Drainage Reports

Abbreviated Water and Sewer Needs

Water Study

Wastewater Study

Stormwater Waiver Application

KLAND CIVIL ENGINEERS

Scottsdale
Preliminary Drainage Report
Papago Plaza Springhill Suites

7047 E. McDowell Road Scottsdale, AZ 85257

#K19113

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

Prepared for:
PEG Companies
180 North University Avenue, Suite 200
Provo, Utah 84601

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

APPROVED

08/27/2019

Richard M. Anderson

Revised August 7, 2019
April 17, 2019

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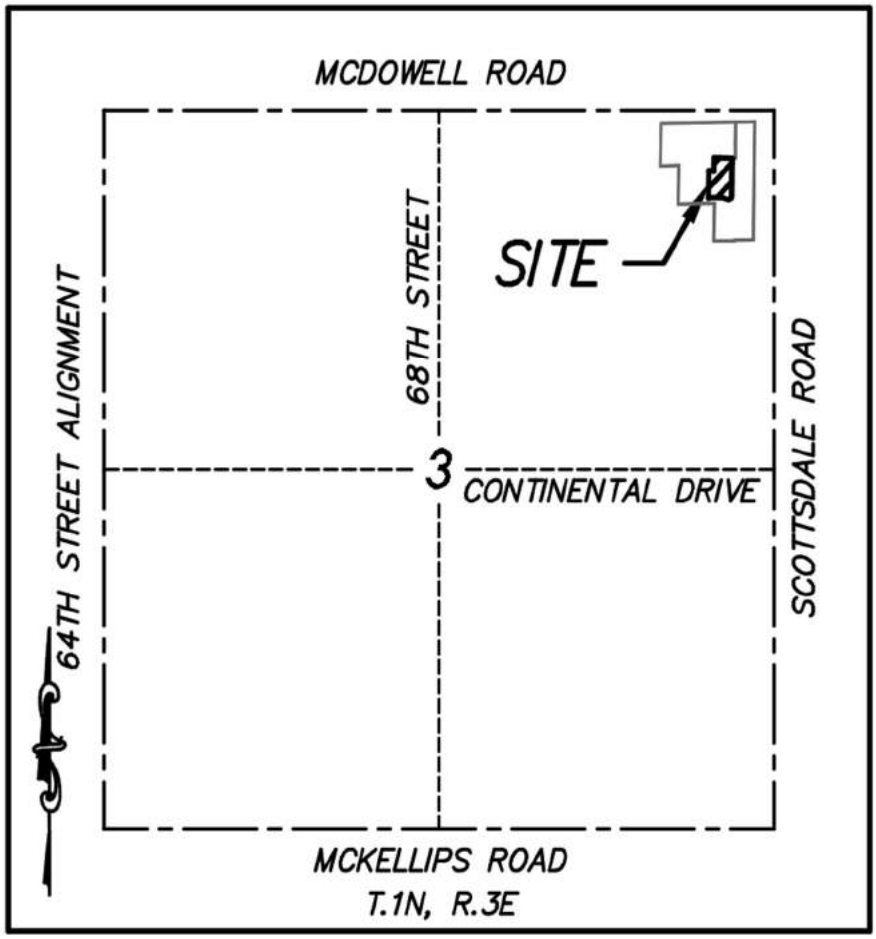
INTRODUCTION

Papago Plaza Springhill Suites is a 116-room hotel located within a portion of the northeast ¼ of Section 3, Township 1 North, Range 3 East of the Gila and Salt River Base and Meridian in Maricopa County, Arizona. The site is bounded on the north and west by Broadstone Papago Marketplace multifamily development, on the east by Papago Plaza retail development and on the south by the access drive for the multifamily development (Please see the vicinity map). The hotel is planned to be constructed after or concurrent to the retail development. This project is designed in accordance with the "Master Drainage Report for Scottsdale McDowell" prepared for the overall development of Scottsdale McDowell, located in Appendix B.



VICINITY MAP

N.T.S.

Federal Emergency Management Agency (FEMA) Designation

The project site lies in a Federal Emergency Management Agency (FEMA) designated Flood Area Zone "X" (shaded) per FIRM Panel 04013C2235L, effective date October 16, 2013 (see below). The FIRM Panel defines a Zone "X" (shaded) designation as follows:

"Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1-foot or with drainage was less than 1 square mile; and areas protected by levees from 1% chance flood."

It is our understanding that no special consideration is required for areas in a FEMA designated Zone "X". See Appendix A of the "Master Drainage Report for Scottsdale McDowell" (located in Appendix A) for FEMA Flood Insurance Rate Map exhibit.

OVERALL DRAINAGE

Existing Drainage

This site is part of the Scottdale McDowell Master Drainage Report. At the request of the City of Scottdale, the south FLO-2D model for the Lower Indian Bend Wash was reviewed. Our evaluation was of the Lower Indian Bend Wash 100-year 6-hour FLO-2D model. In evaluating the FLO-2D model we noticed that the model did not reflect the crown of the streets. We hired HELM to evaluate the FLO-2D model for the offsite storm water flows. HELM evaluated the County model and made tweaks to the model to add details. This includes adding the roadway crowns to the model. The existing onsite drainage was also analyzed based on the topographic survey and the rational method. See Appendix A for the Master Drainage Report for Scottsdale McDowell.

Proposed Drainage

Offsite Drainage

The hotel project is not adjacent to any public roadways. All off site flow will be handled with the retail and multi-family developments and routed within the shared access drives within the master development.

Onsite Drainage

Per the "Master Drainage Report for Scottsdale McDowell", this site is required to provide retention for the first flush volume. The runoff generated from the hotel site will be retained in 8' diameter underground tanks that will be constructed with the retail site development. The retail development will provide a storm drain stub to this site at the northeast corner of the hotel. This storm drain will be extended in the access drive to provide roof drain connections and to capture storm water in the proposed access drive. The underground retention tanks will be equipped with drywells to dissipate the water within 36 hours per the "Master Drainage Report for Scottsdale McDowell". The underground retention system will be designed and operated in conformance with the City of Scottsdale Underground Stormwater Storage Policy as outlined in the Chapter 4 of the Design Standards and Policies Manual. An operations and maintenance manual will be prepared during the construction document phase of the retail development. The ultimate outfall for this tank is to Scottsdale Road.

We have evaluated the drainage system and outfall through the retail development at the south end of the hotel in order to establish a finish floor elevation. The storm drain system through the retail development will be sized for the 100-year storm event. All inlets have been sized to capture the 100-year storm event with a 50% plug factor based on a ponding depth prior to overtopping the downstream ridge. In addition, the access drives have been designed with ridge elevations at a minimum of 6-inches below the adjacent finish floor to allow storm water to flow to the next inlet for an event that one inlet fails. We have also calculated the overflow at the speed table for the overflow volume that could pass over the speed table without impacting the

building finish floors. A flow of 47.15 cfs can flow over the speed table without inundating the buildings. This equates to over a 120% of the tributary areas 100-year discharge. In summary we have designed the storm drain system to capture the entire peak flow from the 100-year storm event. In the event an inlet fails the storm water will pond to a maximum depth of 6 inches before overflowing to the next inlet. All roof drains are connected to the storm system directly and do not surface flow through the drives. These calculations are provided in the "Master Drainage Report for Scottsdale McDowell" located in Appendix A. This site will be required to submit a final drainage report at the time of final construction document preparation. The final drainage report will need to be in accordance with the "Master Drainage Report for Scottsdale McDowell" or justify any deviations.

ADEQ Water Quality Requirements

The proposed disturbed area of this project exceeds 1 acre and is required to be submitted to ADEQ for a Notice of Intent (NOI) Certification. The approved NOI Certification with the AZCON permit number will be included in the construction document submittal and the Final Drainage Report.

See Appendix D for the "Master Drainage Report for Scottsdale McDowell" and Appendix B for "Preliminary Grading and Drainage Plans".

Summary

- The development will occur after or concurrent with the development of Papago Plaza Retail development including the offsite improvements.
- The hotel will be designed in accordance with the "Master Drainage Report for Scottsdale McDowell."
- The retention for the hotel is provide within the Papago Plaza retail development
- The retention will be installed concurrent or before the hotel development.
- The storm drain system will be designed to convey the 100-year peak storm event.
- The inlets will be sized to capture the 100-year storm event with a 50% plug factor.

- The access drives are design with ridges at a minimum of 6-inches below the finish floor elevation.

- The access drive, south of the Hotel can handle 120% of the tributary area 100-year peak flows which would only occur in an event that the entire storm drain system fails.

APPENDIX A: Master Drainage Report for Scottsdale McDowell

KLAND CIVIL ENGINEERS

Scottsdale
Master Drainage Report
Scottsdale McDowell

7047 E. McDowell Road Scottsdale, AZ 85257

#K17127
141-SA-2019

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 July 16, 2019
Revised May 20, 2019
March 21, 2019

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Revised July 16, 2019
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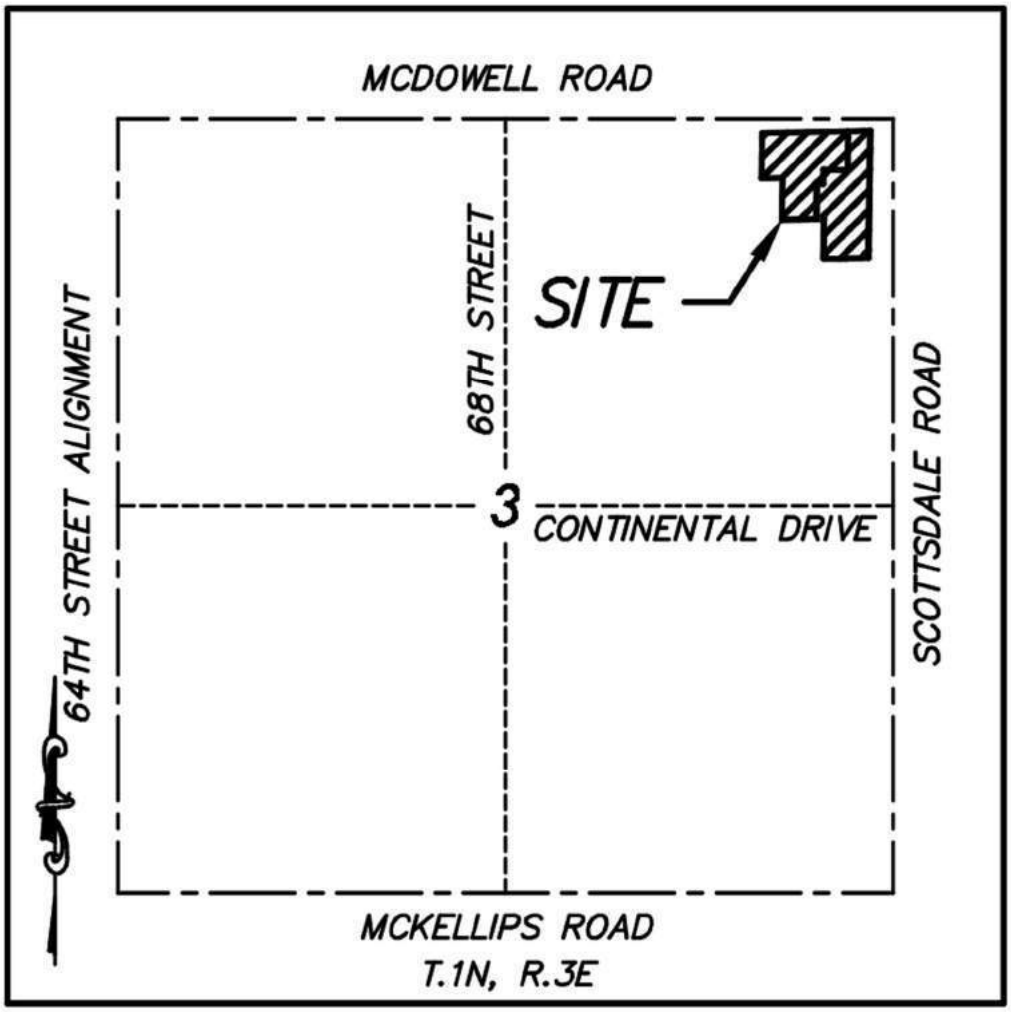
INTRODUCTION

Scottsdale McDowell is a portion of the northeast ¼ of Section 3, Township 1 North, Range 3 East of the Gila and Salt River Base and Meridian in Maricopa County, Arizona. Please see Vicinity Map below. The report consists of descriptions of existing conditions, proposed drainage conditions, methods of analysis, and conclusion. This Drainage Report serves to document that the proposed project does not affect the existing drainage patterns in a significant way and has been designed in accordance with our understanding of known applicable City of Scottsdale criteria, requirements, and design standards associated with storm water management.



VICINITY MAP

N.T.S.

The county assessor's website shows the parcel as APN: 129-12-001Y which is currently fully developed retail. This subject site covers approximately 11 acres net and located at the southwest corner of Scottsdale Road and McDowell Road in Scottsdale, Arizona. The site is bounded on the south and west by existing retail and residential developments on the north, by McDowell Road, and on the east, by Scottsdale Road.

In the proposed redevelopment, the existing buildings and parking lots will be demolished to construct Papago Plaza retail and a multi-family residential development. The multi-family development is 274 units in 3 carriage buildings and a single podium style apartment building over ground level parking. The retail development is planned to be 4 retail/restaurant buildings, a garage, a grocery store and a 116 room hotel.

The project will be built in phases. This is mainly needed to allow the bank on the corner to remain open until the first retail building is constructed for the bank to move into. Although we are phasing the project, we expect a lot of the construction to be concurrent. The first phase will be the infrastructure. This will include the water and sewer construction through the access drives on the retail site, The storm water tank and infrastructure, driveway entrances off McDowell and Scottsdale road, the new water line in Scottsdale road, the new curb inlet in Scottsdale Road, sidewalk along McDowell and Scottsdale Road and the new street signals at Skysong and McDowell intersections with Scottsdale Road.

The second phase will be the retail site and the parking garage. The third phase will be the Residential site. We anticipate this construction will be concurrent with the retail site but will take longer to complete. The fourth phase will be the hotel site. The hotel construction will start shortly after the retail site and will require the parking garage to be complete prior to the hotel opening. The final and fifth phase will be the grocery store. In addition to the five phases of development a set of plans is being prepared for the alley improvements. See Appendix F for Phasing Exhibit and Appendix D for Master Grading & Drainage Plan

Federal Emergency Management Agency (FEMA) Designation

The project site lies in a Federal Emergency Management Agency (FEMA) designated Flood Area Zone "X" (shaded) per FIRM Panel 04013C2235L, effective date October 16, 2013 (see below). The FIRM Panel defines a Zone "X" (shaded) designation as follows:

"Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1-foot or with drainage was less than 1 square mile; and areas protected by levees from 1% chance flood."

It is our understanding that no special consideration is required for areas in a FEMA designated Zone "X". See Appendix A for FEMA Flood Insurance Rate Map exhibit.

OVERALL DRAINAGE

Existing Drainage

Current topography of the existing development shows approximately 5' to 6' of fall from the northwest to the southeast of the site. According to the survey findings, there are no underground retention tanks found on site, and there are three retention areas within the site on the north frontage of McDowell Rd. The volume of these basins, based on our modeling in Civil 3D, is 53 cubic feet. In addition, there is one catch basin in Scottsdale Road along the east property line and one catch basin in McDowell on the north property line.

At the request of the City of Scottdale, we have reviewed the south FLO-2D model for the Lower Indian Bend Wash for the tributary area contributing to the street flows adjacent to this site. Our evaluation was of the Lower Indian Bend Wash 100-year 6-hour FLO-2D model. In evaluating the FLO-2D model we noticed that the model did not reflect the crown of the streets. We hired HELM to evaluate the FLO-2D model for the offsite storm water flows (See Appendix E). HELM evaluated the County model and made tweaks to the model to add details. This includes adding the roadway crowns to the model. The offsite drainage report shows that in the existing condition

there is 7.2 cfs in McDowell Road at the west driveway. Most of the 7.2 cfs enter the site through the west driveway on McDowell Road. The flows continue through the site and exits into Scottsdale Road at the south driveway. The model also shows 3.4 cfs in McDowell Road prior to the sump condition inlet (CB-1) at the southeast corner of Scottsdale Road and McDowell Road. Based on the model the in the inlet has a capacity of 12.5 cfs so no flows should bypass.

For Scottsdale Road there are no flows that come from McDowell Road or to the north. We calculated the street flows in Scottsdale Road using the Flood Control District of Maricopa County DDMSW software. The DDMSW uses the Rational Method for calculating the street flows. This was done using the rational method for both the onsite and offsite flow that contribute to Scottsdale Road. We have calculated that at the north driveway there is 1.5 cfs of flow in Scottsdale Road. At the Skysong driveway there is 5.5 cfs of flow in Scottsdale Road and the existing site discharges approximately 49.56 cfs. The combined flow of 55.06 cfs continues south to a sump condition inlet (CB-2). At this inlet there is an additional 1.8 cfs of flow that comes from the south. Based on this the total flow to inlet CB-2 is approximately 56.86 cfs. We have evaluated this inlet and found that it has a capacity of approximately 2 cfs. The excess flow of 54.86 cfs continues south in Scottsdale Road.

The revised FLO-2D model shows a peak flow in the alley at the middle of this site of 29.5 cfs. This flow includes a portion of the existing retail development that drains to the alley. Roughly 9.4 cfs are in the north portion of the alley near the residential site. The FLO-2D model shows a flow of 28.5 cfs in the alley at the south end of the site. According to HELMS this slight reduction is due to some limited ponding within pavement. This discharge continues south in the alley to Belleview Street.

Just south of McDowell and on the west side of the proposed residential development, the FLO-2D model shows 3.1 CFS entering the site.

See Appendix B for Drainage Calculations and Appendix C for Drainage Map.

Proposed Drainage

Offsite Drainage

Per the above section offsite flows impact the site from McDowell Road. The updated model by HELM shows flows of approximately 7.2 cfs at the existing west driveway on McDowell Road. Approximately 7.2 cfs enter this driveway with 0.1 cfs of flow that bypasses the driveway. In the proposed design the depressed driveway will be removed, and a new driveway that is not depressed will be provided. The new driveway keeps the 7.2 cfs of flow within McDowell Road. We have calculated the depth of flow, 0.42-feet deep, at this location (Section A-A) using Haestad, FlowMaster v7.0. We have set the driveway entrance over 0.7-feet higher than the gutter in order to prevent the offsite flows from entering the driveway. At the east driveway, on McDowell, HELM calculated that the flow would be 10.6 cfs. The calculated depth is 0.4-feet (Section B-B) and the driveway entrance is set at over 0.5-feet above the gutter. Per the existing condition the existing sump condition curb inlet (CB-1) has a capacity of 12.5 cfs. This mean that the inlet can capture the full flow of 10.6 cfs and will reduce the discharge to Scottsdale Road by 7.2 cfs from the historical condition.

Offsite storm water from the west impacts the site in three locations. Near the north end of the site, 3.1 cfs enters the site from the parking area north of the commercial site. This storm water will be allowed to enter the multi-family residential site through a wall opening.

There is an alley just south of the commercial site that carries 9.4 cfs toward the residential site. As a part of the development we will be improving the alley and installing a wall along the Multi-family development property line. We will grade the alley such that the existing single-family home side of the alley is higher than the multi-family side of the alley. Wall openings will be installed along the multi-family section to allow storm water that exceeds the alley capacity to drain into the site. This storm water will be allowed to pass through the site and discharge into the Scottsdale Road 60-inch storm pipe. We discuss this in more detail in the section regarding the storm drain system design.

The third location that off-site flows from the west impact the site is and alley on the south side of the multi-family residential development. This will be handled in the same way as the alley to the north. Flows from the alley will be allowed to enter the site through wall openings. A storm drain system will carry the flows to the Scottsdale Road 60-inch storm pipe.

Per the Existing Drainage section, we calculated the street flows in Scottsdale Road using the Rational Method. We calculated at the north driveway there is approximately 1.3 cfs of flow in the street. This results in a depth of 0.15-feet (Section C-C) and the driveway entrance is set at over 0.5-feet above the gutter. South of the Skysong driveway the existing catch basin and 18-inch storm pipe will be removed and replaced with a catch basin and 36-inch storm pipe. In the existing condition the catch basin captures roughly 2 cfs and 54.86 cfs overflows the ridge in Scottsdale road and drains to the south. With the 36-inch storm pipe we have capacity for the site drainage to drain directly to the 60-inch pipe in Scottsdale Road as well as the Alley flows. This will greatly improvement the street drainage in Scottsdale road at this location. We have included a section of the LIBW study (within Appendix E) that shows a capacity of 157.8 cfs in the 60-inch storm pipe. According to the LIBW study the existing 100-year peak flows in the 60-inch storm drain is 3.7 cfs. The proposed 100-year peak flows from our site to the 60-inch storm drain are 67.40 cfs for a total flow of 71.1 cfs.

The driveway entrance at Skysong has been set at a minimum of 0.5-feet above the gutter to prevent street flows will enter the site. With the catch basin and new storm pipe only 5.3 cfs overflows the ridge in Scottsdale Road. Our calculations assume that all the onsite retention is full when the onsite peak from the 100-year storm event enters the storm system. We used an onsite time of concentration of 5 minutes. The pipe is sized to carry 66.69 cfs, this includes 64.30 from the onsite and 2 cfs from off site.

See Appendix C for Drainage Map, Appendix D for Preliminary Grading and Drainage Plan and Appendix E for Offsite Drainage Report prepared by HELM.

Onsite Drainage

The site is a redevelopment and will therefore be required to provide retention for the higher calculated volume from “Pre- vs. Post-development Method” and “First-Flush Method”. Based on the site plans and drainage calculations, the proposed development will have a lower runoff coefficient and generate less runoff then the existing development due to an increase in open space. Consequently, we are required to provide retention for the first flush. We have provided calculations in Appendix B comparing the different methods.

The first flush retention for the site will be primarily held in three underground tanks systems. Based on the required retention volumes, it was decided to use 6’ and 8’ diameter storage tanks. A few shallow 1’ deep basins along McDowell Road will be constructed to capture the water that fall on the basins. Although these basins do not capture much they do help control and route the storm water safely around the building. The underground retention tanks will be equipped with drywells to dissipate the water within 36 hours. We have looked at dissipating the underground retention via a gravity connection to the public storm drain system. The existing storm drain in McDowell Road does not extend far enough west to allow for a gravity connection from the underground retention tanks. In addition, the residential site is lower than McDowell Road and any surcharge in the offsite storm drain could overflow into the development. For the retention tanks on the retail portion, the tank invert is lower than the 60-inch storm drain in Scottsdale Road. The depth of the system is based on the overflow pipe in near the Skysong intersection and providing a minimum of three feet of cover over the pipe. The top of the storage tank must be below the overflow. This puts the invert deeper than the storm drain system in Scottsdale Road. The drywells are designed with a sedimentation chamber and oil collection pillows prior to the actual drywell chamber. This provides ground water pollution protection that is accepted by most local and state agencies.

The underground retention system will be designed and operated in conformance with the City of Scottsdale Underground Stormwater Storage Policy as outlined in the Chapter 4 of the Design Standards and Policies Manual. An operations and maintenance manual will be prepared during the construction document phase of the project.

The site system has three retention areas. Two of the systems are within the Multi-family development area. These tanks will hold approximately 75% of the residential area retention. The third tank is on the retail development and provides the first flush retention for 25% of the multi-family site, the retail, hotel, garage and grocery store.

The retail portion of the site will be built in two or more phases. The first phase will consist of the retail and restaurant pads and the parking garage at the southwest corner of the site. The hotel and grocery store will be constructed as later phases. Storm drain connections will be provided for the hotel and the grocery store to connect into the system.

In the event that the underground retention system fails or is full a backwater condition with an overflow will send the storm water into the 60-inch storm pipe in Scottsdale road. If this system also fails or if the storm event exceeds the 100-year event the access drives are designed with the overflow to Scottsdale Road through the driveway entrances.

The storm pipes and catch basins onsite will be sized using FlowMaster during final design. It is at final design that we will fully understand the roof drains and the accurate tributary areas. We have provided sizing for the main infrastructure that connects to the overflow pipe near Skysong intersection. Since the intent is to allow the alley flows to pass through the site, we have compared the onsite flows with and the alley flows and sized the pipe for the greater. We had HELM's do a check of the time of concentration (TC) for the alley flows using the rational method. This gave us a TC of over 20 minutes. We are using a TC for the onsite flows of 5 minutes. The peaks will not coincide. In addition, we believe that using the rational method to calculate the alley flows is much too conservative of an analysis and gives us discharge that is not reasonable. The FLO-2D discharge includes roughly half of our site draining to the alley. This area has been eliminated from the flow so we feel the number would actually be less. For our pipe sizing we use the FLO-2D for the alley flow and the rational method for the onsite flows.

Finished floors of the residential site is set at 1235, more than 14-inches higher than the fronting low curb at 1232.58. The high frontage curb is at 1236.33. The apartment site is designed lower than the high curb, similar to the existing retail site. This provides connectivity to the future retail

site and helps to accommodate the 5 to 6 feet of fall across the site. A safe out fall is provided to the southeast. The storm water in excess of the retention volume will drain to the 60-inch storm pipe in Scottsdale Road through the site storm drain system. If this fails, the storm water will exit the site at the Skysong drive entrance. We have evaluated the overflows from each drainage area at the ridges in the access drive using the weir equation. We calculated the 100-year peak flow for each overflow location and did not assume a reduction for the retention volume. The north portion (B-RES) of the multifamily development will overflow south in the access drive. At this location we calculated a peak flow of 13.99 cfs at a weir depth of 0.33-feet. The flow will be contained within the curbs of the access drive. The next outfall from the multifamily development is into a drop inlet that drains to the 36-inch overflow pipe connected to the 60-inch storm pipe in Scottsdale Road. If this system fails, the water will overtop the raised drive between the hotel and the garage and drain out the entrance at SkySong.

The Hotel site and the parking garage are set in relationship to the other shops. All of the retail site is a minimum of 14-inches above the low curb or outfall and 12-inches above the adjacent high curb on Scottsdale Road. We have evaluated the drainage system and outfall through the retail development at the south end of the hotel in order to establish a finish floor elevation. The storm drain system through the retail development will be sized for the 100-year storm event. All inlets have been sized to capture the 100-year storm event with a 50% plug factor based on a ponding depth prior to overtopping the downstream ridge. In addition, the access drives have been designed with ridge elevations at a minimum of 6-inches below the adjacent finish floor to allow storm water to flow to the next inlet for an event that one inlet fails. We have also calculated the overflow at the speed table for the overflow volume that could pass over the speed table without impacting the building finish floors. A flow of 47.15 cfs can flow over the speed table without inundating the buildings. This equates to over a 120% of the tributary areas 100-year discharge. In summary we have designed the storm drain system to capture the entire peak flow from the 100-year storm event. In the event an inlet fails the storm water will pond to a maximum depth of 6 inches before overflowing to the next inlet. All roof drains are connected to the storm system directly and do not surface flow through the drives.

ADEQ Water Quality Requirements

The proposed disturbed area of this project exceeds 1 acre and is required to be submitted to ADEQ for a Notice of Intent (NOI) Certification. The approved NOI Certification with the AZCON permit number will be included in the construction document submittal and the Final Drainage Report.

METHODOLOGY

Offsite Drainage

To check the offsite flow depths in the street and discharge to the drainage infrastructure we used the FLO2D model from FCDMC for the Lower Indian Bend Wash. For the inlets and street depths we used FlowMaster v7.0. This program used Manning's equation and the weir equation.

Manning's Equation:

$$\mathbf{Q = (1.49/n) \times A \times R^{2/3} \times S^{1/2}}$$

Q = Peak Discharge (cfs)
n = Manning Coefficient of Roughness (0.013)
A = Cross-section Area of Flow
R = Hydraulic Radius (ft)
S = Slope of Pipe (ft/ft)

Weir Equation:

Due to the shallow ponding, it is assumed all inlets function as a weir. So, the Weir Equation with the weir coefficient equal to 3 will be used as follow:

$$\mathbf{Q = C_w \times P \times d^{3/2}}$$

Q = Capacity (cfs)
Cw = Weir Coefficient (3)
P = Inlet Perimeter (ft)

d = Flow Depth (ft)

Per the Flood Control District of Maricopa County, we will use plugging factors of 50% for grated catch basins and 20% for curb inlets and wall openings.

Alley Flows and Wall opening

The proposed alley capacity was calculated using FlowMaster v7.0 which uses Manning's equation for an irregular channel.

Manning's Equation:

$$\mathbf{Q = (1.49/n) \times A \times R^{2/3} \times S^{1/2}}$$

Q = Section Capacity (cfs)
n = Manning Coefficient of Roughness (0.013)
A = Cross-section Area of Flow
R = Hydraulic Radius (ft)
S = Slope of Pipe (ft/ft)

The multi-family development side of the alley was set at 0.19 feet lower than the single family side of the alley. We used the alley discharge from the FLO-2D model from HELM's (29.5 cfs) minus the alley capacity to size the wall openings to allow the alley discharge to pass into our site. We also used a 20% plugging factor to determine the length of wall opening.

The Weir Equation with the weir coefficient equal to 3 was be used as follow:

Weir Equation:

$$\mathbf{Q = C_w \times P \times d^{3/2}}$$

Q = Capacity (cfs)
Cw = Weir Coefficient (3)
P = Inlet Perimeter (ft)

d = Flow Depth (ft)

Retention Calculations

Onsite Drainage

In order to compare the existing development runoff with the proposed development we evaluated the runoff coefficient using the below method.

$$\Delta C = C_{post} - C_{pre}$$

$$C = (C_p \times A_p + C_i \times A_i) \div (A_p + A_i)$$

A_p = Landscape and permeable surfaces
A_i = Impermeable surfaces
C_p = 0.5
C_i = 0.95

ΔC = The change in the weighted average runoff coefficient over disturbed area ($C_{post} - C_{pre}$) .

As mentioned previously, the weighted coefficient of the proposed site plan is less than the existing site because of more permeable surfaces. Based on this analysis we anticipate less runoff for the proposed development then for the existing development. So, the required retention volume will be based on the first-flush procedure. Accordingly, minimum first flush volume is calculated as follow:

$$V_r = P \times C \times A$$

V_r = Required first-flush storage volume (cf)
C = Weighted average runoff coefficient for the disturbed area of the proposed development
P = First 0.5 inch of direct runoff rainfall depth, (Converted to ft)
A = Disturbed area of the proposed project site (sf)

The weighted runoff coefficient for the site is calculated based on the runoff coefficients used by the City of Scottsdale which are 0.5 for Landscape and permeable surfaces and 0.95 for Impermeable surfaces:

$$C = (C_p \times A_p + C_i \times A_i) \div (A_p + A_i)$$

Residential:

A_p = 45,183 sft (Landscape and permeable surfaces)
A_i = 165,140 sft (Impermeable surfaces)
C_p = 0.5
C_i = 0.95
C = 0.85

Retail:

A_p = 41,203 sft (Landscape and permeable surfaces)
A_i = 215,832 sft (Impermeable surfaces)
C_p = 0.5
C_i = 0.95
C = 0.88

Storm Drain Calculations

For the final design of the onsite storm drain, the anticipated 100-year peak flows contributing to the storm drain inlets will be calculated using the Rational Method. Ordinarily the City would require the evaluation of the 2, 10, and 100 year storm event, however since we are sizing our storm drain system for the 100 year event it will also carry the 2 year and the 10 year event. The 100-year intensity was determined using NOAA Atlas 14, Volume 1, Version 5 for a 5-minute time-of-concentration as follows:

Q_{100} = CIA

Q_{100} = Peak Flow in cubic feet for the selected storm reoccurrence interval

C = Weighted Runoff Coefficient

I = Rainfall Intensity, 7.37 in/hr for 100-year, 5-minute time-of-concentration (per NOAA Atlas 14, Volume 1, Version 5)

A = Area of project site (acres)

Storm drain pipe sizing will be based on peak storm water discharge using FlowMaster v7.0. Manning's formula assuming a roughness coefficient equal to 0.013.

Inlet Sizing will be based on the Peak Stormwater Discharge for the 100-year storm event. Based on our design the ponding depths at the inlets will be shallow. Therefore, it is assumed all inlets function as a weir. So, the Weir Equation with the weir coefficient equal to 3 will be used.

The inlet size will be selected if its clogged capacity is equal or more than the anticipated 100-year peak flow rate (Q100). Per the Flood Control District of Maricopa County, we will use plugging factors of 50% for grated catch basins and 20% for curb opening, wall openings, channel drains, and scuppers.

Access Drives Overflows

For the final design of the access drives discharge from the anticipated 100-year peak flows will be calculated using the Rational Method. We have assumed that the retention tanks are full. The 100-year intensity is determined using NOAA Atlas 14, Volume 1, Version 5 for a 5-minute time-of-concentration as follows:

Q_{100} = CIA

Q_{100} = Peak Flow in cubic feet for the selected storm reoccurrence interval

C = Weighted Runoff Coefficient

I = Rainfall Intensity, 7.37 in/hr for 100-year, 5-minute time-of-concentration (per NOAA Atlas 14, Volume 1, Version 5)

A = Area of project site (acres)

To check the depth of overflow from one tributary area to the next we used FlowMaster v7.0 which uses the Weir Equation. The worst-case access drive width was used to calculate the overflow depth.

The Weir Equation with the weir coefficient equal to 3 will be used as follow:

Weir Equation:

$$\mathbf{Q = C_w \times P \times d^{3/2}}$$

Q = Capacity (cfs)

Cw = Weir Coefficient (3)

P = Inlet Perimeter (ft)

d = Flow Depth (ft)

We have also checked the depth of flow in the access drive to confirm that the flow will be contained within the access drive. This was done by using FlowMaster v7.0 which uses Manning's equation for an irregular channel.

Manning's Equation:

$$\mathbf{Q = (1.49/n) \times A \times R^{2/3} \times S^{1/2}}$$

Q = Peak Discharge (cfs)

n = Manning Coefficient of Roughness (0.013)

A = Cross-section Area of Flow

R = Hydraulic Radius (ft)

S = Slope of Pipe (ft/ft)

Please see Appendix B for more details on the drainage calculations and Appendix C for Drainage Map.

SUMMARY

Based on KLAND's understanding of the applicable City of Scottsdale criteria, requirements and design standards associated with drainage, it can be concluded that:

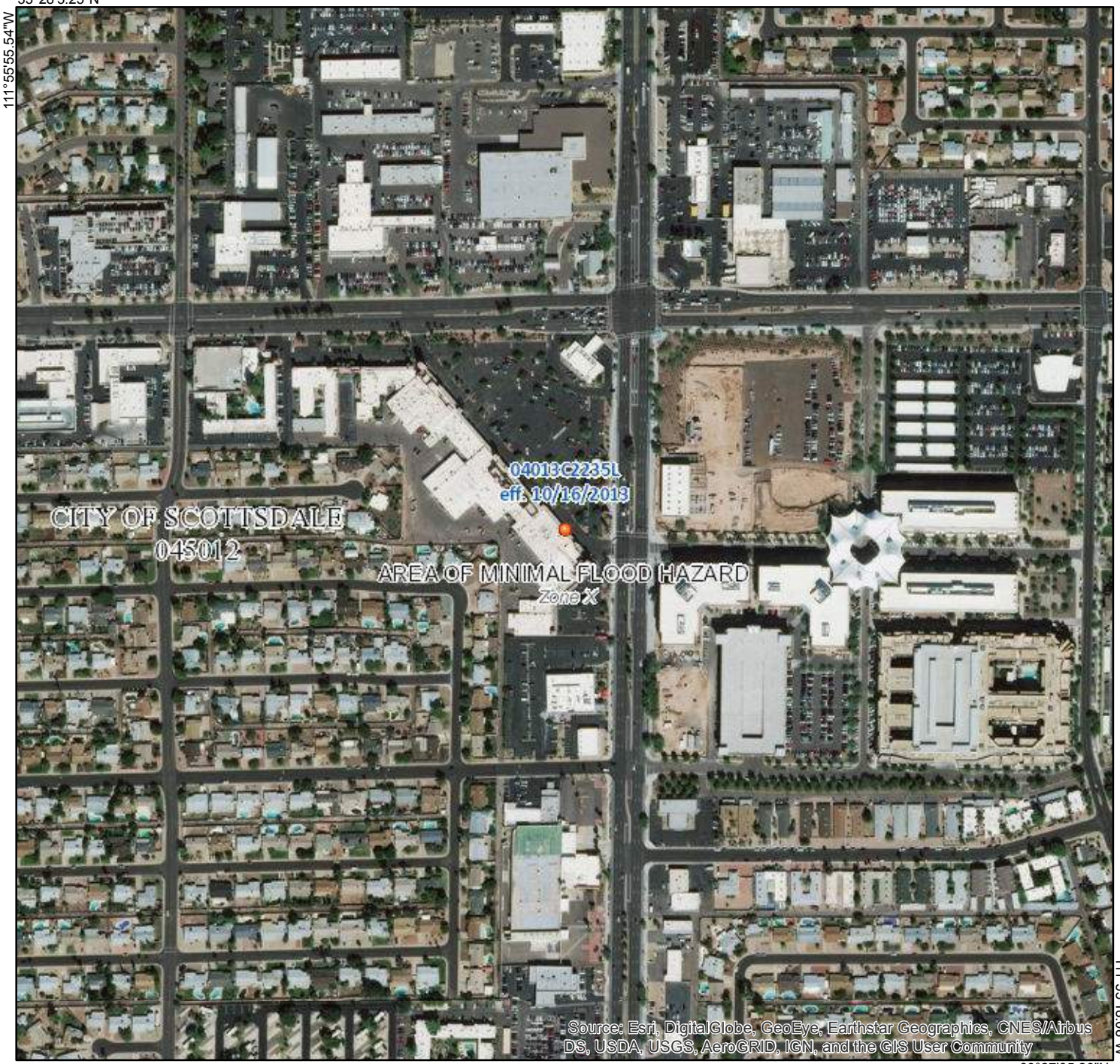
- The proposed conditions will eliminate the offsite flows from McDowell Road from entering the site.
- The proposed development improves the surface permeability in comparison with the existing development.
- The required retention volume is calculated based on the first-flush method.
- All collecting utilities (pipes, catch basins, and wall openings) will be sized for the anticipated peak discharge from the 100-year with 5-minute time of concentration storm event.
- In the residential portion, the storm water runoff will be routed away from the buildings through a series of catch basins and storm drains to surface retention and underground 5' diameter tanks.
- In the retail portion, the storm water runoff will be routed away from the buildings through a series of catch basins and storm drains to 8' diameter underground retention tanks.
- Onsite storm water for the 100-year storm event will discharge to the 60-inch storm pipe in Scottsdale road through a 36-inch pipe near the intersection of Skysong.
- Onsite stormwater in excess of the first flush will back up and overflow to a 36-inch overflow pipe that connects to the 60-inch storm pipe in Scottsdale road. In the event this system fails the storm water will overflow to Scottsdale Road through the driveways.
- Storm water from the alley will pass into the new development through wall openings and pass through the site to the 60-inch storm pipe in Scottsdale Road.

- According to the LIBW study, the existing 60-inch storm drain in Scottsdale road has a capacity of 157.8 cfs and existing 100-year peak flow of 3.7 cfs.
- The proposed 100-year peak discharge to the 60-inch storm drain from this site is 67.40 cfs for a total flow of 71.1 cfs

APPENDIX A: FEMA Exhibit

National Flood Hazard Layer FIRMette

FEMA



Feet 1:6,000

0 250 500 1,000 1,500 2,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth
- Regulatory Floodway *Zone AE, AO, AH, VE, AR*

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/3/2018 at 2:54:12 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX B: Drainage Calculations

