



KLAND CIVIL ENGINEERS

Master Sewer Basis of Design Report Scottsdale and McDowell

7047 E. McDowell Road, Scottsdale, AZ 85257

#K17127

CASE No. 6-2N-2018

Prepared by:

KLAND Civil Engineers, L.L.C.
7227 North 16th Street, Suite 217
Phoenix, Arizona 85020

Prepared for:

Papago Marketplace, LLC
7025 E McDowell Road, Suite 110
Scottsdale, Arizona 85257

Submitted to:

City of Scottsdale
7447 E. Indian School Road
Scottsdale, Arizona 85251



Revised on November 2, 2018
Revised on August 21, 2018
April 3, 2018

PRELIMINARY Basis of Design Report

ACCEPTED

ACCEPTED AS NOTED

REVISE AND RESUBMIT



Disclaimer: If accepted; the preliminary approval is granted under the condition that a final basis of design report will also be submitted for city review and approval (typically during the DR or PP case). The final report shall incorporate further water or sewer design and analysis requirements as defined in the city design standards and policy manual and address those items noted in the preliminary review comments (both separate and included herein). The final report shall be submitted and approved prior to the plan review submission.

For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY Idillon

DATE 11/8/2018

Minor comments throughout.

Most important comment is who is going to fix flat sewer in Skysong??

All flows to be routed through Skysong sewer except select restaurant pads along Scottsdale Road as identified herein.

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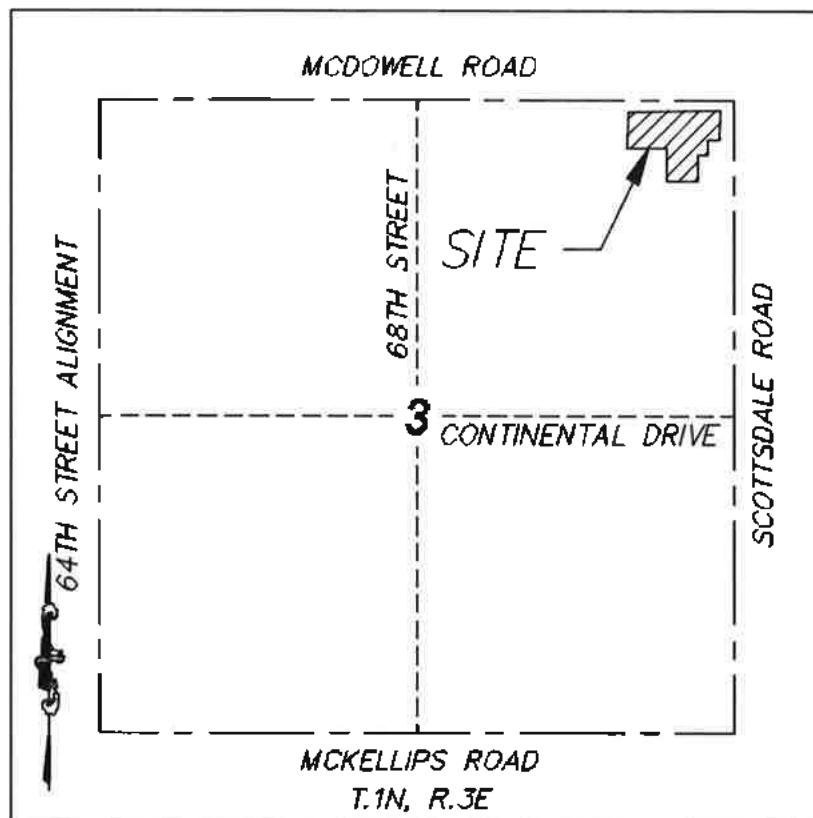
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Appendix A-2 Water and Sewer Plans
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1. Introduction

This site is located at the southwest corner of Scottsdale Road and McDowell Road in Scottsdale, Arizona. The project is within a portion of the northeast $\frac{1}{4}$ of Section 3, Township 1 North, Range 3 East of the Gila and Salt River Base and Meridian in Maricopa County, Arizona. Currently the property is fully developed with retail buildings, surface parking, landscape and hardscape. The site is bounded on the south and west by existing commercial and residential developments, on the north, by McDowell Road, and on the east, by Scottsdale Road. The proposed site will consist of a multi-family and commercial development on approximately 5.55 net acres. The multi-family development is 268 units in a podium style apartment building over ground level parking and 6 units in 3 carriage buildings. A podium style apartment building consist of multiple levels of apartments over a parking garage and the amenity exists in the center of the building, above the parking. The commercial development is comprised of five retail/restaurant buildings, a grocery store and a 116-room hotel.



VICINITY MAP

N.T.S.

With respect to the finish floor elevations (FFE), the highest FFE for the apartments is 42'-2" at the 4th floor and for the hotel is currently at 47'-0" at the 5th floor of the hotel above the ground floor.

The site is located within COS Q.S. 12-44 which is the City of Scottsdale water and sewer service area. The sewer systems available around the site is an 8-inch sewer main within the alley on the south side of the site, a 10-inch sewer main on the south side of McDowell Road, a 12-inch sewer main on the west side of Scottsdale Road and a 12-inch sewer main in Skysong Boulevard. Sewer cleanouts were found on the south side of the building during the topographic survey which indicates that the existing site sewer likely to discharged to the 8-inch sewer main in the alley. These services will need to be removed since they will not be utilized for the new development.

2. Sanitary Sewer System

Minimum City
required size



We have estimated that the multi-family site will be serviced with 6-inch and 8-inch sewer services. The carriage units will have 6-inch sewer services that will connect to the new public sewer main on-site. The podium building will have two or three 8-inch sewer services that will discharge into the new sewer main on site. The Hotel will have one or two sewer services that will discharge into the new public sewer main onsite. In addition, one of the restaurant/retail sites and the grocery store will discharge into the new main. The remaining restaurant/retail sites will be serviced by 6-inch sewer services that discharge to the existing 12-inch sewer main in Scottsdale Road. We currently are showing grease interceptors at the Hotel and retail/restaurant buildings. See Appendix 1 & 2 for the sewer map and plan. The grease interceptors will be sized by the plumbing engineer at the time of final design. The sewer services will be sized per IPC based on plumbing fixture units by the plumbing engineer at final design.

We have performed a sewer hydraulic analysis for the proposed and existing sewer mains that will service our site. We have estimated the sewer discharge from the site using The City of Scottsdale Design Standards & Polices Manual. Our sewer calculations for the site are provided in Appendix 3. Sewer monitoring has been done at 3 locations on the 8-inch sewer main in the alley, on the 10-inch

sewer main in McDowell Rd, the 12-inch sewer main in Scottsdale Rd, and the 12-inch and 18-inch sewer mains in Skysong Boulevard. The monitoring data can be found in Appendix 4.

There are a few things to note regarding the sewer monitoring data. We have provided a map in Appendix 4 that shows the manholes that were monitored. On the 18 inch sewer main there are a lot of times with no reading. This is because the monitoring data does not pick up data for depths less than 1 inch. For the system in Skysong Boulevard a lot of the site has been developed but a number of areas have not yet been constructed per the master plan. Therefore, in analyzing the flows in the system we have added the peak flow for the future development. These flows are noted on the sewer map. We took these flows directly from the BOD report by Wood/Patel for the Skysong development.

acknowledged,
acceptable

Good to know.

Need to determine

The inverts for the sewer manholes were verified with a field survey. In evaluating the sewer slope based on the inverts we found one section of 8-inch sewer main in the Alley to be flat. The flat section prevents us from being able to discharge any of our sewer to the 8-inch alley system. We also found a section of 12-inch sewer main in Skysong Boulevard to be at a slope of 0.08%. This slope does not match the City quarter section maps or the as-built plans. Due to this flat slope the two sections of 12-inch sewer main in Skysong Boulevard will need to be reconstructed. The slope in the flat section will be increased to 0.20% and upstream section will be reduced to a slope of 0.69%. Although 0.20% slope is less than the City minimum slope per the DS&PM our analysis shows that the system will flow at a higher velocity than 2 fps. The limiting factor for the design was the lateral connections to the system. If we made the slope greater than 0.2% the laterals would be deeper than the main.

See Appendix 2 for the proposed new design of the sewer main. This construction will need to occur prior to this development connecting to the Skysong system and be done by either the City of Scottsdale, the Skysong developer or the Scottsdale and McDowell developer.

65% depth, not
capacity

The peak discharge was calculated by increasing the average daily flow for each system by the appropriate peaking factor per Scottsdale Design Standards and Policies Manual Figure 7-1.2. These flows were added to the peak flows in the existing mains. We then used Manning's formula to confirm that the system was flowing at less than 65%. For the Skysong system we evaluated it with and without the 100 gpm from the hotel swimming pool backwash system. If the backwash occurs at

d/D=0.67 is close enough to 0.65.

depth?

the time of the peak discharge the pipe will flow at approximately 67% at the worst location. Without the backwash flow the system will be at approximately 59% at the worst location. Therefore, we will require the backwash to occur between midnight and 5 am. This will be included in the operations and maintenance manual. The Hydraulic analysis can be found in Appendix 3.

500gpm

The sewer main in Scottsdale Road will provide sewer service for 4 of the retail/restaurant pads. Based on the DS & PM we estimate that the peak discharge will be 79 GPM. This was added to the peak discharge in the 12 inch main from the sewer monitoring. The existing peak discharge occurs between midnight and 2am. We anticipate that the peak from the restaurants/ retail sites will be before midnight. We do not expect the two peaks to coincide. However if they did the system would still only be approximately 59% full.

slope=0.33%



3. Conclusion

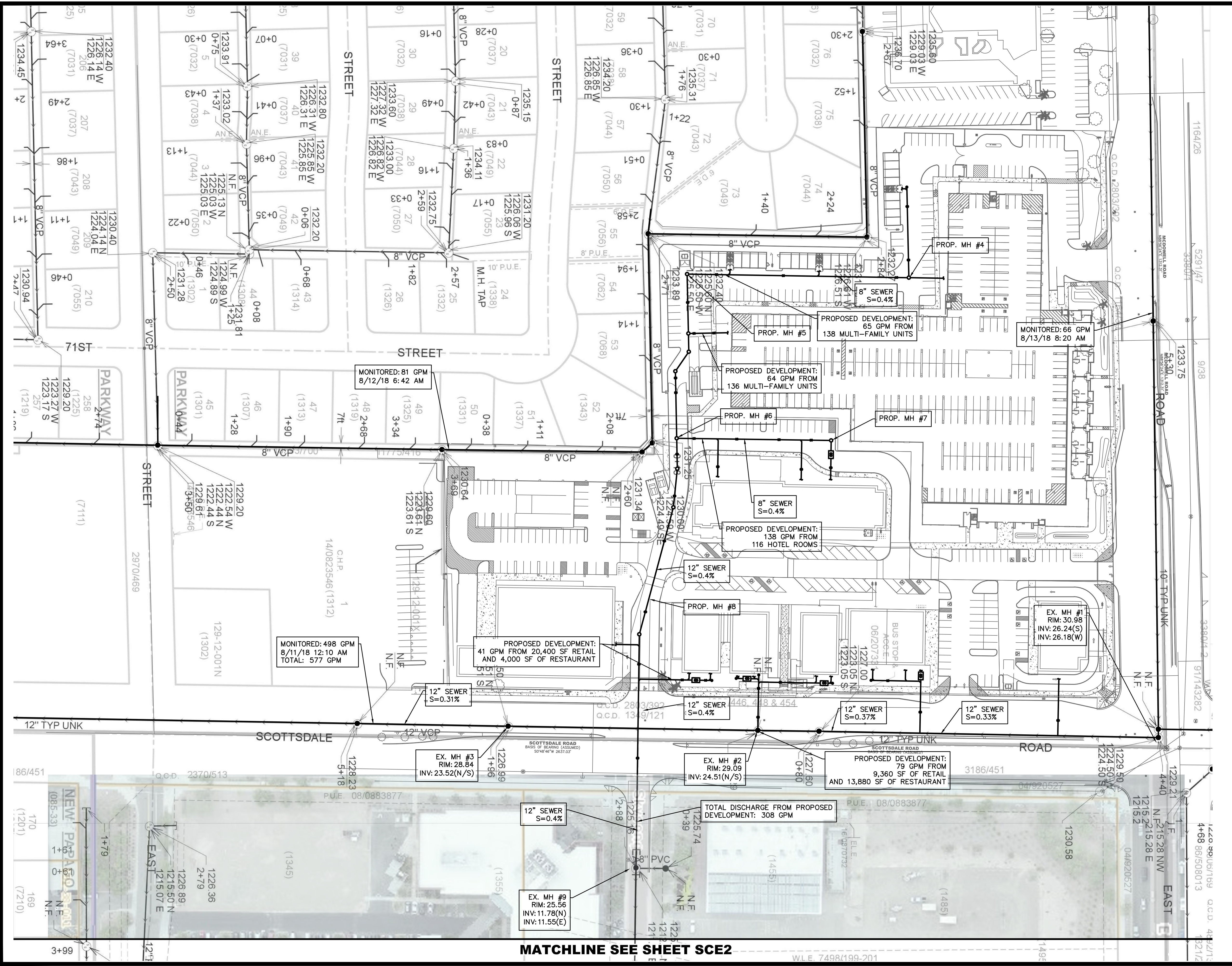
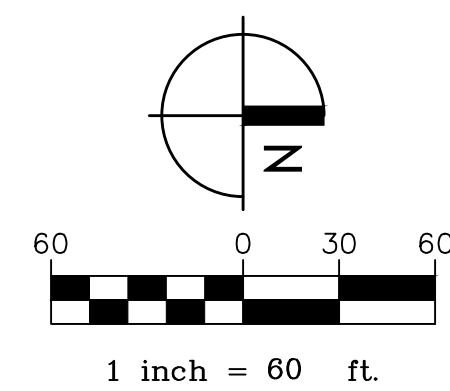
Based on our sewer analysis we believe that the City system has capacity for the Scottsdale & McDowell redevelopment. The following is a summary of our proposed design.

1. No sewer will be discharged to the 8 inch sewer line in the alley.
2. We are proposing sewer service for 4 of the retail/restaurant sites from the 12 inch sewer main in Scottsdale Road.
3. A public onsite sewer line consisting of 8 inch and 12 inch sewer mains will collect the majority of the site sewer and discharge to the sewer system in Skysong Boulevard.
4. The 12 inch sewer main in Skysong Boulevard will need to be reconstructed so that the minimum slope is 0.20%. The limiting factor in the slope is the sewer connections from Skysong.
5. Based on the Skysong Boulevard system being reconstructed to a minimum slope of 0.20% the worst case in the system when it is at the peak is the system will be 59% full.
6. The hotel will be required to schedule the back flow of the swimming pool between the hours of midnight and 5 am to avoid peak hours.

4. References

1. City of Scottsdale Design Standards & Policies Manual, 2018.
2. Skysong Northwest Quadrant Basis of Design Report, Prepared by Wood/Patel, Approved on 8/8/16.
3. Skysong ASU Scottsdale Innovation Center Master Wastewater Collection System Report, Prepared by Wood/Patel, Approved on 6/1/06.

APPENDIX A-1
Sanitary Sewer Maps



MATCHLINE SEE SHEET SCE2

REVISIONS

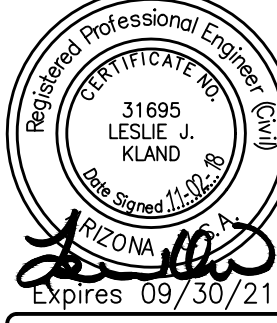
SCOTTSDALE RD AND MCDOWELL

SEWER CAPACITY EXHIBIT

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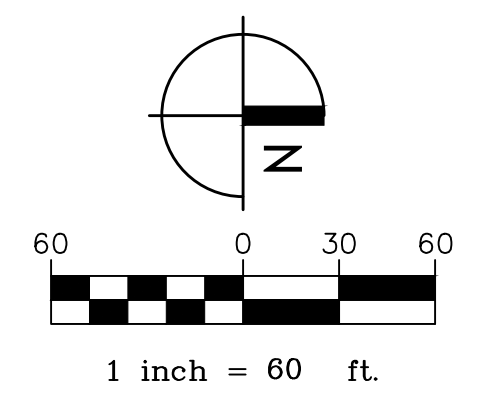
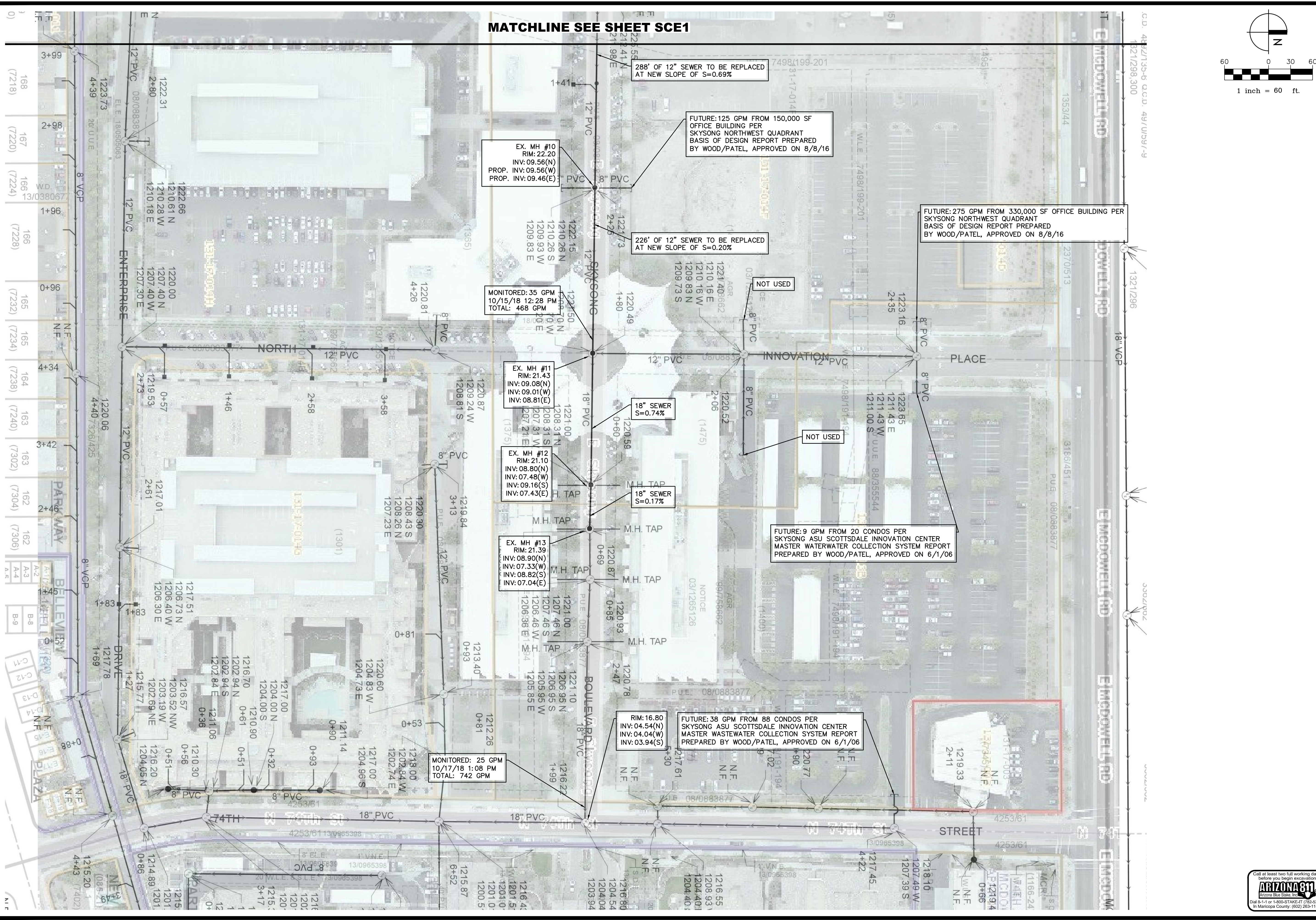
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 OF 2



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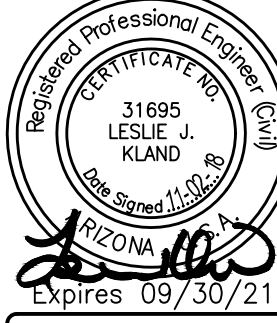
SCOTTSDALE RD AND MCDOWELL

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Sheet No.
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 OF 2



Scottsdale and McDowell Sewer Capacity Exhibit

APPENDIX A-2

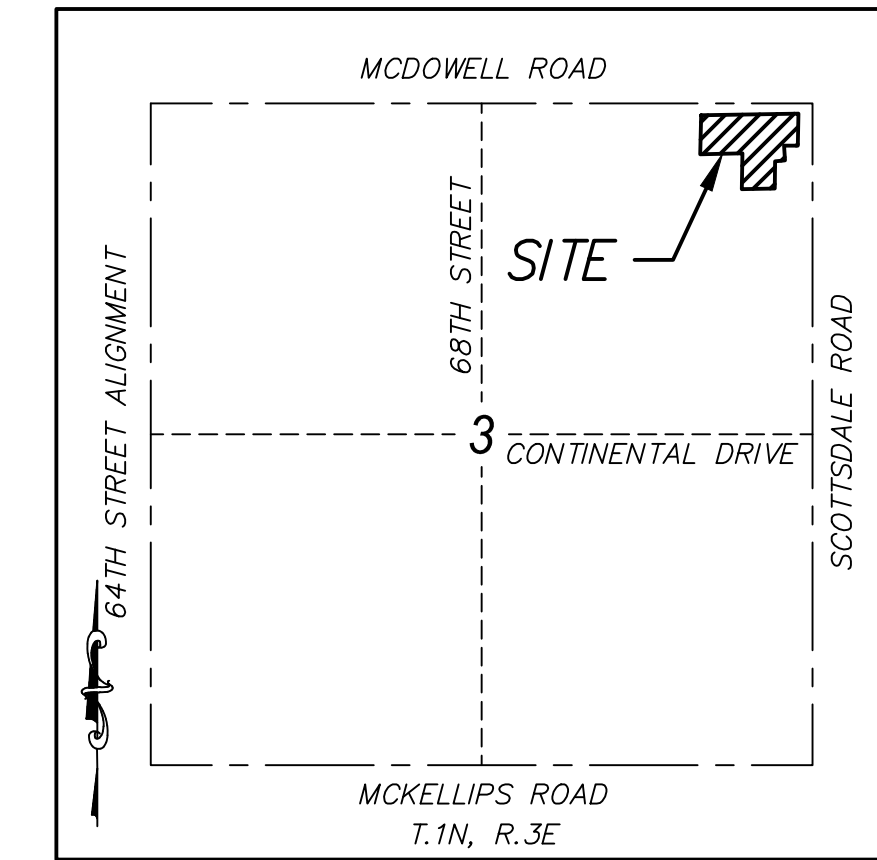
Water and Sewer Plans

PRELIMINARY WATER AND SEWER PLAN

FOR

SCOTTSDALE RD AND MCDOWELL

A PORTION OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 1 NORTH, RANGE 3 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.



