

Lake Mary Housing Public Water & Sewer Impact Analysis

**13.96+/- Acre Development
Project**

Analysis Completed August 11, 2022

Public Water & Sewer Impact Analysis

Prepared by Civil Design & Engineering, Inc., for The City of Flagstaff Water Services

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I. INTRODUCTION

The Lake Mary Housing project is a medium to high-density housing project located south of the intersection of SJ Diamond Road and Lake Mary Road. The project is located on Coconino County parcel 115-03-001A, which is in Section 3, Township 20N, Range 7E of the Gila and Salt River Base & Meridian (See Figure 1).

The proposed development lies within the City of Flagstaff urban growth boundary and can be served by City water and sewer utilities.

The Lake Mary Housing project Site Plan (Exhibit 1) was provided to the City by Civil Design & Engineering, Inc., (CD&E) and has been used as the basis for this preliminary analysis.

The criteria used herein to estimate the project's water demand is from the City of Flagstaff Engineering Design Standards (COF EDS), Chapter 13-09, effective October 2017. This Water and Sewer Impact Analysis (WSIA) is considered valid for two years from its completion date, which is 8/11/2022.



Figure 1 – Vicinity Map. Not to scale.

II. ANALYSIS SUMMARY

On-site modifications:

Sewer: It is assumed that there is currently no infrastructure in the ground to support this development, so all systems will have to be designed and built. Sewer service to all adjacent homes and businesses must be maintained during construction and tapping for this project.

Water: It is assumed that there is currently no infrastructure in the ground to support this development, so all systems will have to be designed and built. Water service to all adjacent homes and businesses must be maintained during construction and tapping for this project.

Off-site modifications:

Sewer: Currently there is infrastructure near the corner of JW Powell Blvd and Lake Mary Road. The project shall extend an 8" PVC sewer to a high point located between the project and this intersection to City of Flagstaff Standards. This extension would require about 3,030 linear feet of additional sewer pipe beyond that which exists. The project will then build a privately owned and operated pressure sewer from the project site to the gravity sewer at the highpoint. This pressure sewer is about 2,900 linear feet. Tapping the sewer manhole should be done according to City of Flagstaff Standards.

Water: Currently there is infrastructure along Lake Mary Road that will serve this project. The existing infrastructure is a dead-end line that will not produce enough water for the proposed improvements. Therefore, the developer will need to loop their on-site water system back to the Lake Mary Treatment Plant. The tap for this extension should be located 10' north of the gate valve on the 30" main that leaves the treatment plant. The water line extension shall be ~4375 linear feet and consist of 8" diameter C-900 PVC pipe, complete including all appurtenances. This extension and tapping of the waterline should be done according to City of Flagstaff Standards.

III. WATER SYSTEM ANALYSIS

A. EXISTING WATER SYSTEM

Currently, some public water infrastructure exists near the property. The site plan provided by CD&E shows the project extending the 8" main in Lake Mary Road around and through the site and back to the Lake Mary Treatment Plant. These mains fall within

the City of Flagstaff pressure Zone 'B'. The pressures on-site will not require the developer to install pressure-reducing valves after the meter.

There is an 8" Asbestos Cement Zone B waterline under Lake Mary Road. The waterline transitions to a 6" pipe before heading west along Frontier Ave. The Site Plan shows a portion of this 6" pipe being re-aligned and replaced for the looping of the system. It is the developer's responsibility to replace this with the minimum 8" diameter pipe. The buildings on this development could have multiple stories with water and sewer fixture heights up to 60 feet above ground level (according to current High-Density Residential and Table 10-40.30.040.C). This analysis provides the water pressure at ground level. After grading is complete and upper finished floor elevations are established, an analysis should be performed by the Architect/Engineer (A/E) to verify adequate pressure throughout the project.

B. PROPOSED WATERLINE EXTENSIONS

The site plan provided by CD&E proposes extending an 8" waterline through the site and providing a separate private domestic waterline. The 4" fire sprinkler lines and seven 6" fire hydrant lines will come off the 8" waterline through the site. CD&E's plan also shows a new 6" hydrant along the frontage. The buildings will each be served with the private domestic waterline and a 4" sprinkler line. The 8" line is shown to be in a 20' PUE.

C. WATER SYSTEM DEMANDS

The following quantifies the anticipated water demands for the project.

Water System Demand

Population = 202 units x 2.5 ppl/bed = 505 ppl

Average Population Demand = 505 ppl X 75 gpcd = 37,875 gpd

Peak Population Demand = 505 ppl X 250 gpcd = 126,250 gpd

Fire Flow Demand = 1,500 gpm

D. WATER SYSTEM ANALYSIS RESULTS

Bentley WaterGEMS software was used for simulations of peak daily and fire flow.

The analysis area used was based on the area estimated to be impacted by the proposed Lake Mary Housing development and includes both junction demand nodes possibly impacted by the additional demands and locations that may need to supply fire flows. This area spans approximately 3,800' northeast to include every node south of the Lake Mary Treatment Plant. See Exhibit 4.

Results of the computer analysis (Appendix A) for peak daily flow indicate a range in pressures off-site in the project vicinity from 67.53 psi (J-230) to 88.49 psi (J-7464). The rest of the nodes are consistent given the elevations of the junction nodes within the analyzed boundary. The junctions J-214 to J-230 were set to the existing contour elevations shown on the site plan. J-230, the highest elevation of the on-site junctions, showed a pressure of 67.53 psi, whereas J-7464 is higher in elevation at 6929.48. The peak daily flow condition yields a pressure on the project site of 67.53 psi. This project meets the minimum pressure requirements stated in the City of Flagstaff Engineering Standards. The pressure associated with peak domestic flows, 83.57 psi, occurs at junction J-230, which is above the City Engineering Standards' minimum pressure of 40 psi (COF EDS 13-9) and above the 80 psi pressure that requires a pressure-reducing valve.

Based on the computer simulation of fire flow, residual pressures in the project vicinity are projected to remain above 20 psi (COF EDS 13-9) or higher during fire flow scenarios of 1000 gpm or less. 1000 gpm is necessary for the surrounding uses which are mostly single-family residential. The subject parcel requires a higher flow rate of 1500 gpm. The nodes inside the project and immediately surrounding the project also meet the requirement of 1500 gpm. The only hydrant that does not produce the required 1000 gpm for its area is the hydrant located at the end of Frontier Avenue (J-8328). In a pre-development condition, this hydrant produced 599.04 gpm. After the proposed improvements, this hydrant will produce 902.66 gpm. This is an improvement that will result from the improvements proposed.

It is the developer's responsibility to design, acquire adequate right-of-way for, and construct all on-site and connecting water infrastructure per all applicable City, State, and Federal rules and regulations.

