

# **APPENDIX H**

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## **WATER MASTER PLAN**

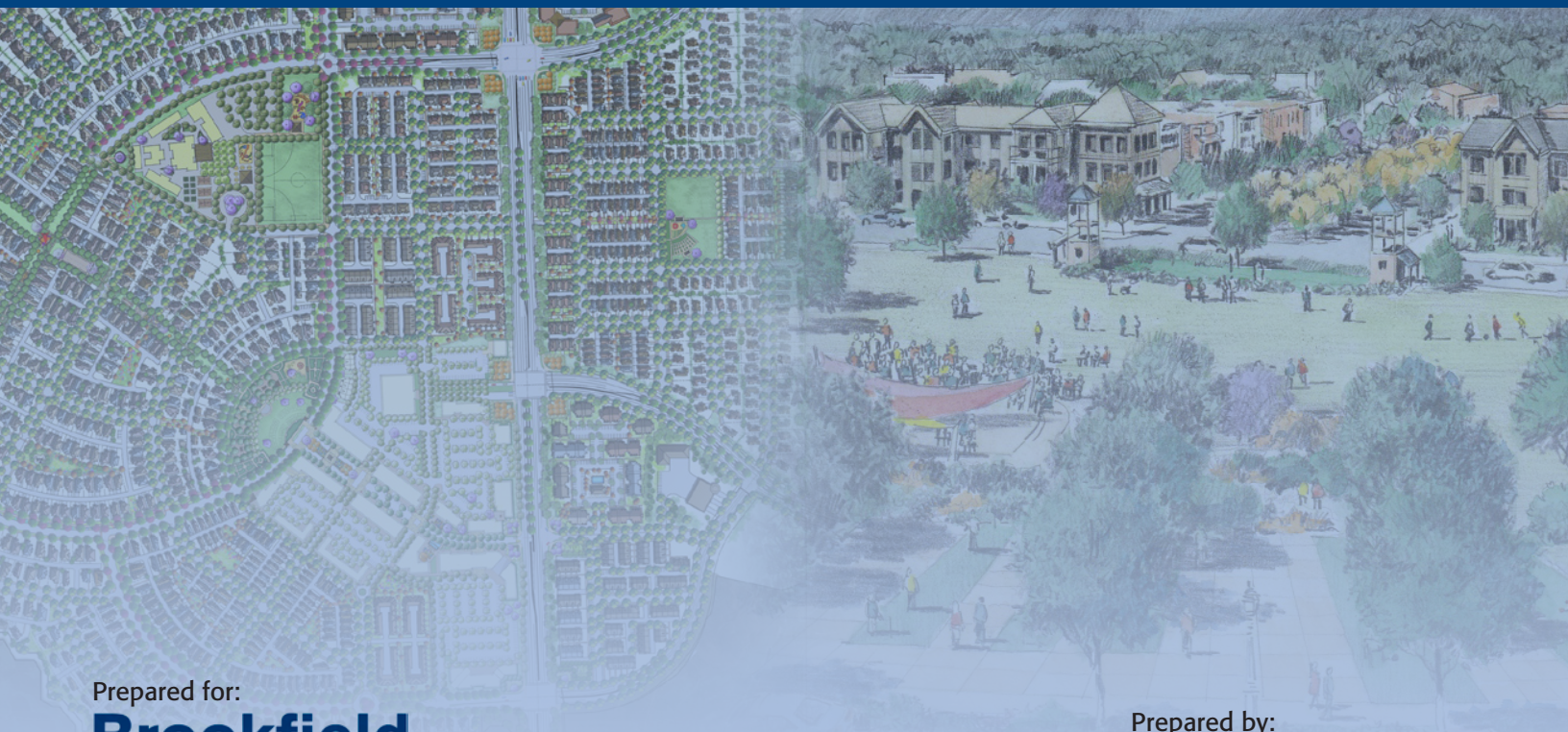


BROOKFIELD RESIDENTIAL

Amoruso Ranch Specific Plan Area

February 2016

WATER MASTER PLAN



Prepared for:

**Brookfield**  
Residential

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**Amoruso Ranch Specific Plan Area**

***Water Master Plan***

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## INTRODUCTION

The Amoruso Ranch Specific Plan (ARSP) Area Water Master Plan (Plan) has been prepared at the request of Brookfield Residential Properties, Inc. (Brookfield) to meet the City of Roseville's (City) planning requirements and in support of the ARSP process.

## *WATER MASTER PLAN PURPOSE*

The purpose of this master plan study is to provide preliminary design and analysis for the domestic (potable) water system that will serve the Amoruso Ranch Specific Plan Area. The information presented herein builds on the 2010 Creekview Potable Master Plan (MacKay & Soms) that conveys flows between the ARSP distribution system and the Westside Tank and Pump Station site. The following items are presented:

- The anticipated water system demands under various scenarios, including fire flows.
- A piping distribution network that meets the projected demands based on the ARSP land use designations.
- The anticipated reservoir storage capacity requirements based on the anticipated ARSP water demands

The results and conclusions of the water modeling are based only on serving the ARSP Area. The ARSP Area will be served through a single point of connection extending from the Creekview Specific Plan area along the extension of Westbrook Boulevard. Future connections and distribution to any adjacent planning areas are considered when sizing pipes at the ARSP boundary, but no flows other than the ARSP demands are included.

## *ARSP AREA LOCATION AND DESCRIPTION*

### **Project Vicinity**

The ARSP Area consists of approximately 694.4-acres located in the northwest edge of the City of Roseville; this total includes the 20 acre Wagner Parcel. Prior to the Specific Plan's adoption, most of the Plan Area was within the City's Sphere of Influence and was recognized as a logical growth extension for the City. The Specific Plan Area is bounded on the west by the Al Johnson Wildlife Area, to the south by the Creekview Specific Plan Area, to the east by the future proposed Placer Ranch Specific Plan Area and to the north by the existing Toad Hill Ranches #1 area. The ARSP project vicinity is shown on Figure 1.

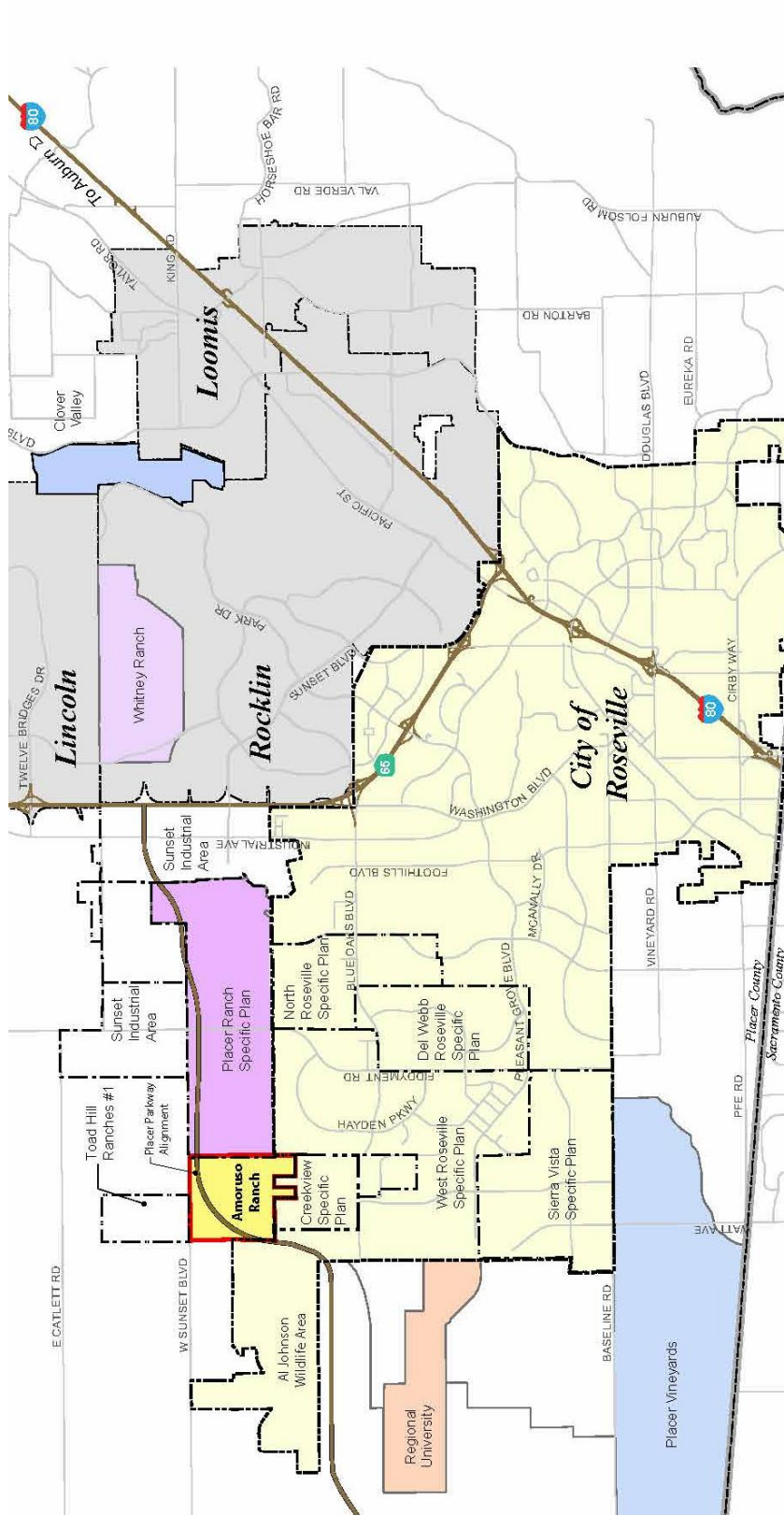


Figure 1 – Amoroso Ranch Specific Plan Area Project Vicinity

## **Pre-Development Conditions**

In the pre-development conditions the ARSP Area was used as a cattle ranch. The primary use was open grazing land, but included a small ranch house and out buildings. The land is gently rolling terrain generally trending to the west and south. Minor drainages flow in a radial pattern from a slight rise in the northeast quadrant of the property. The elevation changes gently from the northeast down to the southwest.

The site vegetation is generally limited to short, seasonal grasses. There are several oak trees located along University Creek and a number of non-native trees located around the former ranch house. Wetland conditions and their associated flora and fauna are located in small areas typically along the drainage corridors and in flats along the southern boundary. Figure 2 highlights the ARSP Area pre-development conditions.

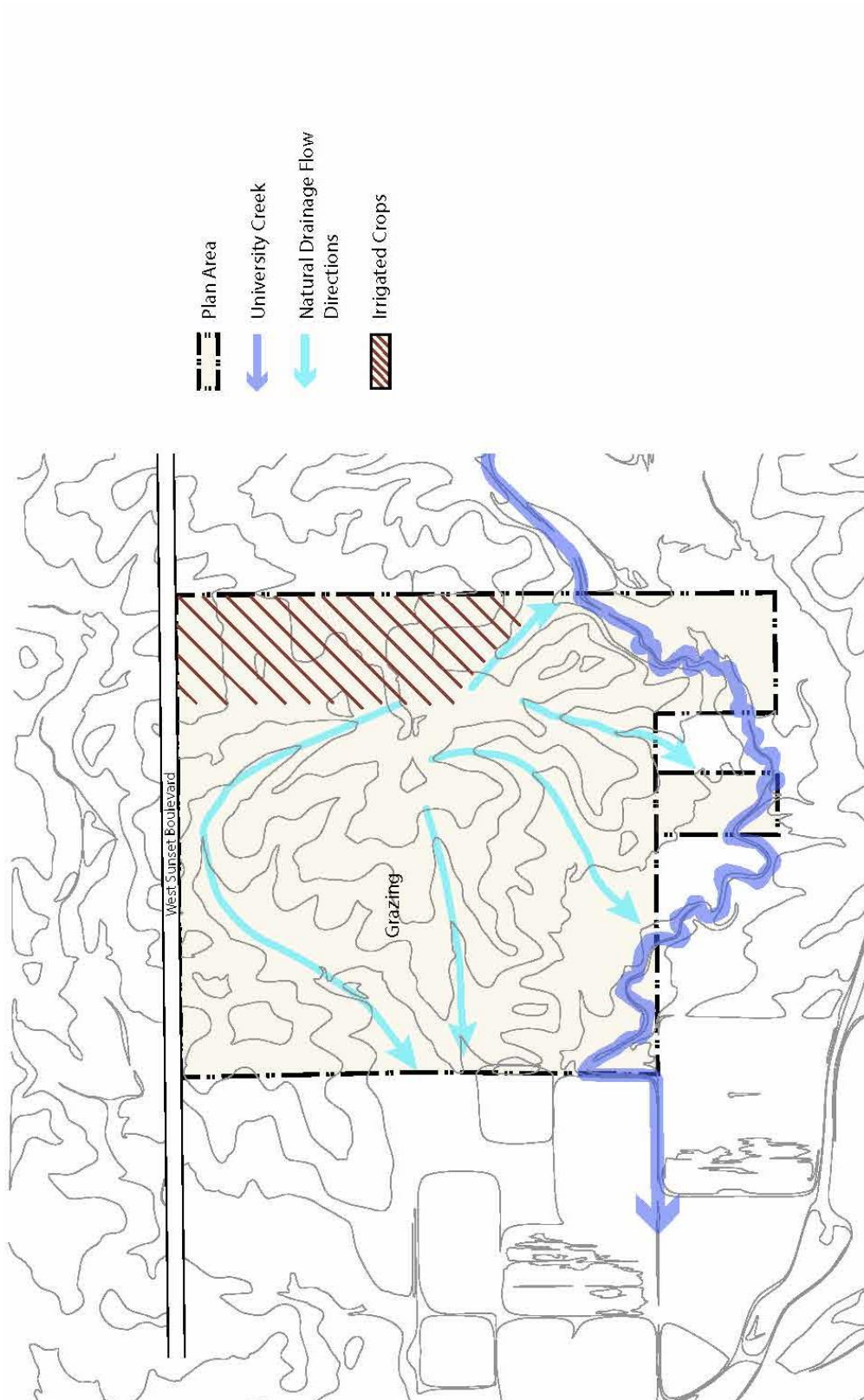


Figure 2 – ARSP Area Pre-Development Conditions

## **ARSP Area Development Opportunities and Constraints**

The proposed ARSP Area land use plan is influenced by several factors, including the physical setting, planning policies, circulation conditions, and the boundary conditions. Two significant aspects of the Brookfield plan area are described below and depicted in Figure 3.

### *Placer Parkway*

The proposed Placer Parkway will be a dominant feature that sweeps through the ARSP Area. Interchanges at Fiddymont Road and Santucci Boulevard will provide access to the ARSP Area.

### *Open Space and Resource Preservation*

The ARSP Area will support open space and resource preservation by providing permanent open space. In combination with the 1,700-acre open space afforded by the City of Roseville Al Johnson Wildlife Area, the Brookfield open space provides connectivity to open space within the Creekview Specific Plan Area, and lands to the east of the ARSP Area.

The Amoruso Ranch Specific Plan will provide an open space corridor that includes a pedestrian and bike path linkage between this major open space area and the City's regional trail system. In addition, the corridor will provide a permanent preservation area for wetland resources.

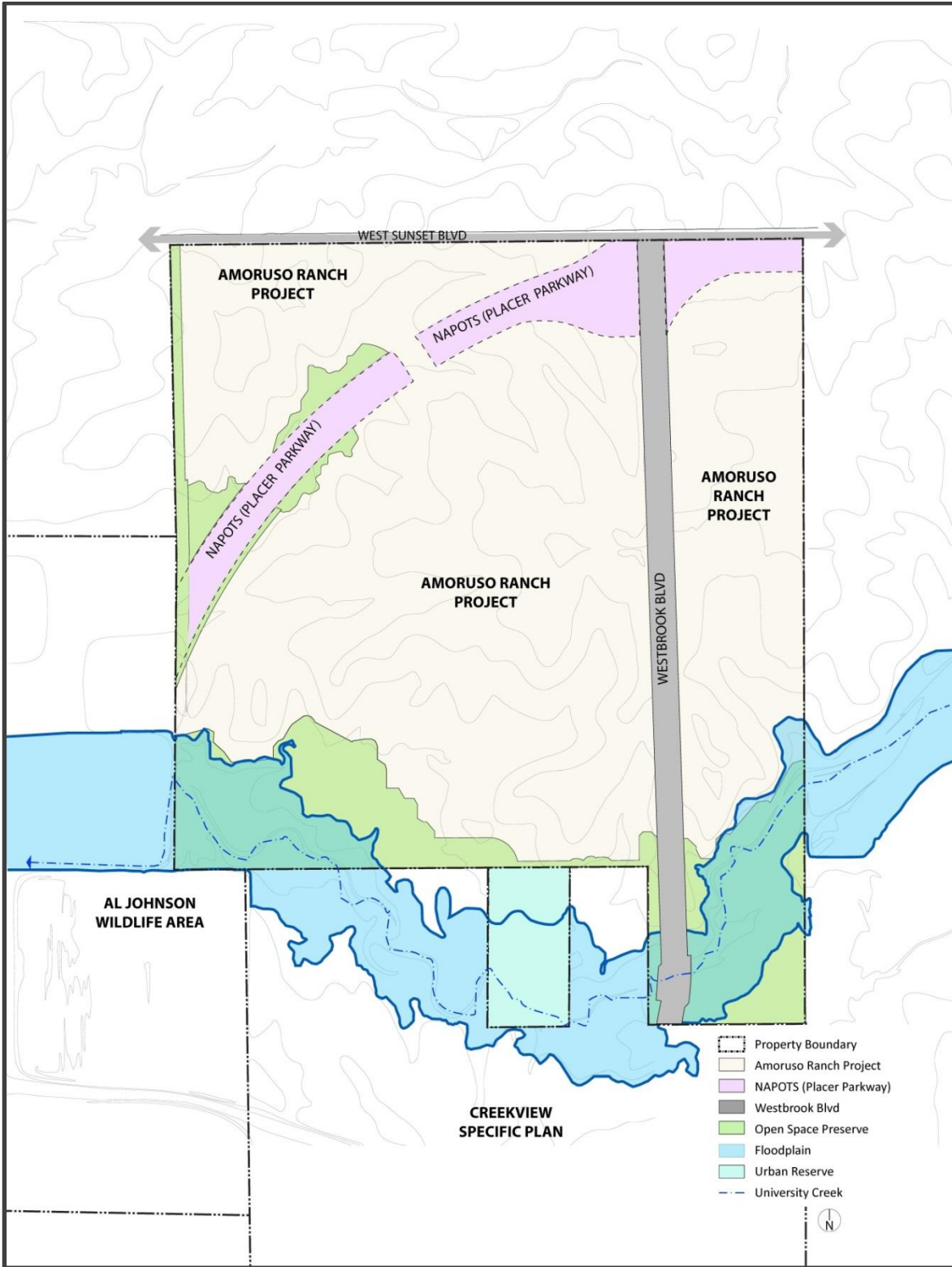


Figure 3 – ARSP Area Opportunities and Constraints

## **ARSP Area Land Use Plan**

The ARSP Area provides for a mix of land uses to achieve the desired community form and objectives. These land use designations include low-, medium- and high density residential uses; commercial and office uses; which in some cases are sited with one another and/or with residential uses; public and quasi-public uses for the schools and civic activities such as a fire station; parks and open space uses; and an urban reserve.

At buildout, the ARSP Area will provide for 2,827 dwelling units, adds approximately 51 acres of commercial retail and office land uses, and provide approximately 22-acres of parks and 146-acres of open space. The ARSP Area Land Use Plan is shown in Figure 4.

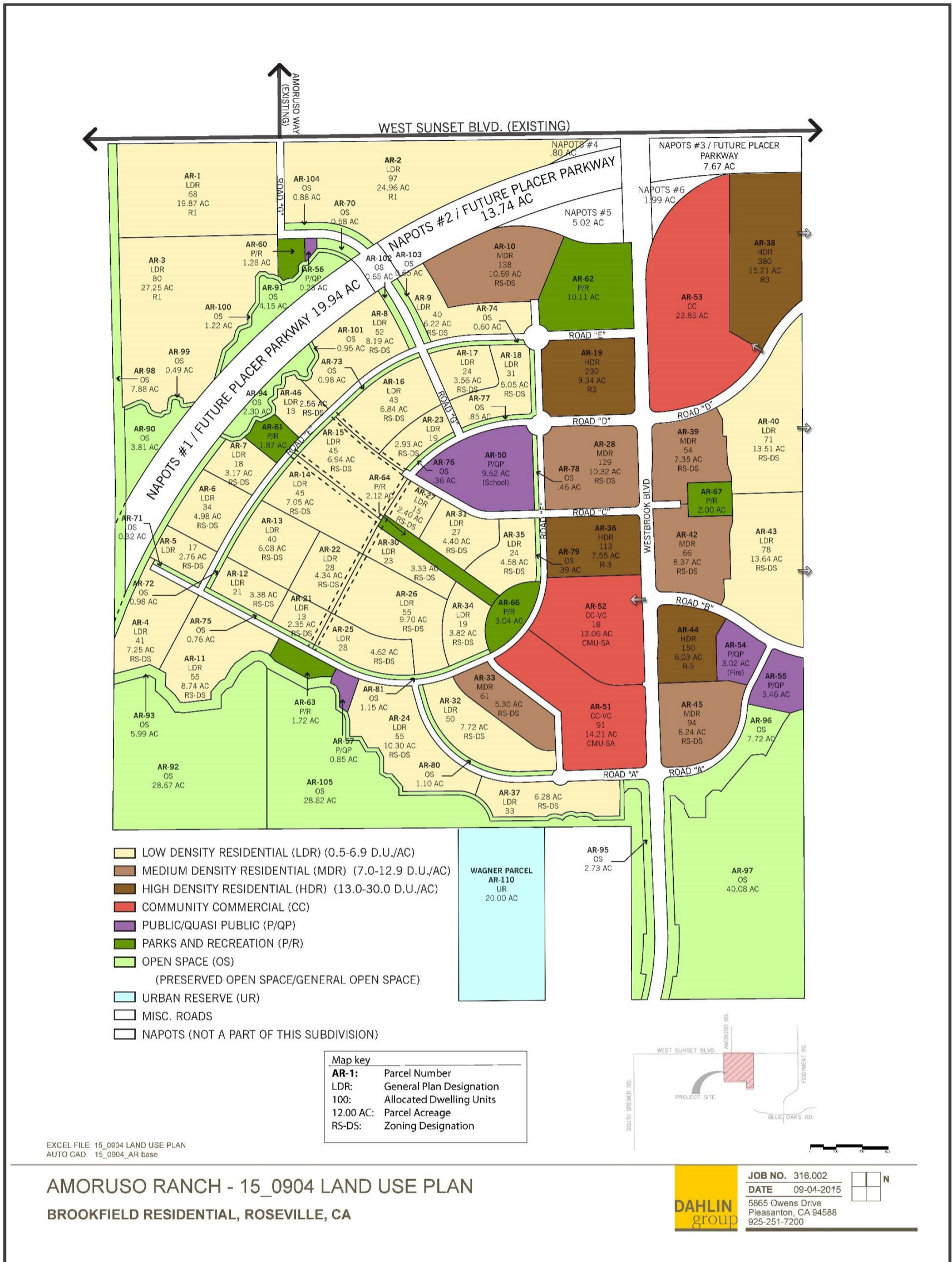


Figure 4 – ARSP Area Land Use Plan

## **WATER STUDY PROCESS**

This Plan analyzes the hydraulics of the proposed water infrastructure necessary to serve the ARSP site. The methodology used for the hydraulic modeling in this Plan conforms to that used by the City of Roseville Environmental Utilities Department. Using the City’s current design criteria and standards, a hydraulic model has been developed to size the ARSP Area’s water infrastructure. The City intends to incorporate the results of this study into their overall “built-out” model to determine any impacts to the City’s existing water system.

### **ARSP Land Use and Demand Projections**

As noted above, the ARSP Area is proposed to be divided into multiple parcels with a variety of land uses including residential, commercial mixed use, open space, schools, and parks. The proposed land use areas and their corresponding unit demands are used to calculate the potable water demand.

Each land use corresponds to a water demand based on unit factors as designated by the City of Roseville. The City of Roseville water demand factors are presented below in Table 1.

**Table 1**  
**Amoruso Ranch Specific Plan**  
**Water Master Plan**  
**City of Roseville Demand Factors**

General Plan Land Use Category	Average Day Demand
<b>Residential (GPD/DU)<sup>1,2</sup></b>	
LDR1: < 3.5 DU / Acre	728 GPD/DU
LDR2: > 3.5 to 5 DU / Acre	600 GPD/DU
LMDR1: > 5 to 6 DU / Acre	521 GPD/DU
LMDR2: > 6 to 8 DU / Acre	430 GPD/DU
MDR: > 8 to 12 DU / Acre	323 GPD/DU
HDR1: > 12 to 16 DU / Acre	288 GPD/DU
HDR2: > 16 DU / Acre	177 GPD/DU
<b>Non-Residential (GPD/Acre)</b>	
Commercial / Retail	2598 GPD/Acre
Business Professional	2598 GPD/Acre
Light Industrial	2598 GPD/Acre
Industrial	2562 GPD/Acre
Railroad Yard	109 GPD/Acre
Elementary School	3454 GPD/Acre
High School	4068 GPD/Acre
Public (Fire Station, etc)	1780 GPD/Acre
Park / Recreation	2988 GPD/Acre
Open Space / ROW	0 GPD/Acre
Vacant	0 GPD/Acre

<sup>1</sup> City of Roseville Planning Department land use designations for residential are as follows:

- Low Density Residential (LDR): 0.5 – 6.9 DU's / Acre
- Medium Density Residential (MDR): 7.0 – 12.9 DU's / Acre
- High Density Residential (HDR): 13.0 DU's / Acre and above

<sup>2</sup> See Table 3 for water demand projections based on water land use categories and City of Roseville planning land use categories.

Table 2 presents the summary of the projected overall water use for the ARSP Area based on the designated land uses shown on Figure 4.

**Table 2**  
**Amoruso Ranch Specific Plan**  
**Water Master Plan**  
**Overall Water Use Factors and Demands**

Land Use	Planning Land Use Abbreviation/ Zoning	Total Area (Acres)	Dwelling Unit Count	Water Use Factor	Daily Demand (GPD)	Annual Demand (AFY)	Annual Demand with 2% (AFY) <sup>1</sup>
Low Density Residential	LDR	248.77	1,302	Varies	660,175	739.5	754.3
Medium Density Residential	MDR	50.27	542	Varies	178,561	200.0	204.0
High Density Residential	HDR	38.13	873	Varies	167,064	187.1	190.9
Community Commercial - Village Center - Residential	CMU-SA (Commercial Mixed-Use - Special Area)	Included On Next Line	109	288	31,392	35.2	35.9
Community Commercial - Village Center – Non-Residential	CMU-SA (Commercial Mixed-Use - Special Area)	27.27	-	2,598	70,847	79.4	80.9
Community Commercial	CC (Community Commercial)	23.85	-	2,598	61,962	69.4	70.8
Open Space (Paseos)	OS	10.71	-	2,988	32,001	35.8	36.6
Open Space (General)	OS	37.24	-	0	0	0	0
Open Space (Preserve)	OS	97.58	-	0	0	0	0
Parks & Recreation	PR	22.14	-	2,988	66,154	74.1	75.6
Public / Quasi Public (school)	P/QP (School)	9.62	-	3,454	33,227	37.2	38.0
Public / Quasi Public (Fire Station & Utility Site)	P/QP	7.61	-	1,780	13,546	15.2	15.5
Urban Reserve	UR	20.00	1	728	728	0.8	0.8
Rights-of-Way	ROW	52.04	-	0	0	0	0
Not a Part of This Subdivision	NAPOTS	49.16	-	0	0	0	0
<b>Total</b>		<b>694.4</b>	<b>2,827</b>	<b>-</b>	<b>1,315,659</b>	<b>1,473.7</b>	<b>1,503.2</b>

<sup>1</sup> Demand accounts for 2% system losses.

Table 3 incorporates information from both Tables 1 and 2 to generate an average daily demand for each type of land use. The average daily demand incorporates a 2% increase in the calculated value, as recommended by the City of Roseville, to account for typical miscellaneous system losses. Table 3 also presents the residential land uses that correspond to the planning designations that are consistent with the Specific Plan document. It should be noted that there is not a direct correlation between the planning designations/densities and those utilized for water system planning. The water system planning densities are further subdivided than those utilized for Specific Plan purposes and are shown in Table 3 in the Land Use column.

**Table 3**  
**Amoruso Ranch Specific Plan**  
**Water Master Plan**  
**Water Demand Projections**

Land Use	Planning Land Use <sup>1</sup>	Total Area (Acres)	Dwelling Unit Count	Unit Demands	Average Daily Demand with 2% (gpm)	Average Annual Demand with 2% (AFY)
LDR1: < 3.5 DU's/Acre	LDR	47.12	148	728 gpd/DU	76.3	123.1
LDR2: > 3.5 to 5.0 DU's/Acre	LDR	28.82	116	600 gpd/DU	49.3	79.5
LMDR1: > 5.0 to 6.0 DU's/Acre	LDR	73.31	401	521 gpd/DU	148.0	238.7
LMDR2: > 6.0 to 8.0 DU's/Acre <sup>2</sup>	LDR	99.52	637	430 gpd/DU	194.0	313.0
LMDR2: > 6.0 to 8.0 DU's/Acre <sup>2</sup>	MDR	15.72	120	430 gpd/DU	36.6	59.0
MDR: >8.0 to 12.0 DU's/Acre	MDR	13.54	155	323 gpd/DU	35.5	57.2
HDR1: >12.0 to 16.0 DU's/Acre <sup>2</sup>	MDR	21.01	267	288 gpd/DU	54.5	87.9
HDR1: >12.0 to 16.0 DU's/Acre <sup>2</sup>	HDR	7.55	113	288 gpd/DU	23.1	37.2
HDR2: >16.0 DU's/Acre	HDR	30.58	760	177 gpd/DU	95.3	153.7
Commercial / Retail (Commercial)	CMU/CC	51.12	0	2,598 gpd/acre	94.1	151.7
Commercial / Retail (Residential)	CMU-SA	-	109	288 gpd/DU	22.2	35.9
Elementary Schools	P/QP	9.62	0	3,454 gpd/acre	23.5	38.0
Public (Fire Station, Utility, etc)	P/QP	7.61	0	1,780 gpd/acre	9.6	15.5
Park/Recreation	PR	22.14	0	2,988 gpd/acre	46.9	75.6
Open Space (General)	OS	37.24	0	0 gpd/acre	0	0
Open Space (Paseos)	OS	10.71	0	2,988 gpd/acre	22.7	36.6
Open Space (Preserve)	OS	97.58	0	0 gpd/acre	0	0
Rights-of-Way	ROW	52.04	0	0 gpd/acre	0	0
Not a Part of this Subdivision	NAPOTS	49.16	0	0 gpd/acre	0	0
Urban Reserve	UR	20.00	1	728 gpd/DU	0.5	0.8
<b>Totals</b>		<b>694.4</b>	<b>2,827</b>	<b>-</b>	<b>931.9</b>	<b>1,503.2</b>

1. City of Roseville Planning Department land use designations for residential are as follows:  
 Low Density Residential (LDR): 0.5 – 6.9 DU's / Acre  
 Medium Density Residential (MDR): 7.0 – 12.9 DU's / Acre  
 High Density Residential (HDR): 13.0 DU's / Acre and above
2. This water land use category includes two City planning land use categories.

The total average day demand with assumed system losses is estimated to be 932 gallons per minute (1,503 AFY). The unit demands listed in Table 3, account for all water use and are not adjusted to account for planned recycled water demands. The demands contained in this report include provisions to supply the recycled water demands with potable water in case the recycled water system is temporarily not operational. The demands also do not assume reduction for inclusion of water conservation measures. Recycled water demands and system information for the ARSP can be found in the Amoruso Ranch Specific Plan Area Recycled Water Master Plan.

Distribution of the water demands based on the land use designations have been developed for use in the water system model.

## Peaking Factors

The Maximum Day Demands and the Peak Hour Demands are developed from the Average Day Demands by using the City of Roseville's peaking factors. These peaking factors are used to simulate system-operating scenarios and analyze the water distribution piping network.

Maximum Day Demands (MDD) are developed by applying the MDD peaking factor (2.0) to the Average Day Demand (ADD) estimates. The maximum day demand estimates are used to size the supply mains and to determine the required supply production rates. The 2.0 peaking factor is consistent with the City of Roseville Design Standards published in January of 2013.

The Peak Hour Demand (PHD) is used to size large transmissions mains, pumps, and storage reservoirs. Peak Hour Demands are developed by applying the PHD peaking factor (1.7) to the MDD. Transmission mains are sized to handle instantaneous peak flows that may occur over shorter periods of time in order to maintain velocities within the City's pipe design criteria. The 1.7 peaking factor is consistent with the City of Roseville Design Standards published in January of 2013.

Using these peaking factors and the ADD estimates, a steady state analysis was performed for the MDD and PHD system demands. These demands account for 2% system losses and the results are presented in Appendix C. Table 4 below summarizes the total system demands for each scenario.

**Table 4**  
***Amoruso Ranch Specific Plan***  
***Water Master Plan***  
***Water System Scenario Demands***

Scenario	Water Demand (gpm)
Average Day Demand	932
Maximum Day Demand (ADD x 2.0)	1,864
Peak Hour Demand (MDD x 1.7)	3,169
Maximum Day Demand plus 2,000 gpm Fire Flow	3,864
Maximum Day Demand plus 2,500 gpm Fire Flow	4,364
Maximum Day Demand plus 4,000 gpm Fire Flow	5,864
Maximum Day Demand plus 4,500 gpm Fire Flow	6,364

## SERVICE REQUIREMENTS

Proposed facilities within the ARSP are intended to provide and maintain an acceptable level of service. For this Plan, it is anticipated that the ARSP will be served by a connection through the Creekview Specific Plan Area and by an onsite groundwater well. The groundwater well would be located within a “P/QP” parcel (AR-55). The well is proposed to meet dry year water needs when surface water supplies are limited and for emergency purposes.

### System Criteria

The City has developed minimum operating goals to be used in the planning of backbone water facilities. One criterion is maximum pipe velocity, which the City requires to be no more than 5 feet per second (fps) for ADD conditions and 6 fps for MDD and PHD operating conditions. The minimum and maximum system pressure criteria used for transmission main sizing, which help ensure that the distribution systems are not undersized, are listed in Table 5 below.