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.4645°, Longitude: -111.9275°
Elevation: 1230.76 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**2.17** (1.82-2.63)	**2.83** (2.40-3.44)	**3.86** (3.24-4.67)	**4.66** (3.88-5.59)	**5.71** (4.69-6.84)	**6.54** (5.29-7.80)	**7.37** (5.86-8.76)	**8.23** (6.43-9.78)	**9.38** (7.14-11.2)	**10.3** (7.66-12.2)
10-min	**1.65** (1.39-2.00)	**2.16** (1.82-2.62)	**2.94** (2.47-3.55)	**3.54** (2.95-4.25)	**4.34** (3.57-5.20)	**4.98** (4.03-5.93)	**5.61** (4.46-6.67)	**6.26** (4.90-7.44)	**7.15** (5.44-8.50)	**7.81** (5.83-9.31)
15-min	**1.36** (1.15-1.66)	**1.78** (1.51-2.16)	**2.43** (2.04-2.94)	**2.92** (2.44-3.52)	**3.59** (2.95-4.30)	**4.11** (3.33-4.90)	**4.64** (3.69-5.51)	**5.18** (4.05-6.15)	**5.90** (4.49-7.02)	**6.46** (4.82-7.69)
30-min	**0.918** (0.772-1.11)	**1.20** (1.01-1.46)	**1.64** (1.37-1.98)	**1.97** (1.64-2.37)	**2.42** (1.99-2.90)	**2.77** (2.24-3.30)	**3.12** (2.48-3.71)	**3.49** (2.73-4.14)	**3.97** (3.02-4.73)	**4.35** (3.24-5.18)
60-min	**0.568** (0.478-0.690)	**0.743** (0.628-0.901)	**1.01** (0.849-1.22)	**1.22** (1.02-1.46)	**1.50** (1.23-1.79)	**1.71** (1.39-2.04)	**1.93** (1.54-2.30)	**2.16** (1.69-2.56)	**2.46** (1.87-2.92)	**2.69** (2.01-3.21)
2-hr	**0.330** (0.282-0.392)	**0.427** (0.366-0.509)	**0.572** (0.488-0.679)	**0.684** (0.576-0.808)	**0.834** (0.696-0.982)	**0.951** (0.782-1.12)	**1.07** (0.867-1.26)	**1.19** (0.948-1.40)	**1.36** (1.05-1.59)	**1.48** (1.13-1.75)
3-hr	**0.238** (0.202-0.285)	**0.305** (0.261-0.367)	**0.402** (0.341-0.481)	**0.478** (0.403-0.569)	**0.585** (0.486-0.692)	**0.670** (0.549-0.791)	**0.759** (0.611-0.896)	**0.852** (0.674-1.00)	**0.981** (0.752-1.16)	**1.09** (0.812-1.28)
6-hr	**0.144** (0.125-0.169)	**0.182** (0.159-0.214)	**0.234** (0.203-0.274)	**0.275** (0.237-0.320)	**0.331** (0.281-0.383)	**0.375** (0.314-0.433)	**0.422** (0.347-0.486)	**0.468** (0.378-0.541)	**0.533** (0.419-0.617)	**0.584** (0.448-0.678)
12-hr	**0.080** (0.070-0.093)	**0.101** (0.089-0.117)	**0.128** (0.112-0.148)	**0.150** (0.130-0.172)	**0.179** (0.153-0.205)	**0.201** (0.170-0.230)	**0.223** (0.187-0.256)	**0.246** (0.203-0.283)	**0.277** (0.223-0.320)	**0.302** (0.238-0.351)
24-hr	**0.048** (0.043-0.054)	**0.061** (0.055-0.069)	**0.079** (0.071-0.089)	**0.094** (0.084-0.104)	**0.113** (0.101-0.126)	**0.129** (0.114-0.144)	**0.145** (0.127-0.162)	**0.162** (0.141-0.181)	**0.186** (0.159-0.207)	**0.204** (0.173-0.228)
2-day	**0.026** (0.023-0.029)	**0.033** (0.030-0.037)	**0.044** (0.039-0.049)	**0.052** (0.046-0.058)	**0.064** (0.056-0.071)	**0.073** (0.064-0.081)	**0.083** (0.072-0.092)	**0.093** (0.081-0.104)	**0.107** (0.092-0.120)	**0.118** (0.101-0.133)
3-day	**0.018** (0.016-0.021)	**0.023** (0.021-0.026)	**0.031** (0.028-0.035)	**0.037** (0.033-0.041)	**0.045** (0.040-0.050)	**0.052** (0.046-0.058)	**0.059** (0.052-0.066)	**0.067** (0.058-0.074)	**0.077** (0.066-0.086)	**0.086** (0.073-0.096)
4-day	**0.014** (0.013-0.016)	**0.019** (0.017-0.021)	**0.024** (0.022-0.027)	**0.029** (0.026-0.033)	**0.036** (0.032-0.040)	**0.041** (0.037-0.046)	**0.047** (0.041-0.053)	**0.054** (0.046-0.060)	**0.062** (0.053-0.069)	**0.069** (0.059-0.077)
7-day	**0.009** (0.008-0.010)	**0.012** (0.011-0.013)	**0.015** (0.014-0.017)	**0.018** (0.016-0.021)	**0.023** (0.020-0.025)	**0.026** (0.023-0.029)	**0.030** (0.026-0.033)	**0.034** (0.029-0.038)	**0.039** (0.034-0.044)	**0.044** (0.037-0.049)
10-day	**0.007** (0.006-0.008)	**0.009** (0.008-0.010)	**0.012** (0.011-0.013)	**0.014** (0.013-0.016)	**0.017** (0.015-0.019)	**0.020** (0.018-0.022)	**0.023** (0.020-0.025)	**0.025** (0.022-0.028)	**0.029** (0.025-0.033)	**0.033** (0.028-0.036)
20-day	**0.004** (0.004-0.005)	**0.006** (0.005-0.006)	**0.007** (0.007-0.008)	**0.009** (0.008-0.010)	**0.010** (0.009-0.012)	**0.012** (0.010-0.013)	**0.013** (0.012-0.015)	**0.015** (0.013-0.016)	**0.017** (0.014-0.018)	**0.018** (0.016-0.020)
30-day	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.006** (0.005-0.006)	**0.007** (0.006-0.007)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.010** (0.009-0.011)	**0.011** (0.010-0.013)	**0.013** (0.011-0.014)	**0.014** (0.012-0.016)
45-day	**0.003** (0.002-0.003)	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.006** (0.006-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.009** (0.008-0.009)	**0.010** (0.008-0.011)	**0.010** (0.009-0.012)
60-day	**0.002** (0.002-0.002)	**0.003** (0.002-0.003)	**0.004** (0.003-0.004)	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.006** (0.005-0.006)	**0.006** (0.006-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.008** (0.007-0.009)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.4645°, Longitude: -111.9275°
Elevation: 1230.76 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.181** (0.152-0.219)	**0.236** (0.200-0.287)	**0.322** (0.270-0.389)	**0.388** (0.323-0.466)	**0.476** (0.391-0.570)	**0.545** (0.441-0.650)	**0.614** (0.488-0.730)	**0.686** (0.536-0.815)	**0.782** (0.595-0.930)	**0.856** (0.638-1.02)
10-min	**0.275** (0.231-0.334)	**0.360** (0.304-0.437)	**0.490** (0.411-0.592)	**0.590** (0.492-0.709)	**0.724** (0.595-0.867)	**0.830** (0.672-0.988)	**0.935** (0.743-1.11)	**1.04** (0.817-1.24)	**1.19** (0.906-1.42)	**1.30** (0.971-1.55)
15-min	**0.341** (0.287-0.414)	**0.446** (0.377-0.541)	**0.607** (0.509-0.734)	**0.731** (0.609-0.879)	**0.898** (0.737-1.08)	**1.03** (0.832-1.23)	**1.16** (0.922-1.38)	**1.30** (1.01-1.54)	**1.48** (1.12-1.76)	**1.61** (1.20-1.92)
30-min	**0.459** (0.386-0.557)	**0.600** (0.507-0.728)	**0.818** (0.686-0.988)	**0.984** (0.821-1.18)	**1.21** (0.993-1.45)	**1.38** (1.12-1.65)	**1.56** (1.24-1.86)	**1.74** (1.36-2.07)	**1.99** (1.51-2.36)	**2.17** (1.62-2.59)
60-min	**0.568** (0.478-0.690)	**0.743** (0.628-0.901)	**1.01** (0.849-1.22)	**1.22** (1.02-1.46)	**1.50** (1.23-1.79)	**1.71** (1.39-2.04)	**1.93** (1.54-2.30)	**2.16** (1.69-2.56)	**2.46** (1.87-2.92)	**2.69** (2.01-3.21)
2-hr	**0.659** (0.564-0.785)	**0.854** (0.731-1.02)	**1.15** (0.976-1.36)	**1.37** (1.15-1.62)	**1.67** (1.39-1.96)	**1.90** (1.56-2.23)	**2.14** (1.73-2.51)	**2.39** (1.90-2.80)	**2.71** (2.10-3.19)	**2.97** (2.25-3.51)
3-hr	**0.714** (0.608-0.855)	**0.916** (0.784-1.10)	**1.21** (1.02-1.44)	**1.44** (1.21-1.71)	**1.76** (1.46-2.08)	**2.01** (1.65-2.38)	**2.28** (1.83-2.69)	**2.56** (2.02-3.02)	**2.95** (2.26-3.48)	**3.26** (2.44-3.86)
6-hr	**0.860** (0.747-1.01)	**1.09** (0.951-1.28)	**1.40** (1.22-1.64)	**1.65** (1.42-1.92)	**1.98** (1.68-2.29)	**2.25** (1.88-2.59)	**2.52** (2.08-2.91)	**2.80** (2.26-3.24)	**3.19** (2.51-3.70)	**3.50** (2.69-4.06)
12-hr	**0.964** (0.845-1.12)	**1.22** (1.07-1.41)	**1.55** (1.35-1.79)	**1.81** (1.57-2.08)	**2.15** (1.85-2.47)	**2.42** (2.05-2.77)	**2.69** (2.25-3.09)	**2.97** (2.45-3.41)	**3.34** (2.69-3.86)	**3.63** (2.87-4.23)
24-hr	**1.16** (1.04-1.29)	**1.47** (1.32-1.65)	**1.90** (1.71-2.13)	**2.25** (2.01-2.51)	**2.72** (2.41-3.04)	**3.10** (2.73-3.44)	**3.49** (3.05-3.88)	**3.89** (3.38-4.33)	**4.45** (3.82-4.96)	**4.89** (4.16-5.47)
2-day	**1.25** (1.12-1.40)	**1.60** (1.44-1.79)	**2.10** (1.88-2.35)	**2.50** (2.23-2.79)	**3.06** (2.71-3.41)	**3.50** (3.08-3.90)	**3.97** (3.48-4.43)	**4.45** (3.87-4.98)	**5.13** (4.41-5.75)	**5.68** (4.83-6.39)
3-day	**1.32** (1.19-1.48)	**1.69** (1.52-1.89)	**2.22** (1.99-2.48)	**2.65** (2.37-2.96)	**3.26** (2.89-3.63)	**3.74** (3.30-4.17)	**4.25** (3.73-4.75)	**4.79** (4.16-5.35)	**5.55** (4.76-6.21)	**6.17** (5.24-6.91)
4-day	**1.39** (1.25-1.56)	**1.78** (1.60-1.99)	**2.35** (2.10-2.62)	**2.81** (2.50-3.13)	**3.46** (3.07-3.85)	**3.98** (3.51-4.43)	**4.54** (3.98-5.06)	**5.14** (4.46-5.72)	**5.98** (5.12-6.66)	**6.66** (5.64-7.44)
7-day	**1.54** (1.38-1.72)	**1.97** (1.77-2.20)	**2.60** (2.32-2.90)	**3.10** (2.77-3.46)	**3.82** (3.39-4.26)	**4.40** (3.88-4.90)	**5.02** (4.39-5.59)	**5.67** (4.92-6.32)	**6.59** (5.65-7.36)	**7.34** (6.22-8.20)
10-day	**1.67** (1.50-1.87)	**2.14** (1.93-2.39)	**2.82** (2.53-3.15)	**3.37** (3.01-3.76)	**4.14** (3.68-4.61)	**4.76** (4.20-5.29)	**5.41** (4.75-6.02)	**6.10** (5.31-6.79)	**7.07** (6.07-7.87)	**7.84** (6.67-8.75)
20-day	**2.06** (1.85-2.29)	**2.64** (2.38-2.94)	**3.49** (3.14-3.88)	**4.13** (3.70-4.58)	**4.99** (4.45-5.53)	**5.65** (5.02-6.27)	**6.32** (5.60-7.02)	**7.01** (6.17-7.79)	**7.93** (6.91-8.83)	**8.63** (7.47-9.63)
30-day	**2.40** (2.15-2.67)	**3.09** (2.78-3.43)	**4.07** (3.65-4.51)	**4.81** (4.31-5.33)	**5.81** (5.19-6.43)	**6.58** (5.85-7.27)	**7.37** (6.52-8.15)	**8.17** (7.19-9.03)	**9.24** (8.07-10.2)	**10.1** (8.72-11.2)
45-day	**2.79** (2.51-3.09)	**3.59** (3.24-3.98)	**4.73** (4.26-5.24)	**5.57** (5.00-6.18)	**6.68** (5.98-7.40)	**7.52** (6.71-8.33)	**8.36** (7.43-9.26)	**9.20** (8.14-10.2)	**10.3** (9.05-11.5)	**11.1** (9.73-12.4)
60-day	**3.09** (2.79-3.42)	**3.99** (3.60-4.41)	**5.25** (4.73-5.80)	**6.16** (5.54-6.81)	**7.35** (6.59-8.12)	**8.23** (7.35-9.10)	**9.11** (8.11-10.1)	**9.97** (8.84-11.0)	**11.1** (9.79-12.3)	**11.9** (10.5-13.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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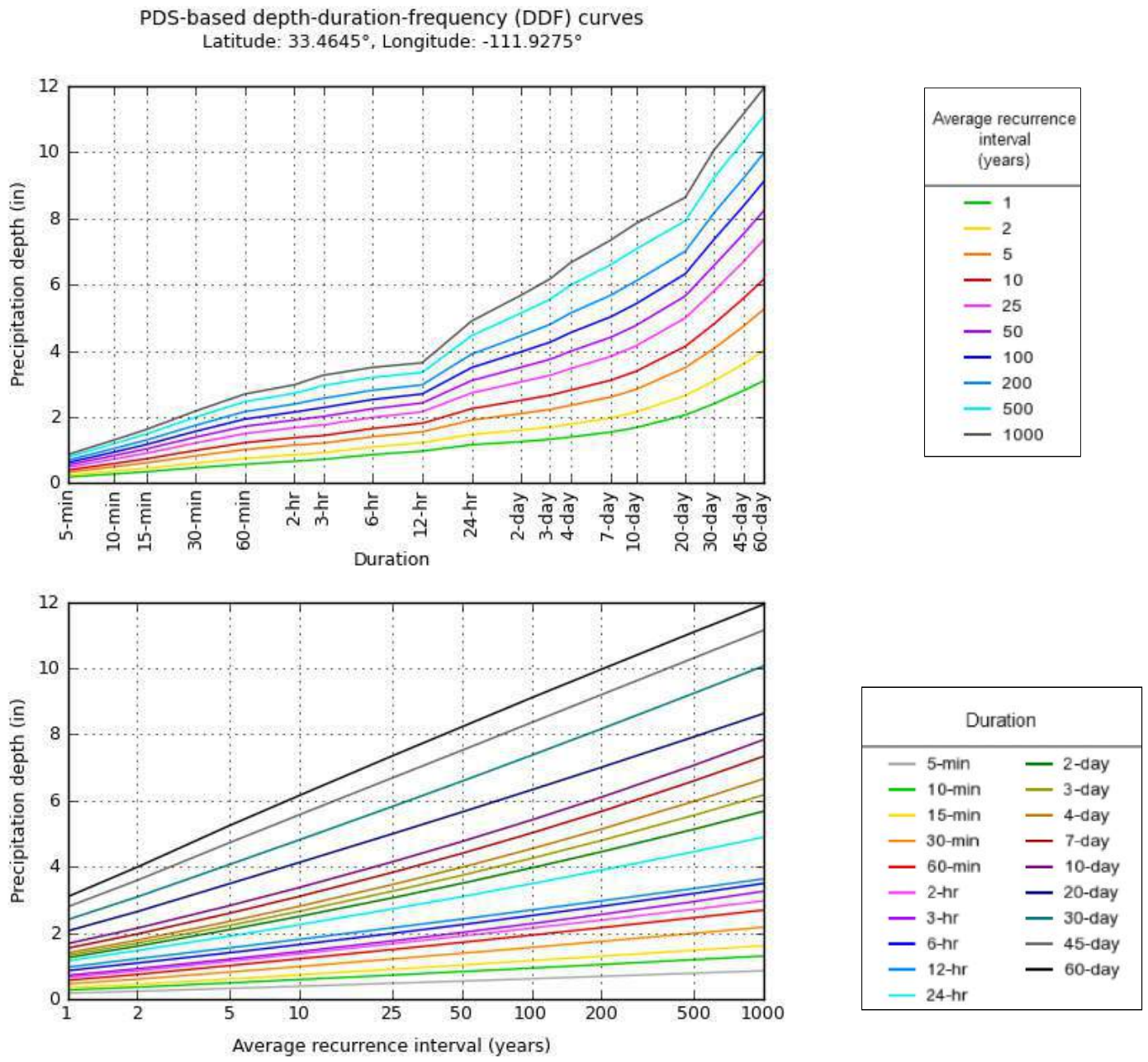
PF graphical



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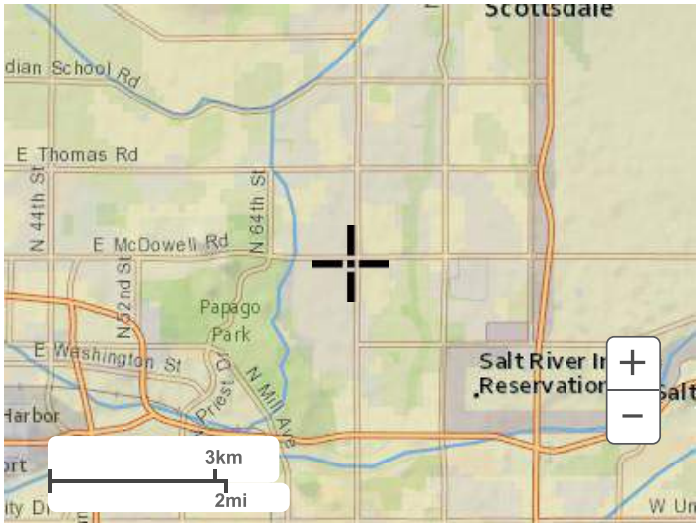
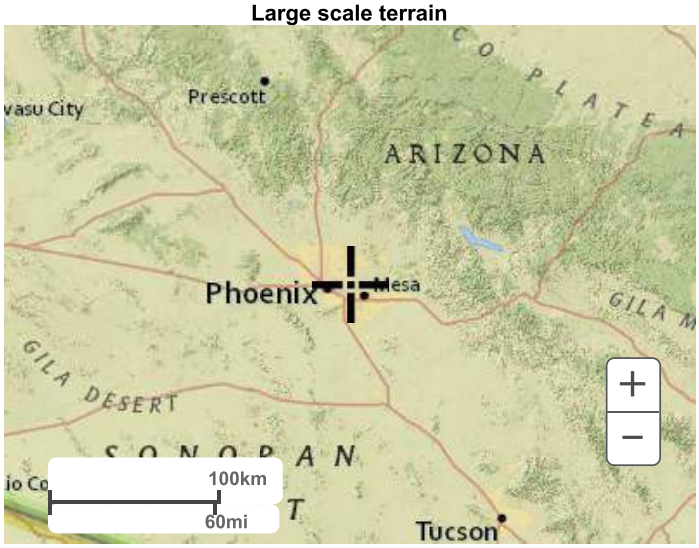
Maps & aerials

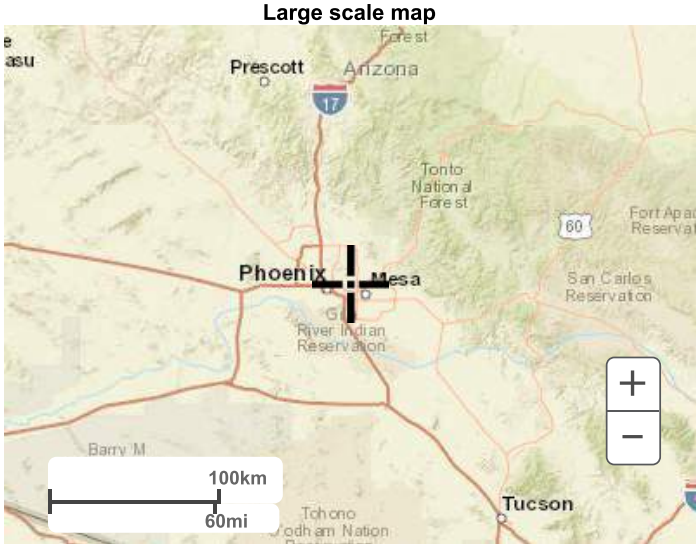
Small scale terrain



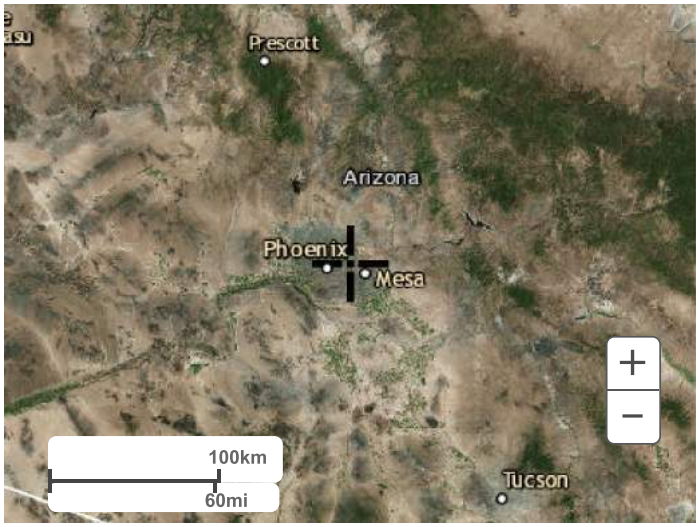
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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RATIONAL METHOD CALCULATIONS

Proposed Inlets

Sub-Area	Area	Area	C	Tc	i_{100}	Q_{100}
	(sf)	(acre)	(weighted)	(min)	(in/hr)	(cfs)
CB1	96,143	2.21	0.86	5	7.37	13.99
CB3	6,804	0.16	0.88	5	7.37	1.01
CB4	3,072	0.07	0.88	5	7.37	0.46
CB5	5,751	0.13	0.88	5	7.37	0.86
CB6	9,143	0.21	0.88	5	7.37	1.36
CB7	12,390	0.28	0.88	5	7.37	1.84
CB7-roof	8,180	0.19	0.88	5	7.37	1.22
CB8	9,133	0.21	0.88	5	7.37	1.36
CB8-roof	4,290	0.10	0.88	5	7.37	0.64
CB9	11,028	0.25	0.88	5	7.37	1.64
CB9-roof	7,427	0.17	0.88	5	7.37	1.11
CB10	8,891	0.20	0.88	5	7.37	1.32
Hotel	40,966	0.94	0.88	5	7.37	6.10

Proposed Site Outfall Discharge Calculations

Sub-Area	Area	Area	C	Tc	i_{100}	Q_{100}
	(sf)	(acre)	(weighted)	(min)	(in/hr)	(cfs)
B-RES	96,143	2.21	0.86	5	7.37	13.99
A-RES	77,209	1.77	0.86	5	7.37	11.23
RES ULT OUT	173,352	3.98	0.86	5	7.37	25.22

Sub-Area	Area	Area	C	Tc	i_{100}	Q_{100}
	(sf)	(acre)	(weighted)	(min)	(in/hr)	(cfs)
A-RET	194,398	4.46	0.88	5	7.37	28.94
B-RET	68,074	1.56	0.88	5	7.37	10.14
ALLEY-W	5,425	0.12	0.95	5	7.37	0.87

Existing Site Outfall Discharge Calculations

Sub-Area	Area	Area	C	Tc	i_{100}	Q_{100}
	(sf)	(acre)	(weighted)	(min)	(in/hr)	(cfs)
EX1	272,136	6.25	0.92	5	7.37	42.36
EX2	195,176	4.48	0.92	5	7.37	30.38

$Q_{100} = CIA$

C = Runoff Coefficient
I = Rainfall Intensity
A = Area is acres

PIPE SIZING CALCULATIONS

n = 0.013				
Pipe	Q100 (cfs)	D (in)	Slope (%)	Capacity (cfs)
P1	17.09	24	1	22.69
P2	29.50	36	0.5	47.31
P4	39.47	36	0.5	47.31
P5	39.93	36	0.5	47.31
P6	2.22	36	0.5	47.31
P7	13.82	30	0.5	29.09
P8	16.89	30	0.5	29.09
P9	18.88	30	0.5	29.09
P10	27.73	30	0.5	29.09
P11	29.06	30	0.5	29.09
Hotel	6.10	18	0.5	7.45
P12	64.30	36	1.2	73.29

Grated Inlet Capacity - weir condition

Q=Cw*P*d^1.5

Cw= 3.0 weir coefficient
Q = discharge capacity
P = inlet perimeter
d = flow depth

Inlet Type	Inlet	Q_{100}	Inlet Capacity	d	Cw	P	Clogging Factor	Q100 W/ Clogging Factor
Catch Basin	CB1	13.99	60.00	1.00	3	20.00	0.5	27.98
Catch Basin	CB2	29.50	60.00	1.00	3	20.00	0.5	59.00
Catch Basin	CB3	1.01	5.30	0.50	3	5.00	0.5	2.03
Catch Basin	CB4	0.46	10.61	0.50	3	10.00	0.5	0.91
Catch Basin	CB5	0.86	1.88	0.25	3	5.00	0.5	1.71
Catch Basin	CB6	1.36	2.89	0.21	3	10.00	0.5	2.72
Catch Basin	CB7	1.84	6.21	0.35	3	10.00	0.5	3.69
Catch Basin	CB8	1.36	6.75	0.37	3	10.00	0.5	2.72
Catch Basin	CB9	1.64	3.75	0.25	3	10.00	0.5	3.28
Catch Basin	CB10	1.32	10.61	0.50	3	10.00	0.5	2.65
Wall opening	WO1	3.10	4.24	0.50	3	4.00	0.2	3.72

X1
Worksheet for Irregular Channel

Project Description	
Worksheet	EX1
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data		
Channel Slope	.0075	ft/ft
Water Surface Elev	33.00	ft

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.015	
Elevation Range	.95 to 34.23	
Discharge	0.52	cfs
Flow Area	0.7	ft²
Wetted Perimeter	28.46	ft
Top Width	28.46	ft
Actual Depth	0.05	ft
Critical Elevation	33.00	ft
Critical Slope	0.0114	ft/ft
Velocity	0.73	ft/s
Velocity Head	0.01	ft
Specific Energy	33.01	ft
Froude Number	0.82	
Flow Type	Subcritical	

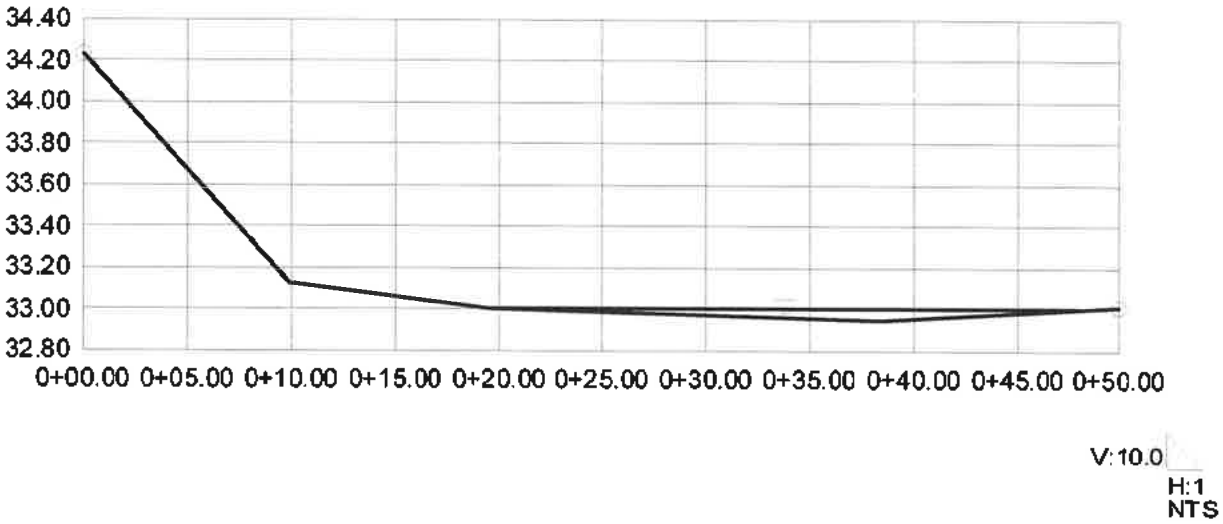
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+49.95	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	34.23
0+09.95	33.12
0+19.57	33.00
0+38.40	32.95
0+49.95	33.01

X1
Cross Section for Irregular Channel

Project Description	
Worksheet	EX1
Flow Element	Irregular Chani
Method	Manning's For
Solve For	Discharge

Section Data		
Mannings Coefficier	0.015	
Channel Slope	0.0075	ft/ft
Water Surface Elev	33.00	ft
Elevation Range	1.95 to 34.23	
Discharge	0.52	cfs



X2
Worksheet for Irregular Channel

Project Description	
Worksheet	EX2
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data		
Channel Slope	.0020	ft/ft
Water Surface Elev	33.02	ft

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.015	
Elevation Range	.67 to 34.37	
Discharge	9.92	cfs
Flow Area	7.2	ft²
Wetted Perimeter	40.91	ft
Top Width	40.91	ft
Actual Depth	0.35	ft
Critical Elevation	32.95	ft
Critical Slope	0.0063	ft/ft
Velocity	1.39	ft/s
Velocity Head	0.03	ft
Specific Energy	33.05	ft
Froude Number	0.58	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+56.36	0.015

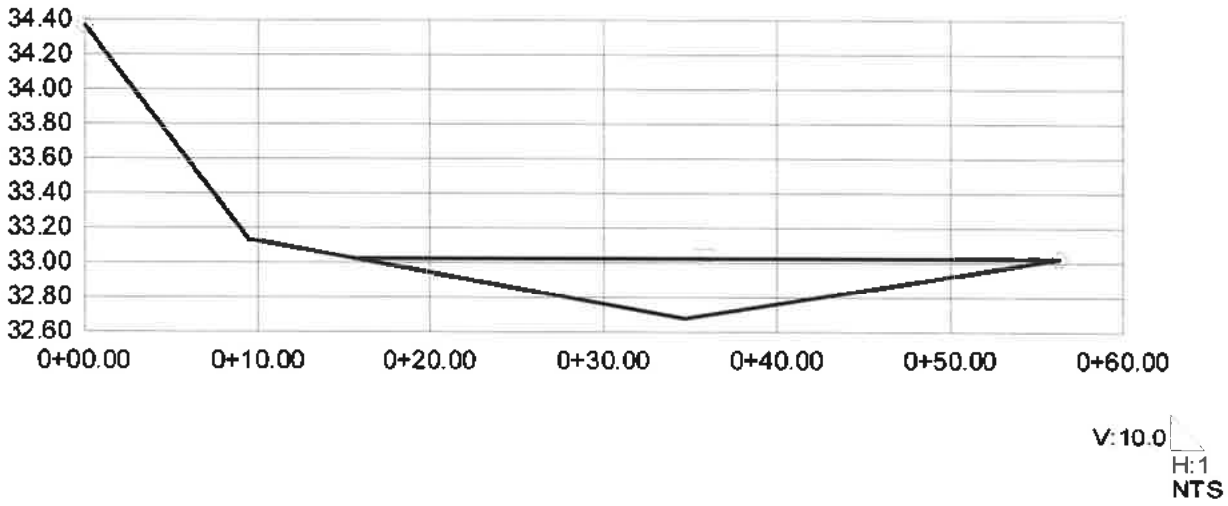
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	34.37
0+09.43	33.13
0+34.61	32.67
0+56.36	33.02

X2
Cross Section for Irregular Channel

Project Description	
Worksheet	EX2
Flow Element	Irregular Chani
Method	Manning's For
Solve For	Discharge

Section Data		
Mannings Coefficier	0.015	
Channel Slope	0.0020	ft/ft
Water Surface Elev	33.02	ft
Elevation Range	:.67 to 34.37	
Discharge	9.92	cfs



X3
Worksheet for Irregular Channel

Project Description	
Worksheet	EX3
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data		
Channel Slope	.0020	ft/ft
Water Surface Elev	31.83	ft

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.015	
Elevation Range	.69 to 33.00	
Discharge	1.19	cfs
Flow Area	1.6	ft²
Wetted Perimeter	22.60	ft
Top Width	22.60	ft
Actual Depth	0.14	ft
Critical Elevation	31.80	ft
Critical Slope	0.0086	ft/ft
Velocity	0.75	ft/s
Velocity Head	0.01	ft
Specific Energy	31.84	ft
Froude Number	0.50	
Flow Type	Subcritical	

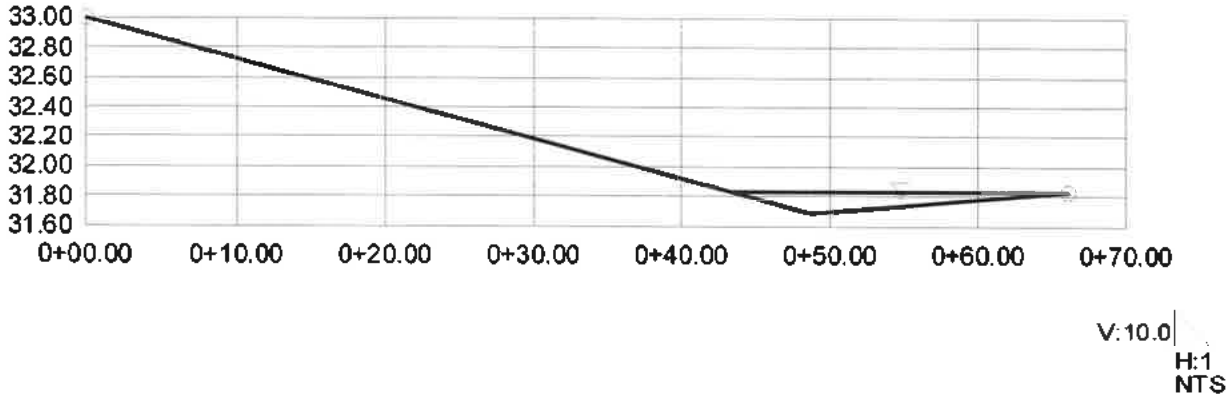
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+66.01	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	33.00
0+16.72	32.54
0+48.67	31.69
0+66.01	31.83

X3
Cross Section for Irregular Channel

Project Description	
Worksheet	EX3
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0020	ft/ft
Water Surface Elev	31.83	ft
Elevation Range	.69 to 33.00	
Discharge	1.19	cfs



X4
Worksheet for Irregular Channel

Project Description	
Worksheet	EX4
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data		
Channel Slope	.0025	ft/ft
Water Surface Elev	31.30	ft

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.015	
Elevation Range	.08 to 31.42	
Discharge	2.47	cfs
Flow Area	2.2	ft²
Wetted Perimeter	19.74	ft
Top Width	19.73	ft
Actual Depth	0.22	ft
Critical Elevation	31.26	ft
Critical Slope	0.0074	ft/ft
Velocity	1.14	ft/s
Velocity Head	0.02	ft
Specific Energy	31.32	ft
Froude Number	0.60	
Flow Type	Subcritical	

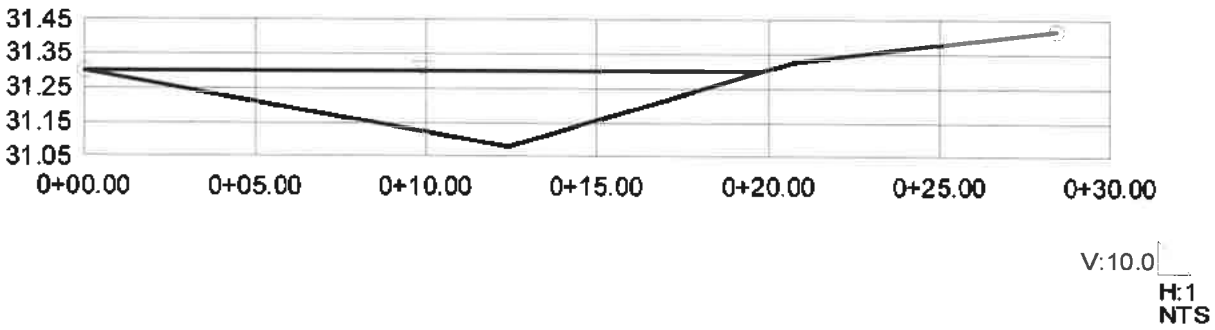
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+28.42	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	31.30
0+12.40	31.08
0+20.73	31.33
0+28.42	31.42

X4
Cross Section for Irregular Channel

Project Description	
Worksheet	EX4
Flow Element	Irregular Chani
Method	Manning's For
Solve For	Discharge

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0025	ft/ft
Water Surface Elev	31.30	ft
Elevation Range	.08 to 31.42	
Discharge	2.47	cfs



P1
Worksheet for Irregular Channel

Project Description	
Worksheet	P1
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data		
Channel Slope	.0130	ft/ft
Water Surface Elev	34.23	ft

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.015	
Elevation Range	.97 to 35.00	
Discharge	9.13	cfs
Flow Area	2.9	ft²
Wetted Perimeter	20.22	ft
Top Width	20.00	ft
Actual Depth	0.26	ft
Critical Elevation	34.27	ft
Critical Slope	0.0059	ft/ft
Velocity	3.12	ft/s
Velocity Head	0.15	ft
Specific Energy	34.38	ft
Froude Number	1.44	
Flow Type	Supercritical	

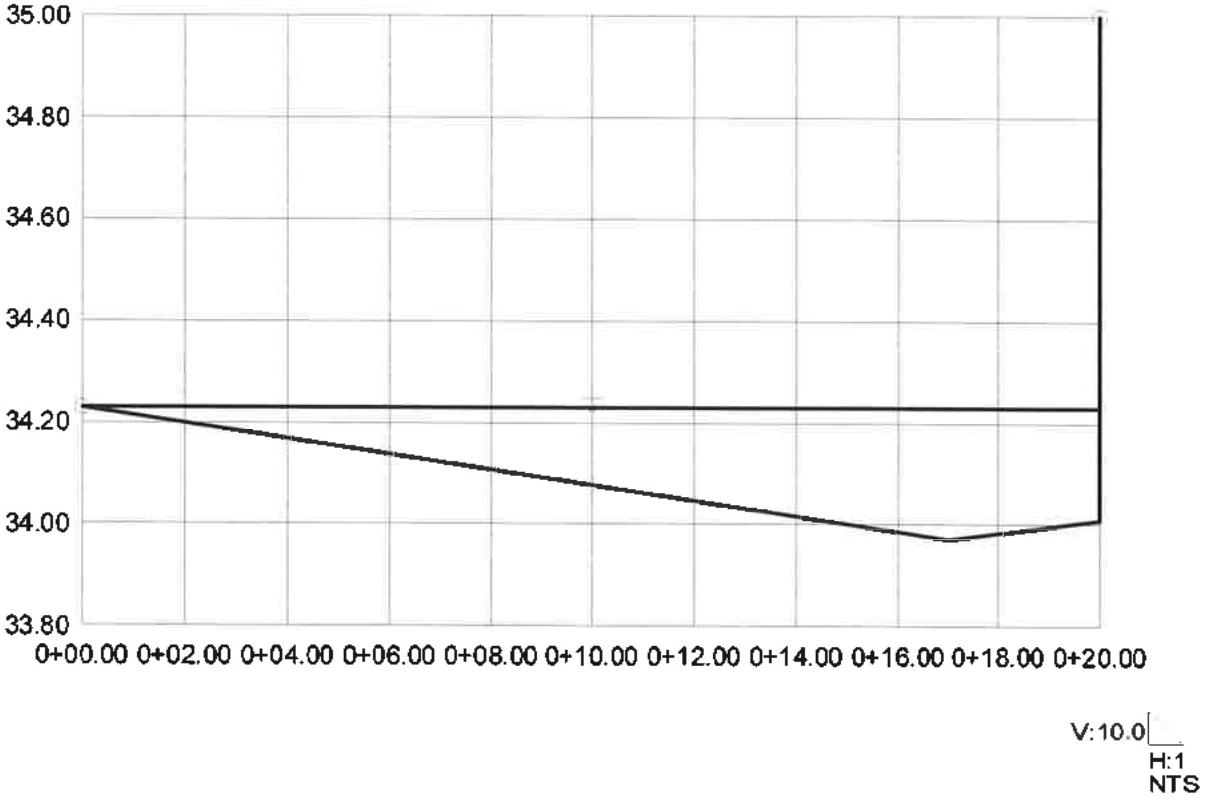
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+20.00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	34.23
0+17.00	33.97
0+20.00	34.01
0+20.00	35.00

P1
Cross Section for Irregular Channel

Project Description	
Worksheet	P1
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0130	ft/ft
Water Surface Elev	34.23	ft
Elevation Range	1.97 to 35.00	
Discharge	9.13	cfs



P2
Worksheet for Irregular Channel

Project Description	
Worksheet	P2
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data		
Channel Slope	.0025	ft/ft
Water Surface Elev	33.53	ft

Options	
Current Roughness Meth	oved Lotter's Method
Open Channel Weighting	oved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.015	
Elevation Range	.33 to 36.00	
Discharge	0.90	cfs
Flow Area	0.8	ft²
Wetted Perimeter	8.41	ft
Top Width	8.40	ft
Actual Depth	0.20	ft
Critical Elevation	33.49	ft
Critical Slope	0.0075	ft/ft
Velocity	1.07	ft/s
Velocity Head	0.02	ft
Specific Energy	33.55	ft
Froude Number	0.59	
Flow Type	Subcritical	

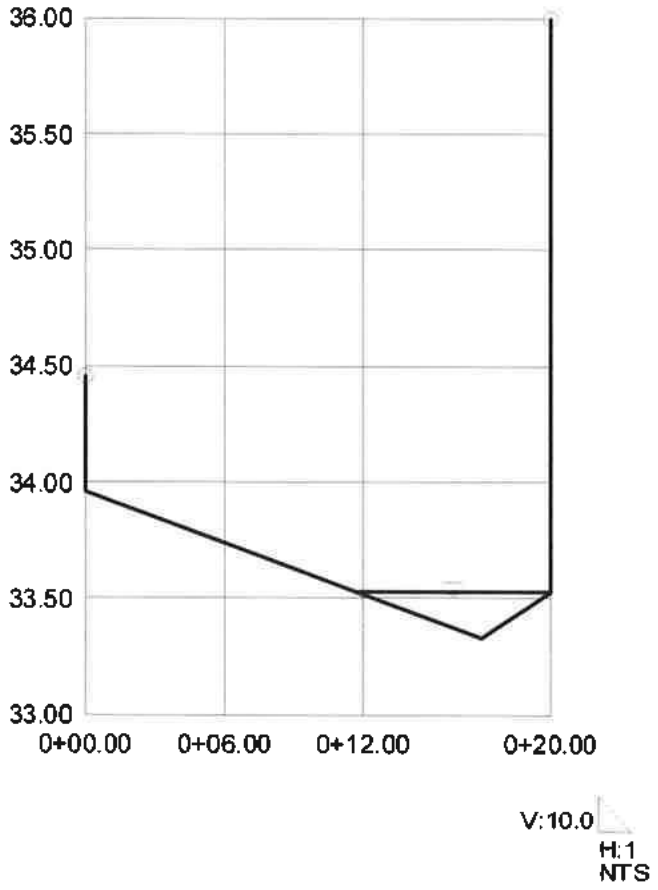
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+20.00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	34.46
0+00.00	33.96
0+17.00	33.33
0+20.00	33.53
0+20.00	36.00

P2
Cross Section for Irregular Channel

Project Description	
Worksheet	P2
Flow Element	Irregular Chani
Method	Manning's For
Solve For	Discharge

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0025	ft/ft
Water Surface Elev	33.53	ft
Elevation Range	.33 to 36.00	
Discharge	0.90	cfs



P3
Worksheet for Irregular Channel

Project Description	
Worksheet	P3
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data		
Channel Slope	.0025	ft/ft
Water Surface Elev	33.29	ft

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.015	
Elevation Range	.03 to 36.00	
Discharge	3.91	cfs
Flow Area	2.9	ft²
Wetted Perimeter	20.19	ft
Top Width	20.00	ft
Actual Depth	0.26	ft
Critical Elevation	33.24	ft
Critical Slope	0.0068	ft/ft
Velocity	1.35	ft/s
Velocity Head	0.03	ft
Specific Energy	33.32	ft
Froude Number	0.63	
Flow Type	Subcritical	

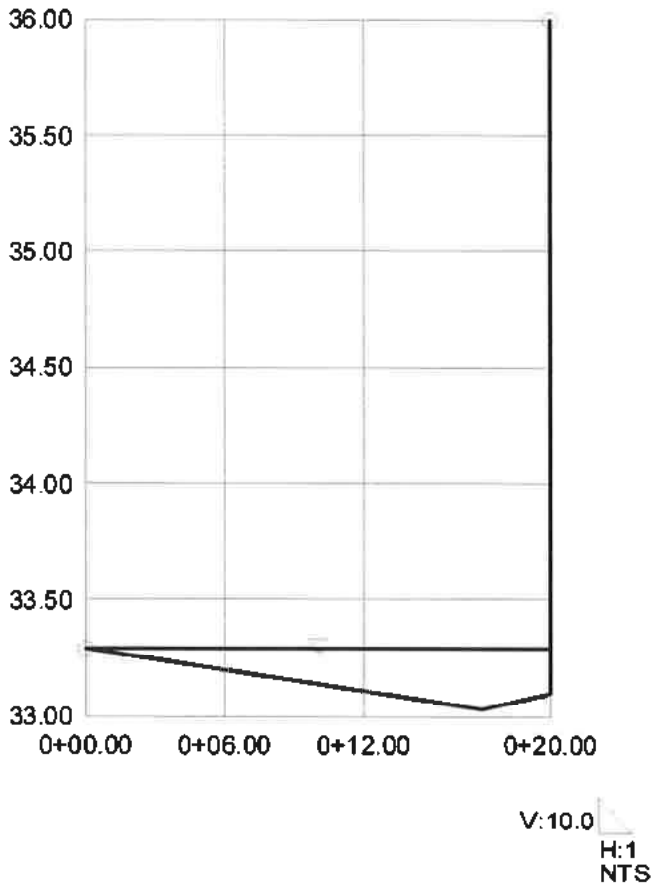
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+20.00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	33.29
0+17.00	33.03
0+20.00	33.10
0+20.00	36.00

P3
Cross Section for Irregular Channel

Project Description	
Worksheet	P3
Flow Element	Irregular Chani
Method	Manning's For
Solve For	Discharge

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0025	ft/ft
Water Surface Elev	33.29	ft
Elevation Range	.03 to 36.00	
Discharge	3.91	cfs



P4
Worksheet for Irregular Channel

Project Description	
Worksheet	P4
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data		
Channel Slope	.0025	ft/ft
Water Surface Elev	31.53	ft

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.015	
Elevation Range	.46 to 31.73	
Discharge	0.14	cfs
Flow Area	0.3	ft²
Wetted Perimeter	7.41	ft
Top Width	7.41	ft
Actual Depth	0.07	ft
Critical Elevation	31.51	ft
Critical Slope	0.0108	ft/ft
Velocity	0.53	ft/s
Velocity Head	0.00	ft
Specific Energy	31.53	ft
Froude Number	0.50	
Flow Type	Subcritical	

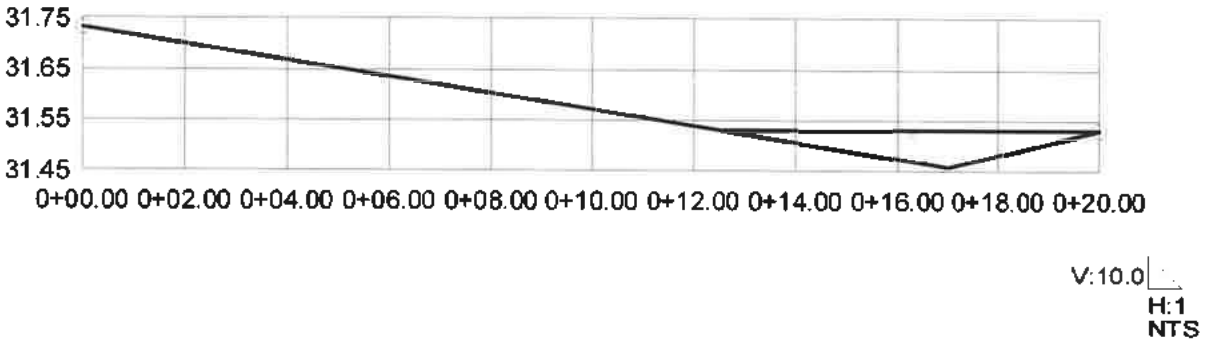
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+20.00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	31.73
0+17.00	31.46
0+20.00	31.53

P4
Cross Section for Irregular Channel

Project Description	
Worksheet	P4
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0025	ft/ft
Water Surface Elev	31.53	ft
Elevation Range	.46 to 31.73	
Discharge	0.14	cfs



Irregular Channel - A
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data		
Channel Sl	0.0064	ft/ft
Discharge	7.30	cfs

Options	
Current Roughness Meth	oved Lotter's Method
Open Channel Weighting	oved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.015	
Water Surface Elev	35.42	ft
Elevation Range	0.00 to 36.02	
Flow Area	2.7	ft²
Wetted Perimeter	12.95	ft
Top Width	12.52	ft
Actual Depth	0.42	ft
Critical Elevation	35.43	ft
Critical Slope	0.0057	ft/ft
Velocity	2.75	ft/s
Velocity Head	0.12	ft
Specific Energy	35.54	ft
Froude Number	1.05	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+68.77	0.015

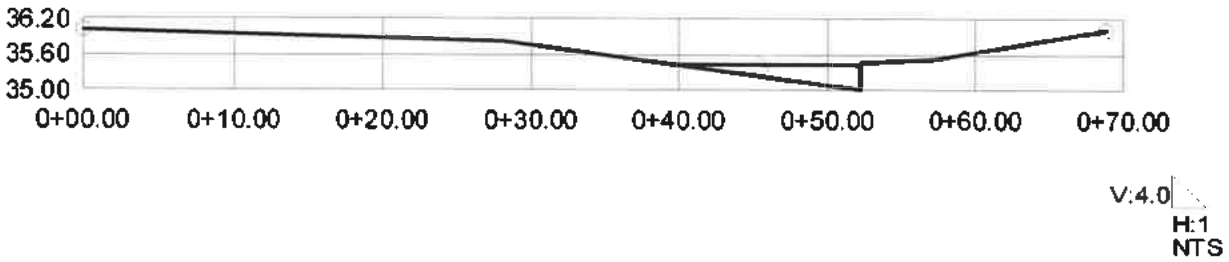
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	36.02
0+28.27	35.81
0+52.22	35.00
0+52.22	35.47
0+57.22	35.52
0+68.77	36.00

Irregular Channel - A
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0064	ft/ft
Water Surface Elev	35.42	ft
Elevation Range	.00 to 36.02	
Discharge	7.30	cfs



Irregular Channel - B
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data		
Channel Sl	0116	ft/ft
Discharge	10.60	cfs

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.015	
Water Surface Elev	31.74	ft
Elevation Range	.34 to 33.32	
Flow Area	3.0	ft²
Wetted Perimeter	15.18	ft
Top Width	14.78	ft
Actual Depth	0.40	ft
Critical Elevation	31.80	ft
Critical Slope	0.0055	ft/ft
Velocity	3.58	ft/s
Velocity Head	0.20	ft
Specific Energy	31.94	ft
Froude Number	1.41	
Flow Type	Supercritical	

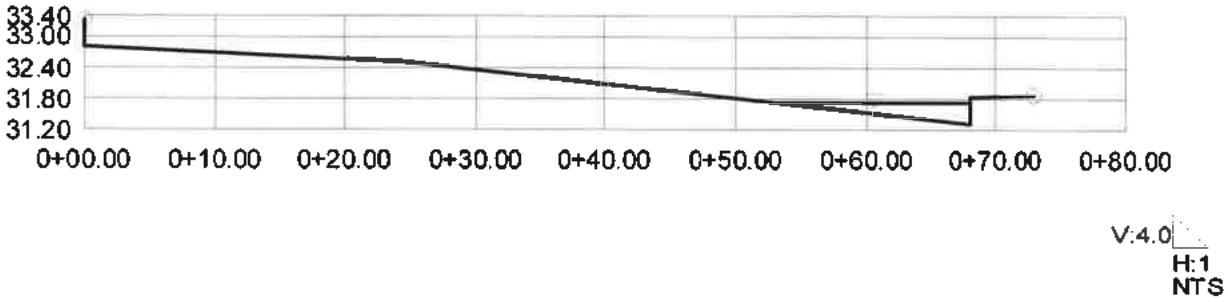
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+73.00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	33.32
0+00.00	32.82
0+24.44	32.52
0+68.00	31.34
0+68.00	31.84
0+73.00	31.89

Irregular Channel - B
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data		
Mannings Coefficier	0.015	
Channel Slope	0.0116	ft/ft
Water Surface Elev	31.74	ft
Elevation Range	.34 to 33.32	
Discharge	10.60	cfs