IV. SEWER SYSTEM ANALYSIS

A. EXISTING SEWER SYSTEM

The sewer line that flows northwesterly along Lake Mary Road, turns at a manhole near the corner of JW Powell Blvd and services the airport. Manhole 6-162 is the closest point of connection to the project. The downstream sewer is a 10" VC line. The effluent is then carried northwesterly along Lake Mary Road until it flows through the Bow and Arrow neighborhood to Zuni Dr., where it eventually reaches the Rio De Flag Skimming Plant. The sewer line information is based on the City of Flagstaff GIS (Geographic Information System) data. See Exhibit 3. The site plan provided by CD&E illustrates the developer's plan to use this sewer line. See Exhibit 1. Connecting to this sewer main will require the developer to get the necessary utility access.

For this analysis, using the City of Flagstaff SewerCAD model, we considered that the developer has proposed that the flow from this project will be collected in a pipe that flows to manhole 6-235. For this analysis, the flows from the project will be added to manhole 6-235. See Exhibit 6.

According to the City of Flagstaff's Biosolids Master Plan developed by Carollo in 2019, the City's wastewater treatment capacity for both treatment plants combined is 6.3 MGD average daily flow based on current conditions and configurations. Average daily flows for both plants measured 5.404 MGD for the calendar year 2021. The remaining treatment capacity of both plants combined has been previously committed. The City is creating additional wastewater treatment capacity currently scheduled for completion by the end of 2024. The wastewater treatment capacity reservations in this WSIA are contingent on the successful construction of improvements for additional capacity.

B. PROPOSED SEWER SYSTEM EXTENSIONS

The project shall extend an 8" PVC sewer line for future connections to a high point located between the project and the manhole located near JW Powell. This shall be done in accordance with City of Flagstaff Standards. This extension would require about 3,030 linear feet of additional sewer pipe beyond the previously described manhole. The subject parcel will use a lift station and pressure sewer system to get their sewage to this high point. The entirety of this system must be privately owned and operated, and comply with all state and federal requirements. The developer is responsible to obtain the necessary property rights and permits to construct and maintain the private pressure sewer system. The developer is also responsible to obtain the necessary property rights and permits to construct the gravity sewer system.

The proposed on-site sewer system was not analyzed as a part of this report and shall be addressed by the A/E as part of their design for their project. The A/E's engineering analysis and design shall be consistent with the requirements called out in the City of Flagstaff Engineering Standards.

C. SEWER SYSTEM FLOWRATES

The following criteria were utilized in determining the anticipated wastewater generation for this project.

Sewer System Design Flows

Population = 202 units x 2.5 ppl/unit = 505 ppl

Average Population Demand = 505 ppl X 75 gpcd = 37,875 gpd

Peak Population Demand = 37,875 x 2.61 P.F. = 98,854 gpd

D. SEWER SYSTEM ANALYSIS RESULTS

In the SewerCAD model prepared for this evaluation, the sewer design flows were applied to manhole 6-235. These total design flows from the Lake Mary Housing project will yield a peak-day flow increase of 98,854 gallons per day (0.099 MGD).

The capacity of the existing collection system downstream of this project is adequate to convey the existing and proposed flow rates and maintain the City's required d/D pipe capacity ratio (expressed as a percentage) at less than 70%. See Appendix C.

V. CONCLUSIONS & REQUIREMENTS

Sewer and water service to all adjacent homes and businesses must be maintained during construction and tapping for this project.

The findings of this analysis indicate that the completion of the project will comply with public water and sewer infrastructure requirements as outlined in the current City of Flagstaff Engineering Standards as long as all on-site and off-site infrastructure is

designed and constructed per the Engineering Standards and as stipulated herein. All new service connections to the City water and sewer infrastructure are required to pay capacity fees for the new connection to the public water and sewer system. Deviations from the intent shown on the developer's provided preliminary drawings, and/or further development beyond what was shown on the preliminary drawings will require additional review and must gain full IDS (Inter-Division Staff) Approval. It should be noted that the City of Flagstaff Engineering Standards (Chapter 13 of the City of Flagstaff Code) is the only document used for this analysis. This WSIA does not guarantee conformance to any other codes, standards, or specifications similar to, but not limited to, IBC, IFC, IRC ...etc.

The location(s) of any required fire hydrants related to this project is (are) left to the discretion of the City of Flagstaff Fire Department per City of Flagstaff Engineering Standards and current Fire Codes. Approval by the City Engineer shall also be obtained.

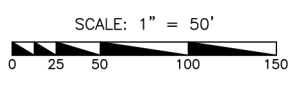
Water and Sewer computer analyses were done with Bentley Systems WaterGEMS and SewerCAD software. The existing City of Flagstaff master water and sewer models were modified to incorporate the estimated infrastructure and flows that will be required by this development.

All existing utility information is based on the City of Flagstaff GIS data and other information contained within the WaterGEMS & SewerCAD master models or provided by the City of Flagstaff engineering staff. The developer's A/E should confirm the City water system supply and wastewater collection system pipe sizes, materials, and locations as part of their design for connection to the COF water and sewer systems.

If the developer changes their plans for development resulting in changes to development size, area of commercial space, number or type of residential units, population, etc., that could render invalid the assumptions made as a basis for the forecasts made in this Water and Sewer Impact Analysis. If such changes are made, then the developer must apply for an updated analysis and provide the proposed changes to the City of Flagstaff for review and consideration. The developer has communicated a proposed completion of December 2024, at which time the City anticipates sufficient wastewater treatment capacity for this development. If the scheduled completion is changed to an earlier date, Water Services must be notified and adequate capacity must be confirmed prior to building permit approval.

This WSIA is considered valid for two years from its completion date, 8/11/2022, which is the date of the engineer's seal on the cover sheet and table of contents of this WSIA.

All water and sewer utility lines and treatment plant capacity reservations as a result of this study will expire at that time. This WSIA will function as a place holder for the developer. The capacity assurances discussed within this report will be provided by the City for 2 years. At which time the developer will need to have applied for a building permit or will be removed from the list of assured capacity. If this project is removed from the capacity assurance list, the developer will need to re-apply for capacity assurance by getting a new WSIA.



LEGEND

- PROPERTY LINE
- EXISTING PAVEMENT
- EXISTING OVERHEAD UTILITY
- EXISTING DIRT ROAD
- PROPOSED PUBLIC 8" WATERLINE WITH 20' EASEMENT
- PRIVATE 4" DRINKING WATERLINE AFTER 3" METER
- PROPOSED FIRE HYDRANT ON 6" LINE
- PROPOSED F.D.C.