**Table 5  
 Amoruso Ranch Specific Plan  
 Water Master Plan  
 Water Supply Pressure Design Criteria**

<b>Scenario</b>	<b>Pressure Criteria</b>
Average Day Demand	Minimum = 50 psi
	Maximum = 100 psi
Maximum Day Demand plus Fire Flow	Minimum = 20 psi (at source node)
	Minimum = 50 psi (elsewhere)

**Water Supply Criteria**

Water is anticipated to be supplied to the site through the Creekview Specific Plan area via existing City water infrastructure in Westbrook Boulevard. Refer to Figure 8, which schematically shows the proposed water facility main lines for the project. Figures 9 and 10 included within Appendix B include the detailed system layouts from the hydraulic modeling analysis.

**Fire Flow Requirements**

Water distribution systems must be sized to provide adequate fire flows at minimum residual pressures that meet or exceed flows specified by the California Fire Code (CFC) and local fire jurisdictions. The distribution system for ARSP is sized to provide adequate fire flows at the City-prescribed residual pressures and that also meet the minimum flows required by the California Fire Code (CFC) and the City of Roseville Fire Department. The City’s fire flow requirements by land use are shown in Table 6 below and assume that all buildings (residential and non-residential) are to have sprinkler systems installed throughout.

**Table 6**  
**Amoruso Ranch Specific Plan**  
**Water Master Plan**  
**Fire Flow Requirements**

Land Use	Fire Flow (gpm)	Residual Pressure (psi)	Required Duration (hrs)
Residential <sup>1</sup>	2,000	20	2
Multi-Family <sup>2</sup>	2,500	20	3
Commercial/Office/Industrial	4,000	20	4
School	4,000 <sup>3</sup>	20	4

1. 1,500 gpm is the requirement for residential areas having primarily one-story single-family dwellings on average size lots. However, 2,000 gpm is used in this Study to provide flexibility for the construction of potentially large dwelling units (up to 6,200 sf per the CFC).
2. 2,500 gpm is allotted for multi-family areas where all structures are sprinklered.
3. 4,000 gpm is the requirement, but 4,500 gpm is used in this study (modeling).

### Groundwater Well Facilities

The City utilizes ground water supplies during dry years and during emergency events only when surface water supplies are limited. The onsite well, which is shown on Figure 9 (AR-55, J-101), is anticipated to have a minimum total supply capacity of approximately 1,800 gpm. The actual yield at the proposed well site will need to be confirmed though drilling an exploratory well to determine the aquifer capacity and water quality. The proposed ARSP onsite groundwater well will provide emergency potable water supply from the groundwater basin.

### Reservoir and Pump Sizing Criteria

The ARSP water storage is provided by planned facilities in the West Roseville Specific Plan (WRSP) Area at the City’s future Westside Tank and Pump Station site. These facilities will be designed to provide sufficient storage and pumping capacity to serve ARSP’s storage needs as part of a centralized water supply for several specific plan areas.

Reservoir sizing is composed of operational demand, fire protection demand, and any emergency demand. The operational and emergency components are calculated based upon

a percentage of the system’s MDD. The fire protection demand is based on the largest volume of fire flow required in a system over a select period of time, typically four hours. The operational storage needed is 25% of the MDD, while the emergency storage is 50% of the MDD. The City of Roseville has allowed groundwater sources to account for up to 25% MDD, 467 gpm, to offset the emergency storage needs.

The operational storage need for ARSP is the Maximum Day Demand of 1,864 gpm. Table 7 details the total storage requirements for ARSP.

**Table 7**  
**Amoruso Ranch Specific Plan**  
**Water Master Plan**  
**Reservoir Sizing Criteria<sup>1,2</sup>**

Category	Equation	Volume (gal)	Volume (MG)
Operational	$(25\%) \times (1,864 \text{ gpm}) \times (1,440 \text{ min/day})$	671,040	0.68
Fire Protection	$(4,500 \text{ gpm}) \times (4 \text{ hours}) \times (60 \text{ min/hr})$	1,080,000 <sup>3</sup>	1.08
Emergency	$(25\%) \times (1,864 \text{ gpm}) \times (1,440 \text{ min/day})$	671,040	0.68
<b>Total Volume</b>		2,422,080	2.43

1. Operational and emergency MDD includes 2% for system losses.
2. Emergency storage is 50% of MDD, but 50% of that emergency volume can be supplied from groundwater sources, resulting in a tank storage capacity requirement of 25% of MDD.
3. Fire protection capacity is also accounted for in the Creekview analysis, therefore, actual ARSP capacity per Creekview Water Master Plan is approximately 1.34 MG (Creekview and ARSP (3.52 MG) – Creekview (2.18 MG) = ARSP (1.34 MG) .

The above calculations result in a need for approximately 2.5 million gallons of potable water storage for ARSP as a stand-alone project. It should be noted that based on the Creekview Water Master Plan (page 11): *“A total of 2.2 million gallons (MG) of treated water storage will be required to provide adequate needs to the CSP and 3.5 MG to provide for the needs of the CSP and Brookfield.”*

In subsequent discussions with the City, it was identified that the calculations within the Creekview Water Master Plan identified a single fire flow capacity of 1.08 MG for both Creekview and the ARSP Area. The City has requested that each specific plan area account for a fire flow capacity (combined total fire flow capacity 2.16 MG). Therefore, the total required storage for the ARSP Area is approximately 2.5 MG and a combined storage capacity of 4.7 MG for both Creekview and the ARSP Area.

The City is currently designing the Westside Tank and Pump Station facility and plans to integrate the overall storage capacity requirements into the proposed regional facility. The location of the regional water storage and pumping facility is shown on Figure 5.



**Figure 5- Regional Water Facilities Location Plan**

## WATER SUPPLY OPTION

The ARSP has identified two water supply options that could be implemented to provide the surface water needed for the project. Those options range from:

1. Use of City supplies, if available;
2. Use of Placer County Water Agency (PCWA) Water.

Each option will be briefly discussed, with focus on infrastructure needs for each option.

## **Option 1 – Use of City Supplies, If Available**

At some future date, the City may determine that there is enough water available to serve the ARSP from existing supplies. Roseville, along with the rest of the State, is mandated to reduce water demands by 20% by the year 2020. To date, the City has been successful in reducing usage but that has been paired with a local drought and downturns in the economy. The City is currently evaluating their current demand factors to determine if they still accurately represent citywide usage.

Under Option 1, the City would use existing and/or planned infrastructure to treat and deliver water to the specific plan area. Infrastructure located in the Creekview Specific Plan (under construction now) would need to be extended to ARSP's southern border to convey treated water to a point where the plan can connect to the system. Local storage will be constructed by the City and funded through the City's Water Connection Fee, which is collected at building permit issuance.

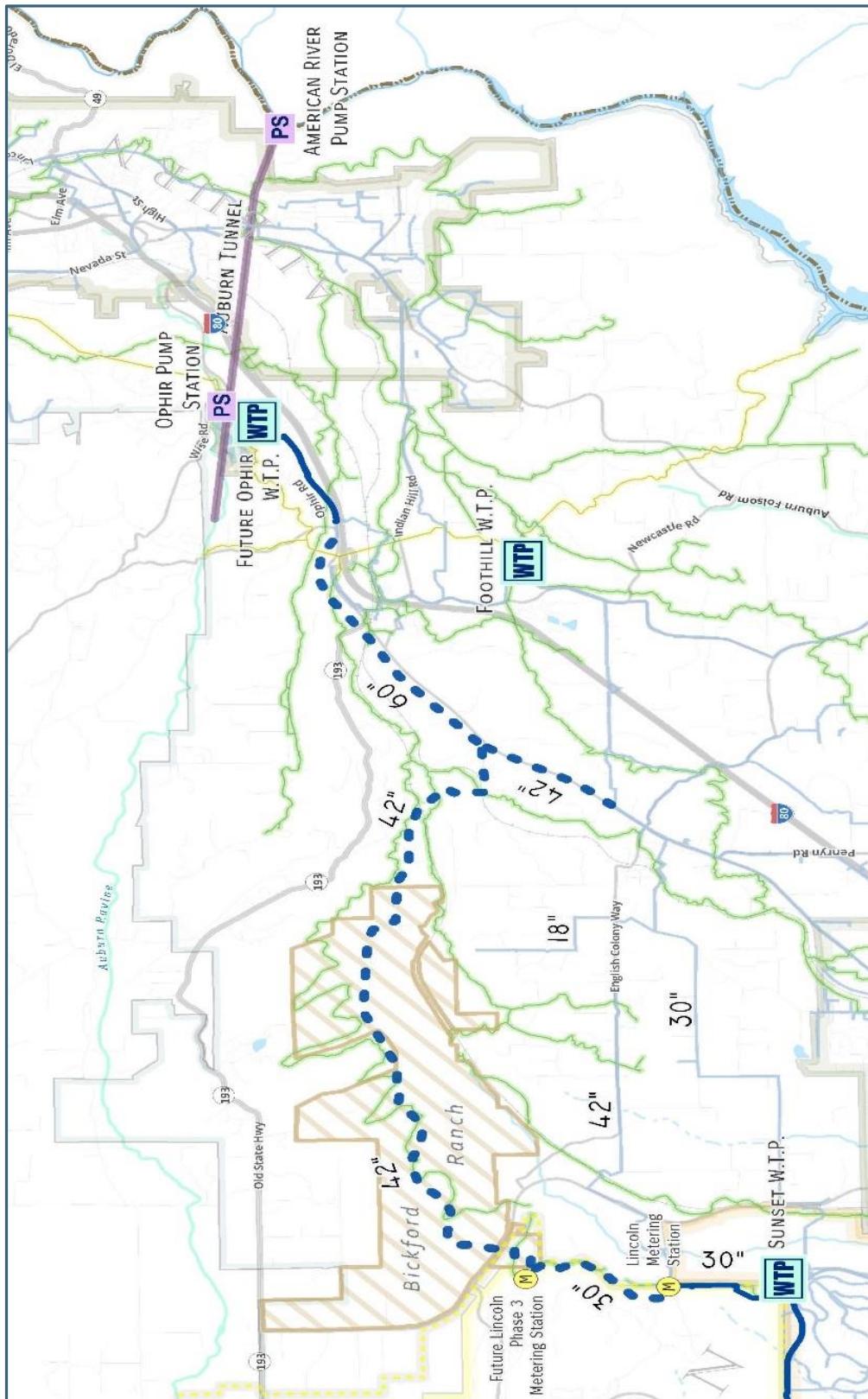
## **Option 2 – Use of Placer County Water Agency Water**

Placer County Water Agency (PCWA) water can be accessed in two different ways. First, through a wholesale agreement with PCWA, where they treat and transport surface water to the northern boundary of the City (see Figures 6&7). From that point, City infrastructure will convey water down Industrial Boulevard to Blue Oaks Boulevard and then use backbone infrastructure to transport wholesale surface water to the plan area. PCWA has the ability to introduce 10 million gallons per day (mgd) of treated water at the Tinker Intertie through the City to the southwest corner of the distribution system (Baseline and Watt).

The second opportunity to use PCWA water involves an agreement with PCWA to deliver raw water to the City of Roseville Water Treatment Plant. Because the City of Roseville does not have sufficient treatment plant capacity to meet Max Day Demands (MDD) of the City at build out and to meet the ARSP demands, this alternative requires the use of aquifer storage and recovery (ASR). Using ASR to bank treated PCWA surface water during shoulder (off peak) months of the year (in the spring and fall) to "shave" peak deliveries during peak months extends existing infrastructure. Most of the treatment and transmission facilities are in place to accomplish this mode of operation, one or two wells may be needed in the ASRP to allow for redundancy while meeting the peak demands. There is adequate capacity to treat and move the water through the City's existing system when necessary if peaks are shaved with ASR.

Agency treatment plant and transmission capacity is limited, but a capital improvement plan is being developed that includes the timeline and budget to construct system wide facilities.

During the interim period, capacity in the City's water treatment plant on Barton Road, and transmission facilities are available to serve the specific plan. Roseville has not reached build out, which results in existing infrastructure having interim capacity available for use. The City and PCWA are working on an agreement to allow for interim use of the City's system.



**M** - Metering Station

Figure 6  
Water Supply Infrastructure  
Ophir Treatment and Transmission Facilities



## PCWA Water Connection with City of Roseville System

At the request of the City of Roseville, a study was conducted by West Yost Associates on bringing the PCWA water into the City of Roseville system. The purpose of the analysis was to determine any potential system impacts, and resultant recommended improvements, to PCWA's Lower Zone 1 water system from serving the City of Roseville 2.7 million gallons per day.

Working with PCWA's hydraulic model, West Yost completed the analysis and a copy of their Technical Memorandum entitled "PCWA Distribution System Analysis for Amoruso Ranch Specific Plan," dated January 22, 2016 is included in Appendix D.

The recommendations contained within the referenced technical memorandum include the following:

1. A new self-contained pump, adjacent to the existing Tinker Pump Station, capable of delivering 2.7 mgd at a similar discharge head to the current 10 mgd pump station;
2. A new pipeline connection into the existing fluoride feeder station or construct a new feeder station inside the new pump building; and
3. Construct approximately 800-feet of 24-inch diameter pipeline along Tinker Road.

These proposed improvements are shown on Figure 1 of the referenced technical memorandum included in Appendix D.

## HYDRAULIC MODEL RESULTS

### Water Service to ARSP

With the ARSP Area being located adjacent to existing City limits and within the City's Sphere of Influence boundaries, annexing the ARSP into the City's incorporated boundary is currently being pursued. The City will be the water purveyor for the ARSP Area upon development. The City will own, operate and maintain the storage, transmission and distribution system within the ARSP Area.

### System Description

The ARSP potable water transmission system has been designed in a looped system following the major arterial and collector street alignments. The pipe diameter sizes range in size from 12 inches to 24 inches. It also includes one groundwater well for back up and emergency services. Figure 8 displays the general water system layout.

## Hydraulic Modeling

The software used in this study was developed by Haestad Methods Inc. under trademark WaterCAD Version 8i. The computer modeling methodologies applied herein incorporate a combination of energy and mass balance iterations including the application of Bernoulli's equation with the Hazen-Williams method for determination of frictional head loss. Directional flow distribution is determined by applying the Hardy-Cross Method.

The WaterCAD software provides a module for testing fire flow and zone pressures at each node in the model. The fire flow data is sampled at each node representing the tee supplying a fire hydrant. WaterCAD tests each zone by applying the available fire flow at hydrant tee locations. Nodes are tested to verify that the available fire flow is greater than the total needed fire flow and the calculated residual pressures are above the designated minimum zone pressure. All nodes satisfying the fire flow constraints are labeled as "true" in the Fire Flow Report (Appendix C), while nodes that fail the fire flow constraints are labeled as "false."

The results of the fire flow analysis are reviewed for the fire flow scenario that produces the worst-case scenario pressure results. The worst-case node is then individually analyzed to check for system wide constraints such as maximum pipe velocities.

The following assumptions were made during the hydraulic modeling:

- The City's existing facilities will accommodate the ARSP water demands
- A Hazen William's "C" value of 130 was used for all pipe
- The connection to the Creekview Specific Plan pipe was modeled as a fixed head reservoir with a fixed hydraulic grade line.
- Maximum flows to Brookfield from the Creekview point of connection is given by the Creekview model for MDD+2% with a fire flow of 4,500 gpm.

The following scenarios were modeled under a steady-state analysis in order to duplicate the operational behavior of the system under various demand scenarios. These included:

- Average Day Demands (models the system under average daily water use)
- Maximum Day Demand (models the system under maximum daily water use)
- Peak Hour Demand (models the system under peak hour water use)
- Fire Flow (models the system under maximum daily water use with an additional fire flow demand)

Fire flow scenarios represent the most critical scenario. Four (4) fire flow demands were ran on the entire system and nine (9) crucial system nodes were analyzed based on the corresponding planned area land use to ensure the resulting fire flow analysis satisfied the

requirements listed in Table 5 and 6. These results accounted for the 2% system losses applied to the maximum daily demand. Refer to Appendix C for the fire flow results.

## City-Wide Hydraulic Modeling

In addition to hydraulic modeling of the proposed ARSP water system, it was necessary to model the entire City of Roseville system to determine any potential constraints that might result from the addition of the ARSP water system to the existing and currently proposed City of Roseville system.

HydroScience Engineers provided a series of modeling services for the city-wide system due to their familiarity with the City's current hydraulic model and work with adjacent developments.

The services provided by HydroScience as part of this project included the following:

1. Converting the existing Amoruso Ranch Specific Plan (ARSP) potable water hydraulic model into Infowater and integrating it into the City potable water hydraulic model;
2. Running the nine scenarios specified by the City for the current, interim, and buildout conditions during both summer drought, fall drought, and normal year conditions;
3. Evaluating water infrastructure requirements for ARSP; and
4. Providing model output reports and/or figures showing the required infrastructure.

Initially it was envisioned that the modeling would be prepared under two buildout scenarios:

1. With the Placer Ranch Specific Plan; and
2. Without the Placer Ranch Specific Plan (PRSP).

Following initiation of the project, the developers of the PRSP decided that they would no longer pursue their project for entitlement. Thus, ARSP was evaluated based on City current, interim, and buildout conditions without the inclusion of PRSP. This methodology was consistent with standard City practices since the water system for the ARSP would be required to operate without the benefit and additional pipeline connections through the PRSP area.

The city-wide hydraulic modeling analysis is presented within the Technical Memorandum entitled "ARSP Potable Water Hydraulic Modeling," dated February 3, 2016, by HydroScience Engineers included with Appendix E of this report. As part of the work completed by

HydroScience there were nine distinct scenarios evaluated as part of the modeling. They include the following:

1. 2015 – Normal
2. 2015 – Drought - Summer
3. 2015 – Drought - Fall
4. 2035 – Normal
5. 2035 – Drought - Summer
6. 2035 – Drought - Fall
7. 2065 – Normal
8. 2065 – Drought - Summer
9. 2065 – Drought - Fall

The conclusion reached from the City-wide modeling analyses listed above is:

*“Potable water was able to be delivered to ARSP within the City’s required criteria for this evaluation for pressure and velocity during each scenario. Thus, no upgrades to City infrastructure are required due to pressure drops or increased velocity directly associated with the addition of ARSP demands. However, there are operational considerations to be made by the City specific to each scenario”* as detailed in the technical memorandum within Appendix E.

## Hydraulic Modeling Results

A detailed model analysis specific to the ARSP development area was performed to provide a comparison of infrastructure requirements needed to support the full build-out of the ARSP demands. A summary of the results for pressure and velocities is shown in Table 8. Table 9 includes results for preliminary sizing of the transmission mains for the project. Appendix B includes the water system layouts and Appendix C includes the hydraulic model run results as generated by the modeling program.

**Table 8**  
**Amoruso Ranch Specific Plan**  
**Water Master Plan**  
**Summary of Results<sup>1</sup>**

Scenario	Minimum Pressure (psi)	Maximum Pressure (psi)	Maximum Velocity (fps)
Average Day Demand	59.6	69.5	0.71
Maximum Day Demand	59.3	69.5	1.42
Peak Hour Demand	58.7	69.5	2.42
Max Day + Fire Flow at Node 46 <sup>2</sup>	58.1	63.8	5.76

1. Results include 2% system losses
2. Node 46 analyzed with highest fire flow demand (4,500 gpm). Refer to Appendix C for all other nodes tested in the system.

Based on the stated assumptions and results presented in Table 8, the water transmission mains satisfy the minimum design criteria. The proposed water infrastructure can adequately supply water to Brookfield while maintaining 50 psi within the ARSP during maximum day and peak hour demands and satisfying the minimum fire flow criteria. Results for the ARSP hydraulic model analysis are presented in the Appendix. The proposed pipe infrastructure required to convey water throughout the ARSP is tabulated in Table 9.

**Table 9**  
**Amoruso Ranch Specific Plan**  
**Water Master Plan**  
**Water System Approximate Pipe Size and Lengths**

Pipe Size	Pipe Length (ft)
12"	15,700
16"	6,700
24"	8,100
<b>Total</b>	<b>30,500</b>

The pipe lengths shown in Table 9 are used for modeling purposes and are an approximate representation of the actual site requirements. The final design and actual lengths may vary slightly.

**References**

Mackay & Somps. 2010. *Creekview Specific Plan Master Water Study*. November.

# **Amoruso Ranch Specific Plan Area**

## ***Water Master Plan***

### **Appendix A**

#### ***Water Demands by Land Use Parcel (AR)***

**Brookfield Water Demand Summary**

Parcel #	Land Use	Acres	Units	Density	Unit Demand		Avg. Day Demand (gpd)	Avg. Day Demand (gpm)	Avg. Annual Demand (AF/yr)	Max Day Demand (gpm)	Peak Hour Demand (gpm)
					Factor	Unit					
1	LDR	19.87	68	3.42		728 gpd/du	49,504	34.4	55.5	68.8	116.9
2	LDR	24.96	97	3.89		600 gpd/du	58,200	40.4	65.2	80.8	137.4
3	LDR	27.25	80	2.94		728 gpd/du	58,240	40.4	65.2	80.9	137.5
4	LDR	7.25	41	5.66		521 gpd/du	21,361	14.8	23.9	29.7	50.4
5	LDR	2.76	17	6.16		430 gpd/du	7,310	5.1	8.2	10.2	17.3
6	LDR	4.98	34	6.83		430 gpd/du	14,620	10.2	16.4	20.3	34.5
7	LDR	3.17	18	5.68		521 gpd/du	9,378	6.5	10.5	13.0	22.1
8	LDR	8.19	52	6.35		430 gpd/du	22,360	15.5	25.0	31.1	52.8
9	LDR	6.22	40	6.43		430 gpd/du	17,200	11.9	19.3	23.9	40.6
10	MDR	10.69	138	12.91		288 gpd/du	39,744	27.6	44.5	55.2	93.8
11	LDR	8.74	55	6.29		430 gpd/du	23,650	16.4	26.5	32.8	55.8
12	LDR	3.38	21	6.21		430 gpd/du	9,030	6.3	10.1	12.5	21.3
13	LDR	6.08	40	6.58		430 gpd/du	17,200	11.9	19.3	23.9	40.6
14	LDR	7.05	45	6.38		430 gpd/du	19,350	13.4	21.7	26.9	45.7
15	LDR	6.94	45	6.48		430 gpd/du	19,350	13.4	21.7	26.9	45.7
16	LDR	6.84	43	6.29		430 gpd/du	18,490	12.8	20.7	25.7	43.7
17	LDR	3.56	24	6.74		430 gpd/du	10,320	7.2	11.6	14.3	24.4
18	LDR	5.05	31	6.14		430 gpd/du	13,330	9.3	14.9	18.5	31.5
19	HDR	9.34	230	24.63		177 gpd/du	40,710	28.3	45.6	56.5	96.1
21	LDR	2.35	13	5.53		521 gpd/du	6,773	4.7	7.6	9.4	16.0
22	LDR	4.34	28	6.45		430 gpd/du	12,040	8.4	13.5	16.7	28.4
23	LDR	2.93	19	6.48		430 gpd/du	8,170	5.7	9.2	11.3	19.3
24	LDR	10.30	55	5.34		521 gpd/du	28,655	19.9	32.1	39.8	67.7
25	LDR	4.62	28	6.06		430 gpd/du	12,040	8.4	13.5	16.7	28.4
26	LDR	9.70	55	5.67		521 gpd/du	28,655	19.9	32.1	39.8	67.7
27	LDR	2.40	15	6.25		430 gpd/du	6,450	4.5	7.2	9.0	15.2
28	MDR	10.32	129	12.50		288 gpd/du	37,152	25.8	41.6	51.6	87.7
30	LDR	3.33	23	6.91		430 gpd/du	9,890	6.9	11.1	13.7	23.4
31	LDR	4.40	27	6.14		430 gpd/du	11,610	8.1	13.0	16.1	27.4
32	LDR	7.72	50	6.48		430 gpd/du	21,500	14.9	24.1	29.9	50.8
33	MDR	5.30	61	11.51		323 gpd/du	19,703	13.7	22.1	27.4	46.5
34	LDR	3.82	19	4.97		600 gpd/du	11,400	7.9	12.8	15.8	26.9
35	LDR	4.58	24	5.24		521 gpd/du	12,504	8.7	14.0	17.4	29.5
36	HDR	7.55	113	14.97		288 gpd/du	32,544	22.6	36.5	45.2	76.8
37	LDR	6.28	33	5.25		521 gpd/du	17,193	11.9	19.3	23.9	40.6
38	HDR	15.21	380	24.98		177 gpd/du	67,260	46.7	75.3	93.4	158.8
39	MDR	7.35	54	7.35		430 gpd/du	23,220	16.1	26.0	32.3	54.8
40	LDR	13.51	71	5.26		521 gpd/du	36,991	25.7	41.4	51.4	87.3
42	MDR	8.37	66	7.89		430 gpd/du	28,380	19.7	31.8	39.4	67.0
43	LDR	13.64	78	5.72		521 gpd/du	40,638	28.2	45.5	56.4	96.0
44	HDR	6.03	150	24.88		177 gpd/du	26,550	18.4	29.7	36.9	62.7
45	MDR	8.24	94	11.41		323 gpd/du	30,362	21.1	34.0	42.2	71.7
46	LDR	2.56	13	5.08		521 gpd/du	6,773	4.7	7.6	9.4	16.0
50	P/QP	9.62				3454 gpd/ac	33,227	23.1	37.2	46.1	78.5
51	CC-VC		91	6.40		288 gpd/du	26,208	18.2	29.4	36.4	61.9
51	CC-VC	14.21				2598 gpd/ac	36,918	25.6	41.4	51.3	87.2
52	CC-VC		18	1.38		288 gpd/du	5,184	3.6	5.8	7.2	12.2
52	CC-VC	13.06				2598 gpd/ac	33,930	23.6	38.0	47.1	80.1
53	CC	23.85				2598 gpd/ac	61,962	43.0	69.4	86.1	146.3



# Amoruso Ranch Specific Plan Area

## *Water Master Plan*

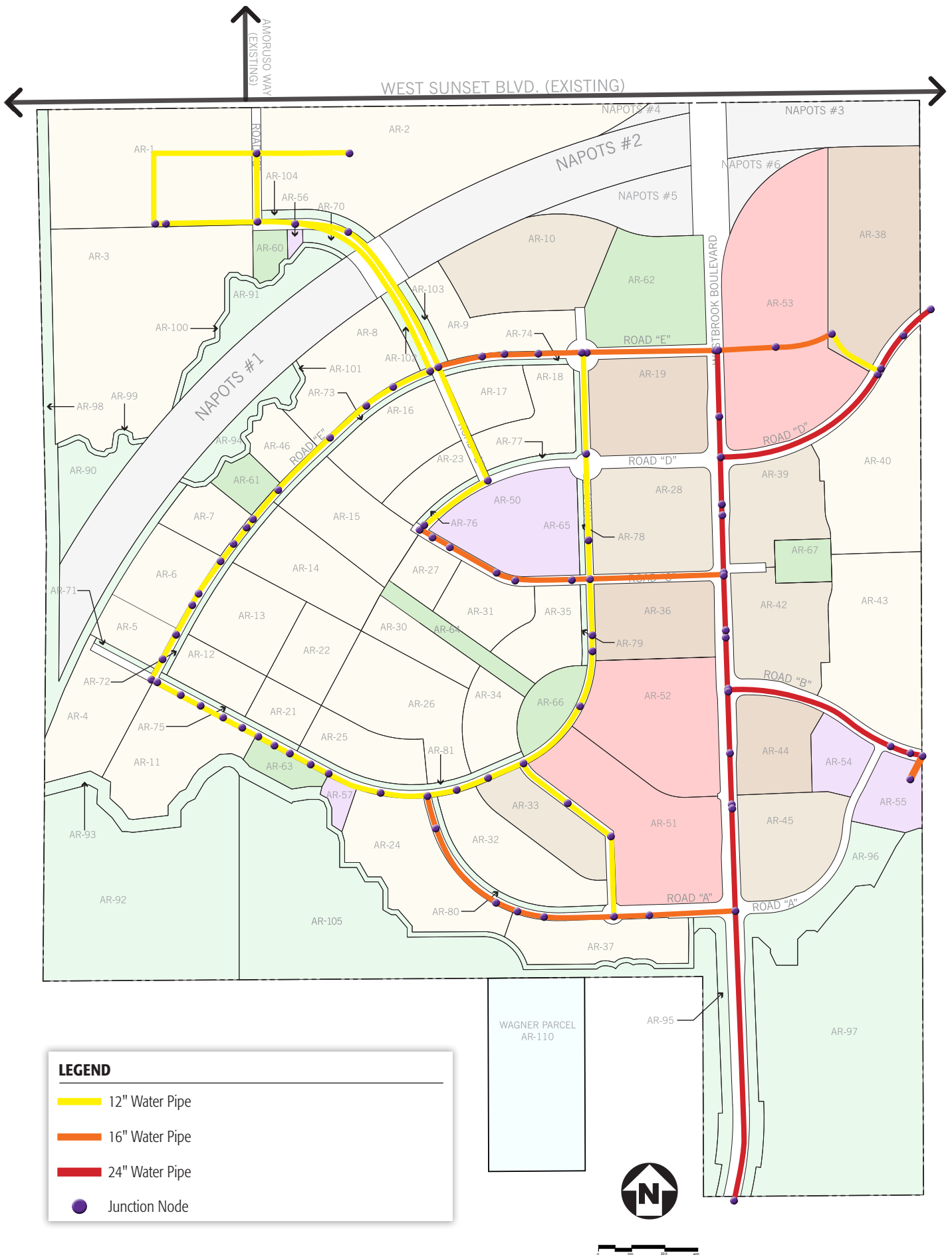
### **Appendix B**

*Figure 8 – ARSP Water System Pipe Network*

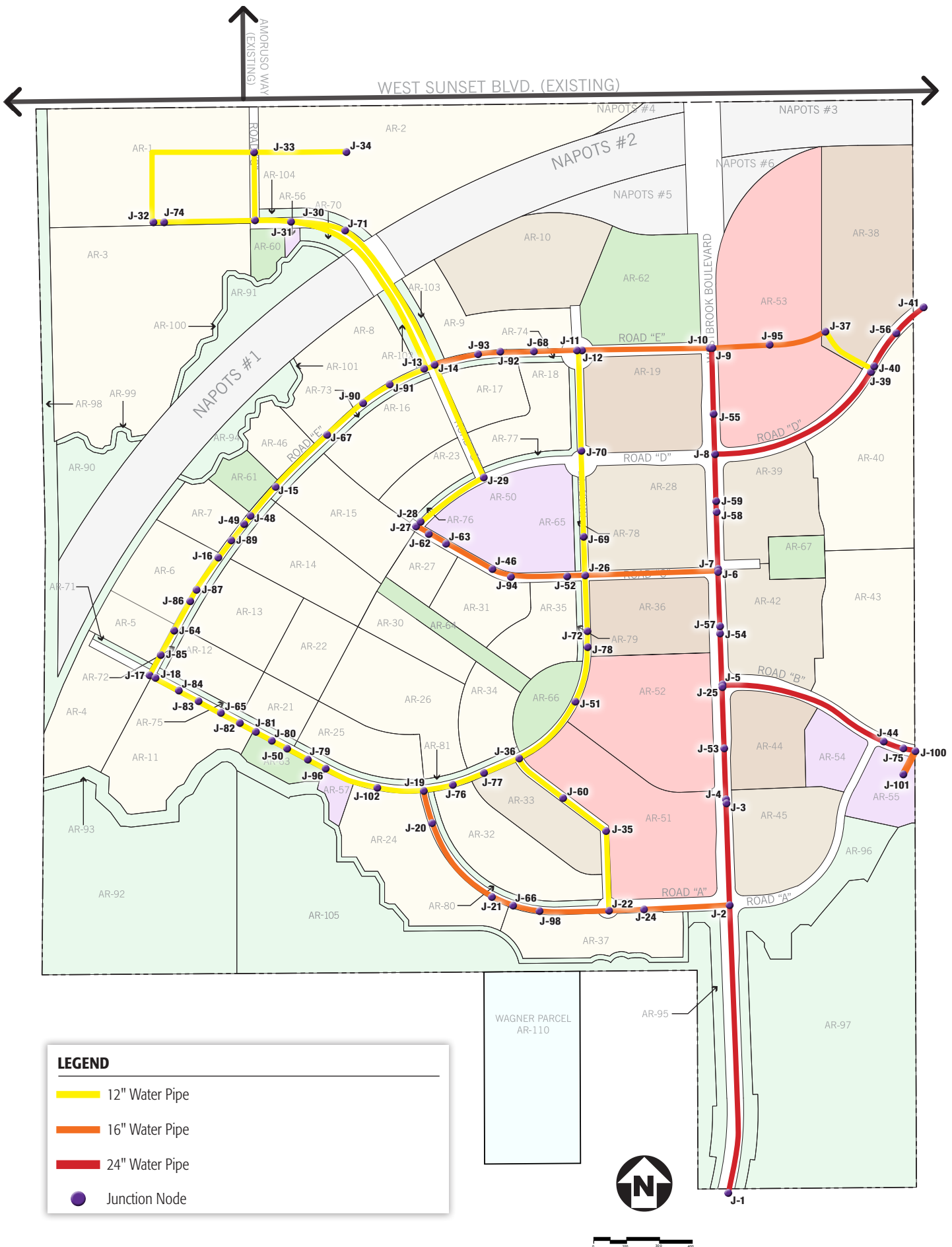
*Figure 9 – ARSP Water System Junction Nodes*