VICINITY MAP
N.T.S.

ENGINEER

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DEVELOPER

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AN ARIZONA LIMITED LIABILITY COMPANY
7025 E. MCDOWELL RD., STE 10
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PH: (602) 821-4552
CONTACT: LEE MASHBURN

ARCHITECT

NELSEN PARTNERS ARCHITECTS & PLANNERS
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CONTACT: MICHAEL SAADY

ORB
2944 N. 44TH ST., STE 101
PHOENIX, AZ 85018
PH: (602) 957-4530
CONTACT: JUAN ASTIAZARAN

FLOOD ZONE

ACCORDING TO THE FLOOD INSURANCE RATE MAP #04013C2235L, DATED OCTOBER 16, 2013, THIS PROPERTY IS LOCATED IN FLOOD ZONE "X" (SHADED).

BASIS OF BEARING

THE EAST LINE OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 1 NORTH, RANGE 4 EAST, USING A BEARING OF SOUTH 00 DEGREES 48 MINUTES 46 SECONDS WEST.

BENCHMARK

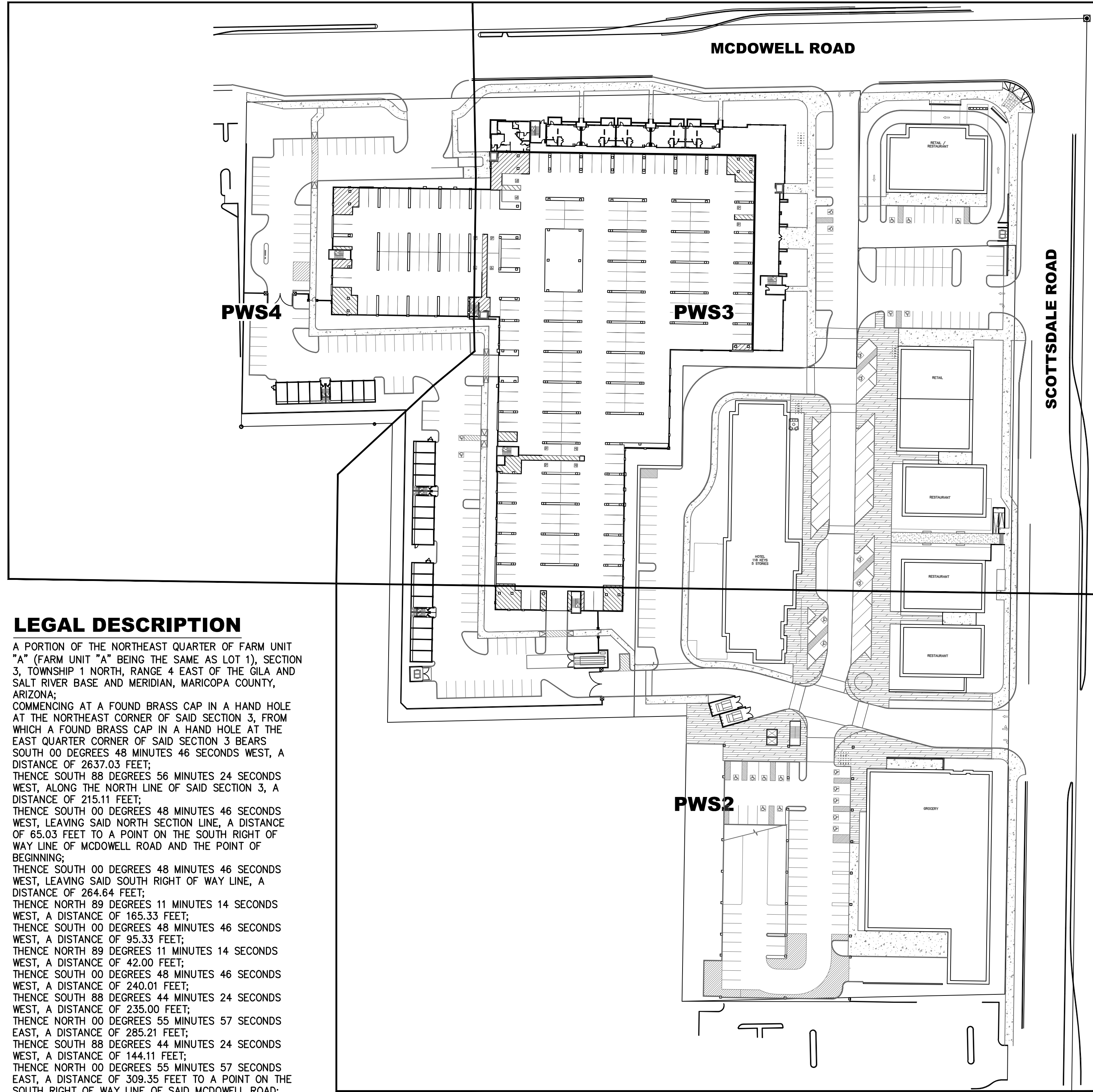
CITY OF SCOTTSDALE BRASS CAP IN HANDHOLE LOCATED AT THE INTERSECTION OF 68TH STREET AND MCDOWELL ROAD (NORTHERLY OF TWO MONUMENTS).
ELEVATION=1254.158' (NAVD 88, CITY OF SCOTTSDALE DATUM)

AREA

479,296 SQ.FT. OR 11.003 ACRES, MORE OR LESS.

ADDRESS

7047 E. MCDOWELL RD.
SCOTTSDALE, AZ 85257



KEYMAP

N.T.S.

LEGAL DESCRIPTION

A PORTION OF THE NORTHEAST QUARTER OF FARM UNIT "A" (FARM UNIT "A" BEING THE SAME AS LOT 1), SECTION 3, TOWNSHIP 1 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA;
COMMENCING AT A FOUND BRASS CAP IN A HAND HOLE AT THE NORTHEAST CORNER OF SAID SECTION 3, FROM WHICH A FOUND BRASS CAP IN A HAND HOLE AT THE EAST QUARTER CORNER OF SAID SECTION 3 BEARS SOUTH 00 DEGREES 48 MINUTES 46 SECONDS WEST, A DISTANCE OF 2637.03 FEET;
THENCE SOUTH 88 DEGREES 56 MINUTES 24 SECONDS WEST, ALONG THE NORTH LINE OF SAID SECTION 3, A DISTANCE OF 215.11 FEET;
THENCE SOUTH 00 DEGREES 48 MINUTES 46 SECONDS WEST, LEAVING SAID NORTH SECTION LINE, A DISTANCE OF 65.03 FEET TO A POINT ON THE SOUTH RIGHT OF WAY LINE OF MCDOWELL ROAD AND THE POINT OF BEGINNING;
THENCE SOUTH 00 DEGREES 48 MINUTES 46 SECONDS WEST, LEAVING SAID SOUTH RIGHT OF WAY LINE, A DISTANCE OF 264.64 FEET;
THENCE NORTH 89 DEGREES 11 MINUTES 14 SECONDS WEST, A DISTANCE OF 165.33 FEET;
THENCE SOUTH 00 DEGREES 48 MINUTES 46 SECONDS WEST, A DISTANCE OF 95.33 FEET;
THENCE NORTH 89 DEGREES 11 MINUTES 14 SECONDS WEST, A DISTANCE OF 42.00 FEET;
THENCE SOUTH 00 DEGREES 48 MINUTES 46 SECONDS WEST, A DISTANCE OF 240.01 FEET;
THENCE SOUTH 88 DEGREES 44 MINUTES 24 SECONDS WEST, A DISTANCE OF 235.00 FEET;
THENCE NORTH 00 DEGREES 55 MINUTES 57 SECONDS EAST, A DISTANCE OF 285.21 FEET;
THENCE SOUTH 88 DEGREES 44 MINUTES 24 SECONDS WEST, A DISTANCE OF 144.11 FEET;
THENCE NORTH 00 DEGREES 55 MINUTES 57 SECONDS EAST, A DISTANCE OF 309.35 FEET TO A POINT ON THE SOUTH RIGHT OF WAY LINE OF SAID MCDOWELL ROAD;
THENCE NORTH 88 DEGREES 56 MINUTES 24 SECONDS EAST, ALONG SAID SOUTH RIGHT OF WAY LINE, A DISTANCE OF 585.26 FEET TO THE POINT OF BEGINNING.

EXISTING	DESCRIPTION	PROPOSED
=====	CURB AND GUTTER	=====
-----	SIDEWALK	-----
-----	SINGLE CURB	-----
-----	RIM AND INVERT ELEVATION	-----
-----1499'-----	CONTOUR	-----49'-----
⊗	WATER FITTINGS	⊗ ⊗
⊙	WATER METER	⊙
---	WATER LINE	---
---	FIRE HYDRANT	⊕
---	SEWER LINE	---
⊙	SEWER MANHOLE/CLEANOUT	⊙
---	STORM DRAIN	---
---	CATCH BASIN	---
---	DRYWELL	---
---	UNDERGROUND STORAGE TANK	---
---	SCUPPER	---
---	FINISHED FLOOR	FF=43.81
---	GAS LINE/METER/VALVE	---
---	ELECTRIC LINE/METER	---
---	CABLE/JUNCTION BOX	---
---	OVERHEAD ELECTRIC/POLE	---
---	BOUNDARY LINE	---
---	CENTER LINE	---
---	EASEMENT	---
---	IRRIGATION	---
---	FIBER OPTIC	---

REVISIONS

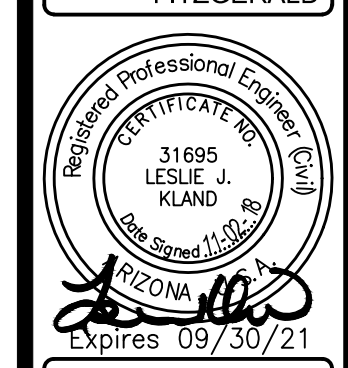
SCOTTSDALE RD AND MCDOWELL

PRELIMINARY WATER AND SEWER PLAN

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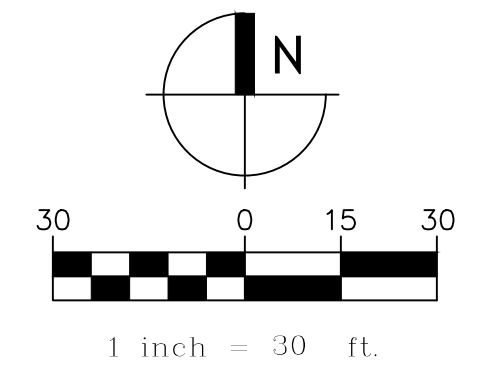
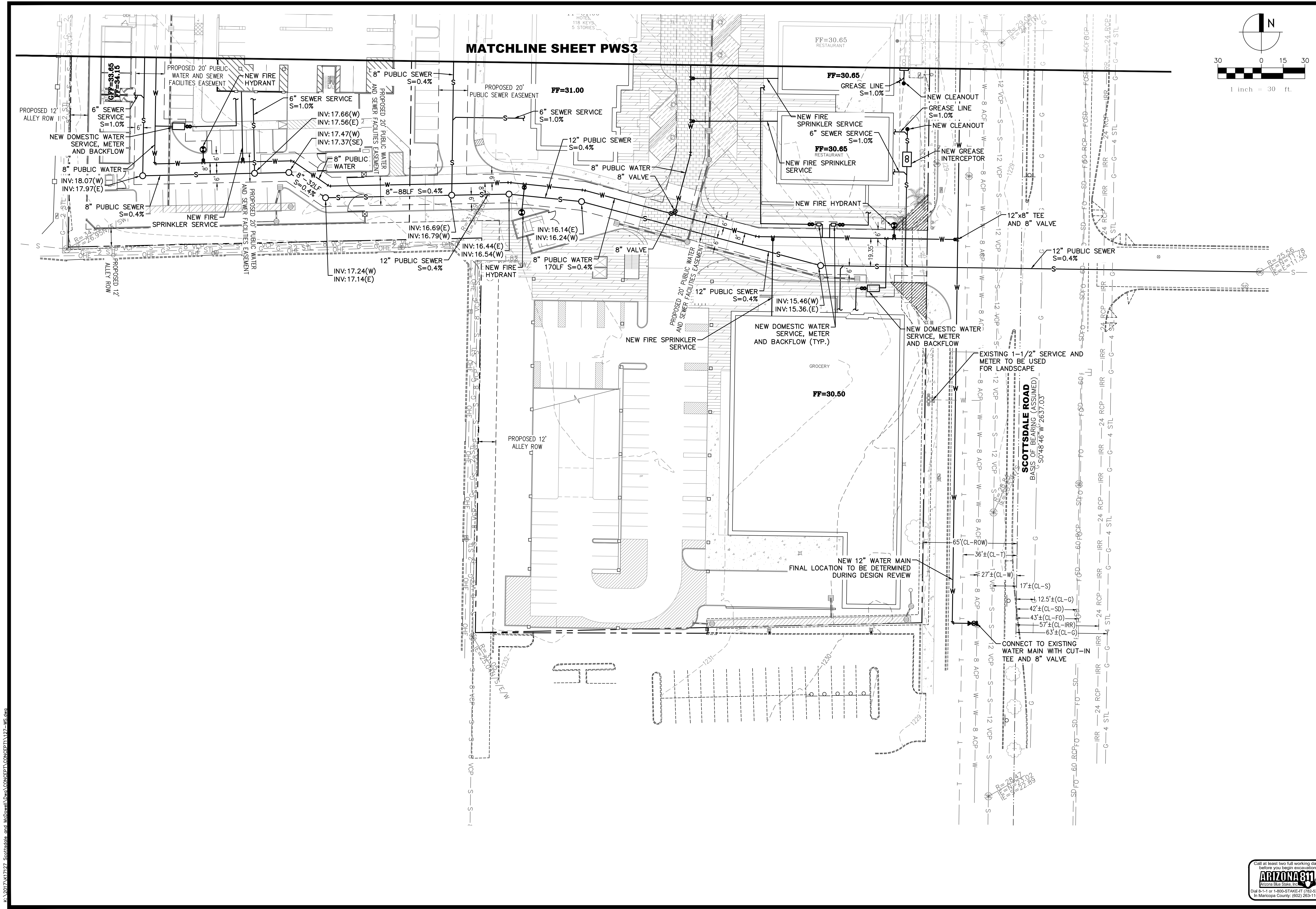
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OF 4



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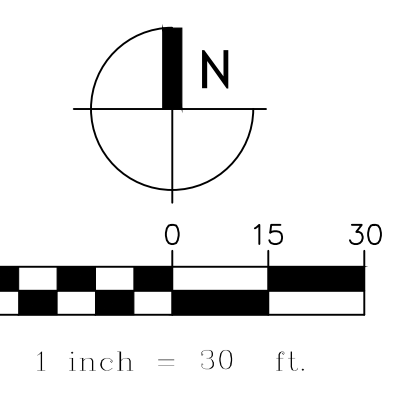
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Sheet No.

PWS2
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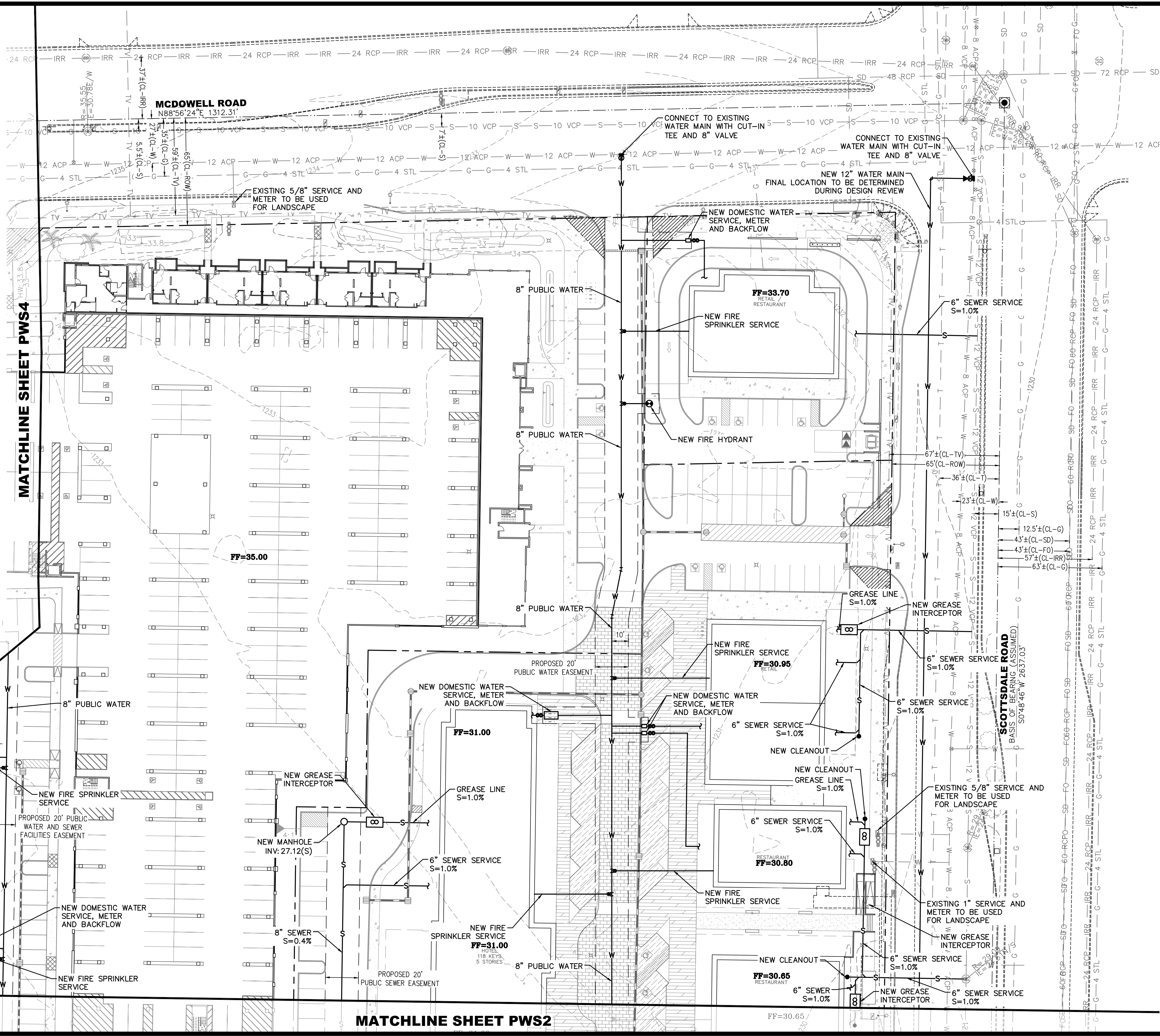
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Sheet No.

PWS3
OF 4

Call at least two full working days
before you begin excavation.