LAKE MARY HOUSING
ATLANTIC DEVELOPMENT & INVESTMENTS, LLC.
 ASSESSOR'S PARCEL NUMBER 115-03-001A
 4631 S. LAKE MARY ROAD
 FLAGSTAFF, AZ 86005

OWNER/DEVELOPER:	ATLANTIC DEVELOPMENT & INVESTMENTS, LLC. 15057 N. 81ST STREET ste.101 SCOTTSDALE, AZ 85260 MARK BREEN 480-256-0506 mbreen@atlanticdev.com
CONTACT:	CIVIL DESIGN & ENGINEERING 618 E. ROUTE 66 FLAGSTAFF, AZ 86001 RYAN MAHAR 928-522-9287 r.mahar@cdeinc.org
ARCHITECT:	BILTFORM ARCHITECTURE GROUP, LLC. 11460 N. CAVE CREEK ROAD, ste.11 PHOENIX, AZ 85020 JIM APPEGATE 602-285-9200 jim@biltform.com

- PRESSURE SEWER NOTES:**
- [CITY CODE 13-09-002-0012 PRIVATE PRESSURE SEWER MAINS AND SERVICES: (B.) PRIVATE PRESSURE SEWER SYSTEMS, INCLUDING INDIVIDUAL PRESSURE SEWER SERVICES ARE NOT ALLOWED UNLESS APPROVED BY THE UTILITIES DIVISION AND THE CITY ENGINEER. OFF-SITE EXTENSIONS OF THE PUBLIC SYSTEM IN ORDER TO PROVIDE GRAVITY SERVICE MAY BE REQUIRED. SHOULD A PRIVATE SYSTEM BE ALLOWED, THE FOLLOWING CRITERIA SHALL BE ADDRESSED PRIOR TO PLAN APPROVAL:
 - A PROVISION FOR CONTINUED OPERATION BY THE APPROPRIATE CLASS OR GRADE OPERATOR AS REQUIRED IN AAC R18-05-114.
 - A PROVISION FOR SCHEDULED ROUTINE OPERATION AND MAINTENANCE BY QUALIFIED PERSONNEL AND AN OPERATION AND MAINTENANCE MANUAL APPROVED BY ADEQ.
 - AN EMERGENCY SPILL PREVENTION AND RESPONSE PLAN SHALL BE KEPT AT THE SITE AND INCLUDE PROVISIONS FOR TWENTY-FOUR (24) HOUR RESPONSE AND MITIGATION BY QUALIFIED PERSONNEL.
 - IN ACCORDANCE WITH AAC R18-9-E301, SEWER COLLECTION, FORCE MAINS, AND LIFT STATIONS HAVING THE DESIGN FLOW OF TEN THOUSAND (10,000) GPD OR MORE SHALL MAINTAIN AND REVISE, WHEN NEEDED, AN OPERATION AND MAINTENANCE PLAN AT THE OPERATOR'S CONTROL CENTER (OFFICE) AND THE APPROPRIATE FIELD PERSON'S VEHICLE.
 - WHEN A LIFT STATION IS INSTALLED AS AN INTERIM CONDITION UNTIL THE FUTURE EXTENSION OF A GRAVITY MAIN, THE DEVELOPER SHALL PAY TO THE CITY UTILITIES DIVISION THE ESTIMATED COST OF DECOMMISSIONING AND REMOVING THE LIFT STATION AND CONNECTING TO THE GRAVITY MAIN. (ORD. 2017-22, REP&REEN, 07/05/2017)]

- NOTES:**
- SEWER LIFT STATION WILL BE PRIVATELY OWNED AND OPERATED BY THE OWNER. THE PRESSURIZED SEWER SYSTEM WILL TRAVEL ALONG LAKE MARY ROAD TO A MANHOLE LOCATED APPROXIMATELY MIDWAY BETWEEN MARY ROAD AND J.W. POWELL BLVD. A GRAVITY SEWER WILL BE CONSTRUCTED FROM THAT LOCATION TO THE CONNECTION POINT NEAR THE J.W. POWELL INTERSECTION. THE GRAVITY PORTION OF SEWER WILL BE DEDICATED TO THE CITY OF FLAGSTAFF.
 - ONSITE WATER SYSTEM WILL CONNECT TO EXISTING 8" WATERLINE IN LAKE MARY ROAD EASEMENT AND TO A PROPOSED LINE IN LAKE MARY ROAD EASEMENT TO LOOP ENTIRE WATER SYSTEM BACK TO LAKE MARY WATER TREATMENT PLANT.
 - PASSIVE RAIN WATER HARVESTING WILL BE IMPLEMENTED VIA NATIVE DROUGHT TOLERANT PLANTS.
 - THERE ARE NO KNOWN NATURAL FEATURES OR DRAINAGE COURSES ON-SITE. THE MAJORITY OF ONSITE FLOWS ARE SHEET FLOW OR SHALLOW CONCENTRATED FLOW IN THE EXISTING UNDEVELOPED CONDITION.
 - THE PROPOSED DRAINAGE PLAN WILL TREAT ROOF FLOWS VIA SMALL BIO RETENTION BASINS THROUGHOUT THE SITE. THE OFF-SITE FLOWS WILL BE CAPTURED VIA STORMWATER INLETS LOCATED NEAR FRONTIER AVENUE. THE OFFSITE AND TREATED FLOWS WILL BE CARRIED TO A DETENTION BASIN AT THE NORTHERN CORNER OF THE SITE. THIS BASIN WILL DISCHARGE SIMILAR TO THE HISTORIC CONDITION VIA OUTLET STRUCTURE AND STILLING BASIN.
 - A STORMWATER IMPACT ANALYSIS WILL BE PROVIDED TO THE CITY OF FLAGSTAFF PRIOR TO SITE PLAN SUBMITTAL.



CIVIL DESIGN & ENGINEERING, INC.
 PHONE (602) 438-2700
 PHOENIX, ARIZONA 85022
 14001 N. 7th St. Suite C-106
 P.O. BOX 30836
 PHOENIX (928) 522-9287
 FLAGSTAFF, ARIZONA 86001-0810

CONCEPT STORMWATER AND UTILITY PLAN
 ATLANTIC DEVELOPMENT & INVESTMENTS, LLC.
 ASSESSOR'S PARCEL NUMBER 115-03-001A
 4631 S. LAKE MARY ROAD
 FLAGSTAFF, AZ 86005

