ending Date/Zulu Time: 07-10-2020, 8:00

Equipment Removal Date/Time: 07-10-2020, 8:50

General Notes:
RDH performed a Confined Space Entry for Installation and Calibration of flow monitoring equipment. The 10" pipe had no debris with about 3.5" of flow with good velocity at the time of the installation. Based on the scum line the flows appear to be in the lower 4" of the pipe with minimal scum build up. The sensor was mounted in the upstream pipe. The manhole appears to be in good condition with thin rusted steps and there were no equipment errors. Below are photos and flow data summaries showing Level, Velocity, Flow and attached excel raw data file.

Flow Monitoring Site Report – SEG Engineering

Flow Monitoring Site Report – SEG Engineering

Sustainability MH73 Level (in.)			
Date	Maximum	Minimum	Average
Wednesday, June 24, 2020	3.22	2.06	2.69
Thursday, June 25, 2020	3.42	1.83	2.60
Friday, June 26, 2020	3.24	2.07	2.63
Saturday, June 27, 2020	3.03	1.77	2.43
Sunday, June 28, 2020	2.77	1.77	2.27
Monday, June 29, 2020	3.26	1.95	2.48
Tuesday, June 30, 2020	3.29	1.74	2.43
Wednesday, July 1, 2020	3.27	2.01	2.57
Thursday, July 2, 2020	3.46	2.04	2.65
Friday, July 3, 2020	3.42	1.95	2.74
Saturday, July 4, 2020	2.94	2.03	2.42
Sunday, July 5, 2020	2.83	1.82	2.24
Monday, July 6, 2020	3.19	1.78	2.47
Tuesday, July 7, 2020	3.36	1.92	2.52
Wednesday, July 8, 2020	3.37	1.74	2.61
Thursday, July 9, 2020	3.53	1.99	2.69
Friday, July 10, 2020	2.99	2.21	2.61

MH73 Period Summary: Level				
Measures	Value	Unit	Date	Time
Max.	3.53	in.	Thursday, July 9, 2020	2:55 PM
Min.	1.74	in.	Wednesday, July 8, 2020	1:50 AM
Avg.	2.52	in.		

*Data begins at 1:00pm on June 24th and ends at 8:00am on July 10th.

Flow Monitoring Site Report – SEG Engineering

Sustainability MH73 Velocity (fps)			
Date	Maximum	Minimum	Average
Wednesday, June 24, 2020	1.58	1.12	1.4
Thursday, June 25, 2020	1.65	1.04	1.36
Friday, June 26, 2020	1.57	1.08	1.33
Saturday, June 27, 2020	1.54	0.98	1.29
Sunday, June 28, 2020	1.42	1.00	1.23
Monday, June 29, 2020	1.59	1.06	1.31
Tuesday, June 30, 2020	1.55	0.95	1.27
Wednesday, July 1, 2020	1.57	1.02	1.32
Thursday, July 2, 2020	1.56	1.01	1.30
Friday, July 3, 2020	1.56	0.93	1.29
Saturday, July 4, 2020	1.46	1.03	1.24
Sunday, July 5, 2020	1.40	0.93	1.16
Monday, July 6, 2020	1.55	0.94	1.24
Tuesday, July 7, 2020	1.65	0.97	1.25
Wednesday, July 8, 2020	1.59	0.99	1.31
Thursday, July 9, 2020	1.67	1.06	1.34
Friday, July 10, 2020	1.48	1.11	1.29

MH73 Period Summary: Velocity				
Measures	Value	Unit	Date	Time
Max.	1.67	fps.	Thursday, July 9, 2020	2:55 PM
Min.	0.93	fps.	Friday, July 3, 2020	1:45 AM
Avg.	1.29	fps.		

*Data begins at 1:00pm on June 24th and ends at 8:00am on July 10th.

Flow Monitoring Site Report – SEG Engineering

Sustainability MH73 Flow				
Date	Maximum (gpm)	Minimum (gpm)	Average (gpm)	Total (gal)
Wednesday, June 24, 2020	105.32	40.76	75.41	49,772.80
Thursday, June 25, 2020	117.30	32.91	71.13	102,424.40
Friday, June 26, 2020	107.48	39.53	69.37	99,890.10
Saturday, June 27, 2020	96.72	28.48	60.85	87,630.80
Sunday, June 28, 2020	78.66	29.19	52.00	74,882.80
Monday, June 29, 2020	110.12	36.40	63.28	91,125.30
Tuesday, June 30, 2020	109.06	28.08	60.09	86,533.80
Wednesday, July 1, 2020	109.38	36.44	66.74	96,099.20
Thursday, July 2, 2020	117.17	36.44	68.87	99,174.60
Friday, July 3, 2020	112.99	31.20	71.70	103,251.90
Saturday, July 4, 2020	86.91	37.12	57.34	82,566.20
Sunday, July 5, 2020	79.70	28.49	48.21	69,421.20
Monday, July 6, 2020	104.04	27.75	60.47	87,081.60
Tuesday, July 7, 2020	119.09	35.14	61.83	89,030.80
Wednesday, July 8, 2020	112.87	28.33	69.17	99,610.50
Thursday, July 9, 2020	128.82	36.49	73.07	105,224.50
Friday, July 10, 2020	91.03	44.83	65.97	15,832.30

MH73 Period Summary: Flow				
Measures	Value	Unit	Date	Time
Max.	128.82	gpm	Thursday, July 9, 2020	2:55 PM
Min.	27.75	gpm	Monday, July 6, 2020	2:30 AM
Avg.	63.98	gpm		
Total	1,439,553.00	gal		

*Data begins at 1:00pm on June 24th and ends at 8:00am on July 10th.