*Figure 10 – ARSP Water System Pipe Layout*

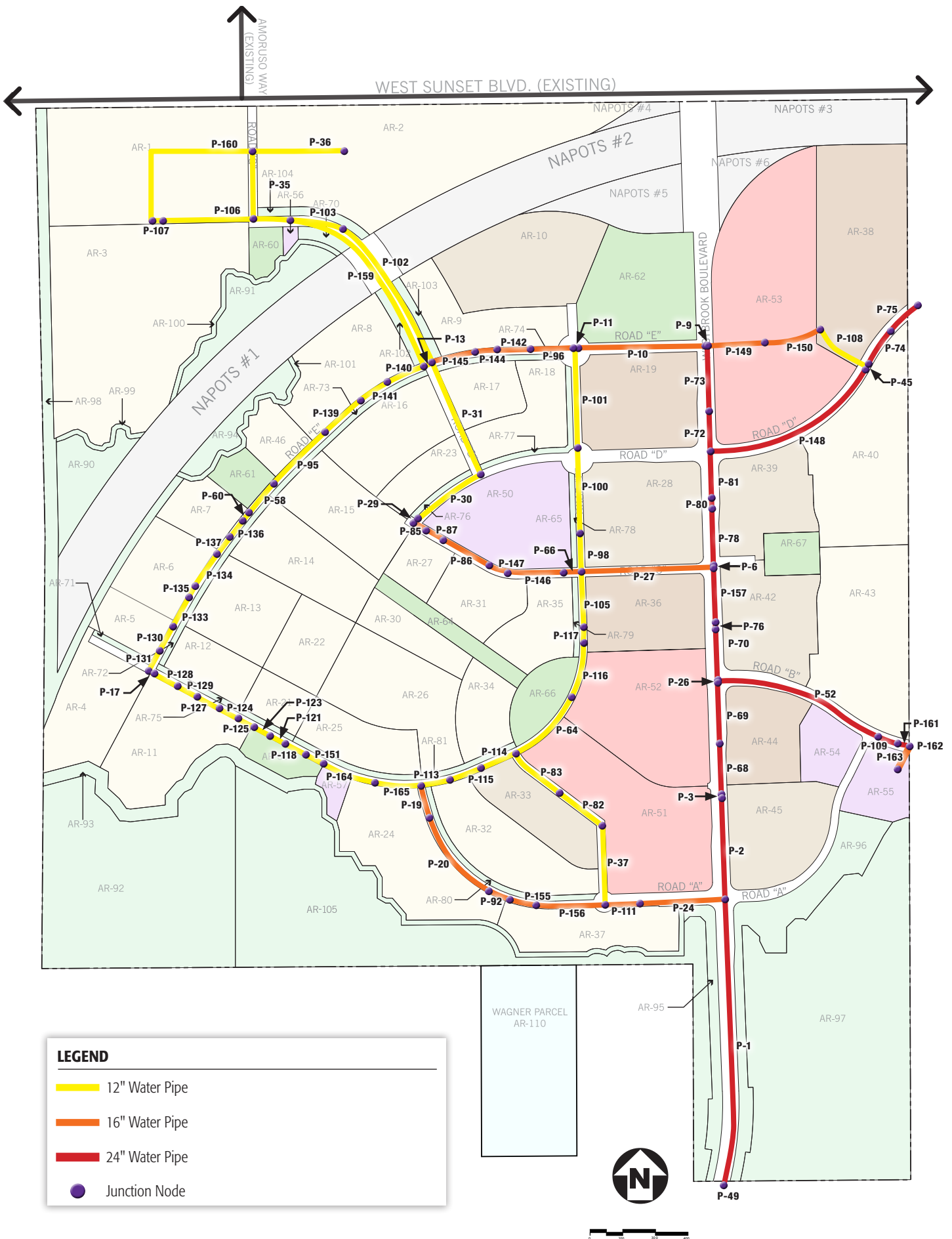
*Recycling Center and Well Site Concept*



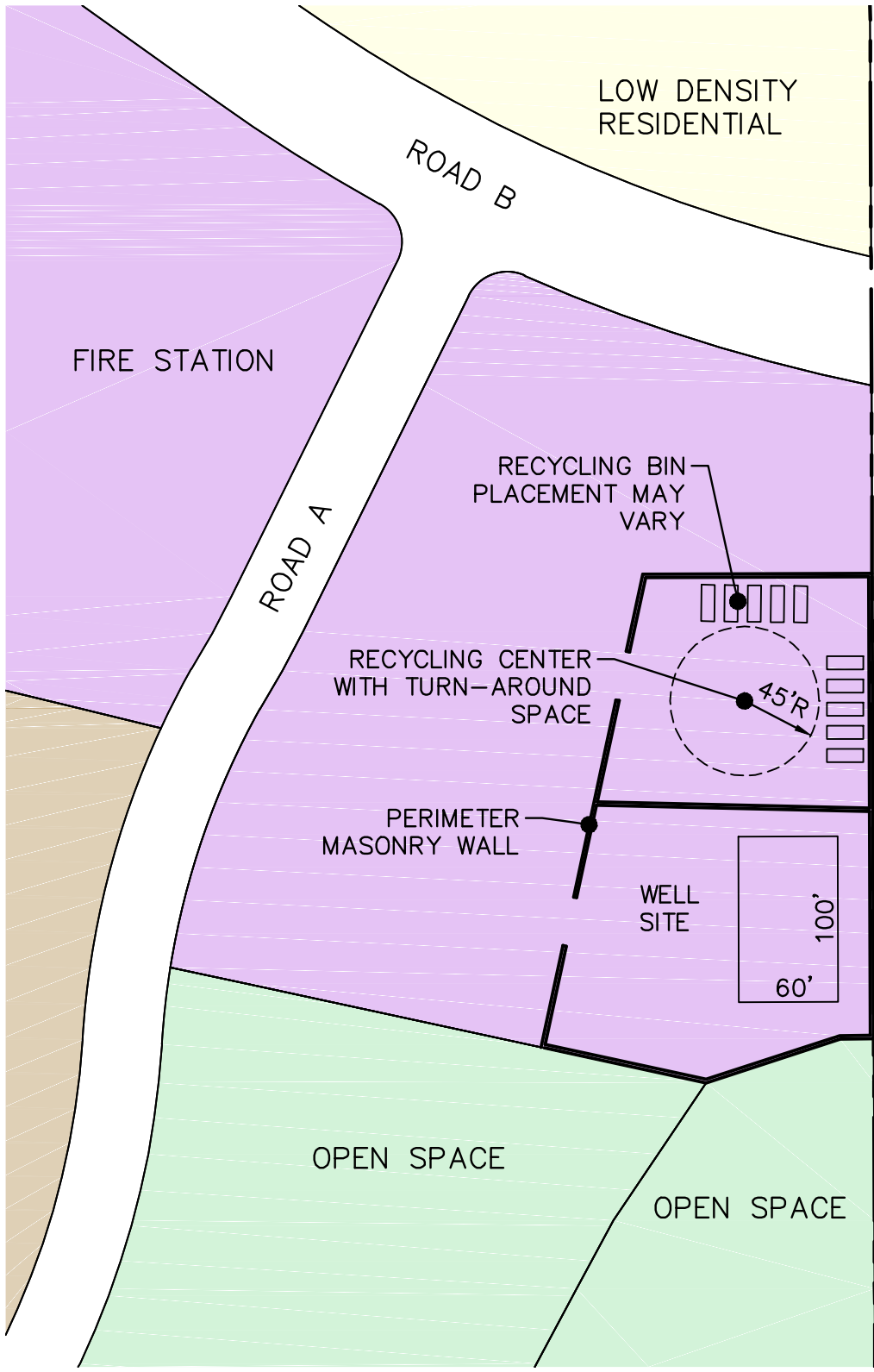
**Figure 8:** Amoruso Ranch (Water System Pipe Network)



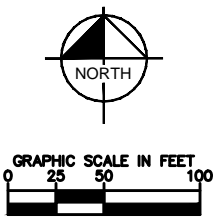
**Figure 9:** Amoruso Ranch (Water System Junction Nodes)



**Figure 10:** Amoruso Ranch (Water System Pipe Layout)



PLACER RANCH SPECIFIC PLAN AREA



# **Amoruso Ranch Specific Plan Area**

## ***Water Master Plan***

### **Appendix C**

#### ***Modeling Results***

Scenario: Average Day Demand  
 Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
28	J-1		82.49	0	243.07	69.5
29	J-2		92.27	0	242.93	65.2
31	J-3	AR-51	94.47	44	242.9	64.2
33	J-4	AR-45	94.6	21	242.9	64.2
35	J-5		97.53	0	242.87	62.9
37	J-6		102.47	0	242.85	60.7
39	J-7	AR-67	102.54	4	242.85	60.7
41	J-8		101.47	0	242.85	61.2
43	J-9		98.66	0	242.84	62.4
45	J-10	AR-62	98.37	21	242.84	62.5
47	J-11	AR-18	95.22	9	242.82	63.9
49	J-12	AR-10	95.15	28	242.82	63.9
51	J-13		91.87	0	242.8	65.3
53	J-14		91.99	0	242.8	65.2
55	J-15	AR-15	88.34	13	242.77	66.8
57	J-16	AR-14	86.23	13	242.77	67.7
59	J-17	AR-71	82.07	1	242.78	69.5
61	J-18	AR-04	82.21	15	242.78	69.5
63	J-19		84.4	0	242.86	68.6
65	J-20	AR-24	86.46	20	242.86	67.7
67	J-21	AR-31	91.2	8	242.87	65.6
69	J-22		89.78	0	242.89	66.2
73	J-24	AR-37	90.58	12	242.9	65.9
76	J-25	AR-52	97.4	27	242.87	62.9
79	J-26		96.1	0	242.84	63.5
81	J-27	AR-76	93.83	1	242.82	64.5
83	J-28	AR-23	95.23	6	242.82	63.9
85	J-29		94.85	0	242.81	64
88	J-30	AR-56	87.87	0	242.78	67
90	J-31	AR-60	87.97	3	242.78	67
92	J-32	AR-01	86.75	34	242.77	67.5
94	J-33		89.79	0	242.77	66.2
96	J-34	AR-02	91.23	40	242.77	65.6
98	J-35		87.98	0	242.87	67
100	J-36		87.4	0	242.86	67.3
105	J-37		102.48	0	242.84	60.7
109	J-39		103.76	0	242.84	60.2
111	J-40	AR-40	103.86	26	242.84	60.1
113	J-41		105.16	0	242.84	59.6
124	J-44	AR-54	90.78	4	242.87	65.8
127	J-45	AR-55	89.13	4	242.87	66.5
130	J-46	AR-50	94.64	23	242.83	64.1
134	J-48	AR-61	86.12	4	242.77	67.8
137	J-49	AR-64	85.93	4	242.77	67.9
140	J-50	AR-63	83.88	4	242.81	68.8
143	J-51	AR-66	89.74	6	242.85	66.2

## Scenario: Average Day Demand

## Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
146	J-52		96.57	0	242.84	63.3
149	J-53	AR-44	95.83	18	242.89	63.6
152	J-54	AR-36	99.73	23	242.86	61.9
155	J-55	AR-19	100.04	28	242.84	61.8
158	J-56	AR-38	104.73	47	242.84	59.8
161	J-57	AR-42	100.07	20	242.86	61.8
164	J-58	AR-27	103.99	4	242.85	60.1
167	J-59	AR-39	104.29	16	242.85	59.9
170	J-60	AR-33	85.92	14	242.86	67.9
174	J-62	AR-26	94.34	20	242.82	64.2
177	J-63	AR-28	93.83	26	242.82	64.5
180	J-64	AR-72	83.48	2	242.78	68.9
183	J-65	AR-75	83.74	2	242.79	68.8
186	J-66	AR-80	88.62	2	242.87	66.7
189	J-67	AR-73 AR-102	90.07	22	242.78	66.1
192	J-68	AR-74 AR-103	94.11	11	242.81	64.3
195	J-69	AR-78	98.44	1	242.84	62.5
198	J-70	AR-77	96.48	2	242.83	63.3
201	J-71	AR-70 AR-104	88.99	16	242.78	66.5
204	J-72	AR-79	92.83	1	242.84	64.9
208	J-74	AR-03	87	40	242.77	67.4
212	J-75	AR-43	90.95	28	242.87	65.7
216	J-76	AR-32	85.25	15	242.86	68.2
219	J-77	AR-34	86.27	8	242.86	67.7
222	J-78	AR-35	91.75	9	242.84	65.4
225	J-79	AR-25	83.28	8	242.82	69
228	J-80	AR-22	84.34	8	242.8	68.6
231	J-81	AR-21	84.54	5	242.8	68.5
234	J-82		84.28	0	242.8	68.6
237	J-83	AR-11	83.17	16	242.79	69.1
240	J-84	AR-12	82.63	6	242.78	69.3
243	J-85	AR-05	83.8	5	242.78	68.8
246	J-86	AR-06	85.87	10	242.77	67.9
249	J-87	AR-13	86.33	12	242.77	67.7
253	J-89	AR-07 AR-46	86.69	41	242.77	67.5
256	J-90	AR-08	91.16	16	242.78	65.6
259	J-91	AR-16	92.01	13	242.79	65.2
262	J-92	AR-09	93.28	12	242.81	64.7
265	J-93	AR-17	92.63	7	242.81	65
268	J-94	AR-30	95.44	7	242.83	63.8
296	J-95	AR-53	100.72	43	242.84	61.5
299	J-96	AR-57	82.66	1	242.82	69.3
307	J-98	AR-110	85.95	1	242.88	67.9
321	J-100		90.34	0	242.87	66
324	J-101		90	0	242.87	66.1
326	J-102	AR-81	83.6	2	242.84	68.9

Scenario: Average Day Demand  
 Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
30	P-1	1740	J-1	J-2	24	Ductile Iron	130	984	0.7
32	P-2	610	J-2	J-3	24	Ductile Iron	130	711	0.5
34	P-3	25	J-3	J-4	24	Ductile Iron	130	667	0.47
40	P-6	13	J-6	J-7	24	Ductile Iron	130	365	0.26
46	P-9	14	J-9	J-10	16	Ductile Iron	130	196	0.31
48	P-10	779	J-10	J-11	16	Ductile Iron	130	175	0.28
50	P-11	16	J-11	J-12	16	Ductile Iron	130	220	0.35
54	P-13	67	J-13	J-14	12	Ductile Iron	130	156	0.44
62	P-17	32	J-17	J-18	12	Ductile Iron	130	60	0.17
66	P-19	200	J-19	J-20	16	Ductile Iron	130	140	0.22
68	P-20	588	J-20	J-21	16	Ductile Iron	130	160	0.25
75	P-24	514	J-24	J-2	16	Ductile Iron	130	274	0.44
78	P-26	14	J-25	J-5	24	Ductile Iron	130	600	0.43
80	P-27	802	J-6	J-26	16	Ductile Iron	130	157	0.25
84	P-29	35	J-27	J-28	12	Ductile Iron	130	75	0.21
86	P-30	460	J-28	J-29	12	Ductile Iron	130	69	0.2
87	P-31	730	J-29	J-13	12	Ductile Iron	130	69	0.2
95	P-35	388	J-30	J-33	12	Ductile Iron	130	59	0.17
97	P-36	285	J-33	J-34	12	Ductile Iron	130	40	0.11
99	P-37	477	J-22	J-35	12	Ductile Iron	130	91	0.26
112	P-45	29	J-39	J-40	24	Ductile Iron	130	72	0.05
119	P-49	62	R-1	J-1	24	Ductile Iron	130	984	0.7
125	P-52	752	J-5	J-44	24	Ductile Iron	130	36	0.03
135	P-58	234	J-15	J-48	12	Ductile Iron	130	33	0.09
138	P-60	51	J-48	J-49	12	Ductile Iron	130	29	0.08
144	P-64	488	J-36	J-51	12	Ductile Iron	130	67	0.19
147	P-66	109	J-26	J-52	16	Ductile Iron	130	151	0.24
150	P-68	304	J-4	J-53	24	Ductile Iron	130	646	0.46
151	P-69	367	J-53	J-25	24	Ductile Iron	130	627	0.44
153	P-70	310	J-5	J-54	24	Ductile Iron	130	564	0.4
156	P-72	239	J-8	J-55	24	Ductile Iron	130	236	0.17
157	P-73	404	J-55	J-9	24	Ductile Iron	130	208	0.15
159	P-74	239	J-40	J-56	24	Ductile Iron	130	47	0.03
160	P-75	221	J-56	J-41	24	Ductile Iron	130	0	0
162	P-76	41	J-54	J-57	24	Ductile Iron	130	541	0.38
165	P-78	345	J-7	J-58	24	Ductile Iron	130	361	0.26
168	P-80	65	J-58	J-59	24	Ductile Iron	130	356	0.25
169	P-81	281	J-59	J-8	24	Ductile Iron	130	340	0.24
171	P-82	324	J-35	J-60	12	Ductile Iron	130	91	0.26
172	P-83	373	J-60	J-36	12	Ductile Iron	130	77	0.22
176	P-85	86	J-62	J-27	16	Ductile Iron	130	76	0.12
178	P-86	318	J-46	J-63	16	Ductile Iron	130	121	0.19
179	P-87	118	J-63	J-62	16	Ductile Iron	130	96	0.15
187	P-92	138	J-21	J-66	16	Ductile Iron	130	168	0.27
191	P-95	440	J-67	J-15	12	Ductile Iron	130	46	0.13

Scenario: Average Day Demand  
 Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
193	P-96	254	J-12	J-68	16	Ductile Iron	130	192	0.31
196	P-98	233	J-26	J-69	12	Ductile Iron	130	56	0.16
199	P-100	516	J-69	J-70	12	Ductile Iron	130	55	0.16
200	P-101	600	J-70	J-11	12	Ductile Iron	130	54	0.15
202	P-102	975	J-13	J-71	12	Ductile Iron	130	76	0.21
203	P-103	277	J-71	J-30	12	Ductile Iron	130	59	0.17
206	P-105	334	J-72	J-26	12	Ductile Iron	130	51	0.14
209	P-106	766	J-31	J-74	12	Ductile Iron	130	56	0.16
210	P-107	66	J-74	J-32	12	Ductile Iron	130	16	0.05
211	P-108	371	J-37	J-39	12	Ductile Iron	130	32	0.09
213	P-109	190	J-44	J-75	24	Ductile Iron	130	33	0.02
215	P-111	210	J-24	J-22	16	Ductile Iron	130	262	0.42
218	P-113	171	J-76	J-19	12	Ductile Iron	130	12	0.03
220	P-114	223	J-36	J-77	12	Ductile Iron	130	11	0.03
221	P-115	200	J-77	J-76	12	Ductile Iron	130	3	0.01
223	P-116	335	J-51	J-78	12	Ductile Iron	130	61	0.17
224	P-117	96	J-78	J-72	12	Ductile Iron	130	52	0.15
226	P-118	141	J-50	J-79	12	Ductile Iron	130	116	0.33
230	P-121	101	J-80	J-50	12	Ductile Iron	130	112	0.32
233	P-123	114	J-81	J-80	12	Ductile Iron	130	104	0.29
235	P-124	131	J-65	J-82	12	Ductile Iron	130	99	0.28
236	P-125	104	J-82	J-81	12	Ductile Iron	130	99	0.28
239	P-127	150	J-83	J-65	12	Ductile Iron	130	97	0.28
241	P-128	164	J-18	J-84	12	Ductile Iron	130	75	0.21
242	P-129	134	J-84	J-83	12	Ductile Iron	130	81	0.23
244	P-130	164	J-64	J-85	12	Ductile Iron	130	54	0.15
245	P-131	139	J-85	J-17	12	Ductile Iron	130	59	0.17
248	P-133	202	J-86	J-64	12	Ductile Iron	130	52	0.15
250	P-134	234	J-16	J-87	12	Ductile Iron	130	30	0.09
251	P-135	79	J-87	J-86	12	Ductile Iron	130	42	0.12
254	P-136	131	J-49	J-89	12	Ductile Iron	130	24	0.07
255	P-137	126	J-89	J-16	12	Ductile Iron	130	17	0.05
258	P-139	290	J-90	J-67	12	Ductile Iron	130	68	0.19
260	P-140	216	J-14	J-91	12	Ductile Iron	130	97	0.27
261	P-141	193	J-91	J-90	12	Ductile Iron	130	84	0.24
263	P-142	198	J-68	J-92	16	Ductile Iron	130	181	0.29
266	P-144	132	J-92	J-93	16	Ductile Iron	130	169	0.27
267	P-145	282	J-93	J-13	16	Ductile Iron	130	162	0.26
269	P-146	336	J-52	J-94	16	Ductile Iron	130	151	0.24
270	P-147	119	J-94	J-46	16	Ductile Iron	130	145	0.23
295	P-148	1118	J-8	J-39	24	Ductile Iron	130	104	0.07
297	P-149	346	J-9	J-95	16	Ductile Iron	130	11	0.02
298	P-150	352	J-95	J-37	16	Ductile Iron	130	32	0.05
300	P-151	122	J-79	J-96	12	Ductile Iron	130	124	0.35
308	P-155	166	J-66	J-98	16	Ductile Iron	130	170	0.27

Scenario: Average Day Demand

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
309	P-156	414	J-98	J-22	16	Ductile Iron	130	170	0.27
316	P-157	327	J-57	J-6	24	Ductile Iron	130	522	0.37
319	P-159	1241	J-14	J-31	12	Ductile Iron	130	59	0.17
320	P-160	1286	J-32	J-33	12	Ductile Iron	130	18	0.05
322	P-161	187	J-75	J-100	24	Ductile Iron	130	4	0
323	P-162	142	J-100	J-45	24	Ductile Iron	130	4	0
325	P-163	152	J-100	J-101	16	Ductile Iron	130	0	0
327	P-164	331	J-96	J-102	12	Ductile Iron	130	125	0.35
328	P-165	285	J-102	J-19	12	Ductile Iron	130	127	0.36

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
28	J-1		82.49	0	243.07	69.5
29	J-2		92.27	0	242.92	65.2
31	J-3	AR-51	94.47	45	242.89	64.2
33	J-4	AR-45	94.6	22	242.89	64.2
35	J-5		97.53	0	242.87	62.9
37	J-6		102.47	0	242.85	60.7
39	J-7	AR-67	102.54	4	242.85	60.7
41	J-8		101.47	0	242.84	61.2
43	J-9		98.66	0	242.83	62.4
45	J-10	AR-62	98.37	21	242.83	62.5
47	J-11	AR-18	95.22	9	242.81	63.9
49	J-12	AR-10	95.15	28	242.81	63.9
51	J-13		91.87	0	242.79	65.3
53	J-14		91.99	0	242.78	65.2
55	J-15	AR-15	88.34	14	242.76	66.8
57	J-16	AR-14	86.23	14	242.76	67.7
59	J-17	AR-71	82.07	1	242.77	69.5
61	J-18	AR-04	82.21	15	242.77	69.5
63	J-19		84.4	0	242.85	68.6
65	J-20	AR-24	86.46	20	242.85	67.7
67	J-21	AR-31	91.2	8	242.86	65.6
69	J-22		89.78	0	242.88	66.2
73	J-24	AR-37	90.58	12	242.89	65.9
76	J-25	AR-52	97.4	28	242.87	62.9
79	J-26		96.1	0	242.83	63.5
81	J-27	AR-76	93.83	1	242.81	64.5
83	J-28	AR-23	95.23	6	242.81	63.9
85	J-29		94.85	0	242.8	64
88	J-30	AR-56	87.87	0	242.76	67
90	J-31	AR-60	87.97	3	242.77	67
92	J-32	AR-01	86.75	35	242.76	67.5
94	J-33		89.79	0	242.76	66.2
96	J-34	AR-02	91.23	41	242.76	65.6
98	J-35		87.98	0	242.87	67
100	J-36		87.4	0	242.85	67.3
105	J-37		102.48	0	242.83	60.7
109	J-39		103.76	0	242.84	60.2
111	J-40	AR-40	103.86	26	242.84	60.1
113	J-41		105.16	0	242.84	59.6
124	J-44	AR-54	90.78	4	242.87	65.8
127	J-45	AR-55	89.13	4	242.87	66.5
130	J-46	AR-50	94.64	24	242.82	64.1
134	J-48	AR-61	86.12	4	242.76	67.8
137	J-49	AR-64	85.93	4	242.76	67.9
140	J-50	AR-63	83.88	4	242.8	68.8
143	J-51	AR-66	89.74	6	242.84	66.2

Scenario: Average Day Demand +2%

Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
146	J-52		96.57	0	242.83	63.3
149	J-53	AR-44	95.83	19	242.88	63.6
152	J-54	AR-36	99.73	23	242.86	61.9
155	J-55	AR-19	100.04	29	242.84	61.8
158	J-56	AR-38	104.73	48	242.84	59.8
161	J-57	AR-42	100.07	20	242.86	61.8
164	J-58	AR-27	103.99	5	242.84	60.1
167	J-59	AR-39	104.29	16	242.84	59.9
170	J-60	AR-33	85.92	14	242.86	67.9
174	J-62	AR-26	94.34	20	242.81	64.2
177	J-63	AR-28	93.83	26	242.81	64.5
180	J-64	AR-72	83.48	2	242.76	68.9
183	J-65	AR-75	83.74	2	242.78	68.8
186	J-66	AR-80	88.62	2	242.87	66.7
189	J-67	AR-73, AR-102	90.07	23	242.77	66.1
192	J-68	AR-74, AR-103	94.11	11	242.8	64.3
195	J-69	AR-78	98.44	1	242.83	62.5
198	J-70	AR-77	96.48	2	242.82	63.3
201	J-71	AR-70, AR-104	88.99	17	242.77	66.5
204	J-72	AR-79	92.83	1	242.83	64.9
208	J-74	AR-03	87	41	242.76	67.4
212	J-75	AR-43	90.95	29	242.87	65.7
216	J-76	AR-32	85.25	15	242.85	68.2
219	J-77	AR-34	86.27	8	242.85	67.7
222	J-78	AR-35	91.75	9	242.83	65.4
225	J-79	AR-25	83.28	9	242.81	69
228	J-80	AR-22	84.34	9	242.79	68.6
231	J-81	AR-21	84.54	5	242.79	68.5
234	J-82		84.28	0	242.79	68.6
237	J-83	AR-11	83.17	17	242.78	69.1
240	J-84	AR-12	82.63	6	242.77	69.3
243	J-85	AR-05	83.8	5	242.77	68.8
246	J-86	AR-06	85.87	10	242.76	67.9
249	J-87	AR-13	86.33	12	242.76	67.7
253	J-89	AR-07, AR-46	86.69	42	242.76	67.5
256	J-90	AR-08	91.16	16	242.77	65.6
259	J-91	AR-16	92.01	13	242.78	65.2
262	J-92	AR-09	93.28	12	242.8	64.7
265	J-93	AR-17	92.63	7	242.8	65
268	J-94	AR-30	95.44	7	242.82	63.8
296	J-95	AR-53	100.72	44	242.83	61.5
299	J-96	AR-57	82.66	1	242.81	69.3
307	J-98	AR-110	85.95	1	242.87	67.9
321	J-100		90.34	0	242.87	66
324	J-101		90	0	242.87	66.1
326	J-102	AR-81	83.6	2	242.83	68.9

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
30	P-1	1,740	J-1	J-2	24	Ductile Iron	130	1,004	0.71
32	P-2	610	J-2	J-3	24	Ductile Iron	130	725	0.51
34	P-3	25	J-3	J-4	24	Ductile Iron	130	680	0.48
40	P-6	13	J-6	J-7	24	Ductile Iron	130	372	0.26
46	P-9	14	J-9	J-10	16	Ductile Iron	130	200	0.32
48	P-10	779	J-10	J-11	16	Ductile Iron	130	179	0.29
50	P-11	16	J-11	J-12	16	Ductile Iron	130	224	0.36
54	P-13	67	J-13	J-14	12	Ductile Iron	130	159	0.45
62	P-17	32	J-17	J-18	12	Ductile Iron	130	61	0.17
66	P-19	200	J-19	J-20	16	Ductile Iron	130	142	0.23
68	P-20	588	J-20	J-21	16	Ductile Iron	130	163	0.26
75	P-24	514	J-24	J-2	16	Ductile Iron	130	279	0.45
78	P-26	14	J-25	J-5	24	Ductile Iron	130	612	0.43
80	P-27	802	J-6	J-26	16	Ductile Iron	130	160	0.26
84	P-29	35	J-27	J-28	12	Ductile Iron	130	77	0.22
86	P-30	460	J-28	J-29	12	Ductile Iron	130	71	0.2
87	P-31	730	J-29	J-13	12	Ductile Iron	130	71	0.2
95	P-35	388	J-30	J-33	12	Ductile Iron	130	60	0.17
97	P-36	285	J-33	J-34	12	Ductile Iron	130	41	0.12
99	P-37	477	J-22	J-35	12	Ductile Iron	130	93	0.26
112	P-45	29	J-39	J-40	24	Ductile Iron	130	74	0.05
119	P-49	62	R-1	J-1	24	Ductile Iron	130	1,004	0.71
125	P-52	752	J-5	J-44	24	Ductile Iron	130	37	0.03
135	P-58	234	J-15	J-48	12	Ductile Iron	130	33	0.09
138	P-60	51	J-48	J-49	12	Ductile Iron	130	29	0.08
144	P-64	488	J-36	J-51	12	Ductile Iron	130	68	0.19
147	P-66	109	J-26	J-52	16	Ductile Iron	130	154	0.25
150	P-68	304	J-4	J-53	24	Ductile Iron	130	659	0.47
151	P-69	367	J-53	J-25	24	Ductile Iron	130	640	0.45
153	P-70	310	J-5	J-54	24	Ductile Iron	130	575	0.41
156	P-72	239	J-8	J-55	24	Ductile Iron	130	241	0.17
157	P-73	404	J-55	J-9	24	Ductile Iron	130	212	0.15
159	P-74	239	J-40	J-56	24	Ductile Iron	130	48	0.03
160	P-75	221	J-56	J-41	24	Ductile Iron	130	0	0
162	P-76	41	J-54	J-57	24	Ductile Iron	130	552	0.39
165	P-78	345	J-7	J-58	24	Ductile Iron	130	368	0.26
168	P-80	65	J-58	J-59	24	Ductile Iron	130	363	0.26
169	P-81	281	J-59	J-8	24	Ductile Iron	130	347	0.25
171	P-82	324	J-35	J-60	12	Ductile Iron	130	93	0.26
172	P-83	373	J-60	J-36	12	Ductile Iron	130	79	0.22
176	P-85	86	J-62	J-27	16	Ductile Iron	130	77	0.12
178	P-86	318	J-46	J-63	16	Ductile Iron	130	124	0.2
179	P-87	118	J-63	J-62	16	Ductile Iron	130	98	0.16
187	P-92	138	J-21	J-66	16	Ductile Iron	130	171	0.27
191	P-95	440	J-67	J-15	12	Ductile Iron	130	47	0.13

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
193	P-96	254	J-12	J-68	16	Ductile Iron	130	196	0.31
196	P-98	233	J-26	J-69	12	Ductile Iron	130	57	0.16
199	P-100	516	J-69	J-70	12	Ductile Iron	130	57	0.16
200	P-101	600	J-70	J-11	12	Ductile Iron	130	55	0.16
202	P-102	975	J-13	J-71	12	Ductile Iron	130	77	0.22
203	P-103	277	J-71	J-30	12	Ductile Iron	130	60	0.17
206	P-105	334	J-72	J-26	12	Ductile Iron	130	52	0.15
209	P-106	766	J-31	J-74	12	Ductile Iron	130	58	0.16
210	P-107	66	J-74	J-32	12	Ductile Iron	130	16	0.05
211	P-108	371	J-37	J-39	12	Ductile Iron	130	32	0.09
213	P-109	190	J-44	J-75	24	Ductile Iron	130	33	0.02
215	P-111	210	J-24	J-22	16	Ductile Iron	130	267	0.43
218	P-113	171	J-76	J-19	12	Ductile Iron	130	12	0.04
220	P-114	223	J-36	J-77	12	Ductile Iron	130	11	0.03
221	P-115	200	J-77	J-76	12	Ductile Iron	130	3	0.01
223	P-116	335	J-51	J-78	12	Ductile Iron	130	62	0.18
224	P-117	96	J-78	J-72	12	Ductile Iron	130	53	0.15
226	P-118	141	J-50	J-79	12	Ductile Iron	130	118	0.33
230	P-121	101	J-80	J-50	12	Ductile Iron	130	114	0.32
233	P-123	114	J-81	J-80	12	Ductile Iron	130	106	0.3
235	P-124	131	J-65	J-82	12	Ductile Iron	130	101	0.29
236	P-125	104	J-82	J-81	12	Ductile Iron	130	101	0.29
239	P-127	150	J-83	J-65	12	Ductile Iron	130	99	0.28
241	P-128	164	J-18	J-84	12	Ductile Iron	130	76	0.22
242	P-129	134	J-84	J-83	12	Ductile Iron	130	83	0.23
244	P-130	164	J-64	J-85	12	Ductile Iron	130	55	0.16
245	P-131	139	J-85	J-17	12	Ductile Iron	130	60	0.17
248	P-133	202	J-86	J-64	12	Ductile Iron	130	53	0.15
250	P-134	234	J-16	J-87	12	Ductile Iron	130	31	0.09
251	P-135	79	J-87	J-86	12	Ductile Iron	130	43	0.12
254	P-136	131	J-49	J-89	12	Ductile Iron	130	25	0.07
255	P-137	126	J-89	J-16	12	Ductile Iron	130	17	0.05
258	P-139	290	J-90	J-67	12	Ductile Iron	130	70	0.2
260	P-140	216	J-14	J-91	12	Ductile Iron	130	98	0.28
261	P-141	193	J-91	J-90	12	Ductile Iron	130	85	0.24
263	P-142	198	J-68	J-92	16	Ductile Iron	130	185	0.29
266	P-144	132	J-92	J-93	16	Ductile Iron	130	172	0.28
267	P-145	282	J-93	J-13	16	Ductile Iron	130	165	0.26
269	P-146	336	J-52	J-94	16	Ductile Iron	130	154	0.25
270	P-147	119	J-94	J-46	16	Ductile Iron	130	147	0.24
295	P-148	1,118	J-8	J-39	24	Ductile Iron	130	106	0.08
297	P-149	346	J-9	J-95	16	Ductile Iron	130	12	0.02
298	P-150	352	J-95	J-37	16	Ductile Iron	130	32	0.05
300	P-151	122	J-79	J-96	12	Ductile Iron	130	127	0.36
308	P-155	166	J-66	J-98	16	Ductile Iron	130	173	0.28

Scenario: Average Day Demand +2%

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
309	P-156	414	J-98	J-22	16	Ductile Iron	130	174	0.28
316	P-157	327	J-57	J-6	24	Ductile Iron	130	532	0.38
319	P-159	1,241	J-14	J-31	12	Ductile Iron	130	60	0.17
320	P-160	1,286	J-32	J-33	12	Ductile Iron	130	19	0.05
322	P-161	187	J-75	J-100	24	Ductile Iron	130	4	0
323	P-162	142	J-100	J-45	24	Ductile Iron	130	4	0
325	P-163	152	J-100	J-101	16	Ductile Iron	130	0	0
327	P-164	331	J-96	J-102	12	Ductile Iron	130	128	0.36
328	P-165	285	J-102	J-19	12	Ductile Iron	130	130	0.37