ARIZONA 811
Arizona Statewide
Dial 8-1-1 or 1-800-STAKE-IT (785-5348)
in Maricopa County: (602) 263-1100

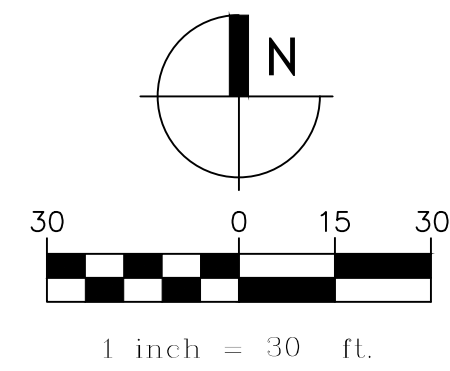
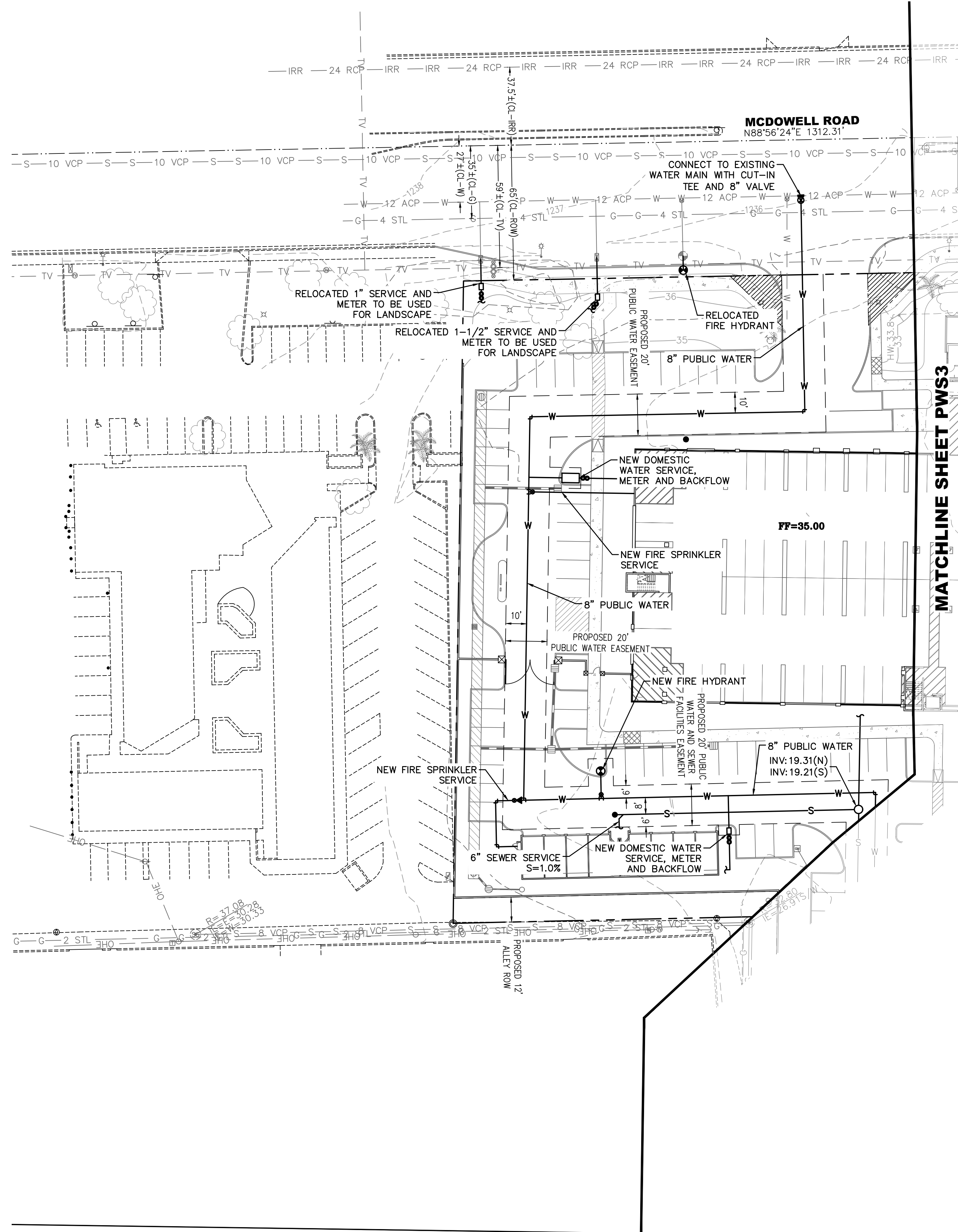


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MATCHLINE SHEET PWS2

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PRELIMINARY WATER AND SEWER PLAN

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APPENDIX A-3
Sanitary Sewer Calculations

OK ✓

Sewer Segment (MH to MH)	New Development per Segment				Population	Average Discharge				⁽¹⁾ New Development Average Discharge (gpd)	Peaking Factor				⁽²⁾ New Development Peak Discharge (gpd)	⁽³⁾ New Development Peak Discharge (gpm)	⁽⁴⁾ Future Development Peak Discharge (gpm)	Monitored Peak Discharge (gpm)	Total Peak Discharge (gpm)	Pipe Diameter (in)	Pipe Slope (ft/ft)	Depth Full (in)	% Full
	Multi-Family (units)	Hotel (Rooms)	Retail (sf)	Restaurant (sf)	Multi-Family (People per unit)	Multi-Family (gpd per person)	Hotel (gpd per room)	Retail (gpd per sf)	Restaurant (gpd per sf)		Multi-Family	Hotel	Retail	Restaurant									
1 to 2	0	0	9360	13880	-	-	-	0.5	1.2	21336	-	-	3	6	113976	79	0	498	577	12	0.0033	6.90	57.50
2 to 3	0	0	9360	13880	-	-	-	0.5	1.2	21336	-	-	3	6	113976	79	0	498	577	12	0.0031	7.03	58.60
4 to 5	138	0	0	0	1.7	100	-	-	-	23450	4	-	-	-	93840	65	0	0	65	8	0.0040	2.36	29.50
5 to 6	274	0	0	0	1.7	100	-	-	-	46580	4	-	-	-	186320	129	0	0	129	8	0.0040	3.40	42.50
7 to 6	0	116	0	0	-	-	380	-	-	44080	-	4.5	-	-	198360	138	0	0	138	8	0.0040	3.53	44.10
6 to 8	274	116	0	0	1.7	100	380	-	-	90660	4	4.5	-	-	384680	267	0	0	267	12	0.0040	4.21	35.10
8 to 9	274	116	20400	4000	1.7	100	380	0.5	1.2	105660	4	4.5	3	6	444080	308	0	0	308	12	0.0040	4.54	37.90
9 to 10	274	116	20400	4000	1.7	100	380	0.5	1.2	105660	4	4.5	3	6	444080	308	0	35	343	12	0.0069	4.16	34.70
10 to 11	274	116	20400	4000	1.7	100	380	0.5	1.2	105660	4	4.5	3	6	444080	308	125	35	468	12	0.0020	7.08	59.00
11 to 12	274	116	20400	4000	1.7	100	380	0.5	1.2	105660	4	4.5	3	6	444080	308	409	25	742	18	0.0074	5.21	29.00
12 to 13	274	116	20400	4000	1.7	100	380	0.5	1.2	105660	4	4.5	3	6	444080	308	409	25	742	18	0.0017	7.71	42.80

Scottsdale Rd

Sky Song Blvd.

Average Discharge for Multi-family = 1.7 People Per Unit x 100 gpd Per Person x Apartment Units
 Average Discharge for Hotel = 380 gpd Per Hotel Rooms x Hotel Rooms
 (1) Average Discharge for Retail = 0.5 gpd x Square Feet Of Retail Building
 Average Discharge for Restaurant = 1.2 gpd x Square Feet Of Restaurant Building

Peak Discharge for Multi-family = Average Discharge x 4 Peaking Factor
 Peak Discharge for Hotel = Average Discharge x 4.5 Peaking Factor
 (2) Peak Discharge for Retail = Average Discharge x 3 Peaking Factor
 Peak Discharge for Restaurant = Average Discharge x 6 Peaking Factor

(3) Gallons Per Day / 1440 Minutes Per Day = Gallons Per Minute

Future sewer discharge was taken from the Skysong Northwest Quadrant Basis of Design Report, Prepared by
 (4) Wood/Patel, Approved on 8/8/16 and Skysong ASU Scottsdale Innovation Center Master Wastewater Collection System Report, Prepared by Wood/Patel, Approved on 6/1/06.

Scottsdale Road Ex. 12" - MH 1 to MH 2 Worksheet for Circular Channel

Project Description	
Worksheet	Scottsdale Road Ex. 12" - MH 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

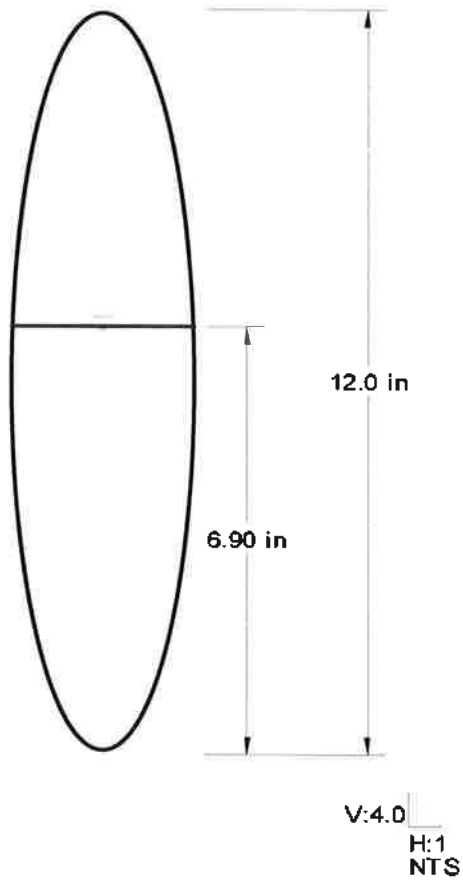
Input Data	
Mannings Coeffic	0.013
Channel Slope	003300 ft/ft
Diameter	12.0 in
Discharge	577 gal/mir

Results	
Depth	6.90 in
Flow Area	0.5 ft ²
Wetted Perime	1.72 ft
Top Width	0.00 ft
Critical Depth	0.48 ft
Percent Full	57.5 %
Critical Slope	0.006036 ft/ft
Velocity	2.75 ft/s
Velocity Head	0.12 ft
Specific Energ	8.31 in
Froude Numbe	0.71
Maximum Disc	988 gal/mir
Discharge Full	919 gal/mir
Slope Full	0.001302 ft/ft
Flow Type	Subcritical

**Scottsdale Road Ex. 12" - MH 1 to MH 2
Cross Section for Circular Channel**

Project Description	
Worksheet	Scottsdale Road Ex. 12" - MH 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefflc	0.013
Channel Slope	003300 ft/ft
Depth	6.90 in
Diameter	12.0 in
Discharge	577 gal/mir



Scottsdale Road Ex. 12" - MH 2 to MH 3
Worksheet for Circular Channel

Project Description	
Worksheet	Scottsdale Road Ex. 12" - MH 2
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

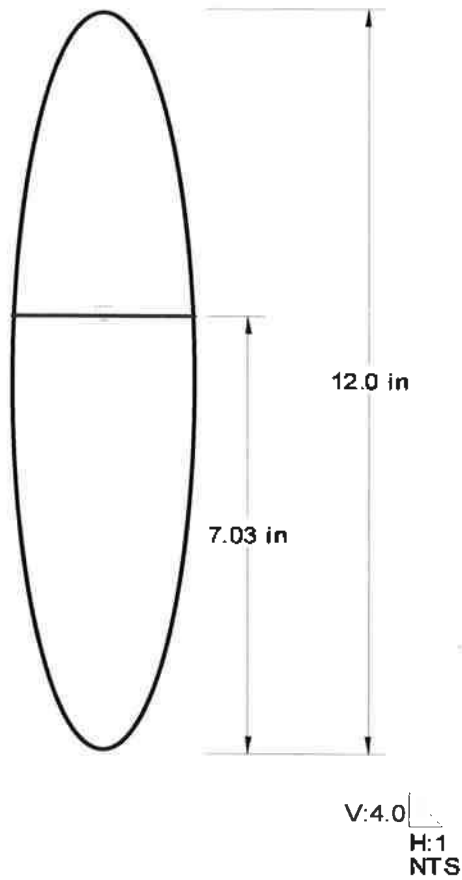
Input Data	
Mannings Coeffic	0.013
Channel Slope	003100 ft/ft
Diameter	12.0 in
Discharge	577 gal/mir

Results	
Depth	7.03 in
Flow Area	0.5 ft ²
Wetted Perime	1.74 ft
Top Width	0.00 ft
Critical Depth	0.48 ft
Percent Full	58.6 %
Critical Slope	0.006036 ft/ft
Velocity	2.69 ft/s
Velocity Head	0.11 ft
Specific Energ	8.38 in
Froude Numbe	0.68
Maximum Disc	958 gal/mir
Discharge Full	890 gal/mir
Slope Full	0.001302 ft/ft
Flow Type	Subcritical

Scottsdale Road Ex. 12" - MH 2 to MH 3
Cross Section for Circular Channel

Project Description	
Worksheet	Scottsdale Road Ex. 12" - MH 2
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeff	0.013
Channel Slope	003100 ft/ft
Depth	7.03 in
Diameter	12.0 in
Discharge	577 gal/mir



**Site Prop. 8" - MH 4 to MH 5
Worksheet for Circular Channel**

Project Description	
Worksheet	Site Prop. 8" - MH 4 to 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

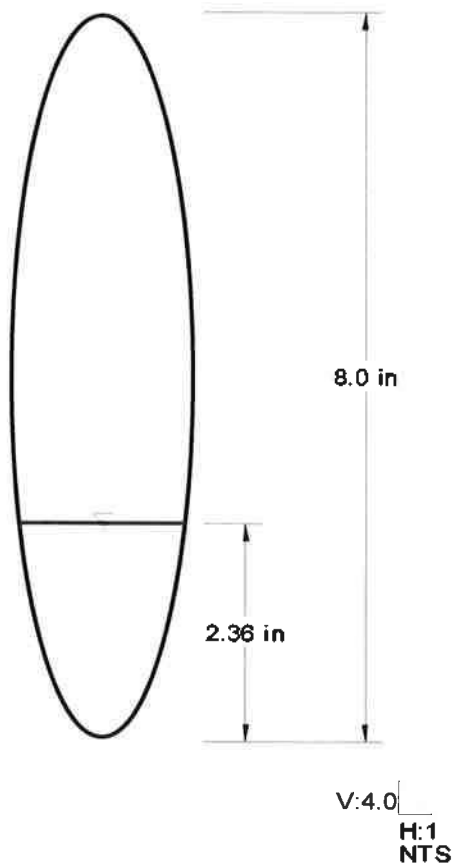
Input Data	
Mannings Coeff	0.013
Channel Slope	004000 ft/ft
Diameter	8.0 in
Discharge	65 gal/mir

Results	
Depth	2.36 in
Flow Area	0.1 ft ²
Wetted Perime	0.77 ft
Top Width	0.00 ft
Critical Depth	0.17 ft
Percent Full	29.5 %
Critical Slope	0.006453 ft/ft
Velocity	1.68 ft/s
Velocity Head	0.04 ft
Specific Energ	2.89 in
Froude Numbe	0.79
Maximum Disc	369 gal/mir
Discharge Full	343 gal/mir
Slope Full	0.000144 ft/ft
Flow Type	Subcritical

Site Prop. 8" - MH 4 to MH 5
Cross Section for Circular Channel

Project Description	
Worksheet	Site Prop. 8" - MH 4 to l
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeff	0.013
Channel Slope	004000 ft/ft
Depth	2.36 in
Diameter	8.0 in
Discharge	65 gal/mir



**Site Prop. 8" - MH 5 to MH 6
Worksheet for Circular Channel**

Project Description	
Worksheet	Site Prop. 8" - MH 5 to 6
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

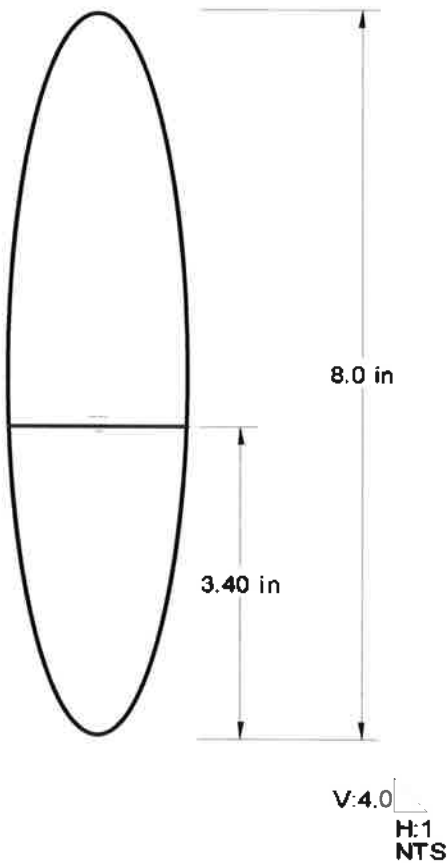
Input Data	
Mannings Coeffic	0.013
Channel Slope	004000 ft/ft
Diameter	8.0 in
Discharge	129 gal/mir

Results	
Depth	3.40 in
Flow Area	0.1 ft ²
Wetted Perime	0.95 ft
Top Width	0.00 ft
Critical Depth	0.25 ft
Percent Full	42.5 %
Critical Slope	0.006514 ft/ft
Velocity	2.03 ft/s
Velocity Head	0.06 ft
Specific Energ;	4.17 in
Froude Numbe	0.77
Maximum Disc	369 gal/mir
Discharge Full	343 gal/mir
Slope Full	0.000566 ft/ft
Flow Type	Subcritical

Site Prop. 8" - MH 5 to MH 6
Cross Section for Circular Channel

Project Description	
Worksheet	Site Prop. 8" - MH 5 to 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeffic	0.013
Channel Slope	004000 ft/ft
Depth	3.40 in
Diameter	8.0 in
Discharge	129 gal/mir



**Site Prop. 8" - MH 7 to MH 6
Worksheet for Circular Channel**

Project Description	
Worksheet	Site Prop. 8" - MH 7 to MH 6
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

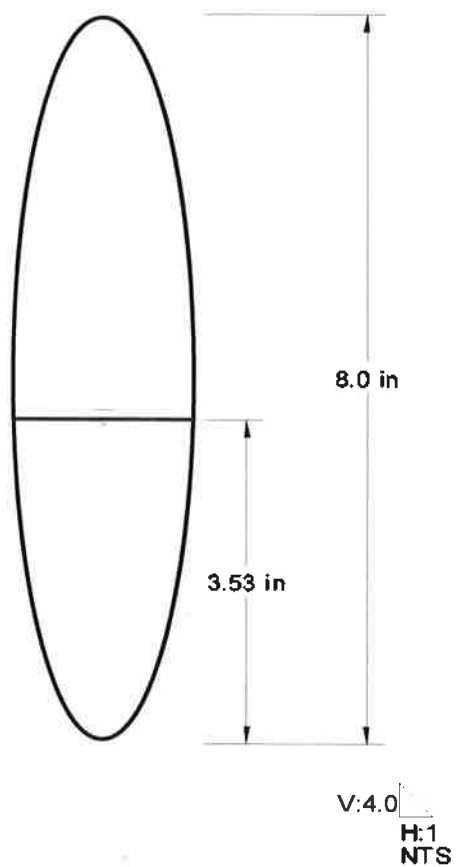
Input Data	
Mannings Coeff	0.013
Channel Slope	0.004000 ft/ft
Diameter	8.0 in
Discharge	138 gal/mir

Results	
Depth	3.53 in
Flow Area	0.1 ft ²
Wetted Perime	0.97 ft
Top Width	0.00 ft
Critical Depth	0.26 ft
Percent Full	44.1 %
Critical Slope	0.006554 ft/ft
Velocity	2.07 ft/s
Velocity Head	0.07 ft
Specific Energy	4.33 in
Froude Number	0.77
Maximum Disc	369 gal/mir
Discharge Full	343 gal/mir
Slope Full	0.000647 ft/ft
Flow Type	Subcritical

Site Prop. 8" - MH 7 to MH 6
Cross Section for Circular Channel

Project Description	
Worksheet	Site Prop. 8" - MH 7 to f
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeffic	0.013
Channel Slope	004000 ft/ft
Depth	3.53 in
Diameter	8.0 in
Discharge	138 gal/mir



Site Prop. 12" - MH 6 to MH 8
Worksheet for Circular Channel

Project Description	
Worksheet	Site Prop. 12" - MH 6 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

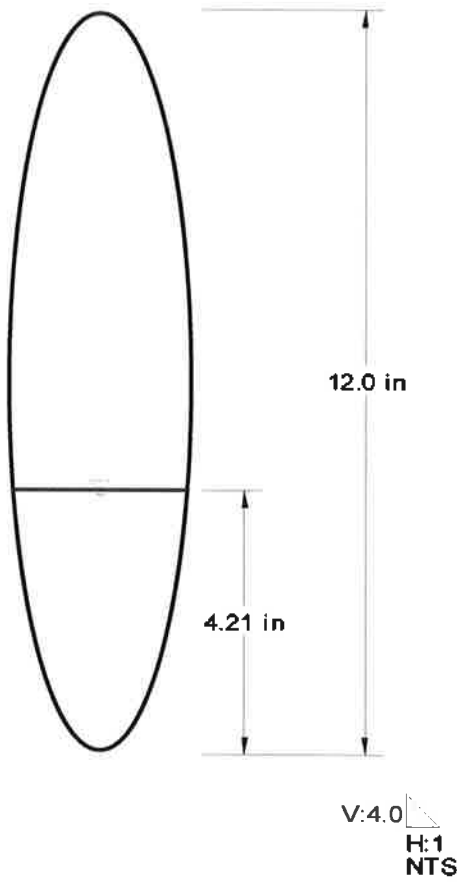
Input Data	
Mannings Coeffic	0.013
Channel Slope	004000 ft/ft
Diameter	12.0 in
Discharge	267 gal/mir