APPENDIX II

Utility Plan

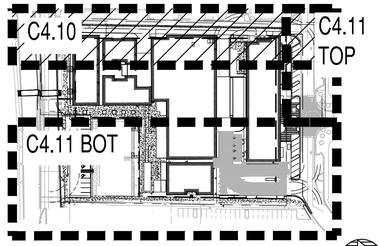
KIMSEY HOTEL & APARTMENT
UTILITY PLAN
7120 E. INDIAN SCHOOL ROAD. SCOTTSDALE, AZ. 85251

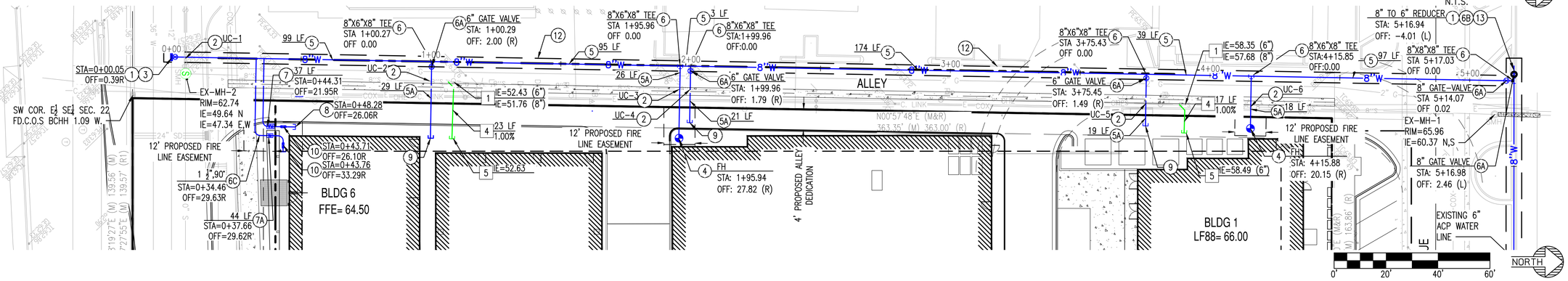
SEWER CONSTRUCTION KEY NOTES

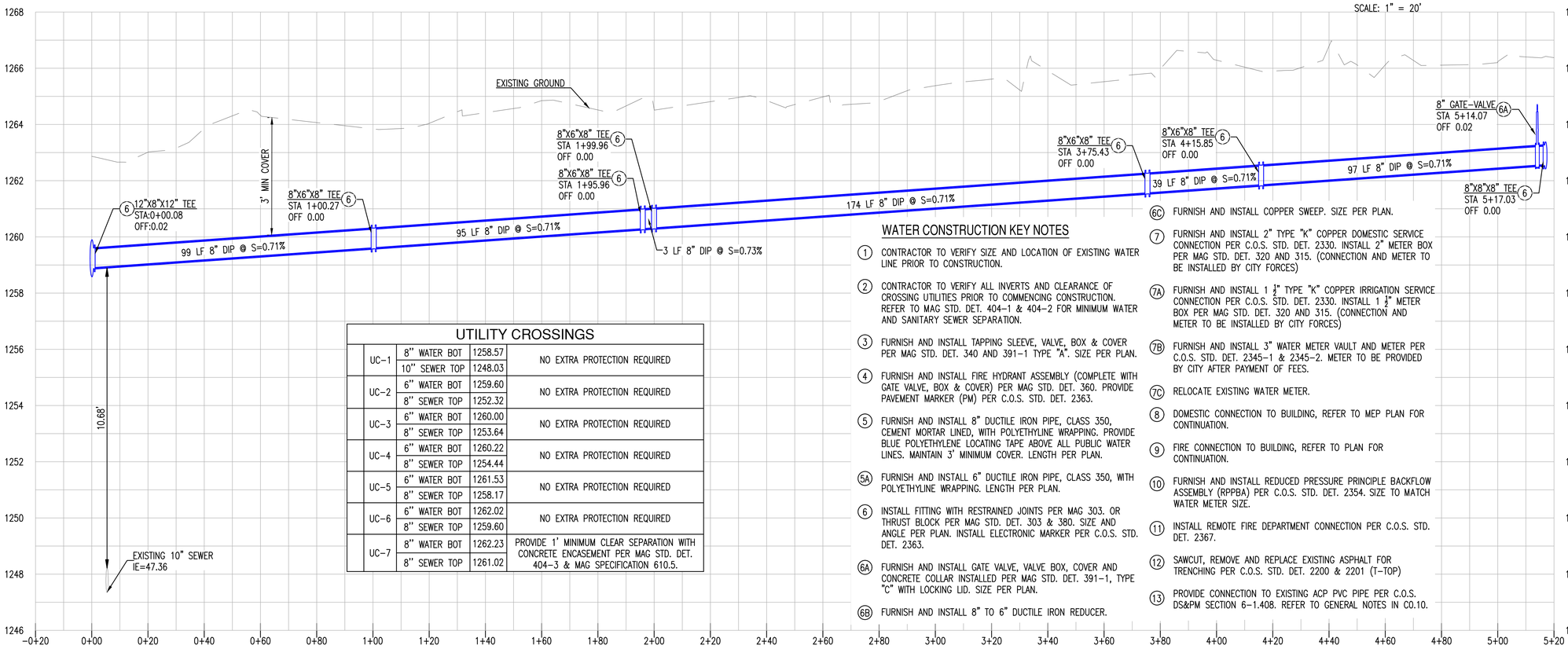
1. CONTRACTOR SHALL VERIFY THE LOCATION OF THE EXISTING SANITARY SEWER LINE BEFORE PROCEEDING WITH TRENCHING. CONTRACTOR SHALL CONTACT ENGINEER IF EXISTING SEWER ELEVATION IS HIGHER THAN PROPOSED TIE-IN INVERT PRIOR TO ANY CONSTRUCTION ACTIVITY.
2. CONTRACTOR SHALL VERIFY ALL INVERTS AND CLEARANCE OF CROSSING UTILITIES PRIOR TO COMMENCING CONSTRUCTION.
3. FURNISH AND INSTALL 6" PVC SDR-35 SEWER LINE. SIZE, LENGTH AND SLOPE PER PLAN. MAINTAIN 4' MINIMUM COVER.
4. FURNISH AND INSTALL 6" PVC-SDR 35 SEWER LINE CONNECTION PER MAG STD. DET. 440-1. LENGTH AND SLOPE PER PLAN.
5. REFER TO BUILDING PLUMBING PLANS FOR CONTINUATION.
6. CORE EXISTING MANHOLE AND PROVIDE WATERTIGHT CONNECTION FOR NEW SEWER. RECONSTRUCT PAVED INVERT AS REQUIRED.

CONSTRUCTION TYPE:
BUILDING 1: TYPE IIB
BUILDINGS 2-6: TYPE IIIA

NOTES:
1. EXISTING MANHOLES RIMS AND INVERTS HAS BEEN SET BASED ON THE SURVEY RECEIVED FROM 3 ENGINEERS, LLC. DATED 02/13/20.
2. EXISTING MANHOLES RIMS AND INVERTS HAS BEEN SET BASED ON QUARTER SECTION MAP QS# 17-44. DATED 06/11/20.
3. EXISTING WATER MAIN INVERT ELEVATIONS TO BE VERIFIED IN FIELD.
4. EXISTING OVERHEAD LINES EXTENDING ACROSS E.3RD AVENUE SHALL BE RELOCATED UNDER THE STREET AND UP TO THE NEXT EXISTING RISER ON THE NORTH SIDE OF E 3RD AVENUE.







UTILITY CROSSINGS

UC-1	8" WATER BOT	1258.57	NO EXTRA PROTECTION REQUIRED
	10" SEWER TOP	1248.03	
UC-2	6" WATER BOT	1259.60	NO EXTRA PROTECTION REQUIRED
	8" SEWER TOP	1252.32	
UC-3	6" WATER BOT	1260.00	NO EXTRA PROTECTION REQUIRED
	8" SEWER TOP	1253.64	
UC-4	6" WATER BOT	1260.22	NO EXTRA PROTECTION REQUIRED
	8" SEWER TOP	1254.44	
UC-5	6" WATER BOT	1261.53	NO EXTRA PROTECTION REQUIRED
	8" SEWER TOP	1258.17	
UC-6	6" WATER BOT	1262.02	NO EXTRA PROTECTION REQUIRED
	8" SEWER TOP	1259.60	
UC-7	8" WATER BOT	1262.23	PROVIDE 1' MINIMUM CLEAR SEPARATION WITH CONCRETE ENCASEMENT PER MAG STD. DET. 404-3 & MAG SPECIFICATION 610.5.
	8" SEWER TOP	1261.02	