Irregular Channel - C
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data		
Channel Slo	0.0020	ft/ft
Discharge	1.30	cfs

Options	
Current Roughness Metho	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weighting	Horton's Method

Results		
Mannings Coefficier	0.015	
Water Surface Elev	29.92	ft
Elevation Range	.77 to 30.76	
Flow Area	1.6	ft²
Wetted Perimeter	21.93	ft
Top Width	21.92	ft
Actual Depth	0.15	ft
Critical Elevation	29.88	ft
Critical Slope	0.0084	ft/ft
Velocity	0.79	ft/s
Velocity Head	0.01	ft
Specific Energy	29.93	ft
Froude Number	0.51	
Flow Type	Subcritical	

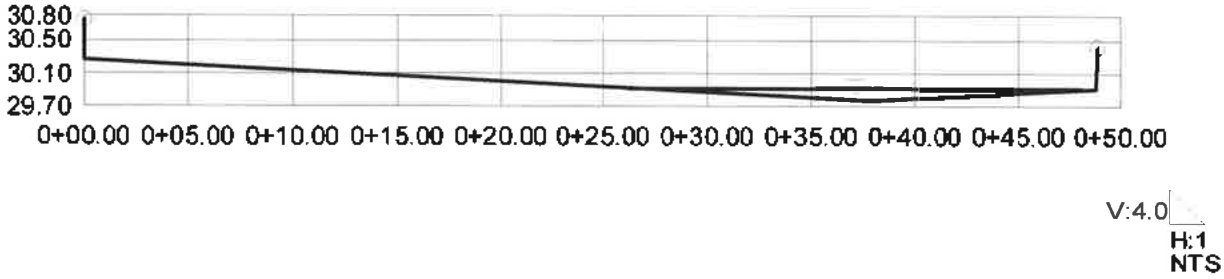
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+48.88	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	30.76
0+00.00	30.26
0+37.81	29.77
0+48.80	29.93
0+48.88	30.43

Irregular Channel - C
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0020	ft/ft
Water Surface Elev	29.92	ft
Elevation Range	1.77 to 30.76	
Discharge	1.30	cfs



Irregular Channel - D
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data		
Channel Sl	0.0027	ft/ft
Discharge	18.05	cfs

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.015	
Water Surface Elev	28.93	ft
Elevation Range	3.53 to 29.66	
Flow Area	9.1	ft²
Wetted Perimeter	37.68	ft
Top Width	37.28	ft
Actual Depth	0.40	ft
Critical Elevation	28.87	ft
Critical Slope	0.0056	ft/ft
Velocity	1.99	ft/s
Velocity Head	0.06	ft
Specific Energy	28.99	ft
Froude Number	0.71	
Flow Type	Subcritical	

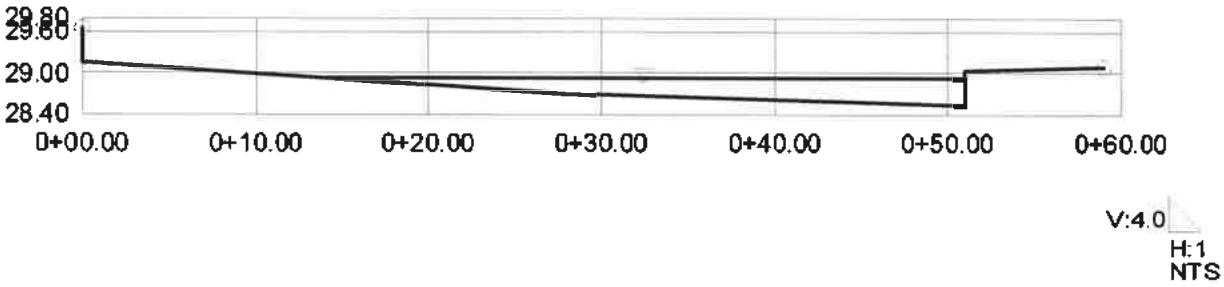
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+59.00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	29.66
0+00.00	29.16
0+28.00	28.69
0+51.00	28.53
0+51.00	29.03
0+59.00	29.10

Irregular Channel - D
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0027	ft/ft
Water Surface Elev	28.93	ft
Elevation Range	.53 to 29.66	
Discharge	18.05	cfs



Irregular Channel - E
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data		
Channel Slo	.0120	ft/ft
Discharge	13.99	cfs

Options	
Current Roughness Metho	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.015	
Water Surface Elev	33.93	ft
Elevation Range	.63 to 34.13	
Flow Area	4.3	ft²
Wetted Perimeter	25.70	ft
Top Width	25.40	ft
Actual Depth	0.30	ft
Critical Elevation	33.97	ft
Critical Slope	0.0056	ft/ft
Velocity	3.28	ft/s
Velocity Head	0.17	ft
Specific Energy	34.09	ft
Froude Number	1.41	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+26.00	0.015

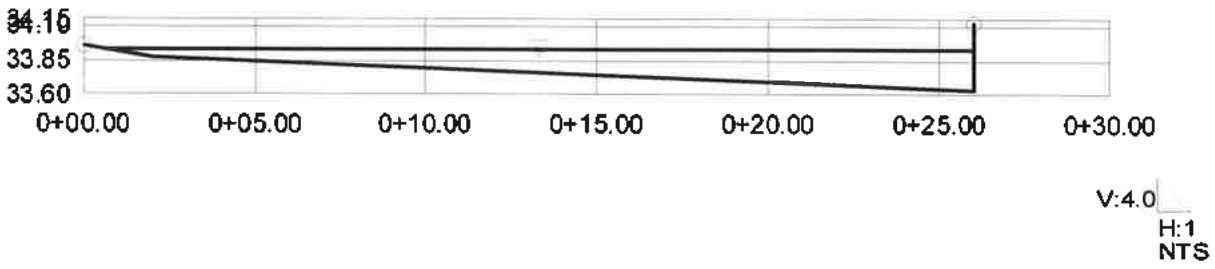
Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	33.95
0+02.00	33.87
0+26.00	33.63
0+26.00	34.13

Irregular Channel - E
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.015	
Channel Slope	0.0120	ft/ft
Water Surface Elev	33.93	ft
Elevation Range	.63 to 34.13	
Discharge	13.99	cfs



Capacity at - CB-1
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	Capacity at - CI
Type	Curb Inlet In Sa
Solve For	Spread

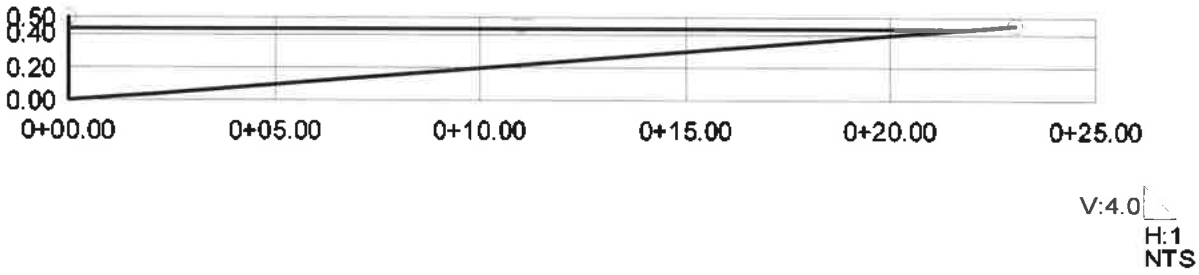
Input Data		
Discharge	12.50	cfs
Gutter Width	2.00	ft
Gutter Cross Slope	0.020	ft/ft
Road Cross Slope	0.020	ft/ft
Curb Opening Len	15.00	ft
Opening Height	0.50	ft
Curb Throat Type	Horizontal	
Local Depression	2.0	in
Local Depression \	2.00	ft

Results		
Spread	22.02	ft
Throat Incline An	90.00	degree
Depth	0.44	ft
Gutter Depressio	0.0	in
Total Depression	2.0	in

Capacity at - CB-1
Cross Section for Curb Inlet In Sag

Project Description	
Worksheet	Capacity at - CI
Type	Curb Inlet In Sa
Solve For	Spread

Section Data		
Discharge	12.50	cfs
Spread	22.02	ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.020	ft/ft
Road Cross Slope	0.020	ft/ft
Curb Opening Leng	15.00	ft
Opening Height	0.50	ft
Curb Throat Type	Horizontal	
Local Depression	2.0	in
Local Depression V	2.00	ft
Throat Incline Angl	90.00	degree



Capacity at - CB-2
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	Capacity at - CI
Type	Curb Inlet In Sa
Solve For	Spread

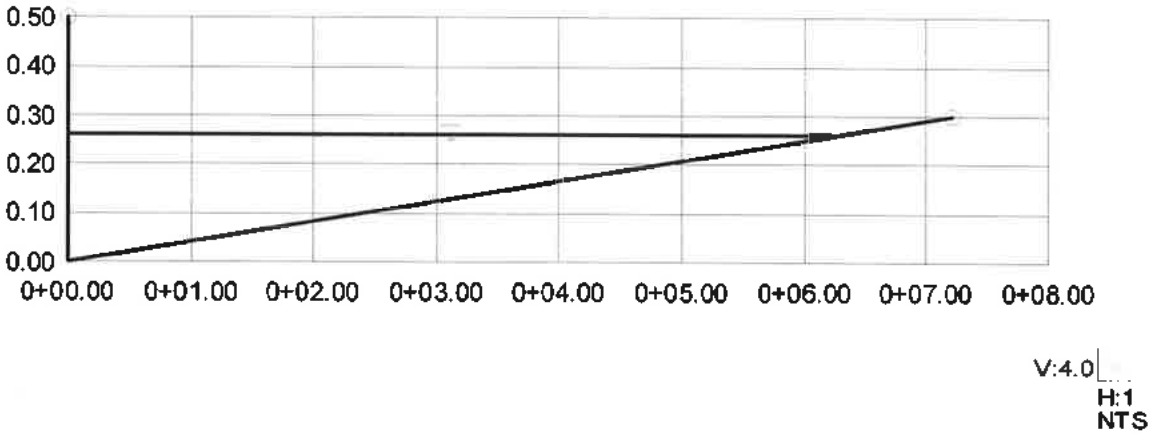
Input Data		
Discharge	2.00	cfs
Gutter Width	2.00	ft
Gutter Cross Slope	0.042	ft/ft
Road Cross Slope	0.042	ft/ft
Curb Opening Len	3.00	ft
Opening Height	0.50	ft
Curb Throat Type	Horizontal	
Local Depression	2.0	in
Local Depression \	2.00	ft

Results		
Spread	6.22	ft
Throat Incline An	30.00	degree
Depth	0.26	ft
Gutter Depressio	0.0	in
Total Depression	2.0	in

Capacity at - CB-2
Cross Section for Curb Inlet In Sag

Project Description	
Worksheet	Capacity at - CI
Type	Curb Inlet In Sa
Solve For	Spread

Section Data		
Discharge	2.00	cfs
Spread	6.22	ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.042	ft/ft
Road Cross Slope	0.042	ft/ft
Curb Opening Leng	3.00	ft
Opening Height	0.50	ft
Curb Throat Type	lorizontal	
Local Depression	2.0	in
Local Depression \	2.00	ft
Throat Incline Angl	90.00	degree



Weir - A-RET-NORTH Outfall
Worksheet for Broad Crested Weir

Project Description	
Worksheet	Weir - A-RET-NORTH
Type	Broad Crested Weir
Solve For	Headwater Elevation

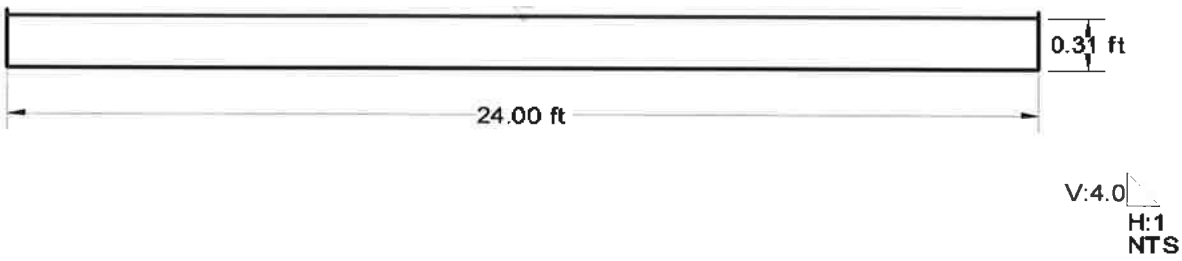
Input Data		
Discharge	12.55	cfs
Crest Elevation	30.33	ft
Tailwater Elevat	30.33	ft
Crest Surface	Ty'aved	
Crest Breadth	2.00	ft
Crest Length	24.00	ft

Results		
Headwater Elevation	30.64	ft
Headwater Height Above	0.31	ft
Tailwater Height Above C	0.00	ft
Discharge Coefficient	3.05	US
Submergence Factor	1.00	
Adjusted Discharge Coef	3.05	US
Flow Area	7.4	ft²
Velocity	1.70	ft/s
Wetted Perimeter	24.62	ft
Top Width	24.00	ft

Weir - A-RET-NORTH Outfall
Cross Section for Broad Crested Weir

Project Description	
Worksheet	Weir - A-RET-NORTH
Type	Broad Crested Weir
Solve For	Headwater Elevation

Section Data		
Discharge	12.55	cfs
Headwater Elev	30.64	ft
Crest Elevation	30.33	ft
Tailwater Elevati	30.33	ft
Crest Surface Ty	aved	
Crest Breadth	2.00	ft
Crest Length	24.00	ft



Weir - North Alley Wall Openings
Worksheet for Sharp Crested Rectangular Weir

Project Description	
Worksheet	Weir - North Alley Wall Op
Type	Sharp Crested Rectangula
Solve For	Crest Length

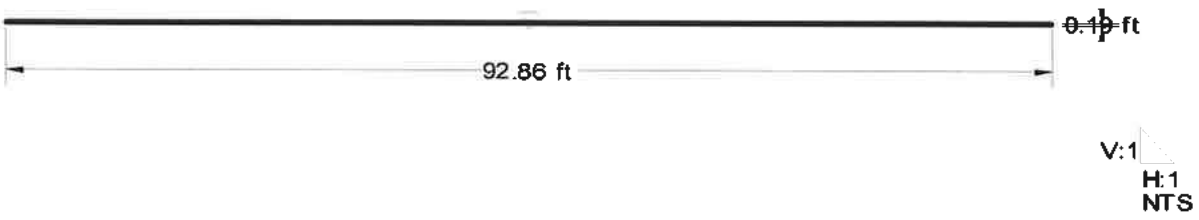
Input Data		
Discharge	25.60	cfs
Headwater Elevati	00.19	ft
Crest Elevation	00.00	ft
Tailwater Elevation	00.00	ft
Discharge Coefficie	3.33	US
Number of Contrac	2	

Results		
Crest Length	32.86	ft
Headwater Height Abov	0.19	ft
Tailwater Height Above	0.00	ft
Flow Area	17.6	ft²
Velocity	1.45	ft/s
Wetted Perimeter	33.24	ft
Top Width	32.86	ft

Weir - North Alley Wall Openings
Cross Section for Sharp Crested Rectangular Weir

Project Description	
Worksheet	Weir - North Alley Wall Op
Type	Sharp Crested Rectangula
Solve For	Crest Length

Section Data		
Discharge	25.60	cfs
Headwater Elevati	00.19	ft
Crest Elevation	00.00	ft
Tailwater Elevation	00.00	ft
Discharge Coefficie	3.33	US
Crest Length	92.86	ft
Number of Contrac	2	



Circular Channel - North Alley Swale
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel - North Alley
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Slope

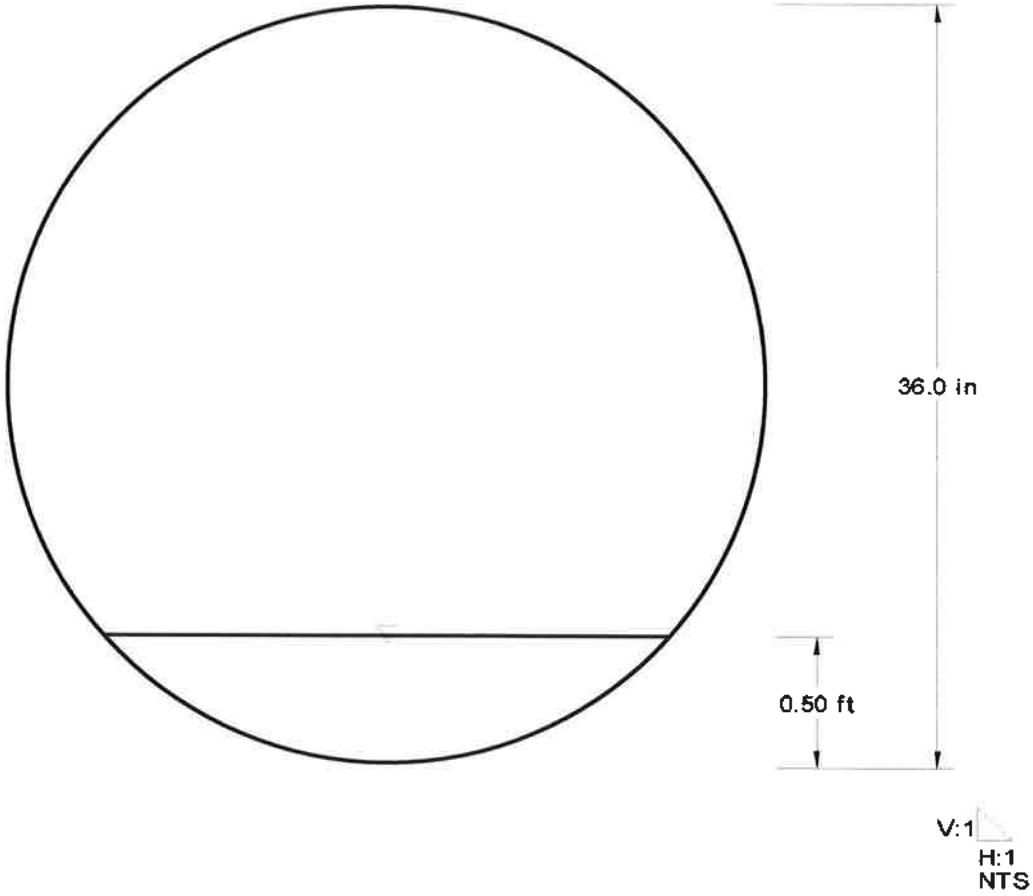
Input Data		
Mannings Coeffic	0.015	
Depth	0.50	ft
Diameter	36.0	in
Discharge	9.40	cfs

Results		
Channel Slope	0.0725	ft/ft
Flow Area	0.8	ft²
Wetted Perime	2.52	ft
Top Width	2.24	ft
Critical Depth	0.97	ft
Percent Full	16.7	%
Critical Slope	0.0052	ft/ft
Velocity	12.14	ft/s
Velocity Head	2.29	ft
Specific Energ	2.79	ft
Froude Numbe	3.64	
Maximum Disc	167.46	cfs
Discharge Full	155.68	cfs
Slope Full	0.0003	ft/ft
Flow Type	Supercritical	

Circular Channel - North Alley Swale
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel - North Alley
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Slope

Section Data		
Mannings Coeffic	0.015	
Channel Slope	1.0725	ft/ft
Depth	0.50	ft
Diameter	36.0	in
Discharge	9.40	cfs



PK Kland
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Weir - South Alley Wall Openings
Worksheet for Sharp Crested Rectangular Weir

Project Description	
Worksheet	Weir - South Alley Wall Op
Type	Sharp Crested Rectangula
Solve For	Crest Length

Input Data		
Discharge	25.60	cfs
Headwater Elevati	00.19	ft
Crest Elevation	00.00	ft
Tailwater Elevation	00.00	ft
Discharge Coefficic	3.33	US
Number of Contrac	2	

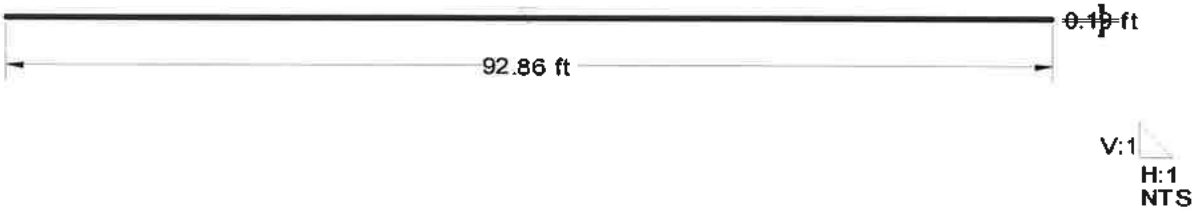
Results		
Crest Length	92.86	ft
Headwater Height Abov	0.19	ft
Tailwater Height Above	0.00	ft
Flow Area	17.6	ft²
Velocity	1.45	ft/s
Wetted Perimeter	93.24	ft
Top Width	92.86	ft

PK Kland
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Weir - South Alley Wall Openings
Cross Section for Sharp Crested Rectangular Weir

Project Description	
Worksheet	Weir - South Alley Wall Op
Type	Sharp Crested Rectangula
Solve For	Crest Length

Section Data		
Discharge	25.60	cfs
Headwater Elevati	00.19	ft
Crest Elevation	00.00	ft
Tailwater Elevation	00.00	ft
Discharge Coefficie	3.33	US
Crest Length	92.86	ft
Number of Contrac	2	



Irregular Channel - South Alley Swale
Worksheet for Irregular Channel

Project Description	
Worksheet	Irregular Channel - South Alley
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Sl	0180	ft/ft
Discharge	29.50	cfs

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.020	
Water Surface Elev	34.05	ft
Elevation Range	90 to 34.10	
Flow Area	4.4	ft²
Wetted Perimeter	8.00	ft
Top Width	7.66	ft
Actual Depth	1.15	ft
Critical Elevation	34.25	ft
Critical Slope	0.0071	ft/ft
Velocity	6.70	ft/s
Velocity Head	0.70	ft
Specific Energy	34.75	ft
Froude Number	1.56	
Flow Type	Supercritical	

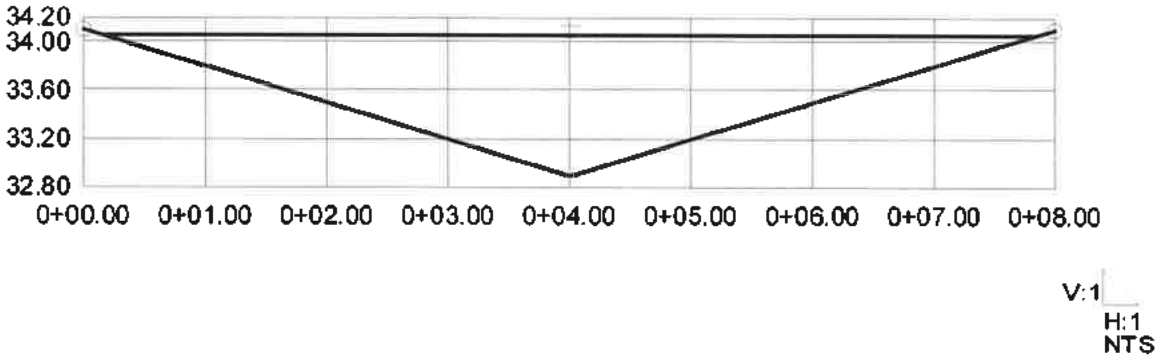
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+08.00	0.020

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	34.10
0+04.00	32.90
0+08.00	34.10

Irregular Channel - South Alley Swale
Cross Section for Irregular Channel

Project Description	
Worksheet	Irregular Channel - South Alley
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.020	
Channel Slope	0.0180	ft/ft
Water Surface Elev	34.05	ft
Elevation Range	:.90 to 34.10	
Discharge	29.50	cfs



Weir - At Speed Table
Worksheet for Broad Crested Weir

Project Description	
Worksheet	Weir - At Speed T
Type	Broad Crested We
Solve For	Discharge

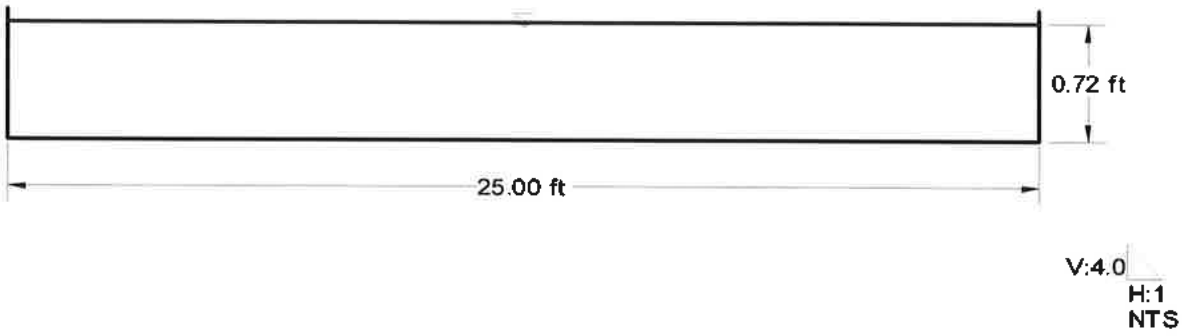
Input Data		
Headwater Elev	32.25	ft
Crest Elevation	31.53	ft
Tailwater Elevati	31.53	ft
Crest Surface Ty	aved	
Crest Breadth	2.00	ft
Crest Length	25.00	ft

Results		
Discharge	17.15	cfs
Headwater Height Above	0.72	ft
Tailwater Height Above C	0.00	ft
Discharge Coefficient	3.09	US
Submergence Factor	1.00	
Adjusted Discharge Coef	3.09	US
Flow Area	18.0	ft²
Velocity	2.62	ft/s
Wetted Perimeter	26.44	ft
Top Width	25.00	ft

Weir - At Speed Table
Cross Section for Broad Crested Weir

Project Description	
Worksheet	Weir - At Speed T.
Type	Broad Crested We
Solve For	Discharge

Section Data		
Discharge	47.15	cfs
Headwater Elev	32.25	ft
Crest Elevation	31.53	ft
Tailwater Elevati	31.53	ft
Crest Surface Ty	aved	
Crest Breadth	2.00	ft
Crest Length	25.00	ft



Weir - Existing South Scottsdale Road Overflow
Worksheet for Broad Crested Weir

Project Description	
Worksheet	Weir - Existing South Scottsdale Roac
Type	Broad Crested Weir
Solve For	Headwater Elevation

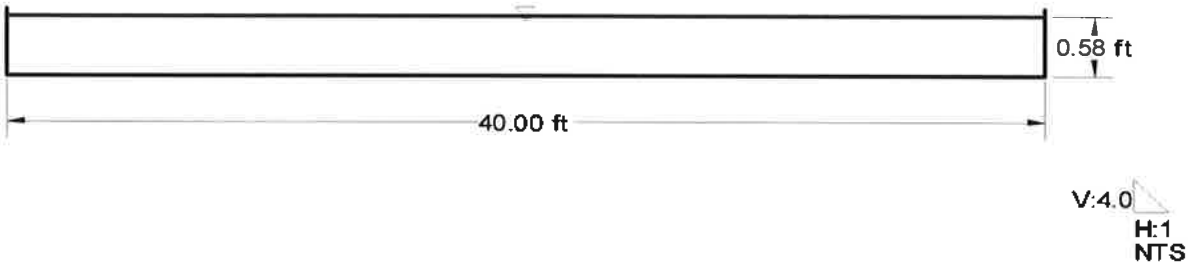
Input Data		
Discharge	54.86	cfs
Crest Elevation	28.15	ft
Tailwater Elevati	28.15	ft
Crest Surface T	aved	
Crest Breadth	2.00	ft
Crest Length	40.00	ft

Results		
Headwater Elevation	28.73	ft
Headwater Height Above	0.58	ft
Tailwater Height Above C	0.00	ft
Discharge Coefficient	3.09	US
Submergence Factor	1.00	
Adjusted Discharge Coef	3.09	US
Flow Area	23.3	ft²
Velocity	2.36	ft/s
Wetted Perimeter	41.16	ft
Top Width	40.00	ft

Weir - Existing South Scottsdale Road Overflow
Cross Section for Broad Crested Weir

Project Description	
Worksheet	Weir - Existing South Scottsdale Roac
Type	Broad Crested Weir
Solve For	Headwater Elevation

Section Data		
Discharge	54.86	cfs
Headwater Elevi	28.73	ft
Crest Elevation	28.15	ft
Tailwater Elevati	28.15	ft
Crest Surface Ty	aved	
Crest Breadth	2.00	ft
Crest Length	40.00	ft



Weir - Proposed South Scottsdale Road Overflow
Worksheet for Broad Crested Weir

Project Description	
Worksheet	Weir - Proposed South Scottsdale Ro:
Type	Broad Crested Weir
Solve For	Headwater Elevation

Input Data		
Discharge	15.30	cfs
Crest Elevation	28.15	ft
Tailwater Elevati	28.15	ft
Crest Surface T	'aved	
Crest Breadth	2.00	ft
Crest Length	10.00	ft

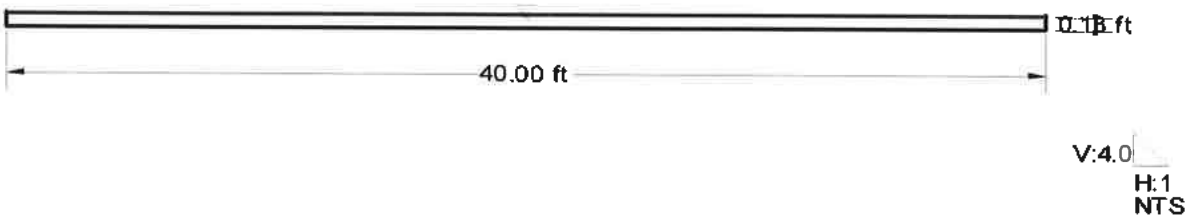
Results		
Headwater Elevation	28.28	ft
Headwater Height Above	0.13	ft
Tailwater Height Above C	0.00	ft
Discharge Coefficient	2.94	US
Submergence Factor	1.00	
Adjusted Discharge Coef	2.94	US
Flow Area	5.1	ft²
Velocity	1.05	ft/s
Wetted Perimeter	10.25	ft
Top Width	10.00	ft

PK Kland
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Weir - Proposed South Scottsdale Road Overflow
Cross Section for Broad Crested Weir

Project Description	
Worksheet	Weir - Proposed South Scottsdale Ro:
Type	Broad Crested Weir
Solve For	Headwater Elevation

Section Data		
Discharge	25.30	cfs
Headwater Elevi	28.28	ft
Crest Elevation	28.15	ft
Tailwater Elevati	28.15	ft
Crest Surface T)	'aved	
Crest Breadth	2.00	ft
Crest Length	40.00	ft



APPENDIX C: Drainage Map

MCDOWELL ROAD

70TH STREET

SCOTTSDALE ROAD

LOMA LAND DR

WILLETTA ST

71ST ST

13+00 12+00 11+00 10+00 9+00 8+00 7+00 6+00 5+00 4+00 3+00 2+00 1+00 0+00

48 RCP

CB–1
EX. C.B. IN SUMP
CAPACITY IS 12.5 CFS

Q_{100}=6 CFS

Q_{100}=0.1 CFS

Q_{100}=1.2 CFS

Q_{100}=3.4 CFS

Q_{100}= 3.1 CFS

Q_{100}=9.4 CFS

Q_{CAP}=0.52 CFS
DEPTH=0.05'

Q_{CAP}=9.92 CFS
DEPTH=0.35'

Q_{100}=28.5 CFS

Q_{100}=29.5 CFS

Q_{CAP}=19 CFS
DEPTH=0.14'

Q_{100}=2.47 CFS
DEPTH=0.22'

Q_{100}=82.5 CFS

Q_{100}=40.56 CFS
EXISTING ONSITE DISCHARGE FROM EX1 TO SCOTTSDALE ROAD THIS INCLUDES THE 7.2 CFS OFFSITE FLOW

Q_{100}=10.38 CFS
EXISTING ONSITE DISCHARGE FROM EX2 TO ALLEY

Q_{100}=5.5 CFS

Q_{100}=1.3 CFS

Q_{100}=1.8 CFS

Q_{100}=4.96 CFS
OVERFLOW

Q_{100}=56.86 CFS
TOTAL HISTORIC FLOW

DRAINAGE DITCH

DRAINAGE DITCH

CB–2
EX. C.B. IN SUMP
CAPACITY IS 2 CFS

S1
0.18
AC

S2
0.78
AC

S3
0.27
AC

EX1
272,136
SFT

EX2
195,176
SFT

X1 X2 X3 X4

Maricopa County Assessor's Office

N

50 0 25 50

1 inch = 50 ft.

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REVISIONS

SCOTTSDALE RD AND MCDOWELL

EXISTING DRAINAGE MAP

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www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. HODJATI
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil)
CERTIFICATE NO.
31695
LESLIE J. KLAND
Date Signed 7-16-19
ARIZONA
Expires 09/30/21

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DM1
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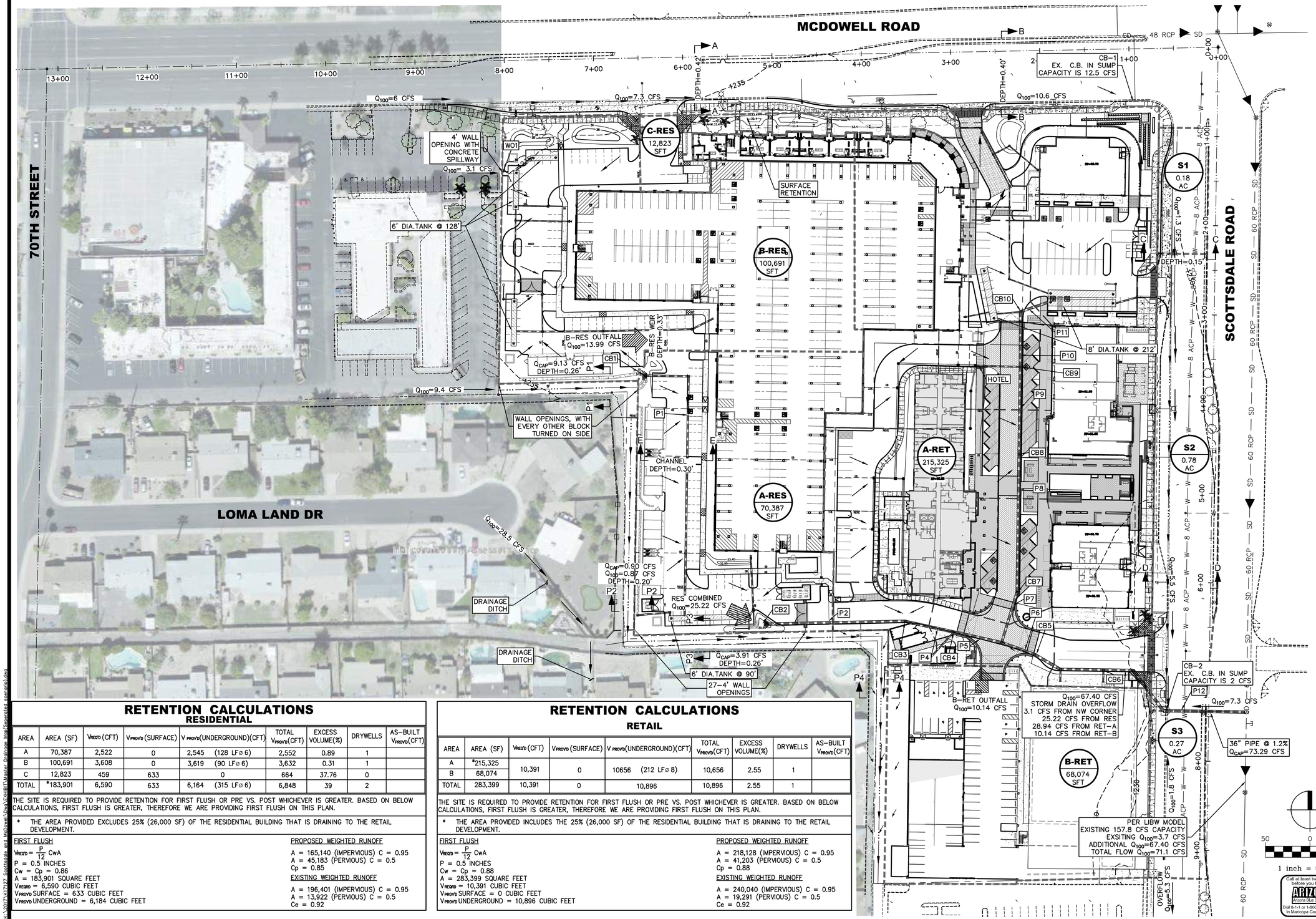

RETENTION CALCULATIONS
RESIDENTIAL

AREA	AREA (SF)	$V_{REQ'D}$ (CFT)	$V_{PROV'D}$ (SURFACE)	$V_{PROV'D}$ (UNDERGROUND) (CFT)	TOTAL $V_{PROV'D}$ (CFT)	EXCESS VOLUME (%)	DRYWELLS	AS-BUILT $V_{PROV'D}$ (CFT)
A	70,387	2,522	0	2,545 (128 LFØ6)	2,552	0.89	1	
B	100,691	3,608	0	3,619 (90 LFØ6)	3,632	0.31	1	
C	12,823	459	633	0	664	37.76	0	
TOTAL	*183,901	6,590	633	6,164 (315 LFØ6)	6,848	39	2	

THE SITE IS REQUIRED TO PROVIDE RETENTION FOR FIRST FLUSH OR PRE VS. POST WHICHEVER IS GREATER. BASED ON BELOW CALCULATIONS, FIRST FLUSH IS GREATER, THEREFORE WE ARE PROVIDING FIRST FLUSH ON THIS PLAN.

* THE AREA PROVIDED EXCLUDES 25% (26,000 SF) OF THE RESIDENTIAL BUILDING THAT IS DRAINING TO THE RETAIL DEVELOPMENT.

FIRST FLUSH

$V_{REQ'D} = \frac{P}{12} CwA$

P = 0.5 INCHES
Cw = Cp = 0.86
A = 183,901 SQUARE FEET
$V_{REQ'D}$ = 6,590 CUBIC FEET
$V_{PROV'D}$ SURFACE = 633 CUBIC FEET
$V_{PROV'D}$ UNDERGROUND = 6,184 CUBIC FEET

PROPOSED WEIGHTED RUNOFF

A = 165,140 (IMPERVIOUS) C = 0.95
A = 45,183 (PERVIOUS) C = 0.5
Cp = 0.85

EXISTING WEIGHTED RUNOFF

A = 196,401 (IMPERVIOUS) C = 0.95
A = 13,922 (PERVIOUS) C = 0.5
Ce = 0.92

RETENTION CALCULATIONS
RETAIL

AREA	AREA (SF)	$V_{REQ'D}$ (CFT)	$V_{PROV'D}$ (SURFACE)	$V_{PROV'D}$ (UNDERGROUND) (CFT)	TOTAL $V_{PROV'D}$ (CFT)	EXCESS VOLUME (%)	DRYWELLS	AS-BUILT $V_{PROV'D}$ (CFT)
A	*215,325	10,391	0	10656 (212 LFØ8)	10,656	2.55	1	
B	68,074							
TOTAL	283,399	10,391	0	10,896	10,896	2.55	1	

THE SITE IS REQUIRED TO PROVIDE RETENTION FOR FIRST FLUSH OR PRE VS. POST WHICHEVER IS GREATER. BASED ON BELOW CALCULATIONS, FIRST FLUSH IS GREATER, THEREFORE WE ARE PROVIDING FIRST FLUSH ON THIS PLAN.

* THE AREA PROVIDED INCLUDES THE 25% (26,000 SF) OF THE RESIDENTIAL BUILDING THAT IS DRAINING TO THE RETAIL DEVELOPMENT.

FIRST FLUSH

$V_{REQ'D} = \frac{P}{12} CwA$

P = 0.5 INCHES
Cw = Cp = 0.88
A = 283,399 SQUARE FEET
$V_{REQ'D}$ = 10,391 CUBIC FEET
$V_{PROV'D}$ SURFACE = 0 CUBIC FEET
$V_{PROV'D}$ UNDERGROUND = 10,896 CUBIC FEET

PROPOSED WEIGHTED RUNOFF

A = 218,128 (IMPERVIOUS) C = 0.95
A = 41,203 (PERVIOUS) C = 0.5
Cp = 0.88

EXISTING WEIGHTED RUNOFF

A = 240,040 (IMPERVIOUS) C = 0.95
A = 19,291 (PERVIOUS) C = 0.5
Ce = 0.92

REVISIONS

SCOTTSDALE RD AND MCDOWELL

PROPOSED SD SYSTEM-FULLY FUNCTIONAL

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Phoenix, Arizona 85020
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www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. HODJATI
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil)
CERTIFICATE NO. 31695
LESLIE J. KLAND
ARIZONA
Expires 09/30/21

Project No.
K17127

07-16-19

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OF 2

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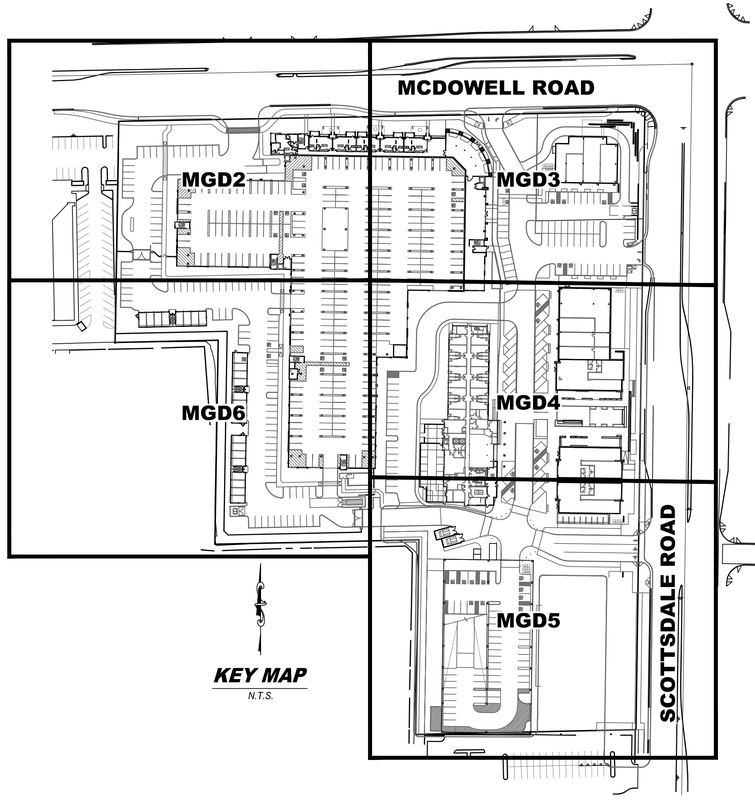
APPENDIX D: Master Grading & Drainage Plan

SHEET INDEX

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.



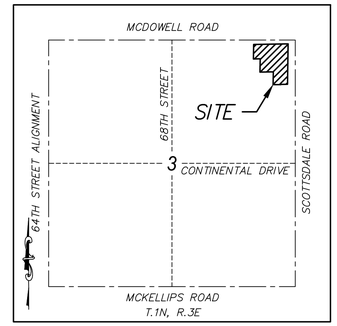
KEY MAP
N.T.S.

MASTER GRADING AND DRAINAGE PLAN
FOR
SCOTTSDALE 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.

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	CURB AND GUTTER	
	SIDEWALK	
	SINGLE CURB	
TC: 62.76 G: 62.33 C: 62.55 P: 62.90	TOP OF CURB AND GUTTER CONCRETE ELEVATION PAVEMENT ELEVATION	TC: 64.04 G: 64.06 C: 63.98 P: 64.36
RIM: 62.48 INV: 56.64	RIM AND INVERT ELEVATION	TG: 62.98 INV: 55.23
1499'	CONTOUR	49
	WATER FITTINGS	
	WATER METER	
W W	WATER LINE	W
	FIRE HYDRANT	
S S	SEWER LINE	S
SW	SEWER MANHOLE/CLEANOUT	
SD ST	STORM DRAIN	
	CATCH BASIN	
	DRYWELL	
	UNDERGROUND STORAGE TANK	
	GRADE BREAK/RIDGE	G.B. / RIDGE
	FLOWLINE	
	SLOPE	1.5%
	SCUPPER	
	FINISHED FLOOR	FF=43.81
G G	GAS LINE/METER/VALVE	
E E	ELECTRIC LINE/METER	
TV T TV	CABLE/JUNCTION BOX	
OHE	OVERHEAD ELECTRIC/POLE	
	BOUNDARY LINE	
	PHASE LINE	
	CENTER LINE	
	EASEMENT	
IRR IRR IRR	IRRIGATION	
FO FO	FIBER OPTIC	



VICINITY MAP
N.T.S.