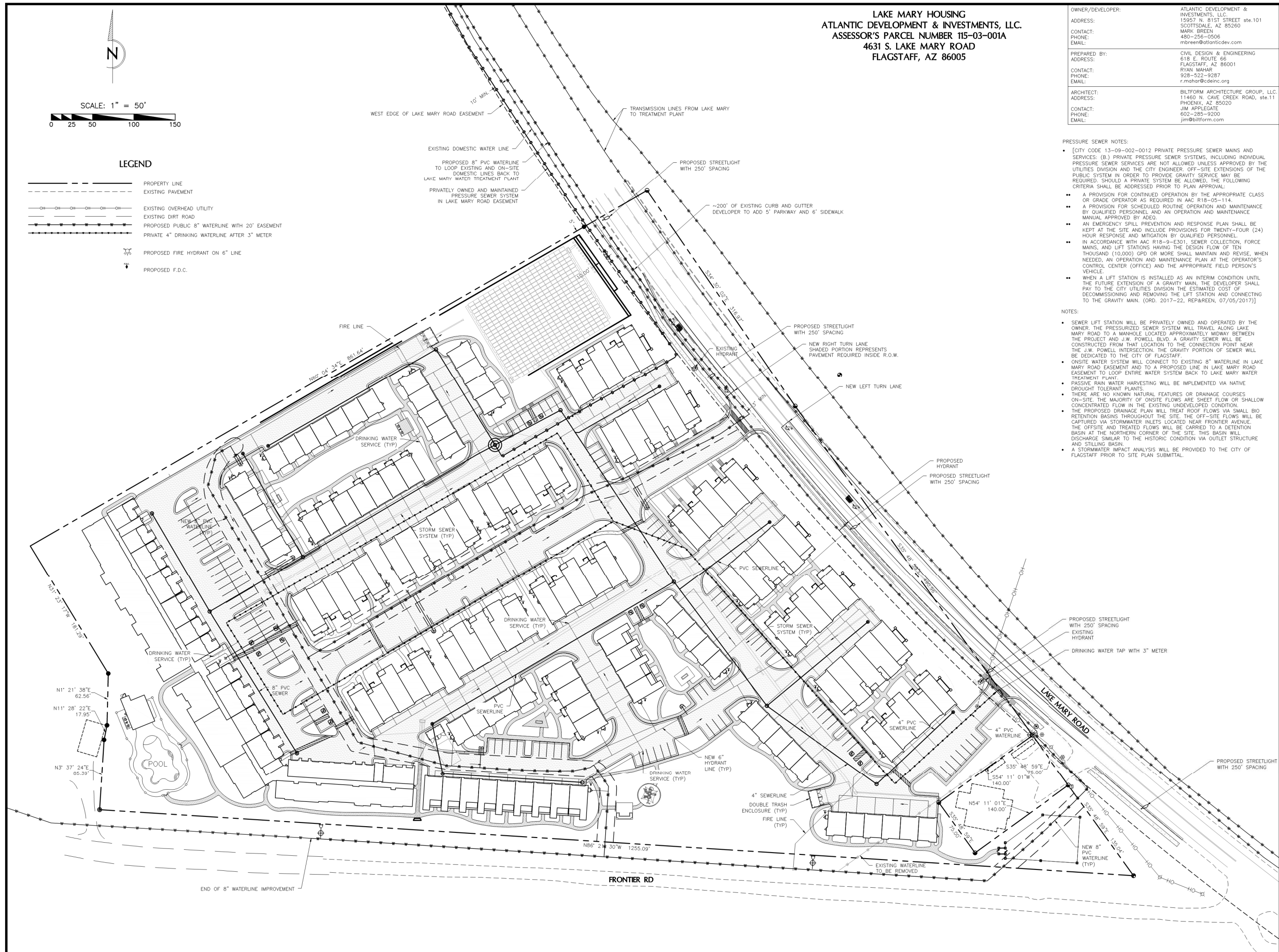
**PRELIMINARY
 NOT FOR
 CONSTRUCTION
 RECORDING**



project: LAKE MARY 14c
 proj. #: 21-037
 drawing name: SITE PLAN.dwg
 drawn by: RM
 reviewed by: RM
 date: 6/14/22
 review #:

revisions:

EXHIBIT 1



City of Flagstaff - Utilities Department

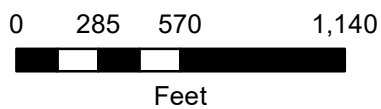
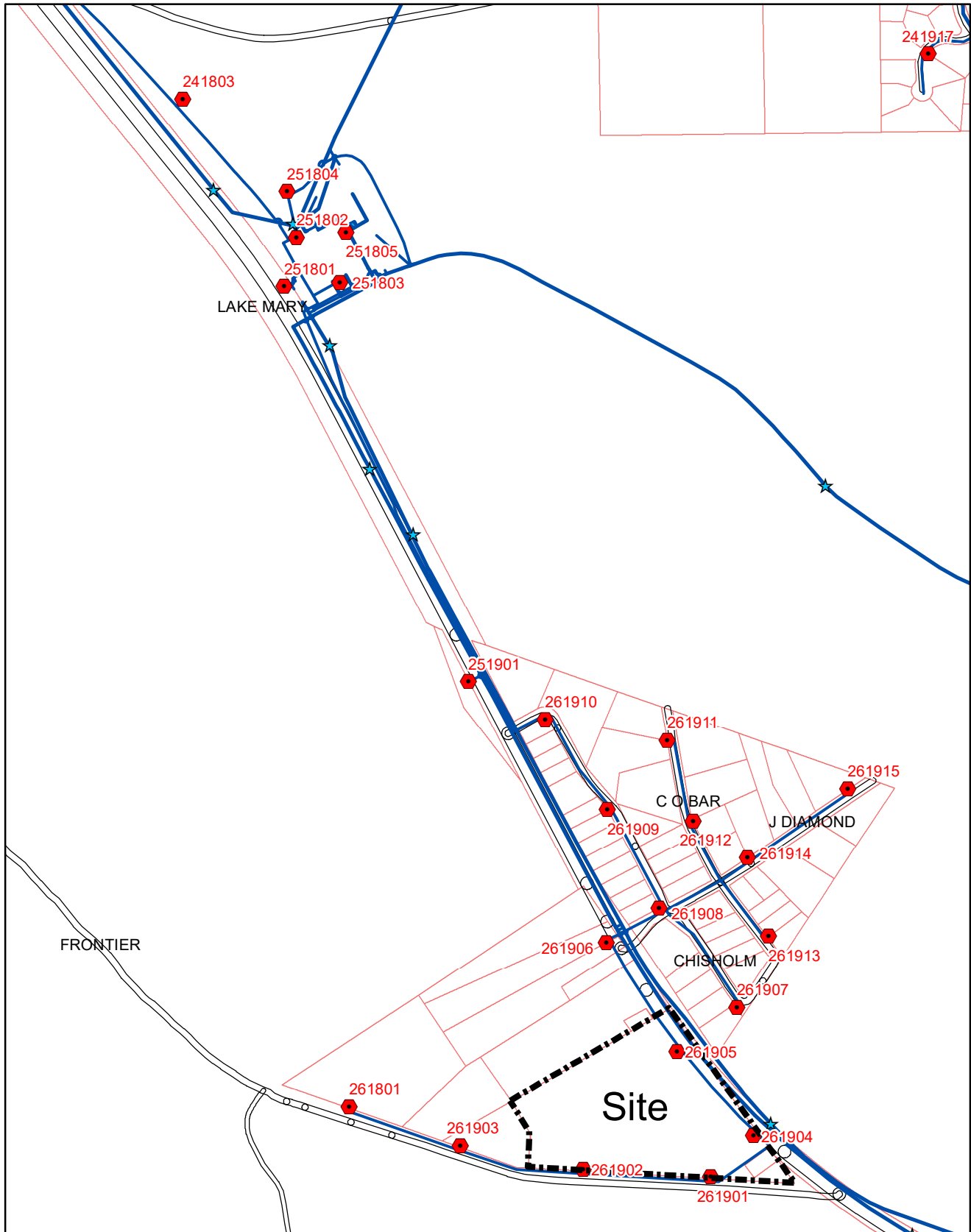