Results	
Depth	4.21 in
Flow Area	0.2 ft ²
Wetted Perime	1.27 ft
Top Width	0.00 ft
Critical Depth	0.32 ft
Percent Full	35.1 %
Critical Slope	0.005622 ft/ft
Velocity	2.42 ft/s
Velocity Head	0.09 ft
Specific Energ	5.30 in
Froude Numbe	0.84
Maximum Disc	1,088 gal/mir
Discharge Full	1,011 gal/mir
Slope Full	0.000279 ft/ft
Flow Type	Subcritical

**Site Prop. 12" - MH 6 to MH 8
Cross Section for Circular Channel**

Project Description	
Worksheet	Site Prop. 12" - MH 6 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeffc	0.013
Channel Slope	004000 ft/ft
Depth	4.21 in
Diameter	12.0 in
Discharge	267 gal/mir



**Site Prop. 12" - MH 8 to MH 9
Worksheet for Circular Channel**

Project Description	
Worksheet	Site Prop. 12" - MH 8 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

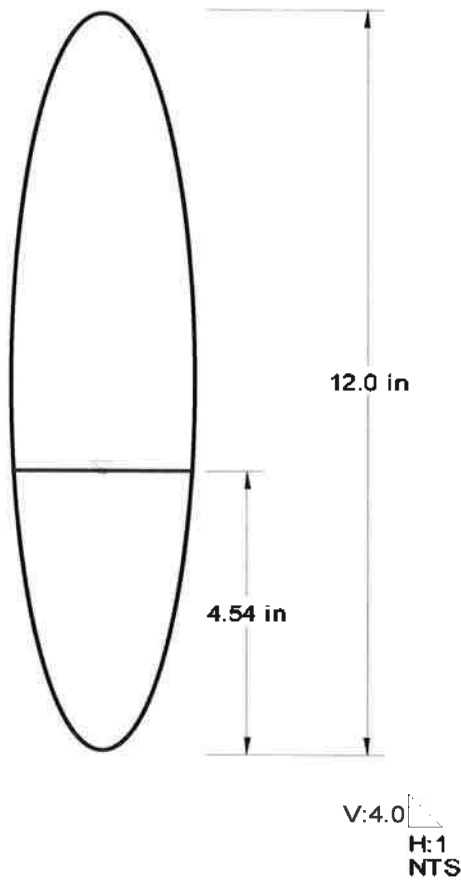
Input Data	
Mannings Coeff	0.013
Channel Slope	004000 ft/ft
Diameter	12.0 in
Discharge	308 gal/mir

Results	
Depth	4.54 in
Flow Area	0.3 ft ²
Wetted Perime	1.33 ft
Top Width	0.00 ft
Critical Depth	0.35 ft
Percent Full	37.9 %
Critical Slope	0.005645 ft/ft
Velocity	2.52 ft/s
Velocity Head	0.10 ft
Specific Energ	5.73 in
Froude Numbe	0.84
Maximum Disc	1,088 gal/mir
Discharge Full	1,011 gal/mir
Slope Full	0.000371 ft/ft
Flow Type	Subcritical

Site Prop. 12" - MH 8 to MH 9
Cross Section for Circular Channel

Project Description	
Worksheet	Site Prop. 12" - MH 8 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeffic	0.013
Channel Slope	004000 ft/ft
Depth	4.54 in
Diameter	12.0 in
Discharge	308 gal/mir



**Skysong Ex. 12" - MH 9 to MH 10
Worksheet for Circular Channel**

Project Description	
Worksheet	Skysong Ex. 12" - MH 9 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

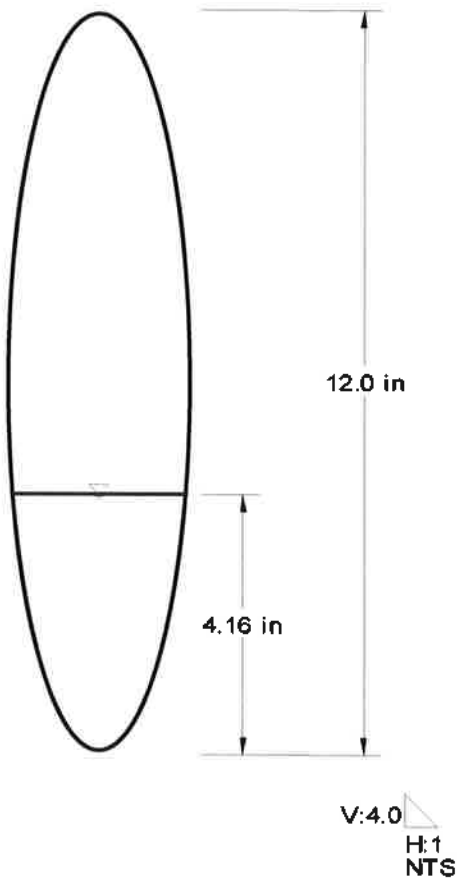
Input Data	
Mannings Coeff	0.013
Channel Slope	0.006900 ft/ft
Diameter	12.0 in
Discharge	343 gal/mir

Results	
Depth	4.16 in
Flow Area	0.2 ft ²
Wetted Perime	1.26 ft
Top Width	0.00 ft
Critical Depth	0.37 ft
Percent Full	34.7 %
Critical Slope	0.005676 ft/ft
Velocity	3.16 ft/s
Velocity Head	0.16 ft
Specific Energ	6.02 in
Froude Numbe	1.11
Maximum Disc	1,429 gal/mir
Discharge Full	1,328 gal/mir
Slope Full	0.000460 ft/ft
Flow Type	Supercritical

Skysong Ex. 12" - MH 9 to MH 10 Cross Section for Circular Channel

Project Description	
Worksheet	Skysong Ex. 12" - MH 9 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeff	0.013
Channel Slope	006900 ft/ft
Depth	4.16 in
Diameter	12.0 in
Discharge	343 gal/mir



**Skysong Ex. 12" - MH 10 to MH 11
Worksheet for Circular Channel**

Project Description	
Worksheet	Skysong Ex. 12" - MH 10 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

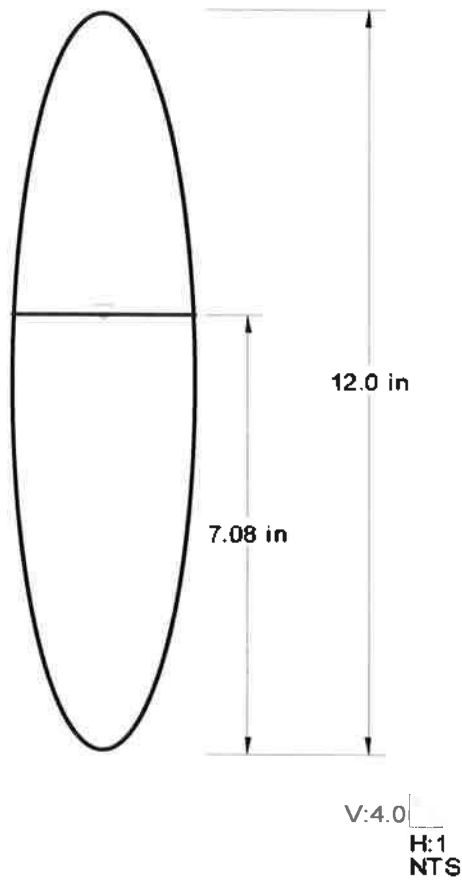
Input Data	
Mannings Coeffic	0.013
Channel Slope	0.02000 ft/ft
Diameter	12.0 in
Discharge	468 gal/mir

Results	
Depth	7.08 in
Flow Area	0.5 ft ²
Wetted Perime	1.75 ft
Top Width	0.00 ft
Critical Depth	0.43 ft
Percent Full	59.0 %
Critical Slope	0.005829 ft/ft
Velocity	2.16 ft/s
Velocity Head	0.07 ft
Specific Energ	7.95 in
Froude Numbe	0.54
Maximum Disc	769 gal/mir
Discharge Full	715 gal/mir
Slope Full	0.000857 ft/ft
Flow Type	Subcritical

Skysong Ex. 12" - MH 10 to MH 11 Cross Section for Circular Channel

Project Description	
Worksheet	Skysong Ex. 12" - MH 10 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeff	0.013
Channel Slope	002000 ft/ft
Depth	7.08 in
Diameter	12.0 in
Discharge	468 gal/mir



Skysong Ex. 18" - MH 11 to MH 12 Worksheet for Circular Channel

Project Description	
Worksheet	Skysong Ex. 18" - MH 11 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

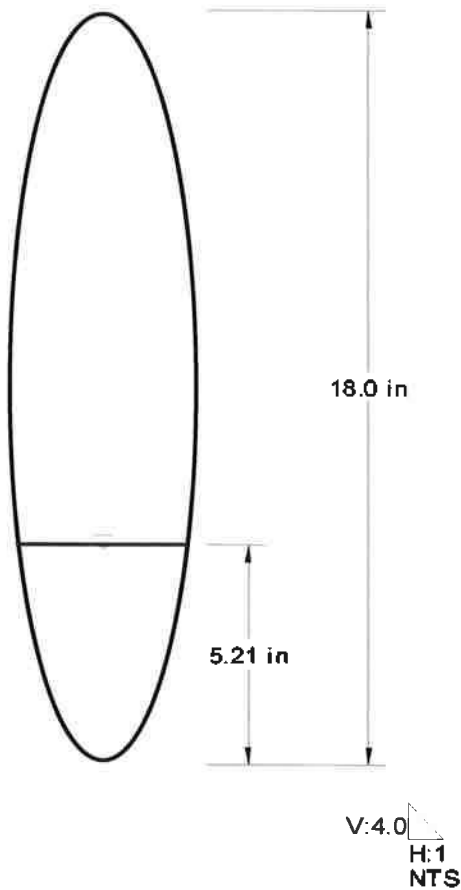
Input Data	
Mannings Coeffic	0.013
Channel Slope	007400 ft/ft
Diameter	18.0 in
Discharge	742 gal/mir

Results	
Depth	5.21 in
Flow Area	0.4 ft ²
Wetted Perime	1.70 ft
Top Width	0.00 ft
Critical Depth	0.48 ft
Percent Full	29.0 %
Critical Slope	0.004912 ft/ft
Velocity	3.89 ft/s
Velocity Head	0.24 ft
Specific Energ	8.04 in
Froude Numbe	1.23
Maximum Disc	4,363 gal/mir
Discharge Full	4,055 gal/mir
Slope Full	0.000248 ft/ft
Flow Type	supercritical

Skysong Ex. 18" - MH 11 to MH 12 Cross Section for Circular Channel

Project Description	
Worksheet	Skysong Ex. 18" - MH 11 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeff	0.013
Channel Slope	007400 ft/ft
Depth	5.21 in
Diameter	18.0 in
Discharge	742 gal/mir



**Skysong Ex. 18" - MH 12 to MH 13
Worksheet for Circular Channel**

Project Description	
Worksheet	Skysong Ex. 18" - MH 12 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

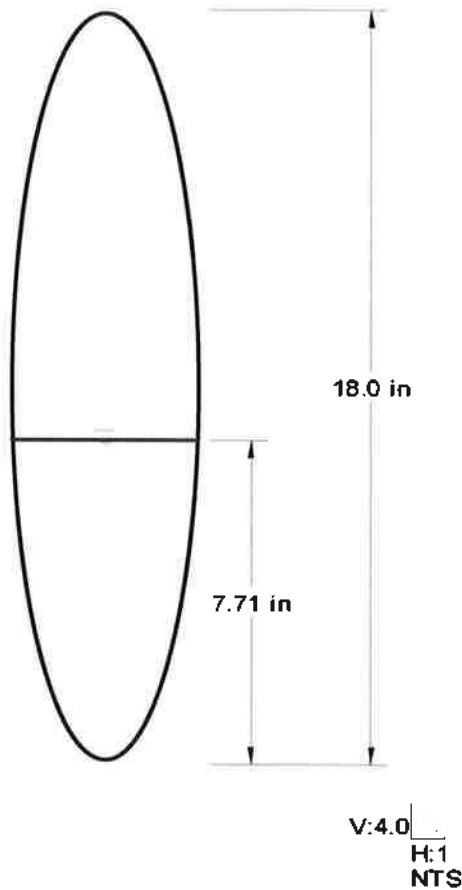
Input Data	
Mannings Coeffic	0.013
Channel Slope	001700 ft/ft
Diameter	18.0 in
Discharge	742 gal/mir

Results	
Depth	7.71 in
Flow Area	0.7 ft ²
Wetted Perime	2.14 ft
Top Width	0.00 ft
Critical Depth	0.48 ft
Percent Full	42.8 %
Critical Slope	0.004912 ft/ft
Velocity	2.29 ft/s
Velocity Head	0.08 ft
Specific Energy	8.69 in
Froude Numbe	0.58
Maximum Disc	2.091 gal/mir
Discharge Full	1,944 gal/mir
Slope Full	0.000248 ft/ft
Flow Type	Subcritical

**Skysong Ex. 18" - MH 12 to MH 13
Cross Section for Circular Channel**

Project Description	
Worksheet	Skysong Ex. 18" - MH 12 to MH 13
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coeffic	0.013
Channel Slope	001700 ft/ft
Depth	7.71 in
Diameter	18.0 in
Discharge	742 gal/mir



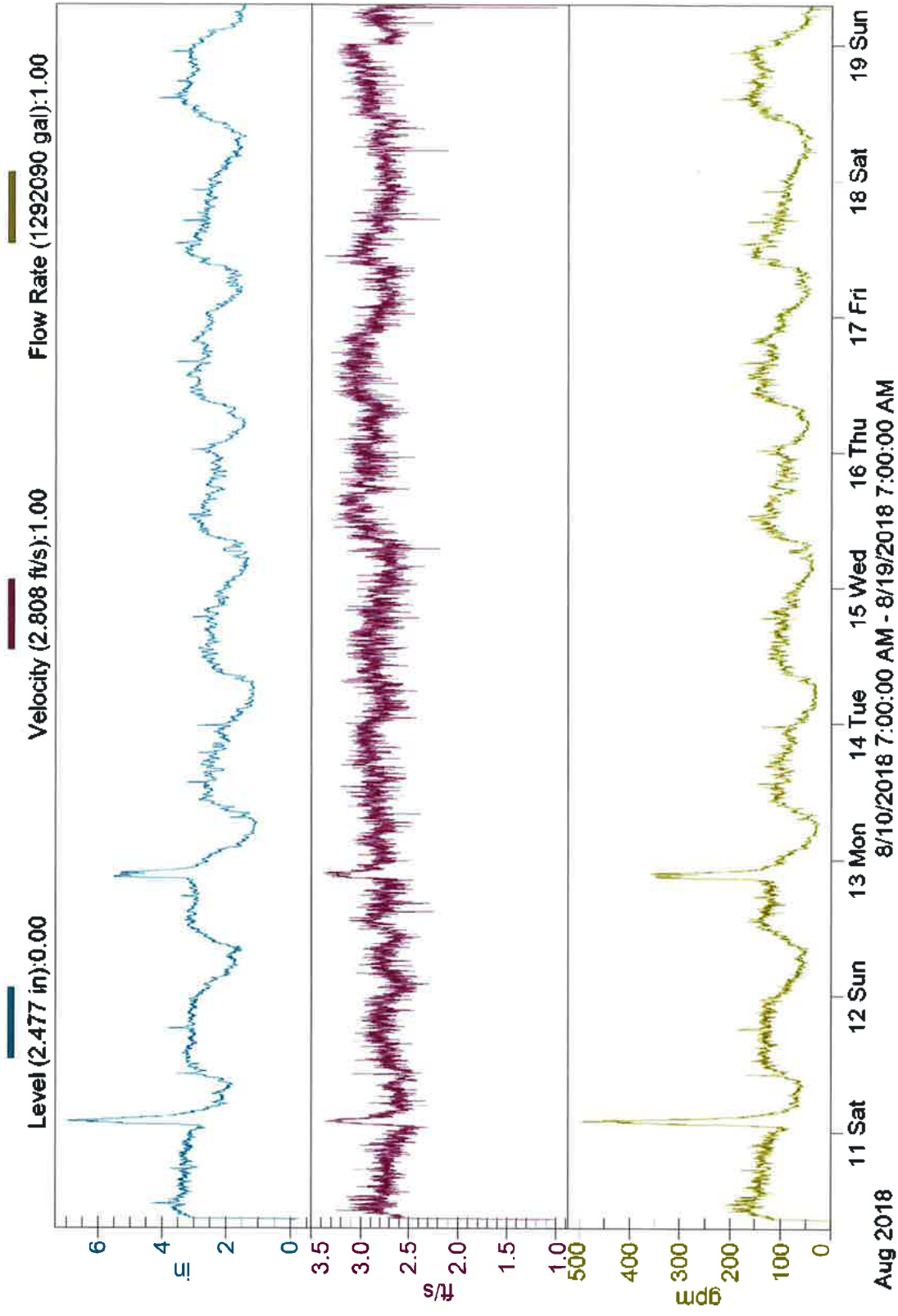
APPENDIX A-4

Sanitary Sewer flow monitoring Data

The following pages include summary graphs for all the sewer manholes that were monitored. We have also included the raw data for the highest peak flows for the systems that we are discharging to. Due to size we did not include all the raw data. If further information is desired we can provide the digital data separately.

Papago Plaza Scottsdale 12 inch Line

Flowlink 5

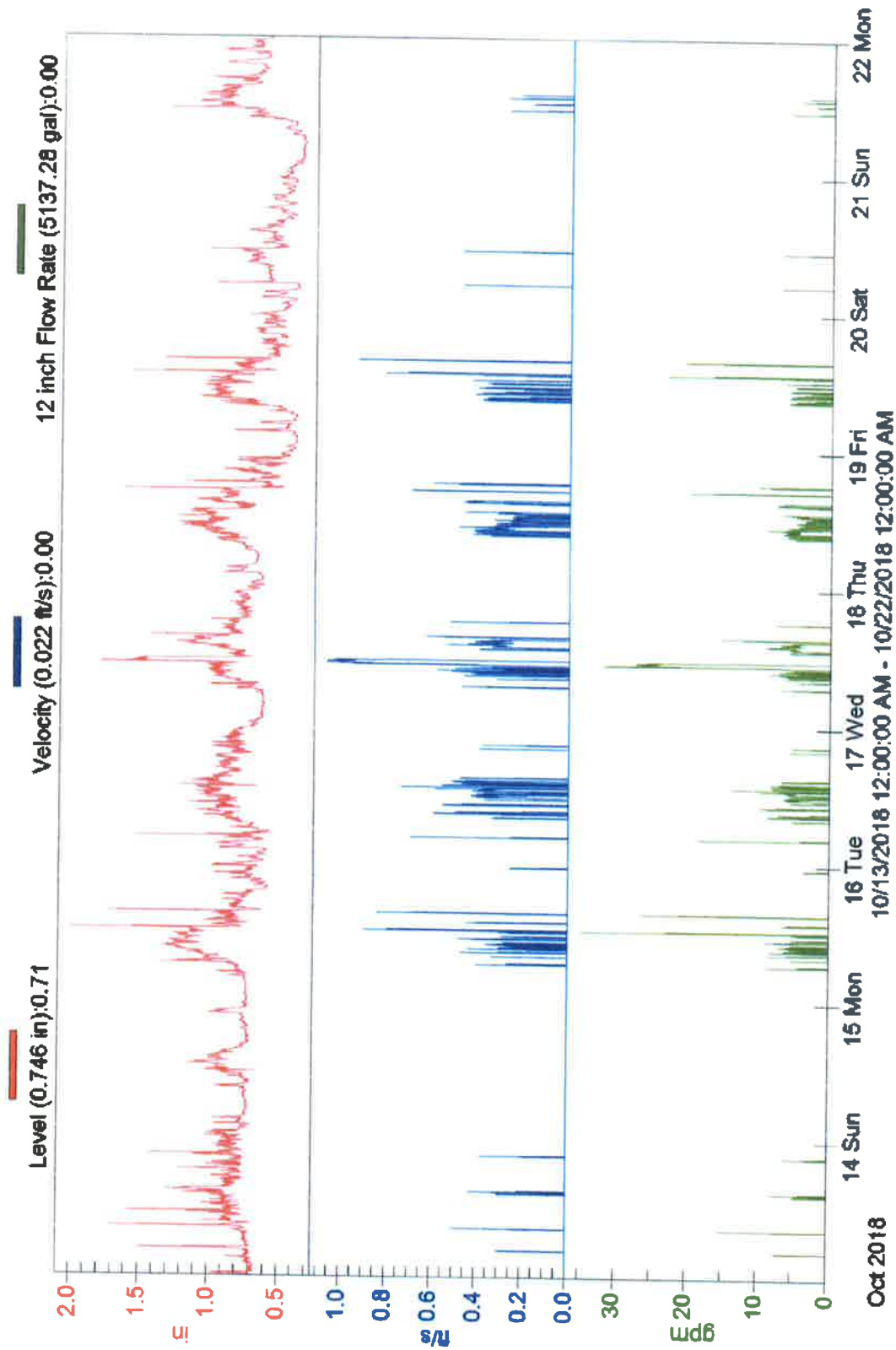


Site Name	Papago Plaza Scottsdale 12 inch Line		
Isco Quantity	Level	Velocity	Flow Rate
Label	Level	Velocity	Flow Rate
Units	in	ft/s	gpm
Resolution	0.1	0.1	0.1
Significant Digits	0	0	0