WATER CONSTRUCTION KEY NOTES

1. CONTRACTOR TO VERIFY SIZE AND LOCATION OF EXISTING WATER LINE PRIOR TO CONSTRUCTION.
2. CONTRACTOR TO VERIFY ALL INVERTS AND CLEARANCE OF CROSSING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. REFER TO MAG STD. DET. 404-1 & 404-2 FOR MINIMUM WATER AND SANITARY SEWER SEPARATION.
3. FURNISH AND INSTALL TAPPING SLEEVE, VALVE, BOX & COVER PER MAG STD. DET. 340 AND 391-1 TYPE "A". SIZE PER PLAN.
4. FURNISH AND INSTALL FIRE HYDRANT ASSEMBLY (COMPLETE WITH GATE VALVE, BOX & COVER) PER MAG STD. DET. 360. PROVIDE PAVEMENT MARKER (PM) PER C.O.S. STD. DET. 2363.
5. FURNISH AND INSTALL 8" DUCTILE IRON PIPE, CLASS 350, CEMENT MORTAR LINED, WITH POLYETHYLINE WRAPPING. PROVIDE BLUE POLYETHYLENE LOCATING TAPE ABOVE ALL PUBLIC WATER LINES. MAINTAIN 3' MINIMUM COVER. LENGTH PER PLAN.
5A. FURNISH AND INSTALL 6" DUCTILE IRON PIPE, CLASS 350, WITH POLYETHYLINE WRAPPING. LENGTH PER PLAN.
6. INSTALL FITTING WITH RESTRAINED JOINTS PER MAG 303. OR THRUST BLOCK PER MAG STD. DET. 303 & 380. SIZE AND ANGLE PER PLAN. INSTALL ELECTRONIC MARKER PER C.O.S. STD. DET. 2363.
6A. FURNISH AND INSTALL GATE VALVE, VALVE BOX, COVER AND CONCRETE COLLAR INSTALLED PER MAG STD. DET. 391-1, TYPE "C" WITH LOCKING LID. SIZE PER PLAN.
6B. FURNISH AND INSTALL 8" TO 6" DUCTILE IRON REDUCER.
6C. FURNISH AND INSTALL COPPER SWEEP. SIZE PER PLAN.
7. FURNISH AND INSTALL 2" TYPE "K" COPPER DOMESTIC SERVICE CONNECTION PER C.O.S. STD. DET. 2330. INSTALL 2" METER BOX PER MAG STD. DET. 320 AND 315. (CONNECTION AND METER TO BE INSTALLED BY CITY FORCES)
7A. FURNISH AND INSTALL 1 ½" TYPE "K" COPPER IRRIGATION SERVICE CONNECTION PER C.O.S. STD. DET. 2330. INSTALL 1 ½" METER BOX PER MAG STD. DET. 320 AND 315. (CONNECTION AND METER TO BE INSTALLED BY CITY FORCES)
7B. FURNISH AND INSTALL 3" WATER METER VAULT AND METER PER C.O.S. STD. DET. 2345-1 & 2345-2. METER TO BE PROVIDED BY CITY AFTER PAYMENT OF FEES.
7C. RELOCATE EXISTING WATER METER.
8. DOMESTIC CONNECTION TO BUILDING, REFER TO MEP PLAN FOR CONTINUATION.
9. FIRE CONNECTION TO BUILDING, REFER TO PLAN FOR CONTINUATION.
10. FURNISH AND INSTALL REDUCED PRESSURE PRINCIPLE BACKFLOW ASSEMBLY (RPPBA) PER C.O.S. STD. DET. 2354. SIZE TO MATCH WATER METER SIZE.
11. INSTALL REMOTE FIRE DEPARTMENT CONNECTION PER C.O.S. STD. DET. 2367.
12. SAWCUT, REMOVE AND REPLACE EXISTING ASPHALT FOR TRENCHING PER C.O.S. STD. DET. 2200 & 2201 (T-TOP)
13. PROVIDE CONNECTION TO EXISTING ACP PVC PIPE PER C.O.S. DS&PM SECTION 6-1.408. REFER TO GENERAL NOTES IN C0.10.

PROPOSED UTILITY LEGEND:
PROPERTY LINE · EASEMENT LINE · 8"W WATER LINE · 8"S SEWER LINE · FIRE HYDRANT · FDC · WATER METER · GATE VALVE · T.S.V.B.&C · BACK FLOW PREVENTER · REDUCER · CAP · BUILDING CONNECTION · SEWER MANHOLE · SEWER CLEAN OUT

8" ALLEY WATERLINE PROFILE VIEW
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

EXISTING LEGEND:
CENTERLINE · EASEMENT LINE AS NOTED · CHAINLINKE FENCE · TREE · EX. S SEWER LINE · SEWER MANHOLE · EX. W WATER LINE · WV WATER VALVE · FIRE HYDRANT · STORM DRAIN LINE · CB STORM CATCH BASIN · STORM MANHOLE · GAS LINE · IRR IRRIGATION LINE · SIGN · STREET LIGHT · FO FIBER OPTIC LINE

NOT FOR CONSTRUCTION

SUSTAINABILITY ENGINEERING GROUP
8280 E. GELDING DRIVE SUITE 101, SCOTTSDALE, ARIZONA 85260
WWW.AZSEG.COM TEL. 480.588.7226 FAX. 480.259.3534