Exhibit 2 - GIS Water Map

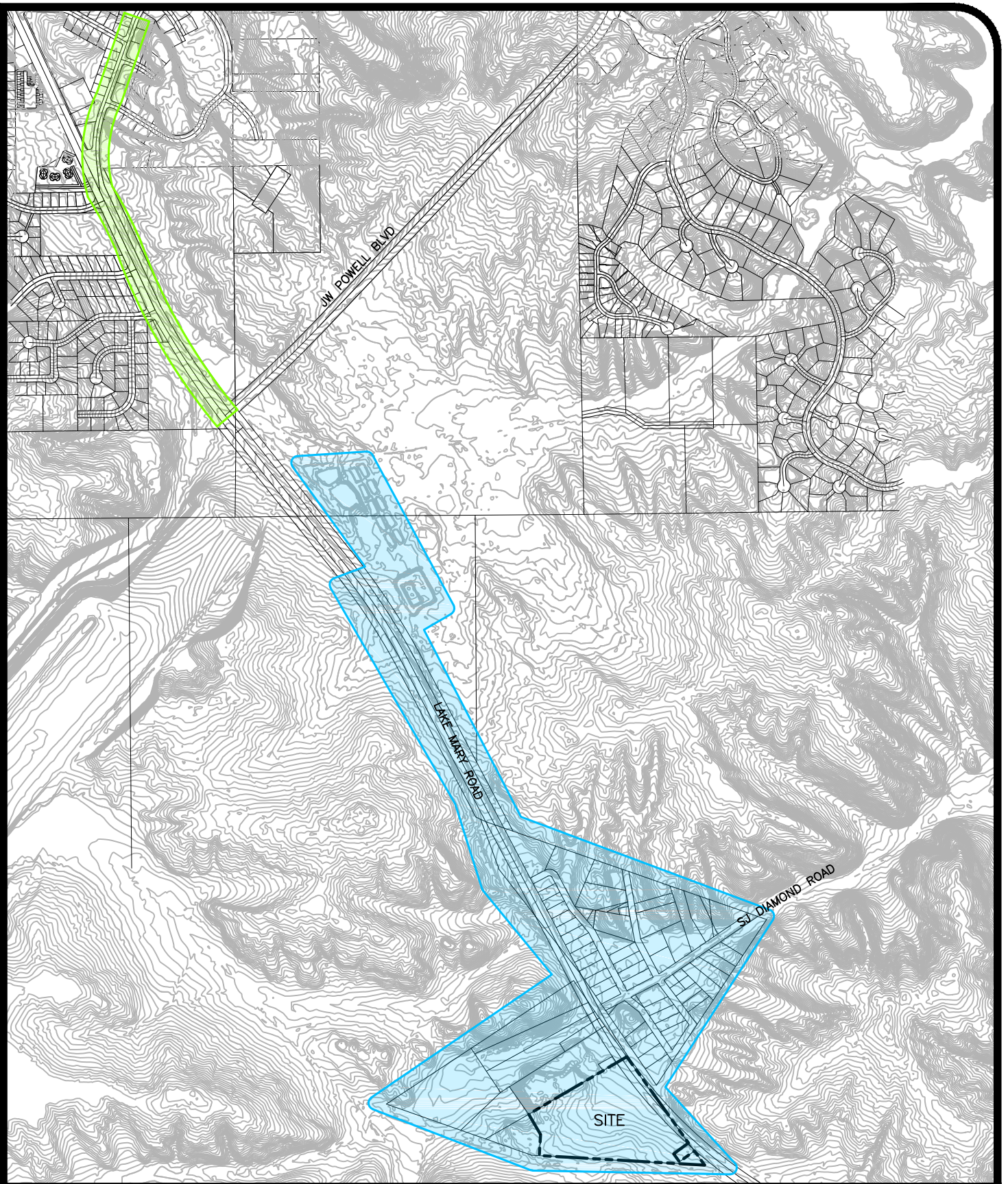


EXHIBIT 4 - ANALYSIS AREA

SCALE: 1" = 1000'