Scenario: Max Day Demand

Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
28	J-1		82.49	0	243.06	69.5
29	J-2		92.27	0	242.53	65
31	J-3	AR-51	94.47	88	242.43	64
33	J-4	AR-45	94.6	42	242.43	64
35	J-5		97.53	0	242.34	62.7
37	J-6		102.47	0	242.27	60.5
39	J-7	AR-67	102.54	8	242.27	60.5
41	J-8		101.47	0	242.24	60.9
43	J-9		98.66	0	242.22	62.1
45	J-10	AR-62	98.37	42	242.22	62.2
47	J-11	AR-18	95.22	19	242.15	63.6
49	J-12	AR-10	95.15	55	242.15	63.6
51	J-13		91.87	0	242.07	65
53	J-14		91.99	0	242.05	64.9
55	J-15	AR-15	88.34	27	241.98	66.5
57	J-16	AR-14	86.23	27	241.97	67.4
59	J-17	AR-71	82.07	1	242	69.2
61	J-18	AR-04	82.21	30	242	69.1
63	J-19		84.4	0	242.27	68.3
65	J-20	AR-24	86.46	40	242.28	67.4
67	J-21	AR-31	91.2	16	242.33	65.4
69	J-22		89.78	0	242.39	66
73	J-24	AR-37	90.58	24	242.43	65.7
76	J-25	AR-52	97.4	54	242.34	62.7
79	J-26		96.1	0	242.21	63.2
81	J-27	AR-76	93.83	2	242.15	64.2
83	J-28	AR-23	95.23	11	242.15	63.6
85	J-29		94.85	0	242.12	63.7
88	J-30	AR-56	87.87	1	241.98	66.7
90	J-31	AR-60	87.97	5	241.99	66.6
92	J-32	AR-01	86.75	69	241.96	67.2
94	J-33		89.79	0	241.96	65.8
96	J-34	AR-02	91.23	81	241.96	65.2
98	J-35		87.98	0	242.34	66.8
100	J-36		87.4	0	242.27	67
105	J-37		102.48	0	242.22	60.5
109	J-39		103.76	0	242.23	59.9
111	J-40	AR-40	103.86	51	242.23	59.9
113	J-41		105.16	0	242.23	59.3
124	J-44	AR-54	90.78	7	242.34	65.6
127	J-45	AR-55	89.13	9	242.34	66.3
130	J-46	AR-50	94.64	46	242.17	63.8
134	J-48	AR-61	86.12	8	241.97	67.4
137	J-49	AR-64	85.93	9	241.97	67.5
140	J-50	AR-63	83.88	7	242.1	68.5
143	J-51	AR-66	89.74	13	242.24	66

Scenario: Max Day Demand

Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
146	J-52		96.57	0	242.2	63
149	J-53	AR-44	95.83	37	242.39	63.4
152	J-54	AR-36	99.73	45	242.3	61.7
155	J-55	AR-19	100.04	57	242.23	61.5
158	J-56	AR-38	104.73	93	242.23	59.5
161	J-57	AR-42	100.07	39	242.3	61.5
164	J-58	AR-27	103.99	9	242.25	59.8
167	J-59	AR-39	104.29	32	242.25	59.7
170	J-60	AR-33	85.92	27	242.3	67.7
174	J-62	AR-26	94.34	40	242.15	64
177	J-63	AR-28	93.83	52	242.16	64.2
180	J-64	AR-72	83.48	4	241.98	68.6
183	J-65	AR-75	83.74	3	242.04	68.5
186	J-66	AR-80	88.62	5	242.34	66.5
189	J-67	AR-73, AR-102	90.07	44	241.99	65.7
192	J-68	AR-74, AR-103	94.11	22	242.12	64
195	J-69	AR-78	98.44	2	242.2	62.2
198	J-70	AR-77	96.48	4	242.18	63
201	J-71	AR-70, AR-104	88.99	33	242	66.2
204	J-72	AR-79	92.83	2	242.22	64.6
208	J-74	AR-03	87	81	241.96	67
212	J-75	AR-43	90.95	56	242.34	65.5
216	J-76	AR-32	85.25	30	242.27	67.9
219	J-77	AR-34	86.27	16	242.27	67.5
222	J-78	AR-35	91.75	17	242.22	65.1
225	J-79	AR-25	83.28	17	242.13	68.7
228	J-80	AR-22	84.34	17	242.09	68.2
231	J-81	AR-21	84.54	9	242.07	68.2
234	J-82		84.28	0	242.06	68.3
237	J-83	AR-11	83.17	33	242.02	68.7
240	J-84	AR-12	82.63	13	242.01	69
243	J-85	AR-05	83.8	10	241.99	68.4
246	J-86	AR-06	85.87	20	241.98	67.5
249	J-87	AR-13	86.33	24	241.97	67.3
253	J-89	AR-07, AR-46	86.69	82	241.97	67.2
256	J-90	AR-08	91.16	31	242.01	65.3
259	J-91	AR-16	92.01	26	242.03	64.9
262	J-92	AR-09	93.28	24	242.1	64.4
265	J-93	AR-17	92.63	14	242.09	64.7
268	J-94	AR-30	95.44	14	242.18	63.5
296	J-95	AR-53	100.72	86	242.22	61.2
299	J-96	AR-57	82.66	2	242.15	69
307	J-98	AR-110	85.95	1	242.35	67.7
321	J-100		90.34	0	242.34	65.8
324	J-101		90	0	242.34	65.9
326	J-102	AR-81	83.6	5	242.21	68.6

Scenario: Max Day Demand

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
30	P-1	1,740	J-1	J-2	24	Ductile Iron	130	1,968	1.4
32	P-2	610	J-2	J-3	24	Ductile Iron	130	1,421	1.01
34	P-3	25	J-3	J-4	24	Ductile Iron	130	1,334	0.95
40	P-6	13	J-6	J-7	24	Ductile Iron	130	730	0.52
46	P-9	14	J-9	J-10	16	Ductile Iron	130	393	0.63
48	P-10	779	J-10	J-11	16	Ductile Iron	130	351	0.56
50	P-11	16	J-11	J-12	16	Ductile Iron	130	440	0.7
54	P-13	67	J-13	J-14	12	Ductile Iron	130	311	0.88
62	P-17	32	J-17	J-18	12	Ductile Iron	130	120	0.34
66	P-19	200	J-19	J-20	16	Ductile Iron	130	279	0.45
68	P-20	588	J-20	J-21	16	Ductile Iron	130	319	0.51
75	P-24	514	J-24	J-2	16	Ductile Iron	130	547	0.87
78	P-26	14	J-25	J-5	24	Ductile Iron	130	1,200	0.85
80	P-27	802	J-6	J-26	16	Ductile Iron	130	314	0.5
84	P-29	35	J-27	J-28	12	Ductile Iron	130	150	0.43
86	P-30	460	J-28	J-29	12	Ductile Iron	130	139	0.39
87	P-31	730	J-29	J-13	12	Ductile Iron	130	139	0.39
95	P-35	388	J-30	J-33	12	Ductile Iron	130	118	0.33
97	P-36	285	J-33	J-34	12	Ductile Iron	130	81	0.23
99	P-37	477	J-22	J-35	12	Ductile Iron	130	182	0.52
112	P-45	29	J-39	J-40	24	Ductile Iron	130	145	0.1
119	P-49	62	R-1	J-1	24	Ductile Iron	130	1,968	1.4
125	P-52	752	J-5	J-44	24	Ductile Iron	130	72	0.05
135	P-58	234	J-15	J-48	12	Ductile Iron	130	65	0.19
138	P-60	51	J-48	J-49	12	Ductile Iron	130	58	0.16
144	P-64	488	J-36	J-51	12	Ductile Iron	130	134	0.38
147	P-66	109	J-26	J-52	16	Ductile Iron	130	303	0.48
150	P-68	304	J-4	J-53	24	Ductile Iron	130	1,292	0.92
151	P-69	367	J-53	J-25	24	Ductile Iron	130	1,255	0.89
153	P-70	310	J-5	J-54	24	Ductile Iron	130	1,128	0.8
156	P-72	239	J-8	J-55	24	Ductile Iron	130	472	0.33
157	P-73	404	J-55	J-9	24	Ductile Iron	130	416	0.29
159	P-74	239	J-40	J-56	24	Ductile Iron	130	93	0.07
160	P-75	221	J-56	J-41	24	Ductile Iron	130	0	0
162	P-76	41	J-54	J-57	24	Ductile Iron	130	1,083	0.77
165	P-78	345	J-7	J-58	24	Ductile Iron	130	721	0.51
168	P-80	65	J-58	J-59	24	Ductile Iron	130	712	0.51
169	P-81	281	J-59	J-8	24	Ductile Iron	130	680	0.48
171	P-82	324	J-35	J-60	12	Ductile Iron	130	182	0.52
172	P-83	373	J-60	J-36	12	Ductile Iron	130	155	0.44
176	P-85	86	J-62	J-27	16	Ductile Iron	130	152	0.24
178	P-86	318	J-46	J-63	16	Ductile Iron	130	243	0.39
179	P-87	118	J-63	J-62	16	Ductile Iron	130	191	0.31
187	P-92	138	J-21	J-66	16	Ductile Iron	130	335	0.54
191	P-95	440	J-67	J-15	12	Ductile Iron	130	92	0.26

Scenario: Max Day Demand

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
193	P-96	254	J-12	J-68	16	Ductile Iron	130	384	0.61
196	P-98	233	J-26	J-69	12	Ductile Iron	130	113	0.32
199	P-100	516	J-69	J-70	12	Ductile Iron	130	111	0.31
200	P-101	600	J-70	J-11	12	Ductile Iron	130	107	0.3
202	P-102	975	J-13	J-71	12	Ductile Iron	130	151	0.43
203	P-103	277	J-71	J-30	12	Ductile Iron	130	118	0.34
206	P-105	334	J-72	J-26	12	Ductile Iron	130	102	0.29
209	P-106	766	J-31	J-74	12	Ductile Iron	130	113	0.32
210	P-107	66	J-74	J-32	12	Ductile Iron	130	32	0.09
211	P-108	371	J-37	J-39	12	Ductile Iron	130	63	0.18
213	P-109	190	J-44	J-75	24	Ductile Iron	130	65	0.05
215	P-111	210	J-24	J-22	16	Ductile Iron	130	523	0.83
218	P-113	171	J-76	J-19	12	Ductile Iron	130	24	0.07
220	P-114	223	J-36	J-77	12	Ductile Iron	130	21	0.06
221	P-115	200	J-77	J-76	12	Ductile Iron	130	5	0.02
223	P-116	335	J-51	J-78	12	Ductile Iron	130	121	0.34
224	P-117	96	J-78	J-72	12	Ductile Iron	130	104	0.29
226	P-118	141	J-50	J-79	12	Ductile Iron	130	231	0.66
230	P-121	101	J-80	J-50	12	Ductile Iron	130	224	0.64
233	P-123	114	J-81	J-80	12	Ductile Iron	130	208	0.59
235	P-124	131	J-65	J-82	12	Ductile Iron	130	198	0.56
236	P-125	104	J-82	J-81	12	Ductile Iron	130	198	0.56
239	P-127	150	J-83	J-65	12	Ductile Iron	130	195	0.55
241	P-128	164	J-18	J-84	12	Ductile Iron	130	150	0.42
242	P-129	134	J-84	J-83	12	Ductile Iron	130	162	0.46
244	P-130	164	J-64	J-85	12	Ductile Iron	130	108	0.31
245	P-131	139	J-85	J-17	12	Ductile Iron	130	119	0.34
248	P-133	202	J-86	J-64	12	Ductile Iron	130	104	0.3
250	P-134	234	J-16	J-87	12	Ductile Iron	130	60	0.17
251	P-135	79	J-87	J-86	12	Ductile Iron	130	84	0.24
254	P-136	131	J-49	J-89	12	Ductile Iron	130	49	0.14
255	P-137	126	J-89	J-16	12	Ductile Iron	130	33	0.09
258	P-139	290	J-90	J-67	12	Ductile Iron	130	136	0.39
260	P-140	216	J-14	J-91	12	Ductile Iron	130	193	0.55
261	P-141	193	J-91	J-90	12	Ductile Iron	130	167	0.48
263	P-142	198	J-68	J-92	16	Ductile Iron	130	362	0.58
266	P-144	132	J-92	J-93	16	Ductile Iron	130	338	0.54
267	P-145	282	J-93	J-13	16	Ductile Iron	130	324	0.52
269	P-146	336	J-52	J-94	16	Ductile Iron	130	303	0.48
270	P-147	119	J-94	J-46	16	Ductile Iron	130	289	0.46
295	P-148	1,118	J-8	J-39	24	Ductile Iron	130	208	0.15
297	P-149	346	J-9	J-95	16	Ductile Iron	130	23	0.04
298	P-150	352	J-95	J-37	16	Ductile Iron	130	63	0.1
300	P-151	122	J-79	J-96	12	Ductile Iron	130	248	0.7
308	P-155	166	J-66	J-98	16	Ductile Iron	130	340	0.54

Scenario: Max Day Demand

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
309	P-156	414	J-98	J-22	16	Ductile Iron	130	341	0.54
316	P-157	327	J-57	J-6	24	Ductile Iron	130	1,043	0.74
319	P-159	1,241	J-14	J-31	12	Ductile Iron	130	118	0.34
320	P-160	1,286	J-32	J-33	12	Ductile Iron	130	37	0.1
322	P-161	187	J-75	J-100	24	Ductile Iron	130	9	0.01
323	P-162	142	J-100	J-45	24	Ductile Iron	130	9	0.01
325	P-163	152	J-100	J-101	16	Ductile Iron	130	0	0
327	P-164	331	J-96	J-102	12	Ductile Iron	130	250	0.71
328	P-165	285	J-102	J-19	12	Ductile Iron	130	255	0.72

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
28	J-1		82.49	0	243.06	69.5
29	J-2		92.27	0	242.51	65
31	J-3	AR-51	94.47	89	242.41	64
33	J-4	AR-45	94.6	43	242.4	63.9
35	J-5		97.53	0	242.31	62.6
37	J-6		102.47	0	242.24	60.5
39	J-7	AR-67	102.54	8	242.24	60.4
41	J-8		101.47	0	242.2	60.9
43	J-9		98.66	0	242.19	62.1
45	J-10	AR-62	98.37	43	242.19	62.2
47	J-11	AR-18	95.22	19	242.12	63.6
49	J-12	AR-10	95.15	56	242.11	63.6
51	J-13		91.87	0	242.03	65
53	J-14		91.99	0	242.01	64.9
55	J-15	AR-15	88.34	27	241.93	66.5
57	J-16	AR-14	86.23	27	241.93	67.4
59	J-17	AR-71	82.07	1	241.96	69.2
61	J-18	AR-04	82.21	30	241.96	69.1
63	J-19		84.4	0	242.24	68.3
65	J-20	AR-24	86.46	41	242.25	67.4
67	J-21	AR-31	91.2	16	242.3	65.4
69	J-22		89.78	0	242.36	66
73	J-24	AR-37	90.58	24	242.4	65.7
76	J-25	AR-52	97.4	55	242.31	62.7
79	J-26		96.1	0	242.18	63.2
81	J-27	AR-76	93.83	2	242.12	64.2
83	J-28	AR-23	95.23	12	242.11	63.5
85	J-29		94.85	0	242.08	63.7
88	J-30	AR-56	87.87	1	241.94	66.7
90	J-31	AR-60	87.97	5	241.95	66.6
92	J-32	AR-01	86.75	70	241.91	67.1
94	J-33		89.79	0	241.92	65.8
96	J-34	AR-02	91.23	82	241.92	65.2
98	J-35		87.98	0	242.31	66.8
100	J-36		87.4	0	242.24	67
105	J-37		102.48	0	242.19	60.4
109	J-39		103.76	0	242.2	59.9
111	J-40	AR-40	103.86	52	242.2	59.9
113	J-41		105.16	0	242.2	59.3
124	J-44	AR-54	90.78	8	242.31	65.6
127	J-45	AR-55	89.13	9	242.31	66.3
130	J-46	AR-50	94.64	47	242.14	63.8
134	J-48	AR-61	86.12	8	241.93	67.4
137	J-49	AR-64	85.93	9	241.93	67.5
140	J-50	AR-63	83.88	7	242.07	68.4
143	J-51	AR-66	89.74	13	242.21	66

Scenario: Max Day Demand +2%

Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
146	J-52		96.57	0	242.17	63
149	J-53	AR-44	95.83	38	242.36	63.4
152	J-54	AR-36	99.73	46	242.27	61.7
155	J-55	AR-19	100.04	58	242.2	61.5
158	J-56	AR-38	104.73	95	242.2	59.5
161	J-57	AR-42	100.07	40	242.27	61.5
164	J-58	AR-27	103.99	9	242.22	59.8
167	J-59	AR-39	104.29	33	242.22	59.7
170	J-60	AR-33	85.92	28	242.27	67.6
174	J-62	AR-26	94.34	41	242.12	63.9
177	J-63	AR-28	93.83	53	242.12	64.2
180	J-64	AR-72	83.48	4	241.94	68.6
183	J-65	AR-75	83.74	3	242	68.5
186	J-66	AR-80	88.62	5	242.31	66.5
189	J-67	AR-73, AR-102	90.07	45	241.95	65.7
192	J-68	AR-74, AR-103	94.11	23	242.09	64
195	J-69	AR-78	98.44	2	242.17	62.2
198	J-70	AR-77	96.48	4	242.14	63
201	J-71	AR-70, AR-104	88.99	33	241.96	66.2
204	J-72	AR-79	92.83	2	242.19	64.6
208	J-74	AR-03	87	82	241.92	67
212	J-75	AR-43	90.95	58	242.31	65.5
216	J-76	AR-32	85.25	30	242.24	67.9
219	J-77	AR-34	86.27	16	242.24	67.5
222	J-78	AR-35	91.75	18	242.19	65.1
225	J-79	AR-25	83.28	17	242.09	68.7
228	J-80	AR-22	84.34	17	242.05	68.2
231	J-81	AR-21	84.54	10	242.03	68.1
234	J-82		84.28	0	242.02	68.2
237	J-83	AR-11	83.17	33	241.98	68.7
240	J-84	AR-12	82.63	13	241.97	68.9
243	J-85	AR-05	83.8	10	241.95	68.4
246	J-86	AR-06	85.87	21	241.93	67.5
249	J-87	AR-13	86.33	24	241.93	67.3
253	J-89	AR-07, AR-46	86.69	84	241.93	67.2
256	J-90	AR-08	91.16	32	241.97	65.2
259	J-91	AR-16	92.01	26	241.99	64.9
262	J-92	AR-09	93.28	24	242.07	64.4
265	J-93	AR-17	92.63	15	242.06	64.6
268	J-94	AR-30	95.44	14	242.14	63.5
296	J-95	AR-53	100.72	88	242.19	61.2
299	J-96	AR-57	82.66	2	242.12	69
307	J-98	AR-110	85.95	1	242.33	67.7
321	J-100		90.34	0	242.31	65.7
324	J-101		90	0	242.31	65.9
326	J-102	AR-81	83.6	5	242.18	68.6

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
30	P-1	1,740	J-1	J-2	24	Ductile Iron	130	2,008	1.42
32	P-2	610	J-2	J-3	24	Ductile Iron	130	1,450	1.03
34	P-3	25	J-3	J-4	24	Ductile Iron	130	1,360	0.96
40	P-6	13	J-6	J-7	24	Ductile Iron	130	744	0.53
46	P-9	14	J-9	J-10	16	Ductile Iron	130	401	0.64
48	P-10	779	J-10	J-11	16	Ductile Iron	130	358	0.57
50	P-11	16	J-11	J-12	16	Ductile Iron	130	448	0.72
54	P-13	67	J-13	J-14	12	Ductile Iron	130	317	0.9
62	P-17	32	J-17	J-18	12	Ductile Iron	130	122	0.35
66	P-19	200	J-19	J-20	16	Ductile Iron	130	285	0.45
68	P-20	588	J-20	J-21	16	Ductile Iron	130	326	0.52
75	P-24	514	J-24	J-2	16	Ductile Iron	130	558	0.89
78	P-26	14	J-25	J-5	24	Ductile Iron	130	1,224	0.87
80	P-27	802	J-6	J-26	16	Ductile Iron	130	320	0.51
84	P-29	35	J-27	J-28	12	Ductile Iron	130	153	0.43
86	P-30	460	J-28	J-29	12	Ductile Iron	130	142	0.4
87	P-31	730	J-29	J-13	12	Ductile Iron	130	142	0.4
95	P-35	388	J-30	J-33	12	Ductile Iron	130	120	0.34
97	P-36	285	J-33	J-34	12	Ductile Iron	130	82	0.23
99	P-37	477	J-22	J-35	12	Ductile Iron	130	186	0.53
112	P-45	29	J-39	J-40	24	Ductile Iron	130	148	0.1
119	P-49	62	R-1	J-1	24	Ductile Iron	130	2,008	1.42
125	P-52	752	J-5	J-44	24	Ductile Iron	130	74	0.05
135	P-58	234	J-15	J-48	12	Ductile Iron	130	67	0.19
138	P-60	51	J-48	J-49	12	Ductile Iron	130	59	0.17
144	P-64	488	J-36	J-51	12	Ductile Iron	130	136	0.39
147	P-66	109	J-26	J-52	16	Ductile Iron	130	309	0.49
150	P-68	304	J-4	J-53	24	Ductile Iron	130	1,317	0.93
151	P-69	367	J-53	J-25	24	Ductile Iron	130	1,280	0.91
153	P-70	310	J-5	J-54	24	Ductile Iron	130	1,150	0.82
156	P-72	239	J-8	J-55	24	Ductile Iron	130	482	0.34
157	P-73	404	J-55	J-9	24	Ductile Iron	130	424	0.3
159	P-74	239	J-40	J-56	24	Ductile Iron	130	95	0.07
160	P-75	221	J-56	J-41	24	Ductile Iron	130	0	0
162	P-76	41	J-54	J-57	24	Ductile Iron	130	1,104	0.78
165	P-78	345	J-7	J-58	24	Ductile Iron	130	736	0.52
168	P-80	65	J-58	J-59	24	Ductile Iron	130	727	0.52
169	P-81	281	J-59	J-8	24	Ductile Iron	130	694	0.49
171	P-82	324	J-35	J-60	12	Ductile Iron	130	186	0.53
172	P-83	373	J-60	J-36	12	Ductile Iron	130	158	0.45
176	P-85	86	J-62	J-27	16	Ductile Iron	130	155	0.25
178	P-86	318	J-46	J-63	16	Ductile Iron	130	248	0.4
179	P-87	118	J-63	J-62	16	Ductile Iron	130	195	0.31
187	P-92	138	J-21	J-66	16	Ductile Iron	130	342	0.55
191	P-95	440	J-67	J-15	12	Ductile Iron	130	94	0.27

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
193	P-96	254	J-12	J-68	16	Ductile Iron	130	392	0.63
196	P-98	233	J-26	J-69	12	Ductile Iron	130	115	0.33
199	P-100	516	J-69	J-70	12	Ductile Iron	130	113	0.32
200	P-101	600	J-70	J-11	12	Ductile Iron	130	109	0.31
202	P-102	975	J-13	J-71	12	Ductile Iron	130	154	0.44
203	P-103	277	J-71	J-30	12	Ductile Iron	130	121	0.34
206	P-105	334	J-72	J-26	12	Ductile Iron	130	104	0.3
209	P-106	766	J-31	J-74	12	Ductile Iron	130	115	0.33
210	P-107	66	J-74	J-32	12	Ductile Iron	130	33	0.09
211	P-108	371	J-37	J-39	12	Ductile Iron	130	64	0.18
213	P-109	190	J-44	J-75	24	Ductile Iron	130	66	0.05
215	P-111	210	J-24	J-22	16	Ductile Iron	130	534	0.85
218	P-113	171	J-76	J-19	12	Ductile Iron	130	25	0.07
220	P-114	223	J-36	J-77	12	Ductile Iron	130	22	0.06
221	P-115	200	J-77	J-76	12	Ductile Iron	130	6	0.02
223	P-116	335	J-51	J-78	12	Ductile Iron	130	123	0.35
224	P-117	96	J-78	J-72	12	Ductile Iron	130	106	0.3
226	P-118	141	J-50	J-79	12	Ductile Iron	130	236	0.67
230	P-121	101	J-80	J-50	12	Ductile Iron	130	229	0.65
233	P-123	114	J-81	J-80	12	Ductile Iron	130	212	0.6
235	P-124	131	J-65	J-82	12	Ductile Iron	130	202	0.57
236	P-125	104	J-82	J-81	12	Ductile Iron	130	202	0.57
239	P-127	150	J-83	J-65	12	Ductile Iron	130	199	0.56
241	P-128	164	J-18	J-84	12	Ductile Iron	130	153	0.43
242	P-129	134	J-84	J-83	12	Ductile Iron	130	165	0.47
244	P-130	164	J-64	J-85	12	Ductile Iron	130	111	0.31
245	P-131	139	J-85	J-17	12	Ductile Iron	130	121	0.34
248	P-133	202	J-86	J-64	12	Ductile Iron	130	106	0.3
250	P-134	234	J-16	J-87	12	Ductile Iron	130	61	0.17
251	P-135	79	J-87	J-86	12	Ductile Iron	130	86	0.24
254	P-136	131	J-49	J-89	12	Ductile Iron	130	50	0.14
255	P-137	126	J-89	J-16	12	Ductile Iron	130	34	0.1
258	P-139	290	J-90	J-67	12	Ductile Iron	130	139	0.39
260	P-140	216	J-14	J-91	12	Ductile Iron	130	197	0.56
261	P-141	193	J-91	J-90	12	Ductile Iron	130	171	0.48
263	P-142	198	J-68	J-92	16	Ductile Iron	130	369	0.59
266	P-144	132	J-92	J-93	16	Ductile Iron	130	345	0.55
267	P-145	282	J-93	J-13	16	Ductile Iron	130	330	0.53
269	P-146	336	J-52	J-94	16	Ductile Iron	130	309	0.49
270	P-147	119	J-94	J-46	16	Ductile Iron	130	295	0.47
295	P-148	1,118	J-8	J-39	24	Ductile Iron	130	212	0.15
297	P-149	346	J-9	J-95	16	Ductile Iron	130	23	0.04
298	P-150	352	J-95	J-37	16	Ductile Iron	130	64	0.1
300	P-151	122	J-79	J-96	12	Ductile Iron	130	253	0.72
308	P-155	166	J-66	J-98	16	Ductile Iron	130	347	0.55

Scenario: Max Day Demand +2%

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
309	P-156	414	J-98	J-22	16	Ductile Iron	130	348	0.55
316	P-157	327	J-57	J-6	24	Ductile Iron	130	1,064	0.75
319	P-159	1,241	J-14	J-31	12	Ductile Iron	130	120	0.34
320	P-160	1,286	J-32	J-33	12	Ductile Iron	130	38	0.11
322	P-161	187	J-75	J-100	24	Ductile Iron	130	9	0.01
323	P-162	142	J-100	J-45	24	Ductile Iron	130	9	0.01
325	P-163	152	J-100	J-101	16	Ductile Iron	130	0	0
327	P-164	331	J-96	J-102	12	Ductile Iron	130	255	0.72
328	P-165	285	J-102	J-19	12	Ductile Iron	130	260	0.74

Scenario: Peak Hour Demand

Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
28	J-1		82.49	0	243.03	69.5
29	J-2		92.27	0	241.62	64.6
31	J-3	AR-51	94.47	149	241.35	63.5
33	J-4	AR-45	94.6	72	241.34	63.5
35	J-5		97.53	0	241.09	62.1
37	J-6		102.47	0	240.91	59.9
39	J-7	AR-67	102.54	14	240.91	59.9
41	J-8		101.47	0	240.82	60.3
43	J-9		98.66	0	240.79	61.5
45	J-10	AR-62	98.37	71	240.79	61.6
47	J-11	AR-18	95.22	31	240.6	62.9
49	J-12	AR-10	95.15	94	240.59	62.9
51	J-13		91.87	0	240.38	64.3
53	J-14		91.99	0	240.33	64.2
55	J-15	AR-15	88.34	46	240.13	65.7
57	J-16	AR-14	86.23	46	240.12	66.6
59	J-17	AR-71	82.07	2	240.19	68.4
61	J-18	AR-04	82.21	50	240.19	68.4
63	J-19		84.4	0	240.92	67.7
65	J-20	AR-24	86.46	68	240.95	66.8
67	J-21	AR-31	91.2	27	241.07	64.8
69	J-22		89.78	0	241.23	65.5
73	J-24	AR-37	90.58	41	241.34	65.2
76	J-25	AR-52	97.4	92	241.1	62.2
79	J-26		96.1	0	240.75	62.6
81	J-27	AR-76	93.83	3	240.6	63.5
83	J-28	AR-23	95.23	19	240.59	62.9
85	J-29		94.85	0	240.51	63
88	J-30	AR-56	87.87	1	240.15	65.9
90	J-31	AR-60	87.97	9	240.17	65.9
92	J-32	AR-01	86.75	117	240.08	66.3
94	J-33		89.79	0	240.1	65
96	J-34	AR-02	91.23	137	240.08	64.4
98	J-35		87.98	0	241.09	66.2
100	J-36		87.4	0	240.92	66.4
105	J-37		102.48	0	240.79	59.8
109	J-39		103.76	0	240.81	59.3
111	J-40	AR-40	103.86	87	240.81	59.3
113	J-41		105.16	0	240.81	58.7
124	J-44	AR-54	90.78	13	241.09	65
127	J-45	AR-55	89.13	15	241.09	65.7
130	J-46	AR-50	94.64	78	240.65	63.2
134	J-48	AR-61	86.12	13	240.12	66.6
137	J-49	AR-64	85.93	15	240.12	66.7
140	J-50	AR-63	83.88	12	240.47	67.7
143	J-51	AR-66	89.74	21	240.84	65.4

Scenario: Peak Hour Demand

Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
146	J-52		96.57	0	240.73	62.4
149	J-53	AR-44	95.83	63	241.22	62.9
152	J-54	AR-36	99.73	77	241	61.1
155	J-55	AR-19	100.04	96	240.81	60.9
158	J-56	AR-38	104.73	159	240.81	58.9
161	J-57	AR-42	100.07	67	240.99	61
164	J-58	AR-27	103.99	15	240.86	59.2
167	J-59	AR-39	104.29	55	240.86	59.1
170	J-60	AR-33	85.92	47	241	67.1
174	J-62	AR-26	94.34	68	240.6	63.3
177	J-63	AR-28	93.83	88	240.61	63.5
180	J-64	AR-72	83.48	7	240.15	67.8
183	J-65	AR-75	83.74	5	240.3	67.7
186	J-66	AR-80	88.62	8	241.1	66
189	J-67	AR-73, AR-102	90.07	75	240.17	64.9
192	J-68	AR-74, AR-103	94.11	38	240.52	63.3
195	J-69	AR-78	98.44	3	240.72	61.6
198	J-70	AR-77	96.48	6	240.67	62.4
201	J-71	AR-70, AR-104	88.99	56	240.18	65.4
204	J-72	AR-79	92.83	3	240.79	64
208	J-74	AR-03	87	137	240.08	66.2
212	J-75	AR-43	90.95	96	241.09	65
216	J-76	AR-32	85.25	51	240.92	67.4
219	J-77	AR-34	86.27	27	240.92	66.9
222	J-78	AR-35	91.75	30	240.8	64.5
225	J-79	AR-25	83.28	28	240.53	68
228	J-80	AR-22	84.34	28	240.43	67.5
231	J-81	AR-21	84.54	16	240.38	67.4
234	J-82		84.28	0	240.35	67.5
237	J-83	AR-11	83.17	56	240.26	68
240	J-84	AR-12	82.63	21	240.22	68.2
243	J-85	AR-05	83.8	17	240.17	67.7
246	J-86	AR-06	85.87	35	240.13	66.7
249	J-87	AR-13	86.33	41	240.12	66.5
253	J-89	AR-07, AR-46	86.69	140	240.11	66.4
256	J-90	AR-08	91.16	53	240.21	64.5
259	J-91	AR-16	92.01	44	240.26	64.1
262	J-92	AR-09	93.28	41	240.47	63.7
265	J-93	AR-17	92.63	24	240.44	64
268	J-94	AR-30	95.44	23	240.67	62.8
296	J-95	AR-53	100.72	146	240.79	60.6
299	J-96	AR-57	82.66	4	240.59	68.3
307	J-98	AR-110	85.95	2	241.14	67.1
321	J-100		90.34	0	241.09	65.2
324	J-101		90	0	241.09	65.4
326	J-102	AR-81	83.6	8	240.77	68