ENGINEER

KLAND CIVIL ENGINEERS
7227 N. 16TH ST., STE 217
PHOENIX, AZ 85020
PH: (480) 344-0480
CONTACT: LESLIE KLAND, PE

DEVELOPER

PAPAGO MARKETPLACE, LLC
AN ARIZONA LIMITED LIABILITY COMPANY
7025 E. MCDOWELL RD., STE 10
SCOTTSDALE, AZ 85257
PH: (602) 821-4552
CONTACT: LEE MASHBURN

ALLIANCE RESIDENTIAL CO.
2415 E. CAMELBACK RD., STE 600
PHOENIX, AZ 85016
PH: (602) 778-2800
FX: (602) 778-2850
CONTACT: IAN SWIERGOL

ARCHITECT

NELSEN PARTNERS ARCHITECTS & PLANNERS
15210 N. SCOTTSDALES RD., STE 300
SCOTTSDALE, AZ 85254
PH: (480) 949-6800
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

REVISIONS

SCOTTSDALE AND MCDOWELL

MASTER GRADING AND DRAINAGE PLAN

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www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil) CERTIFICATE NO. 31695 LESLIE J. KLAND Date Signed 7-16-19 ARIZONA
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07-16-19

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OF 6

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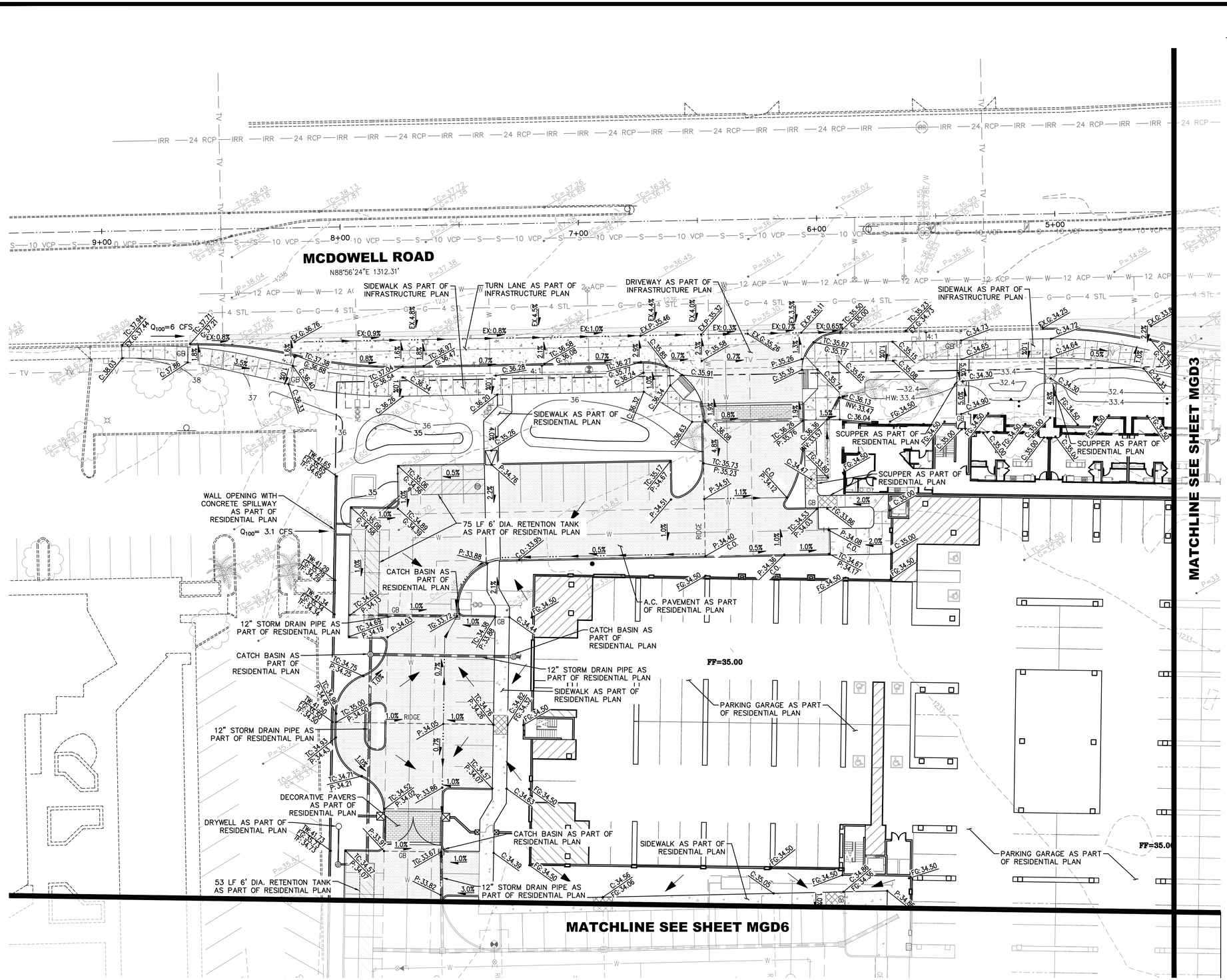

N

20 0 10 20

1 inch = 20 ft.

REVISIONS

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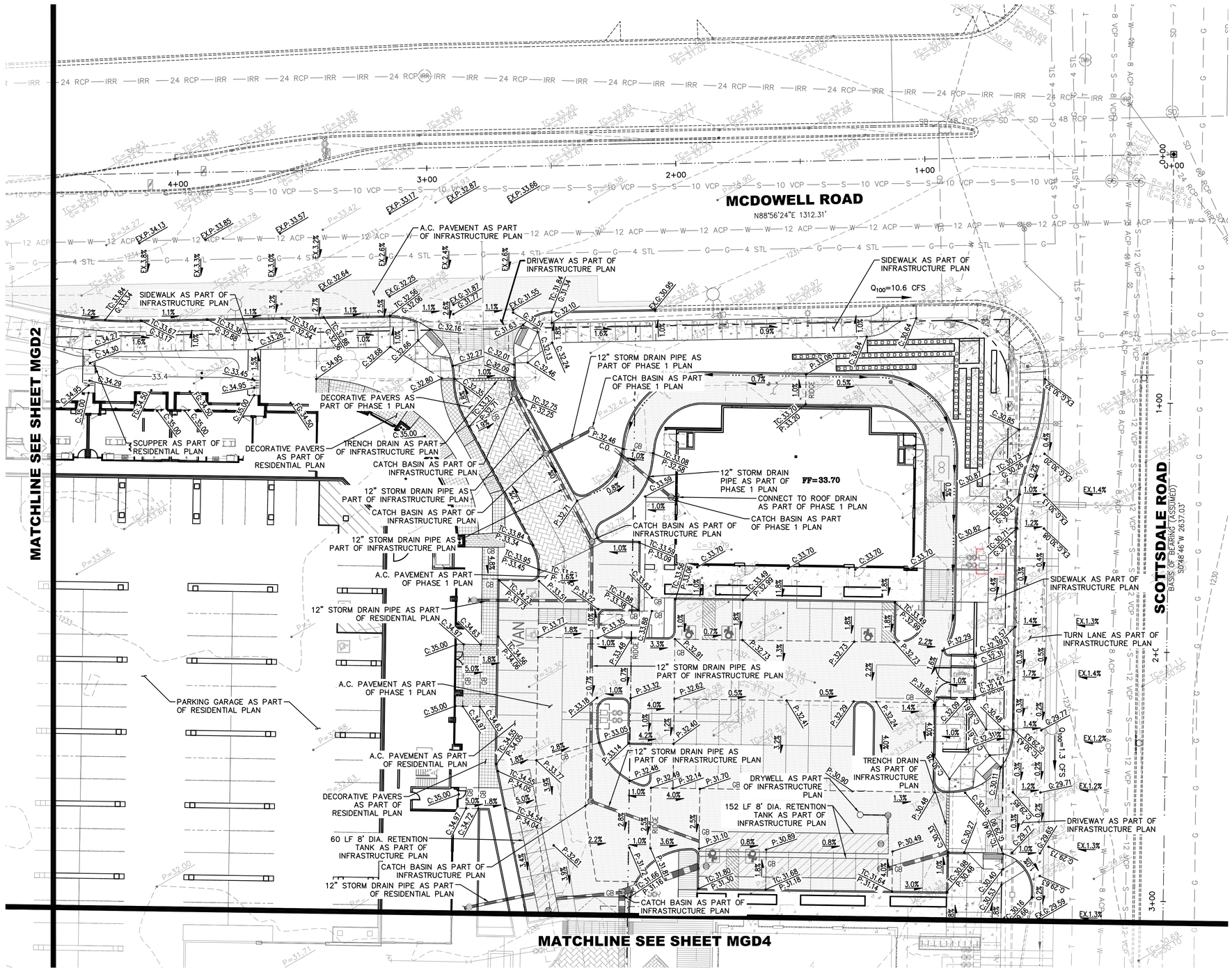

N

20 0 10 20

1 inch = 20 ft.

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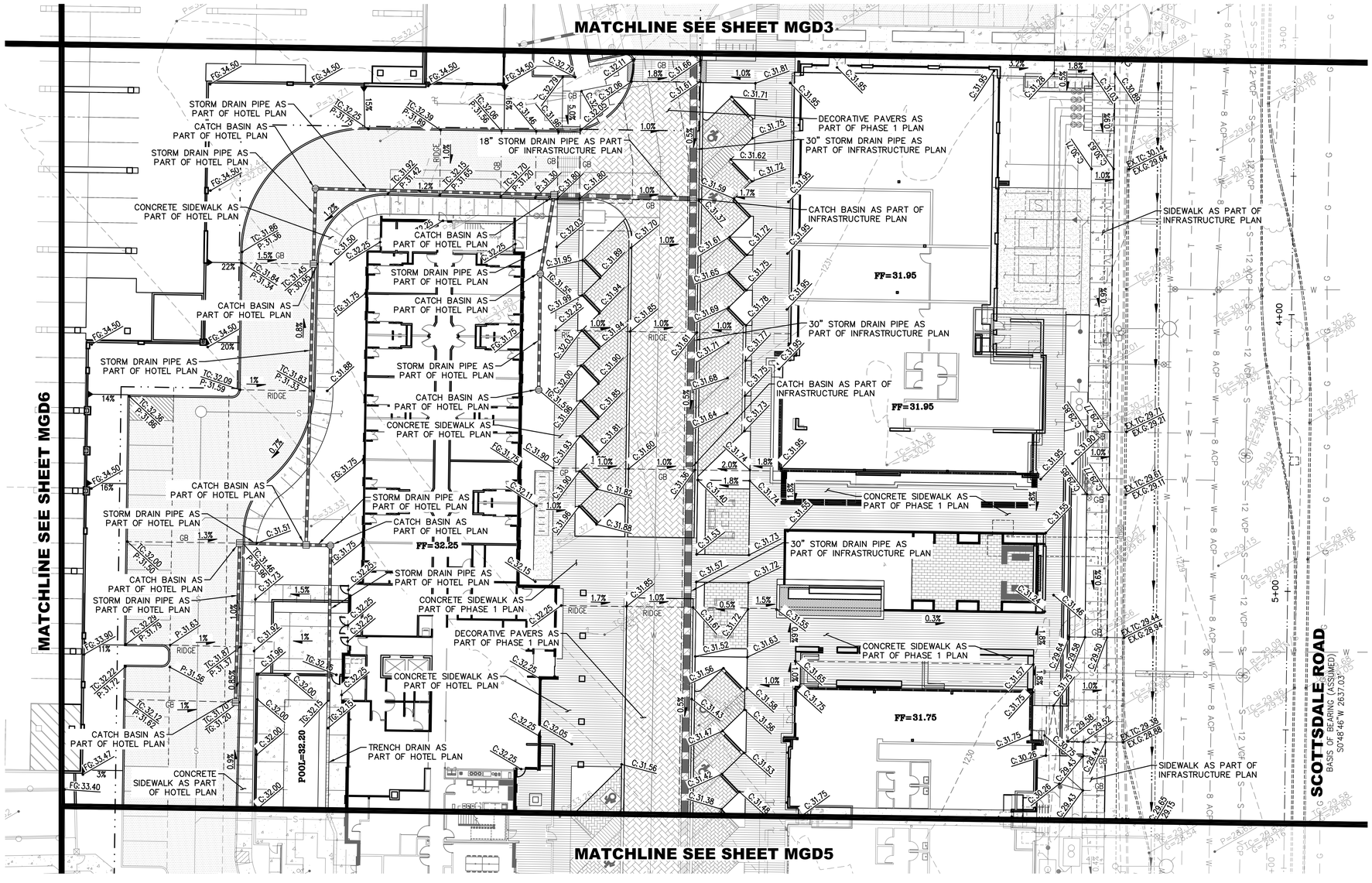

N

20 0 10 20

1 inch = 20 ft.

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Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil)
CERTIFICATE NO.
31695
LESLIE J. KLAND
Date Signed 1-15-21
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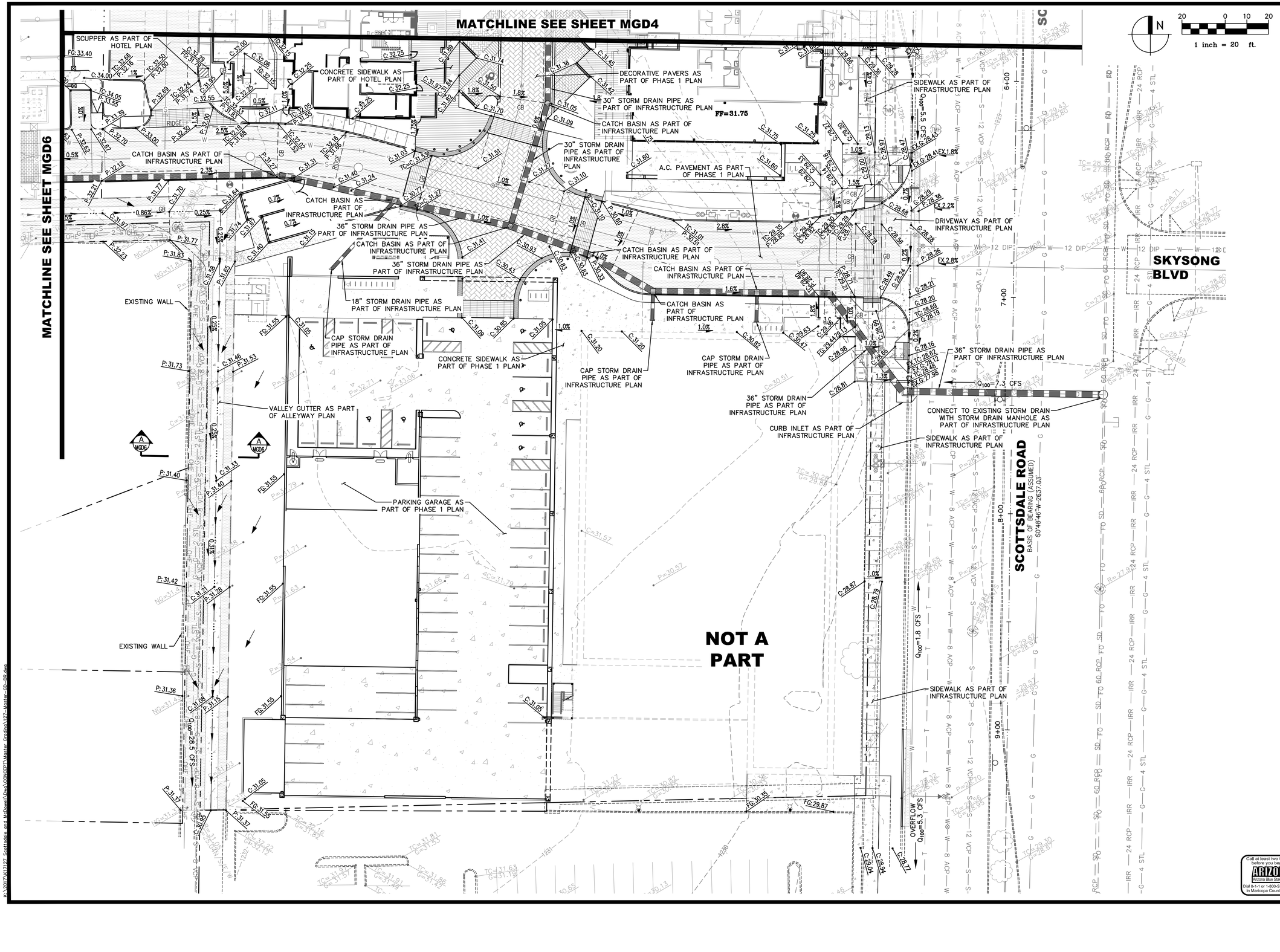

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Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

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MATCHLINE SEE SHEET MGD2

MATCHLINE SEE SHEET MGD5

53 LF 6' DIA. RETENTION TANK AS PART OF RESIDENTIAL PLAN

18" STORM DRAIN PIPE AS PART OF RESIDENTIAL PLAN

CATCH BASIN AS PART OF RESIDENTIAL PLAN

GFF=34.84
FF=35.34

Q_{100}=9.4 CFS

DROP INLET AS PART OF RESIDENTIAL PLAN

EXISTING WALL

A.C. PAVEMENT AS PART OF ALLEYWAY PLAN

BEGIN WALL OPENINGS WITH EVERY OTHER BLOCK TURNED ON SIDE AS PART OF ALLEYWAY PLAN

END WALL OPENINGS WITH EVERY OTHER BLOCK TURNED ON SIDE AS PART OF ALLEYWAY PLAN

GFF=34.39
FF=34.89

18" STORM DRAIN PIPE AS PART OF RESIDENTIAL PLAN

CATCH BASIN AS PART OF RESIDENTIAL PLAN

24" STORM DRAIN PIPE AS PART OF RESIDENTIAL PLAN

A.C. PAVEMENT AS PART OF RESIDENTIAL PLAN

SIDEWALK AS PART OF RESIDENTIAL PLAN

PARKING GARAGE AS PART OF RESIDENTIAL PLAN

FF=35.00

SCUPPER AS PART OF RESIDENTIAL PLAN

GFF=33.80
FF=34.30

EXISTING FENCE

24" STORM DRAIN PIPE AS PART OF RESIDENTIAL PLAN

CATCH BASIN AS PART OF RESIDENTIAL PLAN

A.C. PAVEMENT AS PART OF ALLEYWAY PLAN

CATCH BASIN AS PART OF RESIDENTIAL PLAN

DRYWELL AS PART OF RESIDENTIAL PLAN

Q_{100}=29.5 CFS

90 LF 6' DIA. RETENTION TANK AS PART OF RESIDENTIAL PLAN

DECORATIVE PAVERS AS PART OF RESIDENTIAL PLAN

BEGIN 27–4' WALL OPENINGS AS PART OF ALLEYWAY PLAN

A.C. PAVEMENT AS PART OF ALLEYWAY PLAN

DROP INLET AS PART OF INFRASTRUCTURE PLAN

END 27–4' WALL OPENINGS AS PART OF ALLEYWAY PLAN

N

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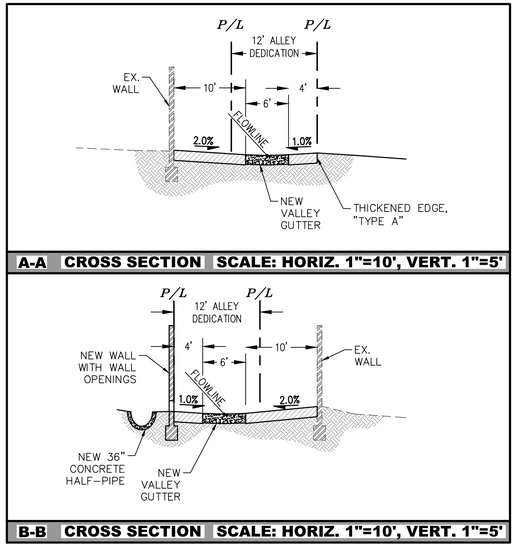
1 inch = 20 ft.



A-A CROSS SECTION SCALE: HORIZ. 1"=10', VERT. 1"=5'

B-B CROSS SECTION SCALE: HORIZ. 1"=10', VERT. 1"=5'

REVISIONS

SCOTTSDALE AND MCDOWELL

MASTER GRADING AND DRAINAGE PLAN

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Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

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CERTIFICATE NO.
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APPENDIX E: Offsite Drainage Report

SCOTTSDALE MCDOWELL – PAPAGO PLAZA/ BROADSTONE PAPAGO MARKETPLACE

Project #K17127

Offsite Drainage Report

Prepared For:
Kland Civil Engineers, LLC
7227 N. 16th Street, Suite 217
Scottsdale, AZ 85020

Prepared By:
Holistic Engineering and Land Management, Inc.
14040 N. Cave Creek Road, Suite 104
Phoenix, AZ 85022

May 20, 2019

Table of Contents

List of Tables

List of Figures

List of Appendices

1 INTRODUCTION

This hydrologic analysis is intended to support this development project and may or may not be applicable to other projects in or adjacent to the project area. The applicability of the data herein for the use on other projects should be evaluated by a qualified engineer with expertise in drainage design and hydrology.

1.1 Purpose

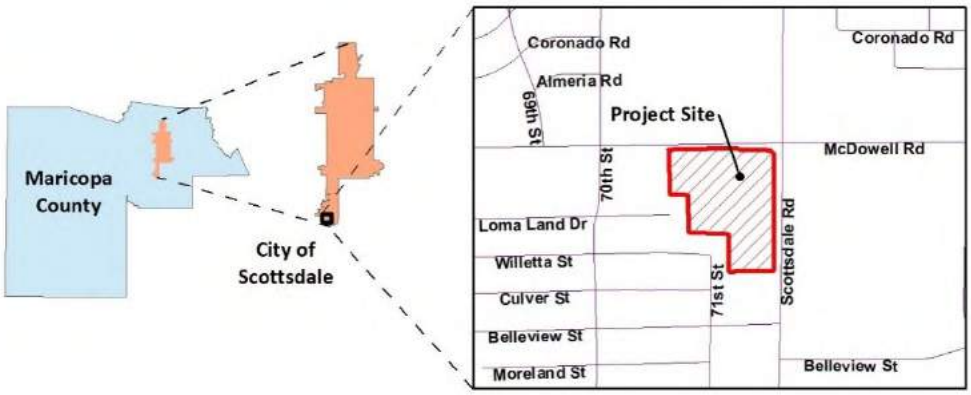
The purpose of this report is to provide an overview and assessment of the drainage impacting the Papago Plaza and Broadstone Papago Marketplace (Scottsdale McDowell) projects. The report provides an evaluation of offsite stormwater flows from the contributing watershed using the existing FLO-2D model developed as part of the Flood Control District of Maricopa County's Lower Indian Bend Wash (LIBW) Area Drainage Master Study (ADMS). Due to the regional nature and goals of the LIBW ADMS, smaller or more localized flooding was not scrutinized to the level required to make a proper offsite drainage assessment for individual properties within the City of Scottsdale. As part of this project, the LIBW ADMS FLO-2D model has been modified to better represent the offsite flow patterning and conditions impacting the project site.

It should be noted that onsite drainage was assessed for this project by Kland Civil Engineers – see the Master Drainage Report for Scottsdale McDowell (March 2019) prepared by Kland Civil Engineers and available under separate cover.

1.2 Location

The Scottsdale McDowell projects are located at 7047 E. McDowell Road (southwest corner of McDowell and Scottsdale Roads) within the City of Scottsdale, Arizona. The site is bound by McDowell Road to the north, Scottsdale Road to the east and existing commercial/residential developments to the west and south. The total area of the site is approximately 11 acres.

Figure 1-1 Vicinity Map



2 BACKGROUND

2.1 Previous Studies

Previous and current drainage studies pertinent to the project include:

- *Lower Indian Bend Wash Area Drainage Master Study – Hydrology & Hydraulics Report* prepared by Gavan & Barker, Inc. for the Flood Control District of Maricopa County, December 2017.
- *Master Drainage Report – Scottsdale McDowell* prepared by Kland Civil Engineers, LLC, March 2019.

2.2 Existing Conditions

The project is located at the site of the current Papago Plaza which, consists of a single-story shopping center, two standalone buildings on the Scottsdale Road frontage and a large parking lot. The property is mostly impervious with some landscaping interspersed around the parking lot and along the frontages with McDowell and Scottsdale Roads. Runoff on the site generally flows from northwest to southeast and discharges to Scottsdale Road north of SkySong Boulevard near the southeast corner of the property. There is currently no onsite retention.

The offsite contributing area extends west-northwest from the project site to the Crosscut Canal and is approximately 50 acres in size. The watershed is urbanized with a mix of commercial and residential. Runoff is mostly concentrated and contained within the streets as it passes through the watershed. Currently, there is no storm drain in the contributing watershed. Storm drain exists in Scottsdale Road and only begins in McDowell Road at roughly Scottsdale Road. There are existing inlets at the intersection of McDowell and Scottsdale Roads and on Scottsdale Road south of SkySong Boulevard.

Based on the results of the LIBW ADMS FLO-2D model, the lack of inlets in the area contributes to significant concentrations of flow within the streets. This results in over 75 cfs (100-year, 6-hour storm event) reaching the north side of McDowell Road, but due to the size of the street and the raised median, that flow largely remains on the north side until it is captured in inlets at Scottsdale Road. This results in minimal flow impacting the site despite street flow from McDowell Road entering the property through a driveway halfway between 70th Street and Scottsdale Road.

The most significant offsite flow entering the property is at the southwest corner behind the main shopping center building. Nearly 30 cfs discharges from the residential cul-de-sac on Loma Land Drive between the existing houses and accumulates in the parking lot behind the main building. The current site is graded to maintain those flows along the western edge of the property and discharge them to the alley behind the commercial property to the south. Flows from that alley eventually discharge to Belleview Street and then drain to Scottsdale Road.

2.3 FEMA Special Flood Hazard Areas

A review of the effective Flood Insurance Rate Map (No. 04013C2235L) indicates that the entire project area lies within Zone X, which is described as an *Area of Minimal Flood Hazard*. See Appendix A for the FEMA FIRM map.

3 OFFSITE DRAINAGE

As previously mentioned, the FLO-2D model developed as part of the LIBW ADMS was used as the basis for offsite drainage analysis on this project. The model used was obtained from the approved LIBW Hydrology & Hydraulics Report from December 2017. According to the disclaimer on the cover of the report, the FLO-2D model was developed as part of a large-scale planning effort for LIBW and the effects of the streets, storm drains and other drainage features may not be adequately represented in the model.

As suggested by the disclaimer, initial review of the existing FLO-2D model results indicated that the contributing offsite flows to the project site were not well reflected based on current roadway profile and grading and drainage conditions. As part of this project, an effort was undertaken to modify the model to better represent the likely flow conditions observed in the field. Additional discussions regarding FLO-2D modifications to better represent both the existing and proposed offsite drainages conditions of the project site are provided in Sections 3.1 and 0, respectively.

For all FLO-2D models runs, only the 100-year, 6-hour model was used for the offsite drainage analysis since it is the governing storm event documented in the LIBW Hydrology & Hydraulics Report.

3.1 Existing Conditions Updates

Assuming appropriate detailed topographic data is available to support FLO-2D model development, the level of detail associated with a FLO-2D model is dictated by the common size of the elements comprising the model domain grid. The smaller the grid element size, the more topographic detail captured by the overall grid. For example, more topographic detail is achieved when averaging existing topographic data for a grid comprised of square elements measuring 10’x10’ when compared to a grid comprised of square elements measure 100’x100’.

A common issue when developing a grid-based, discretized model like FLO-2D is that surface features can become normalized or “washed-out” when applying an average elevation to the grid elements. This grid element normalization may result in flows passing through grids that would otherwise have blocked flow due to an existing topographic feature or grading. Small drainage ways (e.g. curb and gutter) can also be “filled in” by the same elevation normalization process.

For the Scottsdale McDowell project, the most significant issues were the crown of McDowell Road and the drainage outlet for the Loma Land Drive cul-de-sac were not adequately reflected in the LIBW ADMS FLO-2D model. Both of these features were “washed out”, allowing flows to either unreasonably pass across the roadway or prevent positive drainage. This was largely a result of how the 20’x20’ grid elements fell over these surface features. Through survey and field observations, the north side of McDowell Road was determined to convey considerably more flow than what the existing FLO-2D model indicated. For the Loma Land Drive cul-de-sac, levees in the model were preventing the street from draining properly in addition to the grid elevation issue.

To better represent the existing flow conditions impacting the project site, the grid element elevations were adjusted based on the original mapping data used to develop the LIBW ADMS FLO-2D model. The reason for using this original mapping data was to eliminate any potential variation that other mapping sources/products might have when compared with the original mapping data. The following changes where made to the grid element elevations:

- The intersection of McDowell Road and 70th Street was adjusted to better represent the flow split at that location.
- The crown and raised median of McDowell Road were better represented from roughly 69th Street to Scottsdale Road.
- The gutters of McDowell Road were adjusted from 70th Street to Scottsdale Road for positive drainage and to maintain capacity.
- Grids along the north side of the property were elevated based on the mapping to reduce breakout from McDowell Road.
- Grids representing the path of the drainage way from the southeast corner of Loma Land Drive cul-de-sac were adjusted to create positive drainage to the alley behind the houses.
- Levees (used to represent walls in the model) that were blocking flow from the cul-de-sac were removed to allow flow into the alley as intended.

Other than grid elevations and levees, no other parameters for the existing conditions were modified for this project.

The above listed model modifications resulted in an increase in roadway conveyance; however, model modifications did not eliminate some of the breakouts from McDowell Road into the north side of the property. These breakouts appear to be consistent with the existing grading and field observations. Discharge from Loma Land Drive appears to function correctly for the majority of the flows. Some breakout is expected for the larger flows from the 100-year storm event. Table 3-1 shows flows in the vicinity of the project site and Appendix B includes existing condition FLO-2D model results shown graphically.

Table 3-1. Existing Condition Flows Adjacent to Site

FLO-2D XS #	Location	100-year, 6-hour Flow (cfs)
102	McDowell Road North side DS of west driveway	58
103	McDowell Road South side DS of west driveway	6
104	McDowell Road North side DS of middle driveway	76
105	McDowell Road South side DS of middle driveway	0
106	Loma Land Drive US of cul-de-sac	29
107	Parking lot behind main shopping center building	30

3.2 Proposed Conditions Updates

To simulate the proposed conditions, the existing condition model was adjusted to reflect the grading and drainage plans associated with the proposed site (refer to Appendix C for the grading and drainage plans). For the Scottsdale McDowell project, the FLO-2D grid element elevations were adjusted along the frontage with McDowell Road.

Review of the existing Papago Plaza grading showed the intent to accept flow from McDowell Road, allowing it to pass through the site and discharging it to Scottsdale Road. The proposed grading is expected to eliminate these breakouts along McDowell Road by elevating the driveways and landscaped frontage areas. The proposed intent is to keep street flows in McDowell Road.

The results of the 100-year, 6-hour model for the proposed conditions modifications appear to be consistent with the intent of the proposed project grading. The breakout from McDowell Road at the north side of the property was eliminated and kept within the street right-of-way. Table 3-2 lists flows in the vicinity of the project site and Appendix B includes proposed condition FLO-2D model results shown graphically.

Table 3-2. Proposed Condition Flows Adjacent to Site

FLO-2D XS #	Location	100-year, 6-hour Flow (cfs)
102	McDowell Road North side DS of west driveway	58
103	McDowell Road South side DS of west driveway	6
104	McDowell Road North side DS of middle driveway	76
105	McDowell Road South side DS of middle driveway	7
106	McDowell Road South side DS of east driveway	11
107	Scottsdale Road West side at north driveway	2
108	Scottsdale Road West side US of SkySong Blvd	9
109	Scottsdale Road West side DS of SkySong Blvd	1
110	Loma Land Drive US of cul-de-sac	29
111	Parking lot behind main shopping center building	30
112	Site discharge to Scottsdale Road	24
113	Site discharge to Alley at southwest corner	29

4 CONCLUSIONS

Offsite drainage for the Scottsdale McDowell project was assessed using the FLO-2D model developed for the Flood Control of Maricopa County's LIBW ADMS study. Due to the regional focus of the LIBW study, local surface features such as streets and smaller conveyances were not scrutinized to the level needed to properly assess offsite drainage impacts to the project site. Therefore, adjustments to the FLO-2D model (grid element elevation modifications) were necessary to better represent the existing drainage conditions.

Adjustments to the FLO-2D model were largely focused on the elevations of the grids to better simulate the capacity of the adjacent streets and other existing drainage ways. Such grid elevation changes were made to better represent:

- Flow splits at intersections.
- The crowns and gutter of adjacent streets (McDowell Road and 70th Street).
- Any unreasonable breakout into the subject property.
- The drainage way from the Loma Land Drive cul-de-sac to an alley that discharges to the parking lot behind the main building of the shopping center.

Additional adjustments included the removal levees preventing flow from properly draining from the Loma Land Drive cul-de-sac.

A proposed conditions model utilized the project's grading and drainage plans to elevate the site to prevent inflow from the adjacent streets.

Review of the 100-year, 6-hour results for both the existing and proposed conditions found them favorable to the expectations of the field observations. Field assessments included the potential for flow to remain in the street gutters, the ability for flow to cross McDowell Road and the potential for flow to breakout into the property. Refer to Appendix B for FLO-2D model result exhibits.

5 REFERENCES

- *Drainage Design Manual for Maricopa County, Arizona, Hydraulics*, Flood Control District of Maricopa County, December 2018.
- *Drainage Policies and Standards for Maricopa County, Arizona*, Flood Control District of Maricopa County, August 2018.
- *Drainage Standards & Policies Manual*, City of Scottsdale, January 2018.
- *Lower Indian Bend Wash Area Drainage Master Study – Hydrology & Hydraulics Report*, Flood Control District of Maricopa County, December 2017.
- *Master Drainage Report – Scottsdale McDowell*, Kland Civil Engineers, LLC, March 2019.

FEMA Special Flood Hazard Areas

National Flood Hazard Layer FIRMette

FEMA

33°28'5.25"N

111°55'55.54"W

111°55'18.08"W

33°27'35.23"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth
- Regulatory Floodway *Zone AE, AO, AH, VE, AR*

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/3/2018 at 2:54:12 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

FLO-2D Exhibits

SCOTTSDALE MCDOWELL - PAPAGO PLAZA/BROADSTONE PAPAGO MARKETPLACE OFFSITE DRAINAGE REPORT

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

Legend

- Project Area
- SWMM Pipe Junctions
- SWMM Manhole Junctions
- SWMM Inlet Locations
- SWMM Outfall Locations
- SWMM Conduits
- FP Cross-section Peak Discharge (cfs)

Max. Combined Discharge (cfs)

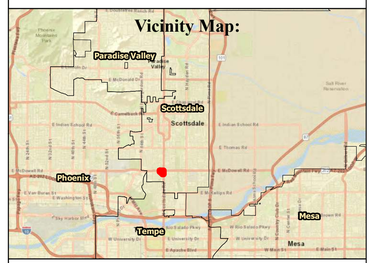
- 0 - 1
- 1 - 2
- 2 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 50
- 50 - 100
- > 100

N

0 100 200
Feet

Notes:

Vicinity Map:



Existing Conditions
100-year 6-hour
Max. Combined Discharge

Sheet 1 of 4

April 2019

Revisions:

HELM
14040 North Cave Creek Road, Ste. 104
Phoenix, Arizona 85022

SCOTTSDALE MCDOWELL - PAPAGO PLAZA/BROADSTONE PAPAGO MARKETPLACE OFFSITE DRAINAGE REPORT

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

Legend

- Project Area
- SWMM Pipe Junctions
- SWMM Manhole Junctions
- SWMM Inlet Locations
- SWMM Outfall Locations
- SWMM Conduits
- FP Cross-section Peak Discharge (cfs)

Max. Flow Depth
(ft)

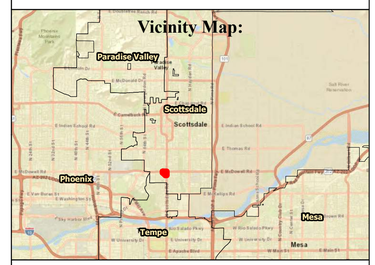
- 0 - 0.2
- 0.2 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- 5 - 10
- 10 - 15
- > 15

N

0 100 200
Feet

Notes:

Vicinity Map:



Existing Conditions
100-year 6-hour
Max. Flow Depth

Sheet 2 of 4

April 2019

Revisions:

HELM
14040 North Cave Creek Road, Ste. 104
Phoenix, Arizona 85022

SCOTTSDALE MCDOWELL - PAPAGO PLAZA/BROADSTONE PAPAGO MARKETPLACE OFFSITE DRAINAGE REPORT

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

Legend

- Project Area
- SWMM Pipe Junctions
- SWMM Manhole Junctions
- SWMM Inlet Locations
- SWMM Outfall Locations
- SWMM Conduits
- FP Cross-section Peak Discharge (cfs)

Max. Combined Discharge (cfs)

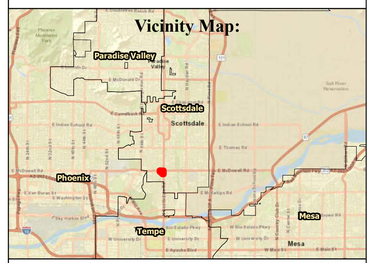
- 0 - 1
- 1 - 2
- 2 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 50
- 50 - 100
- > 100

N

0 100 200
Feet

Notes:

Vicinity Map:



Proposed Conditions
100-year 6-hour
Max. Combined Discharge

Sheet 3 of 4

May 2019

Revisions:

HELM
14040 North Cave Creek Road, Ste. 104
Phoenix, Arizona 85022

SCOTTSDALE MCDOWELL - PAPAGO PLAZA/BROADSTONE PAPAGO MARKETPLACE OFFSITE DRAINAGE REPORT

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

Legend

- Project Area
- SWMM Pipe Junctions
- SWMM Manhole Junctions
- SWMM Inlet Locations
- SWMM Outfall Locations
- SWMM Conduits
- FP Cross-section Peak Discharge (cfs)

Max. Flow Depth
(ft)

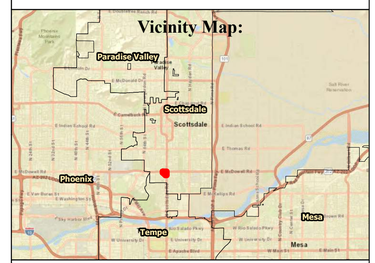
- 0 - 0.2
- 0.2 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 2
- 2 - 3
- 3 - 5
- 5 - 10
- 10 - 15
- > 15

N

0 100 200
Feet

Notes:

Vicinity Map:



Proposed Conditions
100-year 6-hour
Max. Flow Depth

Sheet 4 of 4

May 2019

Revisions:

HELM
14040 North Cave Creek Road, Ste. 104
Phoenix, Arizona 85022

APPENDIX C

Grading and Drainage Plan

See Appendix D of Master Drainage Report for Plans

Flood Control District of Maricopa County

Gavan & Barker INC. Civil Engineering & Landscape Architecture 3030 North Central Avenue, Suite 1530 Phoenix, AZ 85012 Phone 602-200-0031

TY LIN INTERNATIONAL engineers| planners| scientists

Legend (Plan)

- Inlet & SWMM Identifier
- Manhole & SWMM Identifier
- Outlet & SWMM Identifier
- Storm Drain Pipes

Legend (Profile)

- Ground Elevation
- Hydraulic Grade Line (100yr, 6-hr)
- Hydraulic Grade Line (10yr, 6-hr)

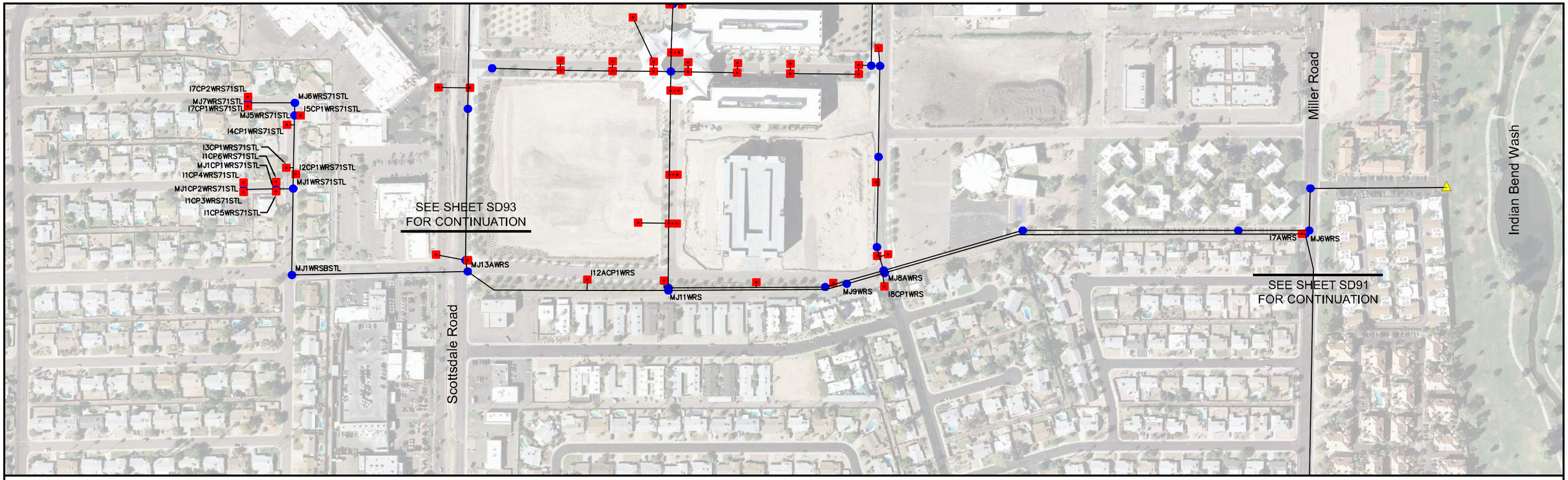
LOWER INDIAN BEND WASH ADMS/P
STUDY AREA-SOUTH

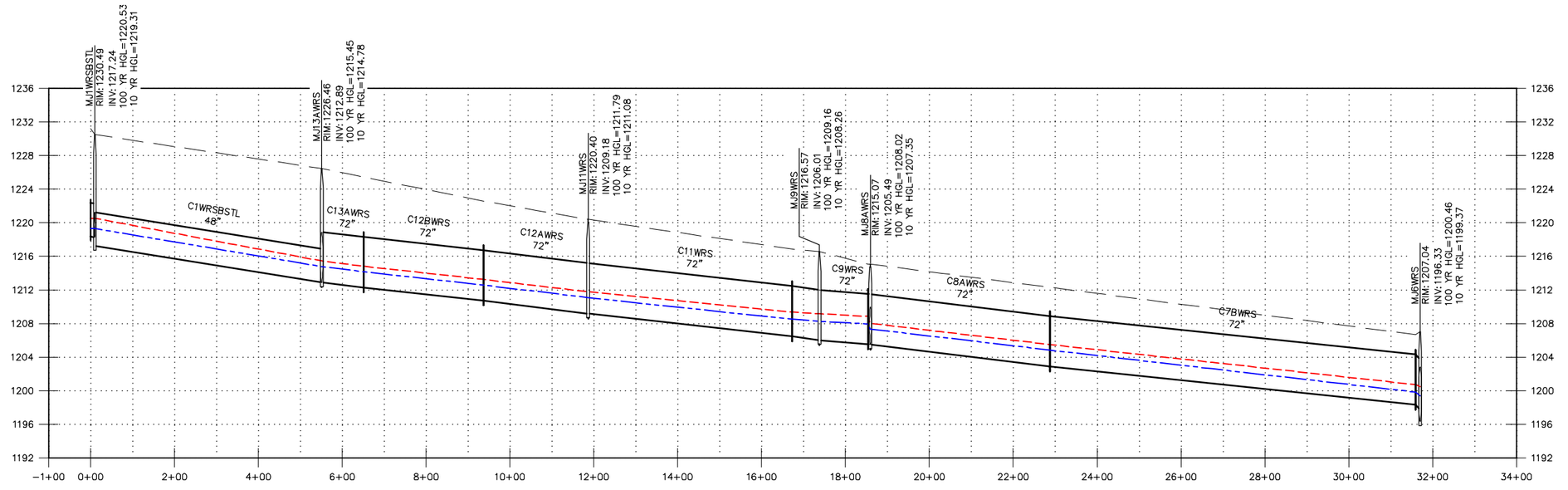
75 0 75 150

Scale: 1"=300' Horizontal
1"=15' Vertical

SWMM Outfall:
WRSIBWOUTFALL
(West Roosevelt Street S.D. Outfall)

	By	Date
Prepared	AJA	12/18/2017
Checked	MTG	12/18/2017





SHEET SD92 OF SD121

Legend (Plan)

- Inlet & SWMM Identifier
- Manhole & SWMM Identifier
- Outlet & SWMM Identifier
- Storm Drain Pipes

Legend (Profile)

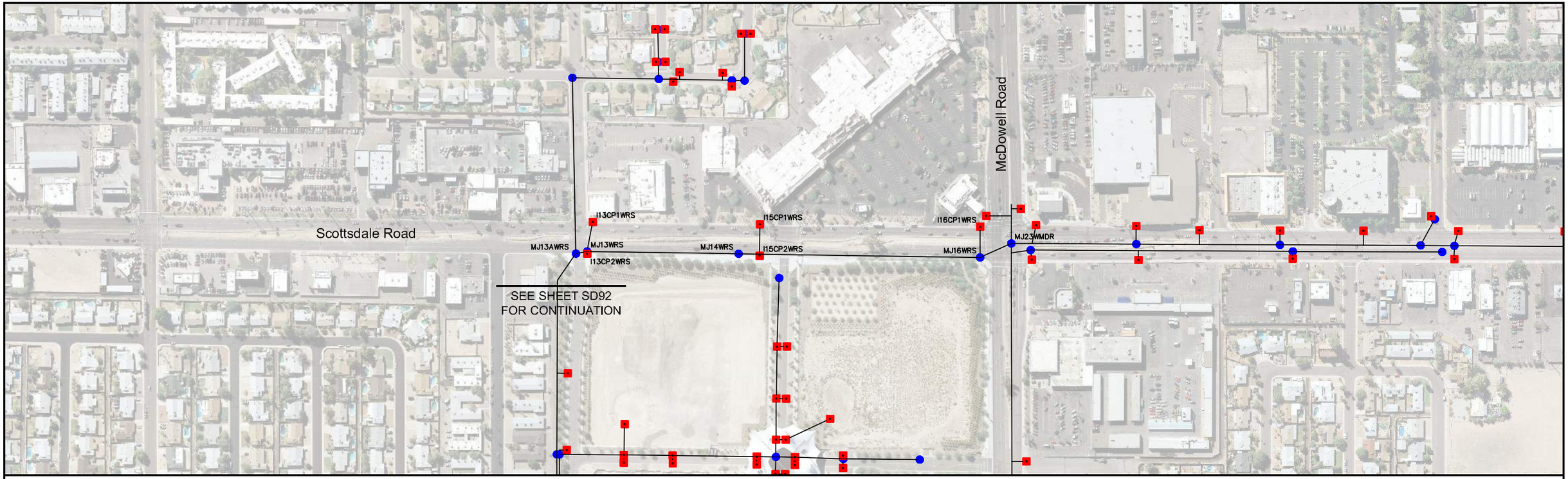
- Ground Elevation
- Hydraulic Grade Line (100yr, 6-hr)
- Hydraulic Grade Line (10yr, 6-hr)

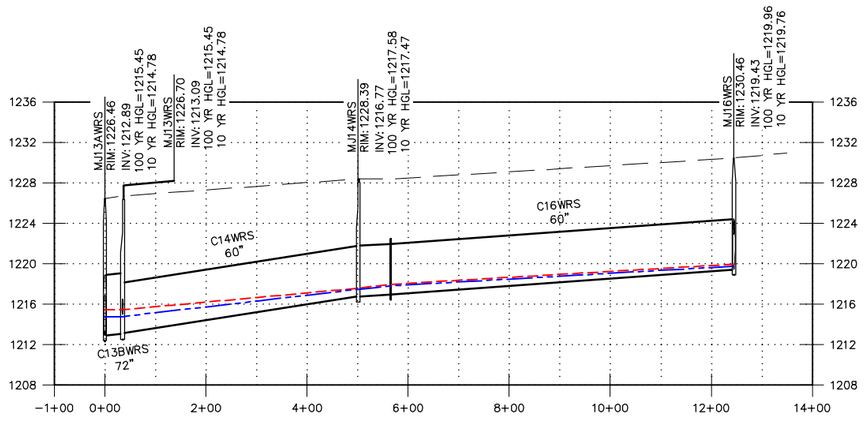
LOWER INDIAN BEND WASH ADMS/P
STUDY AREA-SOUTH

Scale: 1"=300' Horizontal
1"=15' Vertical

SWMM Outfall:
WRSIBWOUTFALL
(West Roosevelt Street S.D. Outfall)

	By	Date
Prepared	AJA	12/18/2017
Checked	MTG	12/18/2017





SHEET SD93 OF SD121

Flood Control District of Maricopa County

Gavan & Barker INC. Civil Engineering & Landscape Architecture 3030 North Central Avenue, Suite 1530 Phoenix, AZ 85012 Phone 602-200-0031

TY LIN INTERNATIONAL engineers| planners| scientists

Legend (Plan)

- I13CP1WRS — Inlet & SWMM Identifier
- MJ13WRS — Manhole & SWMM Identifier
- EWRSBWOUTFALL — Outlet & SWMM Identifier
- Storm Drain Pipes

Legend (Profile)

- Ground Elevation
- Hydraulic Grade Line (100yr, 6-hr)
- Hydraulic Grade Line (10yr, 6-hr)

LOWER INDIAN BEND WASH ADMS/P
STUDY AREA-SOUTH

75 0 75 150

Scale: 1"=300' Horizontal
1"=15' Vertical

SWMM Outfall:
WRSIBWOUTFALL
(West Roosevelt Street S.D. Outfall)

	By	Date
Prepared	AJA	12/18/2017
Checked	MTG	12/18/2017

Inlet Summary Table

SWMM Name		Curb High / Soffit High Inflow	FLO-2D/SWMM Model							
			100-yr, 24-hr		100-yr, 6-hr		10-yr, 24-hr		10-yr, 6-hr	
Inlet	Connector Pipe		Inflow	Pipe Max	Inflow	Pipe Max	Inflow	Pipe Max	Inflow	Pipe Max
		(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
I15CP2WRS	C15CP2WRS	5.4	5.3	5.3	5.7	5.7	4.4	4.4	4.6	4.6
I13CP2WRS	C13CP2WRS	5.4	7.8	7.8	8.3	8.3	5.5	5.5	6.1	6.1
I15CP1WRS	C15CP1WRS	4.4	4.2	4.2	4.3	4.3	3.7	3.7	3.9	3.8
I13CP1WRS	C13CP1WRS	4.4	3.6	3.6	3.8	3.8	2.9	2.9	3.1	3.1
I8CP1WRS	C8CP1WRS	4.4	0.6	0.6	0.8	0.8	0.4	0.4	0.5	0.5
I16CP1WRS	C16CP1WRS	4.4	3.4	3.4	3.7	3.7	0.8	0.8	1.5	1.5
I7AWRS	C7AWRS	2.8	9.3	116.6	9.5	129.5	8.2	64.4	8.5	76.0
I12ACP1WRS	C12ACP1WRS	5.7	4.9	4.9	5.8	5.8	1.8	1.8	2.5	2.5
I1CP3WRS71STL	C1CP3WRS71STL	17.4	10.9	10.9	11.5	11.4	7.3	7.3	8.4	8.4
I1CP4WRS71STL	C1CP4WRS71STL	17.4	11.1	11.1	11.6	11.6	7.2	7.2	8.3	8.3
I1CP5WRS71STL	C1CP5WRS71STL	17.4	6.6	6.6	9.5	9.5	2.6	2.6	3.8	3.8
I1CP6WRS71STL	C1CP6WRS71STL	17.4	6.6	6.6	9.5	9.5	2.6	2.6	3.8	3.8
I2CP1WRS71STL	C2CP1WRS71STL	17.4	0.4	0.4	0.9	0.9	0.2	0.1	0.2	0.2
I3CP1WRS71STL	C3CP1WRS71STL	17.4	1.2	1.2	2.8	2.8	0.6	0.6	0.7	0.7
I4CP1WRS71STL	C4CP1WRS71STL	17.4	8.7	8.7	13.1	13.1	1.6	1.6	2.4	2.3
I5CP1WRS71STL	C5CP1WRS71STL	17.4	8.5	8.5	12.9	12.9	1.6	1.6	2.3	2.3
I7CP2WRS71STL	C7CP2WRS71STL	17.4	15.6	15.4	14.8	15.0	9.4	9.4	11.2	11.2
I7CP1WRS71STL	C7CP1WRS71STL	17.4	15.6	15.4	14.8	15.0	9.5	9.5	11.2	11.2

Pipe Discharge Summary Table

Conduit Name	Normal Depth Capacity	FLO-2D/SWMM Model Discharge			
		100-yr, 24-hr	100-yr, 6-hr	10-yr, 24-hr	10-yr, 6-hr
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
C1WRS	561.6	116.0	129.3	64.4	76.0
C2WRS	565.4	116.0	129.3	64.4	76.0
C3WRS	561.7	116.0	129.3	64.3	76.0
C4WRS	342.0	115.9	129.3	64.4	76.0
C5WRS	233.9	116.0	129.3	64.3	76.1
C6WRS	228.0	116.7	129.4	64.4	76.0
C7AWRS	739.8	116.6	129.5	64.4	76.0
C7BWRS	306.2	107.1	120.5	56.5	67.9
C8AWRS	330.7	106.5	119.9	56.5	68.0
C8BWRS	164.0	118.5	134.2	56.4	69.7
C9WRS	275.9	106.4	119.6	56.4	67.9
C10WRS	351.4	106.4	119.7	56.4	67.9
C11WRS	316.8	106.4	119.8	56.4	67.8
C12AWRS	334.9	106.5	119.8	56.5	67.8
C12BWRS	312.7	102.4	115.2	55.0	65.8
C13AWRS	316.2	102.4	115.2	55.0	65.9
C1WRSBSTL	128.8	81.6	93.0	41.3	50.8
C2WRSBSTL	101.6	0.1	0.1	0.0	0.0
C13BWRS	318.8	22.5	24.7	16.5	18.1
C14WRS	230.2	12.0	13.2	8.6	9.6
C15WRS	133.2	12.2	13.3	9.0	10.1
C16WRS	157.8	3.4	3.7	0.8	1.4

INLET SUMMARY TABLE NOTES:

1. The curb high/soffit high inflow discharge were calculated according to the procedures outlined in the District's Hydraulics Manual.
2. The inflow discharge is the peak hydrograph discharge taken from the SWMMQIN.OUT file.
3. The pipe Max Discharge is the peak hydrograph discharge taken from the 'Link Results' in the SWMM.RTP file.