Gensler

Blue Stake, Inc. Arizona 811 at least two full working days before you begin excavation. ARIZONA811 Call 811 or visit Arizona811.com

PROJECT	KIMSEY HOTEL & APARTMENT
LOCATION	7120 E. INDIAN SCHOOL ROAD. SCOTTSDALE, AZ. 85251

DRAWN	LP	6/14/2021
DESIGNED	LP	6/14/2021
QC	SC	6/15/2021
FINAL QC		
PROJ. MGR.	AF	

DATE: 06/15/2021
ISSUED FOR: DRB

REVISION NO.:	DATE:
1	
2	
3	
4	

JOB NO.: 200504
SHEET TITLE: **UTILITY PLAN**

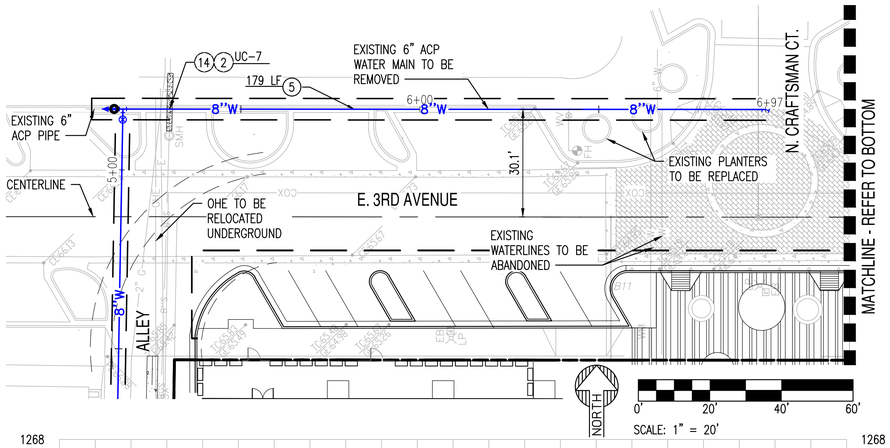
PAGE NO.: 8 OF 9
SHEET NO.: **C4.10**

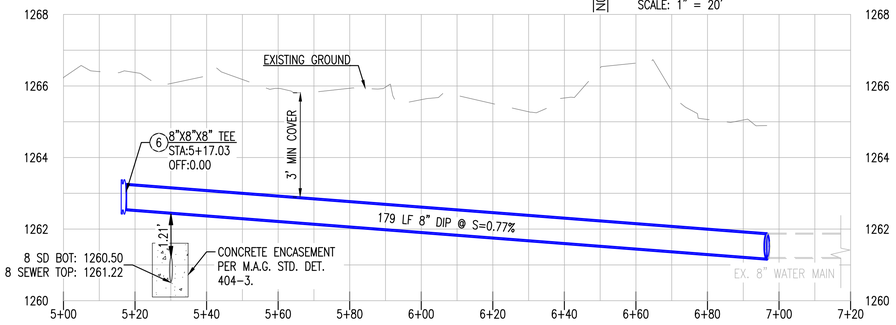
CASE NO.: 10-ZN-2020

LOCATION: Z:\SHARED\PROJECTS\GENSLER\HOJO APARTMENTS SCOTTSDALE 200504\11 CAD (SEG)\11.3 CD'S\200504-CD-C4.00.DWG SAVED BY: LAPTOP02 DATE: 6/15/2021

KIMSEY HOTEL & APARTMENT
UTILITY PLAN

7120 E. INDIAN SCHOOL ROAD. SCOTTSDALE, AZ. 85251





8" E. 3RD AVENUE WATERLINE REPLACEMENT PROFILE VIEW

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

WATER CONSTRUCTION KEY NOTES

1. CONTRACTOR TO VERIFY SIZE AND LOCATION OF EXISTING WATER LINE PRIOR TO CONSTRUCTION.
2. CONTRACTOR TO VERIFY ALL INVERTS AND CLEARANCE OF CROSSING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. REFER TO MAG STD. DET. 404-1 & 404-2 FOR MINIMUM WATER AND SANITARY SEWER SEPARATION.
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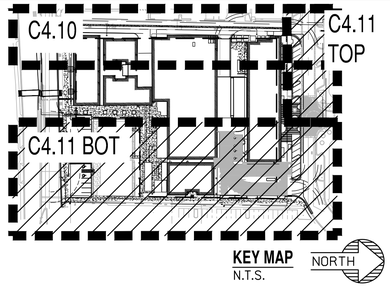
13. PROVIDE CONNECTION TO EXISTING ACP PVC PIPE PER C.O.S. DS&PM SECTION 6-1.408. REFER TO GENERAL NOTES IN C0.10.
14. PROTECT WATERMAIN USING REINFORCED CONCRETE ENCASEMENT ON SEWER PIPE AND WATERMAIN PER MAG STD. DET. 404-3.
15. FURNISH AND INSTALL 6" X 6" CUT-IN TEE.
16. FURNISH AND INSTALL 6" DIP COUPLER AND CONNECT TO EXISTING 6" ACP WATER MAIN.