Scenario: Peak Hour Demand

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
30	P-1	1,740	J-1	J-2	24	Ductile Iron	130	3,346	2.37
32	P-2	610	J-2	J-3	24	Ductile Iron	130	2,416	1.71
34	P-3	25	J-3	J-4	24	Ductile Iron	130	2,267	1.61
40	P-6	13	J-6	J-7	24	Ductile Iron	130	1,240	0.88
46	P-9	14	J-9	J-10	16	Ductile Iron	130	668	1.07
48	P-10	779	J-10	J-11	16	Ductile Iron	130	596	0.95
50	P-11	16	J-11	J-12	16	Ductile Iron	130	747	1.19
54	P-13	67	J-13	J-14	12	Ductile Iron	130	529	1.5
62	P-17	32	J-17	J-18	12	Ductile Iron	130	204	0.58
66	P-19	200	J-19	J-20	16	Ductile Iron	130	475	0.76
68	P-20	588	J-20	J-21	16	Ductile Iron	130	543	0.87
75	P-24	514	J-24	J-2	16	Ductile Iron	130	930	1.48
78	P-26	14	J-25	J-5	24	Ductile Iron	130	2,041	1.45
80	P-27	802	J-6	J-26	16	Ductile Iron	130	533	0.85
84	P-29	35	J-27	J-28	12	Ductile Iron	130	255	0.72
86	P-30	460	J-28	J-29	12	Ductile Iron	130	236	0.67
87	P-31	730	J-29	J-13	12	Ductile Iron	130	236	0.67
95	P-35	388	J-30	J-33	12	Ductile Iron	130	200	0.57
97	P-36	285	J-33	J-34	12	Ductile Iron	130	137	0.39
99	P-37	477	J-22	J-35	12	Ductile Iron	130	310	0.88
112	P-45	29	J-39	J-40	24	Ductile Iron	130	246	0.17
119	P-49	62	R-1	J-1	24	Ductile Iron	130	3,346	2.37
125	P-52	752	J-5	J-44	24	Ductile Iron	130	123	0.09
135	P-58	234	J-15	J-48	12	Ductile Iron	130	111	0.31
138	P-60	51	J-48	J-49	12	Ductile Iron	130	98	0.28
144	P-64	488	J-36	J-51	12	Ductile Iron	130	227	0.64
147	P-66	109	J-26	J-52	16	Ductile Iron	130	515	0.82
150	P-68	304	J-4	J-53	24	Ductile Iron	130	2,196	1.56
151	P-69	367	J-53	J-25	24	Ductile Iron	130	2,133	1.51
153	P-70	310	J-5	J-54	24	Ductile Iron	130	1,917	1.36
156	P-72	239	J-8	J-55	24	Ductile Iron	130	803	0.57
157	P-73	404	J-55	J-9	24	Ductile Iron	130	707	0.5
159	P-74	239	J-40	J-56	24	Ductile Iron	130	159	0.11
160	P-75	221	J-56	J-41	24	Ductile Iron	130	0	0
162	P-76	41	J-54	J-57	24	Ductile Iron	130	1,841	1.31
165	P-78	345	J-7	J-58	24	Ductile Iron	130	1,226	0.87
168	P-80	65	J-58	J-59	24	Ductile Iron	130	1,211	0.86
169	P-81	281	J-59	J-8	24	Ductile Iron	130	1,156	0.82
171	P-82	324	J-35	J-60	12	Ductile Iron	130	310	0.88
172	P-83	373	J-60	J-36	12	Ductile Iron	130	263	0.75
176	P-85	86	J-62	J-27	16	Ductile Iron	130	258	0.41
178	P-86	318	J-46	J-63	16	Ductile Iron	130	413	0.66
179	P-87	118	J-63	J-62	16	Ductile Iron	130	325	0.52
187	P-92	138	J-21	J-66	16	Ductile Iron	130	570	0.91
191	P-95	440	J-67	J-15	12	Ductile Iron	130	157	0.44

Scenario: Peak Hour Demand

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
193	P-96	254	J-12	J-68	16	Ductile Iron	130	653	1.04
196	P-98	233	J-26	J-69	12	Ductile Iron	130	192	0.54
199	P-100	516	J-69	J-70	12	Ductile Iron	130	188	0.53
200	P-101	600	J-70	J-11	12	Ductile Iron	130	182	0.52
202	P-102	975	J-13	J-71	12	Ductile Iron	130	257	0.73
203	P-103	277	J-71	J-30	12	Ductile Iron	130	201	0.57
206	P-105	334	J-72	J-26	12	Ductile Iron	130	173	0.49
209	P-106	766	J-31	J-74	12	Ductile Iron	130	192	0.54
210	P-107	66	J-74	J-32	12	Ductile Iron	130	54	0.15
211	P-108	371	J-37	J-39	12	Ductile Iron	130	107	0.3
213	P-109	190	J-44	J-75	24	Ductile Iron	130	111	0.08
215	P-111	210	J-24	J-22	16	Ductile Iron	130	889	1.42
218	P-113	171	J-76	J-19	12	Ductile Iron	130	42	0.12
220	P-114	223	J-36	J-77	12	Ductile Iron	130	36	0.1
221	P-115	200	J-77	J-76	12	Ductile Iron	130	9	0.03
223	P-116	335	J-51	J-78	12	Ductile Iron	130	206	0.58
224	P-117	96	J-78	J-72	12	Ductile Iron	130	176	0.5
226	P-118	141	J-50	J-79	12	Ductile Iron	130	393	1.12
230	P-121	101	J-80	J-50	12	Ductile Iron	130	381	1.08
233	P-123	114	J-81	J-80	12	Ductile Iron	130	353	1
235	P-124	131	J-65	J-82	12	Ductile Iron	130	337	0.96
236	P-125	104	J-82	J-81	12	Ductile Iron	130	337	0.96
239	P-127	150	J-83	J-65	12	Ductile Iron	130	331	0.94
241	P-128	164	J-18	J-84	12	Ductile Iron	130	254	0.72
242	P-129	134	J-84	J-83	12	Ductile Iron	130	276	0.78
244	P-130	164	J-64	J-85	12	Ductile Iron	130	184	0.52
245	P-131	139	J-85	J-17	12	Ductile Iron	130	202	0.57
248	P-133	202	J-86	J-64	12	Ductile Iron	130	177	0.5
250	P-134	234	J-16	J-87	12	Ductile Iron	130	102	0.29
251	P-135	79	J-87	J-86	12	Ductile Iron	130	143	0.41
254	P-136	131	J-49	J-89	12	Ductile Iron	130	83	0.24
255	P-137	126	J-89	J-16	12	Ductile Iron	130	57	0.16
258	P-139	290	J-90	J-67	12	Ductile Iron	130	232	0.66
260	P-140	216	J-14	J-91	12	Ductile Iron	130	328	0.93
261	P-141	193	J-91	J-90	12	Ductile Iron	130	285	0.81
263	P-142	198	J-68	J-92	16	Ductile Iron	130	615	0.98
266	P-144	132	J-92	J-93	16	Ductile Iron	130	575	0.92
267	P-145	282	J-93	J-13	16	Ductile Iron	130	550	0.88
269	P-146	336	J-52	J-94	16	Ductile Iron	130	515	0.82
270	P-147	119	J-94	J-46	16	Ductile Iron	130	492	0.78
295	P-148	1,118	J-8	J-39	24	Ductile Iron	130	353	0.25
297	P-149	346	J-9	J-95	16	Ductile Iron	130	39	0.06
298	P-150	352	J-95	J-37	16	Ductile Iron	130	107	0.17
300	P-151	122	J-79	J-96	12	Ductile Iron	130	422	1.2
308	P-155	166	J-66	J-98	16	Ductile Iron	130	578	0.92

Scenario: Peak Hour Demand

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
309	P-156	414	J-98	J-22	16	Ductile Iron	130	580	0.92
316	P-157	327	J-57	J-6	24	Ductile Iron	130	1,773	1.26
319	P-159	1,241	J-14	J-31	12	Ductile Iron	130	201	0.57
320	P-160	1,286	J-32	J-33	12	Ductile Iron	130	63	0.18
322	P-161	187	J-75	J-100	24	Ductile Iron	130	15	0.01
323	P-162	142	J-100	J-45	24	Ductile Iron	130	15	0.01
325	P-163	152	J-100	J-101	16	Ductile Iron	130	0	0
327	P-164	331	J-96	J-102	12	Ductile Iron	130	425	1.21
328	P-165	285	J-102	J-19	12	Ductile Iron	130	433	1.23

Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
28	J-1		82.49	0	243.03	69.5
29	J-2		92.27	0	241.56	64.6
31	J-3	AR-51	94.47	152	241.28	63.5
33	J-4	AR-45	94.6	73	241.27	63.5
35	J-5		97.53	0	241.02	62.1
37	J-6		102.47	0	240.83	59.9
39	J-7	AR-67	102.54	14	240.83	59.8
41	J-8		101.47	0	240.74	60.3
43	J-9		98.66	0	240.71	61.5
45	J-10	AR-62	98.37	73	240.7	61.6
47	J-11	AR-18	95.22	32	240.51	62.9
49	J-12	AR-10	95.15	96	240.5	62.9
51	J-13		91.87	0	240.28	64.2
53	J-14		91.99	0	240.23	64.1
55	J-15	AR-15	88.34	47	240.02	65.6
57	J-16	AR-14	86.23	47	240.01	66.5
59	J-17	AR-71	82.07	2	240.08	68.4
61	J-18	AR-04	82.21	51	240.08	68.3
63	J-19		84.4	0	240.84	67.7
65	J-20	AR-24	86.46	69	240.87	66.8
67	J-21	AR-31	91.2	28	241	64.8
69	J-22		89.78	0	241.16	65.5
73	J-24	AR-37	90.58	41	241.27	65.2
76	J-25	AR-52	97.4	94	241.02	62.1
79	J-26		96.1	0	240.67	62.5
81	J-27	AR-76	93.83	3	240.51	63.5
83	J-28	AR-23	95.23	20	240.5	62.9
85	J-29		94.85	0	240.42	63
88	J-30	AR-56	87.87	1	240.04	65.8
90	J-31	AR-60	87.97	9	240.06	65.8
92	J-32	AR-01	86.75	119	239.97	66.3
94	J-33		89.79	0	239.99	65
96	J-34	AR-02	91.23	140	239.97	64.4
98	J-35		87.98	0	241.02	66.2
100	J-36		87.4	0	240.84	66.4
105	J-37		102.48	0	240.71	59.8
109	J-39		103.76	0	240.72	59.3
111	J-40	AR-40	103.86	89	240.72	59.2
113	J-41		105.16	0	240.72	58.7
124	J-44	AR-54	90.78	13	241.02	65
127	J-45	AR-55	89.13	15	241.02	65.7
130	J-46	AR-50	94.64	80	240.56	63.1
134	J-48	AR-61	86.12	13	240.01	66.6
137	J-49	AR-64	85.93	15	240.01	66.7
140	J-50	AR-63	83.88	12	240.37	67.7
143	J-51	AR-66	89.74	22	240.76	65.3

Report: Junction Table

ID	Label	Parcel #	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
146	J-52		96.57	0	240.65	62.3
149	J-53	AR-44	95.83	64	241.16	62.9
152	J-54	AR-36	99.73	78	240.92	61.1
155	J-55	AR-19	100.04	98	240.73	60.9
158	J-56	AR-38	104.73	162	240.72	58.8
161	J-57	AR-42	100.07	68	240.91	60.9
164	J-58	AR-27	103.99	16	240.78	59.2
167	J-59	AR-39	104.29	56	240.77	59
170	J-60	AR-33	85.92	47	240.92	67.1
174	J-62	AR-26	94.34	69	240.51	63.2
177	J-63	AR-28	93.83	89	240.52	63.5
180	J-64	AR-72	83.48	7	240.04	67.7
183	J-65	AR-75	83.74	5	240.2	67.7
186	J-66	AR-80	88.62	8	241.03	65.9
189	J-67	AR-73, AR-102	90.07	77	240.06	64.9
192	J-68	AR-74, AR-103	94.11	39	240.43	63.3
195	J-69	AR-78	98.44	3	240.64	61.5
198	J-70	AR-77	96.48	6	240.58	62.3
201	J-71	AR-70, AR-104	88.99	57	240.08	65.4
204	J-72	AR-79	92.83	3	240.7	64
208	J-74	AR-03	87	140	239.97	66.2
212	J-75	AR-43	90.95	98	241.02	64.9
216	J-76	AR-32	85.25	52	240.84	67.3
219	J-77	AR-34	86.27	27	240.84	66.9
222	J-78	AR-35	91.75	30	240.71	64.4
225	J-79	AR-25	83.28	29	240.44	68
228	J-80	AR-22	84.34	29	240.33	67.5
231	J-81	AR-21	84.54	16	240.28	67.4
234	J-82		84.28	0	240.25	67.5
237	J-83	AR-11	83.17	57	240.15	67.9
240	J-84	AR-12	82.63	22	240.12	68.1
243	J-85	AR-05	83.8	18	240.06	67.6
246	J-86	AR-06	85.87	35	240.02	66.7
249	J-87	AR-13	86.33	41	240.01	66.5
253	J-89	AR-07, AR-46	86.69	142	240	66.3
256	J-90	AR-08	91.16	54	240.11	64.4
259	J-91	AR-16	92.01	45	240.16	64.1
262	J-92	AR-09	93.28	41	240.37	63.6
265	J-93	AR-17	92.63	25	240.34	63.9
268	J-94	AR-30	95.44	24	240.58	62.8
296	J-95	AR-53	100.72	149	240.71	60.6
299	J-96	AR-57	82.66	4	240.5	68.3
307	J-98	AR-110	85.95	2	241.07	67.1
321	J-100		90.34	0	241.02	65.2
324	J-101		90	0	241.02	65.3
326	J-102	AR-81	83.6	8	240.68	68

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
30	P-1	1,740	J-1	J-2	24	Ductile Iron	130	3,413	2.42
32	P-2	610	J-2	J-3	24	Ductile Iron	130	2,465	1.75
34	P-3	25	J-3	J-4	24	Ductile Iron	130	2,313	1.64
40	P-6	13	J-6	J-7	24	Ductile Iron	130	1,265	0.9
46	P-9	14	J-9	J-10	16	Ductile Iron	130	681	1.09
48	P-10	779	J-10	J-11	16	Ductile Iron	130	608	0.97
50	P-11	16	J-11	J-12	16	Ductile Iron	130	762	1.22
54	P-13	67	J-13	J-14	12	Ductile Iron	130	540	1.53
62	P-17	32	J-17	J-18	12	Ductile Iron	130	208	0.59
66	P-19	200	J-19	J-20	16	Ductile Iron	130	484	0.77
68	P-20	588	J-20	J-21	16	Ductile Iron	130	554	0.88
75	P-24	514	J-24	J-2	16	Ductile Iron	130	949	1.51
78	P-26	14	J-25	J-5	24	Ductile Iron	130	2,081	1.48
80	P-27	802	J-6	J-26	16	Ductile Iron	130	544	0.87
84	P-29	35	J-27	J-28	12	Ductile Iron	130	260	0.74
86	P-30	460	J-28	J-29	12	Ductile Iron	130	241	0.68
87	P-31	730	J-29	J-13	12	Ductile Iron	130	241	0.68
95	P-35	388	J-30	J-33	12	Ductile Iron	130	204	0.58
97	P-36	285	J-33	J-34	12	Ductile Iron	130	140	0.4
99	P-37	477	J-22	J-35	12	Ductile Iron	130	316	0.9
112	P-45	29	J-39	J-40	24	Ductile Iron	130	251	0.18
119	P-49	62	R-1	J-1	24	Ductile Iron	130	3,413	2.42
125	P-52	752	J-5	J-44	24	Ductile Iron	130	126	0.09
135	P-58	234	J-15	J-48	12	Ductile Iron	130	113	0.32
138	P-60	51	J-48	J-49	12	Ductile Iron	130	100	0.28
144	P-64	488	J-36	J-51	12	Ductile Iron	130	232	0.66
147	P-66	109	J-26	J-52	16	Ductile Iron	130	525	0.84
150	P-68	304	J-4	J-53	24	Ductile Iron	130	2,239	1.59
151	P-69	367	J-53	J-25	24	Ductile Iron	130	2,176	1.54
153	P-70	310	J-5	J-54	24	Ductile Iron	130	1,956	1.39
156	P-72	239	J-8	J-55	24	Ductile Iron	130	819	0.58
157	P-73	404	J-55	J-9	24	Ductile Iron	130	721	0.51
159	P-74	239	J-40	J-56	24	Ductile Iron	130	162	0.11
160	P-75	221	J-56	J-41	24	Ductile Iron	130	0	0
162	P-76	41	J-54	J-57	24	Ductile Iron	130	1,877	1.33
165	P-78	345	J-7	J-58	24	Ductile Iron	130	1,251	0.89
168	P-80	65	J-58	J-59	24	Ductile Iron	130	1,235	0.88
169	P-81	281	J-59	J-8	24	Ductile Iron	130	1,179	0.84
171	P-82	324	J-35	J-60	12	Ductile Iron	130	316	0.9
172	P-83	373	J-60	J-36	12	Ductile Iron	130	269	0.76
176	P-85	86	J-62	J-27	16	Ductile Iron	130	263	0.42
178	P-86	318	J-46	J-63	16	Ductile Iron	130	421	0.67
179	P-87	118	J-63	J-62	16	Ductile Iron	130	332	0.53
187	P-92	138	J-21	J-66	16	Ductile Iron	130	581	0.93
191	P-95	440	J-67	J-15	12	Ductile Iron	130	160	0.45

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
193	P-96	254	J-12	J-68	16	Ductile Iron	130	667	1.06
196	P-98	233	J-26	J-69	12	Ductile Iron	130	195	0.55
199	P-100	516	J-69	J-70	12	Ductile Iron	130	192	0.55
200	P-101	600	J-70	J-11	12	Ductile Iron	130	186	0.53
202	P-102	975	J-13	J-71	12	Ductile Iron	130	262	0.74
203	P-103	277	J-71	J-30	12	Ductile Iron	130	205	0.58
206	P-105	334	J-72	J-26	12	Ductile Iron	130	177	0.5
209	P-106	766	J-31	J-74	12	Ductile Iron	130	196	0.55
210	P-107	66	J-74	J-32	12	Ductile Iron	130	55	0.16
211	P-108	371	J-37	J-39	12	Ductile Iron	130	109	0.31
213	P-109	190	J-44	J-75	24	Ductile Iron	130	113	0.08
215	P-111	210	J-24	J-22	16	Ductile Iron	130	907	1.45
218	P-113	171	J-76	J-19	12	Ductile Iron	130	42	0.12
220	P-114	223	J-36	J-77	12	Ductile Iron	130	37	0.1
221	P-115	200	J-77	J-76	12	Ductile Iron	130	9	0.03
223	P-116	335	J-51	J-78	12	Ductile Iron	130	210	0.6
224	P-117	96	J-78	J-72	12	Ductile Iron	130	180	0.51
226	P-118	141	J-50	J-79	12	Ductile Iron	130	401	1.14
230	P-121	101	J-80	J-50	12	Ductile Iron	130	389	1.1
233	P-123	114	J-81	J-80	12	Ductile Iron	130	360	1.02
235	P-124	131	J-65	J-82	12	Ductile Iron	130	344	0.97
236	P-125	104	J-82	J-81	12	Ductile Iron	130	344	0.97
239	P-127	150	J-83	J-65	12	Ductile Iron	130	338	0.96
241	P-128	164	J-18	J-84	12	Ductile Iron	130	259	0.74
242	P-129	134	J-84	J-83	12	Ductile Iron	130	281	0.8
244	P-130	164	J-64	J-85	12	Ductile Iron	130	188	0.53
245	P-131	139	J-85	J-17	12	Ductile Iron	130	206	0.58
248	P-133	202	J-86	J-64	12	Ductile Iron	130	181	0.51
250	P-134	234	J-16	J-87	12	Ductile Iron	130	104	0.3
251	P-135	79	J-87	J-86	12	Ductile Iron	130	146	0.41
254	P-136	131	J-49	J-89	12	Ductile Iron	130	85	0.24
255	P-137	126	J-89	J-16	12	Ductile Iron	130	58	0.16
258	P-139	290	J-90	J-67	12	Ductile Iron	130	237	0.67
260	P-140	216	J-14	J-91	12	Ductile Iron	130	335	0.95
261	P-141	193	J-91	J-90	12	Ductile Iron	130	290	0.82
263	P-142	198	J-68	J-92	16	Ductile Iron	130	628	1
266	P-144	132	J-92	J-93	16	Ductile Iron	130	586	0.94
267	P-145	282	J-93	J-13	16	Ductile Iron	130	561	0.9
269	P-146	336	J-52	J-94	16	Ductile Iron	130	525	0.84
270	P-147	119	J-94	J-46	16	Ductile Iron	130	501	0.8
295	P-148	1,118	J-8	J-39	24	Ductile Iron	130	361	0.26
297	P-149	346	J-9	J-95	16	Ductile Iron	130	40	0.06
298	P-150	352	J-95	J-37	16	Ductile Iron	130	109	0.17
300	P-151	122	J-79	J-96	12	Ductile Iron	130	430	1.22
308	P-155	166	J-66	J-98	16	Ductile Iron	130	589	0.94

Scenario: Peak Hour Demand +2%

Report: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)
309	P-156	414	J-98	J-22	16	Ductile Iron	130	591	0.94
316	P-157	327	J-57	J-6	24	Ductile Iron	130	1,809	1.28
319	P-159	1,241	J-14	J-31	12	Ductile Iron	130	205	0.58
320	P-160	1,286	J-32	J-33	12	Ductile Iron	130	64	0.18
322	P-161	187	J-75	J-100	24	Ductile Iron	130	15	0.01
323	P-162	142	J-100	J-45	24	Ductile Iron	130	15	0.01
325	P-163	152	J-100	J-101	16	Ductile Iron	130	0	0
327	P-164	331	J-96	J-102	12	Ductile Iron	130	434	1.23
328	P-165	285	J-102	J-19	12	Ductile Iron	130	442	1.25

Scenario: Max Day Demand + 2% + 4,000 gpm Fire Flow

Report: Fire Flow (System Results, Fire Flow Demand Analyzed at J-03, J-25, J-95)

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Maximum) (psi)	Velocity of Maximum Pipe (ft/s)
J-1	TRUE	4,000	4,000	4,000	4,000	20	69.4	59.2	J-41	69.5	4.26
J-2	TRUE	4,000	4,000	4,000	4,000	20	63.4	57.7	J-41	65	4.26
J-3	TRUE	4,000	4,000	4,089	4,089	20	62	57.3	J-41	64	4.26
J-4	TRUE	4,000	4,000	4,043	4,043	20	61.9	57.3	J-41	63.9	4.26
J-5	TRUE	4,000	4,000	4,000	4,000	20	60.2	56.9	J-41	62.6	4.26
J-6	TRUE	4,000	4,000	4,000	4,000	20	57.7	56.6	J-41	60.5	4.26
J-7	TRUE	4,000	4,000	4,008	4,008	20	57.7	56.6	J-41	60.4	4.26
J-8	TRUE	4,000	4,000	4,000	4,000	20	57.9	56.3	J-41	60.9	4.26
J-9	TRUE	4,000	4,000	4,000	4,000	20	58.9	56.3	J-41	62.1	4.26
J-10	TRUE	4,000	4,000	4,043	4,043	20	59	56.3	J-41	62.2	5.46
J-11	TRUE	4,000	4,000	4,019	4,019	20	59.5	56.5	J-41	63.6	4.26
J-12	TRUE	4,000	4,000	4,056	4,056	20	59.5	56.5	J-41	63.6	5.34
J-13	TRUE	4,000	4,000	4,000	4,000	20	59.9	56.6	J-41	65	4.45
J-14	TRUE	4,000	4,000	4,000	4,000	20	59.3	56.6	J-41	64.9	9.33
J-15	TRUE	4,000	4,000	4,027	4,027	20	54.6	56.1	J-48	66.5	7.58
J-16	TRUE	4,000	4,000	4,027	4,027	20	54.4	54.8	J-89	67.4	6.87
J-17	TRUE	4,000	4,000	4,001	4,001	20	56.3	56	J-85	69.2	6.77
J-18	TRUE	4,000	4,000	4,030	4,030	20	56.3	56.1	J-85	69.1	6.8
J-19	TRUE	4,000	4,000	4,000	4,000	20	63.6	57.2	J-41	68.3	4.62
J-20	TRUE	4,000	4,000	4,041	4,041	20	62.8	57.2	J-41	67.4	4.68
J-21	TRUE	4,000	4,000	4,016	4,016	20	61.1	57.3	J-41	65.4	4.89
J-22	TRUE	4,000	4,000	4,000	4,000	20	62.7	57.3	J-41	66	5.18
J-24	TRUE	4,000	4,000	4,024	4,024	20	62.7	57.4	J-41	65.7	5.48
J-25	TRUE	4,000	4,000	4,055	4,055	20	60.3	56.9	J-41	62.7	4.26
J-26	TRUE	4,000	4,000	4,000	4,000	20	59.7	56.6	J-41	63.2	4.26
J-27	TRUE	4,000	4,000	4,002	4,002	20	58.7	56.6	J-41	64.2	4.75
J-28	TRUE	4,000	4,000	4,012	4,012	20	57.9	56.6	J-41	63.5	7.83
J-29	TRUE	4,000	4,000	4,000	4,000	20	57.1	56.6	J-41	63.7	6.04
J-30	TRUE	4,000	4,000	4,001	4,001	20	53	52.2	J-34	66.7	7.68
J-31	TRUE	4,000	4,000	4,005	4,005	20	52.9	54.8	J-74	66.6	7.59
J-32	TRUE	4,000	4,000	4,070	4,070	20	51.4	51.6	J-74	67.1	6.51
J-33	TRUE	4,000	4,000	4,000	4,000	20	50.9	50.3	J-34	65.8	7.15
J-34	TRUE	4,000	4,000	4,082	4,082	20	46.1	50.9	J-33	65.2	11.58
J-35	TRUE	4,000	4,000	4,000	4,000	20	61.2	57.3	J-41	66.8	6.66
J-36	TRUE	4,000	4,000	4,000	4,000	20	62.2	57.1	J-41	67	4.32
J-37	TRUE	4,000	4,000	4,000	4,000	20	56.4	56.2	J-41	60.4	4.52
J-39	TRUE	4,000	4,000	4,000	4,000	20	56.5	55.9	J-41	59.9	4.26
J-40	TRUE	4,000	4,000	4,052	4,052	20	56.4	55.9	J-41	59.9	4.26
J-41	TRUE	4,000	4,000	4,000	4,000	20	55.6	55.9	J-56	59.3	4.26
J-44	TRUE	4,000	4,000	4,008	4,008	20	62.7	56.9	J-41	65.6	4.26
J-45	TRUE	4,000	4,000	4,009	4,009	20	63.2	56.9	J-41	66.3	4.26
J-46	TRUE	4,000	4,000	4,047	4,047	20	59.1	56.6	J-41	63.8	5.16
J-48	TRUE	4,000	4,000	4,008	4,008	20	55	55.2	J-49	67.4	7.27
J-49	TRUE	4,000	4,000	4,009	4,009	20	55	55	J-89	67.5	7.2
J-50	TRUE	4,000	4,000	4,007	4,007	20	58.1	57	J-41	68.4	8.04
J-51	TRUE	4,000	4,000	4,013	4,013	20	60.2	57	J-41	66	5.84
J-52	TRUE	4,000	4,000	4,000	4,000	20	59.2	56.6	J-41	63	5.7
J-53	TRUE	4,000	4,000	4,038	4,038	20	61.2	57.1	J-41	63.4	4.26
J-54	TRUE	4,000	4,000	4,046	4,046	20	59.1	56.7	J-41	61.7	4.26
J-55	TRUE	4,000	4,000	4,058	4,058	20	58.4	56.3	J-41	61.5	4.26
J-56	TRUE	4,000	4,000	4,095	4,095	20	55.9	55.7	J-41	59.5	4.26
J-57	TRUE	4,000	4,000	4,040	4,040	20	58.9	56.7	J-41	61.5	4.26
J-58	TRUE	4,000	4,000	4,009	4,009	20	56.9	56.4	J-41	59.8	4.26
J-59	TRUE	4,000	4,000	4,033	4,033	20	56.8	56.4	J-41	59.7	4.26
J-60	TRUE	4,000	4,000	4,028	4,028	20	61.9	57.2	J-41	67.6	6.09

Scenario: Max Day Demand + 2% + 4,000 gpm Fire Flow

Report: Fire Flow (System Results, Fire Flow Demand Analyzed at J-03, J-25, J-95)

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Maximum) (psi)	Velocity of Maximum Pipe (ft/s)
J-62	TRUE	4,000	4,000	4,041	4,041	20	58.6	56.6	J-41	63.9	4.81
J-63	TRUE	4,000	4,000	4,053	4,053	20	59	56.6	J-41	64.2	4.89
J-64	TRUE	4,000	4,000	4,004	4,004	20	55.5	55.1	J-86	68.6	6.4
J-65	TRUE	4,000	4,000	4,003	4,003	20	56.6	57	J-41	68.5	7.38
J-66	TRUE	4,000	4,000	4,005	4,005	20	62.3	57.3	J-41	66.5	4.94
J-67	TRUE	4,000	4,000	4,045	4,045	20	55.6	56.8	J-41	65.7	8.25
J-68	TRUE	4,000	4,000	4,023	4,023	20	59.6	56.5	J-41	64	5.02
J-69	TRUE	4,000	4,000	4,002	4,002	20	57.1	56.6	J-41	62.2	7.89
J-70	TRUE	4,000	4,000	4,004	4,004	20	57	56.6	J-41	63	5.84
J-71	TRUE	4,000	4,000	4,033	4,033	20	53.7	53.7	J-34	66.2	8.11
J-72	TRUE	4,000	4,000	4,002	4,002	20	59.4	56.8	J-41	64.6	7.18
J-74	TRUE	4,000	4,000	4,082	4,082	20	51.4	51.7	J-32	67	6.59
J-75	TRUE	4,000	4,000	4,058	4,058	20	62.6	56.9	J-41	65.5	4.26
J-76	TRUE	4,000	4,000	4,030	4,030	20	62.8	57.2	J-41	67.9	6.42
J-77	TRUE	4,000	4,000	4,016	4,016	20	62.3	57.2	J-41	67.5	6.06
J-78	TRUE	4,000	4,000	4,018	4,018	20	59.6	56.9	J-41	65.1	6.81
J-79	TRUE	4,000	4,000	4,017	4,017	20	59	57	J-41	68.7	8.28
J-80	TRUE	4,000	4,000	4,017	4,017	20	57.5	57	J-41	68.2	7.89
J-81	TRUE	4,000	4,000	4,010	4,010	20	57	57	J-41	68.1	7.71
J-82	TRUE	4,000	4,000	4,000	4,000	20	56.7	57	J-41	68.2	7.56
J-83	TRUE	4,000	4,000	4,033	4,033	20	56.4	56.9	J-41	68.7	7.18
J-84	TRUE	4,000	4,000	4,013	4,013	20	56.4	56.8	J-85	68.9	7.01
J-85	TRUE	4,000	4,000	4,010	4,010	20	55.4	55.8	J-86	68.4	6.6
J-86	TRUE	4,000	4,000	4,021	4,021	20	54.4	54.5	J-87	67.5	6.49
J-87	TRUE	4,000	4,000	4,024	4,024	20	54.2	54.7	J-86	67.3	6.59
J-89	TRUE	4,000	4,000	4,084	4,084	20	54.4	55	J-16	67.2	7.03
J-90	TRUE	4,000	4,000	4,032	4,032	20	56.6	56.7	J-41	65.2	8.78
J-91	TRUE	4,000	4,000	4,026	4,026	20	57.5	56.7	J-41	64.9	9.21
J-92	TRUE	4,000	4,000	4,024	4,024	20	59.7	56.6	J-41	64.4	4.81
J-93	TRUE	4,000	4,000	4,015	4,015	20	59.8	56.6	J-41	64.6	4.69
J-94	TRUE	4,000	4,000	4,014	4,014	20	59	56.6	J-41	63.5	5.28
J-95	TRUE	4,000	4,000	4,088	4,088	20	57.4	56.2	J-41	61.2	4.6
J-96	TRUE	4,000	4,000	4,002	4,002	20	59.9	57.1	J-41	69	8.5
J-98	TRUE	4,000	4,000	4,001	4,001	20	63.7	57.3	J-41	67.7	4.99
J-100	TRUE	4,000	4,000	4,000	4,000	20	62.7	56.9	J-41	65.7	4.26
J-101	TRUE	4,000	4,000	4,000	4,000	20	62.4	56.9	J-41	65.9	6.38
J-102	TRUE	4,000	4,000	4,005	4,005	20	61.6	57.1	J-41	68.6	9.22

Scenario: Max Day Demand + 2% + 2,000 gpm Fire Flow

Report: Fire Flow (System Results, Fire Flow Demand Analyzed at J-16, J-32, J-75)