PIPE DISCHARGE SUMMARY TABLE NOTES:

1. The normal depth capacity discharges were obtained from the SWMM.RPT file.
2. The pipe discharge is the peak hydrograph discharge taken from the 'Link Results" in the SWMM.RTP file.

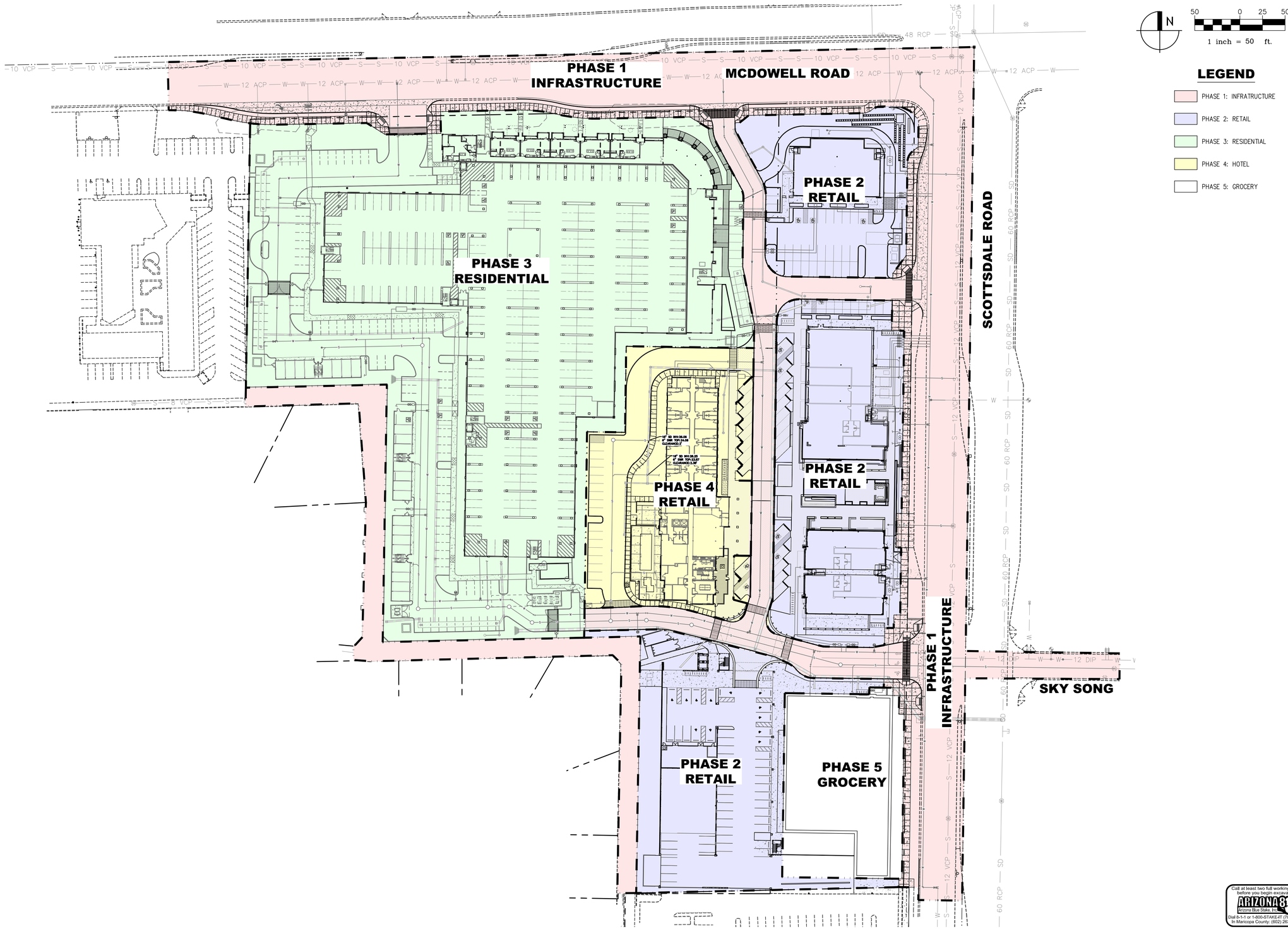
Flood Control District of Maricopa County
Gavan & Barker Inc. Civil Engineering & Landscape Architecture 3030 North Central Avenue, Suite 1230 Phoenix, AZ 85012 Phone 602-200-0031
TY LIN INTERNATIONAL engineers| planners| scientists

LOWER INDIAN BEND WASH ADMS/P
STUDY AREA-SOUTH

SWMM Outfall:
WRSIBWOUTFALL
(West Roosevelt Street S.D. Outfall)

	By	Date
Prepared	AJA	12/18/2017
Checked	MTG	12/18/2017

APPENDIX F: Phasing Exhibit



N

50 0 25 50

1 inch = 50 ft.

LEGEND

- PHASE 1: INFRATRUCTURE
- PHASE 2: RETAIL
- PHASE 3: RESIDENTIAL
- PHASE 4: HOTEL
- PHASE 5: GROCERY

REVISIONS

SCOTTSDALE RD AND MCDOWELL

PHASING EXHIBIT

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PHONE: (480) 344-0480
www.klandeng.com

ENGINEER:	L. KLAND
DESIGNER:	T. HODJATI
CAD TECH:	FITZGERALD

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Project No.
K17127

05-20-19

Sheet No.
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OF 6

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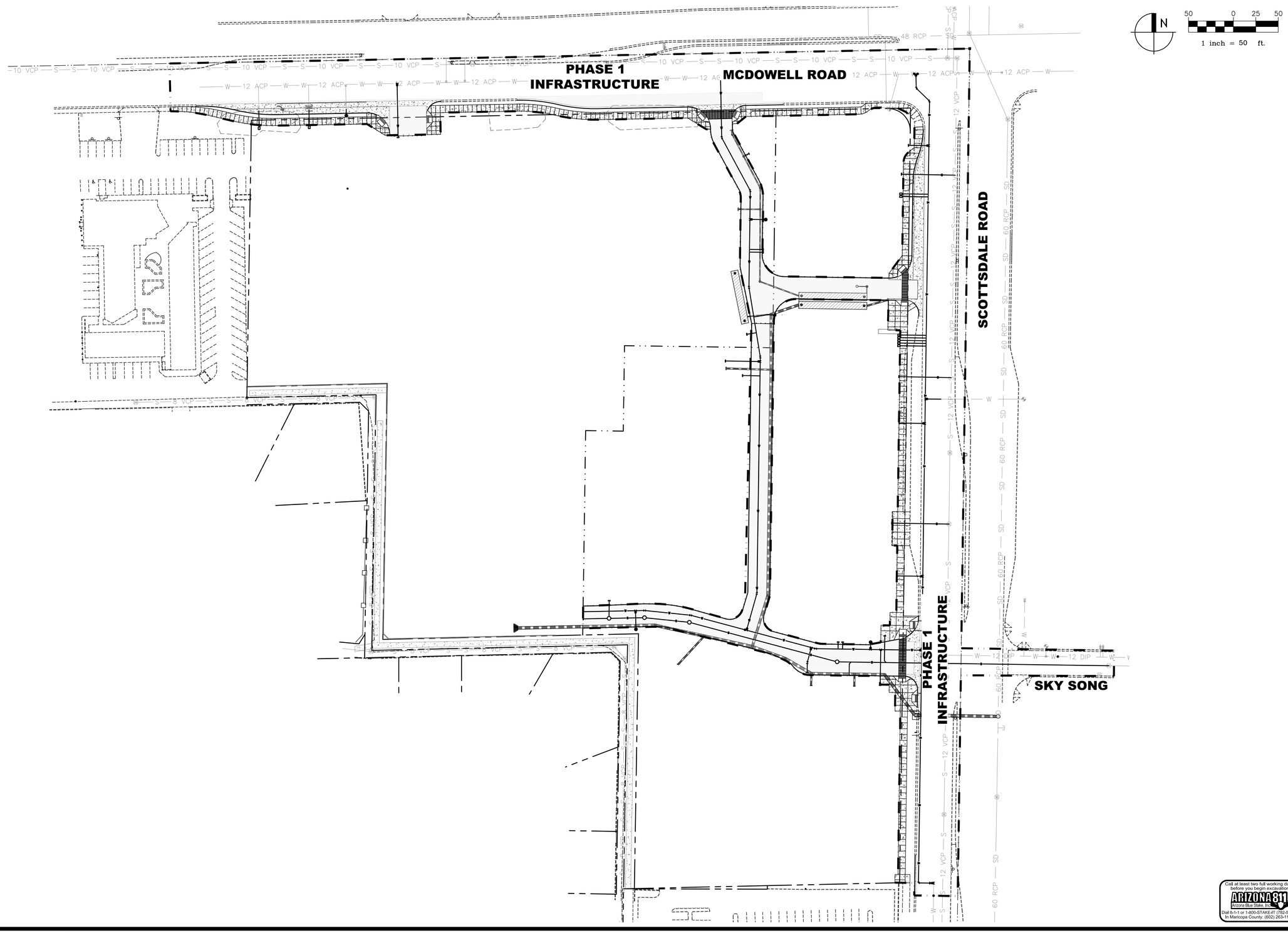

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PHASE 1 INFRASTRUCTURE

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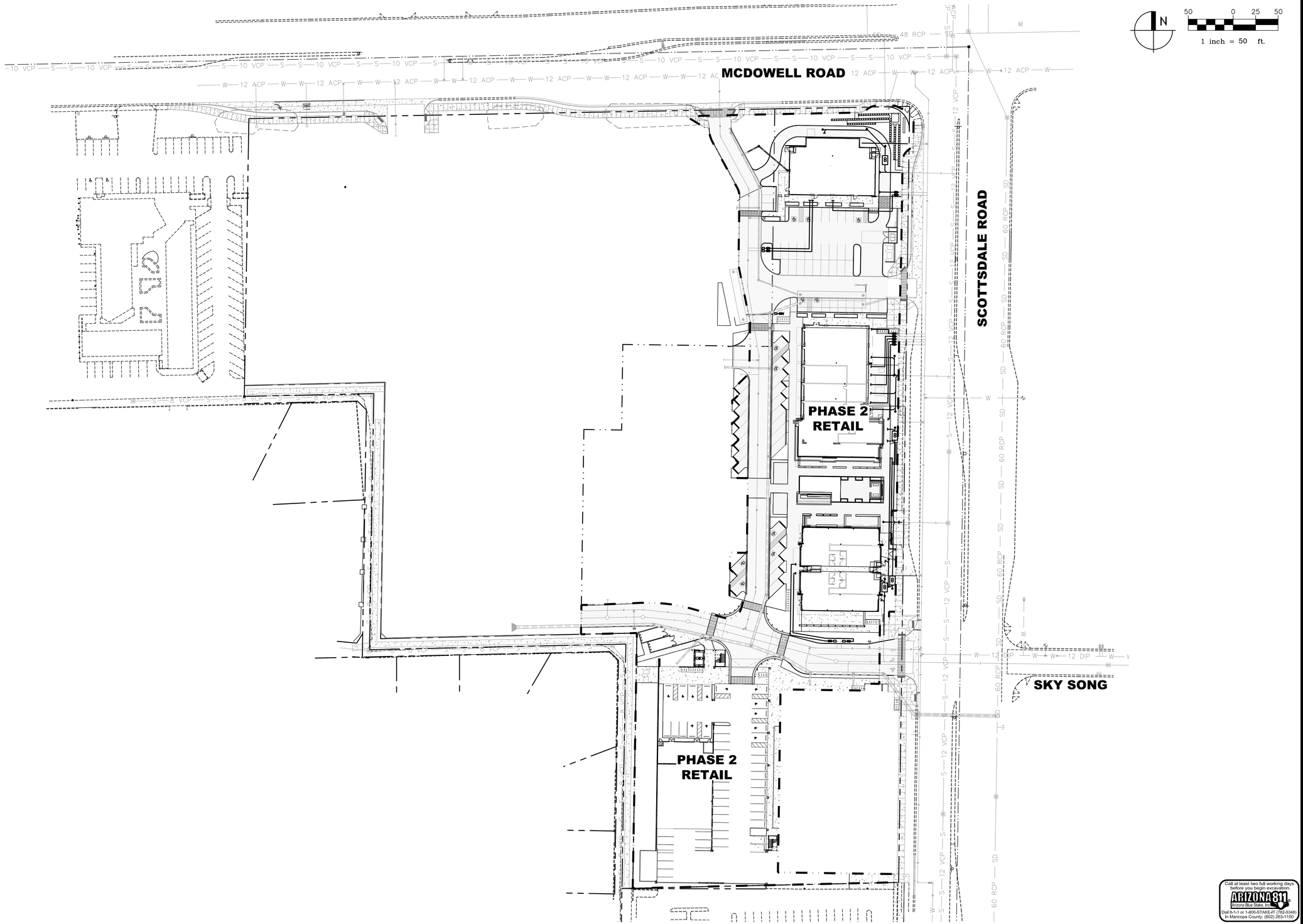

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PHASE 2 RETAIL

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PH2

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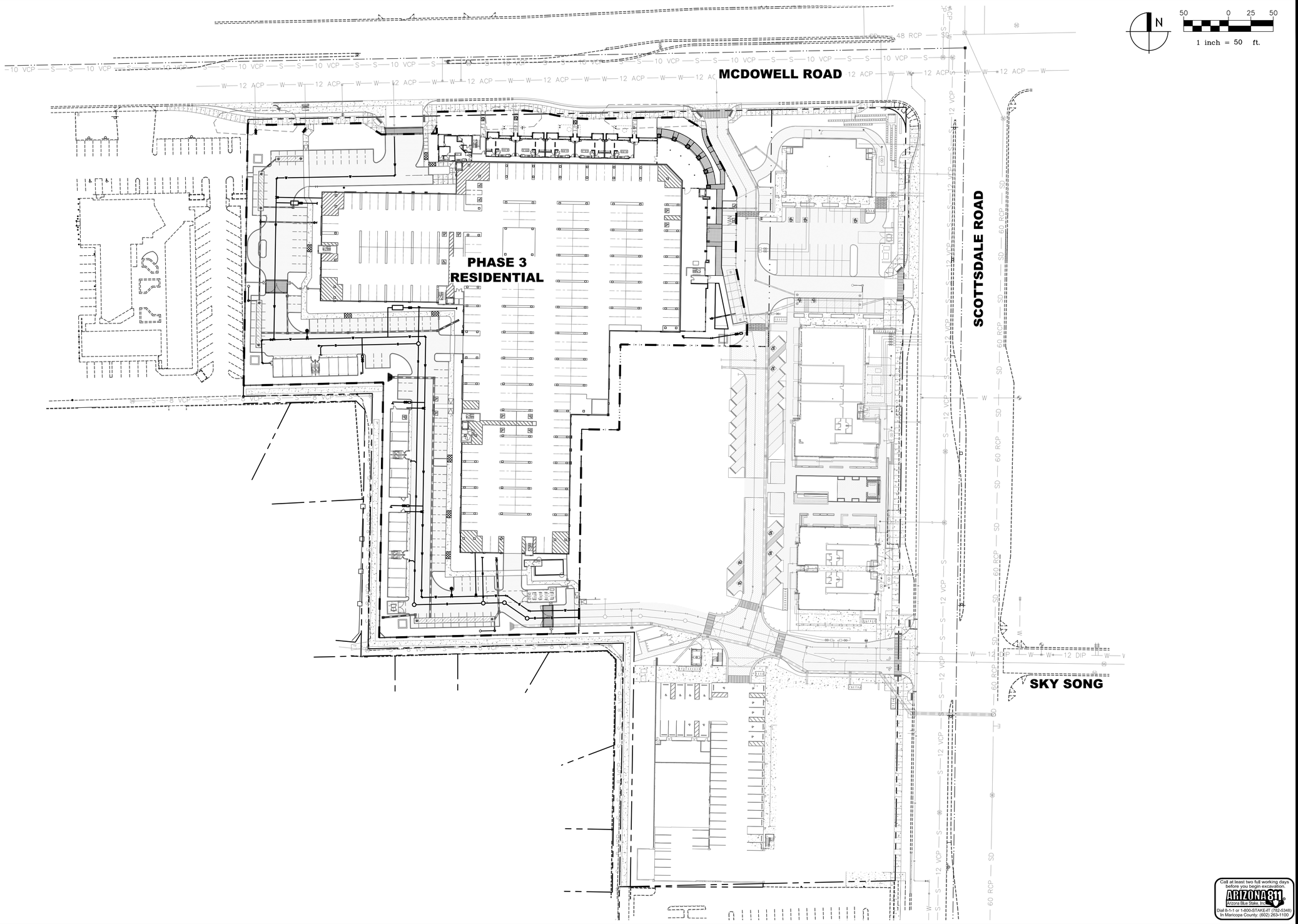

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PHASE 3 RESIDENTIAL

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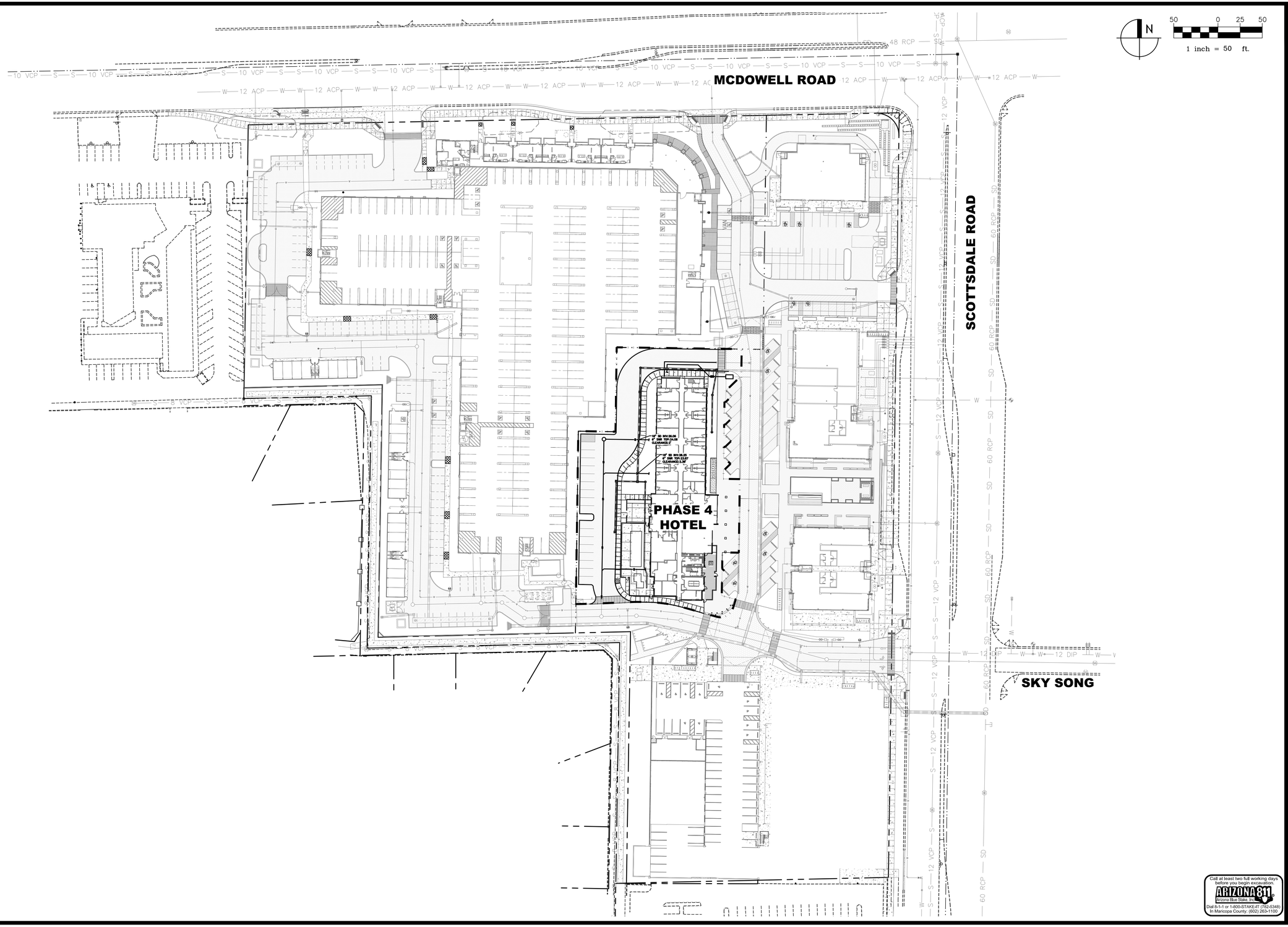

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PHASE 4 HOTEL

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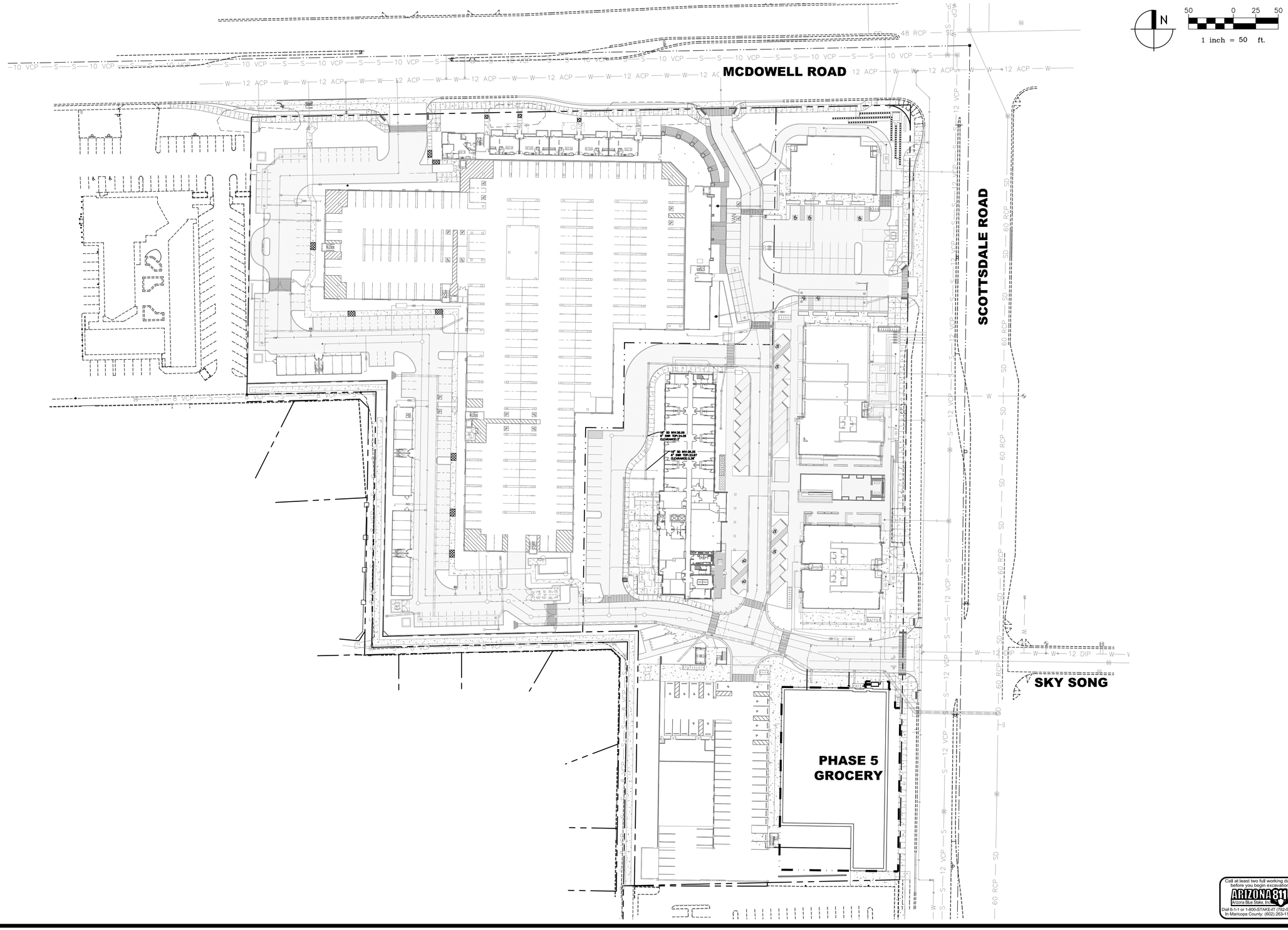

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PHASE 5 GROCERY

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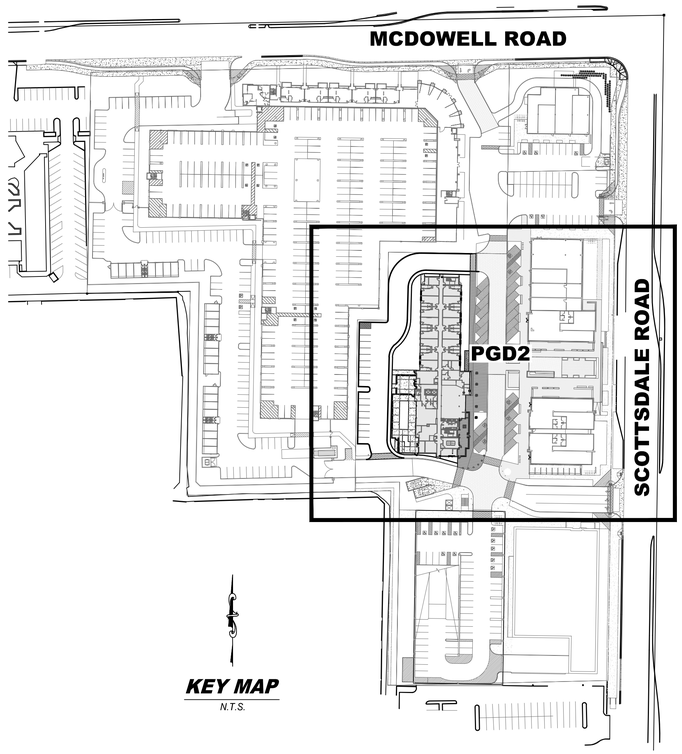
APPENDIX B: Preliminary Grading and Drainage Plans

SHEET INDEX



KEY MAP
N.T.S.

PRELIMINARY GRADING AND DRAINAGE PLAN

FOR

PAPAGO PLAZA SPRINGHILL SUITES
SCOTTSDALE RD & MCDOWELL RD

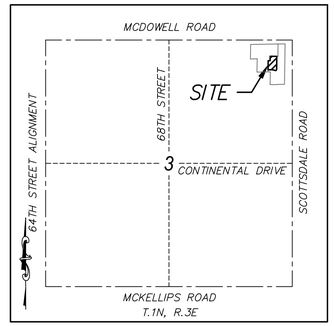
A PORTION OF THE NORTHEAST QUARTER OF SECTION 3, TOWNSHIP 1 NORTH, RANGE 3 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	CURB AND GUTTER	
	SIDEWALK	
	SINGLE CURB	
TC: 62.75 G: 62.33 FL: 61.55 PC: 62.90	TOP OF CURB AND GUTTER	TC: 64.04 G: 64.06
	CONCRETE ELEVATION	C: 63.98
	PAVEMENT ELEVATION	P: 64.36
RIM: 62.48 INV: 56.64	RIM AND INVERT ELEVATION	TG: 62.58 INV: 55.23
1499'	CONTOUR	49
	WATER FITTINGS	
	WATER METER	
W W	WATER LINE	W
	FIRE HYDRANT	
S S	SEWER LINE	S
SW	SEWER MANHOLE/CLEANOUT	
SD ST	STORM DRAIN	
	CATCH BASIN	
	DRYWELL	
	UNDERGROUND STORAGE TANK	
	GRADE BREAK/RIDGE	G.B. / RIDGE
	FLOWLINE	
	SLOPE	1.5%
	SCUPPER	
	FINISHED FLOOR	FF=43.81
G G	GAS LINE/METER/VALVE	
E E	ELECTRIC LINE/METER	
TV T TV	CABLE/JUNCTION BOX	
OHE	OVERHEAD ELECTRIC/POLE	
	BOUNDARY LINE	
	CENTER LINE	
	EASEMENT	
IRR IRR IRR	IRRIGATION	
FO FO	FIBER OPTIC	

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.



VICINITY MAP
N.T.S.

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PHOENIX, AZ 85020
PH: (480) 344-0480
CONTACT: LESLIE KLAND, PE

DEVELOPER

PEG COMPANIES
180 N. UNIVERSITY AVE., STE 200
PROVO, UT 84601
PH: (801) 664-2939
CONTACT: MR. TYLER MAHONEY

ARCHITECT

NELSEN PARTNERS ARCHITECTS & PLANNERS
15210 N. SCOTTSDALES RD., STE 300
SCOTTSDALE, AZ 85254
PH: (480) 949-6800
CONTACT: KELSEY REUST

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

REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES
SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY GRADING AND DRAINAGE PLAN

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Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER:	L. KLAND
DESIGNER:	T. M. ZADEH
CAD TECH:	FITZGERALD

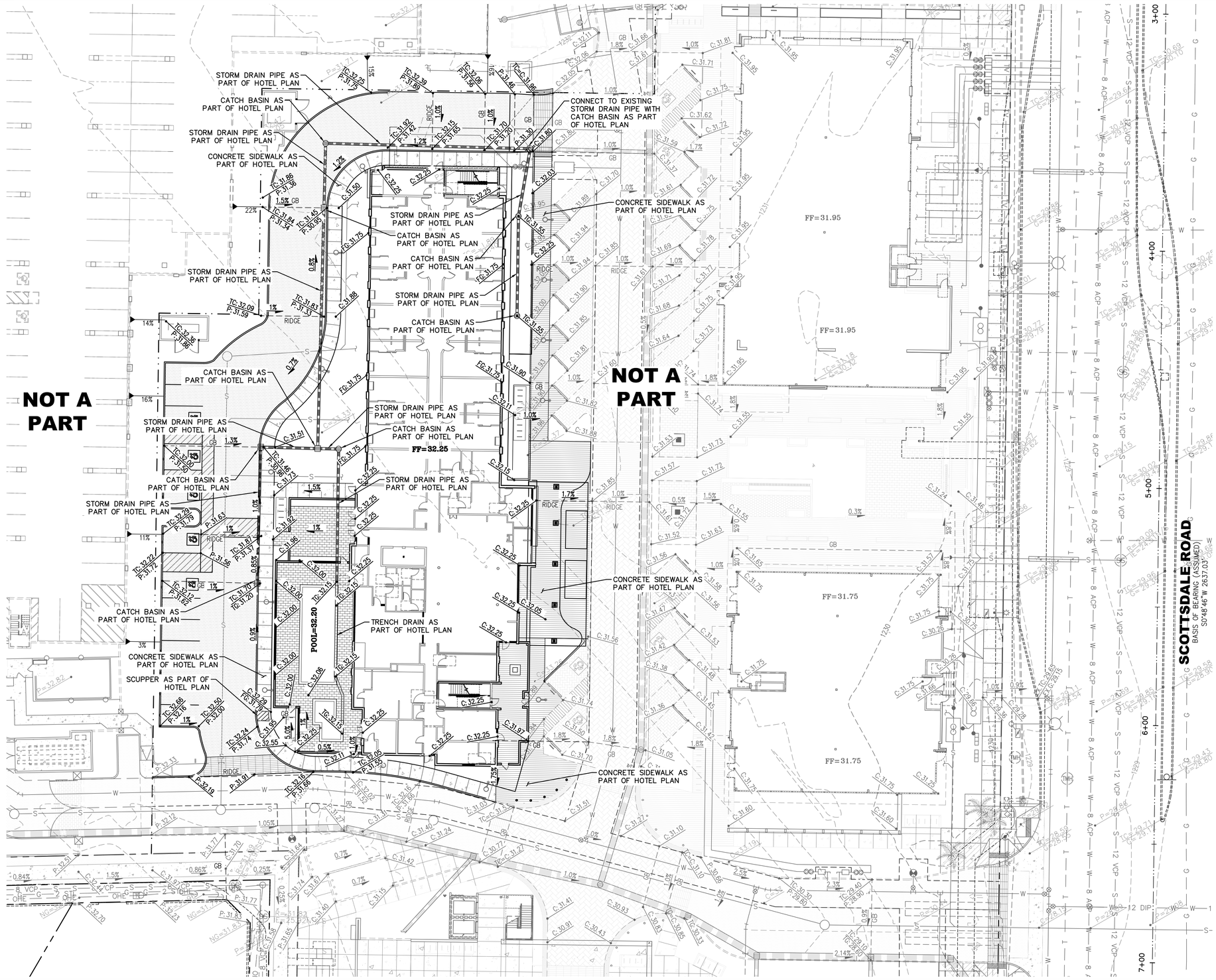
Registered Professional Engineer (Civil) CERTIFICATE NO. 31695 LESLIE J. KLAND Date Signed 9-30-19 ARIZONA
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PGD1
OF 2

K:\2019\K19113 Papago Plaza Springhill Suites\Dwg\CONCEPTUAL Hotel\113-HOTEL-PGD-GD.dwg



REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY GRADING AND DRAINAGE PLAN

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
51695
LESLIE J. KLAND
Date Signed 9-30-19
ARIZONA
Expires 09/30/21

Project No.
K19123

08-07-19

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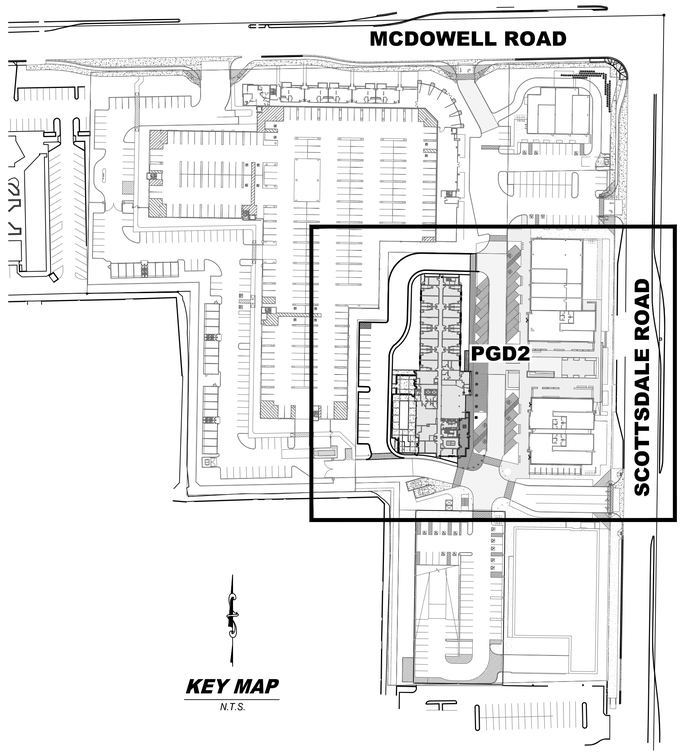
K:\2019\K19113 Papago Plaza Springhill Suites\Dwg\CONCEPTUAL Hotel\113--HOTEL--CRS--GD.dwg

SHEET INDEX



KEY MAP
N.T.S.

PRELIMINARY GRADING AND DRAINAGE PLAN

FOR

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	DRYWELL	
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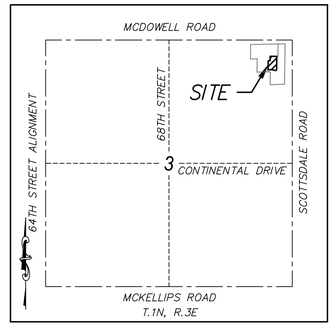

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THENCE NORTH 89 DEGREES 11 MINUTES 14 SECONDS WEST, A DISTANCE OF 165.33 FEET;
THENCE SOUTH 00 DEGREES 48 MINUTES 46 SECONDS WEST, A DISTANCE OF 95.33 FEET;
THENCE NORTH 89 DEGREES 11 MINUTES 14 SECONDS WEST, A DISTANCE OF 42.00 FEET;
THENCE SOUTH 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.

REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY GRADING AND DRAINAGE PLAN

KLAND CIVIL ENGINEERS
CIVIL ENGINEERING
LAND DEVELOPMENT SERVICES
LAND SURVEYING
7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil) CERTIFICATE NO. 31695 LESLIE J. KLAND Date Signed 9-30-19 ARIZONA
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PGD1
OF 2

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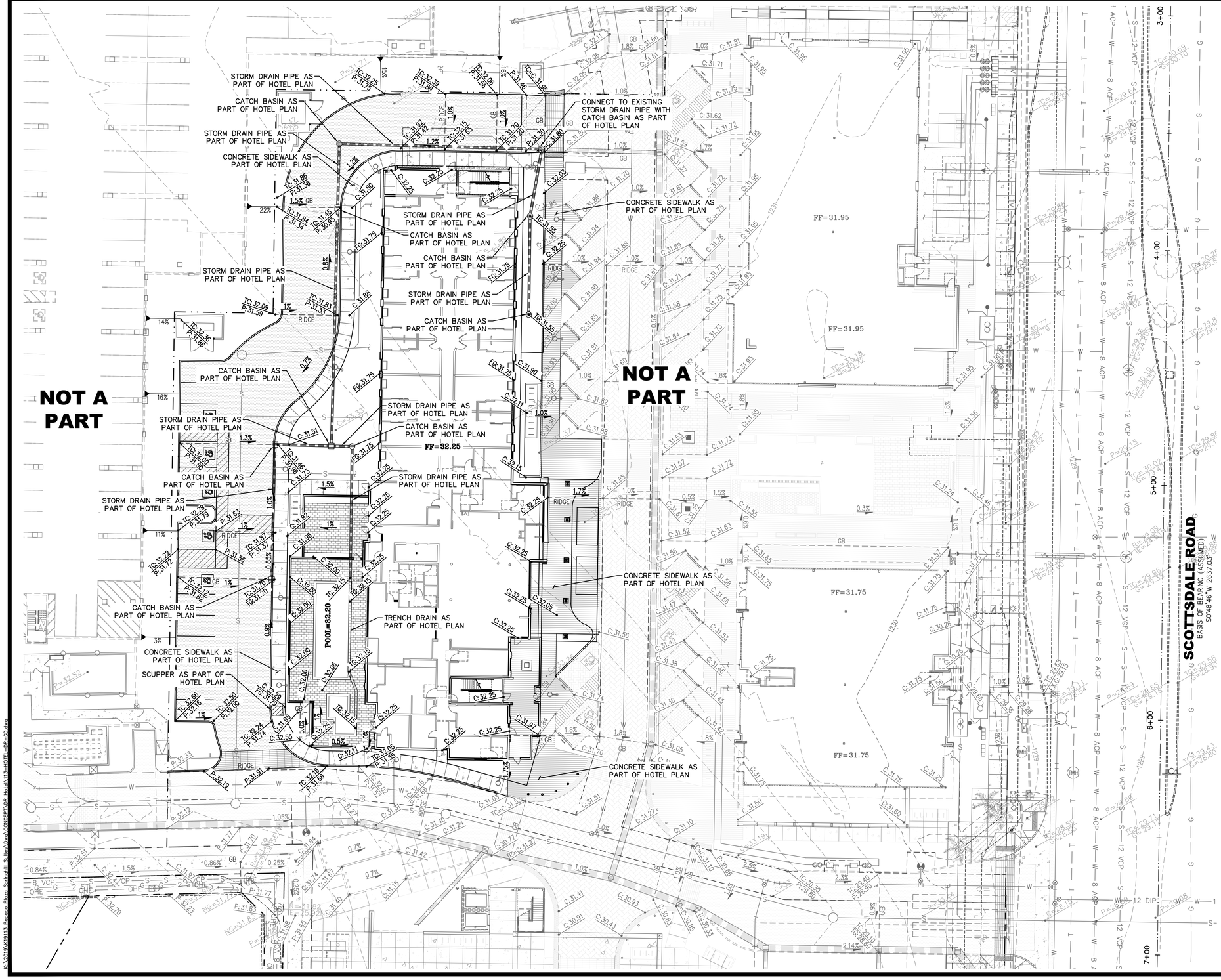


REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY GRADING AND DRAINAGE PLAN

KLAND
CIVIL ENGINEERS

CIVIL ENGINEERING
LAND DEVELOPMENT SERVICES
LAND SURVEYING

7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil)
CERTIFICATE NO.
51695
LESLIE J. KLAND
State Standard
ARIZONA
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PGD2
OF 2

K:\2019\K19113 Papago Plaza Springhill Suites\Dwg\CONCEPTUAL Hotel\113--HOTEL--CRS--GD.dwg

KLAND CIVIL ENGINEERS

Scottsdale
Preliminary Sewer Basis of Design Report
Papago Plaza Springhill Suites

7047 E. McDowell Road, Scottsdale, AZ 85257
#K19113

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

Prepared for:
PEG Companies
180 North University Avenue, Suite 200
Provo, Utah 84601

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

Revised August 7, 2019
April 17, 2019

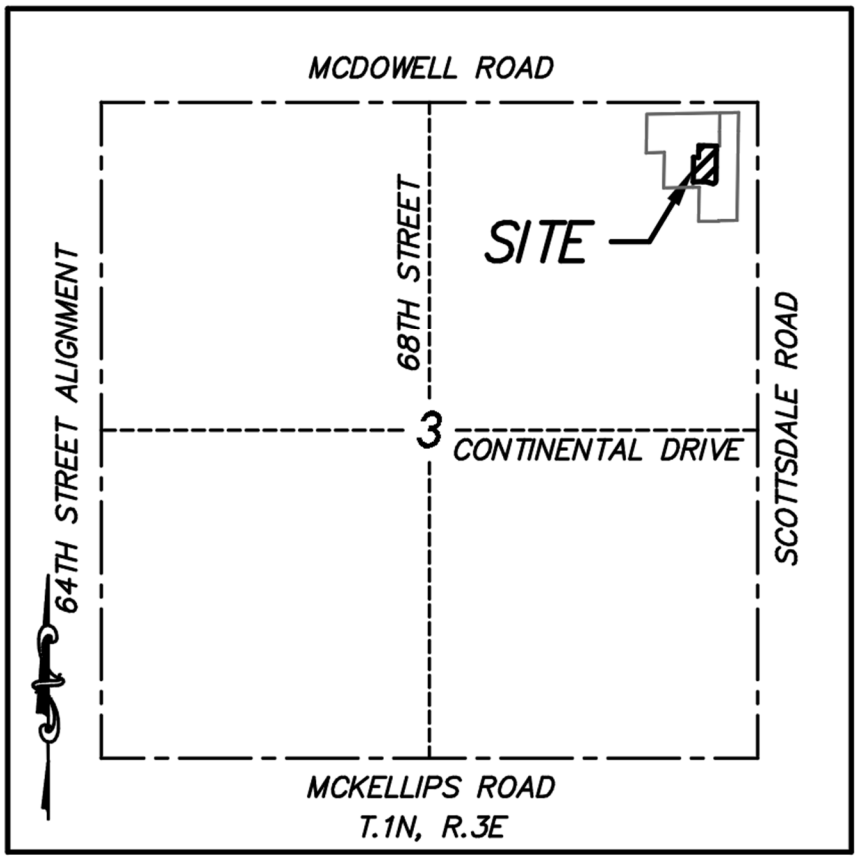
Table of Contents

Revised August 7, 2019

April 17, 2019

INTRODUCTION

Papago Plaza Springhill Suites is a 116-room hotel located within a portion of the northeast ¼ of Section 3, Township 1 North, Range 3 East of the Gila and Salt River Base and Meridian in Maricopa County, Arizona. The site is bounded on the north and west by Broadstone Papago Marketplace multifamily development, on the east by Papago Plaza retail development, and on the south by the access drive for multifamily development (Please see the vicinity map). The hotel is planned to be constructed after or concurrent to the Retail development. Detailed information on the Retail plans is presented in Appendix A-4 "Master Sewer Basis of Design Report for Scottsdale McDowell" and Appendix A-5 "Master Water Basis of Design Report for Scottsdale McDowell". The focus of this report is the basis of the design for the hotel to confirm that the results and design criteria conform to the methodology used in the master design.