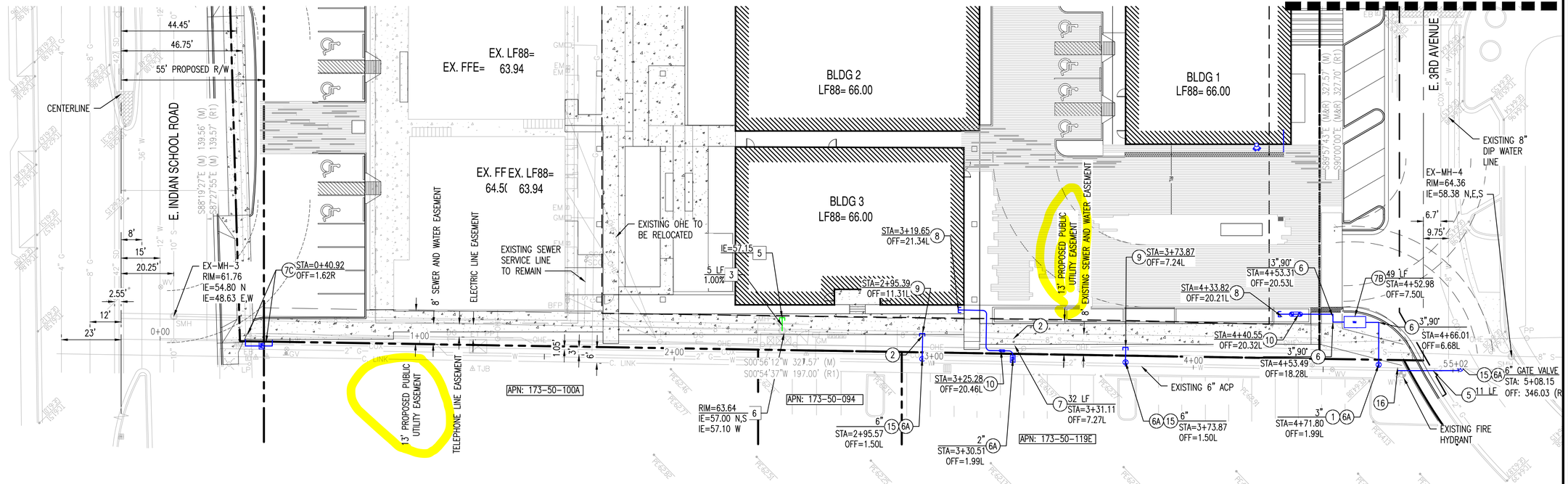


SEWER CONSTRUCTION KEY NOTES

1. CONTRACTOR SHALL VERIFY THE LOCATION OF THE EXISTING SANITARY SEWER LINE BEFORE PROCEEDING WITH TRENCHING. CONTRACTOR SHALL CONTACT ENGINEER IF EXISTING SEWER ELEVATION IS HIGHER THAN PROPOSED TIE-IN INVERT PRIOR TO ANY CONSTRUCTION ACTIVITY.
2. CONTRACTOR SHALL VERIFY ALL INVERTS AND CLEARANCE OF CROSSING UTILITIES PRIOR TO COMMENCING CONSTRUCTION.
4. FURNISH AND INSTALL 6" PVC-SDR 35 SEWER LINE CONNECTION PER MAG STD. DET. 440-1. LENGTH AND SLOPE PER PLAN.
5. REFER TO BUILDING PLUMBING PLANS FOR CONTINUATION.

UTILITY CROSSINGS

UC-7	8" WATER BOT	1262.23	PROVIDE 1' MINIMUM CLEAR SEPARATION WITH CONCRETE ENCASEMENT PER MAG STD. DET. 404-3 & MAG SPECIFICATION 610.5.
	8" SEWER TOP	1261.22	



PROPOSED UTILITY LEGEND:

- PROPERTY LINE
- EASEMENT LINE
- 8"W WATER LINE
- 8"S SEWER LINE
- FIRE HYDRANT
- FDC
- WATER METER
- GATE VALVE
- T.S.V.B.&C
- BACK FLOW PREVENTER
- REDUCER
- CAP
- BUILDING CONNECTION
- SEWER MANHOLE
- SEWER CLEAN OUT

EXISTING LEGEND:

- CENTERLINE
- EASEMENT LINE AS NOTED
- CHAINLINKE FENCE
- TREE
- EX. S SEWER LINE
- SEWER MANHOLE
- EX. W WATER LINE
- WATER VALVE
- FIRE HYDRANT
- STORM DRAIN LINE
- CB
- STORM CATCH BASIN
- STORM MANHOLE
- GAS LINE
- IRR IRRIGATION LINE
- SIGN
- STREET LIGHT
- FO FIBER OPTIC LINE