WATERGEMS ANALYSIS AREA



SEWERCAD ANALYSIS AREA



ENGINEERING • SURVEY

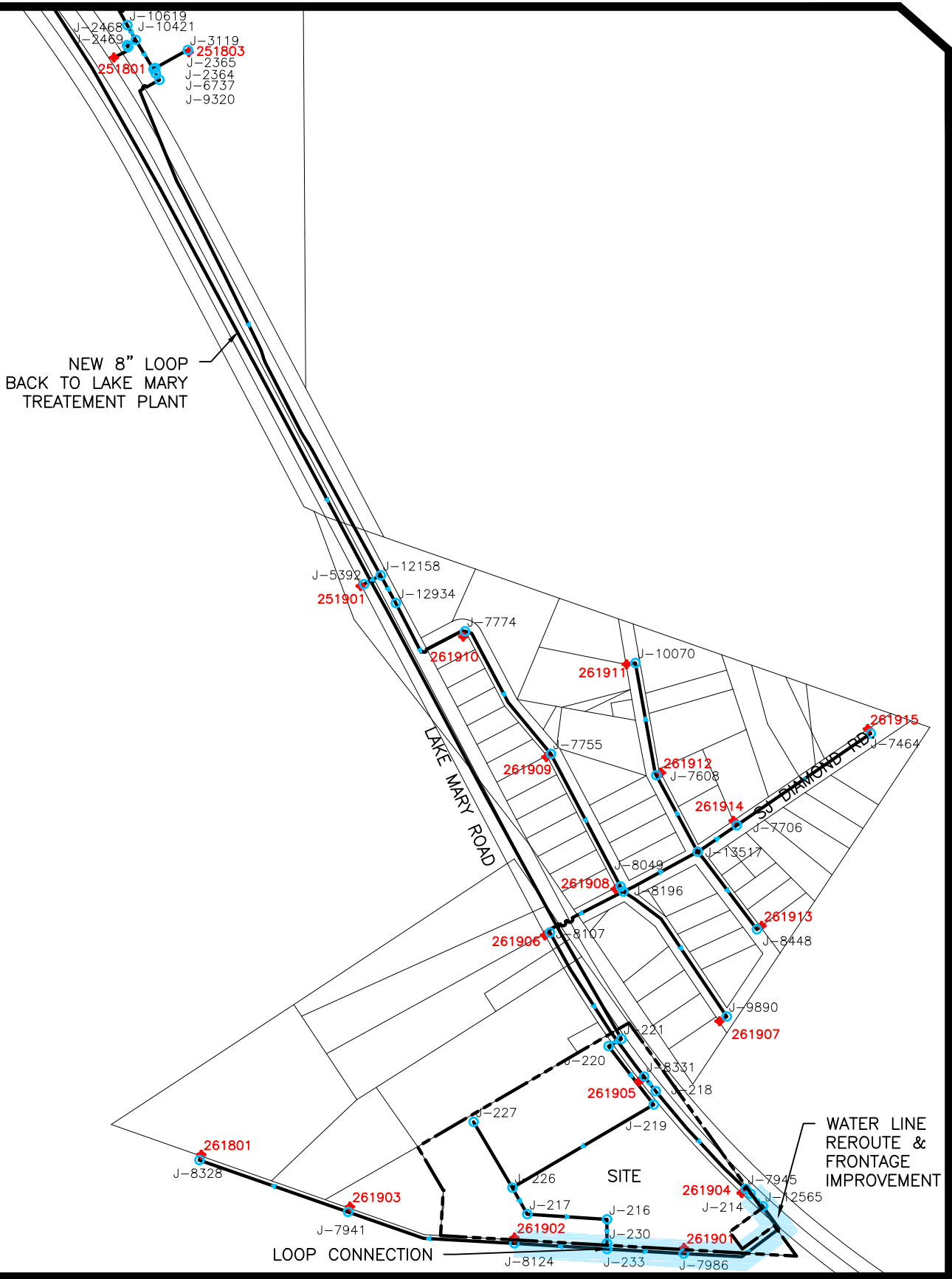


EXHIBIT 5 – WaterGEMS Analysis

SCALE: 1" = 500'



ENGINEERING • SURVEY

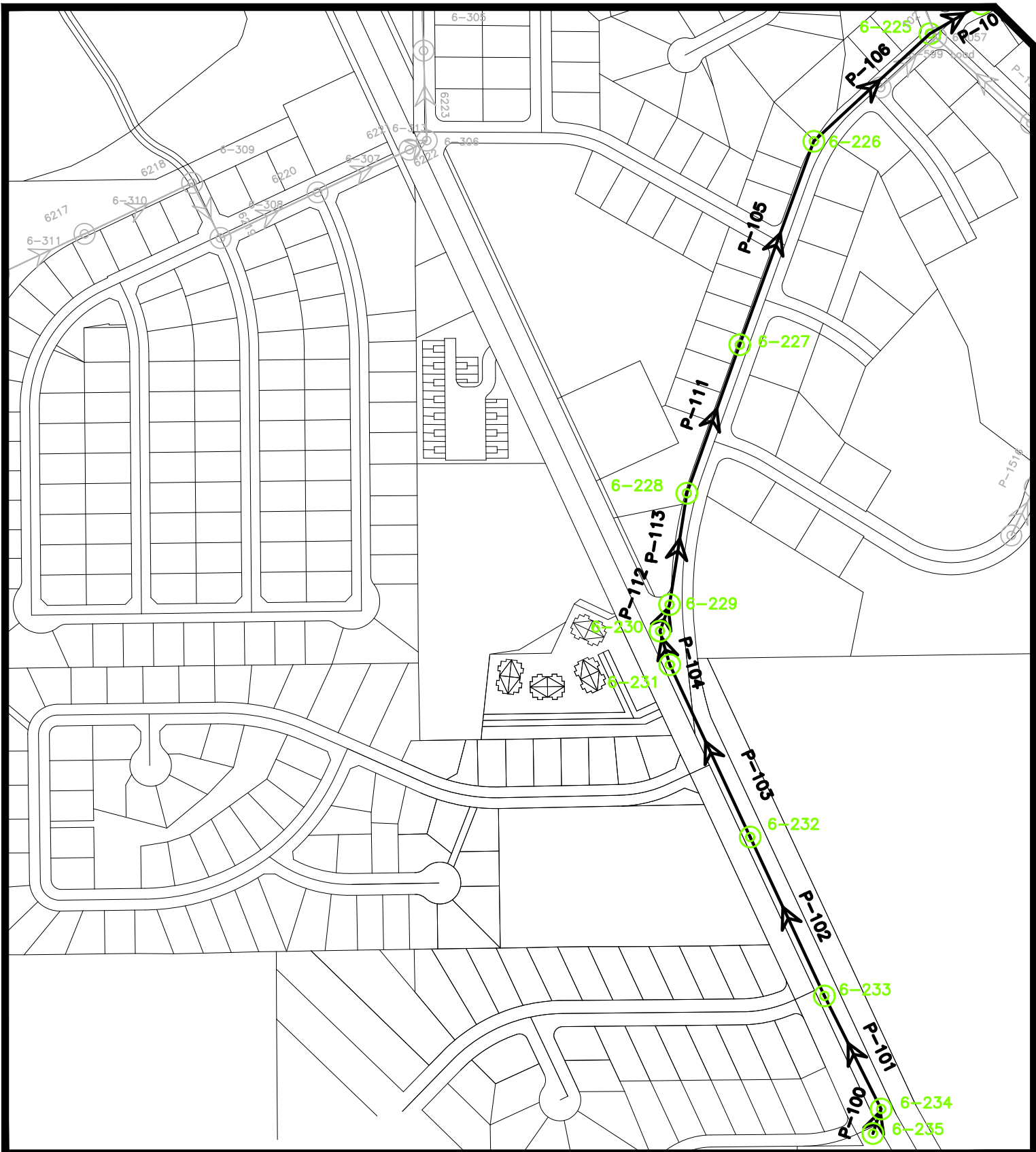


EXHIBIT 6 - SewerCAD Analysis

SCALE: 1" = 300'