VICINITY MAP

N.T.S.

SANITARY SEWER SYSTEM

The site is located within COS Q.S. 12-44 which is the City of Scottsdale water and sewer service area. For the detailed information on the existing condition, please refer to APPENDIX A-4: “Master Sewer Basis of Design Report for Scottsdale McDowell”. We have performed a sewer monitoring and hydraulic analysis for the proposed and existing sewer mains in the Master Sewer Design Report. The sewer discharge from the site was estimated using the City of Scottsdale Design Standards & Polices Manual.

As shown in Appendix A-3: “Preliminary Water and Sewer Design”, to service the hotel site, the onsite public 8-inch sewer main which will be installed with the retail development phase will be extended to the north along the west side of the hotel. At this point, we are proposing three 6-inch sewer services to the hotel to be connected to the extended 8-in sewer main. According to our calculations, the average discharge from the hotel was 30.6 gpm and the peak daily demand was calculated by increasing the average daily demand by a factor of 4.5, which is a total of 137.74 gpm. This result conforms to the conducted estimations in master sewer design presented in Appendix A-3.

Please see Appendix A-1: “Preliminary Sewer Calculations” and Appendix A-2:” Preliminary Water and Sewer Plans” for more detail. The sewer services will be sized per IPC based on plumbing fixture units by the plumbing engineer at final design.

APPENDIX A-1: Preliminary Sewer Calculations

.

Discharge by Type

Number of Hotel Rooms: 116 at 380 gpd/room

Average Day Demand

Hotel: 116 x 380 = 44,080 gpd (30.6 gpm)

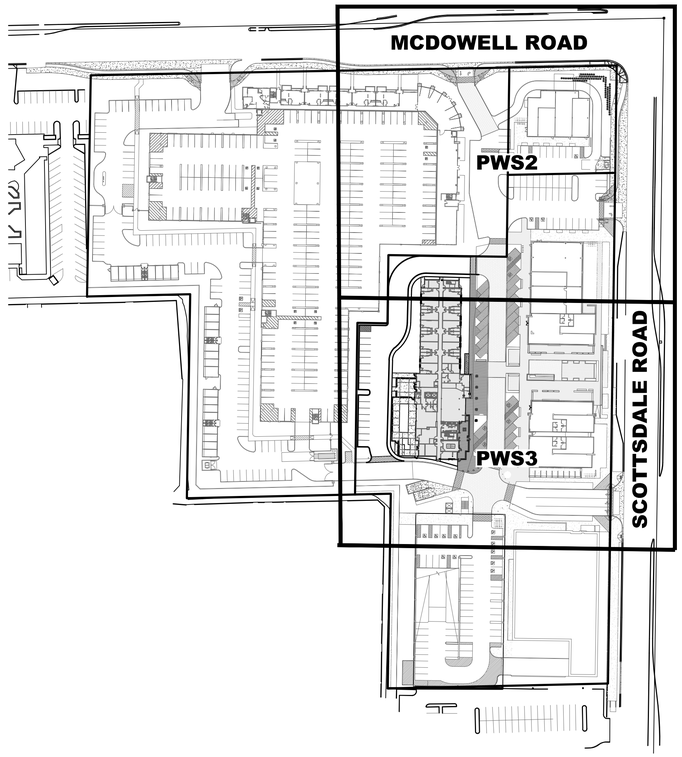
Maximum Day Demand

Maximum daily peaking factor: 4.5

4.5 x 44,080 gpd = 198,360 gpd (137.75 gpm)

APPENDIX A-2: Preliminary Water and Sewer Plans

SHEET INDEX



PRELIMINARY WATER AND SEWER PLAN

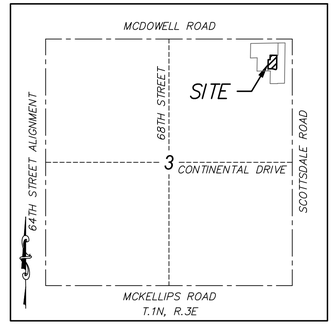
FOR

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

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.

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	CURB AND GUTTER	
	SIDEWALK	
	SINGLE CURB	
RIM: 62.48 INV: 56.64	RIM AND INVERT ELEVATION	
-1499'-	CONTOUR	
	WATER FITTINGS	
	WATER METER	
W W	WATER LINE	W
	FIRE HYDRANT	
S S	SEWER LINE	S
SW	SEWER MANHOLE/CLEANOUT	
SD ST	STORM DRAIN	
	CATCH BASIN	
	DRYWELL	
	UNDERGROUND STORAGE TANK	
	SCUPPER	
	FINISHED FLOOR	FF=43.81
G G	GAS LINE/METER/VALVE	
E E	ELECTRIC LINE/METER	
TV T TV	CABLE/JUNCTION BOX	
OHE	OVERHEAD ELECTRIC/POLE	
	BOUNDARY LINE	
	CENTER LINE	
	EASEMENT	
IRR IRR IRR	IRRIGATION	
FO FO	FIBER OPTIIC	



VICINITY MAP

N.T.S.

ENGINEER

KLAND CIVIL ENGINEERS
7227 N. 16TH ST., STE 217
PHOENIX, AZ 85020
PH: (480) 344–0480
CONTACT: LESLIE KLAND, PE

DEVELOPER

PEG COMPANIES
180 N. UNIVERSITY AVE., STE 200
PROVO, UT 84601
PH: (801) 664–2939
CONTACT: MR. TYLER MAHONEY

ARCHITECT

NELSEN PARTNERS ARCHITECTS & PLANNERS
15210 N. SCOTTSDALES RD., STE 300
SCOTTSDALE, AZ 85254
PH: (480) 949–6800
CONTACT: KELSEY REUST

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

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;
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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.

Call at least two full working days before you begin excavation.
ARIZONA 811 Arizona Blue Stake, Inc.
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In Maricopa County: (602) 263-1100

REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY WATER AND SEWER PLAN

KLAND CIVIL ENGINEERS
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LAND DEVELOPMENT SERVICES
LAND SURVEYING
7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer
CERTIFICATE NO.
31695
LESLIE J. KLAND
Date Signed 5-3-19
ARIZONA U.S.A.
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PWS1
OF 3

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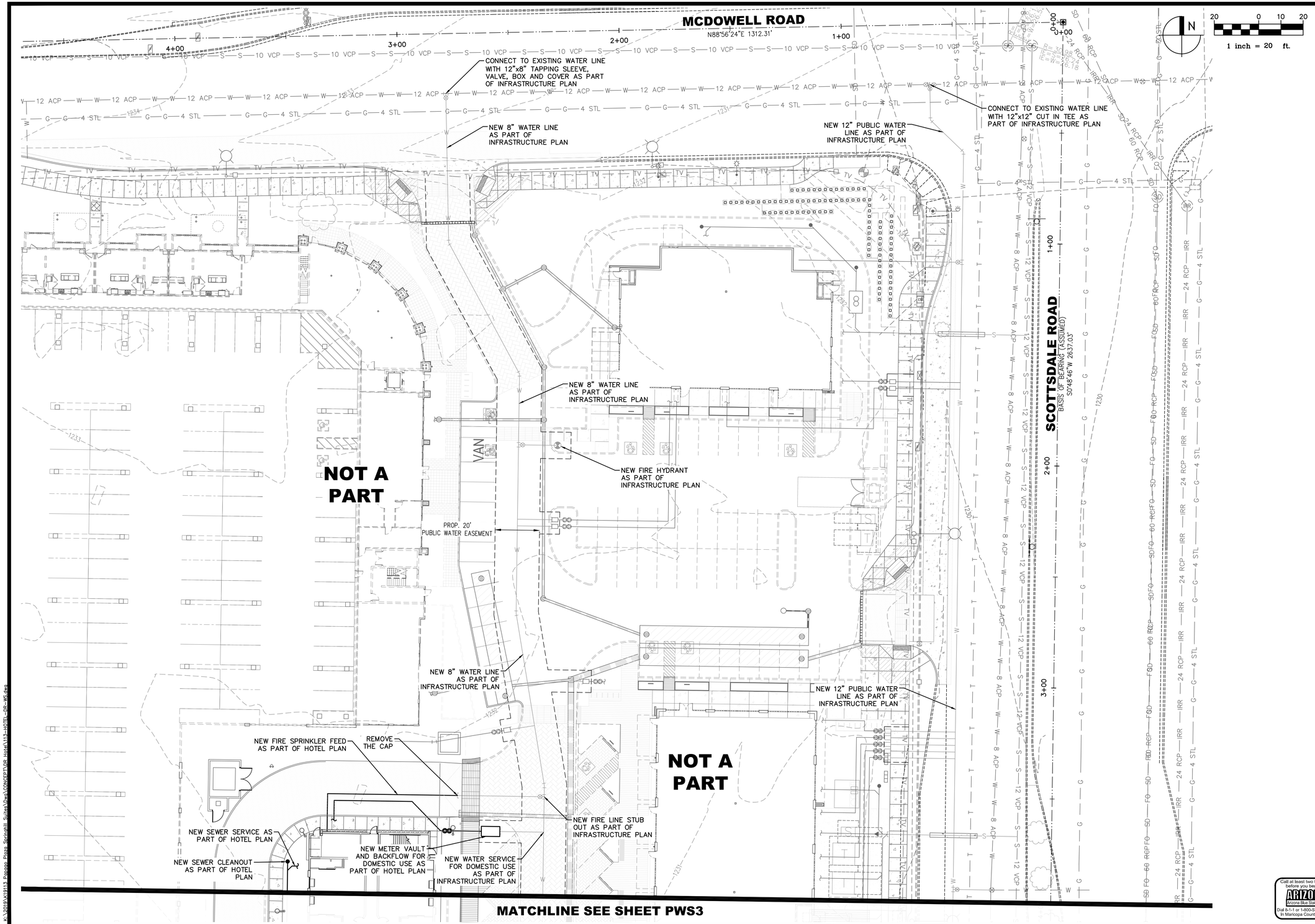
18-DR-2019
8/9/2019



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REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY WATER AND SEWER PLAN

KLAND
CIVIL ENGINEERS

CIVIL ENGINEERING
LAND DEVELOPMENT SERVICES
LAND SURVEYING

7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
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ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil)
CERTIFICATE NO.
31695
LESLIE J.
KLAND
Date Signed 8-7-19
ARIZONA
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PWS2
OF 3

18-DR-2019
8/9/2019

MATCHLINE SEE SHEET PWS1

NOT A PART

NOT A PART

NOT A PART

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW SEWER MANHOLE AS PART HOTEL PLAN

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW 8" SEWER LINE AS PART OF HOTEL PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

FF=32.25

PROP. 20' PUBLIC WATER EASEMENT

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW 8" SEWER LINE AS PART OF HOTEL PLAN

POOL=32.20

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 8" SEWER LINE AS PART OF HOTEL PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

CAP NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

REMOVE THE CAP

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 8" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

PROP. 12" PUBLIC WATER EASEMENT

NEW FIRE HYDRANT AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE HYDRANT AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW 8" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

CAP NEW 8" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE LINE STUB OUT AS PART OF INFRASTRUCTURE PLAN

NEW WATER SERVICE FOR DOMESTIC USE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE STUBOUT AS PART OF INFRASTRUCTURE PLAN

NEW FIRE HYDRANT AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE STUBOUT AS PART OF INFRASTRUCTURE PLAN

NEW 12" PUBLIC WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12"x8" TEE AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

CONNECT TO EXISTING MANHOLE AS PART OF INFRASTRUCTURE PLAN

CONNECT TO EXISTING WATER LINE WITH 8"x8" CUT IN TEE AS PART OF INFRASTRUCTURE PLAN

SCOTTSDALE ROAD
BASIS OF BEARING (ASSUMED)
S0°48'46"W 2637.03'

SKYSONG BLVD

4+00

5+00

6+00

7+00

8+00

N

20 0 10 20

1 inch = 20 ft.

REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY WATER AND SEWER PLAN

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LAND DEVELOPMENT SERVICES
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7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
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ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer
CERTIFICATE NO.
31695
LESLIE J. KLAND
Date Signed 8.7.19
ARIZONA U.S.A.
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PWS3
OF 3

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APPENDIX A-3: Master Sewer Basis of Design Report for Scottsdale McDowell

KLAND CIVIL ENGINEERS

Scottsdale
Master Sewer Basis of Design Report
Scottsdale 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

Expires 09/30/21

Revised August 7, 2019
March 21, 2019

Table of Contents

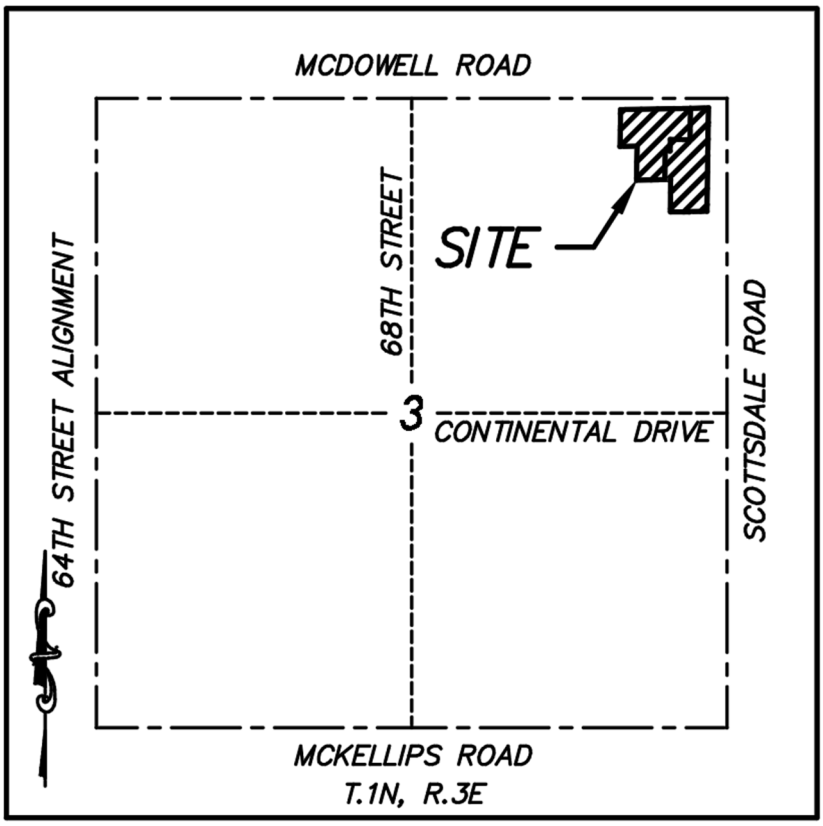
Expires 09/30/21

Revised August 7, 2019

March 21, 2019

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 ¼ 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 development on approximately 5.55 net acres and commercial development on approximately 5.45 net acres. The multi-family development is 274 units in 3 carriage buildings (single apartment above garage) and a single podium style apartment building over ground level parking. A podium style apartment building consists of multiple levels of apartments over a parking garage with amenities on the podium deck. The commercial development is comprised of four retail/restaurant buildings, a grocery store and a 116-room hotel.



VICINITY MAP

N.T.S.

During phase 1 of this project the sewer main in the south access drive will be constructed. The sewer stubs to the retail/restaurant buildings, grocery store and hotel will also be installed. The continuation of the sewer on the multi-family site will be installed with their site development. The grocery store and hotel are not being constructed at this time. These developments will be required to submit separate basis of design reports showing that they are in conformance with this Master Sewer Basis of Design Report.

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 anticipated to be 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.

SANITARY SEWER SYSTEM

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 A1 for the Sewer Capacity Exhibit and A2 for the Master Sewer Exhibit. 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 A3. 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 A4.

There are a few things to note regarding the sewer monitoring data. We have provided a map in Appendix A4 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. For the future flows we used the peak flows from the BOD report by Wood/Patel for the Skysong development. These flows were combined with our proposed peak flows and the existing peak flows. In our analysis of the existing flows we also confirmed that the existing building are close to fully occupied. To do this we talked to the Skysong management office and was told that they were almost at 100% occupied and was starting to prelease the next proposed building that is under construction. We also confirmed that the sewer monitoring of the existing flows was not done over a holiday or the ASU fall break. The ASU fall break was the week prior to the testing.

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. Based on our calculations the 12-inch sewer pipe would be over 85% full. During the zoning submittal it was proposed that the section of sewer main be reconstructed at a steeper slope. The City of Scottsdale determined that the section of pipe will remain in place and does not need to be reconstructed.

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 the time of the peak discharge the system will be under 65% except through the flat section of 12-inch sewer main in Skysong Boulevard. Without the backwash flow this section of main is over 85% full. 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 A3.

The sewer main in Scottsdale Road will provide sewer service for 3 of the retail/restaurant pads. Based on the DS & PM we estimate that the peak discharge will be 73 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 58% full.

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 City of Scottdale has determined that the flat section of sewer pipe in Skysong Boulevard will not be required to be replaced.
5. 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.

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: Sewer Capacity Exhibit

SCOTTSDALE RD AND MCDOWELL

SEWER CAPACITY EXHIBIT

REVISIONS

N

60 0 30 60

1 inch = 60 ft.

8" SEWER S=0.53% MINIMUM

PROP. MH #4

PROPOSED DEVELOPMENT: 65 GPM FROM 138 MULTI-FAMILY UNITS

MONITORED: 66 GPM 8/13/18 8:20 AM

PROP. MH #5

PROPOSED DEVELOPMENT: 64 GPM FROM 136 MULTI-FAMILY UNITS

MONITORED: 81 GPM 8/12/18 6:42 AM

PROP. MH #6

PROP. MH #7

8" SEWER S=0.53% MINIMUM

PROPOSED DEVELOPMENT: 138 GPM FROM 116 HOTEL ROOMS

12" SEWER S=0.4% MINIMUM

PROP. MH #8

EX. MH #1 RIM: 30.98 INV: 26.24(S) INV: 26.18(W)

MONITORED: 498 GPM 8/11/18 12:10 AM TOTAL: 571 GPM

PROPOSED DEVELOPMENT: 40 GPM FROM 20,400 SF OF RETAIL AND 3,819 SF OF RESTAURANT

12" SEWER S=0.31%

12" SEWER S=0.4% MINIMUM

12" SEWER S=0.37%

12" SEWER S=0.33%

EX. MH #3 RIM: 28.84 INV: 23.52(N/S)

EX. MH #2 RIM: 29.09 INV: 24.51(N/S)

PROPOSED DEVELOPMENT: 73 GPM FROM 7,200 SF OF RETAIL AND 13,199 SF OF RESTAURANT

12" SEWER S=0.4% MINIMUM

TOTAL DISCHARGE FROM PROPOSED DEVELOPMENT: 307 GPM

EX. MH #9 RIM: 25.56 INV: 11.78(N) INV: 11.55(E)

MATCHLINE SEE SHEET SCE2

KLAND CIVIL ENGINEERS

CIVIL ENGINEERING

LAND DEVELOPMENT SERVICES

LAND SURVEYING

7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil) CERTIFICATE NO. 31695 LESLIE J. KLAND Date Signed 8-7-19 ARIZONA U.S.A. Expires 09/30/21

Project No. **K17127**

08-07-19

Sheet No. **SCE1** OF 2

Call at least two full working days before you begin excavation. ARIZONA811 Arizona Blue Stake, Inc. Dial 8-1-1 or 1-800-STAKE-IT (782-5348) In Maricopa County: (602) 263-1100

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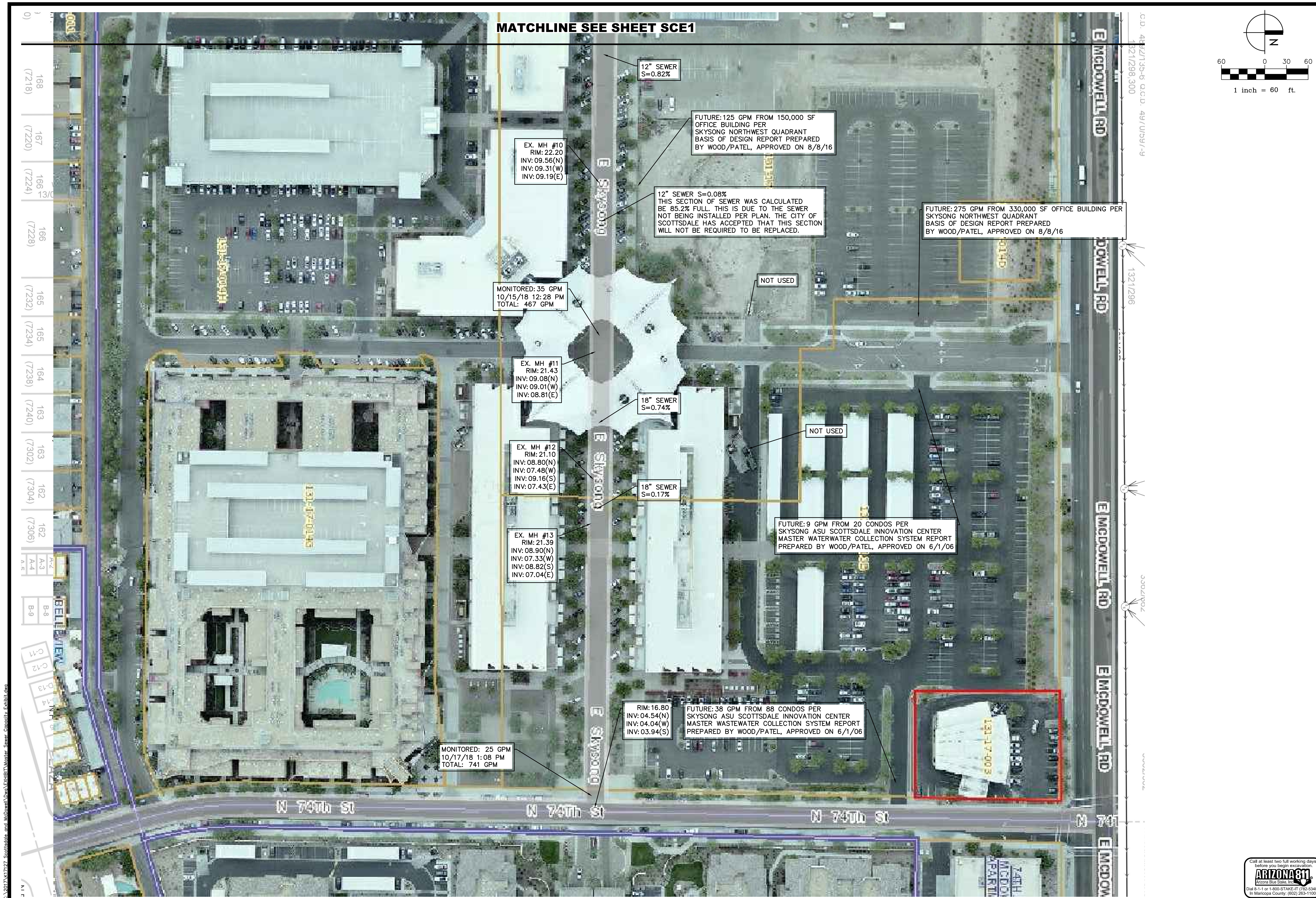
18-DR-2019
8/9/2019



REVISIONS

SCOTTSDALE RD AND MCDOWELL

SEWER CAPACITY EXHIBIT

KLAND CIVIL ENGINEERS

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Registered Professional Engineer (Civil) 31695 LESLIE J. KLAND ARIZONA, U.S.A.
Expires 09/30/21

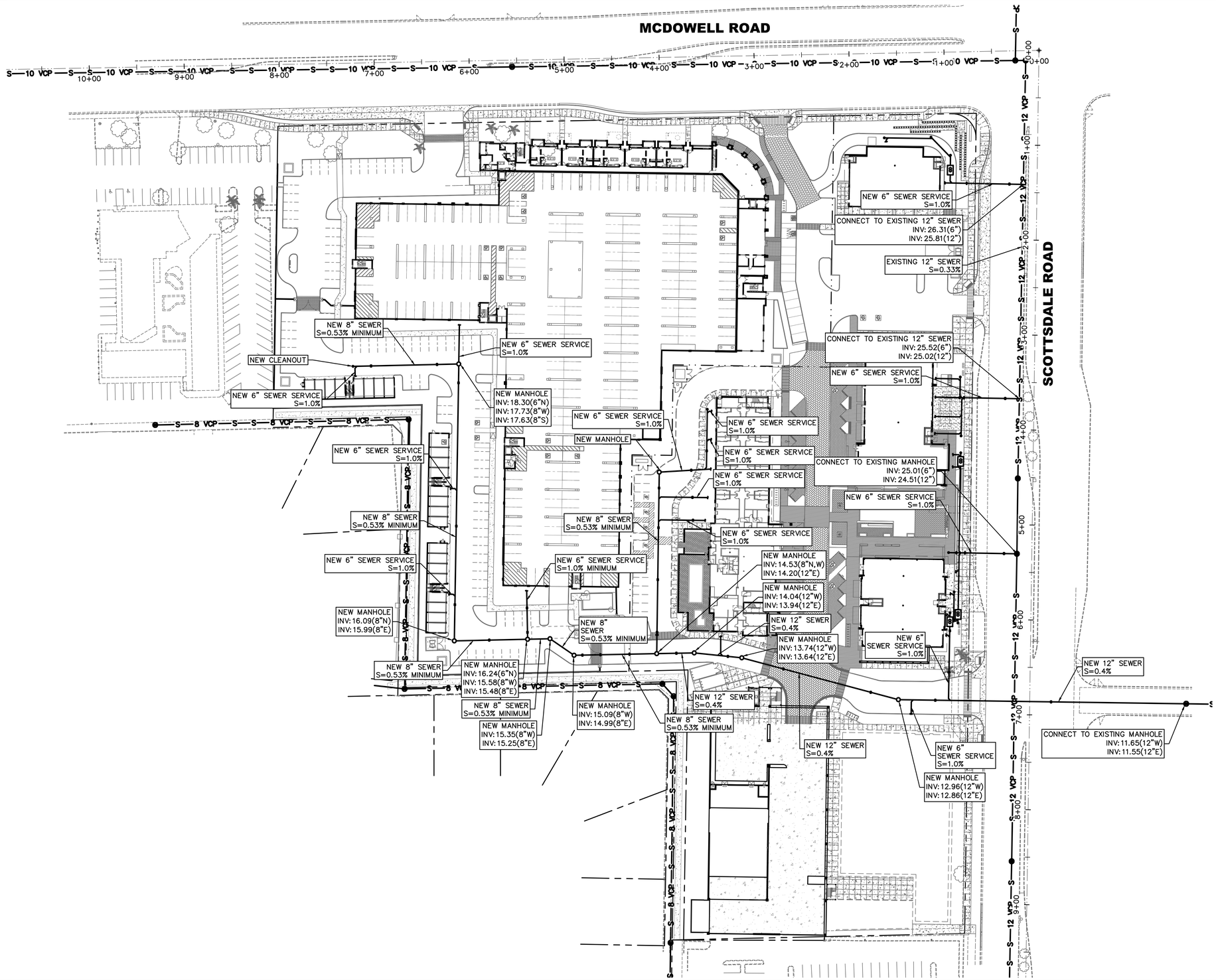
Project No. K17127

08-07-19

Sheet No. SCE2 OF 2

Call at least two full working days before you begin excavation.
ARIZONA 811
Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

APPENDIX A-2: Master Sewer Exhibit



N

50 0 25 50

1 inch = 50 ft.

REVISIONS

SCOTTSDALE RD AND MCDOWELL

MASTER SEWER EXHIBIT

KLAND
CIVIL ENGINEERS

CIVIL ENGINEERING
LAND DEVELOPMENT SERVICES
LAND SURVEYING

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ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer
CERTIFICATE NO.
31695
LESLIE J. KLAND
Date Signed 8-7-19
ARIZONA U.S.A.
Expires 09/30/21

Project No.
K17127

08-07-19

Sheet No.
MSE1
OF 1

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ARIZONA 811
Arizona Blue Stake, Inc.
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APPENDIX A-3: Sanitary Sewer Calculations

		New Development per Segment				Population	Average Discharge					Peaking Factor											
	Sewer Segment (MH to MH	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)	[1] New Development Average discharge (gpd)	Multi-Family	Hotel	Retail	Restaurant	[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
Scottsdale Rd	1 to 2	0	0	7200	13199	-	-	-	0.5	1.2	19438.8	-	-	3	6	105833	73	0	498	571	12	0.0033	6.85	57.10
	2 to 3	0	0	7200	13199	-	-	-	0.5	1.2	19438.8	-	-	3	6	105833	73	0	498	571	12	0.0031	6.99	58.20
Sky Song Blvd.	4 to 5	138	0	0	0	1.7	100	380	0.5	1.2	23460	4	4.5	3	6	93840	65	0	0	65	8	0.0053	2.20	27.40
	5 to 6	274	0	0	0	1.7	100	380	0.5	1.2	46580	4	4.5	3	6	186320	129	0	0	129	8	0.0053	3.15	39.30
	7 to 6	0	116	0	0	1.7	100	380	0.5	1.2	44080	4	4.5	3	6	198360	138	0	0	138	8	0.0053	3.26	40.80
	6 to 8	274	116	0	0	1.7	100	380	0.5	1.2	90660	4	4.5	3	6	384680	267	0	0	267	12	0.0040	4.21	35.10
	8 to 9	274	116	20400	3819	1.7	100	380	0.5	1.2	105442.8	4	4.5	3	6	442777	307	0	0	307	12	0.0040	4.54	37.80
	9 to 10	274	116	20400	3819	1.7	100	380	0.5	1.2	105442.8	4	4.5	3	6	442777	307	0	35	342	12	0.0082	3.97	33.10
	10 to 11	274	116	20400	3819	1.7	100	380	0.5	1.2	105442.8	4	4.5	3	6	442777	307	125	35	467	12	0.0008	10.23	85.20
	11 to 12	274	116	20400	3819	1.7	100	380	0.5	1.2	105442.8	4	4.5	3	6	442777	307	409	25	741	18	0.0074	5.21	28.90
	12 to 13	274	116	20400	3819	1.7	100	380	0.5	1.2	105442.8	4	4.5	3	6	442777	307	409	25	741	18	0.0017	7.71	42.80

(1) 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
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

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

(4) Future sewer dishcarge was taken from the Skysong Northwest Quadrant Basis of Design Report, Prepared by 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

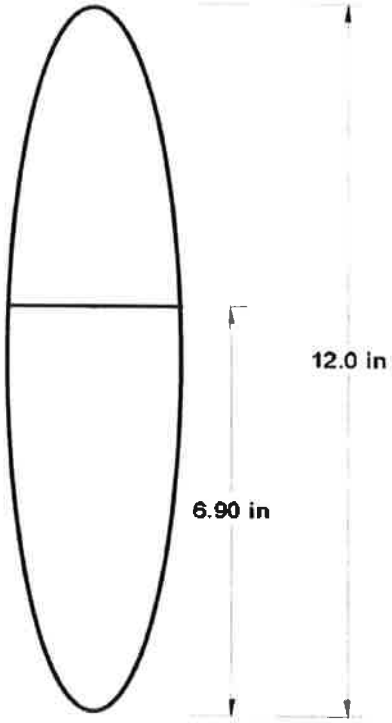
Input Data		
Mannings Coeffic	0.013	
Channel Slope	003300	ft/ft
Diameter	12.0	in
Discharge	577	gal/mir

Results		
Depth	6.90	in
Flow Area	0.5	ft²
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 Coeffic	0.013	
Channel Slope	003300	ft/ft
Depth	6.90	in
Diameter	12.0	in
Discharge	577	gal/mir



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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	ft²
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	

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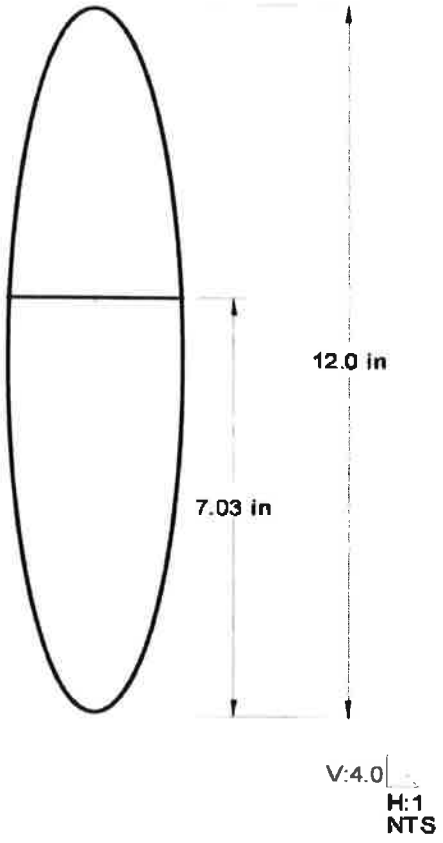
Scottsdale Road Ex. 12" - MH 2 to MH 3
Cross Section for Circular Channel

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

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



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

Project Description	
Worksheet	03 Site Prop. 8" - MH 4 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	005300	ft/ft
Diameter	8.0	in
Discharge	65	gal/mir

Results		
Depth	2.20	in
Flow Area	0.1	ft²
Wetted Perime	0.74	ft
Top Width	0.00	ft
Critical Depth	0.17	ft
Percent Full	27.4	%
Critical Slope	0.006453	ft/ft
Velocity	1.86	ft/s
Velocity Head	0.05	ft
Specific Energ:	2.84	in
Froude Numbe	0.91	
Maximum Disc	425	gal/mir
Discharge Full	395	gal/mir
Slope Full	0.000144	ft/ft
Flow Type	Subcritical	

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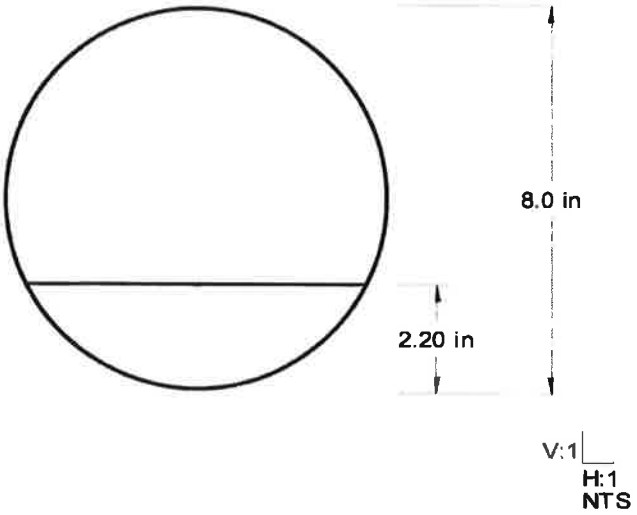
Site Prop. 8" - MH 4 to MH 5
Cross Section for Circular Channel

Project Description	
Worksheet	03 Site Prop. 8" - MH 4 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Channel Slope	005300	ft/ft
Depth	2.20	in
Diameter	8.0	in
Discharge	65	gal/mir



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

Project Description	
Worksheet	05 Site Prop. 8" - MH 5 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	005300	ft/ft
Diameter	8.0	in
Discharge	129	gal/mir

Results		
Depth	3.15	in
Flow Area	0.1	ft²
Wetted Perime	0.90	ft
Top Width	0.00	ft
Critical Depth	0.25	ft
Percent Full	39.3	%
Critical Slope	0.006514	ft/ft
Velocity	2.25	ft/s
Velocity Head	0.08	ft
Specific Energ	4.09	in
Froude Numbe	0.90	
Maximum Disc	425	gal/mir
Discharge Full	395	gal/mir
Slope Full	0.000566	ft/ft
Flow Type	Subcritical	

18-DR-2019
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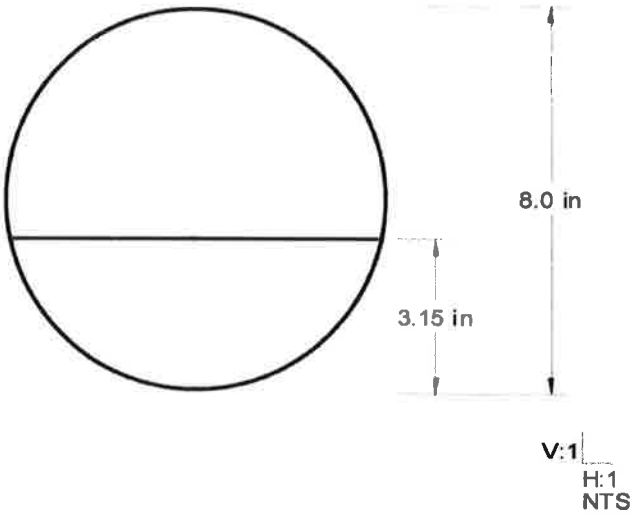
Site Prop. 8" - MH 5 to MH 6
Cross Section for Circular Channel

Project Description	
Worksheet	05 Site Prop. 8" - MH 5 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.013	
Channel Slope	005300	ft/ft
Depth	3.15	in
Diameter	8.0	in
Discharge	129	gal/mir



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

Project Description	
Worksheet	06 Site Prop. 8" - MH 7 to
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	005300	ft/ft
Diameter	8.0	in
Discharge	138	gal/mir

Results		
Depth	3.26	in
Flow Area	0.1	ft²
Wetted Perime	0.92	ft
Top Width	0.00	ft
Critical Depth	0.26	ft
Percent Full	40.8	%
Critical Slope	0.006554	ft/ft
Velocity	2.30	ft/s
Velocity Head	0.08	ft
Specific Energ	4.25	in
Froude Numbe	0.90	
Maximum Disc	425	gal/mir
Discharge Full	395	gal/mir
Slope Full	0.000647	ft/ft
Flow Type	Subcritical	

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

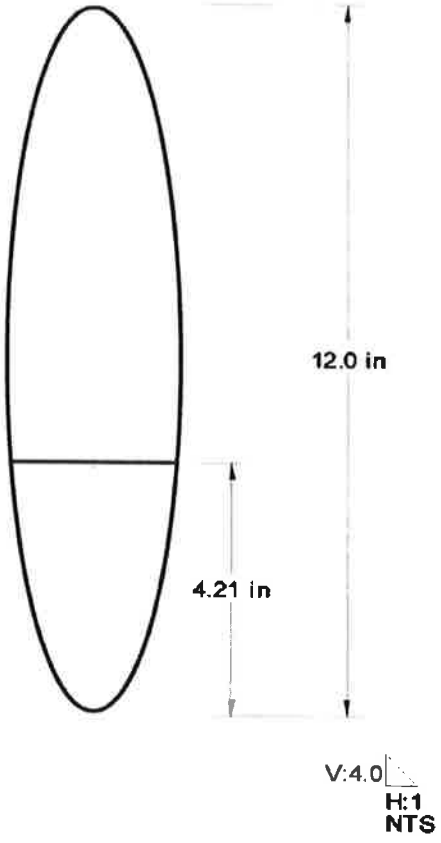
Input Data		
Mannings Coeffic	0.013	
Channel Slope	004000	ft/ft
Diameter	12.0	in
Discharge	267	gal/mir

Results		
Depth	4.21	in
Flow Area	0.2	ft²
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	1,068	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 Coeffic	0.013	
Channel Slope	004000	ft/ft
Depth	4.21	in
Diameter	12.0	in
Discharge	267	gal/mir



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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 Coeffic	0.013	
Channel Slope	004000	ft/ft
Diameter	12.0	in
Discharge	308	gal/mir

Results		
Depth	4.54	in
Flow Area	0.3	ft²
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 Energy	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	

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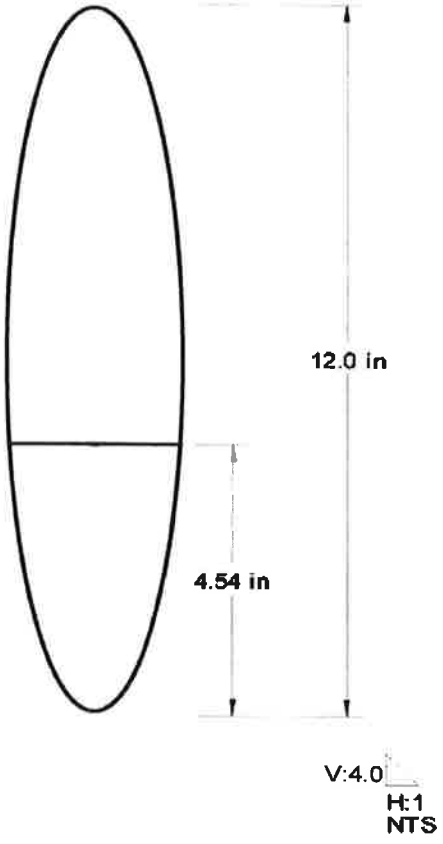
Site Prop. 12" - MH 8 to MH 9
Cross Section for Circular Channel

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



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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 Coeffic	0.013	
Channel Slope	006900	ft/ft
Diameter	12.0	in
Discharge	343	gal/mir

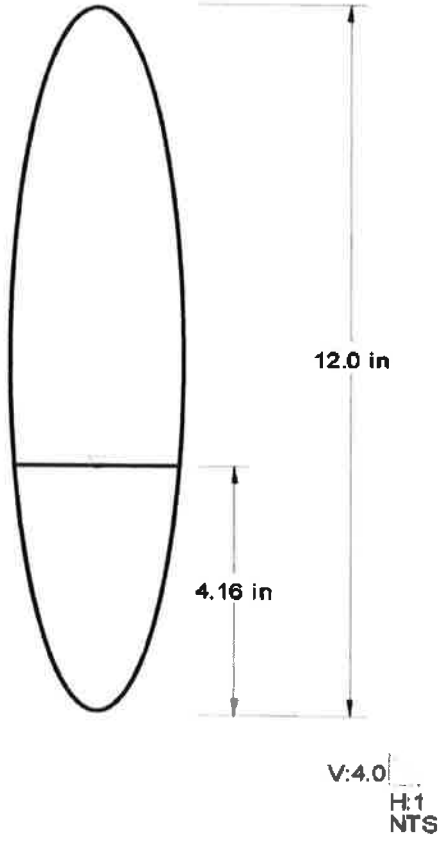
Results		
Depth	4.16	in
Flow Area	0.2	ft²
Wetted Perime	1.26	ft
Top Width	0.00	ft
Critical Depth	0.37	ft
Percent Full	34.7	%
Critical Slope	0.005676	ft/ft
Velocity	3.16	ft/s
Velocity Head	0.16	ft
Specific Energy	6.02	in
Froude Numbe	1.11	
Maximum Disc	1,429	gal/mir
Discharge Full	1,328	gal/mir
Slope Full	0.000460	ft/ft
Flow Type	Supercritical	

18-DR-2019
8/9/2019

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 Coeffic	0.013	
Channel Slope	006900	ft/ft
Depth	4.16	in
Diameter	12.0	in
Discharge	343	gal/mir



18-DR-2019
8/9/2019

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

Project Description	
Worksheet	Skysong Ex. 12" - MH 10 t
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

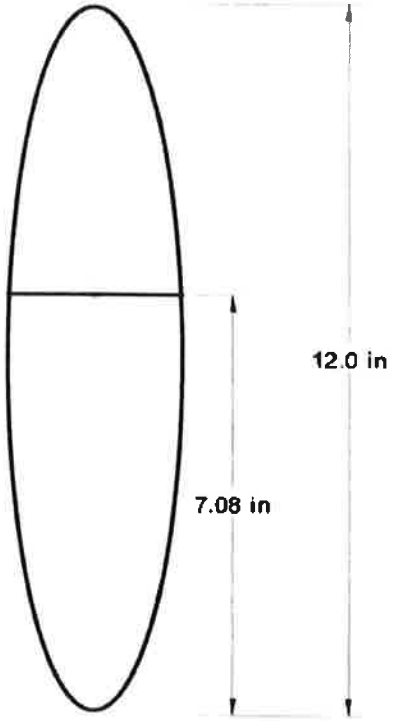
Input Data		
Mannings Coeffic	0.013	
Channel Slope	002000	ft/ft
Diameter	12.0	in
Discharge	468	gal/mir