8/11/2018 0:10	6.914	3.366	498.572
8/11/2018 0:14	6.983	3.281	486.552
8/11/2018 0:12	6.906	3.301	484.199
8/11/2018 0:16	6.712	3.319	471.386
8/11/2018 0:22	6.241	3.262	453.243
8/11/2018 0:18	6.582	3.244	445.335
8/11/2018 0:02	6.379	3.221	423.89
8/11/2018 0:20	6.413	3.182	419.191
8/11/2018 0:00	6.312	3.179	410.535
8/11/2018 0:24	6.099	3.264	408.413
8/11/2018 0:04	6.176	3.185	400.525
8/11/2018 0:08	6.075	3.223	393.582
8/11/2018 0:26	5.944	3.253	393.465
8/10/2018 23:58	6.067	3.196	393.458
8/11/2018 0:06	6.011	3.214	392.034
8/10/2018 23:56	5.799	3.257	381.824
8/12/2018 19:48	5.309	3.387	360.207
8/11/2018 0:28	5.732	3.153	358.992
8/12/2018 19:32	5.276	3.354	352.293
8/12/2018 19:10	5.329	3.294	347.904
8/12/2018 19:50	5.289	3.307	346.419
8/12/2018 19:14	5.508	3.184	345.762
8/11/2018 0:32	5.4	3.238	345.279
8/12/2018 19:28	5.35	3.265	345.265
8/12/2018 19:56	5.204	3.333	342.896
8/12/2018 19:12	5.526	3.138	340.024
8/12/2018 19:06	5.472	3.149	337.375
8/12/2018 19:30	5.312	3.232	337.055
8/12/2018 19:16	5.289	3.234	335.481
8/11/2018 0:30	5.602	3.06	333.358
8/12/2018 19:24	5.106	3.298	329.461
8/10/2018 23:54	5.479	3.084	327.76
8/12/2018 19:22	4.982	3.182	326.569
8/12/2018 19:34	5.276	3.168	324.627
8/12/2018 19:54	5.076	3.277	323.906
8/10/2018 23:46	5.401	3.097	323.72
8/11/2018 0:34	5.275	3.153	322.263
8/10/2018 23:48	5.398	3.078	320.55
8/12/2018 19:18	5.079	3.248	320.085

8/11/2018 0:38	5.26	2.991	319.079
8/12/2018 19:26	5.096	3.226	318.393
8/12/2018 19:46	4.922	3.312	315.783
8/12/2018 19:36	5.079	3.204	313.733
8/12/2018 19:38	5.015	3.125	312.26
8/12/2018 19:04	5.21	3.113	311.232
8/10/2018 23:50	5.307	3.013	303.707
8/12/2018 19:58	5.075	3.125	302.383
8/12/2018 19:52	5.111	3.18	299.527
8/12/2018 19:08	5.51	3.184	297.058
8/12/2018 19:02	5.036	3.094	294.829
8/12/2018 19:20	4.987	3.12	294.75
8/12/2018 20:00	4.892	3.133	289.034
8/10/2018 23:52	5.223	2.995	284.33
8/10/2018 23:44	5.08	2.991	283.589
8/11/2018 0:36	5.204	2.91	280.897
8/11/2018 0:42	4.955	3.02	278.536
8/12/2018 19:40	4.729	3.104	272.618
8/12/2018 19:42	4.624	3.156	271.003
8/12/2018 19:44	4.568	3.143	265.05
8/11/2018 0:40	4.957	2.904	262.688
8/10/2018 23:42	4.993	2.88	261.938
8/12/2018 20:02	4.663	3.046	260.135
8/12/2018 19:00	4.491	3.15	259.931
8/12/2018 20:08	4.207	3.004	249.639
8/12/2018 20:04	4.499	3.044	247.684
8/11/2018 0:48	4.621	2.952	245.324
8/10/2018 23:40	4.824	2.812	241.209
8/11/2018 0:44	4.75	2.814	236.603
8/12/2018 20:10	4.117	3.098	225.48
8/11/2018 0:46	4.685	2.754	224.645
8/12/2018 20:06	4.374	2.924	224.51
8/11/2018 0:50	4.69	2.715	219.905
8/11/2018 0:52	4.122	2.666	218.71
8/18/2018 12:48	3.865	3.21	217.833
8/12/2018 20:16	4.097	3.016	215.271
8/11/2018 0:54	4.227	2.914	213.277
8/10/2018 9:40	4.343	2.841	212.788
8/12/2018 20:12	4.059	2.99	209.788
8/12/2018 20:22	3.679	3.005	203.938
8/12/2018 20:14	3.929	3.02	203.766
8/10/2018 8:32	3.619	3.255	203.005
8/18/2018 12:50	4.132	2.878	202.937
8/18/2018 21:06	3.741	3.151	202.8
8/10/2018 9:00	3.752	3.064	195.412
8/10/2018 8:56	3.673	3.125	195.353
8/10/2018 9:36	3.679	3.106	194.064

SkySong 12 Inch Flowlink 5



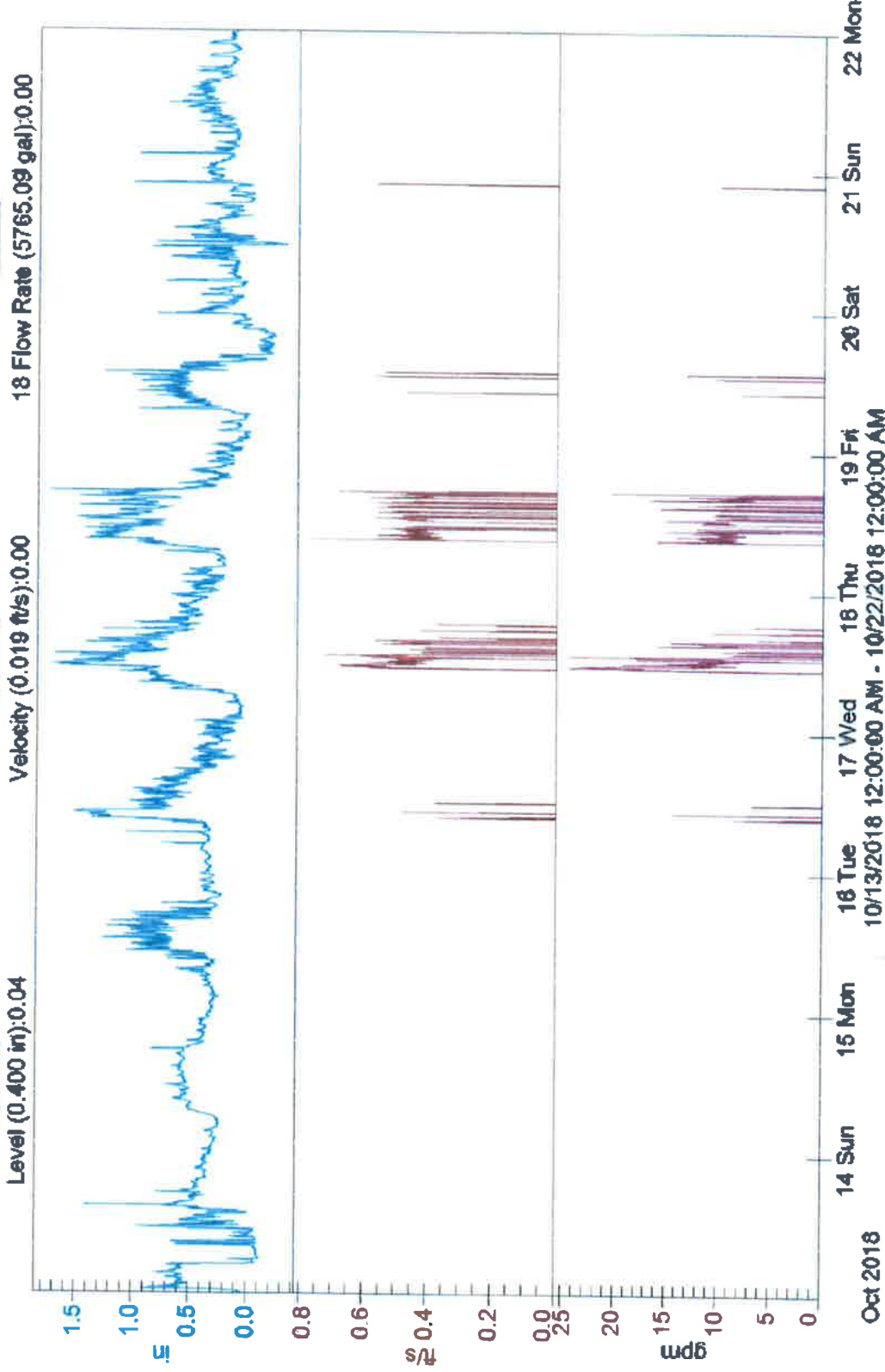
Skysong 12 inch Line Data 1

Isco Quantity Label Units Resolution Significant Digits	Level Level in 0.1 0	Velocity Velocity ft/s 0.1 0	Flow Rate 2 inch Flow Rate gpm 0.1 0
10/15/2018 12:28	2.013	0.897	34.993
10/17/2018 10:48	1.797	0.956	31.62
10/17/2018 11:16	1.506	1.064	27.226
10/17/2018 11:08	1.557	0.999	26.826
10/17/2018 10:58	1.577	0.974	26.654
10/17/2018 10:56	1.475	1.069	26.537
10/15/2018 15:26	1.733	0.845	26.51
10/17/2018 11:24	1.492	1.032	26.046
10/17/2018 11:10	1.491	1.029	25.931
10/17/2018 11:22	1.489	1.03	25.924
10/17/2018 11:04	1.528	0.991	25.887
10/17/2018 11:00	1.52	0.983	25.486
10/17/2018 11:20	1.524	0.975	25.378
10/17/2018 11:14	1.504	0.987	25.206
10/17/2018 11:06	1.472	1.017	25.178
10/17/2018 11:12	1.515	0.941	24.292
10/17/2018 10:54	1.497	0.956	24.227
10/17/2018 11:02	1.476	0.967	24.031
10/17/2018 10:50	1.465	0.967	23.775
10/17/2018 11:18	1.46	0.961	23.495
10/19/2018 13:28	1.601	0.822	23.005
10/17/2018 10:52	1.463	0.871	21.356
10/19/2018 15:46	1.355	0.937	20.548
10/18/2018 17:04	1.642	0.688	19.976
10/17/2018 11:26	1.321	0.901	19.019
10/16/2018 4:38	1.543	0.7	18.561
10/19/2018 13:26	1.38	0.701	15.775
10/15/2018 15:28	1.597	0.564	15.731
10/13/2018 8:40	1.718	0.5	15.504
10/17/2018 15:36	1.452	0.635	15.41
10/16/2018 13:20	1.23	0.74	14.088
10/18/2018 17:06	1.24	0.706	13.58
10/17/2018 10:46	1.148	0.789	13.568
10/15/2018 15:24	1.508	0.495	12.675
10/15/2018 12:30	1.104	0.691	11.212
10/18/2018 17:02	1.305	0.538	11.149
10/17/2018 11:28	1.001	0.754	10.598
10/19/2018 13:30	1.125	0.626	10.446
10/18/2018 18:18	1.13	0.607	10.202
10/19/2018 15:44	1.082	0.639	10.069

10/16/2018 10:16	1.169	0.559	9.875
10/18/2018 18:16	1.224	0.507	9.575
10/16/2018 13:08	1.109	0.586	9.57
10/15/2018 15:22	1.155	0.55	9.535
10/19/2018 15:48	1.112	0.56	9.183
10/17/2018 14:18	1.129	0.544	9.132
10/17/2018 15:32	1.136	0.536	9.078
10/15/2018 10:58	1.208	0.483	8.953
10/18/2018 10:46	1.194	0.491	8.945
10/17/2018 15:34	1.229	0.469	8.921
10/15/2018 6:32	1.347	0.401	8.711
10/17/2018 14:24	1.255	0.443	8.674
10/15/2018 8:34	1.192	0.473	8.599
10/16/2018 8:44	1.015	0.595	8.537
10/15/2018 9:14	1.235	0.442	8.452
10/17/2018 9:50	1.017	0.585	8.404
10/16/2018 4:40	1.117	0.506	8.355
10/16/2018 14:18	1.117	0.505	8.348
10/15/2018 6:30	1.308	0.395	8.223
10/16/2018 10:18	1.08	0.52	8.165
10/16/2018 14:16	1.093	0.502	8.021
10/18/2018 17:00	1.068	0.518	8.013
10/16/2018 14:00	1.143	0.467	7.985
10/13/2018 15:06	1.208	0.43	7.97
10/16/2018 13:46	1.011	0.555	7.915
10/15/2018 11:00	1.214	0.418	7.803
10/16/2018 10:14	1.028	0.532	7.774
10/15/2018 15:30	1.089	0.484	7.703
10/18/2018 15:06	1.108	0.472	7.699
10/17/2018 18:16	1.006	0.529	7.49
10/16/2018 10:28	1.087	0.466	7.396
10/13/2018 4:46	1.51	0.288	7.389
10/16/2018 14:24	1.012	0.517	7.377
10/13/2018 4:48	1.452	0.301	7.296
10/18/2018 18:14	1.062	0.476	7.289
10/20/2018 4:56	1.057	0.478	7.274
10/16/2018 9:04	1.049	0.481	7.238
10/18/2018 10:44	1.22	0.384	7.224
10/16/2018 14:28	1.051	0.478	7.222
10/18/2018 15:08	1.126	0.43	7.188
10/16/2018 14:26	1.043	0.481	7.176
10/16/2018 9:06	1.022	0.495	7.173
10/17/2018 9:38	0.99	0.517	7.14
10/15/2018 10:06	1.268	0.358	7.118
10/17/2018 9:48	1.001	0.506	7.106
10/20/2018 10:52	1.033	0.477	7.026
10/17/2018 10:06	1	0.501	7.024

SkySong and 74th Street

Flowlink 5



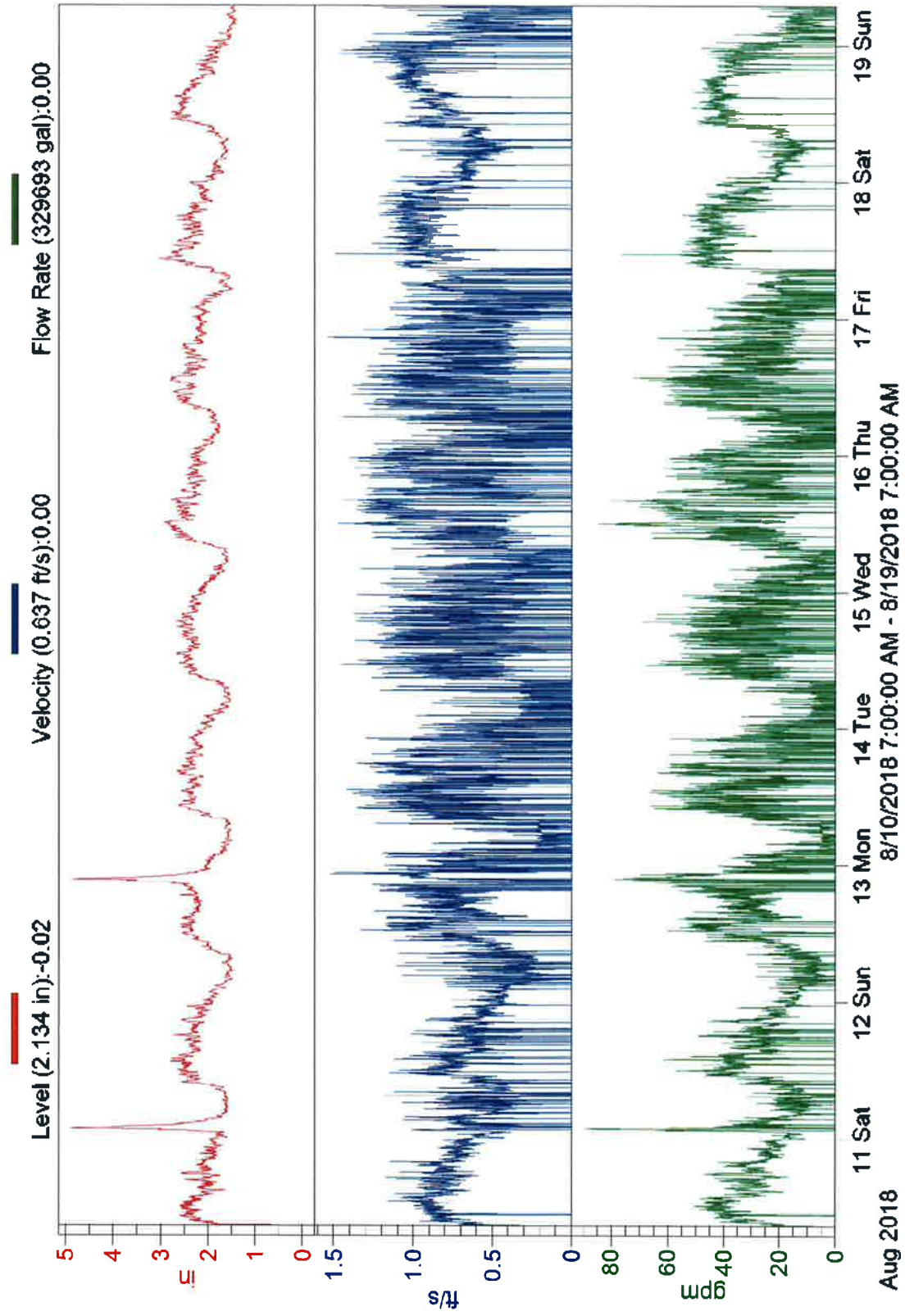
Skysong 18 inch Line Data 1

Isco Quantity	Level	Velocity	Flow Rate
Label	Level	Velocity	18 Flow Rate
Units	in	ft/s	gpm
Resolution	0.1	0.1	0.1
Significant Digits	0	0	0
10/17/2018 13:08	1.571	0.724	24.483
10/17/2018 11:16	1.648	0.673	24.388
10/17/2018 11:32	1.735	0.602	23.553
10/17/2018 11:30	1.68	0.583	21.74
10/17/2018 11:18	1.68	0.579	21.588
10/17/2018 11:20	1.636	0.59	21.147
10/17/2018 11:28	1.528	0.639	20.733
10/17/2018 11:22	1.567	0.608	20.449
10/17/2018 11:24	1.445	0.683	20.411
10/18/2018 17:10	1.758	0.51	20.333
10/17/2018 11:26	1.596	0.573	19.835
10/17/2018 11:54	1.53	0.593	19.286
10/17/2018 11:04	1.559	0.576	19.247
10/17/2018 13:12	1.689	0.497	18.683
10/17/2018 13:06	1.43	0.625	18.394
10/17/2018 11:12	1.462	0.604	18.34
10/17/2018 11:34	1.539	0.554	18.152
10/17/2018 11:06	1.519	0.557	17.895
10/17/2018 11:58	1.507	0.561	17.847
10/17/2018 12:40	1.48	0.576	17.823
10/17/2018 13:14	1.511	0.558	17.804
10/17/2018 13:10	1.707	0.464	17.716
10/18/2018 12:38	1.474	0.57	17.527
10/17/2018 13:04	1.463	0.575	17.497
10/17/2018 11:14	1.527	0.533	17.279
10/17/2018 11:10	1.404	0.581	16.633
10/18/2018 16:06	1.49	0.532	16.617
10/18/2018 17:08	1.361	0.602	16.455
10/18/2018 8:50	1.124	0.776	16.013
10/17/2018 15:08	1.427	0.541	15.887
10/18/2018 9:04	1.392	0.56	15.828
10/18/2018 14:38	1.481	0.503	15.575
10/17/2018 11:56	1.533	0.474	15.451
10/18/2018 16:04	1.41	0.532	15.338
10/18/2018 12:34	1.509	0.477	15.198
10/18/2018 17:14	1.183	0.683	15.187
10/18/2018 10:38	1.442	0.502	14.965
10/17/2018 12:08	1.396	0.524	14.864
10/18/2018 12:32	1.502	0.468	14.801
10/17/2018 13:02	1.249	0.608	14.634