ENGINEERING ■ SURVEY

**Lake Mary Housing
Peak Day Domestic Flows and Pressures**

Label	Elevation (ft)	Zone	Demand (gal/min)	Pressure (psi)	Hydraulic Grade (ft)
J-230	6977.90	B	0.00	67.53	7133.97
J-8124	6974.15	B	0.07	69.15	7133.97
J-227	6972.81	B	0.00	69.74	7134.00
J-233	6971.34	B	0.00	70.36	7133.97
J-216	6970.00	B	0.00	70.95	7133.98
J-217	6970.00	B	0.00	70.95	7134.00
J-7986	6968.99	B	0.00	71.37	7133.96
J-7941	6966.45	B	0.22	72.48	7133.97
J-9320	6966.45	B	0.00	72.63	7134.32
J-226	6962.88	B	0.00	74.04	7134.00
J-5392	6959.51	B	0.28	75.55	7134.14
J-12565	6957.57	B	0.36	76.30	7133.93
J-223	6957.43	B	0.00	76.53	7134.33
J-214	6956.94	B	87.67	76.57	7133.93
J-7945	6956.30	B	0.00	76.85	7133.93
J-12158	6955.78	B	0.00	77.17	7134.14
J-222	6955.00	B	0.00	77.59	7134.32
J-220	6953.00	B	0.00	78.33	7134.05
J-221	6953.00	B	0.00	78.34	7134.06
J-219	6952.73	B	0.00	78.44	7134.04
J-8328	6952.61	B	3.59	78.47	7133.97
J-12934	6952.49	B	0.59	78.59	7134.13
J-218	6950.78	B	0.00	79.25	7133.96
J-8331	6950.00	B	0.00	79.59	7133.96
J-7774	6947.82	B	0.62	80.59	7134.10
J-9890	6945.62	B	0.27	81.51	7134.02
J-8448	6942.96	B	0.72	82.66	7134.02
J-8107	6940.00	B	0.99	83.93	7134.00
J-10070	6939.31	B	0.10	84.24	7134.02
J-7755	6937.42	B	1.87	85.08	7134.06
J-8196	6935.05	B	0.00	86.08	7134.02
J-8049	6935.00	B	0.40	86.11	7134.02
J-13517	6934.39	B	0.52	86.37	7134.02
J-7608	6932.88	B	0.28	87.02	7134.02
J-7706	6932.00	B	1.20	87.40	7134.02
J-7464	6929.48	B	0.05	88.49	7134.02

Lake Mary Housing Surrounding Area Fire Flow Report

Label	Zone	Fire Flow Iterations	Is Fire Flow Run Balanced?	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gal/min)	Fire Flow (Available) (gal/min)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)
251901	B	4	TRUE	TRUE	1000.00	2137.11	20.00	J-5392
261801	B	3	TRUE	FALSE	1000.00	902.66	20.01	J-8328
261901	B	5	TRUE	TRUE	1000.00	1874.27	20.00	J-230
261902	B	5	TRUE	TRUE	1000.00	1719.99	20.00	J-8124
261903	B	3	TRUE	TRUE	1000.00	1078.01	20.01	J-7941
261904	B	4	TRUE	TRUE	1000.00	1948.08	20.02	J-230
261905	B	4	TRUE	TRUE	1000.00	1965.37	20.00	J-230
261906	B	4	TRUE	TRUE	1000.00	2083.16	20.00	J-8107
261907	B	4	TRUE	TRUE	1000.00	1211.74	20.00	J-9890
261908	B	7	TRUE	TRUE	1000.00	2127.23	20.82	261907
261909	B	5	TRUE	TRUE	1000.00	2177.88	20.00	J-7755
261910	B	5	TRUE	TRUE	1000.00	2178.60	20.00	J-7774
261911	B	4	TRUE	TRUE	1000.00	1115.08	20.00	J-10070
261912	B	6	TRUE	TRUE	1000.00	1439.01	21.58	261911
261913	B	4	TRUE	TRUE	1000.00	1350.66	20.01	J-8448
261914	B	3	TRUE	TRUE	1000.00	1638.19	20.01	J-7706
261915	B	4	TRUE	TRUE	1000.00	1146.60	20.00	J-7464
J-214	B	7	TRUE	TRUE	1000.00	1953.32	22.41	J-230
J-216	B	7	TRUE	TRUE	1000.00	1873.58	23.01	J-230
J-217	B	7	TRUE	TRUE	1000.00	1916.07	22.05	J-230
J-218	B	4	TRUE	TRUE	1000.00	2045.16	20.02	J-230
J-219	B	7	TRUE	TRUE	1000.00	2032.45	27.21	J-230
J-220	B	22	TRUE	TRUE	1000.00	2082.09	26.23	J-230
J-221	B	6	TRUE	TRUE	1000.00	2094.82	26.04	J-230
J-222	B	4	TRUE	TRUE	1000.00	3500.00	66.90	181701
J-223	B	4	TRUE	TRUE	1000.00	3500.00	67.17	181701
J-226	B	6	TRUE	TRUE	1000.00	1932.58	24.76	J-230
J-227	B	4	TRUE	TRUE	1000.00	1796.82	20.00	J-230
J-230	B	5	TRUE	TRUE	1000.00	1856.49	20.00	J-8124
J-233	B	6	TRUE	TRUE	1000.00	1857.59	22.74	J-230
J-5392	B	4	TRUE	TRUE	1000.00	2185.88	20.02	251901
J-7464	B	21	TRUE	TRUE	1000.00	1156.34	20.33	261915
J-7608	B	5	TRUE	TRUE	1000.00	1439.01	23.05	261911
J-7706	B	3	TRUE	TRUE	1000.00	1666.66	20.02	261914
J-7755	B	6	TRUE	TRUE	1000.00	2250.52	20.02	261909
J-7774	B	5	TRUE	TRUE	1000.00	2249.89	20.00	261910
J-7941	B	3	TRUE	TRUE	1000.00	1086.67	20.00	261903
J-7945	B	22	TRUE	TRUE	1000.00	1957.58	22.43	J-230
J-7986	B	6	TRUE	TRUE	1000.00	1886.35	21.74	J-230
J-8049	B	6	TRUE	TRUE	1000.00	2127.43	24.47	261907
J-8107	B	4	TRUE	TRUE	1000.00	2150.02	20.02	261906

Lake Mary Housing Surrounding Area Fire Flow Report

J-8124	B	5	TRUE	TRUE	1000.00	1762.34	20.00	261902
J-8196	B	6	TRUE	TRUE	1000.00	2122.09	24.66	261907
J-8328	B	4	TRUE	FALSE	1000.00	906.69	20.00	261801
J-8331	B	22	TRUE	TRUE	1000.00	2045.60	20.32	261905
J-8448	B	6	TRUE	TRUE	1000.00	1370.62	21.02	261913
J-9320	B	4	TRUE	TRUE	1000.00	3500.00	45.15	181701
J-9890	B	5	TRUE	TRUE	1000.00	1233.01	20.08	261907
J-10070	B	20	TRUE	TRUE	1000.00	1131.52	20.31	261911
J-12158	B	7	TRUE	TRUE	1000.00	2257.19	21.63	J-5392
J-12565	B	7	TRUE	TRUE	1000.00	1941.17	22.94	J-230
J-12934	B	6	TRUE	TRUE	1000.00	2283.81	20.49	J-5392
J-13517	B	6	TRUE	TRUE	1000.00	1907.72	24.73	261913