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Gensler

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811 Call 811 or visit Arizona811.com

PROJECT	LOCATION
KIMSEY HOTEL & APARTMENT	7120 E. INDIAN SCHOOL ROAD. SCOTTSDALE, AZ. 85251

DRAWN	LP	6/14/2021
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JOB NO.: 200504

SHEET TITLE: **UTILITY PLAN**

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APPENDIX III

Sewer Hydraulic Calculations

6" ONSITE SERVICE LINES - Allowable Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Normal Depth	6.0 in
Diameter	6.0 in
Discharge	251.83 gal/min

Results	
Discharge	251.83 gal/min
Normal Depth	6.0 in
Flow Area	0.2 ft²
Wetted Perimeter	1.6 ft
Hydraulic Radius	1.5 in
Top Width	0.00 ft
Critical Depth	4.6 in
Percent Full	100.0 %
Critical Slope	0.012 ft/ft
Velocity	2.86 ft/s
Velocity Head	0.13 ft
Specific Energy	0.63 ft
Froude Number	(N/A)
Maximum Discharge	270.89 gal/min
Discharge Full	251.83 gal/min
Slope Full	0.010 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	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	6.0 in
Critical Depth	4.6 in
Channel Slope	0.010 ft/ft
Critical Slope	0.012 ft/ft

8" Sewer at 0.0152'/' - PEG West Lot Line

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.015 ft/ft
Diameter	8.0 in
Discharge	238.00 gal/min

Results	
Normal Depth	3.3 in
Flow Area	0.1 ft²
Wetted Perimeter	0.9 ft
Hydraulic Radius	1.8 in
Top Width	0.66 ft
Critical Depth	4.1 in
Percent Full	41.2 %
Critical Slope	0.007 ft/ft
Velocity	3.91 ft/s
Velocity Head	0.24 ft
Specific Energy	0.51 ft
Froude Number	1.517
Maximum Discharge	719.27 gal/min
Discharge Full	668.65 gal/min
Slope Full	0.002 ft/ft
Flow Type	Supercritical

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	41.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.3 in
Critical Depth	4.1 in
Channel Slope	0.015 ft/ft
Critical Slope	0.007 ft/ft

8" Sewer at 0.0152 ft/ft - East Lot Line

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.015 ft/ft
Diameter	8.0 in
Discharge	253.00 gal/min

Results	
Normal Depth	3.4 in
Flow Area	0.1 ft²
Wetted Perimeter	1.0 ft
Hydraulic Radius	1.8 in
Top Width	0.66 ft
Critical Depth	4.2 in
Percent Full	42.8 %
Critical Slope	0.007 ft/ft
Velocity	3.95 ft/s
Velocity Head	0.24 ft
Specific Energy	0.53 ft
Froude Number	1.499
Maximum Discharge	714.52 gal/min
Discharge Full	664.23 gal/min
Slope Full	0.002 ft/ft
Flow Type	Supercritical

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	42.8 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.4 in
Critical Depth	4.2 in
Channel Slope	0.015 ft/ft
Critical Slope	0.007 ft/ft

8" Pipe at 0.0152 ft/ft; d/D=0.65

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.015 ft/ft
Normal Depth	5.2 in
Diameter	8.0 in

Results	
Discharge	505.77 gal/min
Flow Area	0.2 ft²
Wetted Perimeter	1.3 ft
Hydraulic Radius	2.3 in
Top Width	0.64 ft
Critical Depth	6.0 in
Percent Full	65.0 %
Critical Slope	0.010 ft/ft
Velocity	4.69 ft/s
Velocity Head	0.34 ft
Specific Energy	0.78 ft
Froude Number	1.346
Maximum Discharge	719.27 gal/min
Discharge Full	668.65 gal/min
Slope Full	0.009 ft/ft
Flow Type	Supercritical

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	65.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.2 in
Critical Depth	6.0 in
Channel Slope	0.015 ft/ft
Critical Slope	0.010 ft/ft

10" Pipe at 0.0049 ft/ft = Peak Flow w/ Pool

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Diameter	10.0 in
Discharge	681.50 gal/min

Results	
Normal Depth	8.1 in
Flow Area	0.5 ft²
Wetted Perimeter	1.9 ft
Hydraulic Radius	3.0 in
Top Width	0.65 ft
Critical Depth	6.6 in
Percent Full	81.1 %
Critical Slope	0.008 ft/ft
Velocity	3.21 ft/s
Velocity Head	0.16 ft
Specific Energy	0.84 ft
Froude Number	0.663
Maximum Discharge	740.45 gal/min
Discharge Full	688.33 gal/min
Slope Full	0.005 ft/ft
Flow Type	Subcritical

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	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	8.1 in
Critical Depth	6.6 in
Channel Slope	0.005 ft/ft
Critical Slope	0.008 ft/ft