10/17/2018 11:08	1.39	0.517	14.605
10/17/2018 15:44	1.304	0.567	14.565
10/16/2018 10:20	1.45	0.479	14.379
10/17/2018 12:38	1.406	0.5	14.359
10/18/2018 9:44	1.35	0.524	14.147
10/17/2018 10:56	1.253	0.584	14.124
10/18/2018 12:36	1.444	0.473	14.122
10/17/2018 15:42	1.311	0.535	13.85
10/18/2018 14:40	1.32	0.518	13.527
10/17/2018 10:58	1.248	0.561	13.516
10/17/2018 12:02	1.385	0.481	13.515
10/17/2018 12:10	1.376	0.485	13.482
10/18/2018 10:40	1.373	0.485	13.434
10/17/2018 15:12	1.318	0.513	13.381
10/17/2018 15:10	1.388	0.473	13.314
10/17/2018 11:38	1.289	0.525	13.25
10/19/2018 13:34	1.267	0.535	13.159
10/17/2018 12:00	1.396	0.461	13.089
10/18/2018 8:54	1.34	0.487	13.013
10/18/2018 14:36	1.265	0.528	12.968
10/18/2018 16:38	1.291	0.512	12.956
10/18/2018 9:06	1.328	0.489	12.898
10/17/2018 13:16	1.384	0.458	12.841
10/17/2018 15:06	1.27	0.519	12.817
10/18/2018 12:42	1.272	0.515	12.752
10/18/2018 10:22	1.317	0.486	12.666
10/18/2018 12:30	1.402	0.439	12.549
10/17/2018 12:12	1.291	0.495	12.523
10/18/2018 10:50	1.182	0.555	12.328
10/18/2018 12:28	1.277	0.493	12.265
10/17/2018 11:36	1.385	0.435	12.219
10/18/2018 16:14	1.294	0.481	12.209
10/18/2018 9:32	1.339	0.455	12.161
10/18/2018 11:10	1.308	0.471	12.159
10/17/2018 11:40	1.296	0.478	12.151
10/17/2018 11:02	1.174	0.552	12.147
10/18/2018 8:52	1.438	0.409	12.144
10/18/2018 15:14	1.234	0.513	12.136
10/18/2018 12:06	1.432	0.404	11.914
10/18/2018 9:40	1.145	0.561	11.888
10/18/2018 12:26	1.327	0.451	11.874
10/17/2018 11:46	1.27	0.48	11.839
10/18/2018 9:56	1.292	0.467	11.831
10/17/2018 15:40	1.263	0.481	11.794
10/18/2018 12:24	1.251	0.488	11.783
10/18/2018 15:16	1.169	0.539	11.758
10/18/2018 12:04	1.259	0.481	11.738

Papago Plaza McDowell 10 inch Line

Flowlink 5



Level (2.134 in): -0.02

Velocity (0.637 ft/s): 0.00

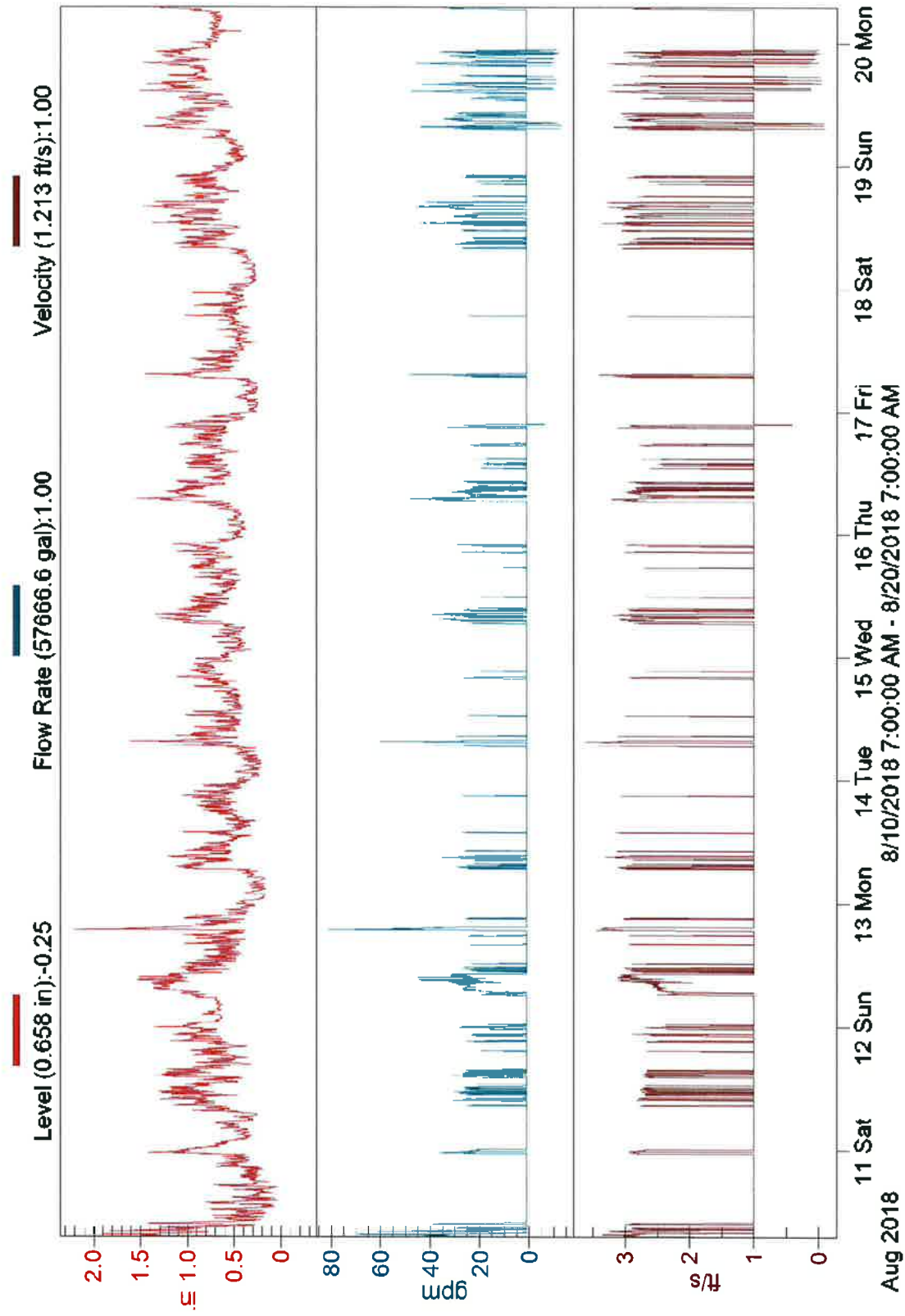
Flow Rate (329693 gal): 0.00

Aug 2018

8/10/2018 7:00:00 AM - 8/19/2018 7:00:00 AM

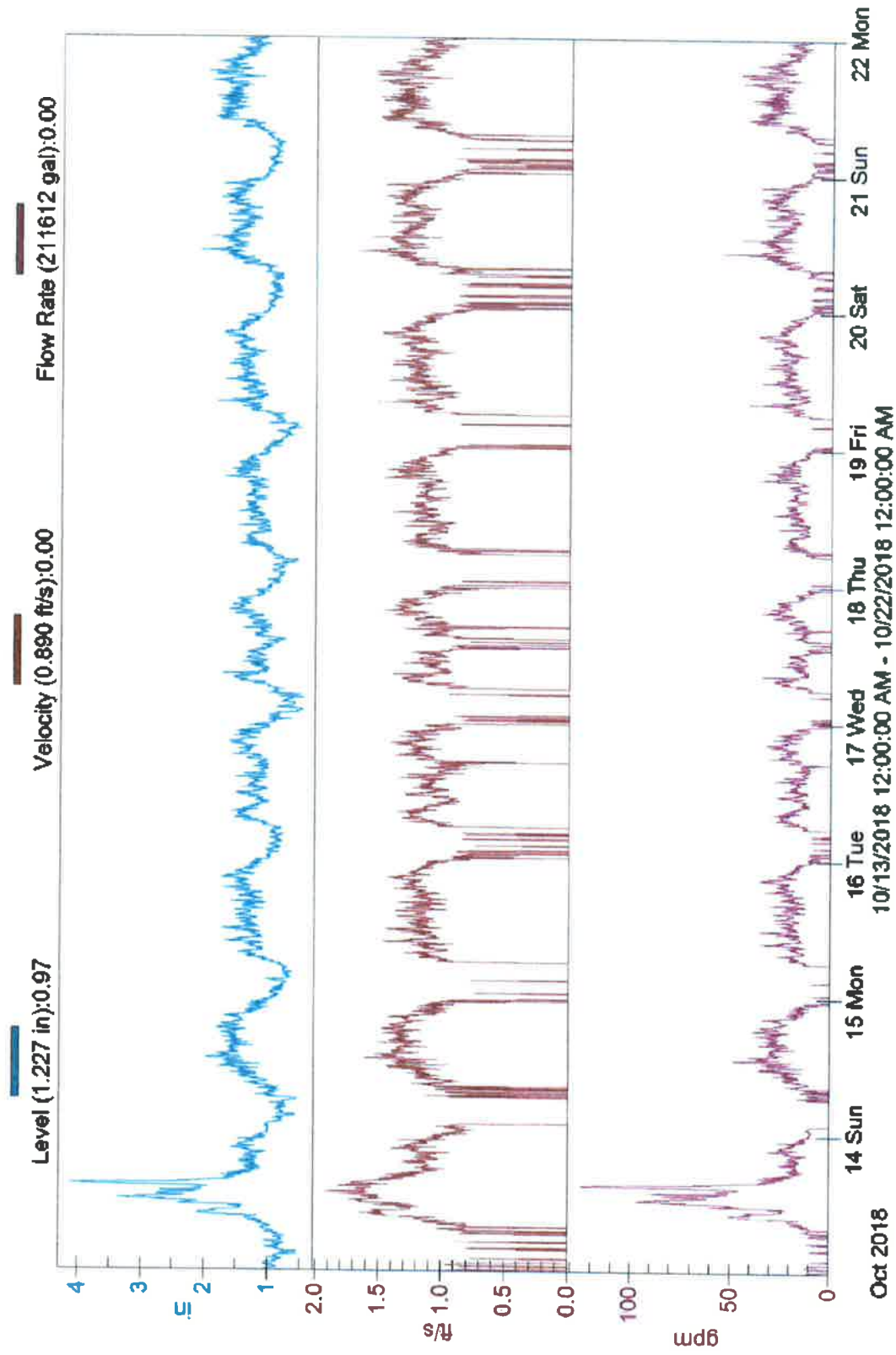
Papago Plaza 8 inch Line

Flowlink 5



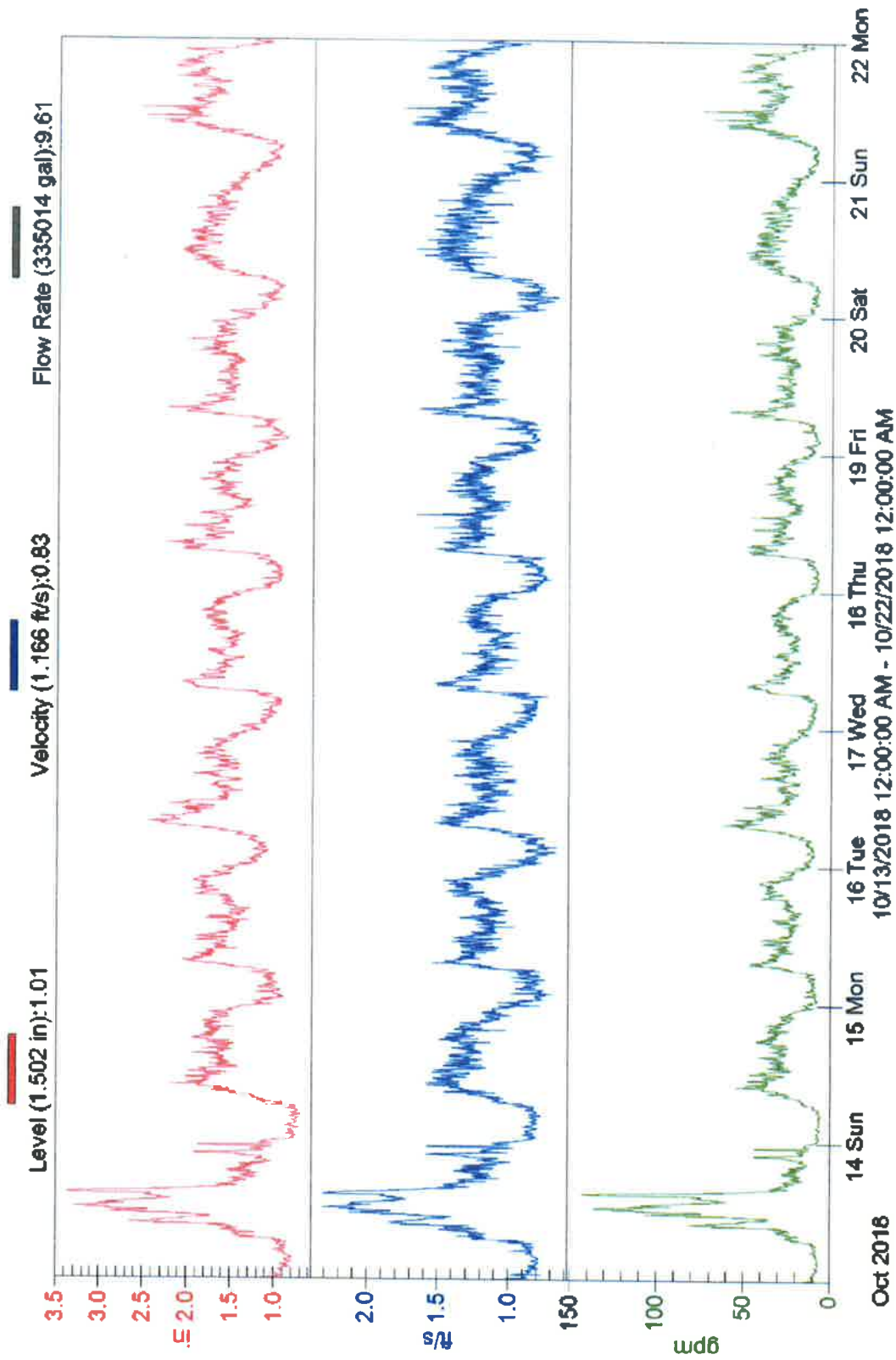
Alley East-West 8 inch Line

Flowlink 5



Alley North-South 8 inch Line

Flowlink 5



APPENDIX A-5
Skysong BOD Reports

**PRELIMINARY
WASTEWATER BASIS OF
DESIGN REPORT
FOR
SKYSONG NORTHWEST QUADRANT**

July 14, 2016
WP# 123808

Accepted
City of Scottsdale
Water Resources Administration
9379 E. San Salvador
Scottsdale, AZ 85258
Douglas Mann 8.3.16

Prepared For: **Plaza Companies, AMO®**
Mr. Jon Stelzer
9401 West Thunderbird Road
Suite 200
Peoria, Arizona 85381
Phone: (623) 344-4539

Submitted To: **Mr. Douglas L. Mann, P.E.**
Water Resources Engineer
City of Scottsdale
9388 East San Salvador Drive
Scottsdale, AZ 85258
Phone: (480) 312-5636
Fax: (480) 312-5615

Prepared By: **Wood, Patel & Associates, Inc.**
2220 South Country Club Drive
Suite 101
Mesa, Arizona 85210
Phone: (480) 834-3300



Expires 3-31-17

Darrel E. Wood, P.E., R.L.S.
Ashok C. Patel, P.E., R.L.S., CFM
Michael T. Young, P.E., LEED AP
James S. Campbell, P.E., LEED GA
Thomas R. Gettings, R.L.S.
Darin L. Moore, P.E., LEED GA
Jeffrey R. Minch, P.E., CFM
Robert D. Gofonia, P.E., R.L.S.

July 14, 2016

Mr. Douglas L. Mann, P.E.
Water Resources Engineer
City of Scottsdale
9388 East San Salvador Drive
Scottsdale, AZ 85258

Phone: (480) 312-5636
dmann@scottsdaleaz.gov

Re: **Skysong Northwest Quadrant**
Wastewater Basis of Design
WP# 123808

Dear Mr. Mann:

The proposed Skysong Northwest Quadrant (Site) development is a commercial development with three (3) office buildings, a restaurant building, and a parking structure with associated landscaping and hardscape. The office buildings will have multiple stories (up to 6 stories), and range from 130,000 square feet (sf) to 200,000 sf, and the restaurant will be approximately 12,000 sf, according to information provided by the Architect, Butler Design Group. The proposed development is located east of Scottsdale Road and south of McDowell Road. More specifically, the Site is located in the northwest quarter of Section 2, Township 1 North, Range 4 East, of the Gila and Salt River Meridian. Refer to the *Vicinity Map* at the back of this report for the project location. The existing Skysong Northwest Quadrant is undeveloped with some desert landscaping.

This Basis of Design report has been prepared as required by the City of Scottsdale to demonstrate compliance with the *Master Wastewater Collection System Report for Skysong ASU Scottsdale Innovation Center*, by Wood, Patel & Associates, Inc. (Wood/Patel), dated May 11, 2006.

Wastewater from the proposed buildings will be conveyed by a proposed 8-inch gravity line and existing 12-inch public gravity sewer lines that were constructed as part of the Skysong ASU Scottsdale Innovation Center infrastructure improvements. These existing sewer lines connect to an existing 18-inch gravity sewer line in Skysong Boulevard (see attached *Sewer Exhibit*). The existing sewer lines are part of the City of Scottsdale's public wastewater collection system. Since the entire parcel of land is owned by the City of Scottsdale, it is Wood/Patel's understanding public sewer lines will be located within a dedicated utility corridor.

Projected wastewater flows are based on criteria provided in the City of Scottsdale's *Design Standards & Policy Manual*. Specifically, the design criteria utilized are as follows:

Mr. Douglas L. Mann, P.E.
City of Scottsdale
Skysong Northwest Quadrant
WP# 123808

July 14, 2016
Page 2 of 2

- Peaking Factor, Office: 3.0*
- Peaking Factor, Restaurant: 6.0*
- Maximum Peak Flow d/D Ratio (12" dia. or less Sewers): d/D = 0.65

Abbreviations: gpd = gallons per day

*When a combination of apartments and commercial impacts a sewerline, used 4.0 in model.

**Per the *Master Wastewater Collection System Report for Skysong ASU Scottsdale Innovation Center*.

Preliminary plans for Skysong Building 6 include one (1) sewer building connection. Preliminary plans for Skysong Building 7 include one (1) sewer building connection. Preliminary plans for Skysong Building 8 include two (2) sewer building connections. The Skysong Building 9 Restaurant is currently under construction (by others) and includes one (1) sewer building connection. Each building connection is identified on the attached exhibit, with corresponding wastewater flows assigned to each shown in the attached spreadsheets.

Based on the attached calculations, the Average-Day wastewater preliminary design flow for Skysong Building 6 is approximately 60,000 gallons per day (gpd). The Average-Day wastewater preliminary design flow for Skysong Building 7 is approximately 52,000 gpd. The Average-Day wastewater preliminary design flow for Skysong Building 8 is approximately 80,000 gpd. The Average-Day wastewater preliminary design flow for Skysong Building 9 is approximately 14,400 gpd. The combined peak wet-weather preliminary design flow from Skysong Buildings 6, 7, 8, and 9 within the Skysong project is approximately 662,400 gpd. It is assumed the infiltration and inflow from wet weather has been accounted for in the published design flow rates for the development and the maximum d/D. Therefore, those flows have not been added into the calculations. The proposed sanitary sewer collection system is designed to have adequate capacity to serve the proposed development. The proposed wastewater collection system is in compliance with the *Master Wastewater Collection System Report for Skysong ASU Scottsdale Innovation Center*.

Enclosed are a set of drawings and spreadsheets which summarize the design and capacity of the system. The spreadsheets show the proposed sewer slopes, projected peak flow rates, and pipe flow capacities. Refer to the attached *Vicinity Map* and *Sewer Exhibit*.

Thank you for your prompt review of the preliminary proposed wastewater collection system provided for the Skysong Northwest Quadrant. Please contact us if you have any questions.

Sincerely,

Wood, Patel & Associates, Inc.



John M. Bulka, P.E.
Project Manager

JMB/km

CALCULATIONS

WOOD/PATEL

WASTEWATER COLLECTION SYSTEM DESIGN CRITERIA

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

Project: Skysong Northwest Quadrant
 Location: Scottsdale, AZ

Proj. Number: 123808
 Project Manager: John Bulka, P.E.

References: City of Scottsdale Design Standards and Manuals January 2010

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	

Pipe Size (IN)	Min Slope (FT/FT)
4	0.0131
6	0.0076
8	0.0052
10	0.0039
12	0.0030
15	0.0022
18	0.0018
21	0.0014
24	0.0012

FIGURE 7.1-2 AVERAGE DAY SEWER DEMAND IN GALLONS

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

Gravity Sewer Minimum Pipe Velocity 2.5 FPS
 Gravity Sewer Maximum Pipe Velocity 10.0 FPS

WOOD/PATEL

WASTEWATER MODEL SPREADSHEET

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

Project: Skyong Northwest Quadrant
 Location: Scottsdale, AZ
 References: City of Scottsdale Design Standards and Manuals January 2010

Proj. Number: 123808
 Project Manager: John Bulica, P.E.