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Maximum) (psi)	Velocity of Maximum Pipe (ft/s)
J-1	TRUE	2,000	2,000	2,000	2,000	20	69.4	59.3	J-41	69.5	2.84
J-2	TRUE	2,000	2,000	2,000	2,000	20	64.4	58.7	J-41	65	2.84
J-3	TRUE	2,000	2,000	2,089	2,089	20	63.2	58.5	J-41	64	2.84
J-4	TRUE	2,000	2,000	2,043	2,043	20	63.1	58.5	J-41	63.9	2.84
J-5	TRUE	2,000	2,000	2,000	2,000	20	61.7	58.4	J-41	62.6	2.84
J-6	TRUE	2,000	2,000	2,000	2,000	20	59.4	58.2	J-41	60.5	2.84
J-7	TRUE	2,000	2,000	2,008	2,008	20	59.4	58.2	J-41	60.4	2.84
J-8	TRUE	2,000	2,000	2,000	2,000	20	59.7	58.1	J-41	60.9	2.84
J-9	TRUE	2,000	2,000	2,000	2,000	20	60.9	58.1	J-41	62.1	2.84
J-10	TRUE	2,000	2,000	2,043	2,043	20	61	58.1	J-41	62.2	3.09
J-11	TRUE	2,000	2,000	2,019	2,019	20	62.1	58.2	J-41	63.6	2.84
J-12	TRUE	2,000	2,000	2,056	2,056	20	62.1	58.2	J-41	63.6	3.04
J-13	TRUE	2,000	2,000	2,000	2,000	20	63.1	58.2	J-41	65	2.84
J-14	TRUE	2,000	2,000	2,000	2,000	20	62.9	58.2	J-41	64.9	5.13
J-15	TRUE	2,000	2,000	2,027	2,027	20	62.6	58.3	J-41	66.5	4.16
J-16	TRUE	2,000	2,000	2,027	2,027	20	63.1	58.3	J-41	67.4	3.87
J-17	TRUE	2,000	2,000	2,001	2,001	20	65	58.3	J-41	69.2	3.69
J-18	TRUE	2,000	2,000	2,030	2,030	20	65	58.3	J-41	69.1	3.71
J-19	TRUE	2,000	2,000	2,000	2,000	20	66.6	58.4	J-41	68.3	2.84
J-20	TRUE	2,000	2,000	2,041	2,041	20	65.8	58.5	J-41	67.4	2.84
J-21	TRUE	2,000	2,000	2,016	2,016	20	63.9	58.5	J-41	65.4	2.84
J-22	TRUE	2,000	2,000	2,000	2,000	20	64.8	58.5	J-41	66	3.02
J-24	TRUE	2,000	2,000	2,024	2,024	20	64.6	58.5	J-41	65.7	3.21
J-25	TRUE	2,000	2,000	2,055	2,055	20	61.7	58.4	J-41	62.7	2.84
J-26	TRUE	2,000	2,000	2,000	2,000	20	61.9	58.3	J-41	63.2	2.84
J-27	TRUE	2,000	2,000	2,002	2,002	20	62.3	58.3	J-41	64.2	2.84
J-28	TRUE	2,000	2,000	2,012	2,012	20	61.6	58.3	J-41	63.5	3.99
J-29	TRUE	2,000	2,000	2,000	2,000	20	61.5	58.3	J-41	63.7	3.13
J-30	TRUE	2,000	2,000	2,001	2,001	20	62.2	58.2	J-41	66.7	4.03
J-31	TRUE	2,000	2,000	2,005	2,005	20	62.2	58.2	J-41	66.6	3.95
J-32	TRUE	2,000	2,000	2,070	2,070	20	62.1	58.2	J-41	67.1	3.42
J-33	TRUE	2,000	2,000	2,000	2,000	20	61	58.2	J-41	65.8	3.77
J-34	TRUE	2,000	2,000	2,082	2,082	20	59.2	58.2	J-41	65.2	5.91
J-35	TRUE	2,000	2,000	2,000	2,000	20	64.9	58.5	J-41	66.8	3.42
J-36	TRUE	2,000	2,000	2,000	2,000	20	65.3	58.4	J-41	67	2.84
J-37	TRUE	2,000	2,000	2,000	2,000	20	59	58.1	J-41	60.4	2.84
J-39	TRUE	2,000	2,000	2,000	2,000	20	58.6	58	J-41	59.9	2.84
J-40	TRUE	2,000	2,000	2,052	2,052	20	58.6	58	J-41	59.9	2.84
J-41	TRUE	2,000	2,000	2,000	2,000	20	57.9	58.2	J-56	59.3	2.84
J-44	TRUE	2,000	2,000	2,008	2,008	20	64.5	58.4	J-41	65.6	2.84
J-45	TRUE	2,000	2,000	2,009	2,009	20	65.1	58.4	J-41	66.3	2.84
J-46	TRUE	2,000	2,000	2,047	2,047	20	62.1	58.3	J-41	63.8	2.84
J-48	TRUE	2,000	2,000	2,008	2,008	20	63.3	58.3	J-41	67.4	4.03
J-49	TRUE	2,000	2,000	2,009	2,009	20	63.4	58.3	J-41	67.5	4
J-50	TRUE	2,000	2,000	2,007	2,007	20	65.1	58.4	J-41	68.4	4.33
J-51	TRUE	2,000	2,000	2,013	2,013	20	64	58.4	J-41	66	2.98
J-52	TRUE	2,000	2,000	2,000	2,000	20	61.6	58.3	J-41	63	3.08
J-53	TRUE	2,000	2,000	2,038	2,038	20	62.5	58.4	J-41	63.4	2.84
J-54	TRUE	2,000	2,000	2,046	2,046	20	60.7	58.3	J-41	61.7	2.84
J-55	TRUE	2,000	2,000	2,058	2,058	20	60.3	58.1	J-41	61.5	2.84
J-56	TRUE	2,000	2,000	2,095	2,095	20	58.2	58	J-41	59.5	2.84
J-57	TRUE	2,000	2,000	2,040	2,040	20	60.5	58.3	J-41	61.5	2.84
J-58	TRUE	2,000	2,000	2,009	2,009	20	58.7	58.2	J-41	59.8	2.84
J-59	TRUE	2,000	2,000	2,033	2,033	20	58.5	58.2	J-41	59.7	2.84
J-60	TRUE	2,000	2,000	2,028	2,028	20	65.7	58.5	J-41	67.6	2.97

Scenario: Max Day Demand + 2% + 2,000 gpm Fire Flow

Report: Fire Flow (System Results, Fire Flow Demand Analyzed at J-16, J-32, J-75)

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Maximum) (psi)	Velocity of Maximum Pipe (ft/s)
J-62	TRUE	2,000	2,000	2,041	2,041	20	62.1	58.3	J-41	63.9	2.84
J-63	TRUE	2,000	2,000	2,053	2,053	20	62.3	58.3	J-41	64.2	2.84
J-64	TRUE	2,000	2,000	2,004	2,004	20	64.3	58.3	J-41	68.6	3.6
J-65	TRUE	2,000	2,000	2,003	2,003	20	64.6	58.4	J-41	68.5	4
J-66	TRUE	2,000	2,000	2,005	2,005	20	65	58.5	J-41	66.5	2.87
J-67	TRUE	2,000	2,000	2,045	2,045	20	62.3	58.3	J-41	65.7	4.45
J-68	TRUE	2,000	2,000	2,023	2,023	20	62.4	58.2	J-41	64	2.87
J-69	TRUE	2,000	2,000	2,002	2,002	20	60.4	58.2	J-41	62.2	3.97
J-70	TRUE	2,000	2,000	2,004	2,004	20	61	58.2	J-41	63	2.85
J-71	TRUE	2,000	2,000	2,033	2,033	20	62.1	58.2	J-41	66.2	4.25
J-72	TRUE	2,000	2,000	2,002	2,002	20	62.9	58.3	J-41	64.6	3.52
J-74	TRUE	2,000	2,000	2,082	2,082	20	62	58.2	J-41	67	3.46
J-75	TRUE	2,000	2,000	2,058	2,058	20	64.4	58.4	J-41	65.5	2.84
J-76	TRUE	2,000	2,000	2,030	2,030	20	66.2	58.4	J-41	67.9	3.16
J-77	TRUE	2,000	2,000	2,016	2,016	20	65.7	58.4	J-41	67.5	3.13
J-78	TRUE	2,000	2,000	2,018	2,018	20	63.3	58.3	J-41	65.1	3.35
J-79	TRUE	2,000	2,000	2,017	2,017	20	65.5	58.4	J-41	68.7	4.45
J-80	TRUE	2,000	2,000	2,017	2,017	20	64.7	58.4	J-41	68.2	4.25
J-81	TRUE	2,000	2,000	2,010	2,010	20	64.5	58.4	J-41	68.1	4.16
J-82	TRUE	2,000	2,000	2,000	2,000	20	64.5	58.4	J-41	68.2	4.09
J-83	TRUE	2,000	2,000	2,033	2,033	20	64.7	58.4	J-41	68.7	3.9
J-84	TRUE	2,000	2,000	2,013	2,013	20	64.9	58.4	J-41	68.9	3.81
J-85	TRUE	2,000	2,000	2,010	2,010	20	64.2	58.3	J-41	68.4	3.61
J-86	TRUE	2,000	2,000	2,021	2,021	20	63.2	58.3	J-41	67.5	3.7
J-87	TRUE	2,000	2,000	2,024	2,024	20	63	58.3	J-41	67.3	3.74
J-89	TRUE	2,000	2,000	2,084	2,084	20	63	58.3	J-41	67.2	3.93
J-90	TRUE	2,000	2,000	2,032	2,032	20	62.3	58.3	J-41	65.2	4.68
J-91	TRUE	2,000	2,000	2,026	2,026	20	62.3	58.3	J-41	64.9	4.87
J-92	TRUE	2,000	2,000	2,024	2,024	20	62.7	58.2	J-41	64.4	2.84
J-93	TRUE	2,000	2,000	2,015	2,015	20	62.9	58.2	J-41	64.6	2.84
J-94	TRUE	2,000	2,000	2,014	2,014	20	61.9	58.3	J-41	63.5	2.84
J-95	TRUE	2,000	2,000	2,088	2,088	20	59.8	58.1	J-41	61.2	2.84
J-96	TRUE	2,000	2,000	2,002	2,002	20	66	58.4	J-41	69	4.56
J-98	TRUE	2,000	2,000	2,001	2,001	20	66.2	58.5	J-41	67.7	2.91
J-100	TRUE	2,000	2,000	2,000	2,000	20	64.6	58.4	J-41	65.7	2.84
J-101	TRUE	2,000	2,000	2,000	2,000	20	64.6	58.4	J-41	65.9	3.19
J-102	TRUE	2,000	2,000	2,005	2,005	20	66.3	58.4	J-41	68.6	4.94

Scenario: Max Day Demand + 2% + 4,500 gpm Fire Flow

Report: Fire Flow (System Results, Fire Flow Demand Analyzed at J-46)

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Maximum) (psi)	Velocity of Maximum Pipe (ft/s)
J-1	TRUE	4,500	4,500	4,500	4,500	20	69.4	59.2	J-41	69.5	4.62
J-2	TRUE	4,500	4,500	4,500	4,500	20	63.1	57.4	J-41	65	4.62
J-3	TRUE	4,500	4,500	4,589	4,589	20	61.6	56.9	J-41	64	4.62
J-4	TRUE	4,500	4,500	4,543	4,543	20	61.5	56.9	J-41	63.9	4.62
J-5	TRUE	4,500	4,500	4,500	4,500	20	59.8	56.4	J-41	62.6	4.62
J-6	TRUE	4,500	4,500	4,500	4,500	20	57.2	56.1	J-41	60.5	4.62
J-7	TRUE	4,500	4,500	4,508	4,508	20	57.2	56.1	J-41	60.4	4.62
J-8	TRUE	4,500	4,500	4,500	4,500	20	57.3	55.7	J-41	60.9	4.62
J-9	TRUE	4,500	4,500	4,500	4,500	20	58.3	55.7	J-41	62.1	4.62
J-10	TRUE	4,500	4,500	4,543	4,543	20	58.4	55.7	J-41	62.2	6.06
J-11	TRUE	4,500	4,500	4,519	4,519	20	58.7	56	J-41	63.6	4.62
J-12	TRUE	4,500	4,500	4,556	4,556	20	58.7	56	J-41	63.6	5.92
J-13	TRUE	4,500	4,500	4,500	4,500	20	58.9	56.1	J-41	65	4.92
J-14	TRUE	4,500	4,500	4,500	4,500	20	58.1	56.1	J-41	64.9	10.39
J-15	TRUE	4,500	4,500	4,527	4,527	20	52.1	53.7	J-48	66.5	8.46
J-16	TRUE	4,500	4,500	4,527	4,527	20	51.6	52.1	J-89	67.4	7.65
J-17	TRUE	4,500	4,500	4,501	4,501	20	53.5	53.3	J-85	69.2	7.53
J-18	TRUE	4,500	4,500	4,530	4,530	20	53.5	53.5	J-85	69.1	7.58
J-19	TRUE	4,500	4,500	4,500	4,500	20	62.6	56.8	J-41	68.3	5.1
J-20	TRUE	4,500	4,500	4,541	4,541	20	61.8	56.8	J-41	67.4	5.18
J-21	TRUE	4,500	4,500	4,516	4,516	20	60.2	56.9	J-41	65.4	5.41
J-22	TRUE	4,500	4,500	4,500	4,500	20	62.1	57	J-41	66	5.73
J-24	TRUE	4,500	4,500	4,524	4,524	20	62.2	57	J-41	65.7	6.06
J-25	TRUE	4,500	4,500	4,555	4,555	20	59.8	56.4	J-41	62.7	4.62
J-26	TRUE	4,500	4,500	4,500	4,500	20	59	56.2	J-41	63.2	4.62
J-27	TRUE	4,500	4,500	4,502	4,502	20	57.6	56.1	J-41	64.2	5.3
J-28	TRUE	4,500	4,500	4,512	4,512	20	56.8	56.1	J-41	63.5	8.79
J-29	TRUE	4,500	4,500	4,500	4,500	20	55.6	56.1	J-41	63.7	6.77
J-30	TRUE	4,500	4,500	4,501	4,501	20	50	49.4	J-34	66.7	8.6
J-31	TRUE	4,500	4,500	4,505	4,505	20	49.9	52.1	J-74	66.6	8.5
J-32	TRUE	4,500	4,500	4,570	4,570	20	47.9	48.2	J-74	67.1	7.28
J-33	TRUE	4,500	4,500	4,500	4,500	20	47.7	47	J-34	65.8	8
J-34	TRUE	4,500	4,500	4,582	4,582	20	41.8	47.7	J-33	65.2	13
J-35	TRUE	4,500	4,500	4,500	4,500	20	59.9	56.9	J-41	66.8	7.47
J-36	TRUE	4,500	4,500	4,500	4,500	20	61.2	56.7	J-41	67	4.77
J-37	TRUE	4,500	4,500	4,500	4,500	20	55.5	55.6	J-41	60.4	5.08
J-39	TRUE	4,500	4,500	4,500	4,500	20	55.8	55.2	J-41	59.9	4.62
J-40	TRUE	4,500	4,500	4,552	4,552	20	55.8	55.2	J-41	59.9	4.62
J-41	TRUE	4,500	4,500	4,500	4,500	20	54.9	55.2	J-56	59.3	4.62
J-44	TRUE	4,500	4,500	4,508	4,508	20	62.2	56.4	J-41	65.6	4.62
J-45	TRUE	4,500	4,500	4,509	4,509	20	62.6	56.4	J-41	66.3	4.62
J-46	TRUE	4,500	4,500	4,547	4,547	20	58.1	56.1	J-41	63.8	5.76
J-48	TRUE	4,500	4,500	4,508	4,508	20	52.3	52.5	J-49	67.4	8.1
J-49	TRUE	4,500	4,500	4,509	4,509	20	52.2	52.3	J-89	67.5	8.02
J-50	TRUE	4,500	4,500	4,507	4,507	20	55.8	55.8	J-80	68.4	8.98
J-51	TRUE	4,500	4,500	4,513	4,513	20	58.9	56.5	J-41	66	6.55
J-52	TRUE	4,500	4,500	4,500	4,500	20	58.4	56.2	J-41	63	6.36
J-53	TRUE	4,500	4,500	4,538	4,538	20	60.7	56.7	J-41	63.4	4.62
J-54	TRUE	4,500	4,500	4,546	4,546	20	58.6	56.3	J-41	61.7	4.62
J-55	TRUE	4,500	4,500	4,558	4,558	20	57.8	55.7	J-41	61.5	4.62
J-56	TRUE	4,500	4,500	4,595	4,595	20	55.2	55	J-41	59.5	4.62
J-57	TRUE	4,500	4,500	4,540	4,540	20	58.4	56.2	J-41	61.5	4.62
J-58	TRUE	4,500	4,500	4,509	4,509	20	56.4	55.9	J-41	59.8	4.62
J-59	TRUE	4,500	4,500	4,533	4,533	20	56.2	55.8	J-41	59.7	4.62
J-60	TRUE	4,500	4,500	4,528	4,528	20	60.6	56.8	J-41	67.6	6.87
J-62	TRUE	4,500	4,500	4,541	4,541	20	57.5	56.1	J-41	63.9	5.37
J-63	TRUE	4,500	4,500	4,553	4,553	20	57.9	56.1	J-41	64.2	5.46
J-64	TRUE	4,500	4,500	4,504	4,504	20	52.6	52.5	J-86	68.6	7.12
J-65	TRUE	4,500	4,500	4,503	4,503	20	54	54.6	J-83	68.5	8.23

Scenario: Max Day Demand + 2% + 4,500 gpm Fire Flow

Report: Fire Flow (System Results, Fire Flow Demand Analyzed at J-46)

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Maximum) (psi)	Velocity of Maximum Pipe (ft/s)
J-66	TRUE	4,500	4,500	4,505	4,505	20	61.5	56.9	J-41	66.5	5.46
J-67	TRUE	4,500	4,500	4,545	4,545	20	53.4	55	J-15	65.7	9.21
J-68	TRUE	4,500	4,500	4,523	4,523	20	58.7	56	J-41	64	5.56
J-69	TRUE	4,500	4,500	4,502	4,502	20	56.1	56.1	J-41	62.2	8.87
J-70	TRUE	4,500	4,500	4,504	4,504	20	55.8	56.1	J-41	63	6.59
J-71	TRUE	4,500	4,500	4,533	4,533	20	50.9	51.2	J-34	66.2	9.08
J-72	TRUE	4,500	4,500	4,502	4,502	20	58.3	56.4	J-41	64.6	8.09
J-74	TRUE	4,500	4,500	4,582	4,582	20	47.9	48.3	J-32	67	7.37
J-75	TRUE	4,500	4,500	4,558	4,558	20	62	56.4	J-41	65.5	4.62
J-76	TRUE	4,500	4,500	4,530	4,530	20	61.7	56.8	J-41	67.9	7.23
J-77	TRUE	4,500	4,500	4,516	4,516	20	61.2	56.8	J-41	67.5	6.8
J-78	TRUE	4,500	4,500	4,518	4,518	20	58.5	56.4	J-41	65.1	7.67
J-79	TRUE	4,500	4,500	4,517	4,517	20	56.9	56.6	J-41	68.7	9.24
J-80	TRUE	4,500	4,500	4,517	4,517	20	55.1	55.3	J-81	68.2	8.8
J-81	TRUE	4,500	4,500	4,510	4,510	20	54.5	54.9	J-82	68.1	8.61
J-82	TRUE	4,500	4,500	4,500	4,500	20	54.2	54.8	J-65	68.2	8.44
J-83	TRUE	4,500	4,500	4,533	4,533	20	53.7	54.4	J-84	68.7	8.01
J-84	TRUE	4,500	4,500	4,513	4,513	20	53.6	54.3	J-83	68.9	7.81
J-85	TRUE	4,500	4,500	4,510	4,510	20	52.6	53.2	J-86	68.4	7.34
J-86	TRUE	4,500	4,500	4,521	4,521	20	51.5	51.7	J-87	67.5	7.22
J-87	TRUE	4,500	4,500	4,524	4,524	20	51.3	51.9	J-86	67.3	7.33
J-89	TRUE	4,500	4,500	4,584	4,584	20	51.6	52.3	J-16	67.2	7.83
J-90	TRUE	4,500	4,500	4,532	4,532	20	54.8	55.6	J-67	65.2	9.81
J-91	TRUE	4,500	4,500	4,526	4,526	20	56	56.2	J-41	64.9	10.3
J-92	TRUE	4,500	4,500	4,524	4,524	20	58.8	56	J-41	64.4	5.33
J-93	TRUE	4,500	4,500	4,515	4,515	20	58.9	56.1	J-41	64.6	5.19
J-94	TRUE	4,500	4,500	4,514	4,514	20	58.1	56.1	J-41	63.5	5.89
J-95	TRUE	4,500	4,500	4,588	4,588	20	56.7	55.6	J-41	61.2	5.16
J-96	TRUE	4,500	4,500	4,502	4,502	20	57.9	56.7	J-41	69	9.49
J-98	TRUE	4,500	4,500	4,501	4,501	20	62.8	56.9	J-41	67.7	5.52
J-100	TRUE	4,500	4,500	4,500	4,500	20	62.2	56.4	J-41	65.7	4.62
J-101	TRUE	4,500	4,500	4,500	4,500	20	61.6	56.4	J-41	65.9	7.18
J-102	TRUE	4,500	4,500	4,505	4,505	20	60.1	56.7	J-41	68.6	10.3

Scenario: Max Day Demand + 2% + 2,500 gpm Fire Flow

Report: Fire Flow (System Results, Fire Flow Demand Analyzed at J-56, J-60)

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Maximum) (psi)	Velocity of Maximum Pipe (ft/s)
J-1	TRUE	2,500	2,500	2,500	2,500	20	69.4	59.3	J-41	69.5	3.2
J-2	TRUE	2,500	2,500	2,500	2,500	20	64.2	58.4	J-41	65	3.2
J-3	TRUE	2,500	2,500	2,589	2,589	20	62.9	58.2	J-41	64	3.2
J-4	TRUE	2,500	2,500	2,543	2,543	20	62.9	58.2	J-41	63.9	3.2
J-5	TRUE	2,500	2,500	2,500	2,500	20	61.4	58	J-41	62.6	3.2
J-6	TRUE	2,500	2,500	2,500	2,500	20	59	57.9	J-41	60.5	3.2
J-7	TRUE	2,500	2,500	2,508	2,508	20	59	57.9	J-41	60.4	3.2
J-8	TRUE	2,500	2,500	2,500	2,500	20	59.3	57.7	J-41	60.9	3.2
J-9	TRUE	2,500	2,500	2,500	2,500	20	60.5	57.7	J-41	62.1	3.2
J-10	TRUE	2,500	2,500	2,543	2,543	20	60.6	57.7	J-41	62.2	3.67
J-11	TRUE	2,500	2,500	2,519	2,519	20	61.5	57.8	J-41	63.6	3.2
J-12	TRUE	2,500	2,500	2,556	2,556	20	61.5	57.8	J-41	63.6	3.61
J-13	TRUE	2,500	2,500	2,500	2,500	20	62.4	57.9	J-41	65	3.2
J-14	TRUE	2,500	2,500	2,500	2,500	20	62.1	57.9	J-41	64.9	6.17
J-15	TRUE	2,500	2,500	2,527	2,527	20	60.9	58	J-41	66.5	4.96
J-16	TRUE	2,500	2,500	2,527	2,527	20	61.3	58	J-41	67.4	4.56
J-17	TRUE	2,500	2,500	2,501	2,501	20	63.2	58	J-41	69.2	4.46
J-18	TRUE	2,500	2,500	2,530	2,530	20	63.2	58	J-41	69.1	4.49
J-19	TRUE	2,500	2,500	2,500	2,500	20	66	58.2	J-41	68.3	3.2
J-20	TRUE	2,500	2,500	2,541	2,541	20	65.2	58.2	J-41	67.4	3.21
J-21	TRUE	2,500	2,500	2,516	2,516	20	63.3	58.2	J-41	65.4	3.34
J-22	TRUE	2,500	2,500	2,500	2,500	20	64.4	58.2	J-41	66	3.55
J-24	TRUE	2,500	2,500	2,524	2,524	20	64.2	58.3	J-41	65.7	3.76
J-25	TRUE	2,500	2,500	2,555	2,555	20	61.4	58	J-41	62.7	3.2
J-26	TRUE	2,500	2,500	2,500	2,500	20	61.4	57.9	J-41	63.2	3.2
J-27	TRUE	2,500	2,500	2,502	2,502	20	61.5	57.9	J-41	64.2	3.2
J-28	TRUE	2,500	2,500	2,512	2,512	20	60.9	57.9	J-41	63.5	4.96
J-29	TRUE	2,500	2,500	2,500	2,500	20	60.6	57.9	J-41	63.7	3.85
J-30	TRUE	2,500	2,500	2,501	2,501	20	60.4	57.9	J-41	66.7	4.94
J-31	TRUE	2,500	2,500	2,505	2,505	20	60.3	57.9	J-41	66.6	4.86
J-32	TRUE	2,500	2,500	2,570	2,570	20	59.9	57.9	J-41	67.1	4.19
J-33	TRUE	2,500	2,500	2,500	2,500	20	59	57.9	J-41	65.8	4.61
J-34	TRUE	2,500	2,500	2,582	2,582	20	56.5	57.9	J-41	65.2	7.33
J-35	TRUE	2,500	2,500	2,500	2,500	20	64.1	58.2	J-41	66.8	4.23
J-36	TRUE	2,500	2,500	2,500	2,500	20	64.7	58.1	J-41	67	3.2
J-37	TRUE	2,500	2,500	2,500	2,500	20	58.4	57.7	J-41	60.4	3.2
J-39	TRUE	2,500	2,500	2,500	2,500	20	58.2	57.5	J-41	59.9	3.2
J-40	TRUE	2,500	2,500	2,552	2,552	20	58.1	57.5	J-41	59.9	3.2
J-41	TRUE	2,500	2,500	2,500	2,500	20	57.4	57.7	J-56	59.3	3.2
J-44	TRUE	2,500	2,500	2,508	2,508	20	64.1	58	J-41	65.6	3.2
J-45	TRUE	2,500	2,500	2,509	2,509	20	64.7	58	J-41	66.3	3.2
J-46	TRUE	2,500	2,500	2,547	2,547	20	61.5	57.9	J-41	63.8	3.36
J-48	TRUE	2,500	2,500	2,508	2,508	20	61.6	58	J-41	67.4	4.77
J-49	TRUE	2,500	2,500	2,509	2,509	20	61.6	58	J-41	67.5	4.74
J-50	TRUE	2,500	2,500	2,507	2,507	20	63.6	58.1	J-41	68.4	5.25
J-51	TRUE	2,500	2,500	2,513	2,513	20	63.2	58.1	J-41	66	3.69
J-52	TRUE	2,500	2,500	2,500	2,500	20	61.1	57.9	J-41	63	3.73
J-53	TRUE	2,500	2,500	2,538	2,538	20	62.2	58.1	J-41	63.4	3.2
J-54	TRUE	2,500	2,500	2,546	2,546	20	60.3	58	J-41	61.7	3.2
J-55	TRUE	2,500	2,500	2,558	2,558	20	59.9	57.7	J-41	61.5	3.2
J-56	TRUE	2,500	2,500	2,595	2,595	20	57.7	57.5	J-41	59.5	3.2
J-57	TRUE	2,500	2,500	2,540	2,540	20	60.2	57.9	J-41	61.5	3.2
J-58	TRUE	2,500	2,500	2,509	2,509	20	58.3	57.8	J-41	59.8	3.2
J-59	TRUE	2,500	2,500	2,533	2,533	20	58.2	57.8	J-41	59.7	3.2
J-60	TRUE	2,500	2,500	2,528	2,528	20	65	58.2	J-41	67.6	3.76

Scenario: Max Day Demand + 2% + 2,500 gpm Fire Flow

Report: Fire Flow (System Results, Fire Flow Demand Analyzed at J-56, J-60)

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Maximum) (psi)	Velocity of Maximum Pipe (ft/s)
J-62	TRUE	2,500	2,500	2,541	2,541	20	61.3	57.9	J-41	63.9	3.2
J-63	TRUE	2,500	2,500	2,553	2,553	20	61.6	57.9	J-41	64.2	3.2
J-64	TRUE	2,500	2,500	2,504	2,504	20	62.5	58	J-41	68.6	4.24
J-65	TRUE	2,500	2,500	2,503	2,503	20	63	58.1	J-41	68.5	4.84
J-66	TRUE	2,500	2,500	2,505	2,505	20	64.5	58.2	J-41	66.5	3.38
J-67	TRUE	2,500	2,500	2,545	2,545	20	60.9	58	J-41	65.7	5.36
J-68	TRUE	2,500	2,500	2,523	2,523	20	61.8	57.9	J-41	64	3.4
J-69	TRUE	2,500	2,500	2,502	2,502	20	59.8	57.9	J-41	62.2	4.95
J-70	TRUE	2,500	2,500	2,504	2,504	20	60.2	57.9	J-41	63	3.6
J-71	TRUE	2,500	2,500	2,533	2,533	20	60.4	57.9	J-41	66.2	5.21
J-72	TRUE	2,500	2,500	2,502	2,502	20	62.2	58	J-41	64.6	4.44
J-74	TRUE	2,500	2,500	2,582	2,582	20	59.8	57.9	J-41	67	4.24
J-75	TRUE	2,500	2,500	2,558	2,558	20	64	58	J-41	65.5	3.2
J-76	TRUE	2,500	2,500	2,530	2,530	20	65.5	58.2	J-41	67.9	3.98
J-77	TRUE	2,500	2,500	2,516	2,516	20	65	58.1	J-41	67.5	3.86
J-78	TRUE	2,500	2,500	2,518	2,518	20	62.5	58	J-41	65.1	4.22
J-79	TRUE	2,500	2,500	2,517	2,517	20	64.2	58.1	J-41	68.7	5.4
J-80	TRUE	2,500	2,500	2,517	2,517	20	63.3	58.1	J-41	68.2	5.15
J-81	TRUE	2,500	2,500	2,510	2,510	20	63	58.1	J-41	68.1	5.05
J-82	TRUE	2,500	2,500	2,500	2,500	20	62.9	58.1	J-41	68.2	4.95
J-83	TRUE	2,500	2,500	2,533	2,533	20	63	58	J-41	68.7	4.72
J-84	TRUE	2,500	2,500	2,513	2,513	20	63.1	58	J-41	68.9	4.61
J-85	TRUE	2,500	2,500	2,510	2,510	20	62.4	58	J-41	68.4	4.36
J-86	TRUE	2,500	2,500	2,521	2,521	20	61.4	58	J-41	67.5	4.36
J-87	TRUE	2,500	2,500	2,524	2,524	20	61.2	58	J-41	67.3	4.41
J-89	TRUE	2,500	2,500	2,584	2,584	20	61.2	58	J-41	67.2	4.65
J-90	TRUE	2,500	2,500	2,532	2,532	20	61.1	57.9	J-41	65.2	5.69
J-91	TRUE	2,500	2,500	2,526	2,526	20	61.3	57.9	J-41	64.9	5.95
J-92	TRUE	2,500	2,500	2,524	2,524	20	62	57.9	J-41	64.4	3.27
J-93	TRUE	2,500	2,500	2,515	2,515	20	62.2	57.9	J-41	64.6	3.2
J-94	TRUE	2,500	2,500	2,514	2,514	20	61.3	57.9	J-41	63.5	3.44
J-95	TRUE	2,500	2,500	2,588	2,588	20	59.3	57.7	J-41	61.2	3.2
J-96	TRUE	2,500	2,500	2,502	2,502	20	64.8	58.1	J-41	69	5.54
J-98	TRUE	2,500	2,500	2,501	2,501	20	65.7	58.2	J-41	67.7	3.42
J-100	TRUE	2,500	2,500	2,500	2,500	20	64.2	58	J-41	65.7	3.2
J-101	TRUE	2,500	2,500	2,500	2,500	20	64.2	58	J-41	65.9	3.99
J-102	TRUE	2,500	2,500	2,505	2,505	20	65.3	58.1	J-41	68.6	6.01

# **Amoruso Ranch Specific Plan Area**

## ***Water Master Plan***

### **Appendix D**

*Technical Memorandum entitled “PCWA Distribution Analysis for Amoruso Ranch Specific Plan”, dated January 22, 2016, by West Yost Associates*



## MEMORANDUM

DATE: January 22, 2016 Project No.: 415-12-15-23  
SENT VIA: EMAIL

TO: Kelye McKinney, City of Roseville

CC: Tony Firenzi, Placer County Water Agency

FROM: Patrick Johnston, PE, RCE #59028 and Polly Boissevain, PE, RCE#36164

REVIEWED BY: Charles Duncan, PE, RCE #55498

SUBJECT: PCWA Distribution System Analysis for Amoruso Ranch Specific Plan

At the request of the City of Roseville, West Yost Associates (West Yost) has prepared a hydraulic analysis in support of the water supply assessment and the California Environmental Quality Act analysis that the City of Roseville is preparing for the Amoruso Ranch Specific Plan. The purpose of the analysis is to determine the impacts to the Placer County Water Agency's (PCWA's) Lower Zone 1 water system of providing service to Roseville for Amoruso Ranch at a rate of 2.7 million gallons per day (mgd), and identify new infrastructure improvements required to mitigate those impacts. Separately, the City of Roseville is evaluating impacts to the City of Roseville's water distribution system to determine required infrastructure for the City of Roseville's system.

Currently PCWA has a contract right to deliver up to 10 mgd through the City of Roseville to other water purveyors south of Baseline Road and southwest of the City. Deliveries are made at an interconnection located at the Tinker Pump Station and Reservoir located in the Sunset Industrial sub-pressure zone of the Lower Zone 1 system. Current deliveries are provided to Cal Am at a rate of 2 mgd. With deliveries for Amoruso Ranch, a total of 12.7 mgd would need to be delivered through the intertie, leaving the 10 mgd available for development in west Placer County outside of the City of Roseville.

The analysis was performed using the most recent hydraulic model of the PCWA distribution system. The three scenarios that were run in the model are as follows:

- Existing maximum day demand of 53 mgd, of which 2 mgd is delivered to Cal Am via the Roseville interconnection (Existing Conditions);
- Total maximum day demand of 61 mgd, of which 10 mgd is delivered for west Placer County via the Roseville interconnection (Baseline Scenario); and
- Total maximum day demand of 64 mgd, of which 13 mgd for west Placer County and Amoruso Ranch is delivered via the Roseville Interconnection (Project Scenario).

The existing maximum day demand used for the analysis is 53 mgd, based on 2013 maximum day demand conditions for Lower Zone 1. Demands in the hydraulic model were scaled up to match 2013 maximum day demands. For each of the three scenarios above, a demand was added to represent the delivery to the Roseville interconnection.

The model was updated to include a planned 42-inch diameter pipeline for the second and third scenarios. This pipeline starts at the western end of Whitney Ranch Parkway, crosses Highway 65, and ends at Industrial Avenue.

The criteria provided by PCWA for their system include a maximum velocity of 5 feet per second, minimum pressure of 40 pounds per square inch (psi), and no more than a 5 psi drop in pressure from the Baseline Scenario to the Project Scenario.

The Tinker Road Pump Station includes a set of four high-head pumps, a set of four low-head pumps, and a 10 million gallon storage tank. PCWA indicated that the high-head pumps deliver water from the storage tank into the PCWA distribution system from approximately 4 AM until 10 AM to augment system pressures during the high demand period. The low-head pumps deliver water from the PCWA distribution system to the Roseville distribution system at a rate that matches flow leaving the Roseville distribution system instantaneously through use of remote communication systems. The storage is refilled each evening with water from the PCWA distribution system between midnight and 4 AM. Simplified operational parameters were incorporated into the model, using a constant delivery flowrate to the Roseville system, and 4 AM to 10 AM refill of the tank, to create a 72-hour model run for each of the three scenarios mentioned above.

PCWA requested that the distribution system be analyzed downstream from the pressure reducing station at the intersection of Whitney Ranch Parkway and Spring Ranch Drive and the pressure reducing station at the intersection of Sunset Boulevard and Blue Oaks, two of the supplies to the Sunset Industrial pressure zone. The model analysis revealed that it is the 4-hour period when the tank is being refilled in which the lowest pressures in this part of the system occur, with the lowest pressures found along the 14-inch diameter pipeline on Tinker Road that supplies the Tinker Pump Station facility. For the first two scenarios, the pressures remain above 40 psi throughout the area that was analyzed. However, the lowest pressures during the Project Scenario drop below 30 psi during the tank refilling period along Tinker Road only.

West Yost evaluated options for relieving the capacity issues along the 14-inch diameter pipeline on Tinker Road. One option is to extend the tank refilling period and lower the rate at which the tank is refilled. A second option is to install a parallel pipeline along Tinker Road to provide additional capacity. For this second option, it was determined that approximately 800 feet of 24-inch diameter pipeline would be needed. This pipeline is shown on Figure 1. While both options increase the pressure to adequate levels along Tinker Road, the addition of a new pipeline is recommended, since velocities are excessively high in the existing 14-inch diameter pipeline on Tinker Road.