Lake Mary Housing On-Site Fire Flow Report

Label	Zone	Fire Flow Iterations	Is Fire Flow Run Balanced?	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gal/min)	Fire Flow (Available) (gal/min)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)
J-214	B	5	TRUE	TRUE	1500.00	1952.97	22.41	J-230
J-216	B	6	TRUE	TRUE	1500.00	1873.56	23.01	J-230
J-217	B	22	TRUE	TRUE	1500.00	1915.62	22.05	J-230
J-219	B	8	TRUE	TRUE	1500.00	2032.44	27.21	J-230
J-220	B	8	TRUE	TRUE	1500.00	2082.14	26.24	J-230
J-221	B	11	TRUE	TRUE	1500.00	2095.29	26.02	J-230
J-226	B	5	TRUE	TRUE	1500.00	1932.92	24.77	J-230
J-227	B	3	TRUE	TRUE	1500.00	1796.42	20.01	J-230
J-230	B	3	TRUE	TRUE	1500.00	1855.95	20.01	J-8124

Lake Mary Housing Gravity Sewer Pipe Report

Label	Dia. (in)	Material	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Depth (Average End) / Rise (%)	Flow (gpd)	Capacity (Design) (gpd)
5816	24	PVC	6-210	6867.65	6-266	6864.5	24.7	1,897,017	22,539,024
5817	24	PVC	6-266	6864.5	6-265	6861.45	24.8	1,897,017	22,129,036
4793	24	PVC	6-238	6794.5	JMP House	6791.15	34.2	1,897,017	18,489,476
5818	24	PVC	6-265	6861.45	6-264	6856.55	25.5	1,897,017	19,489,869
5819	24	PVC	6-264	6856.55	6-263	6856.05	26.1	1,897,017	17,801,287
5820	24	PVC	6-263	6856.05	6-262	6853.05	25	1,897,017	21,429,324
5821	24	PVC	6-262	6853.05	6-261	6851.25	27.1	1,897,017	14,529,971
5822	24	PVC	6-261	6851.25	6-260	6850.02	27.7	1,897,017	13,331,726
5823	24	PVC	6-260	6850.02	6-259	6848.35	27.7	1,897,017	13,262,183
5824	24	PVC	6-259	6848.35	6-258	6844.05	26.1	1,897,017	17,418,192
5825	24	PVC	6-258	6844.05	6-257	6838.65	24.8	1,897,017	22,139,060
5826	24	PVC	6-257	6838.65	6-256	6833.05	24.9	1,897,017	22,078,716
5827	24	PVC	6-256	6833.05	6-255	6831.05	24.6	1,897,017	23,307,356
5828	24	PVC	6-255	6831.05	6-254	6824.75	23.8	1,897,017	27,681,900
5830	24	PVC	6-254	6824.75	6-253	6823.15	27.1	1,897,017	14,524,077
5831	24	PVC	6-253	6823.15	6-252	6821.32	26.8	1,897,017	15,504,688
5832	24	PVC	6-252	6821.32	6-251	6819.47	26.7	1,897,017	15,560,916
5833	24	PVC	6-251	6819.47	6-250	6817.75	26.6	1,897,017	15,957,805
5834	24	PVC	6-250	6817.75	6-249	6816.35	27.5	1,897,017	13,635,887
5835	24	PVC	6-249	6816.35	6-248	6814.75	27.5	1,897,017	13,811,553
5840	24	PVC	6-248	6814.75	6-247	6811.05	25.5	1,897,017	19,322,494
5841	24	PVC	6-247	6811.05	6-246	6810.55	27.1	1,897,017	14,663,890
5842	24	PVC	6-246	6810.55	6-245	6808.25	26.2	1,897,017	17,134,622
5843	24	PVC	6-245	6808.25	6-244	6804.95	26.4	1,897,017	16,367,442
5844	24	PVC	6-244	6804.95	6-243	6802.85	25.2	1,897,017	20,472,656
5845	24	PVC	6-243	6802.85	6-242	6797.65	31.3	1,897,017	19,579,765
5846	24	uctile Iron	6-242	6797.65	6-241	6796.55	33.3	1,897,017	8,164,296
5847	24	uctile Iron	6-241	6796.55	6-240	6795.74	33.6	1,897,017	7,730,821
5848	24	uctile Iron	6-240	6795.74	6-239	6795.15	31.7	1,897,017	7,836,824
4792	24	uctile Iron	6-239	6795.15	6-238	6794.5	25.2	1,897,017	21,899,783
5815	21	PVC	Canyon	6868.78	6-210	6867.65	32.9	1,893,267	9,434,233
5813	21	PVC	cle Load	6871.25	6-211	6869.49	28.7	1,513,792	10,335,311
5814	21	PVC	6-211	6869.49	ine Canyon	6868.78	33.5	1,513,792	9,480,338
112	21	PVC	6-217	6878.05	6-216	6877.78	27.6	1,410,666	10,803,105
113	21	PVC	6-216	6877.78	6-215	6877.05	29.6	1,410,666	7,886,574
5810	21	PVC	6-215	6877.05	6-214	6875.56	29.9	1,410,666	7,568,352
5811	21	PVC	6-214	6875.56	6-213	6873.32	28.5	1,410,666	9,210,002
5812	21	PVC	6-213	6873.32	nacle Load	6871.25	31	1,410,666	8,464,647
P-114	21	PVC	6-221	6885.45	6-220	6883.25	16.7	519,943	10,421,321
6230	21	PVC	6-220	6883.25	6-219	6881.05	17.5	519,943	8,634,141
6231	21	PVC	6-219	6881.05	6-218	6880.05	18.3	519,943	7,156,828
6233	21	PVC	6-218	6880.05	6-217	6878.05	24.4	519,943	10,332,481

Lake Mary Housing Gravity Sewer Pipe Report

P-101	15	PVC	6-234	6911.45	6-233	6908.95	12	119,442	5,021,835
P-102	15	PVC	6-233	6908.95	6-232	6905.35	11.9	119,442	5,116,908
P-103	15	PVC	6-232	6905.35	6-231	6901.55	11.9	119,442	5,049,442
P-104	15	PVC	6-231	6901.55	6-230	6900.18	11.2	119,442	7,058,325
P-105	15	PVC	6-227	6893.65	6-226	6890.45	12.3	119,442	4,341,841
P-106	15	PVC	6-226	6890.45	6-225	6888.85	12.9	119,442	3,593,333
P-107	15	PVC	6-225	6888.85	6-224	6888.15	12.6	119,442	3,879,472
P-108	15	PVC	6-224	6888.15	6-223	6887.67	13.6	119,442	3,390,408
P-109	15	PVC	6-223	6887.67	6-222	6887.05	13.6	119,442	2,848,974
P-110	15	PVC	6-222	6887.05	6-221	6885.45	19.4	119,442	7,723,788
P-111	15	PVC	6-228	6896.55	6-227	6893.65	12	119,442	4,844,313
P-112	15	PVC	6-230	6900.18	6-229	6897.65	10.3	119,442	10,707,485
P-113	15	PVC	6-229	6897.65	6-228	6896.55	12.9	119,442	3,530,153
P-100	15	PVC	6-235	6912.5	6-234	6911.45	12.8	103,554	7,179,644