COMMERCIAL									
UPSTREAM NODE	DOWNSTREAM NODE	Office (S.F.)	Restaurant (S.F.)	ADF/UNIT (GPD) ²	SEWER NODE ADF (GPD)	TOTAL ADF (GPD)	PEAKING FACTOR ¹	SEWER NODE PEAK FLOW (GPD)	PEAK FLOW (GPD)
Proposed Sewer Service									
Proposed Building 7	MH 1	130,000	--	0.4	52,000	52,000	3.00	156,000	156,000
MH 1	B8 Connect 1	--	--	--	--	52,000	--	--	156,000
(1/2) Proposed Building 8	B8 Connect 1	100,000	--	0.4	40,000	40,000	3.00	120,000	120,000
B8 Connect 1	B8 Connect 2	--	--	--	--	92,000	3.00	--	276,000
(1/2) Proposed Building 8	B8 Connect 2	100,000	--	0.4	40,000	40,000	3.00	120,000	120,000
B8 Connect 2	EX MH 1	--	--	--	--	182,000	--	--	596,000
EX MH 1	EX MH 2	--	--	--	--	132,000	--	--	396,000
EX MH 2	EX MH 3	--	--	--	--	132,000	--	--	396,000
Proposed Building 9	EX MH 5	--	12,000	1.2	14,400	14,400	6.00	96,400	96,400
EX MH 5	EX MH 4	--	--	--	--	148,400	--	--	96,400
Proposed Building 6	EX MH 4	150,000	--	0.4	60,000	60,000	3.00	180,000	180,000
EX MH 4	EX MH 3	--	--	--	--	208,400	--	--	256,400
EX MH 3	Ex 18" Gravity Sewer	--	--	--	--	538,400	--	--	662,400
					338,400				
					662,400				

1) Peaking factor taken from the City of Scottsdale Design Standards and Manuals January 2010 section 7-1.403

WOOD/PATEL

PIPE CAPACITIES

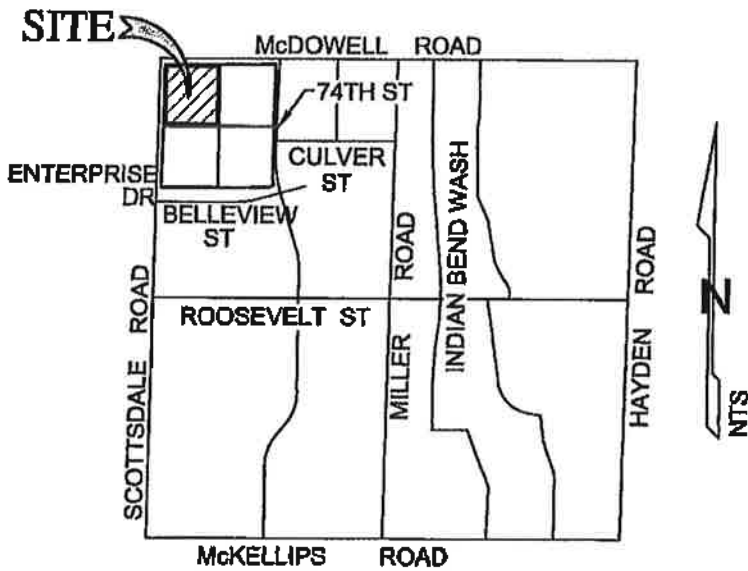
CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: Skysong Northwest Quadrant
 Location: Scottsdale, AZ
 References: City of Scottsdale Design Standards and Manuals January 2010

Proj. Number: 123808
 Project Manager: John Bulka, P.E.

FROM NODE	TO NODE	PIPE DIA. (INCHES)	PEAK FLOW (GPD)	PIPE SLOPE (FT / FT)	FULL FLOW VELOCITY (FPS)	d/D RATIO	PIPE CAPACITY (GPD)	SURPLUS CAPACITY (GPD)	PERCENT OF CAPACITY
Proposed Sewer Service									
Proposed Building 7	MH 1	6	156,000	0.005	2.0	0.56	256,928	100,928	61%
MH 1	B8 Connect 1	8	156,000	0.005	2.5	0.36	553,380	397,380	25%
(1/2) Proposed Building 8	B8 Connect 1	6	120,000	0.02	4.0	0.33	513,857	393,857	23%
B8 Connect 1	B8 Connect 2	8	276,000	0.005	2.5	0.50	553,380	277,380	50%
(1/2) Proposed Building 8	B8 Connect 2	6	120,000	0.02	4.0	0.33	513,857	393,857	23%
B8 Connect 2	EX MH 1	8	396,000	0.005	2.5	0.63	553,380	157,380	72%
EX MH 1	EX MH 2	12	396,000	0.005	3.2	0.34	1,631,771	1,235,771	24%
EX MH 2	EX MH 3	12	396,000	0.005	3.2	0.34	1,631,771	1,235,771	24%
Proposed Building 9	EX MH 5	12	88,400	0.005	3.2	0.16	1,631,771	1,545,371	5%
EX MH 5	EX MH 4	12	88,400	0.003	13.1	0.08	6,648,339	6,561,939	1%
Proposed Building 6	EX MH 4	6	180,000	0.02	4.0	0.41	513,857	333,857	35%
EX MH 4	EX MH 3	12	286,400	0.0035	2.7	0.30	1,365,237	1,098,837	20%
EX MH 3	Ex 18" Gravity Sewer	18	662,400	0.005	4.2	0.25	4,811,655	4,149,255	14%

VICINITY MAP



N:\2012\123808\Project Support\Reports\Water_BOD\Skysong_C4\Exhibit\3608_50 Exhibit 1 - Vicinity Map.dwg

VICINITY MAP

SKYSONG NW QUADRANT

WOOD/PATEL
 MISSION: CLIENT SERVICE™
 (602) 335-8300
 WWW.WOODPATEL.COM

DATE 01-18-2016	SCALE N.T.S.	SHEET 1 OF 1
JOB NO. 123808.50	DESIGN JB DRAWN JS	CHECK RS

SEWER EXHIBIT

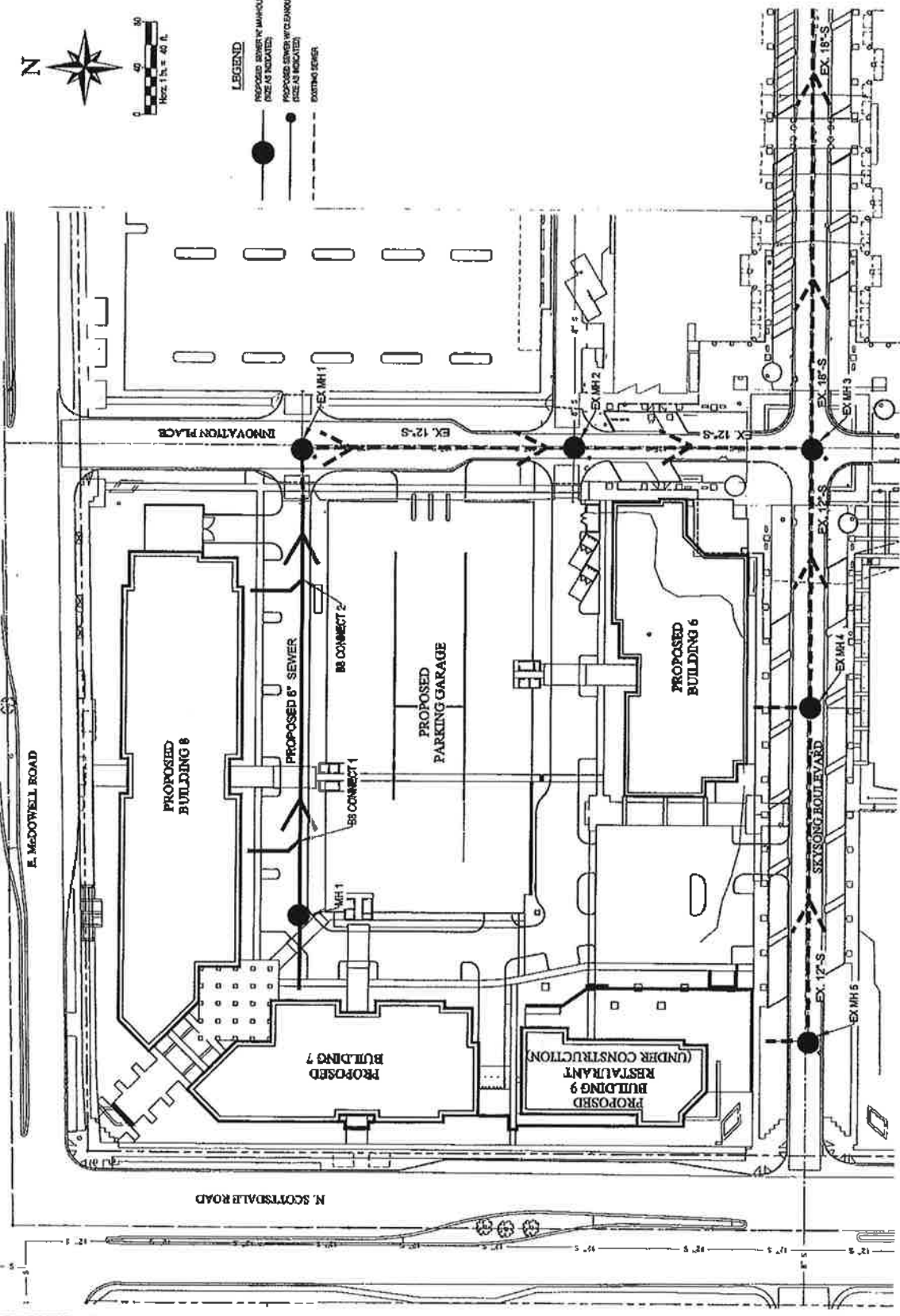
REV	DESCRIPTION	DATE

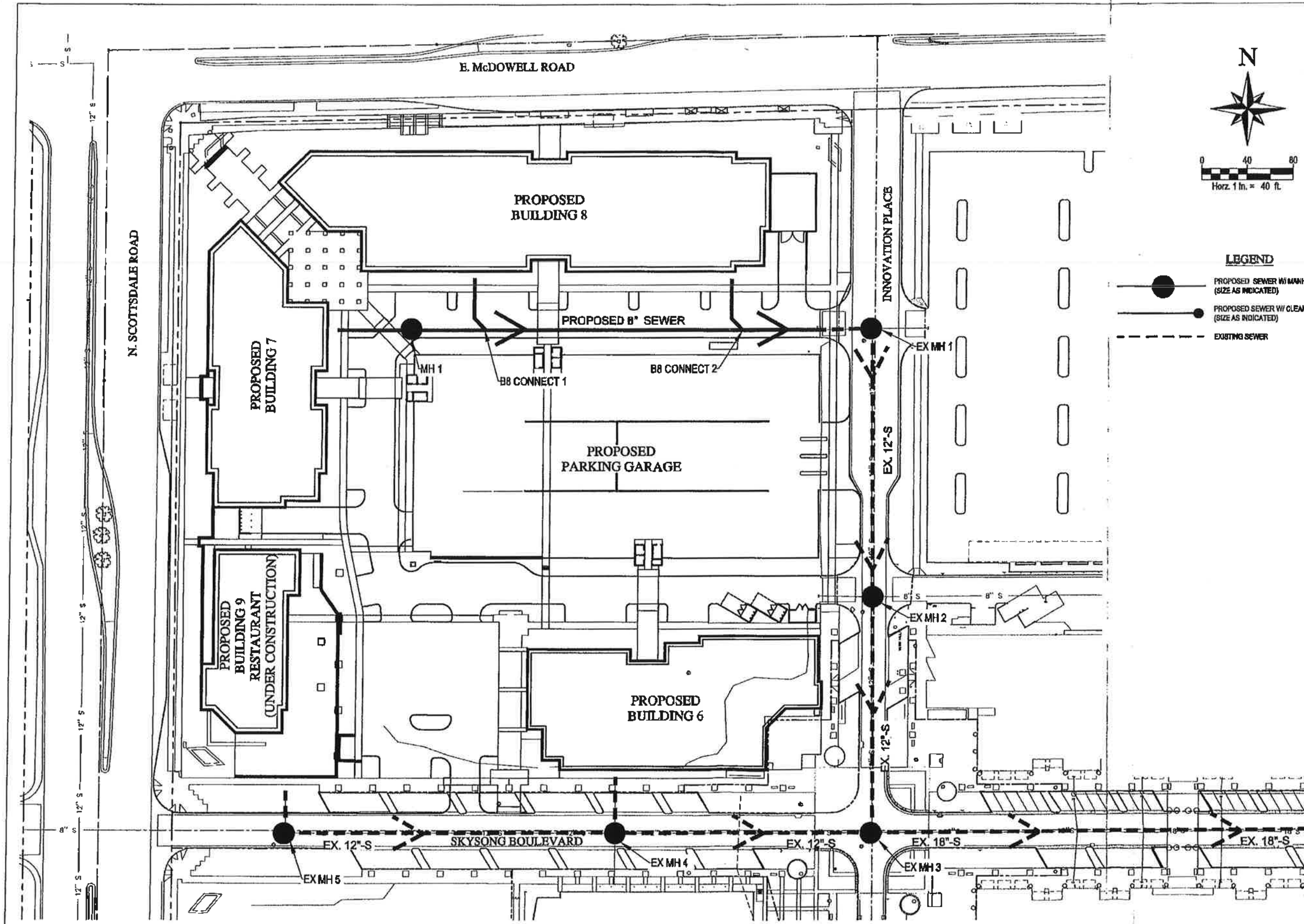
NO.	DATE	BY	CHKD.	SCALE






LEGEND

- PROPOSED SEWER MANHOLE (SIZE AS INDICATED)
- PROPOSED SEWER W/ CLEANOUT (SIZE AS INDICATED)
- EXISTING SEWER





LEGEND

-  PROPOSED SEWER W/ MANHOLE (SIZE AS INDICATED)
-  PROPOSED SEWER W/ CLEANOUT (SIZE AS INDICATED)
-  EXISTING SEWER

WOOD/PATEL
 MISSION: CLIENT SERVICE •
 (602) 335-8500
 WWW.WOODPATEL.COM

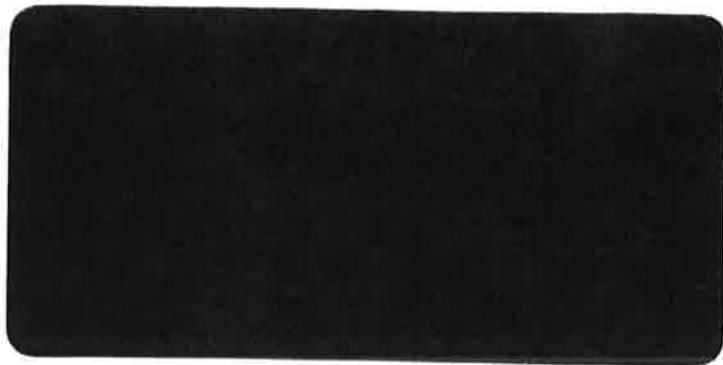


SKYSONG
 NW QUADRANT
 SCOTTSDALE, ARIZONA
 WASTEWATER EXHIBIT

REV	DESCRIPTION	DATE

SCALE (HORIZONTAL) 1" = 40'
 SCALE (VERTICAL) N/A
 DATE 07/14/2016
 JOB NUMBER 123808
 SHEET 1 OF 1

CASE FILE



2nd
zmc

5/17

Accepted for

CITY OF SCOTTSDALE
WATER RESOURCES DEPT
9388 E SAN SALVADOR DR.
SCOTTSDALE, AZ 85258

By Doug Mann
6.1.06

with comments

2037-06

WOOD/PATEL

**MASTER
WASTEWATER COLLECTION
SYSTEM REPORT
FOR
SKYSONG ASU SCOTTSDALE
INNOVATION CENTER**

Revised May 11, 2006
April 4, 2006
WP #052562 & 062663

Prepared For:

Ms. Thyra Ryden-Diaz
Project Manager
Capital Project Management
City of Scottsdale
7447 E. Indian School Road
Scottsdale, AZ 85251
Phone (480) 312-4327
Fax (480) 312-9226

Submitted To:

Mr. Douglas L. Mann, P.E.
Water Resources Engineer
City of Scottsdale
9388 E. San Salvador Drive
Scottsdale, AZ 85258
Phone (480) 312-5636
Fax (480) 312-5615

Prepared By:

Wood, Patel & Associates, Inc.
1855 North Stapley Drive
Mesa, Arizona 85203
Phone: (480) 834-3300
Fax: (480) 834-3320



Engineer

Prepared by: Jesse Heywood E.I.T.



Peer Review

**City of Scottsdale
Water Resources Department**

Basis of Design Review Comments

Project: SKYSONG -
Master Wastewater and Master Water Reports
Wastewater and Water System Reports for Building 1

Engineer: Wood/Patel

Date: June 2, 2006

Master Water Report:

1. The current expectation is 325 apartments by the end of 2007.
2. City legal staff will assist the engineer with documentation regarding easement issues for public water and sewer lines on this site.
3. Will need to retain the water connectivity between 74th and Miller Road thru the Miller Crossing site.

Master Wastewater Report:

4. You seem to have excess pipe capacity at build out above and beyond our d/D ratios. During final design, the pipe diameters should be verified.
5. The preliminary invert at MH#10 matches the top of the 30" pipe in Miller Road. You should try to avoid inflow from the Miller trunk line into the Culver sewer. The Miller Road relief sewer will be deeper than the existing 30" sewer and the Culver sewer should be directed to the relief pipe.

Master Water Distribution System Report for Building 1:

6. You do not address irrigation demand for the site beyond the "pad" for building 1. The design demands from our DS+PM have outside water uses built in. You will need to identify all site irrigation demands in the water needs report for meter sizing and estimation of development fees.

Master Wastewater Collection System Report for Building 1:

7. Reviewed for onsite 8-inch temporary sewer only.

Doug Mann, Water Resources Engineer

May 11, 2006

Mr. Douglas L. Mann, P.E.
Water Resources Engineer
City of Scottsdale
9388 E. San Salvador Drive
Scottsdale, AZ 85258

Phone: (480) 312-5636
Fax: (480) 312-5615

Re: Skysong ASU Scottsdale Innovation Center
Master Wastewater Collection System Report
WP #052562

Dear Mr. Mann:

The Skysong ASU Scottsdale Innovation Center is a 42.2 acre site with 1.2 million square feet of research and general office space and approximately 604 residential condominium units planned at full buildout. The City of Scottsdale is planning to construct approximately 95,000 square feet of office space along with a possible 200-room hotel. This development lies in Section 2, Township 1 North, Range 4 East of the Gila and Salt River Meridian and is located at the southeast corner of McDowell and Scottsdale Roads (see attached Vicinity Map). Although the proposed infrastructure is planned to be completed in one phase, future build out will be phased.

According to the current lease agreement between Higgins Development Partners and the City of Scottsdale, a minimum of 150,000 square feet will be built every 3 years. Currently, Higgins Development Partners plans to complete the ultimate build out of 1.2 million square feet at an accelerated pace and be completed by 2013. Buildings 1 and 2, along with 388 apartment units are planned to be completed by the end of 2007, which would mean an average of 151,500 square feet of building a year for every year thereafter. The first phase of the project will consist of dividing the site into four quadrants with Center Street and Plaza Boulevard bisecting the site with a proposed drive running along the south property line. It is anticipated that these proposed streets will be constructed in the first phase with the necessary utility infrastructure for ultimate build out. Since the entire parcel of land is owned by the City of Scottsdale, it is Wood/Patel's understanding that there is no intent to declare water and sewer easements within the site.

As future phases are developed, individual Basis of Design reports for each phase are required to demonstrate compliance with this Master Report. Detailed breakdowns of commercial and research building areas are unknown to Wood/Patel at this time. For design purposes, the majority of proposed facilities are modeled as commercial areas.

Wastewater from the proposed buildings will be conveyed by proposed 12-inch and 18-inch public gravity sewer lines to a proposed manhole located in the intersection of 74th Street and

Culver Street. It is Wood/Patel's understanding that the City of Scottsdale, as part of their Capital Improvement Project (CIP) Program will install approximately 1330 lineal feet of 24-inch public sewer line east along Culver Street from 74th Street to Miller Road, where it will connect into an existing 30-inch public sewer line. Adjacent parcels south of Culver Street are currently served by existing sewers, so flow from these parcels is not included as part of the Master Plan. The parcels north of Culver Street are under planning to be re-developed and there is a possibility that they may flow into the proposed sewer line in Culver Street. The extent and size of the redevelopment zone is unknown at this time, so additional design flows into the proposed 24-inch public sewer line in Culver Street from the redevelopment zone are projected at 1,284 gpd per acre. Completion of this future 24-inch public sewer line is not projected until after completion of Building 1; therefore, Building 1 may be served by a temporary sewer connection to an existing 8-inch gravity sewer line in 74th Street. In the event that the 24-inch public sewer line in Culver Street is not completed prior to future development being built, there is a contingency plan to design and construct a temporary lift station to handle the additional flows.

The existing 30-inch public sewer line in Miller Road is currently part of the City of Scottsdale's wastewater collection system. According to City staff, the existing 30-inch sewer line currently has an available capacity of 1.9 mgd, which is significantly lower than the peak wet-weather design flows for the site at ultimate build out. As part of the City's CIP Program, a future replacement of the existing sewer line in Miller Road from McDowell Road south to the Princess Metering Station will be designed and installed in order to accommodate growth and revitalization impacts from the area. This sewer line is needed in order to provide excess capacity to the Miller Road sewer line and serve the Skysong ASU Scottsdale Innovation Center at ultimate buildout. Phased wastewater design flows are provided in the attached spreadsheets.