PCWA has indicated that the low-head pumps in the Tinker Road Pump Station are not capable of providing more than the 10 mgd for which they are designed. PCWA indicated that additional pumping capacity will be required in order to provide the additional 2.7 mgd that is being requested

for Amoruso Ranch. A subsequent evaluation will be needed to identify a feasible location for the additional pump and necessary mechanical, electrical, building and site improvements.

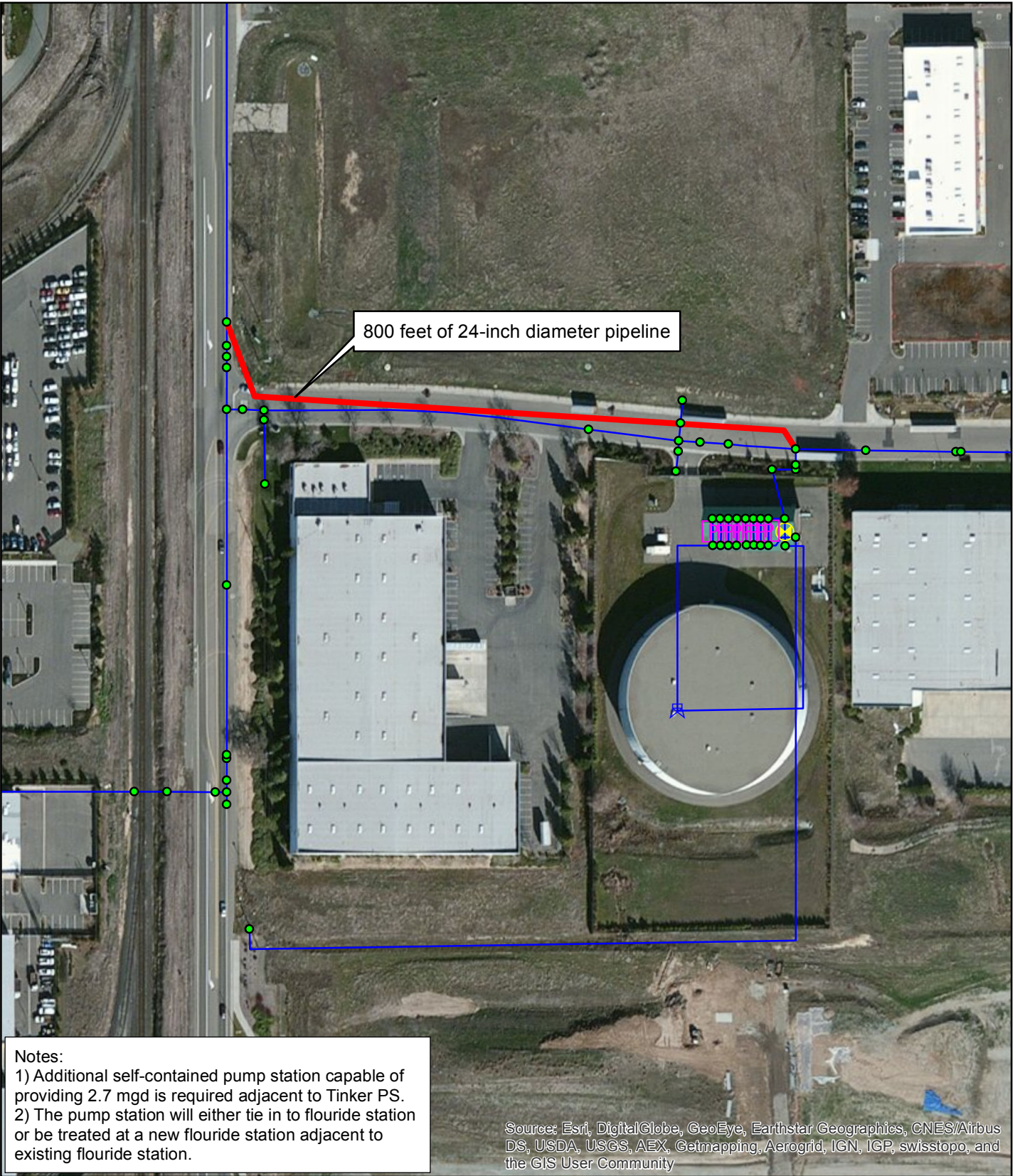
## **RECOMMENDATIONS**

Based on West Yost hydraulic evaluation using the updated PCWA hydraulic model, PCWA is able to provide the City of Roseville with the 2.7 mgd required for the Amoruso Ranch Specific Plan; however, additional infrastructure will be required. This additional infrastructure includes:

- New, self-contained pump, adjacent to the existing Tinker Pump Station, capable of delivering 2.7 mgd at a similar discharge head to the current 10 mgd pump station;
- New pipeline connection into the existing fluoride feeder station or construct new feeder stations inside new pump building; and
- Construct approximately 800 feet of 24-inch diameter pipeline along Tinker Road.

Once this infrastructure is constructed, PCWA will be able to deliver the additional 2.7 mgd to the City of Roseville.

Last Saved: 11/23/2015 4:24:50 PM N:\Clients\415 City of Roseville\12-15-23 On Call Modeling\MOD\PCWA model build 2015-11-10.mxd ; pjohnston

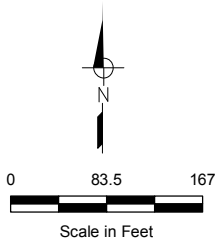


800 feet of 24-inch diameter pipeline

Notes:  
 1) Additional self-contained pump station capable of providing 2.7 mgd is required adjacent to Tinker PS.  
 2) The pump station will either tie in to flouride station or be treated at a new flouride station adjacent to existing flouride station.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

**Symbology**  
**Pipe**  
 — Existing Pipelines  
 — Proposed Pipeline



**Figure 1**  
**Tinker Road Pump Station**  
**Proposed Pipeline in PCWA System**



City of Roseville  
 PCWA System Analysis for  
 Amoruso Ranch Specific Plan

# **Amoruso Ranch Specific Plan Area**

## ***Water Master Plan***

### **Appendix E**

*Technical Memorandum entitled  
“ARSP Potable Water Hydraulic Modeling”,  
dated December 15, 2015,  
by HydroScience Engineers*

**To:** Paul Klein, Kimley Horn  
**From:** Curtis Lam  
**Reviewed by:** Kyle Horn  
**Subject:** ARSP Potable Water Hydraulic Modeling  
**Date:** December 16, 2015

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## Background

HydroScience Engineers was retained by Kimley Horn to provide the following services.

- Converting the existing Amoruso Specific Plan (ARSP) potable water hydraulic model into Infowater and integrating it into the City/Placer Ranch Specific Plan (PRSP) potable water hydraulic model
- Running the nine scenarios specified by the City for the current, interim, and buildout conditions during both summer drought, fall drought, and normal year conditions.
- Evaluating water infrastructure requirements for ARSP assuming 1) PRSP at buildout and 2) without PRSP.
- Providing Kimley-Horn with model output reports and/or figures showing the required infrastructure.

Following initiation of the project, the developers of the PRSP decided that they would no longer pursue their project for entitlement. Thus, ARSP was evaluated instead based on City current, interim, and buildout conditions without the inclusion of PRSP.

This technical memorandum is intended to summarize the work performed by HydroScience as part of this agreement.

## Merging Models

The stand-alone Amoruso Ranch Specific Plan Hydraulic model (created by Kimley Horn) was merged with the City model in order to accurately reflect the planned infrastructure within the ARSP project and provide the City with a complete potable water model.

## Water Demands

Water demands for the ARSP were provided by Kimley Horn (**Attachment 1**), and are based on the 15\_0504 Land Use Plan (**Attachment 2**) prepared by the Dahlin Group dated May 4, 2015. Based on these water demands, the ARSP totaled 1.34 MGD at buildout, including 2% for system losses. A table of water demands by parcel and a map of the parcels is included in the attached tables.

Through a separate process, water demands for each portion of the City were developed by the Municipal Resource Group (MRG) in conjunction with the City. These water demands were developed by totaling the buildout water demand estimates that have been approved by the City

with the assumed and estimated absorption rates for 19 separate areas of the City. An elaborate spreadsheet was prepared that identified buildout, 2035, and 2015 water demands for each specific plan area of the City by year. Copies of these tables can be provided upon request. It should be noted that the MRG analysis yielded a projected buildout demand for the ARSP project of 2.03MGD. For purposes of this analysis, the more conservative MRG demand was used.

HydroScience took these tables and converted the data into inputs to replace the water demands in the City’s hydraulic model. The overall data used in the model is attached and summarized below. Water demands by Specific Plan are further detailed in the attachments.

**Table 1: Summary of overall water demands**

Year	Normal		Drought			
			Summer (July)		Fall (September)	
	AFY	MGD	AFY	MGD	AFY	MGD
2015	35,253	62.94	28,202	50.35	19,798	35.35
2035	45,233	80.76	36,187	64.61	25,403	45.36
2065	56,689	101.22	45,351	80.97	31,837	56.84
Buildout	64,719	115.56	51,775	92.44	36,346	64.90

Notes:

1. MGD is a straight conversion from AFY then multiplied by 2 for MDD
2. Summer represents a 20% reduction from the normal year due to water conservation efforts
3. Fall represents a 22% reduction from Summer demands (Summer is assumed to be July, fall is assumed to be September) based on the Annual Diurnal demand curve provided by the City plus a 10% reduction due to water conservation efforts.

### Modeled Scenarios

The City identified multiple time periods and supply/demand conditions, to be modeled as part of the Placer Ranch Specific Plan hydraulic analysis. These scenarios were designed to ensure there is adequate supply available for the project as well as provide the City with a long term city-wide supply/demand picture under ‘Normal’ and ‘Drought’ conditions. With the PRSP project on hold, the City required the ARSP hydraulic analysis include these same scenarios. A copy of the modeling scenarios developed for the PRSP project and applied to the ARSP project, and are included as **Attachment 3**. This list of scenarios identified three critical time periods for further consideration, which were as follows:

- 2015 (existing):** This demand scenario represents the current year demands
- 2035 (Interim):** This demand scenario represents the pre-Ophir condition
- 2065 (Buildout):** This demand scenario represents the buildout water condition, though it was noted that the City does not actually top out water demands at buildout. 2065 demands were capped by assumed absorption rates for units.

Each time scenario includes three separate climactic conditions:

**Normal:** This condition is intended to represent:

- 1) Maximum demand during the month of July with no water conservation
- 2) Assumes all normal water deliveries are made without use of interties
- 3) No use of groundwater
- 4) Use of recycled water

**Drought/Summer:** This condition is intended to represent:

- 1) Maximum demand condition during the month of July with 20% water conservation
- 2) Assumes the City receives 39,800 AFY from Folsom Lake in accordance with the water forum agreement
- 3) Maximizes the use of recycled water
- 4) Maximizes the use of on-site wells
- 5) Utilizes interties with PCWA and SSWD (Tinker and PFE respectively)

**Drought/Fall:** This condition is intended to represent:

- 1) Fall demand condition during the month of September with 10% water conservation
- 2) Assumes the City is limited to 13 MGD of Folsom Lake supply due to use of barge
- 3) Maximizes the use of recycled water
- 4) Maximizes the use of on-site wells
- 5) Utilizes interties with PCWA and SSWD (Tinker and PFE respectively)

The scenarios modeled for the ARSP were as follows:

- 2015 – Normal
- 2015 – Drought - Summer
- 2015 – Drought - Fall
- 2035 – Normal
- 2035 – Drought - Summer
- 2035 – Drought - Fall
- 2065 – Normal
- 2065 – Drought - Summer
- 2065 – Drought - Fall

Based on the overall water demands calculated by the Municipal Resource Group and the modeling assumptions identified for each scenario above, HydroScience calculated the water demands applicable to each plan area by year and scenario. These demands are detailed in **Attachment 4**. These demands were then input into the City/ARSP hydraulic model in lieu of the existing modeled demands for each of the nine modeling scenarios.

## Modeling Considerations

During the execution of the modeling of each scenario, overall and scenario specific assumptions were identified and detailed. All of the detailed modifications not already detailed above are detailed in **Attachment 5**.

Some of the highlights of the modeling edits included:

- Modifying supply adjustments to the Folsom supply pipelines so the supply represented scenario conditions
- Modifying the timer controls for the Zone 2 Pump Station to remove warning errors
- Activating various well pumps for each scenario. Pressure controls (on/off) were added as required.
  - 6 wells for 2015
  - 15 wells for 2035
  - 17 wells for 2065.
- Adjusting SSWD intertie to force it to deliver 6 MGD. Method of demand placement was made to be similar to Tinker, which delivers water as a negative demand.
- Modifying 10 MGD withdrawal by PCWA where required to balance Zone 4 supply with Zone 4 demands
- Activating/deactivating Pleasant Grove Zone 4 to Zone 1 Pump station depending on Zone 4 supply and Zone 4 demands
  - Modifying the design point of the pump to better fit surplus demand in Zone 4
- Turning on or off the West Side Tank and Pump Station and Sierra Vista Tank and Pump Station in the 2035 and 2065 drought scenarios
- Modifying number of pumps in operation and run times for the West Side Tank and Pump Station and Sierra Vista Tank and Pump Station
- Adding in an additional 10 MGD at Tinker for a total of 16 MGD is delivered from PCWA to that location (6 MGD contract and 10 MGD from Ophir)

An electronic copy of the model will be provided to the City by HydroScience for further evaluation.

## Summary

Potable water was able to be delivered to ARSP within City standards for pressure during each scenario. Thus, no upgrades to City infrastructure are required due to pressure drops directly associated with the addition of ARSP demands. However, there are significant modifications to the City water model that were specific to each scenario. These modifications include:

- Confirming how water will be delivered into the City. It is recommended that not all of this water enter through Tinker, but rather 10 MGD of this water enter the City through a future Placer Ranch connection. However, 16 MGD can enter the City at Tinker at buildout with some transmission main improvements.
- The WRSP phase #2 well (at Winding Creek Way) does not pump water due to high pressure in the system at this location. It is recommended to either increase the discharge pressure or relocate the well to a different, more efficient location in the City. The current proximity to Tinker diminishes the effectiveness of this well during the drought scenarios.

- Confirm that 6 MGD can be received from Sacramento Suburban Water District. As currently designed/modeled, the pump/control valve responsible for delivering this water to the City system is undersized. The full 6 MGD is not delivered.
- Consider adjusting well discharge pressure setpoints to allow them to deliver their maximum capacity instead of competing against pressures delivered by future Zone 4 pump stations or Zone 1/Zone 4 PRVs.
- HydroScience recommends designing the upgraded Tinker pump station (for the buildout 2065 time period when Ophir is online) for a higher HGL in order to maintain 60+ psi at the Zone 4 PRV's. Additional modeling is recommended to determine HGL and potential new set points for Zone 4 PRV's and Tank/Pump stations.
  - Results of this modeling effort for the 2065 normal year scenario yields pressures in known low pressure areas of Zone 4 as low as 45 psi.

**ATTACHMENT 1**

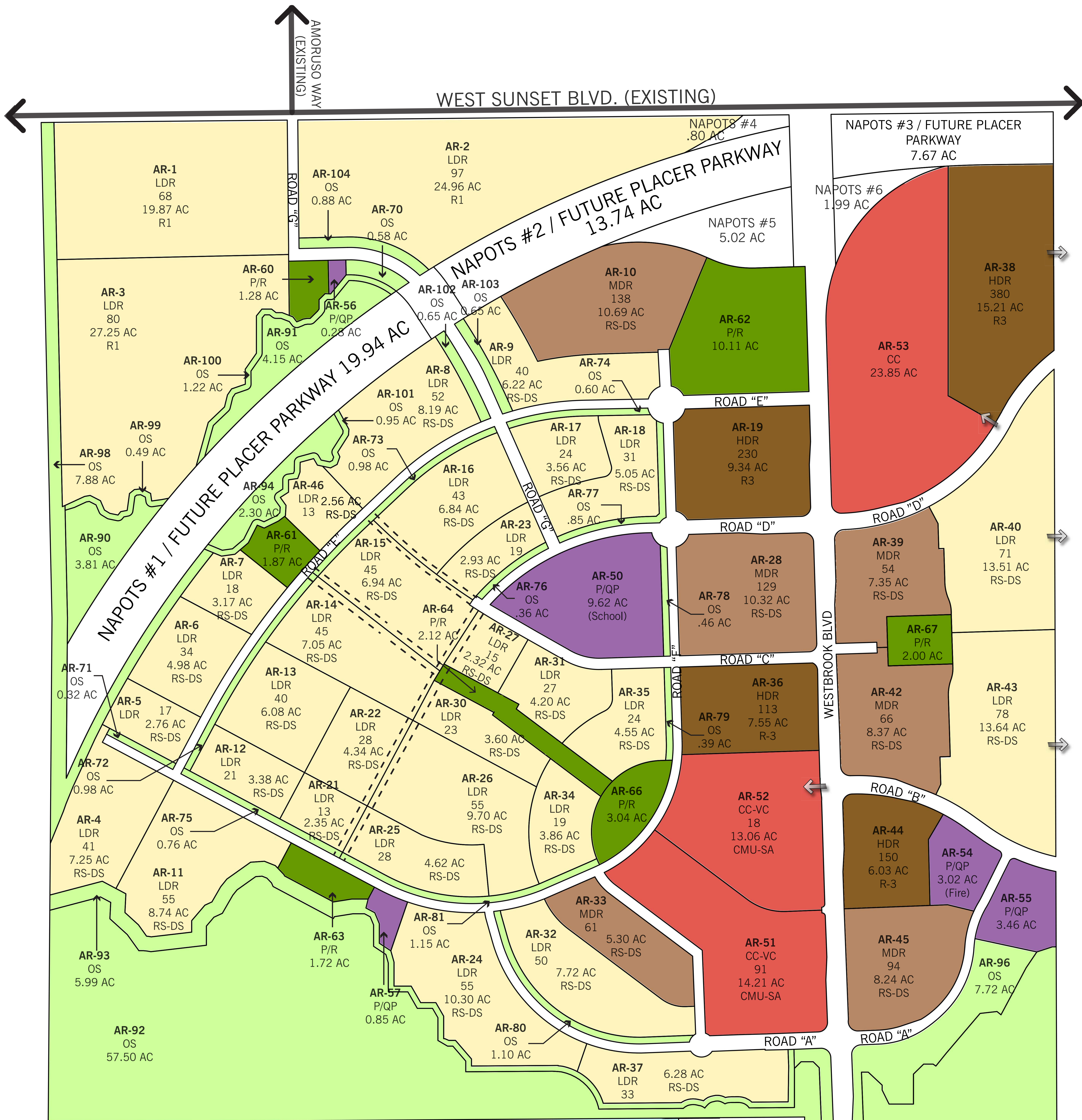
Amoruso Ranch Specific Plan – Water Demands

Brookfield Water Demand Summary

Parcel #	Land Use	Acres	Units	Density	Unit Demand		Avg. Day Demand (gpd)	Avg. Day Demand (gpm)	Avg. Annual Demand (AF/yr)	Max Day Demand (gpm)	Peak Hour Demand (gpm)
					Factor	Unit					
1	LDR	19.87	68	3.42	728	gpd/du	49,504	34.4	55.5	68.8	116.9
2	LDR	24.96	97	3.89	600	gpd/du	58,200	40.4	65.2	80.8	137.4
3	LDR	27.25	80	2.94	728	gpd/du	58,240	40.4	65.2	80.9	137.5
4	LDR	7.25	41	5.66	521	gpd/du	21,361	14.8	23.9	29.7	50.4
5	LDR	2.76	17	6.16	430	gpd/du	7,310	5.1	8.2	10.2	17.3
6	LDR	4.98	34	6.83	430	gpd/du	14,620	10.2	16.4	20.3	34.5
7	LDR	3.17	18	5.68	521	gpd/du	9,378	6.5	10.5	13.0	22.1
8	LDR	8.19	52	6.35	430	gpd/du	22,360	15.5	25.0	31.1	52.8
9	LDR	6.22	40	6.43	430	gpd/du	17,200	11.9	19.3	23.9	40.6
10	MDR	10.69	138	12.91	288	gpd/du	39,744	27.6	44.5	55.2	93.8
11	LDR	8.74	55	6.29	430	gpd/du	23,650	16.4	26.5	32.8	55.8
12	LDR	3.38	21	6.21	430	gpd/du	9,030	6.3	10.1	12.5	21.3
13	LDR	6.08	40	6.58	430	gpd/du	17,200	11.9	19.3	23.9	40.6
14	LDR	7.05	45	6.38	430	gpd/du	19,350	13.4	21.7	26.9	45.7
15	LDR	6.94	45	6.48	430	gpd/du	19,350	13.4	21.7	26.9	45.7
16	LDR	6.84	43	6.29	430	gpd/du	18,490	12.8	20.7	25.7	43.7
17	LDR	3.56	24	6.74	430	gpd/du	10,320	7.2	11.6	14.3	24.4
18	LDR	5.05	31	6.14	430	gpd/du	13,330	9.3	14.9	18.5	31.5
19	HDR	9.34	230	24.63	177	gpd/du	40,710	28.3	45.6	56.5	96.1
21	LDR	2.35	13	5.53	521	gpd/du	6,773	4.7	7.6	9.4	16.0
22	LDR	4.34	28	6.45	430	gpd/du	12,040	8.4	13.5	16.7	28.4
23	LDR	2.93	19	6.48	430	gpd/du	8,170	5.7	9.2	11.3	19.3
24	LDR	10.30	55	5.34	521	gpd/du	28,655	19.9	32.1	39.8	67.7
25	LDR	4.62	28	6.06	430	gpd/du	12,040	8.4	13.5	16.7	28.4
26	LDR	9.70	55	5.67	521	gpd/du	28,655	19.9	32.1	39.8	67.7
27	LDR	2.32	15	6.47	430	gpd/du	6,450	4.5	7.2	9.0	15.2
28	MDR	10.32	129	12.50	288	gpd/du	37,152	25.8	41.6	51.6	87.7
30	LDR	3.60	23	6.39	430	gpd/du	9,890	6.9	11.1	13.7	23.4
31	LDR	4.20	27	6.43	430	gpd/du	11,610	8.1	13.0	16.1	27.4
32	LDR	7.72	50	6.48	430	gpd/du	21,500	14.9	24.1	29.9	50.8
33	MDR	5.30	61	11.51	323	gpd/du	19,703	13.7	22.1	27.4	46.5
34	LDR	3.86	19	4.92	600	gpd/du	11,400	7.9	12.8	15.8	26.9
35	LDR	4.55	24	5.27	521	gpd/du	12,504	8.7	14.0	17.4	29.5
36	HDR	7.55	113	14.97	288	gpd/du	32,544	22.6	36.5	45.2	76.8
37	LDR	6.28	33	5.25	521	gpd/du	17,193	11.9	19.3	23.9	40.6
38	HDR	15.21	380	24.98	177	gpd/du	67,260	46.7	75.3	93.4	158.8
39	MDR	7.35	54	7.35	430	gpd/du	23,220	16.1	26.0	32.3	54.8
40	LDR	13.51	71	5.26	521	gpd/du	36,991	25.7	41.4	51.4	87.3
42	MDR	8.37	66	7.89	430	gpd/du	28,380	19.7	31.8	39.4	67.0
43	LDR	13.64	78	5.72	521	gpd/du	40,638	28.2	45.5	56.4	96.0
44	HDR	6.03	150	24.88	177	gpd/du	26,550	18.4	29.7	36.9	62.7
45	MDR	8.24	94	11.41	323	gpd/du	30,362	21.1	34.0	42.2	71.7
46	LDR	2.56	13	5.08	521	gpd/du	6,773	4.7	7.6	9.4	16.0
50	P/QP	9.62			3454	gpd/ac	33,227	23.1	37.2	46.1	78.5
51	CC-VC		91	6.40	288	gpd/du	26,208	18.2	29.4	36.4	61.9
51	CC-VC	14.21			2598	gpd/ac	36,918	25.6	41.4	51.3	87.2
52	CC-VC		18	1.38	288	gpd/du	5,184	3.6	5.8	7.2	12.2
52	CC-VC	13.06			2598	gpd/ac	33,930	23.6	38.0	47.1	80.1
53	CC	23.85			2598	gpd/ac	61,962	43.0	69.4	86.1	146.3
54	P/QP	3.02			1780	gpd/ac	5,376	3.7	6.0	7.5	12.7
55	P/QP	3.46			1780	gpd/ac	6,159	4.3	6.9	8.6	14.5
56	P/QP	0.28			1780	gpd/ac	498	0.3	0.6	0.7	1.2
57	P/QP	0.85			1780	gpd/ac	1,513	1.1	1.7	2.1	3.6
60	P/R	1.28			2988	gpd/ac	3,825	2.7	4.3	5.3	9.0
61	P/R	1.87			2988	gpd/ac	5,588	3.9	6.3	7.8	13.2
62	P/R	10.11			2988	gpd/ac	30,209	21.0	33.8	42.0	71.3
63	P/R	1.72			2988	gpd/ac	5,139	3.6	5.8	7.1	12.1
64	P/R	2.12			2988	gpd/ac	6,335	4.4	7.1	8.8	15.0
66	P/R	3.04			2988	gpd/ac	9,084	6.3	10.2	12.6	21.4
67	P/R	2.00			2988	gpd/ac	5,976	4.2	6.7	8.3	14.1
70	OS (Paseo)	0.58			2988	gpd/ac	1,733	1.2	1.9	2.4	4.1
71	OS (Paseo)	0.32			2988	gpd/ac	956	0.7	1.1	1.3	2.3
72	OS (Paseo)	0.98			2988	gpd/ac	2,928	2.0	3.3	4.1	6.9
73	OS (Paseo)	0.98			2988	gpd/ac	2,928	2.0	3.3	4.1	6.9
74	OS (Paseo)	0.60			2988	gpd/ac	1,793	1.2	2.0	2.5	4.2
75	OS (Paseo)	0.76			2988	gpd/ac	2,271	1.6	2.5	3.2	5.4
76	OS (Paseo)	0.36			2988	gpd/ac	1,076	0.7	1.2	1.5	2.5
77	OS (Paseo)	0.85			2988	gpd/ac	2,540	1.8	2.8	3.5	6.0
78	OS (Paseo)	0.46			2988	gpd/ac	1,374	1.0	1.5	1.9	3.2
79	OS (Paseo)	0.39			2988	gpd/ac	1,165	0.8	1.3	1.6	2.8
80	OS (Paseo)	1.10			2988	gpd/ac	3,287	2.3	3.7	4.6	7.8
81	OS (Paseo)	1.15			2988	gpd/ac	3,436	2.4	3.8	4.8	8.1
90	OS (General)	3.81			0	gpd/ac					
91	OS (General)	4.15			0	gpd/ac					
92	OS (Preserve)	57.50			0	gpd/ac					
93	OS (General)	5.99			0	gpd/ac					
94	OS (General)	2.30			0	gpd/ac					
95	OS (General)	2.73			0	gpd/ac					
96	OS (General)	7.72			0	gpd/ac					
97	OS (Preserve)	40.08			0	gpd/ac					
98	OS (General)	7.88			0	gpd/ac					
99	OS (General)	0.49			0	gpd/ac					
100	OS (General)	1.22			0	gpd/ac					
101	OS (General)	0.95			0	gpd/ac					
102	OS (Paseo)	0.65			2988	gpd/ac	1,942	1.3	2.2	2.7	4.6
103	OS (Paseo)	0.65			2988	gpd/ac	1,942	1.3	2.2	2.7	4.6
104	OS (Paseo)	0.88			2988	gpd/ac	2,629	1.8	2.9	3.7	6.2
110	UR	20.00	1	0.1	728	gpd/du	728	0.5	0.8	1.0	1.7
	NAPOTS	49.16			0	gpd/ac					
	ROW	52.04			0	gpd/ac					
<b>Subtotal</b>							1,315,659	914	1,474	1,827	3,106
<b>2% System Loss</b>							26,313	18	29	37	62
<b>Total</b>							1,341,972	932	1,503	1,864	3,169

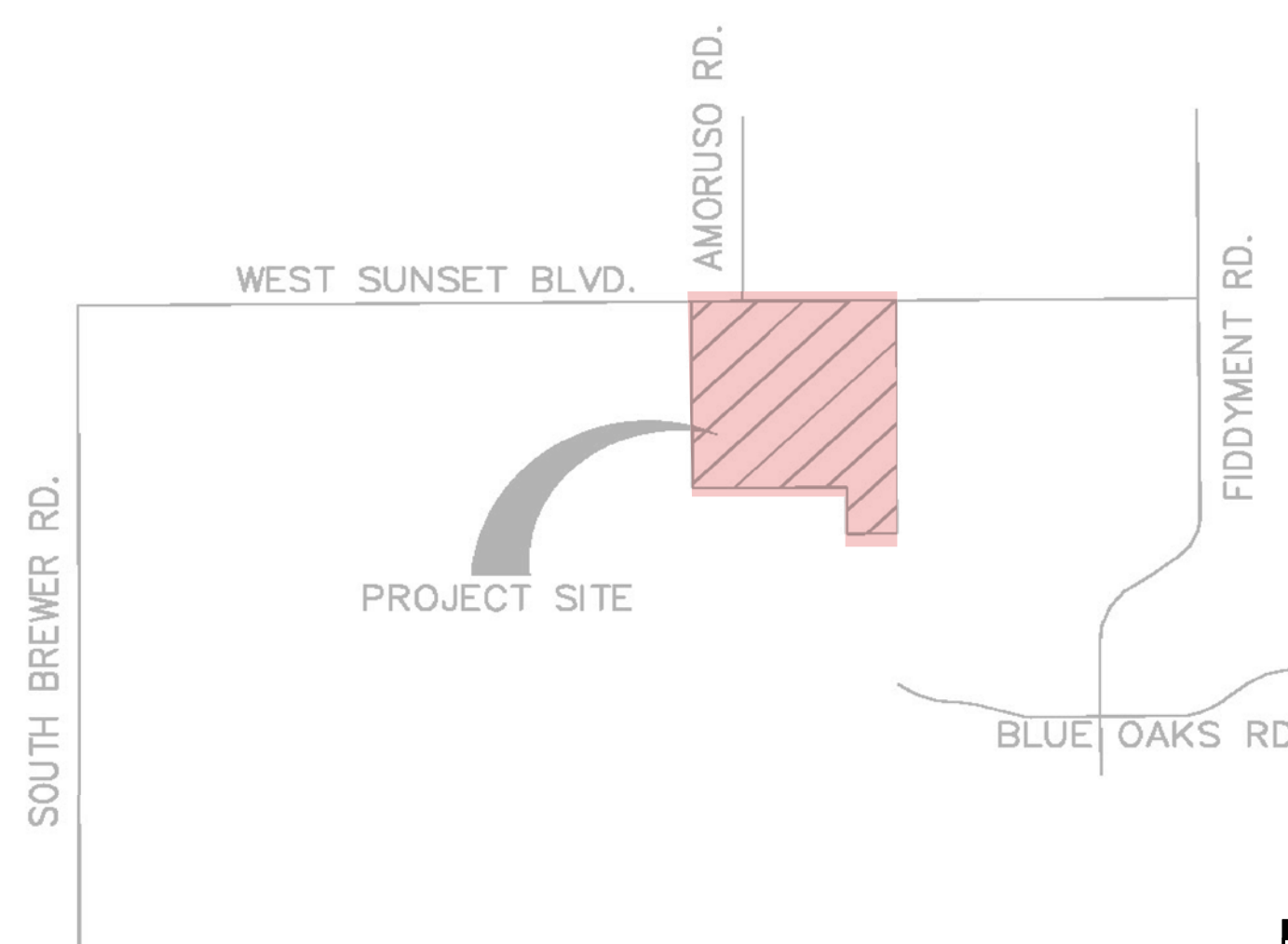
**ATTACHMENT 2**

Amoruso Ranch Specific Plan – Land Use Plan



- LOW DENSITY RESIDENTIAL (LDR) (0.5-6.9 D.U./AC)
- MEDIUM DENSITY RESIDENTIAL (MDR) (7.0-12.9 D.U./AC)
- HIGH DENSITY RESIDENTIAL (HDR) (13.0-30.0 D.U./AC)
- COMMUNITY COMMERCIAL (CC)
- PUBLIC/QUASI PUBLIC (P/QP)
- PARKS AND RECREATION (P/R)
- OPEN SPACE (OS)  
(PRESERVED OPEN SPACE/GENERAL OPEN SPACE)
- URBAN RESERVE (UR)
- MISC. ROADS
- NAPOTS (NOT A PART OF THIS SUBDIVISION)

Map key	
<b>AR-1:</b>	Parcel Number
<b>LDR:</b>	General Plan Designation
<b>100:</b>	Allocated Dwelling Units
<b>12.00 AC:</b>	Parcel Acreage
<b>RS-DS:</b>	Zoning Designation



EXCEL FILE: 15\_0504 LAND USE PLAN  
 AUTO CAD: 15\_0504\_AR base

# AMORUSO RANCH - 15\_0504 LAND USE PLAN

## BROOKFIELD RESIDENTIAL, ROSEVILLE, CA



**JOB NO.** 316.002  
**DATE** 05-04-2015  
 5865 Owens Drive  
 Pleasanton, CA 94588  
 925-251-7200



## **ATTACHMENT 3**

### Water Model Scenario Summary Spreadsheet

Time Period	Scenario	Demand		Interties	Zone 4 to Zone 1 PS Active	Groundwater	Surface Water	Water Conservation (%)
		AFY	MGD					
2015	Normal Year	35,253	63	6MGD PCWA @ Tinker -10 MGD PCWA @ Baseline	No	0 Wells 0 MGD	97 MGD 150 CFS Limitation	0%
	Drought Summer	28,202	50	6MGD PCWA @ Tinker 6 MGD SSWD @ PFE -10 MGD PCWA @ Baseline	No	6 Wells ~ 15 MGD	34 MGD Full Lake Accessibility	20%
	Drought Fall	19,798	35	6MGD PCWA @ Tinker 6 MGD SSWD @ PFE	Yes	6 Wells ~ 15 MGD	13 MGD 20 CFS from Barge	10%
2035	Normal Year	45,233	81	6MGD PCWA @ Tinker -10 MGD PCWA @ Baseline	No	0 Wells 0 MGD	97 MGD 150 CFS Limitation	0%
	Drought Summer	36,187	65	6MGD PCWA @ Tinker 6 MGD SSWD @ PFE -10 MGD PCWA @ Baseline	No	15 Wells ~ 37 MGD	35 MGD Full Lake Accessibility	20%
	Drought Fall	25,403	45	6MGD PCWA @ Tinker 6 MGD SSWD @ PFE -10 MGD PCWA @ Baseline	No	15 Wells ~ 37 MGD	13 MGD 20 CFS from Barge	10%
2065	Normal Year	56,689	101	16MGD PCWA @ Tinker (max of 20 MGD = 10 MGD Wheeled + 10 MGD Ophir) -10 MGD PCWA @ Baseline	No	0 Wells 0 MGD	97 MGD 150 CFS Limitation	0%
	Drought Summer	45,351	81	16MGD PCWA @ Tinker (max of 20 MGD = 10 MGD Wheeled + 10 MGD Ophir) 6 MGD SSWD @ PFE -10 MGD PCWA @ Baseline	No	17 Wells ~ 42 MGD	35 MGD Full Lake Accessibility	20%
	Drought Fall	31,837	57	16MGD PCWA @ Tinker (max of 20 MGD = 10 MGD Wheeled + 10 MGD Ophir) 6 MGD SSWD @ PFE -10 MGD PCWA @ Baseline	No	17 Wells ~ 42 MGD	13 MGD 20 CFS from Barge	10%