10" Pipe at 0.0049'/' d/D=0.8

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	8.0 in
Diameter	10.0 in

Results	
Discharge	672.82 gal/min
Flow Area	0.5 ft²
Wetted Perimeter	1.8 ft
Hydraulic Radius	3.0 in
Top Width	0.67 ft
Critical Depth	6.6 in
Percent Full	80.0 %
Critical Slope	0.008 ft/ft
Velocity	3.20 ft/s
Velocity Head	0.16 ft
Specific Energy	0.83 ft
Froude Number	0.675
Maximum Discharge	740.45 gal/min
Discharge Full	688.33 gal/min
Slope Full	0.005 ft/ft
Flow Type	Subcritical

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	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	8.0 in
Critical Depth	6.6 in
Channel Slope	0.005 ft/ft
Critical Slope	0.008 ft/ft

10" Pipe at 0.0049 ft/ft - Peak Flow w/o Pool

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Diameter	10.0 in
Discharge	586.50 gal/min

Results	
Normal Depth	7.1 in
Flow Area	0.4 ft²
Wetted Perimeter	1.7 ft
Hydraulic Radius	3.0 in
Top Width	0.76 ft
Critical Depth	6.1 in
Percent Full	71.0 %
Critical Slope	0.007 ft/ft
Velocity	3.16 ft/s
Velocity Head	0.15 ft
Specific Energy	0.75 ft
Froude Number	0.752
Maximum Discharge	740.45 gal/min
Discharge Full	688.33 gal/min
Slope Full	0.004 ft/ft
Flow Type	Subcritical

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	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	7.1 in
Critical Depth	6.1 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

10" Pipe at 0.0048'/' d/D =0.65

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	6.5 in
Diameter	10.0 in

Results	
Discharge	520.66 gal/min
Flow Area	0.4 ft²
Wetted Perimeter	1.6 ft
Hydraulic Radius	2.9 in
Top Width	0.79 ft
Critical Depth	5.8 in
Percent Full	65.0 %
Critical Slope	0.007 ft/ft
Velocity	3.09 ft/s
Velocity Head	0.15 ft
Specific Energy	0.69 ft
Froude Number	0.793
Maximum Discharge	740.45 gal/min
Discharge Full	688.33 gal/min
Slope Full	0.003 ft/ft
Flow Type	Subcritical

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	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	6.5 in
Critical Depth	5.8 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Miller Road 15" at 0.0439 ft/ft - Total Peak Flow w/ Pools

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.044	ft/ft
Diameter	15.0	in
Discharge	1,391.10	gal/min

Results		
Normal Depth	4.9	in
Flow Area	0.3	ft^2
Wetted Perimeter	1.5	ft
Hydraulic Radius	2.7	in
Top Width	1.17	ft
Critical Depth	8.5	in
Percent Full	32.5	%
Critical Slope	0.006	ft/ft
Velocity	8.95	ft/s
Velocity Head	1.25	ft
Specific Energy	1.65	ft
Froude Number	2.902	
Maximum Discharge	6,534.37	gal/min
Discharge Full	6,074.50	gal/min
Slope Full	0.002	ft/ft
Flow Type	Supercritical	

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	32.5	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.9	in
Critical Depth	8.5	in
Channel Slope	0.044	ft/ft
Critical Slope	0.006	ft/ft

Miller Road 15" at 0.0065 ft/ft - Total Peak Flow w/ Pools

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.007 ft/ft
Diameter	15.0 in
Discharge	1,391.10 gal/min

Results	
Normal Depth	8.3 in
Flow Area	0.7 ft²
Wetted Perimeter	2.1 ft
Hydraulic Radius	4.0 in
Top Width	1.24 ft
Critical Depth	8.5 in
Percent Full	55.5 %
Critical Slope	0.006 ft/ft
Velocity	4.43 ft/s
Velocity Head	0.30 ft
Specific Energy	1.00 ft
Froude Number	1.040
Maximum Discharge	2,514.36 gal/min
Discharge Full	2,337.41 gal/min
Slope Full	0.002 ft/ft
Flow Type	Supercritical

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	55.5 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.3 in
Critical Depth	8.5 in
Channel Slope	0.007 ft/ft
Critical Slope	0.006 ft/ft

24" Pipe at 0.0085'/' d/D=0.7

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.009	ft/ft
Normal Depth	16.8	in
Diameter	24.0	in

Results		
Discharge	7,837.11	gal/min
Flow Area	2.3	ft²
Wetted Perimeter	4.0	ft
Hydraulic Radius	7.1	in
Top Width	1.83	ft
Critical Depth	18.1	in
Percent Full	70.0	%
Critical Slope	0.007	ft/ft
Velocity	7.43	ft/s
Velocity Head	0.86	ft
Specific Energy	2.26	ft
Froude Number	1.158	
Maximum Discharge	10,069.34	gal/min
Discharge Full	9,360.68	gal/min
Slope Full	0.006	ft/ft
Flow Type	Supercritical	

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	70.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	16.8	in
Critical Depth	18.1	in
Channel Slope	0.009	ft/ft
Critical Slope	0.007	ft/ft