Wastewater design flows are based on criteria provided in the *City of Scottsdale Design Standards and Policy Manual*, and information provided in Chapter 9 of Title 18 of the *Arizona Administrative Code*. Specifically, the design criteria utilized are as follows:

- Avg Day Wastewater Flow, Hotel: 402 gpd/unit
- Avg Day Wastewater Flow, Condominium: 155 gpd/unit
- Avg Day Wastewater Flow, Commercial: 0.7 gpd/sf
- Avg Day Wastewater Flow, Commercial 1284 gpd/acre
- Peaking Factor, Hotel: 4.0*
- Peaking Factor, Condominium: 4.0*
- Peaking Factor, Commercial: 3.5*
- Infiltration / Inflow: 250 gal/day per acre
- Min. Full Flow Velocity 2.5 ft/s
- Max d/D 12" and below 0.70
- Max d/D above 12" 0.65

* Peaking factors are based on factors that were used on a similar project that was approved by the City of Scottsdale: *Stacked 40's Master On-Site Wastewater Plan* Dated August 25, 2005 by Wood/Patel & Associates.

Currently, the peak wet-weather design flow rate for the proposed wastewater collection system is 3.7 million gallons per day (gpd), or 60% capacity for the proposed 24-inch sewer outfall. The proposed 24-inch diameter sanitary sewer outfall is designed to convey wastewater flow from the proposed development per the above mentioned capacity.

City of Scottsdale
Skysong ASU Scottsdale Innovation Center
WP# 052562

May 11, 2006
Page 3

The system design and capacity are summarized on the attached spreadsheets. The spreadsheets show the proposed sewer slopes, projected peak flow rates, and pipe flow capacities. Please refer to the attached vicinity map and sewer exhibit.

Thank you for your prompt review of the proposed wastewater collection system provided for Skysong ASU Scottsdale Innovation Center. Please contact us if you have any questions.

Sincerely,

WOOD, PATEL & ASSOCIATES, INC.



Troy A. Bontrager, P.E.
Senior Project Engineer

CALCULATIONS

WOOD/PATEL**LAND USE**

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

Project: Skysong ASU Scottsdale Innovation Center**Proj. Number:** 052562**Location:** Scottsdale, AZ**Proj. Engineer:** Troy Bontrager, P.E.**Date:** May 11, 2006**References:** City of Scottsdale Design Standards and Policies Manual

ZONE	SQUARE FOOTAGE	DWELLING UNITS	
	Commercial/General Office/Research and Development	Hotel	Condominium
NW	370,000		20
NE	303,000		88
SW	370,000	200	44
SE	162,000		452
TOTAL	1,195,000	200	604

*Breakdown of Future Development was provided to Wood/Patel by DMJM, who is the architectural firm designing the site, on 3/24/2006

WOOD/PATEL

Project: Skyway ASU Scottsdale Innovation Center
 Location: Scottsdale, AZ
 Date: 5/1/2005
 Reference: City of Scottsdale Design Standards and Policies Manual

WASTEWATER CALCULATIONS (FULL BUILDOUT)

Proj. Number: 0502562
 Proj. Engineer: Tony Beninger, P.E.

SEWER SEWERMENT (MM TO MH#)	SEWER SEWERMENT AVE. DAILY FLOW (GPD)					PEAKING FACTOR					INFILTRATION/BILOW (GPD)	MAX. DAILY FLOW (GPD)	PIPE DIA. (IN)	PIPE SLOPE (FT/FT)	FULL FLOW VELOCITY (FT/S)	NORMAL FLOW VELOCITY (FT/S)	PIPE CAPACITY (GPD)	PERCENT OF CAPACITY
	COMMERCIAL	CONDOMINIUM	HOTEL	CUMULATIVE AVE. DAILY FLOW (GPD)	EQUIVALENT POPULATION	COMMERCIAL?	HOTEL & CONDOMINIUM*	COMMERCIAL?	HOTEL & CONDOMINIUM*									
1 TO 2	64,750	0	0	64,750	648	3.50	4.00	3.50	4.00	528	227,153	12	0.0075	3.9	2.6	0.23	1,598,503	11%
2 TO 3	138,500	0	0	138,500	1,943	3.50	4.00	3.50	4.00	1,055	560,830	12	0.0050	3.2	3.1	0.45	1,631,771	42%
3 TO 4	117,175	3,106	0	120,281	1,395	3.50	4.00	3.50	4.00	528	425,164	12	0.0050	3.2	2.7	0.35	1,631,771	26%
4 TO 5	53,025	0	0	53,025	2,397	3.50	4.00	3.50	4.00	1,055	637,904	12	0.0050	4.2	3.2	0.51	1,631,771	51%
5 TO 6	0	14,966	0	14,966	4,839	3.50	4.00	3.50	4.00	2,638	1,204,946	18	0.0075	5.2	3.9	0.41	4,811,655	35%
6 TO 7	0	0	0	0	3,350	3.50	4.00	3.50	4.00	528	1,897,094	12	0.0100	4.5	4.6	0.39	5,863,860	32%
7 TO 8	0	0	0	0	0	3.50	4.00	3.50	4.00	0	96,149	12	0.0100	7.8	1.8	0.11	2,907,872	2%
8 TO 9	0	0	0	0	5,528	3.50	4.00	3.50	4.00	4,220	1,846,735	18	0.0170	4.9	6.2	0.32	8,872,254	22%
9 TO 10	64,750	6,833	80,340	151,923	1,519	3.50	4.00	3.50	4.00	528	575,645	12	0.0100	4.9	3.8	0.24	2,907,872	25%
10 TO 11	64,750	0	0	64,750	2,157	3.50	4.00	3.50	4.00	1,055	802,998	12	0.0100	4.5	4.1	0.41	2,907,872	35%
11 TO 12	100,217	0	0	100,217	1,002	3.50	4.00	3.50	4.00	528	351,286	12	0.0033	2.6	2.6	0.10	1,342,807	26%
12 TO 13	0	70,196	0	70,196	3,169	3.50	4.00	3.50	4.00	2,110	1,154,811	12	0.0033	3.7	2.9	0.27	1,668,305	68%
13 TO 14	35,467	0	0	35,467	4,228	3.50	4.00	3.50	4.00	2,638	1,560,254	18	0.0018	4.3	4.7	0.52	2,198,250	71%
14 TO 15	0	0	0	0	4,228	3.50	4.00	3.50	4.00	3,165	1,560,782	18	0.0018	2.5	2.6	0.52	2,198,250	54%
15 TO 16	0	0	0	0	4,228	3.50	4.00	3.50	4.00	3,165	1,560,782	18	0.0018	2.5	2.6	0.52	2,198,250	54%
16 TO 17	0	0	0	0	4,228	3.50	4.00	3.50	4.00	3,165	1,560,782	18	0.0018	2.5	2.6	0.52	2,198,250	54%
17 TO 18	0	0	0	0	4,228	3.50	4.00	3.50	4.00	3,165	1,560,782	18	0.0018	2.5	2.6	0.52	2,198,250	54%
18 TO 19	0	0	0	0	4,228	3.50	4.00	3.50	4.00	3,165	1,560,782	18	0.0018	2.5	2.6	0.52	2,198,250	54%
19 TO 20	0	0	0	0	4,228	3.50	4.00	3.50	4.00	3,165	1,560,782	18	0.0018	2.5	2.6	0.52	2,198,250	54%
20 TO 21	0	0	0	0	4,228	3.50	4.00	3.50	4.00	3,165	1,560,782	18	0.0018	2.5	2.6	0.52	2,198,250	54%
21 TO 22	0	0	0	0	4,228	3.50	4.00	3.50	4.00	3,165	1,560,782	18	0.0018	2.5	2.6	0.52	2,198,250	54%
22 TO 10	0	0	0	0	4,228	3.50	4.00	3.50	4.00	3,165	1,560,782	12	0.0200	6.4	3.1	0.13	3,383,541	4%
10 TO OS MH 1	30,174	0	0	30,174	3,856	3.50	4.00	3.50	4.00	10,550	125,716	12	0.0200	6.4	3.1	0.13	3,383,541	4%
Total	856,674	53,001	80,340	1,040,615	10,408	3.50	4.00	3.50	4.00	10,550	3,240,474	24	0.0018	3.1	3.2	0.56	6,218,095	60%

Infiltration / Inflow Rate = 250 gal / acre / day
 Project Area = 42.20 acres
 Total Infiltration Flow = 10,580 gal / day
 No. of Pipes = 20
 Infiltration / Inflow per Pipe = 529 gal / pipe

*Proposed audit connections to existing Skyway sewer located along Alder Road.
 *Peaking factors used are 3.5 for commercial and 4.0 for condominiums and hotels, per the approved Storm On-Site Hydrologic Plan for Skyway etc., by Wood/Patel Associates, dated August 25, 2004.
 *Max. Day Flow = Ave. Daily Flow x Peaking Factor + Infiltration/Inflow.

WOOD/PATEL

WASTEWATER DESIGN FLOWS BY ZONE (FULL BUILDOUT)

CIVIL ENGINEER • HYDROLOGIST • L&ES 00075000 • CIVIL/STRUCTURAL/MECHANICAL

Project: Strong ASU Scottsdale Innovation Center
 Location: Scottsdale, AZ
 Date: May 11, 2008
 Reference: City of Scottsdale Design Standards and Policies Manual

Proj. Number: 052342
 Proj. Engineer: Tony Benninger, P.E.

ZONE	SEWER SEGMENT (N/E TO S/W)	COMMERCIAL AREA (ACRES)	COMMERCIAL AREA (SQ FT)	CONDOMINIUMS (DU)	HOTEL (ROOMS)	UNIT DAILY FLOW					AVE. DAILY FLOW				
						COMMERCIAL (GPD/ACRE)	COMMERCIAL (GPD/FT ²)	CONDOMINIUMS (GPD/UNIT)	HOTELS (GPD/ROOM)	COMMERCIAL (GPD)	CONDOMINIUMS (GPD)	HOTELS (GPD)	COMMERCIAL (GPD)	CONDOMINIUMS (GPD)	HOTEL (GPD)
NW & SW	1 TO 2	92,810	148,000	0	0	1,284	0.7	158.3	491.7	128,500	0	0	0	0	128,500
NW & SW	2 TO 3	0	0	0	0	1,284	0.7	158.3	491.7	0	0	0	0	0	13,008
NE	9 TO 5	0	0	20	0	1,284	0.7	158.3	491.7	417.75	3,186	0	0	0	130,841
NW & NE	1 TO 2	168,250	168,250	0	0	1,284	0.7	158.3	491.7	117,275	0	0	0	0	117,275
NW & NE	3 TO 4	75,750	75,750	0	0	1,284	0.7	158.3	491.7	89,025	0	0	0	0	51,025
NE	2 TO 4	0	0	0	0	1,284	0.7	158.3	491.7	53,025	0	0	0	0	54,250
NE	4 TO 5	0	0	0	0	1,284	0.7	158.3	491.7	64,250	0	0	0	0	64,250
SW	7 TO 15	0	0	44	500	1,284	0.7	158.3	491.7	64,750	8,813	0	0	0	80,340
SW	11 TO 16	0	0	0	0	1,284	0.7	158.3	491.7	64,750	0	0	0	0	34,250
SW	16 TO 15	0	0	0	0	1,284	0.7	158.3	491.7	64,750	0	0	0	0	35,025
SE	14 TO 13	0	0	452	0	1,284	0.7	158.3	491.7	35,467	0	0	0	0	35,467
SE	6 TO 15	0	0	0	0	1,284	0.7	158.3	491.7	35,467	0	0	0	0	35,467
SE	20 TO 21	0	0	0	0	1,284	0.7	158.3	491.7	35,467	0	0	0	0	35,467
Residential	10 TO 09 MIN 1	23.5	1,191,000	634	200	1,284	0.7	158.3	491.7	30,174	0	0	0	0	30,174
TOTAL			1,191,000	634	200					328,674	53,601	80,340	1,040,515		

* Commercial (office) flows per the City of Scottsdale Design Standards Manual. Assume 100% occupancy rate.
 † Assume multi-story buildings per above table flow factor.

WOOD/PATTEL

PHASED WASTEWATER DESIGN FLOWS

Project: SkySong ASU Scottsdale Innovation Center
 Location: Scottsdale, AZ
 Date: May 11, 2006
 References: City of Scottsdale Design Standards and Policies Manual

Proj Number: 052562
 Proj Engineer: Troy Bantinger, P.E.

CML ENGINEERS - HYDROLOGISTS - LANE SURVEYORS - CONSTRUCTION MANAGERS

YEAR ¹	COMMERCIAL AREA (SF)	CONDOMINIUMS (DU)	HOTEL (Rooms)	UNIT DAILY FLOW				AVE. DAILY FLOW				PROJECTED PEAK WET WEATHER FLOW (GPD) ²
				COMMERCIAL (GPD/UNIT) ³	CONDOMINIUMS (GPD/UNIT) ¹	HOTEL (GPD/ROOM) ¹	COMMERCIAL (GPD)	CONDOMINIUMS (GPD)	HOTEL (GPD)	TOTAL (GPD)		
2007	298,774	388		0.7	155.3	401.7	200,042	60,256	0	260,298	951,722	
2008	151,538	64		0.7	155.3	401.7	106,077	9,939	0	376,914	1,162,747	
2009	151,538	88		0.7	155.3	401.7	106,077	13,565	0	496,057	1,758,631	
2010	151,538			0.7	155.3	401.7	106,077	0	0	602,134	2,129,948	
2011	151,538	44		0.7	155.3	401.7	106,077	6,833	0	715,043	2,858,550	
2012	151,538	20	200	0.7	155.3	401.7	106,077	3,305	80,340	904,565	3,252,602	
2013	151,538			0.7	155.3	401.7	106,077	0	0	1,010,643	3,634,870	
	1,195,002	604	200									

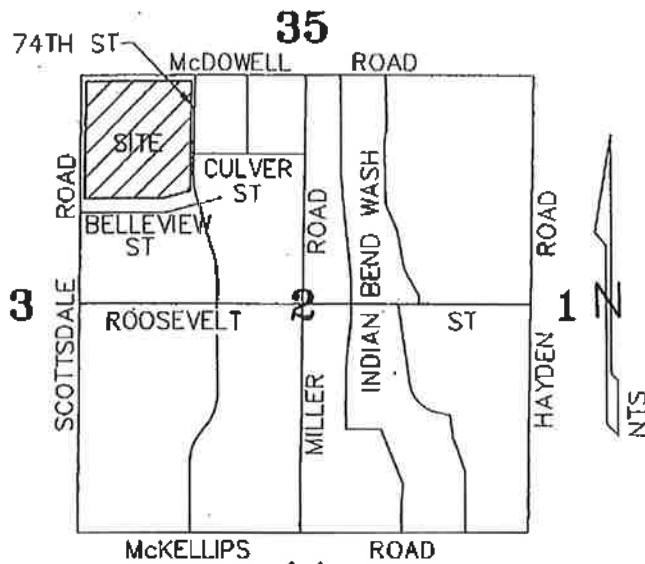
¹ Flows per the City of Scottsdale Design Standards Manual. Assumes inside water use = wastewater flow.

² Parking factors used are 3.2 for commercial and 4.0 for Condominiums and Hotels, per the approved Master On-Site Wastewater Plan for SkySong, by Wood, Paul & Associates, dated August 28, 2005.

³ Total infiltration is projected to be 10,550 gpd for the 42.2 acre site.

⁴ This is a projected final rate to ultimate build-out with the average square footage to be built each year. This timeline is for estimating purposes only and is subject to change at any time. According to the current lease agreement with C.O.S., Developer is only required to build 150,000 sq ft every 3 years.

VICINITY MAP



11
VICINITY MAP

NW 1/4 SECTION 2, T-1N, R-4E

VICINITY MAP

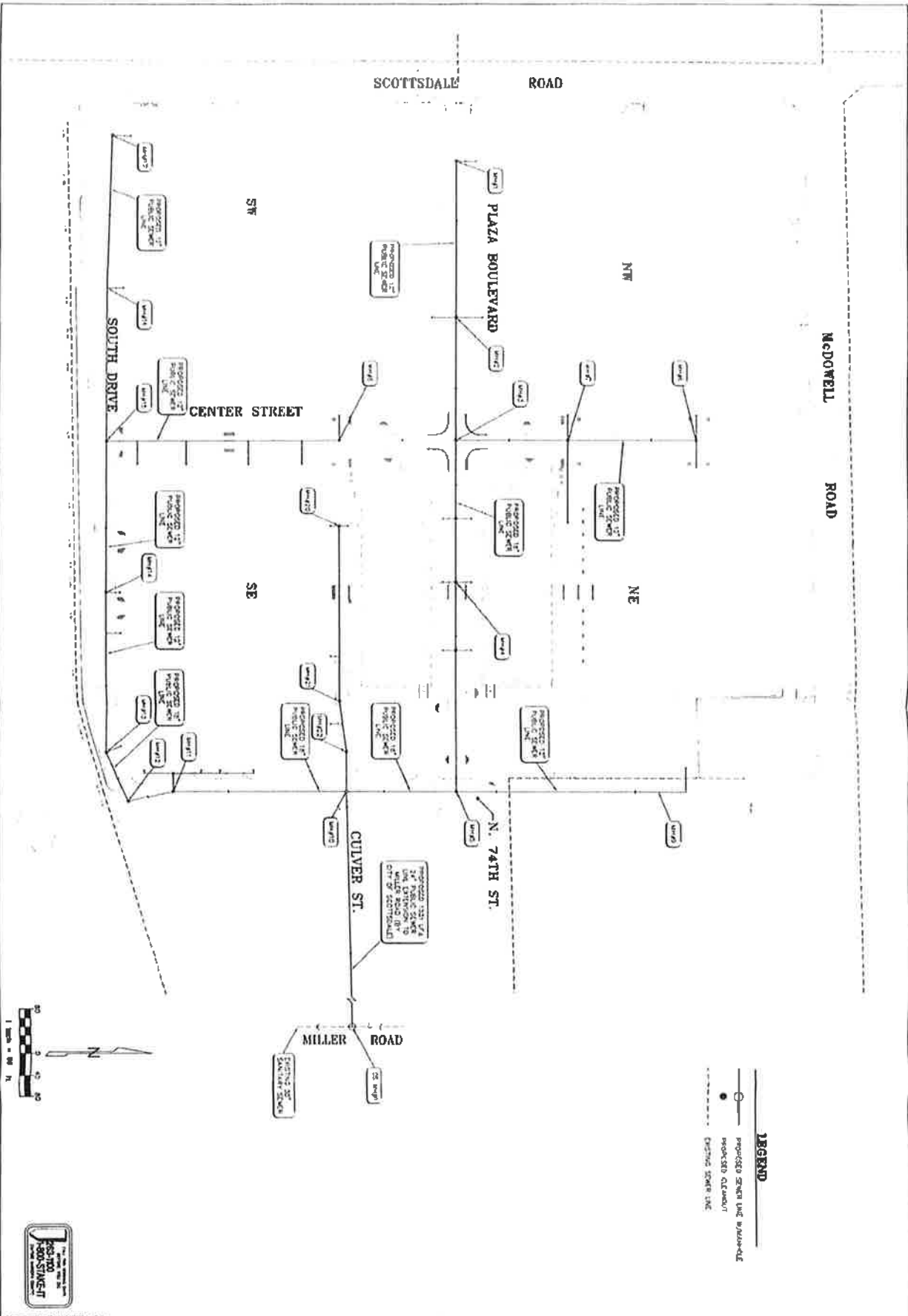
ASU CENTER FOR NEW TECHNOLOGY
SCOTTSDALE, AZ

ENGINEER	<u>T. HONSESKI</u>	SCALE	<u>NTS</u>
DESIGNER	<u>J. HEYWOOD</u>	DATE	<u>09-26-05</u>
CAD TECHNICIAN	<u>D. SAYRE</u>	JOB NUMBER	<u>052562</u>
		REF. SHEET	<u>1 OF 1</u>

WOOD/PATEL ASSOCIATES INC.
Civil Engineers, Hydrologists
and Land Surveyors

1855 North Stapley Drive
Mesa, Arizona 85203
(480) 834-3300
(480) 834-3320 FAX

SEWER EXHIBIT



LEGEND

—○— PROPOSED SEWER LINE (SCHEDULE 40)

● PROPOSED CLEANOUT

- - - - - EXISTING SEWER LINE

SKYSONG ASU SCOTTSDALE
INNOVATION CENTER
MASTER SEWER EXHIBIT

PRELIMINARY
 NOT
 FOR
 CONSTRUCTION
 OR RECORDING

WOOD/PATEL
 CIVIL ENGINEER
 LICENSE NO. 12345
 1800 North Skyway Drive
 Scottsdale, AZ 85258
 Phone: (480) 941-1000
 Fax: (480) 941-1000
 WWW.WOODPATEL.COM

PROJECT: SKYSONG ASU
DATE: 08/15/2023
SCALE: AS SHOWN
SHEET: 1 OF 1