Results		
Depth	7.08	in
Flow Area	0.5	ft²
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 t
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

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



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

Project Description	
Worksheet	Skysong Ex. 18" - MH 11 t
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

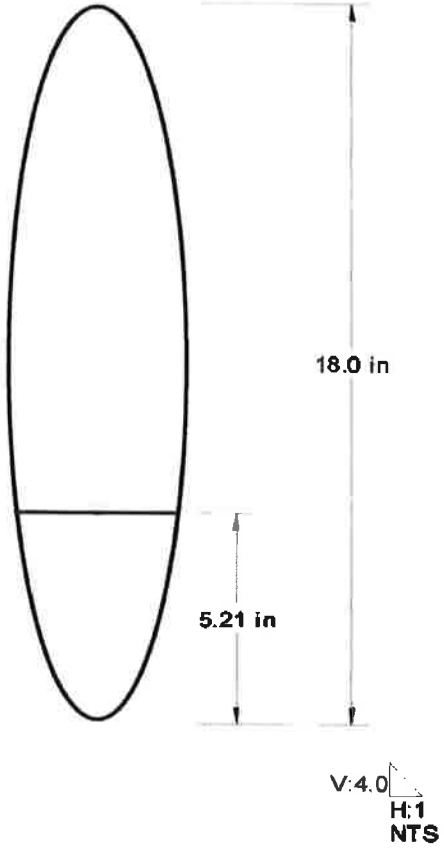
Results		
Depth	5.21	in
Flow Area	0.4	ft²
Wetted Perime	1.70	ft
Top Width	0.00	ft
Critical Depth	0.48	ft
Percent Full	29.0	%
Critical Slope	0.004912	ft/ft
Velocity	3.89	ft/s
Velocity Head	0.24	ft
Specific Energ	8.04	in
Froude Numbe	1.23	
Maximum Disc	4,363	gal/mir
Discharge Full	4,065	gal/mir
Slope Full	0.000248	ft/ft
Flow Type	Supercritical	

18-DR-2019
8/9/2019

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

Project Description	
Worksheet	Skysong Ex. 18" - MH 11 t
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

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



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

Project Description	
Worksheet	Skysong Ex. 18" - MH 12 t
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	ft²
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 Energ	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	

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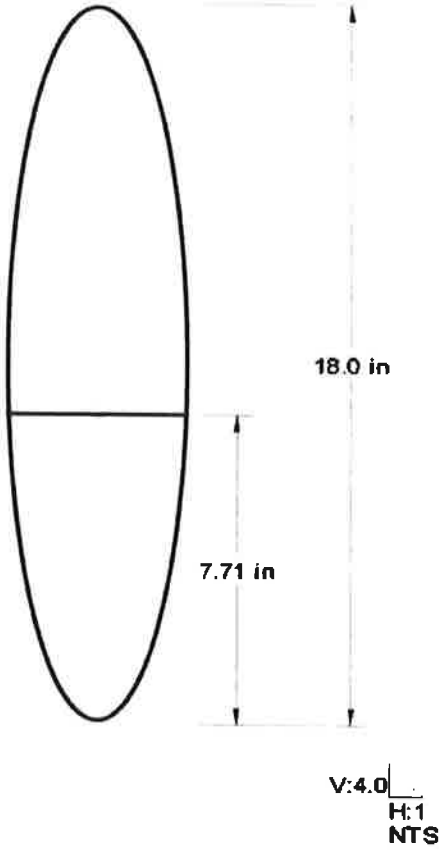
Skysong Ex. 18" - MH 12 to MH 13
Cross Section for Circular Channel

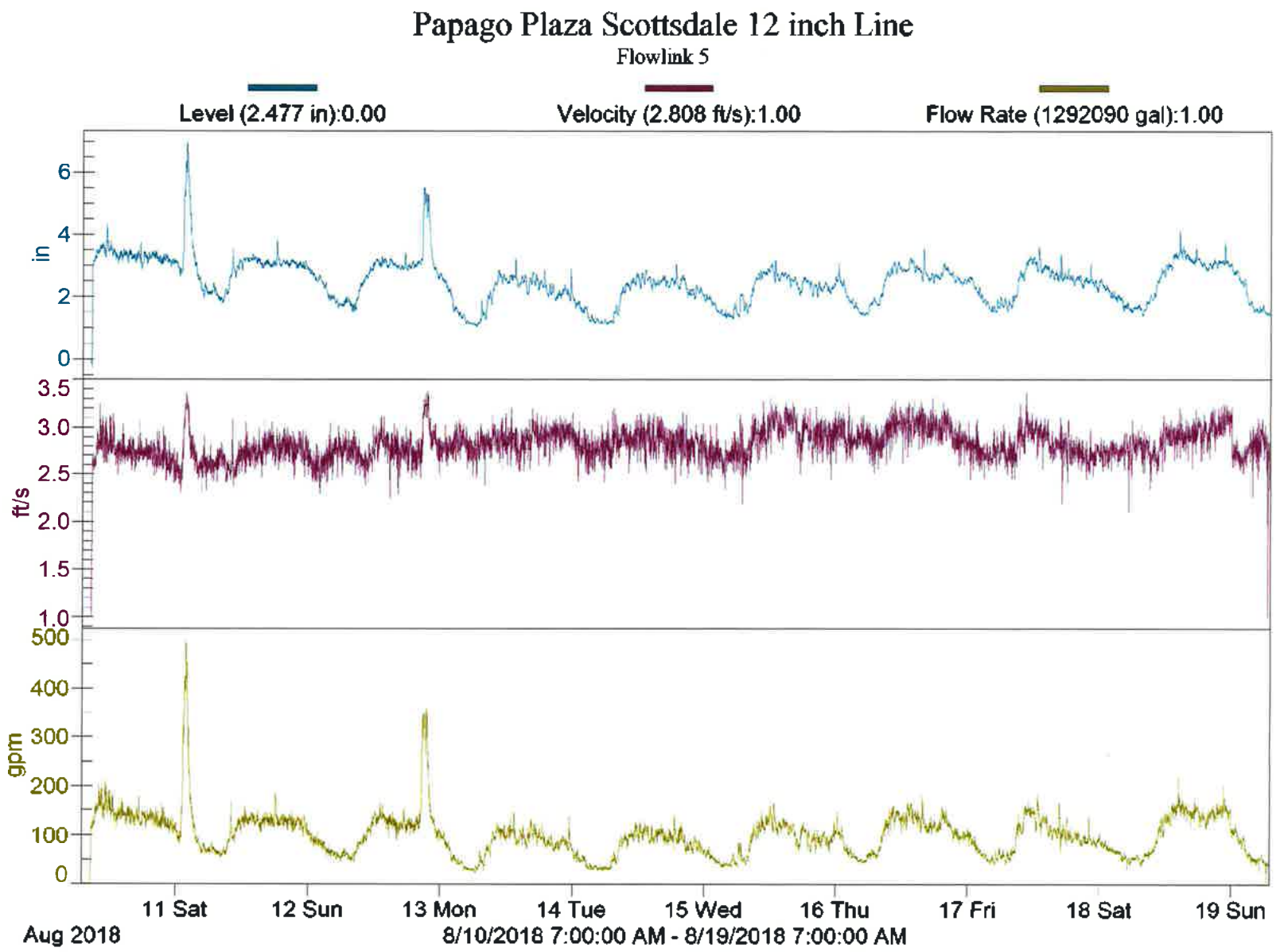
Project Description	
Worksheet	Skysong Ex. 18" - MH 12 t
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

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.



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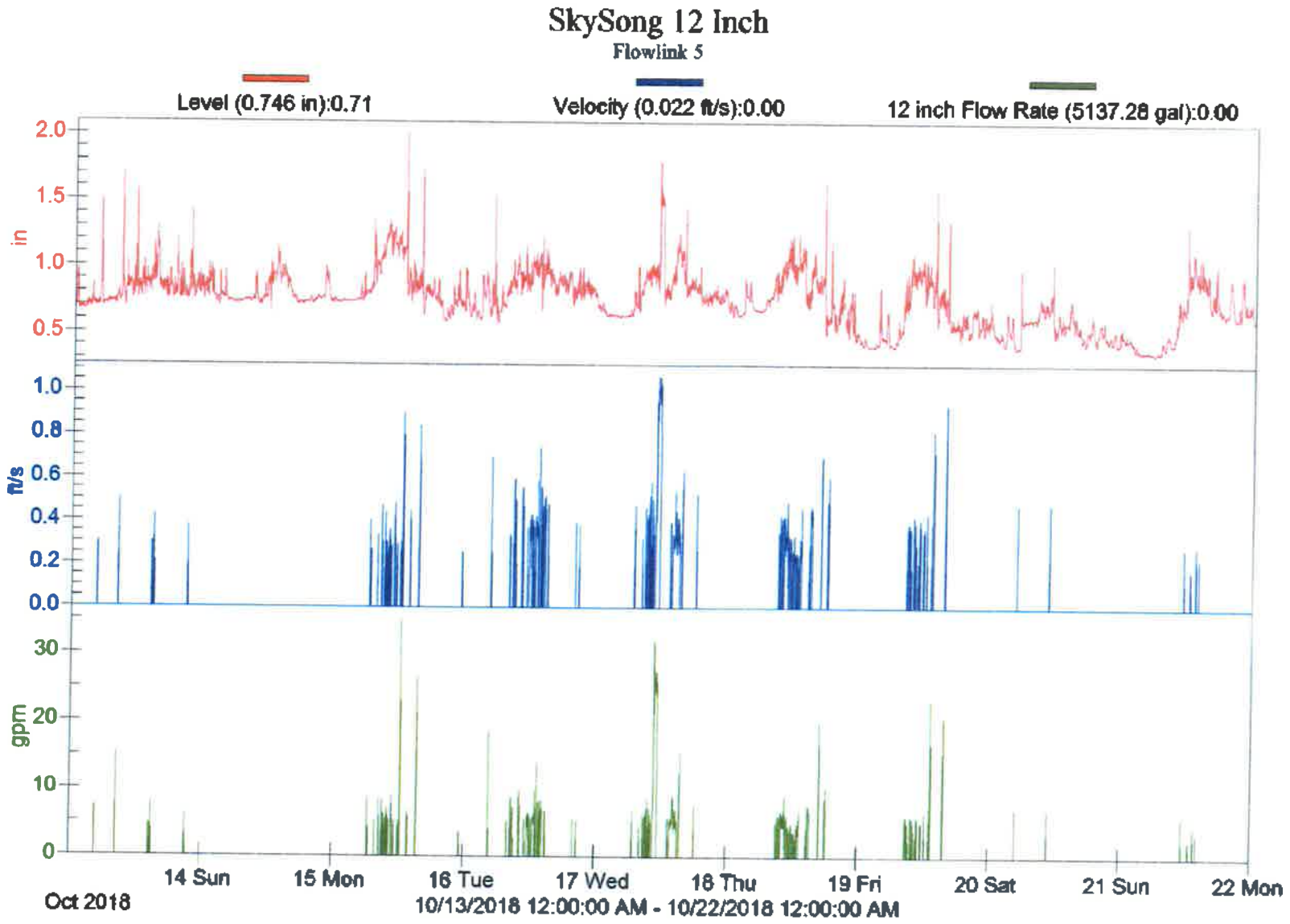
Site Name	Papago Plaza Scottsdale 12 inch Line		
Isco Quantity	Level	Velocity	Flow Rate
Label	Level	Velocity	Flow Rate
Units	in	ft/s	gpm
Resolution	0.1	0.1	0.1
Significant Digits	0	0	0
8/11/2018 0:10	6.914	3.366	498.572
8/11/2018 0:14	6.983	3.281	486.552
8/11/2018 0:12	6.906	3.301	484.199
8/11/2018 0:16	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



18-DR-2019
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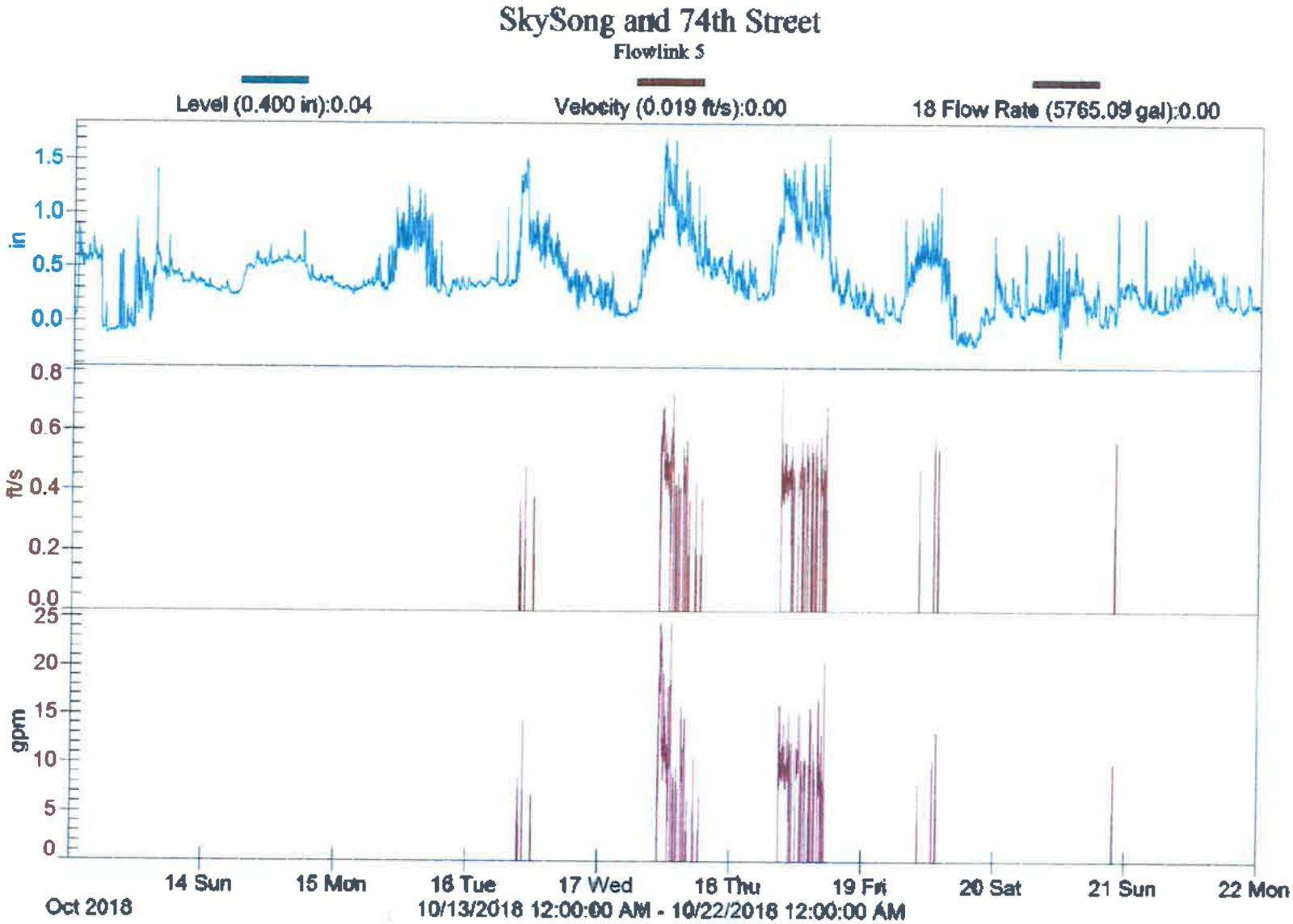
Skysong 12 inch Line Data 1

Isco Quantity	Level	Velocity	Flow Rate
Label	Level	Velocity	2 inch Flow Rate
Units	in	ft/s	gpm
Resolution	0.1	0.1	0.1
Significant Digits	0	0	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



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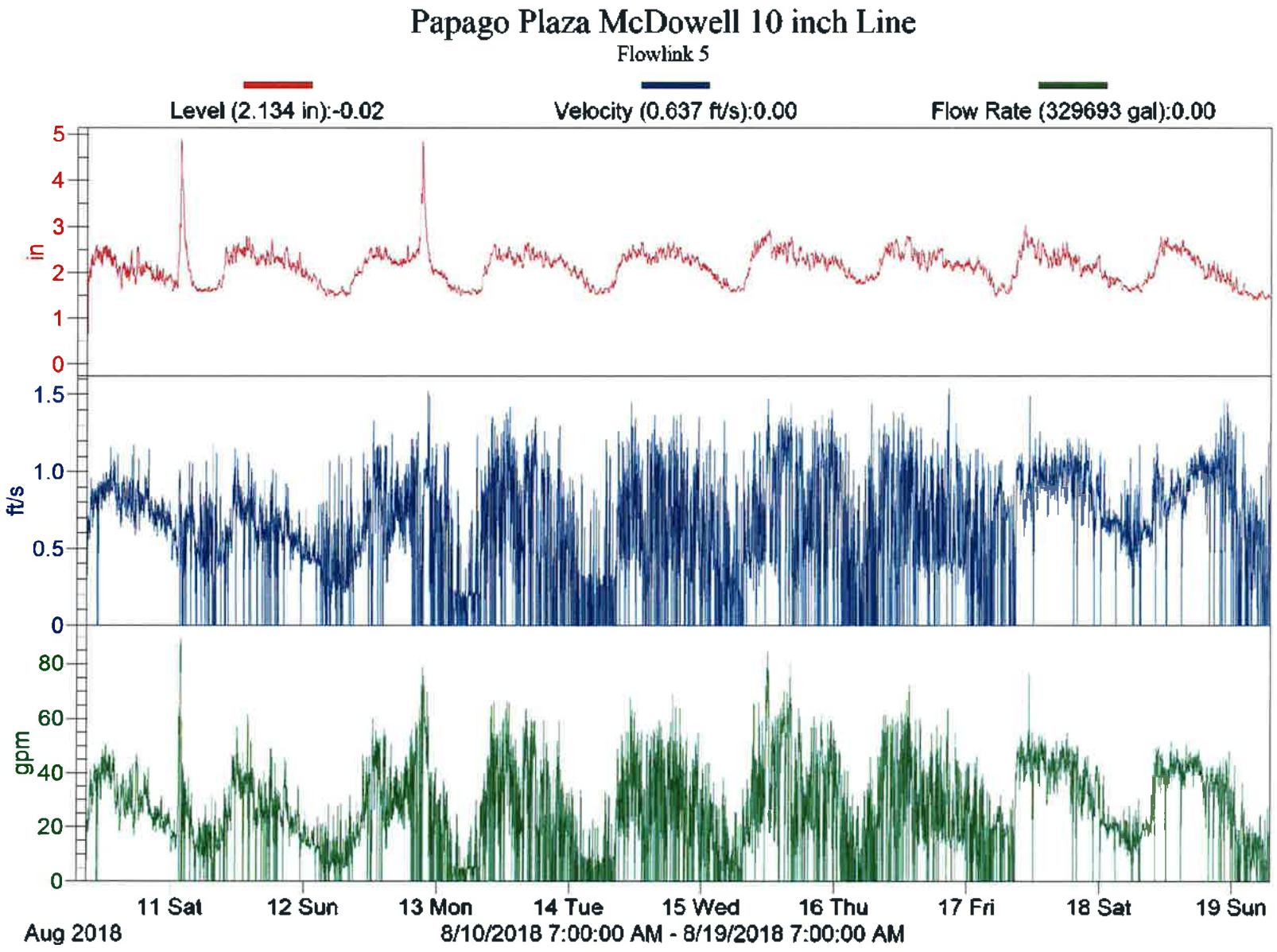
Skysong 18 inch Line Data 1

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



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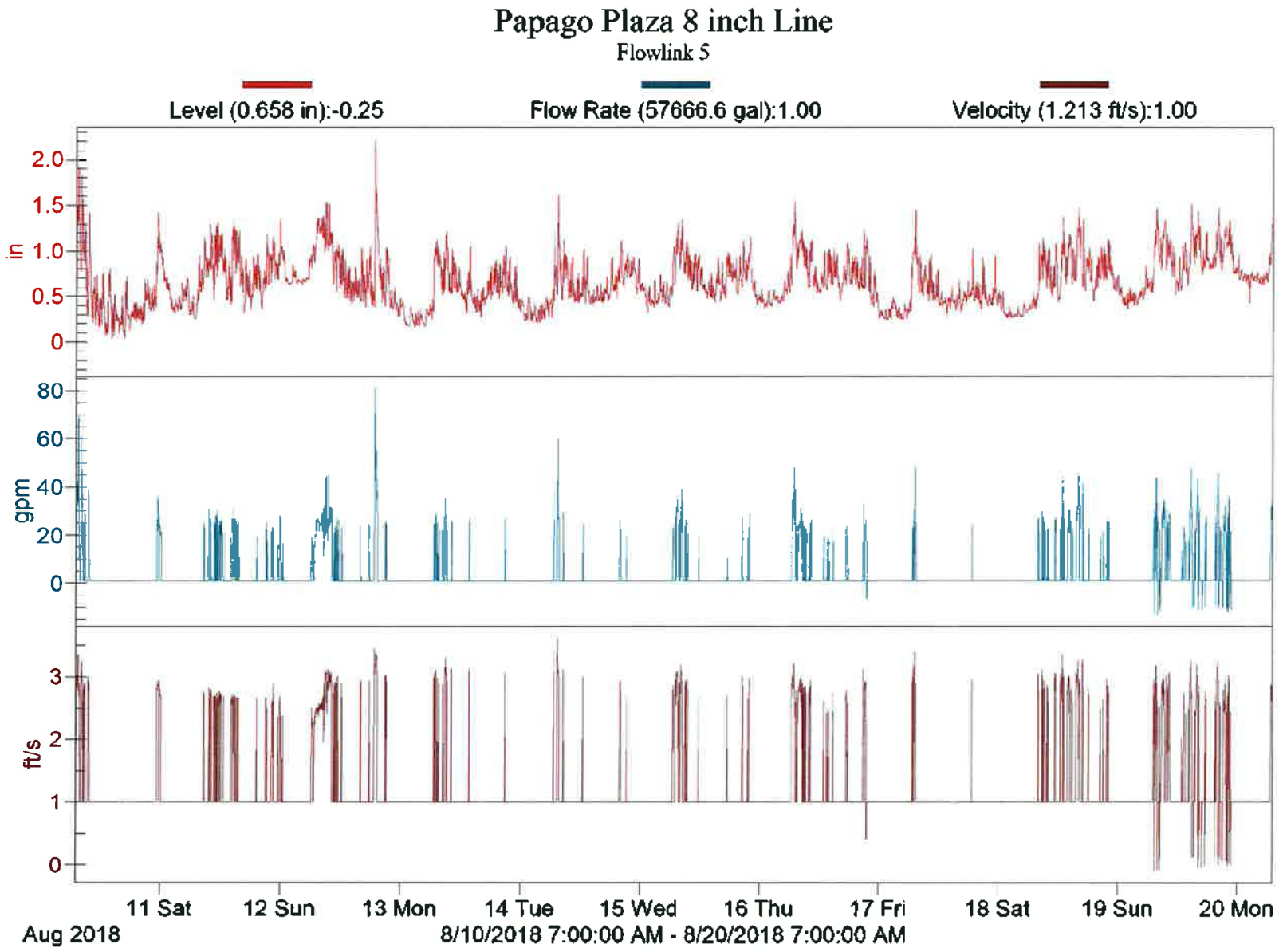
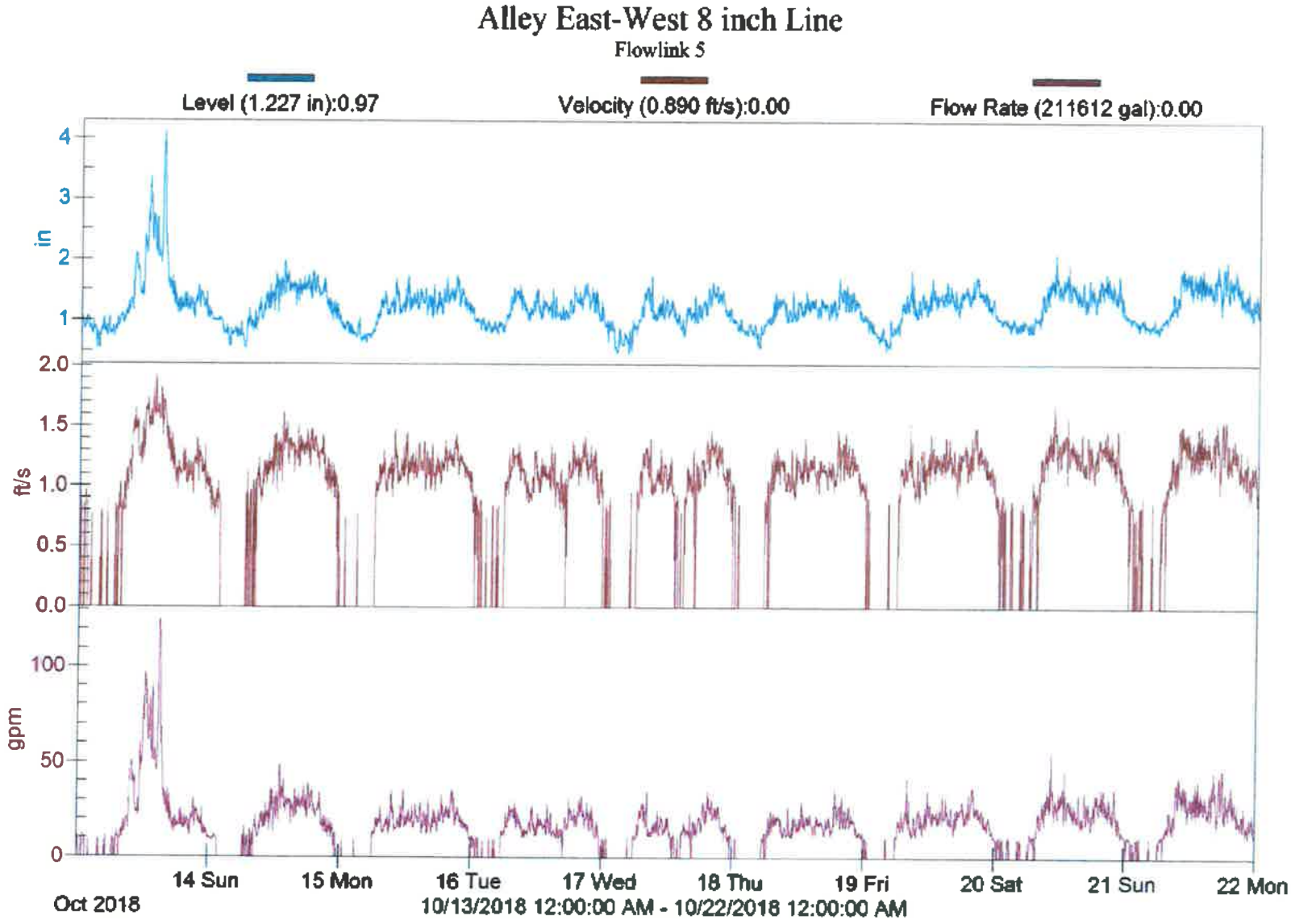
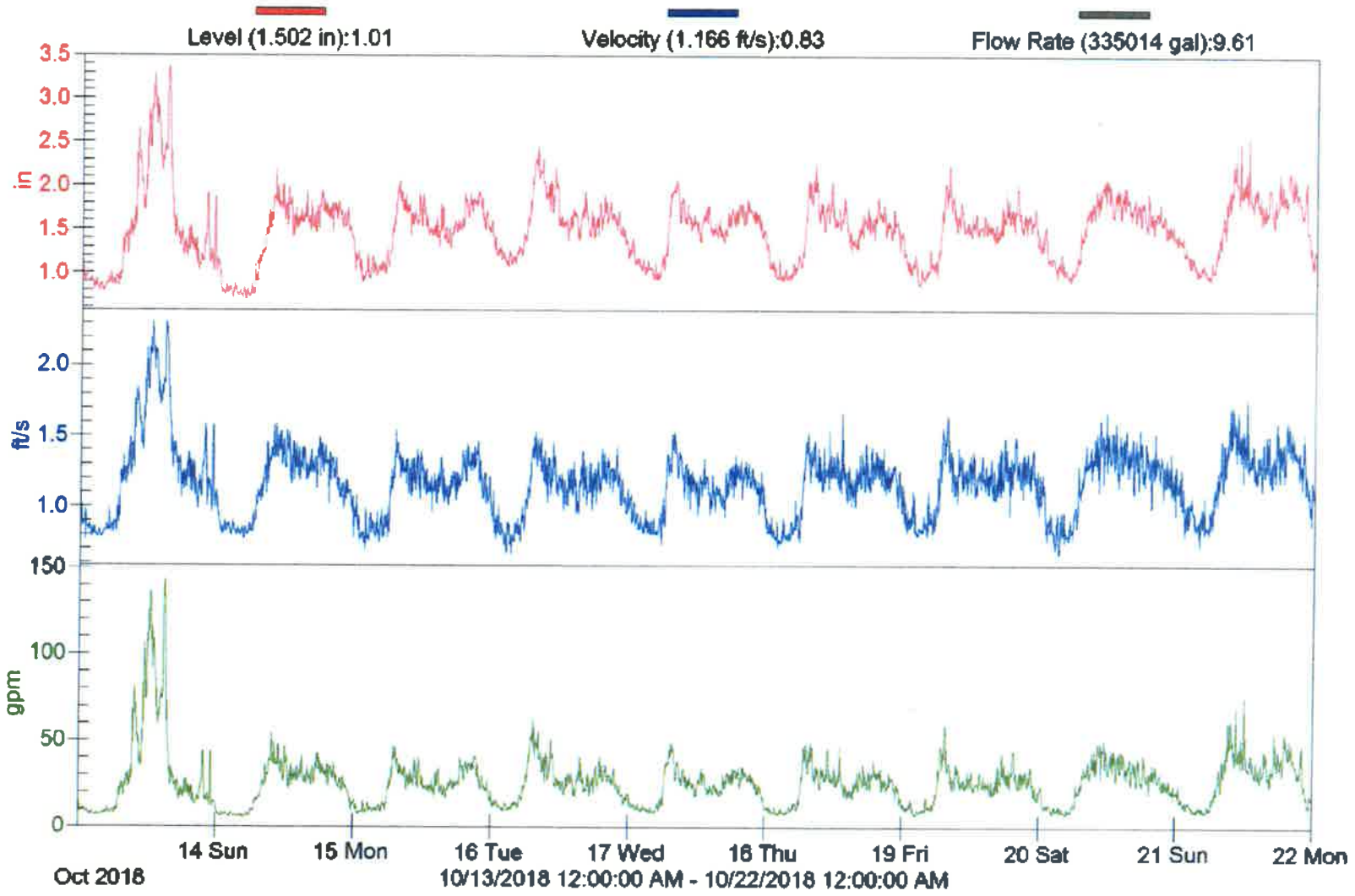


18-DR-2019
8/9/2019


Alley East-West 8 inch Line
Flowlink 5
Level (1.227 in):0.97
Velocity (0.890 ft/s):0.00
Flow Rate (211612 gal):0.00
in
4
3
2
1
ft/s
2.0
1.5
1.0
0.5
0.0
gpm
100
50
0
14 Sun
15 Mon
16 Tue
17 Wed
18 Thu
19 Fri
20 Sat
21 Sun
22 Mon
Oct 2018
10/13/2018 12:00:00 AM - 10/22/2018 12:00:00 AM

Alley North-South 8 inch Line

Flowlink 5



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8/9/2019

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
Doug 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

Registered Professional Engineer (Civil)
CERTIFICATE NO.
33359
JOHN M. BULKA
7-14-16
ARIZONA U.S.A.
expires 3-31-17

WOOD/PATEL
MISSION: CLIENT SERVICE®

18-DR-2019
8/9/2019

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CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

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:

- 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

N:\2012\123808\Project Support\Reports\Sewer BOD\Text\123808 Skysong NW Quadrant Preliminary Wastewater BOD Report.docx

CALCULATIONS

WOOD/PATEL **WASTEWATER COLLECTION SYSTEM DESIGN CRITERIA**

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

Project: Skysong Northwest Quadrant
Location: Scottdale, 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

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

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
27	0.0010
30	0.0009
36	0.0007
42	0.0006
48	0.0005

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

N:\2001\011480\Sewer\3808-Q4 Sewer BOD

WOOD/PATEL

WASTEWATER MODEL SPREADSHEET

CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

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

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

		COMMERCIAL							
UPSTREAM NODE	DOWNSTREAM NODE	Office (S.F.)	Restaurant (S.F.)	ADF/ UNIT (GPD)[2]	SEWER NODE ADF (GPD)	TOTAL ADF (GDP)	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	--	--	--	--	132,000	--	--	396,000
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	86,400	86,400
EX MH 5	EX MH 4	--	--	--	--	146,400	--	--	86,400
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	--	--	--	--	206,400	--	--	266,400
EX MH 3	Ex 18" Gravity Sewer	--	--	--	--	338,400	--	--	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

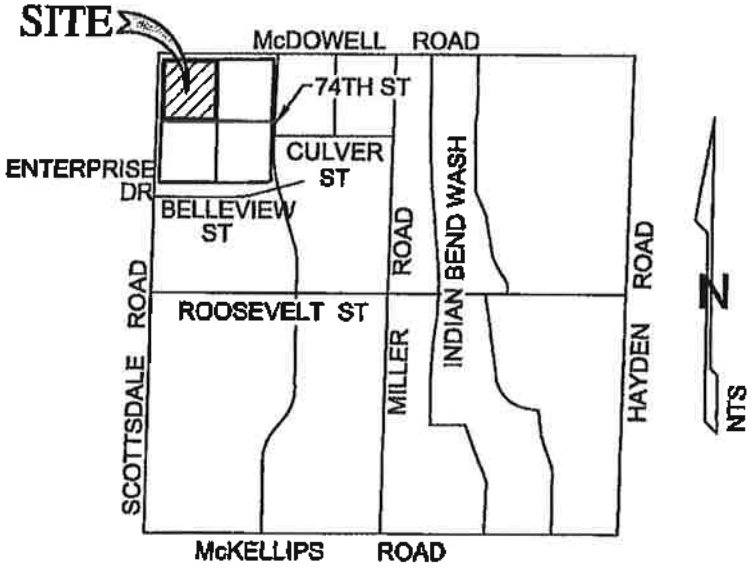
CIVIL ENGINEERS * HYDROLOGISTS * LAND SURVEYORS * CONSTRUCTION MANAGERS

Project: Skysong Northwest Quadrant
Location: Scottdale, 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	28%
(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	86,400	0.005	3.2	0.16	1,631,771	1,545,371	5%
EX MH 5	EX MH 4	12	86,400	0.083	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	266,400	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\Proled Support\Reports\Water BOD\Skysong Q4\Exhibits\123808_50 Exhibit 1 - Vicinity Map.dwg

VICINITY MAP

SKYSONG NW QUADRANT

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

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

SEWER EXHIBIT

SKYSONG

NW QUADRANT
SCOTTSDALE, ARIZONA
WASTEWATER EXHIBIT

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

LEGEND
PROPOSED SEWER W/ MANHOLE (SIZE AS INDICATED)
PROPOSED SEWER W/O MANHOLE (SIZE AS INDICATED)
EXISTING SEWER

N

0 40 80
Horz. 1 in. = 40 ft.

EX. 18"-S
EX. 16"-S
EX. 12"-S
EX MH 1
EX MH 2
EX MH 3
EX MH 4
EX MH 5
INNOVATION PLACE
PROPOSED 8" SEWER
SS CONNECT 2
SS CONNECT 1
MH 1
PROPOSED BUILDING 8
PROPOSED PARKING GARAGE
PROPOSED BUILDING 6
SKYSONG BOULEVARD
E. McDOWELL ROAD
N. SCOTTSDALE ROAD
PROPOSED BUILDING 7
PROPOSED BUILDING 9 RESTAURANT (UNDER CONSTRUCTION)

18-DR-2019
8/9/2019

E. McDOWELL ROAD

N. SCOTTSDALE ROAD

INNOVATION PLACE

PROPOSED BUILDING 8

PROPOSED BUILDING 7

PROPOSED BUILDING 9 RESTAURANT (UNDER CONSTRUCTION)

PROPOSED PARKING GARAGE

PROPOSED BUILDING 6

PROPOSED 8" SEWER

MH 1

B8 CONNECT 1

B8 CONNECT 2

EX MH 1

EX MH 2

EX MH 3

EX MH 4

EX MH 5

EX. 12"-S

EX. 18"-S

SKYSONG BOULEVARD

N

0 40 80

Horz. 1 In. = 40 ft.

LEGEND

PROPOSED SEWER W/ MANHOLE (SIZE AS INDICATED)

PROPOSED SEWER W/ CLEANOUT (SIZE AS INDICATED)

EXISTING SEWER

WOOD/PATEL

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(602) 335-8500

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ARIZONA811

SKYSONG

NW QUADRANT

SCOTTSDALE, ARIZONA

WASTEWATER EXHIBIT

REV	DESCRIPTION	DATE

SCALE (HORIZONTAL) 1" = 40'

SCALE (VERTICAL) N/A

DATE 07/14/2016

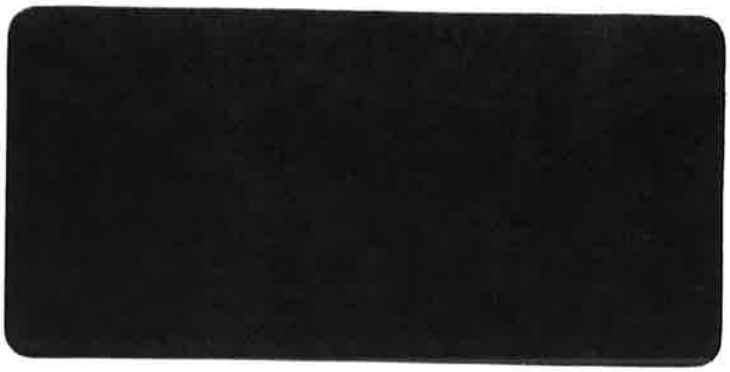
JOB NUMBER 123808

SHEET 1 OF 1

CASE FILE

2nd
2nc

Slip



Accepted for
CITY OF SCOTTSDALE
WATER RESOURCES DEPT
9388 E SAN SALVADOR DR.
SCOTTSDALE, AZ 85258
By Doug Mann
6.1.06
with comments

2037-01

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

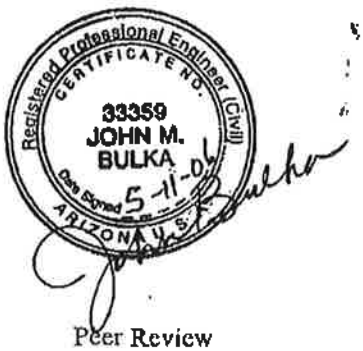
Submitted To:

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



Peer Review

Prepared by: Jesse Heywood E.I.T.

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 designs 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.

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
Location: Scottsdale, AZ
Date: May 11, 2006
References: City of Scottsdale Design Standards and Policies Manual

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

	SQUARE FOOTAGE	DWELLING UNITS	
ZONE	Commercial/General Office/Research and Development	Hotel	Condominium
NW	370,000		20
NE	303,000		88
SW	370,000	200	44
SE	152,000		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

WASTEWATER CALCULATIONS (FULL BUILDOUT)

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

Project: Skysong ASU Scottsdale Innovation Center
Location: Scottsdale, AZ
Date: 5/11/2009
References: City of Scottsdale Design Standards and Policies Manual

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

SEWER SEGMENT (MH TO MH)[1]	SEWER SEGMENT AVE. DAILY FLOW (GPD)			CUMULATIVE AVE. DAILY FLOW (GPD)	EQUIVALENT POPULATION	PEAKING FACTOR		INFILTRATION / INFLOW (GPD)	MAX-DAY FLOW (GPD)[3]	PIPE DIA. (IN)	PIPE SLOPE (FT./ FT)	FULL FLOW VELOCITY (FT/S)	NORMAL FLOW VELOCITY (FT/S)	d/D	PIPE CAPACITY (GPD)	PERCENT OF CAPACITY
	COMMERCIAL	CONDOMINIUM	HOTEL			COMMERCIAL[2]	HOTEL & CONDOMINIUM[2]									
1 TO 2	64,750	0	0	64,750	648	3.50	4.00	528	227,153	12	0.0075	3.9	2.6	0.23	1,998,503	11%
2 TO 3	129,500	0	0	194,250	1,943	3.50	4.00	1,055	660,930	12	0.0050	3.2	3.1	0.45	1,631,771	42%
6 TO 7	117,775	3,106	0	120,881	1,209	3.50	4.00	528	425,164	12	0.0050	3.2	2.7	0.35	1,631,771	26%
7 TO 3	117,775	0	0	238,656	2,387	3.50	4.00	1,055	837,904	12	0.0050	3.2	3.2	0.51	1,631,771	51%
3 TO 4	53,025	0	0	485,931	4,859	3.50	4.00	2,638	1,704,949	18	0.0050	4.2	3.9	0.41	4,811,655	35%
4 TO 5	53,025	0	0	538,956	5,390	3.50	4.00	3,165	1,891,064	18	0.0075	5.2	4.6	0.39	5,853,050	32%
9 TO 5	0	13,556	0	13,556	137	3.50	4.00	528	56,199	12	0.0100	4.5	1.9	0.19	2,307,672	2%
5 TO 10	0	0	0	552,622	5,526	3.50	4.00	4,220	1,946,785	18	0.0170	7.8	6.2	0.32	8,872,254	22%
17 TO 16	64,750	6,833	80,340	151,923	1,519	3.50	4.00	528	575,845	12	0.0100	4.5	3.8	0.34	2,307,672	25%
16 TO 15	64,750	0	0	216,673	2,167	3.50	4.00	1,055	802,998	12	0.0100	4.5	4.1	0.41	2,307,672	35%
8 TO 15	100,217	0	0	100,217	1,002	3.50	4.00	528	351,286	12	0.0033	2.6	2.2	0.35	1,325,657	26%
15 TO 14	0	0	0	316,890	3,169	3.50	4.00	2,110	1,154,811	12	0.0065	3.7	3.9	0.57	1,860,505	62%
14 TO 13	35,467	70,196	0	422,552	4,226	3.50	4.00	2,638	1,560,254	12	0.0050	4.3	4.7	0.62	2,189,250	71%
13 TO 12	0	0	0	422,552	4,226	3.50	4.00	3,165	1,560,782	18	0.0018	2.5	2.6	0.52	2,886,993	54%
12 TO 11	0	0	0	422,552	4,226	3.50	4.00	3,693	1,561,309	18	0.0018	2.5	2.6	0.52	2,886,993	54%
11 TO 10	0	0	0	422,552	4,226	3.50	4.00	4,220	1,561,837	18	0.0018	2.5	2.6	0.52	2,886,993	54%
20 TO 21	35,467	0	0	35,467	355	3.50	4.00	528	124,661	12	0.0100	4.5	2.4	0.16	2,307,672	5%
21 TO 22	0	0	0	35,467	355	3.50	4.00	1,055	125,188	12	0.0200	6.4	3.1	0.13	3,263,541	4%
22 TO 10	0	0	0	35,467	355	3.50	4.00	1,583	125,716	12	0.0200	6.4	3.1	0.13	3,263,541	4%
10 TO OS MH 1	30,174	0	0	1,040,815	10,408	3.50	4.00	10,550	3,740,474	24	0.0018	3.1	3.2	0.56	6,216,095	60%
Total	866,674	93,801	80,340	1,040,815	10,408			10,550	3,740,474							

Infiltration / Inflow Rate =	250	gal / acre / day
Project Area =	42.20	acres
Total Infiltration Flow =	10,550	gal / day
No. of Pipes =	20	pipes
Infiltration / Inflow per Pipe =	528	gal / pipe

[1] Proposed outfall connection to existing 30-inch sewer located along Miller Road.
[2] Peaking factors used are 3.5 for commercial and 4.0 for Condominiums and Hotels, per the approved *Master On-Site Wastewater Plan for Stacked 40s*, by Wood, Patel & Associates, dated August 25, 2005.
[3] Max Day Flow = Ave. Daily Flow x Peaking Factor + Infiltration/Inflow.

WOOD/PATEL

WASTEWATER DESIGN FLOWS BY ZONE (FULL BUILDOUT)

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS • CONSTRUCTION MANAGERS

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

Proj. Number: 062562
Proj. Engineer: Troy Beninger, P.E.

						UNIT DAILY FLOW				AVE. DAILY FLOW			
ZONE	SEWER SEGMENT (MH TO MH)	COMMERCIAL AREA (ACRES)	COMMERCIAL AREA (SF)[2]	CONDOMINIUMS (DU)	HOTEL (Rooms)	COMMERCIAL (GPD/ACRE)[1]	COMMERCIAL (GPD/S.F.)[1]	CONDOMINIUMS (GPD/UNIT)[1]	HOTELS (GPD/ROOM)[1]	COMMERCIAL (GPD)	CONDOMINIUMS (GPD)	HOTEL (GPD)	TOTAL (GPD)
NW	1 TO 2		92,500			1,284	0.7	155.3	401.7	84,750	0	0	84,750
NW & SW	2 TO 3		185,000			1,284	0.7	155.3	401.7	129,500	0	0	129,500
NE	9 TO 5			88		1,284	0.7	155.3	401.7	0	13,666	0	13,666
NW & NE	6 TO 7		166,250	20		1,284	0.7	155.3	401.7	117,775	3,106	0	120,881
NW & NE	7 TO 3		166,250			1,284	0.7	155.3	401.7	117,775	0	0	117,775
NE	3 TO 4		75,750			1,284	0.7	155.3	401.7	53,025	0	0	53,025
NE	4 TO 5		75,750			1,284	0.7	155.3	401.7	53,025	0	0	53,025
SW	5 TO 15		92,500			1,284	0.7	155.3	401.7	84,750	0	0	84,750
SW	17 TO 16		92,500	44	200	1,284	0.7	155.3	401.7	84,750	6,833	80,340	151,923
SW	16 TO 15		92,500			1,284	0.7	155.3	401.7	84,750	0	0	84,750
SE	14 TO 13		50,667	452		1,284	0.7	155.3	401.7	33,467	70,195	0	105,662
SE	5 TO 15		50,667			1,284	0.7	155.3	401.7	35,467	0	0	35,467
SE	20 TO 21		50,667			1,284	0.7	155.3	401.7	35,467	0	0	35,467
Redevelopment Zone	10 TO OS MH 1	23.5				1,284	0.7	155.3	401.7	30,174	0	0	30,174
TOTAL			1,195,000	584	200					806,674	93,801	80,340	1,040,815

[1] Commercial (office) flows per the City of Scottsdale Design Standards Manual. Assumes hotel water use = wastewater flow.
[2] Assumes multi-story buildings areas above include upper levels.

WOOD/PATEL

PHASED WASTEWATER DESIGN FLOWS

CIVIL ENGINEERS · HYDROLOGISTS · LAND SURVEYORS · CONSTRUCTION MANAGERS

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 Bentrager, P.E.

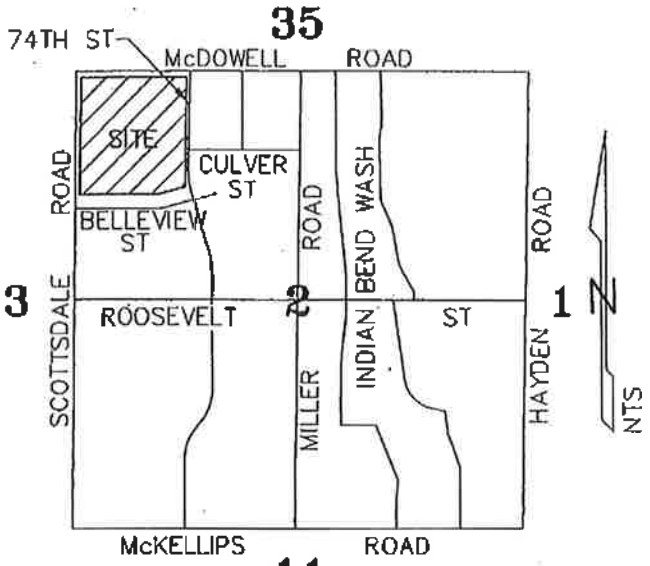
				UNIT DAILY FLOW			AVE. DAILY FLOW				
YEAR[3]	COMMERCIAL AREA (SF)	CONDOMINIUMS (DU)	HOTEL (Rooms)	COMMERCIAL (GPD/UNIT)[1]	CONDOMINIUMS (GPD/UNIT)[1]	HOTEL (GPD/ROOM)[1]	COMMERCIAL (GPD)	CONDOMINIUMS (GPD)	HOTEL (GPD)	TOTAL (GPD)	PROJECTED PEAK WET-WEATHER FLOW (GPD)[2]
2007	285,774	388		0.7	155.3	401.7	200,042	60,256	0	260,298	951,722
2008	151,538	64		0.7	155.3	401.7	106,077	9,939	0	376,314	1,362,747
2009	151,538	88		0.7	155.3	401.7	106,077	13,666	0	495,057	1,788,681
2010	151,538			0.7	155.3	401.7	106,077	0	0	602,134	2,159,948
2011	151,538	44		0.7	155.3	401.7	106,077	6,833	0	715,043	2,558,550
2012	151,536	20	200	0.7	155.3	401.7	106,077	3,105	80,340	904,566	3,253,602
2013	151,536			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] Peaking factors used are 3.5 for commercial and 4.0 for Condominiums and Hotels, per the approved *Master On-Site Wastewater Plan for Stacked 40's*, by Wood, Patel & Associates, dated August 25, 2005. Total infiltration is projected to be 10,550 gpd for the 42.2 acre site.

[3] This is a projected timeline for ultimate buildout 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 sf every 3 years.

VICINITY MAP



VICINITY MAP

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

VICINITY MAP

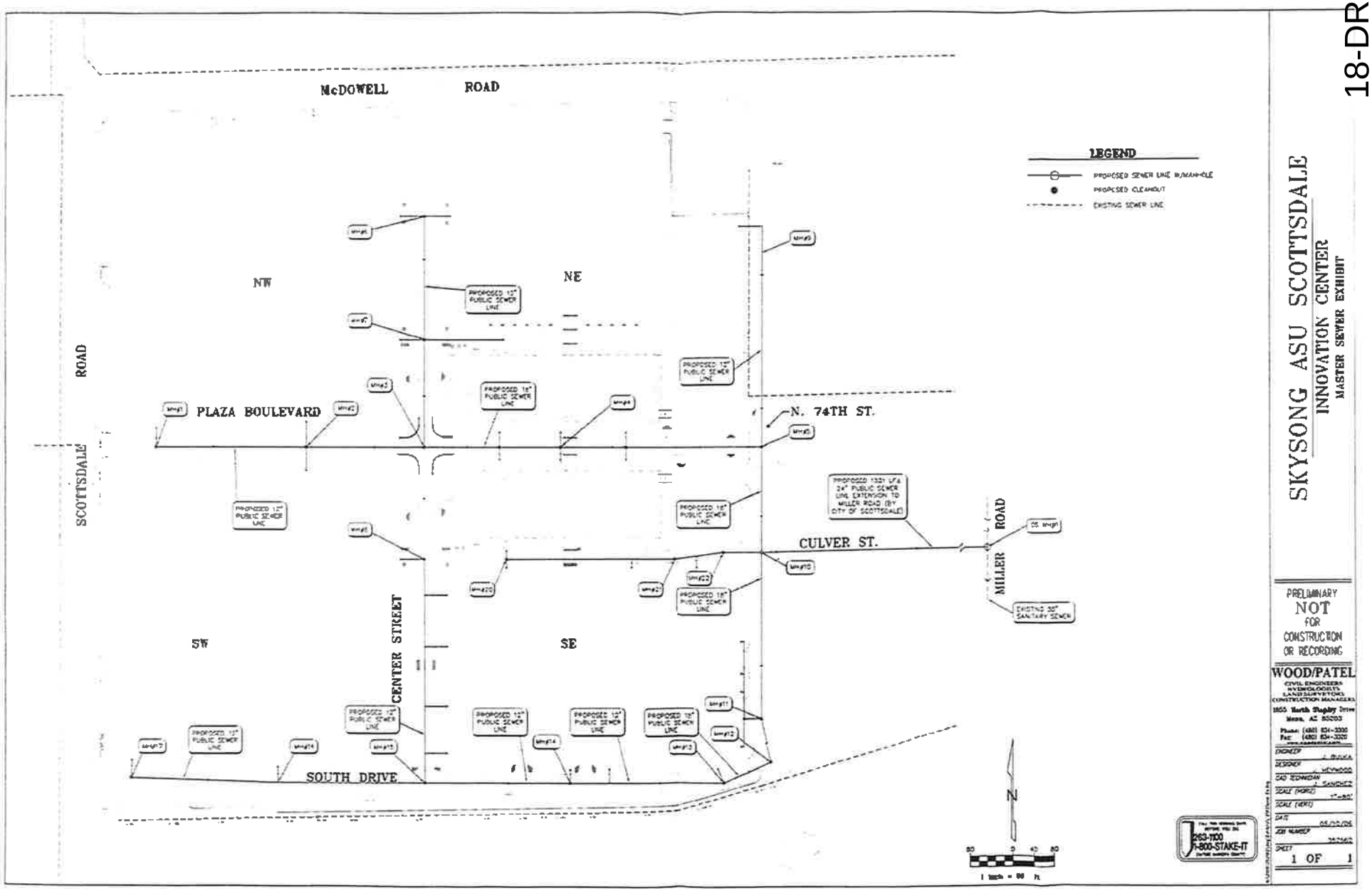
ASU CENTER FOR NEW TECHNOLOGY
SCOTTSDALE, AZ

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

WOOD/PATEL ASSOCIATES INC.
Civil Engineers, Hydrologists and Land Surveyors
1655 North Stapley Drive
Mesa, Arizona 85203
(480) 834-3300
(480) 834-3320 FAX

SEWER EXHIBIT

18-DR-2019
8/9/2019



SKYSONG ASU SCOTTSDALE

INNOVATION CENTER

MASTER SEWER EXHIBIT

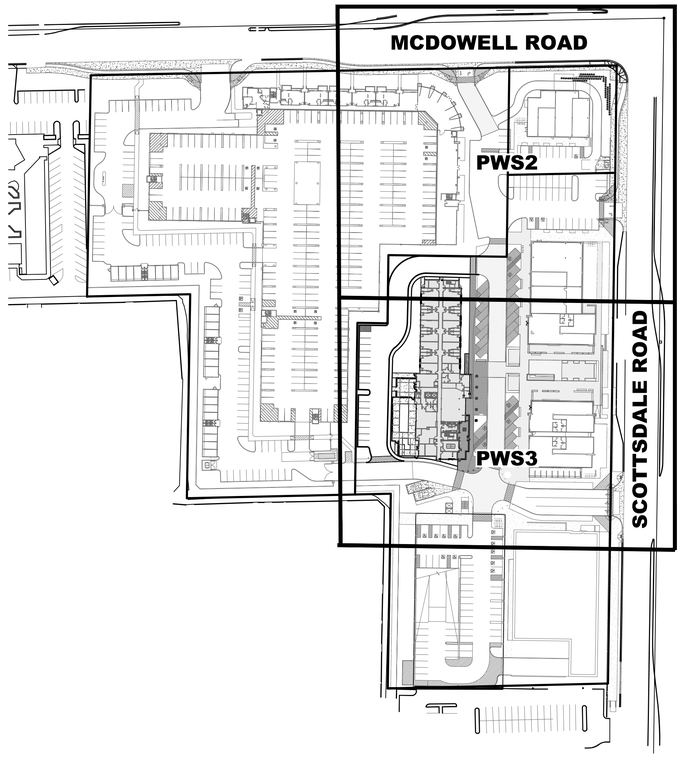
PRELIMINARY
NOT
FOR
CONSTRUCTION
OR RECORDING

WOOD/PATEL
CIVIL ENGINEERS
HYDROLOGISTS
LAND SURVEYORS
CONSTRUCTION MANAGERS
1655 North Rugby Drive
Mesa, AZ 85203
Phone: (480) 834-3300
Fax: (480) 834-3320

ENGINEER J. BUCKA
DESIGNER MCWOOD
CAD TECHNICIAN J. SANCHEZ
SCALE (HORZ) 1"=80'
SCALE (VERT)
DATE 05/10/06
JOB NUMBER 0675.03
SHEET 1 OF 1

263-1100
1-800-STAKE-IT

SHEET INDEX



PRELIMINARY WATER AND SEWER PLAN

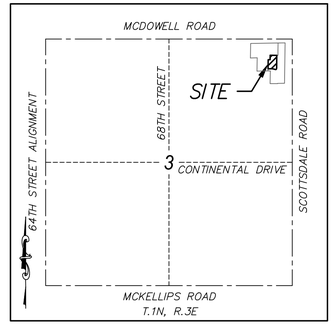
FOR

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

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.

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	CURB AND GUTTER	
	SIDEWALK	
	SINGLE CURB	
RIM: 62.48 INV: 56.64	RIM AND INVERT ELEVATION	
-1499-	CONTOUR	
⊗	WATER FITTINGS	
W W	WATER METER	
	WATER LINE	W
	FIRE HYDRANT	
S S	SEWER LINE	S
SW	SEWER MANHOLE/CLEANOUT	
SD ST	STORM DRAIN	
	CATCH BASIN	
	DRYWELL	
	UNDERGROUND STORAGE TANK	
	SCUPPER	
	FINISHED FLOOR	FF=43.81
G G	GAS LINE/METER/VALVE	
E E	ELECTRIC LINE/METER	
TV T TV	CABLE/JUNCTION BOX	
OHE	OVERHEAD ELECTRIC/POLE	
	BOUNDARY LINE	
	CENTER LINE	
	EASEMENT	
IRR IRR IRR	IRRIGATION	
FO FO	FIBER OPTIIC	



VICINITY MAP

N.T.S.

ENGINEER

KLAND CIVIL ENGINEERS
7227 N. 16TH ST., STE 217
PHOENIX, AZ 85020
PH: (480) 344–0480
CONTACT: LESLIE KLAND, PE

DEVELOPER

PEG COMPANIES
180 N. UNIVERSITY AVE., STE 200
PROVO, UT 84601
PH: (801) 664–2939
CONTACT: MR. TYLER MAHONEY

ARCHITECT

NELSEN PARTNERS ARCHITECTS & PLANNERS
15210 N. SCOTTSDALES RD., STE 300
SCOTTSDALE, AZ 85254
PH: (480) 949–6800
CONTACT: KELSEY REUST

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

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.

Call at least two full working days before you begin excavation.
ARIZONA 811 Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY WATER AND SEWER PLAN

KLAND CIVIL ENGINEERS
CIVIL ENGINEERING
LAND DEVELOPMENT SERVICES
LAND SURVEYING
7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer
CERTIFICATE NO.
31695
LESLIE J. KLAND
Date Signed 8-7-19
ARIZONA U.S.A.
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PWS1
OF 3

K:\2019\K19113 Papago Plaza Springhill Suites\Dwg\CONCEPT\DR Hotel\113-HOTEL-DRS-WS.dwg

MCDOWELL ROAD

N88°56'24"E 1312.31'

SCOTTSDALE ROAD

BASIS OF BEARING (ASSUMED)

S0°48'46"W 2637.03'

CONNECT TO EXISTING WATER LINE WITH 12"x8" TAPPING SLEEVE, VALVE, BOX AND COVER AS PART OF INFRASTRUCTURE PLAN

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" PUBLIC WATER LINE AS PART OF INFRASTRUCTURE PLAN

CONNECT TO EXISTING WATER LINE WITH 12"x12" CUT IN TEE AS PART OF INFRASTRUCTURE PLAN

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE HYDRANT AS PART OF INFRASTRUCTURE PLAN

NOT A PART

PROP. 20' PUBLIC WATER EASEMENT

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" PUBLIC WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE SPRINKLER FEED AS PART OF HOTEL PLAN

REMOVE THE CAP

NOT A PART

NEW FIRE LINE STUB OUT AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW SEWER CLEANOUT AS PART OF HOTEL PLAN

NEW METER VAULT AND BACKFLOW FOR DOMESTIC USE AS PART OF HOTEL PLAN

NEW WATER SERVICE FOR DOMESTIC USE AS PART OF INFRASTRUCTURE PLAN

MATCHLINE SEE SHEET PWS3

N

20 0 10 20

1 inch = 20 ft.

Call at least two full working days before you begin excavation.
ARIZONA 811
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REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY WATER AND SEWER PLAN

KLAND
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LAND DEVELOPMENT SERVICES
LAND SURVEYING
7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil) CERTIFICATE NO. 31695 LESLIE J. KLAND Date Signed 8.7.19 ARIZONA U.S.A.

Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PWS2
OF 3

K:\2019\K19113 Papago Plaza Springhill Suites\Dwg\CONCEPT\06 Hotel\113-HOTEL-DSR-WS.dwg

MATCHLINE SEE SHEET PWS1

N

20 0 10 20

1 inch = 20 ft.

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW SEWER MANHOLE AS PART HOTEL PLAN

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW 8" SEWER LINE AS PART OF HOTEL PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

FF=32.25

PROP. 20' PUBLIC WATER EASEMENT

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW 8" SEWER LINE AS PART OF HOTEL PLAN

POOL=32.20

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 8" SEWER LINE AS PART OF HOTEL PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

CAP NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

REMOVE THE CAP

NEW 8" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

PROP. 12' PUBLIC WATER EASEMENT

NOT A PART

NOT A PART

NOT A PART

NEW FIRE HYDRANT AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE HYDRANT AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW 8" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

CAP NEW 8" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE LINE STUB OUT AS PART OF INFRASTRUCTURE PLAN

NEW WATER SERVICE FOR DOMESTIC USE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE STUBOUT AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE STUBOUT AS PART OF INFRASTRUCTURE PLAN

NEW 12" PUBLIC WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12"x8" TEE AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

CONNECT TO EXISTING MANHOLE AS PART OF INFRASTRUCTURE PLAN

CONNECT TO EXISTING WATER LINE WITH 8"x8" CUT IN TEE AS PART OF INFRASTRUCTURE PLAN

SCOTTSDALE ROAD

BASIS OF BEARING (ASSUMED)
S0°48'46"W 2637.03'

SKYSONG BLVD

4+00

5+00

6+00

7+00

8+00

Call at least two full working days before you begin excavation.
ARIZONA 811
Arizona Blue Stake, Inc.
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In Maricopa County: (602) 263-1100

K:\2019\K19113 Papago Plaza Springhill Suites\Dwg\CONCEPT\DR Hotel\113-HOTEL-DR-WS.dwg

REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY WATER AND SEWER PLAN

KLAND CIVIL ENGINEERS

CIVIL ENGINEERING

LAND DEVELOPMENT SERVICES

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ENGINEER: L. KLAND
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CAD TECH: FITZGERALD

Registered Professional Engineer
CERTIFICATE NO.
31695
LESLIE J. KLAND
Date Signed 8-7-19
ARIZONA U.S.A.
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PWS3
OF 3

KLAND CIVIL ENGINEERS

Scottsdale
Preliminary Water Basis of Design Report
Papago Plaza Springhill Suites

7047 E. McDowell Road, Scottsdale, AZ 85257
#K19113

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

Prepared for:
PEG Companies
180 North University Avenue, Suite 200
Provo, Utah 84601

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

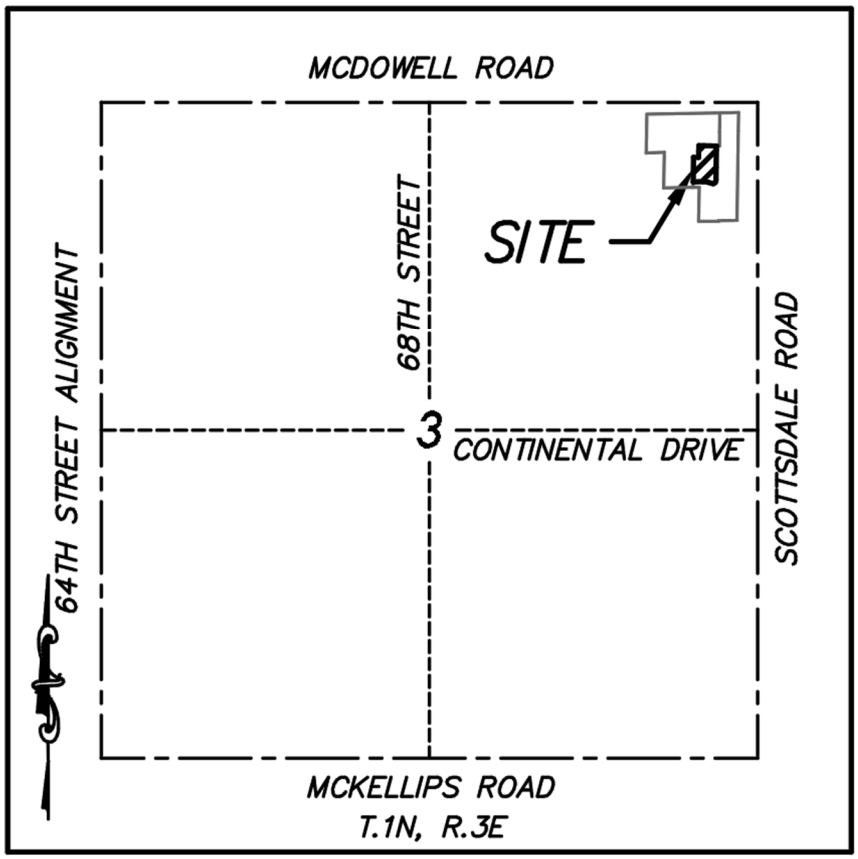
Revised August 7, 2019
April 17, 2019

Table of Contents

Revised August 7, 2019
April 17, 2019

INTRODUCTION

Papago Plaza Springhill Suites is a 116-room hotel located within a portion of the northeast ¼ of Section 3, Township 1 North, Range 3 East of the Gila and Salt River Base and Meridian in Maricopa County, Arizona. The site is bounded on the north and west by Broadstone Papago Marketplace multifamily development, on the east by Papago Plaza retail development, and on the south by the access drive for multifamily development (Please see the vicinity map). The hotel is planned to be constructed after or concurrent to the Retail development. Detailed information on the Retail plans is presented in Appendix A-4 "Master Sewer Basis of Design Report for Scottsdale McDowell" and Appendix A-5 "Master Water Basis of Design Report for Scottsdale McDowell". The focus of this report is the basis of the design for the hotel to confirm that the results and design criteria conform to the methodology used in the master design.



VICINITY MAP

N.T.S.

WATER SYSTEM

The site is located within COS Q.S. 12-44 which is the City of Scottsdale water and sewer service area. For the detailed information on the existing condition, please refer to APPENDIX A-5: “Master Water Basis of Design Report for Scottsdale McDowell”.

As shown in Appendix A-2: “Preliminary Water and Sewer Design”, a new 8-in public water line with a 20-feet easement will be installed with the retail development. During the infrastructure phase, two water services will stubbed to the hotel site along the east side and capped to be used for domestic and fire sprinkler services. Water meter and service extension will be done by the hotel site.

We have also estimated the water demand for the site using The City of Scottsdale Design Standards & Polices Manual. The average daily demand was estimated at 35.95 gpm. The peak daily demand was calculated by increasing the average daily demand by a factor of 2.0, which is a total of 71.91 gpm. The peak hour demand was calculated by increasing the average daily demand by a factor of 3.5, which is a total of 125.83 gpm.

The fire flow demand also was estimated based on the hotel construction type and area. As shown in Appendix A-1 “Preliminary Water Calculations”, the estimated domestic water and fire flow demands for the hotel conform to the estimations in the master design. Please see Appendix A-2 and Appendix A-3 for the Preliminary Water and Sewer Plan and Master Water Basis of Design Report, respectively.

APPENDIX A-1: Preliminary Water Calculations

DOMESTIC WATER DEMAND

Water Demand by Type

Number of Hotel Rooms: 116 at 446.3 gpd/room

Average Day Demand

Hotel: 116 x 446.3 = 51,770.8 gpd

Maximum Day Demand

Maximum daily peaking factor: 2.0

2.0 x 51,770.8 gpd = 103,541.6 gpd (71.91 gpm)

Peak Hour Demand

Peak hour demand factor: 3.5

3.5 x 51,770.8 gpd = 181,197.8 gpd (125.83 gpm)

The plumping engineer will size the water meters to meet IPC fixture unit demands at the time of construction document preparation. In addition, a separate landscape meter will be installed for landscape needs.

FIRE FLOW DEMAND

Hotel Building – 5 Story

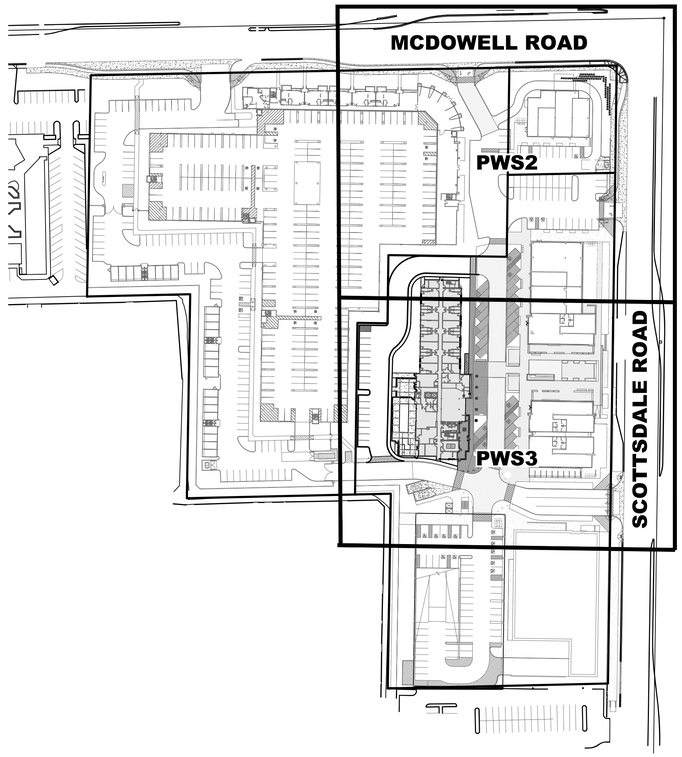
Area = 73,479 sf, Construction Type = III-B, Required Fire Flow = 5,750 gpm

Per 2012 International Fire Code, Appendix B, Section B105.2 a 75% reduction in the fire flow can be approved if an approved automatic sprinkler system is installed. The resulting fire flow shall not be less than the required minimum of 1,500 gpm. Based on the 75% fire flow reduction the fire flow would be 1437.5 gpm. Therefore, the minimum 1,500 gpm fire flow is required which is equal to the calculated flow demand in master water calculations. To examine the existing fire system, a

flow-pressure fire hydrant test was conducted by EJ Flow Tests LCC on the existing fire hydrant in E McDowell Road and then proposed system was modeled. Per modelling results which is available in Appendix A-4 in detail, the proposed system has the required capacity to service the site with a demand fire flow of 1500 gpm.

APPENDIX A-2: Preliminary Water and Sewer Plans

SHEET INDEX



PRELIMINARY WATER AND SEWER PLAN

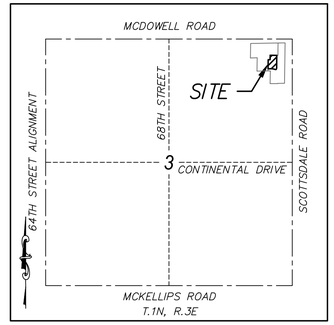
FOR

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

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.

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	CURB AND GUTTER	
	SIDEWALK	
	SINGLE CURB	
RIM: 62.48 INV: 56.64	RIM AND INVERT ELEVATION	
-1499-	CONTOUR	
⊗	WATER FITTINGS	
W W	WATER METER	
	WATER LINE	W
	FIRE HYDRANT	
S S	SEWER LINE	S
SW	SEWER MANHOLE/CLEANOUT	
SD ST	STORM DRAIN	
	CATCH BASIN	
	DRYWELL	
	UNDERGROUND STORAGE TANK	
	SCUPPER	
	FINISHED FLOOR	FF=43.81
G G	GAS LINE/METER/VALVE	
E E	ELECTRIC LINE/METER	
TV T TV	CABLE/JUNCTION BOX	
OHE	OVERHEAD ELECTRIC/POLE	
	BOUNDARY LINE	
	CENTER LINE	
	EASEMENT	
IRR IRR IRR	IRRIGATION	
FO FO	FIBER OPTIIC	



VICINITY MAP

N.T.S.

ENGINEER

KLAND CIVIL ENGINEERS
7227 N. 16TH ST., STE 217
PHOENIX, AZ 85020
PH: (480) 344–0480
CONTACT: LESLIE KLAND, PE

DEVELOPER

PEG COMPANIES
180 N. UNIVERSITY AVE., STE 200
PROVO, UT 84601
PH: (801) 664–2939
CONTACT: MR. TYLER MAHONEY

ARCHITECT

NELSEN PARTNERS ARCHITECTS & PLANNERS
15210 N. SCOTTSDALES RD., STE 300
SCOTTSDALE, AZ 85254
PH: (480) 949–6800
CONTACT: KELSEY REUST

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

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.

Call at least two full working days before you begin excavation.
ARIZONA 811 Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY WATER AND SEWER PLAN

KLAND CIVIL ENGINEERS
CIVIL ENGINEERING
LAND DEVELOPMENT SERVICES
LAND SURVEYING
7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer
CERTIFICATE NO.
31695
LESLIE J. KLAND
Date Signed 8-7-19
ARIZONA U.S.A.
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PWS1
OF 3

K:\2019\K19113 Papago Plaza Springhill Suites\Dwg\CONCEPT\DR Hotel\113-HOTEL-DRS-WS.dwg

MCDOWELL ROAD

N88°56'24"E 1312.31'

SCOTTSDALE ROAD

BASIS OF BEARING (ASSUMED)

S0°48'46"W 2637.03'

CONNECT TO EXISTING WATER LINE WITH 12"x8" TAPPING SLEEVE, VALVE, BOX AND COVER AS PART OF INFRASTRUCTURE PLAN

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" PUBLIC WATER LINE AS PART OF INFRASTRUCTURE PLAN

CONNECT TO EXISTING WATER LINE WITH 12"x12" CUT IN TEE AS PART OF INFRASTRUCTURE PLAN

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE HYDRANT AS PART OF INFRASTRUCTURE PLAN

NOT A PART

PROP. 20' PUBLIC WATER EASEMENT

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" PUBLIC WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE SPRINKLER FEED AS PART OF HOTEL PLAN

REMOVE THE CAP

NOT A PART

NEW FIRE LINE STUB OUT AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW SEWER CLEANOUT AS PART OF HOTEL PLAN

NEW METER VAULT AND BACKFLOW FOR DOMESTIC USE AS PART OF HOTEL PLAN

NEW WATER SERVICE FOR DOMESTIC USE AS PART OF INFRASTRUCTURE PLAN

MATCHLINE SEE SHEET PWS3

N

20 0 10 20

1 inch = 20 ft.

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

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY WATER AND SEWER PLAN

KLAND
CIVIL ENGINEERS
CIVIL ENGINEERING
LAND DEVELOPMENT SERVICES
LAND SURVEYING
7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
www.klandeng.com

ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer (Civil) CERTIFICATE NO. 31695 LESLIE J. KLAND Date Signed 8.7.19 ARIZONA U.S.A.

Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PWS2
OF 3

K:\2019\K19113 Papago Plaza Springhill Suites\Dwg\CONCEPT\06 Hotel\113-HOTEL-DSR-WS.dwg

MATCHLINE SEE SHEET PWS1

N

20 0 10 20

1 inch = 20 ft.

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW SEWER MANHOLE AS PART HOTEL PLAN

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW 8" SEWER LINE AS PART OF HOTEL PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

FF=32.25

PROP. 20' PUBLIC WATER EASEMENT

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW 8" SEWER LINE AS PART OF HOTEL PLAN

POOL=32.20

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 8" SEWER LINE AS PART OF HOTEL PLAN

NEW SEWER SERVICE AS PART OF HOTEL PLAN

NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

CAP NEW 8" WATER LINE AS PART OF INFRASTRUCTURE PLAN

REMOVE THE CAP

NEW 8" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

PROP. 12' PUBLIC WATER EASEMENT

NOT A PART

NOT A PART

NOT A PART

NEW FIRE HYDRANT AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE HYDRANT AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW 8" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

CAP NEW 8" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

NEW FIRE LINE STUB OUT AS PART OF INFRASTRUCTURE PLAN

NEW WATER SERVICE FOR DOMESTIC USE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER MANHOLE AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE STUBOUT AS PART OF INFRASTRUCTURE PLAN

NEW SEWER SERVICE STUBOUT AS PART OF INFRASTRUCTURE PLAN

NEW 12" PUBLIC WATER LINE AS PART OF INFRASTRUCTURE PLAN

NEW 12"x8" TEE AS PART OF INFRASTRUCTURE PLAN

NEW 12" SEWER LINE AS PART OF INFRASTRUCTURE PLAN

CONNECT TO EXISTING MANHOLE AS PART OF INFRASTRUCTURE PLAN

CONNECT TO EXISTING WATER LINE WITH 8"x8" CUT IN TEE AS PART OF INFRASTRUCTURE PLAN

SCOTTSDALE ROAD

BASIS OF BEARING (ASSUMED)
S0°48'46"W 2637.03'

SKYSONG BLVD

4+00

5+00

6+00

7+00

8+00

Call at least two full working days before you begin excavation.
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K:\2019\K19113 Papago Plaza Springhill Suites\Dwg\CONCEPT\DR Hotel\113-HOTEL-DR-WS.dwg

REVISIONS

PAPAGO PLAZA SPRINGHILL SUITES SCOTTSDALE RD & MCDOWELL RD

PRELIMINARY WATER AND SEWER PLAN

KLAND CIVIL ENGINEERS

CIVIL ENGINEERING

LAND DEVELOPMENT SERVICES

LAND SURVEYING

7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
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ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
CAD TECH: FITZGERALD

Registered Professional Engineer
CERTIFICATE NO.
31695
LESLIE J. KLAND
Date Signed 8-7-19
ARIZONA U.S.A.
Expires 09/30/21

Project No.
K19123

08-07-19

Sheet No.
PWS3
OF 3

APPENDIX A-3: Master Water Basis of Design Report for Scottsdale McDowell

KLAND CIVIL ENGINEERS

Scottsdale
Master Water Basis of Design Report
Scottsdale 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

Expires 09/30/21

Revised August 7, 2019
March 21, 2019

Table of Contents

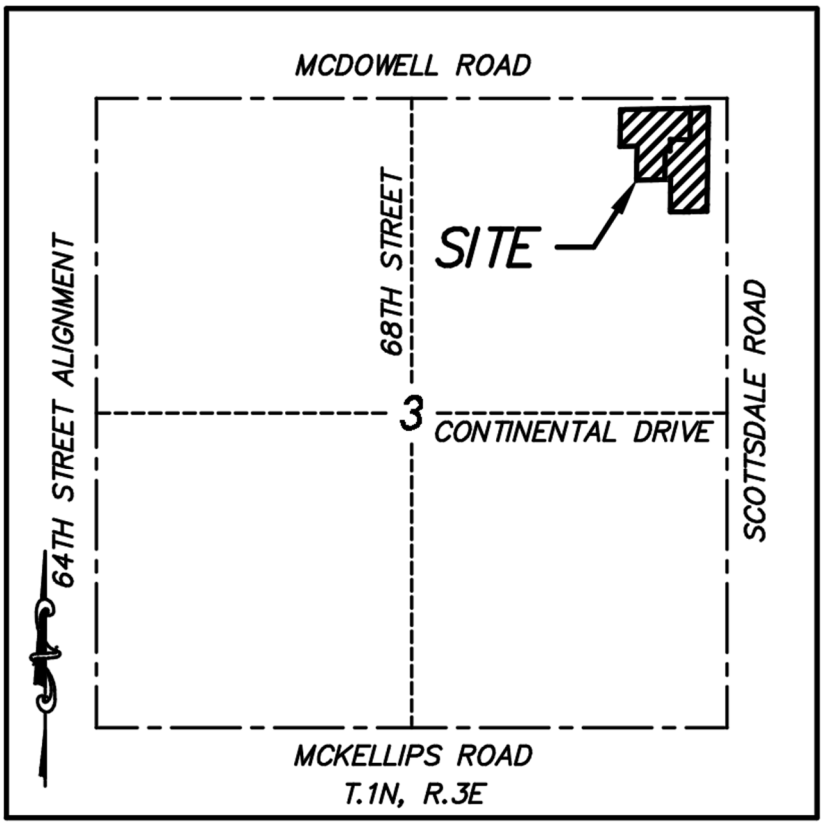
Expires 09/30/21

Revised August 7, 2019

March 21, 2019

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 ¼ 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 development on approximately 5.55 net acres and commercial development on approximately 5.45 net acres. The multi-family development is 274 units in 3 carriage buildings (single apartment above garage) and a single podium style apartment building over ground level parking. A podium style apartment building consists of multiple levels of apartments over a parking garage with amenities on the podium deck. The commercial development is comprised of four 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. There is an existing 8-inch water line on the west side of Scottsdale Road and an existing 12-inch water line on the south side of McDowell Road. The site currently has three water services on McDowell Road and three water services on Scottsdale Road. Some of these existing services will likely be used for landscape and the unused ones will need to be removed. There is also an existing 6-inch fire line service on McDowell Road that will be removed with this development.

WATER SYSTEM

A new 12-inch water main will be installed in Scottsdale Road from the intersection of McDowell Road, south to the south property line of this development. The new 12-inch water main will connect to the existing 12-inch water main in McDowell Road at the intersection of Scottsdale Road and at the southern property limits. The 8-inch existing water main in Scottsdale Road will be removed in the area that the new 12-inch water main is being installed. The existing services including the 12-inch water main in Skysong will be connected to the new 12-inch water main in Scottsdale Road. In order to remove the existing 8-inch water main in Scottdale Road there will be 2 inline valves installed to maintain water service to the existing developments. The first valve will be on the 8-inch water main, south of the 12-inch connection point to the 8-inch water main. This valve will be installed by City of Scottsdale. The second valve will be installed on the existing 12-inch water main in Skysong Boulevard, just west of the meters for the restaurant and will be installed by this development.

The retail and multi-family sites will be serviced with a new 8-inch public water main looping through the site in the access drive. The new 8-inch public water will be contained in a 20-foot public water easement. The 8-inch public water main will connect to the new 12-inch water main in Scottsdale Road and twice to the 12-inch public water main in McDowell Road. The retail development with be services with domestic water and fire sprinklers for either the onsite 8-inch water main or the 12-inch water main in Scottsdale Road. The Hotel and Grocery store domestic water, landscape water services, fire

sprinkler services will be provided from the proposed 8-inch public water main. The existing water meter sizes have been shown on the attached Preliminary Water and Sewer Plan. The existing water services will be removed if they are not utilized for landscape purposes. Any existing water service on Scottdale Road that will be utilized will be reconnected to the proposed 12-inch water main. The existing 6-inch fire line on McDowell Road will also be removed. Fire hydrant coverage is provided by proposed onsite fire hydrants connected to the proposed 8-inch public water main.

We anticipate that the multi-family development will be service by two 3-inch domestic water meters. For the commercial development we anticipate that the Hotel will be service by a 3-inch domestic water meter and the retail/restaurants will each have a 2-inch domestic water meter. Water meter and service sizing will be done by the Plumbing Engineer at the time of final design.

We have also estimated the water demand for the site using The City of Scottsdale Design Standards & Polices Manual. The average daily demand was estimated at 110 gpm. The peak daily demand was calculated by increasing the average daily demand by a factor of 2.0, which is a total of 220 gpm. The peak hour demand was calculated by increasing the average daily demand by a factor of 3.5, which is a total of 385 gpm. The hydraulic capacity analyses based on the demand flow is submitted along with final design package.

With respect to fire flow demand, the most demanding water is the hotel with 71,265 sf and construction type III-B (please see Appendix A-1 for the detailed calculations). Per the 2012 International Fire Code, Appendix B, Section B105.2, the minimum fire flow is 1,500 gpm with the allowable 75% reduction. Water Demand Calculations are provided in Appendix A-1 and Appendix A-2 for the Master Water Exhibit.

REFERENCES

1. City of Scottsdale Design Standards & Policies Manual, 2018.

2. 2012 International Fire Code, Appendix B, Fire-Flow Requirements for Buildings

APPENDIX A-1: Water Calculations

Water Demand by Type

Number of Apartment Units:	274 at 227.6 gpd/unit
Number of Hotel Rooms:	116 at 446.3 gpd/room
Area of Restaurant:	17,018 sf at 1.3 gpd/sf
Area of Retail:	27,600 sf at 0.8 gpd/sf

Average Day Demand

Apartments:	274 x 227.6 = 62,362.4 gpd
Hotel:	116 x 446.3 = 51,770.8 gpd
Restaurant:	17,018 x 1.3 = 22,123.4 gpd
Retail:	27,600x 0.8 = 22,080 gpd
Total:	**158,336.6 gpd (109.96 gpm)**

Maximum Day Demand

Maximum daily peaking factor:		2.0
Total:	**2.0 x 158,336.6 gpd**	**= 316,673.2 gpd (219.91 gpm)**

Peak Hour Demand

Peak hour demand factor:		3.5
Total:	**3.5 x 158,336.6 gpd**	**= 554,178.1 gpd (384.85 gpm)**

The plumping engineer will size the water meters to meet IPC fixture unit demands at the time of construction document preparation. In addition, a separate landscape meter will be installed for landscape needs.

<u>FIRE FLOW DEMAND - For Retail</u>

Hotel Building – 5 Story

Area = 71,265 sf, Construction Type = III-B, Required Fire Flow = 5,750 gpm

Grocery Building – 1 Story

Area = 20,400 sf, Construction Type = V-B, Required Fire Flow = 3,750gpm

Retail/Restaurant Building – 1 Story

Area = 7,200 sf, Construction Type = V-B, Required Fire Flow = 2,250gpm

FIRE FLOW DEMAND - For Multi-Family

Building 1 (Carriage Units) – 2 Story

Area = 4,060 sf, Construction Type = V-B, Required Fire Flow = 1,750 gpm

Building 2 (Carriage Units) – 2 Story

Area = 4,144 sf, Construction Type = V-B, Required Fire Flow = 1,750 gpm

Building 4 (Garage for Apartments) – 1 Story

Area = 112,887 sf, Construction Type = I-A, Required Fire Flow = 3,750 gpm

Building 5 – 4 Story

Area = 57,955 sf, Construction Type = V-A, Required Fire Flow = 4,250 gpm

Building 6 – 4 Story

Area = 91,833 sf, Construction Type = V-A, Required Fire Flow = 5,500 gpm

Building 7 – 4 Story

Area = 93,799 sf, Construction Type = V-A, Required Fire Flow = 5,500 gpm

Building 8 – 4 Story

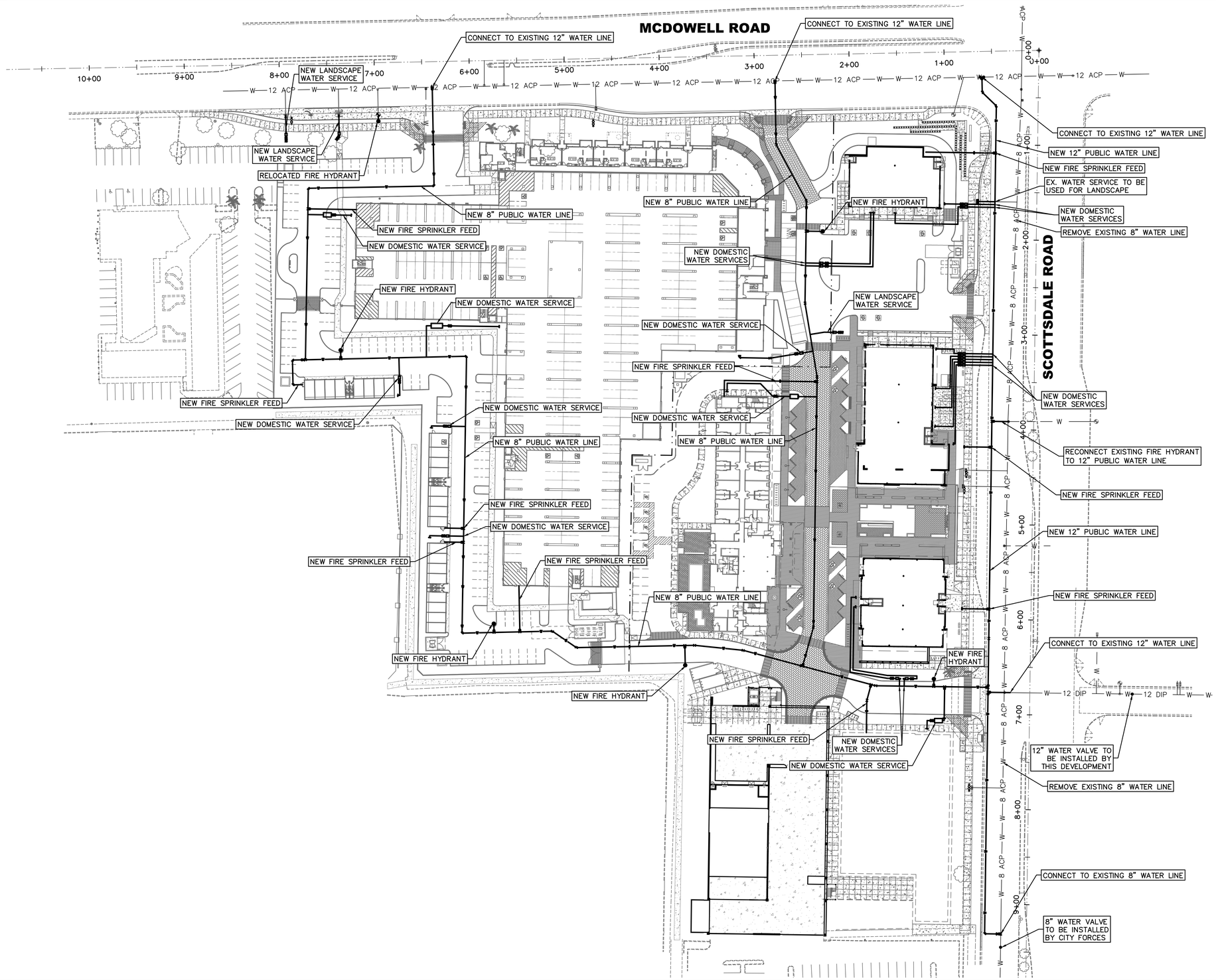
Area = 54,688 sf, Construction Type = V-A, Required Fire Flow = 4,250 gpm

Per 2012 International Fire Code, Appendix B, Section B105.2 a 75% reduction in the fire flow can be approved if an approved automatic sprinkler system is installed. The resulting fire flow shall not be less than the required minimum of 1,500 gpm. All buildings in this development will be provided with an automatic fire sprinkler system. The largest fire flow required is 5,750 gpm for the Hotel. Based on the 75% fire flow reduction the fire flow would be 1437.5 gpm. Therefore, the minimum 1,500 gpm fire flow is required.

To examine the existing fire system, a flow-pressure fire hydrant test was conducted by EJ Flow Tests LCC on the existing fire hydrant in E McDowell Road. According to the raw flow test results, the static pressures was 86.0 with a residual pressure of 78.0 PSI flowing 2,252 GPM. The results from the fire flow test were put into the Anvil Fire – Flow Test Graph to determine the residual

pressure at the fire flow demand. The Anvil Fire - Flow Test Graph provides a N1.85 Logarithmic Graph based on NFPA 291 recommendations. Based on the Anvil Fire - Flow Test Graph a fire flow demand of 1500 gpm results in a residual pressure of 82 psi. See attached fire flow test result and Anvil Fire – Flow Test Graph included in this report. The resulting 82 psi was then converted to head (ft), see attached for conversion. This equates to a pressure head of 189 ft. To model the system Bentley WaterCAD V8 XM Edition was used. The proposed system was modeled using a reservoir with the head elevation applied at the connections to the existing public water main. All minor friction losses due to fittings were included in the analysis. Per modelling results, the proposed system has the required capacity to service the site with a demand fire flow of 1500 gpm. Please see the following documents for the detailed test results and model.

APPENDIX A-2: Master Water Exhibit



N

50 0 25 50

1 inch = 50 ft.

REVISIONS

SCOTTSDALE RD AND MCDOWELL

MASTER WATER EXHIBIT

KLAND
CIVIL ENGINEERS

CIVIL ENGINEERING

LAND DEVELOPMENT SERVICES

LAND SURVEYING

7227 N. 16th St. Suite 217
Phoenix, Arizona 85020
PHONE: (480) 344-0480
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ENGINEER: L. KLAND
DESIGNER: T. M. ZADEH
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Registered Professional Engineer (Civil)
CERTIFICATE NO.
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LESLIE J. KLAND
Date Signed 8-7-19
ARIZONA
Expires 09/30/21

Project No.
K17127

08-07-19

Sheet No.
MWE1
OF 1

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In Maricopa County: (602) 263-1100

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