## **ATTACHMENT 4**

### Potable Water Demands per Specific Plan/Planning Area

## Normal Year

Plan Area	2015		2035		2065		Build Out Estimate	
	Buidlout (%)	MGD	Buidlout (%)	MGD	Buidlout (%)	MGD	AFY	MGD
Infill	73%	22.63	75%	23.25	85%	26.35	17360.63	31.00
DTSP	25%	0.43	35%	0.61	80%	1.39	971.58	1.73
RGSP	45%	0.14	55%	0.17	85%	0.26	173.71	0.31
SE	93%	2.99	95%	3.05	95%	3.05	1800.12	3.21
NE	75%	3.07	85%	3.47	97%	3.96	2288.88	4.09
SR	45%	1.28	80%	2.27	97%	2.75	1589.64	2.84
NC	60%	4.66	85%	6.60	97%	7.53	4346.03	7.76
HR	50%	1.49	92%	2.74	96%	2.85	1665.42	2.97
NW	93%	12.08	95%	12.34	98%	12.73	7272.90	12.99
DW	85%	5.07	90%	5.37	95%	5.67	3341.14	5.97
NI	25%	2.01	35%	2.82	65%	5.23	4507.02	8.05
CO	0%	0.00	50%	0.52	97%	1.00	578.40	1.03
NR	55%	3.91	90%	6.39	90%	6.39	3979.60	7.11
WR	25%	3.20	50%	6.40	85%	10.88	7169.81	12.80
SV	0%	0.00	35%	2.52	80%	5.77	4036.42	7.21
WB	0%	0.00	45%	0.91	90%	1.82	1133.42	2.02
CV	0%	0.00	30%	0.58	80%	1.55	1086.36	1.94
AR	0%	0.00	30%	0.76	80%	2.03	1418.11	2.53
PR	0%	0.00	30%	0.00	90%	0.00	0.00	0.00
Total	-	62.94	-	80.76	-	101.22	64719.19	115.56

## Drought Summer

Plan Area	2015		2035		2065		Build Out Estimate	
	Buidlout (%)	MGD	Buidlout (%)	MGD	Buidlout (%)	MGD	AFY	MGD
Infill	73%	18.10	75%	18.60	85%	21.08	13888.50	24.80
DTSP	25%	0.35	35%	0.49	80%	1.11	777.26	1.39
RGSP	45%	0.11	55%	0.14	85%	0.21	138.97	0.25
SE	93%	2.39	95%	2.44	95%	2.44	1440.09	2.57
NE	75%	2.45	85%	2.78	97%	3.17	1831.10	3.27
SR	45%	1.02	80%	1.82	97%	2.20	1271.71	2.27
NC	60%	3.72	85%	5.28	97%	6.02	3476.82	6.21
HR	50%	1.19	92%	2.19	96%	2.28	1332.34	2.38
NW	93%	9.66	95%	9.87	98%	10.18	5818.32	10.39
DW	85%	4.06	90%	4.30	95%	4.53	2672.91	4.77
NI	25%	1.61	35%	2.25	65%	4.18	3605.61	6.44
CO	0%	0.00	50%	0.41	97%	0.80	462.72	0.83
NR	55%	3.13	90%	5.12	90%	5.12	3183.68	5.68
WR	25%	2.56	50%	5.12	85%	8.71	5735.85	10.24
SV	0%	0.00	35%	2.02	80%	4.61	3229.13	5.77
WB	0%	0.00	45%	0.73	90%	1.46	906.74	1.62
CV	0%	0.00	30%	0.47	80%	1.24	869.09	1.55
AR	0%	0.00	30%	0.61	80%	1.62	1134.49	2.03
PR	0%	0.00	30%	0.00	90%	0.00	0.00	0.00
Total	-	50.35	-	64.61	-	80.97	51775.35	92.44

## Drought Fall

Plan Area	2015		2035		2065		Build Out Estimate	
	Buidlout (%)	MGD	Buidlout (%)	MGD	Buidlout (%)	MGD	AFY	MGD
Infill	73%	12.71	75%	13.06	85%	14.80	9749.73	17.41
DTSP	25%	0.24	35%	0.34	80%	0.78	545.64	0.97
RGSP	45%	0.08	55%	0.10	85%	0.15	97.55	0.17
SE	93%	1.68	95%	1.71	95%	1.71	1010.95	1.81
NE	75%	1.72	85%	1.95	97%	2.23	1285.43	2.30
SR	45%	0.72	80%	1.28	97%	1.55	892.74	1.59
NC	60%	2.61	85%	3.70	97%	4.23	2440.73	4.36
HR	50%	0.83	92%	1.54	96%	1.60	935.30	1.67
NW	93%	6.78	95%	6.93	98%	7.15	4084.46	7.29
DW	85%	2.85	90%	3.02	95%	3.18	1876.39	3.35
NI	25%	1.13	35%	1.58	65%	2.94	2531.14	4.52
CO	0%	0.00	50%	0.29	97%	0.56	324.83	0.58
NR	55%	2.19	90%	3.59	90%	3.59	2234.95	3.99
WR	25%	1.80	50%	3.59	85%	6.11	4026.56	7.19
SV	0%	0.00	35%	1.42	80%	3.24	2266.85	4.05
WB	0%	0.00	45%	0.51	90%	1.02	636.53	1.14
CV	0%	0.00	30%	0.33	80%	0.87	610.10	1.09
AR	0%	0.00	30%	0.43	80%	1.14	796.41	1.42
PR	0%	0.00	30%	0.00	90%	0.00	0.00	0.00
Total	-	35.35	-	45.36	-	56.84	36346.30	64.90

## **ATTACHMENT 5**

### Hydraulic Modeling Adjustment Log and Notes

## General assumptions/modifications:

- The stand-alone ARSP model was merged with the City model to provide one complete model to work from and preserve the work previously done by Kimley Horn
- All modeling was done by creating three child scenarios to the BO\_MDD\_PZ4\_ARSAFIX\_ALT\_REDUCE base scenario
  - As identified by George Hanson during the Placer Ranch project modeling effort
- These three child scenarios are the 'Normal Year' scenarios
  - 2015 (existing)
  - 2035 (interim)
  - 2065 (buildout).
- Each normal year scenario has 2 child scenarios
  - Summer
  - Fall
- Demands for each scenario are based off of Derrick's spreadsheet and are broken out geographically by specific plan.
  - Summer demands represent a 20% reduction due to water conservation
  - Fall demands represent 78% of the summer demand (yearly demand curve provided by the City/West Yost with the assumption of September as 'Fall'), plus an additional 10% reduction for water conservation
- Water supply was modeled according to Kelye's Dry.xls spreadsheet with the exception being that Placer Ranch was not included (2 less supply wells).
- Anytime supply adjustments were made to the Folsom WTP, the flow control valves were adjusted while keeping the same ratio of flow through the 72inch pipe from the 'New Tank' (60%) and the 42 inch pipe from the 'clear well' (40%).

## 2015

- 2015\_Normal\_Year
  - Modified demands to total 62.94MGD
  - Modified zone 2 pump station controls to remove errors (added pump when the two timer controlled pumps were pumping out of their range, also shortened the refill period for tanks 903 and 904).
- 2015\_Drought\_Summer
  - Modified Demands to total 50.35MGD (total supply approximately = 61MGD thus 10MGD to PCWA @ Baseline left in)
  - WTP set to supply 34MGD
  - 6 wells activated
    - Pressure controls added to Hayden well to turn off when downstream pressure is too high
  - 6MGD SSWD intertie
    - Pump is unable push the full 6MGD into the system (recommend making necessary adjustment)
  - 6MGD PCWA @ Tinker
  - 10MGD out PCWA @ Baseline
  - Modified zone 2 pump station controls to remove errors (added pump when the two timer controlled pumps were pumping out of their range, disabled 2 pumps and modified controls to slow the refill period for tanks 903 and 904).
  - Demand in Z4 (9.6MGD MDD) is greater than supply (8.4MGD) regardless of 10MGD PCWA. No PG Z4 to Z1 pump station.
  - WRSP Tank and pump station is off
- 2015\_Drought\_Fall
  - Modified Demands to total 35.35MGD (total supply approximately = 40MGD thus 10MGD to PCWA @ Baseline removed)
  - WTP set to supply 13MGD
  - 6 wells activated
    - Pressure controls added to Hayden well to turn off when downstream pressure is too high
  - 6MGD SSWD intertie
    - Pump is assumed to push the full 6MGD into the system (modeled with negative demand similar to Tinker)
  - 6MGD PCWA @ Tinker
  - 10MGD out PCWA @ Baseline=OFF
  - Modified zone 2 pump station controls to remove errors (added pump when the two timer controlled pumps were pumping out of their range, also disabled 2 pumps and modified controls to slow the refill period for tanks 903 and 904).
  - Demand in Z4 (6.4MGD MDD) is less than supply (8.4MGD) with 10MGD PCWA outflow removed. PG Z4 to Z1 pump station is active.
    - Activated PG PZ4 to PZ1 PS and modified pump for a design flow of the excess 2MGD.
    - Set pressure controls such that it would turn off when insufficient PZ4 pressure
  - WRSP Tank and pump station is off

## 2035

- 2035\_Normal\_Year
  - Modified demands to total 80.76MGD
  - Modified zone 2 pump station controls to remove errors (added pump when the two timer controlled pumps were pumping out of their range).
- 2035\_Drought\_Summer
  - Modified Demands to total 64.61MGD (total supply approximately = 82MGD thus 10MGD to PCWA @ Baseline left in)
  - WTP set to supply 35MGD
  - 15 wells activated
    - WRSP Phase #2 @ Winding Creek never pumps due to high pressure in system - Turned off
    - Pressure controls added to Hayden Well and WRSP Phase #3 well.
  - 6MGD SSWD intertie
    - Pump is assumed to push the full 6MGD into the system (modeled with negative demand similar to Tinker)
  - 8.5MGD PCWA @ Tinker (6MGD contract +2.5MGD for Amoruso)
  - 10MGD out PCWA @ Baseline
  - Modified zone 2 pump station controls to remove errors (added pumps when the two timer controlled pumps were pumping out of their range, disabled 2 pumps to slow the refill period for tanks 903 and 904).
  - Demand in Z4 (16.6MGD MDD) + PCWA 10MGD is greater than supply (20.1MGD). No PG Z4 to Z1 pump station.
  - SVSP Tank and Pump station – pump 2 disabled and modified start up time for pump 1
  - WRSP Tank and pump station – active
- 2035\_Drought\_Fall
  - Modified Demands to total 45.36MGD (total supply approximately = 60MGD thus 10MGD to PCWA @ Baseline active)
  - WTP set to supply 13MGD
  - 15 wells activated
    - Pressure controls added to WRSP Phase 3 well to turn off when downstream pressure is too high
    - WRSP Phase #2 @ Winding Creek never pumps due to high pressure in system - Turned off
  - 6MGD SSWD intertie
    - Pump is assumed to push the full 6MGD into the system (modeled with negative demand similar to Tinker)
  - 8.5MGD PCWA @ Tinker (6MGD contract +2.5MGD for Amoruso)
  - 10MGD out PCWA @ Baseline
  - Modified zone 2 pump station controls to remove errors (added pump when the two timer controlled pumps were pumping out of their range, also disabled 2 pumps and modified controls to slow the refill period for tanks 903 and 904).
  - Demand in Z4 (11.86MGD MDD) +10MGD PCWA outflow is greater than supply (20.1MGD). PG Z4 to Z1 pump station is disabled.
  - WRSP Tank and pump station – pump 2 is off
  - SVSP tank and pump station - disabled

## 2065








- 2065\_Normal\_Year
  - Modified demands to total 101.22MGD
  - Modified zone 2 pump station controls to remove errors (added pump when the two timer controlled pumps were pumping out of their range).
  - 16MGD@ Tinker (6MGD Current plus 10MGD Ophir)
    - Didn't do the full 20MGD in order to keep velocities down. Didn't need to up it to get the system to work.
  - SVSP Tank and pump station
    - Modified SV fill valve to shorter fill times
    - Added pump 3 during the peak hour
  - WRSP Tank and pump station
    - Added pump 4 during the peak hour
- 2065\_Drought\_Summer
  - Modified Demands to total 80.97MGD (total supply approximately = 103MGD thus 10MGD to PCWA @ Baseline left in)
  - WTP set to supply 35MGD
  - 17 wells activated
    - WRSP Phase #2 @ Winding Creek never pumps due to high pressure in system - Turned off
  - 6MGD SSWD intertie
    - Pump is assumed to push the full 6MGD into the system (modeled with negative demand similar to Tinker)
  - 16MGD PCWA @ Tinker (6MGD contract +10MGD from Ophir)
  - 10MGD out PCWA @ Baseline
  - Modified zone 2 pump station controls to remove errors (added pumps when the two timer controlled pumps were pumping out of their range, disabled 2 pumps to slow the refill period for tanks 903 and 904).
  - Demand in Z4 (35.38MGD MDD) + PCWA 10MGD is greater than supply (25.3MGD). No PG Z4 to Z1 pump station.
  - SVSP Tank and Pump station – disabled
- 2065\_Drought\_Fall
  - Modified Demands to total 56.84MGD (total supply approximately = 81MGD thus 10MGD to PCWA @ Baseline active)
  - WTP set to supply 13MGD
  - 17 wells activated
    - WRSP Phase #2 @ Winding Creek never pumps due to high pressure in system - Turned off
  - 6MGD SSWD intertie
    - Pump is assumed to push the full 6MGD into the system (modeled with negative demand similar to Tinker)
  - 16MGD PCWA @ Tinker (6MGD contract +10MGD from Ophir)
  - 10MGD out PCWA @ Baseline
  - Modified zone 2 pump station controls to remove errors (added pump when the two timer controlled pumps were pumping out of their range, also disabled 2 pumps and modified controls to slow the refill period for tanks 903 and 904).
  - Demand in Z4 (17.8MGD MDD) +10MGD PCWA outflow is greater than supply (25.3MGD). PG Z4 to Z1 pump station is disabled.
  - WRSP Tank and pump station – pump 2 is off
  - SVSP tank and pump station - disabled

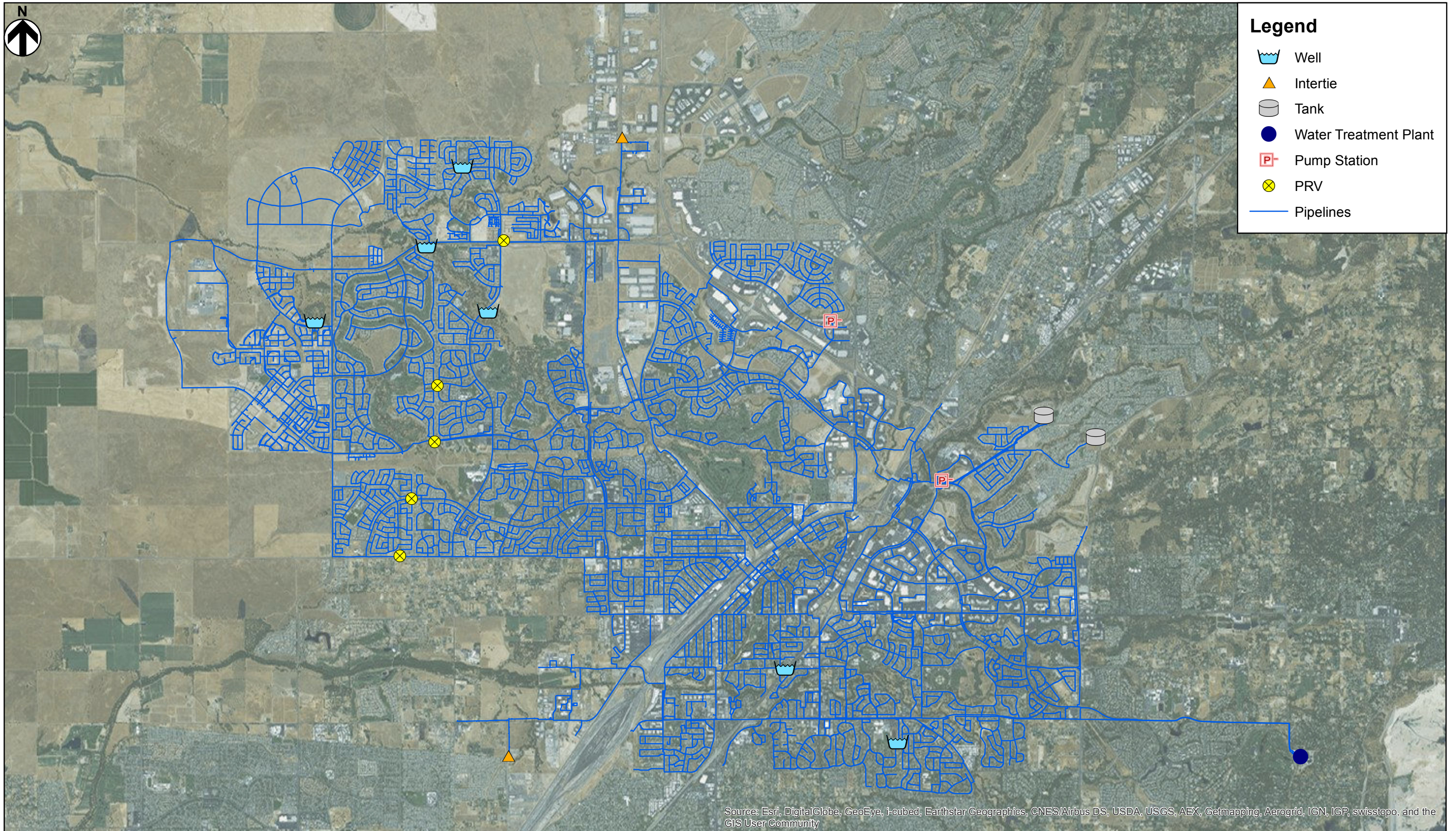
## **ATTACHMENT 6**

### City of Roseville Figures and Modeling Results Figures



### Legend








-  Well
-  Intertie
-  Tank
-  Water Treatment Plant
-  Pump Station
-  PRV
-  Pipelines

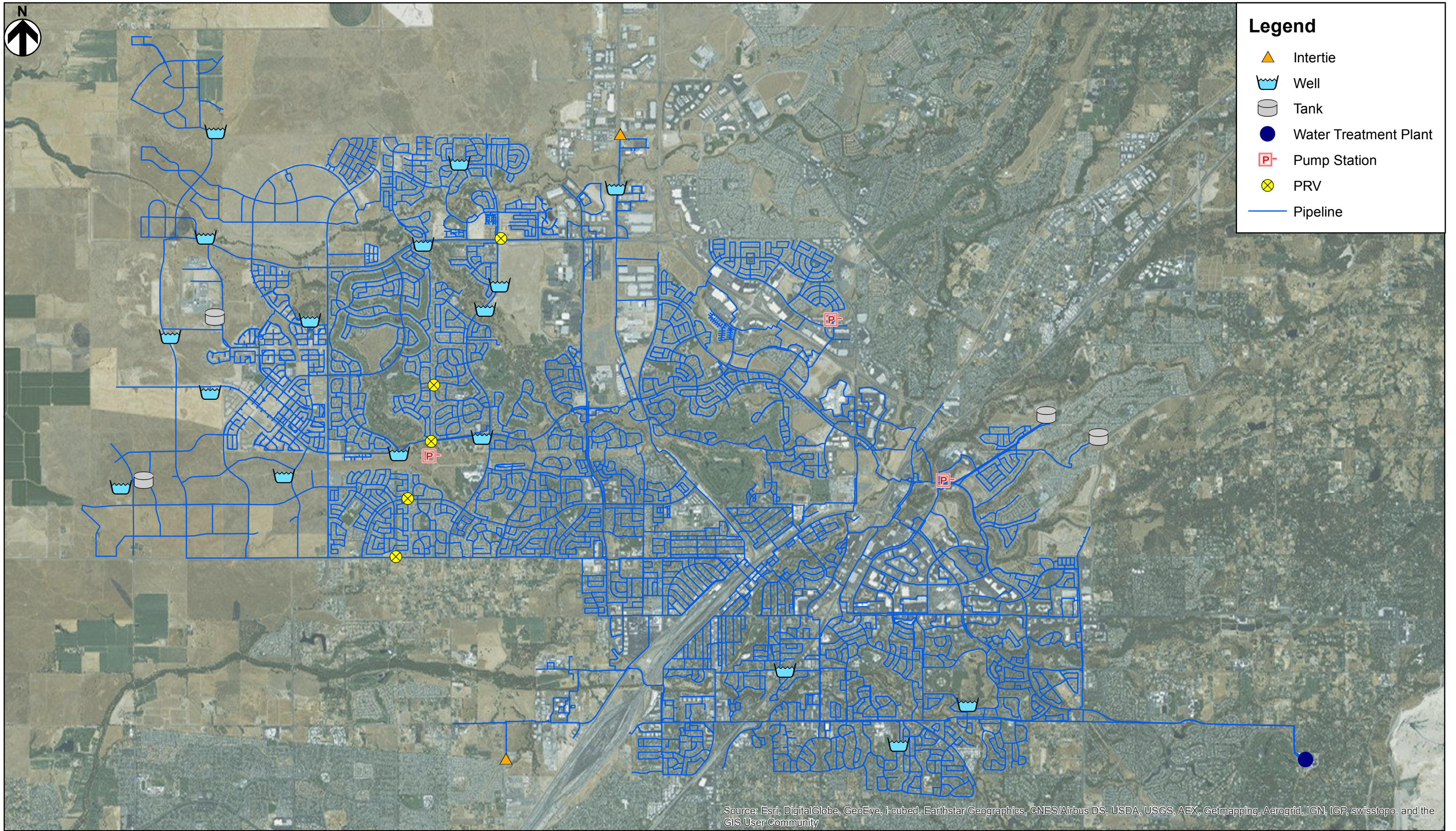


Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

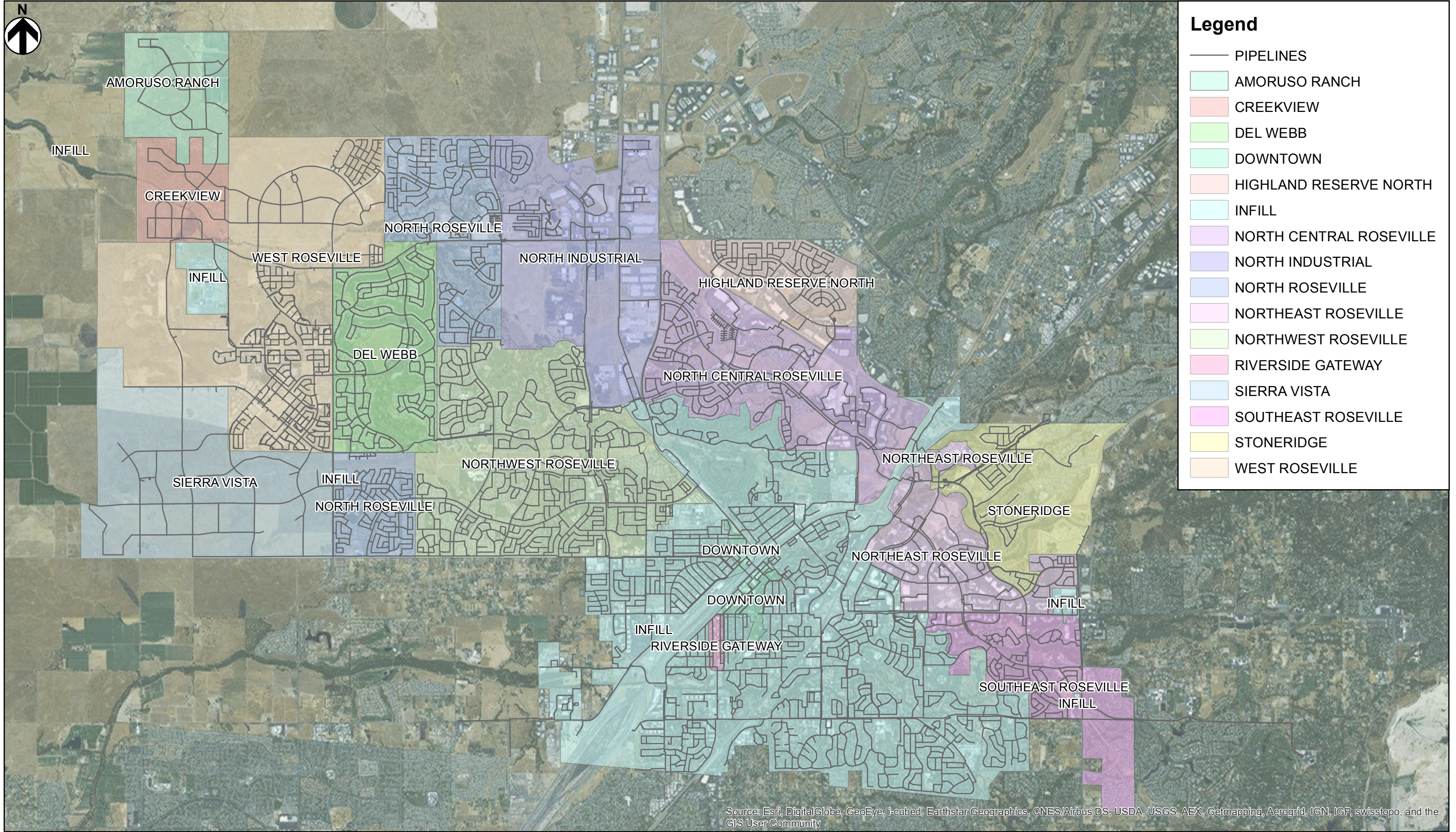


### Legend

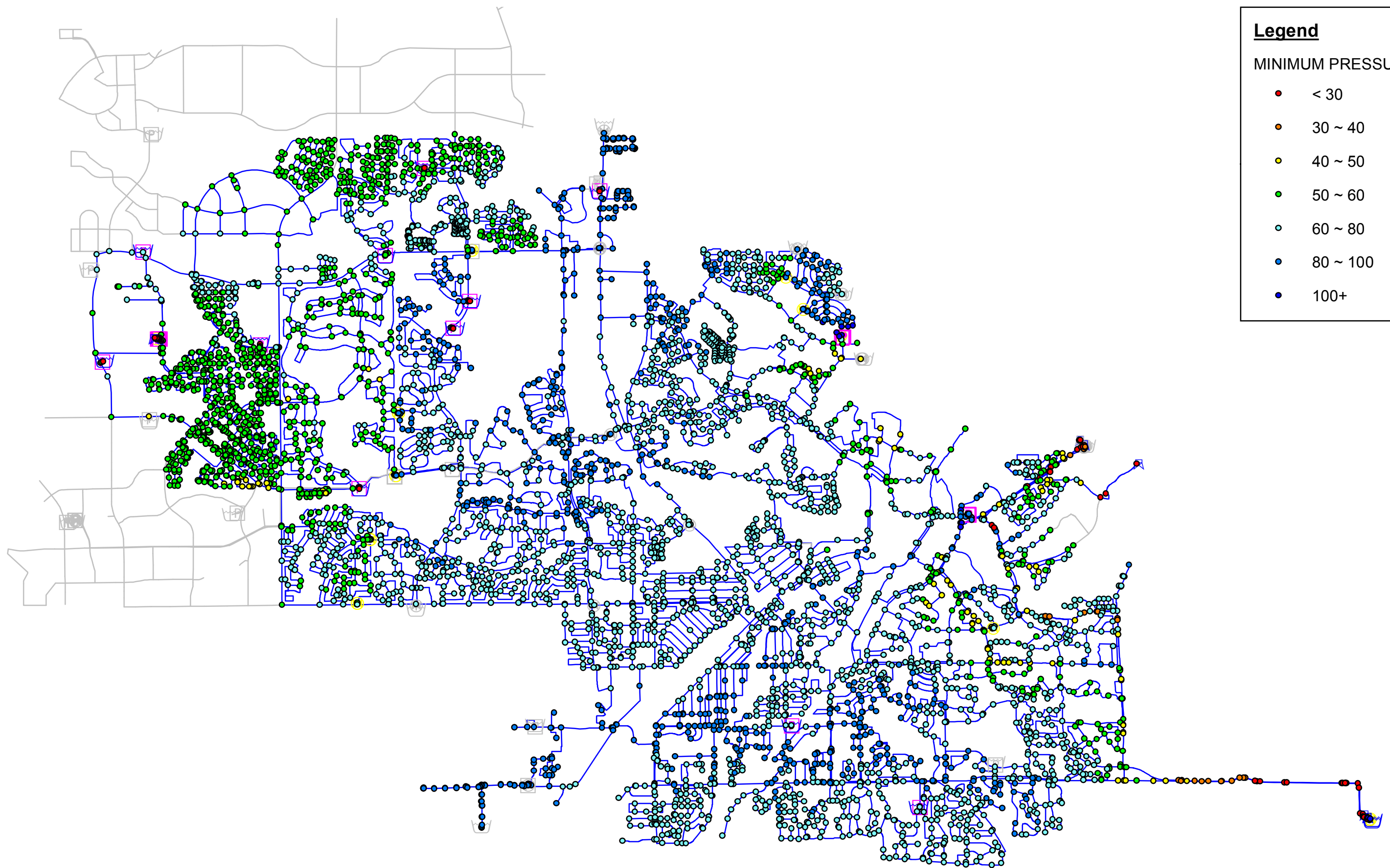
-  Intertie
-  Well
-  Tank
-  Water Treatment Plant
-  Pump Station
-  PRV
-  Pipeline



Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



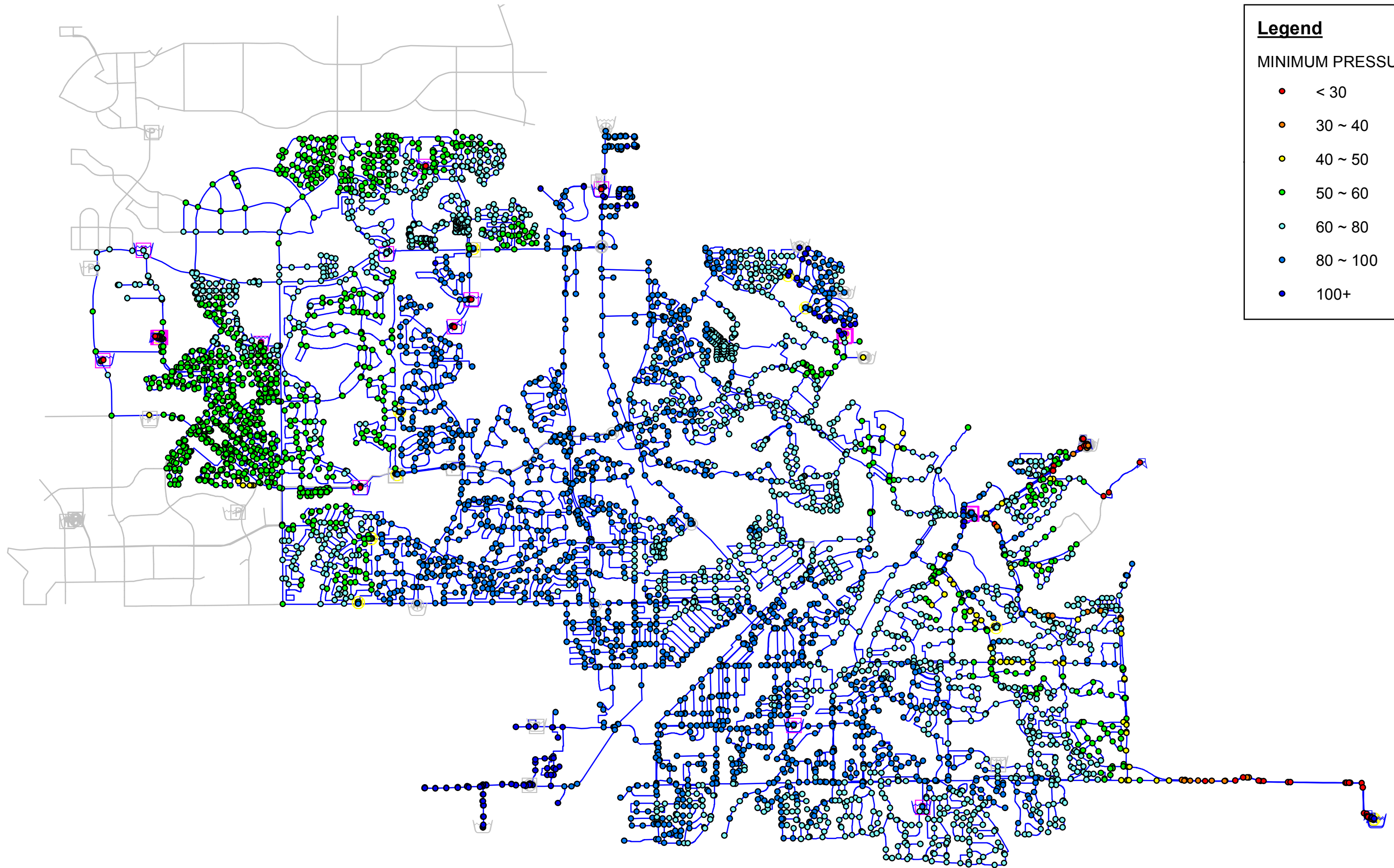
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**Legend**

MINIMUM PRESSURE (psi)

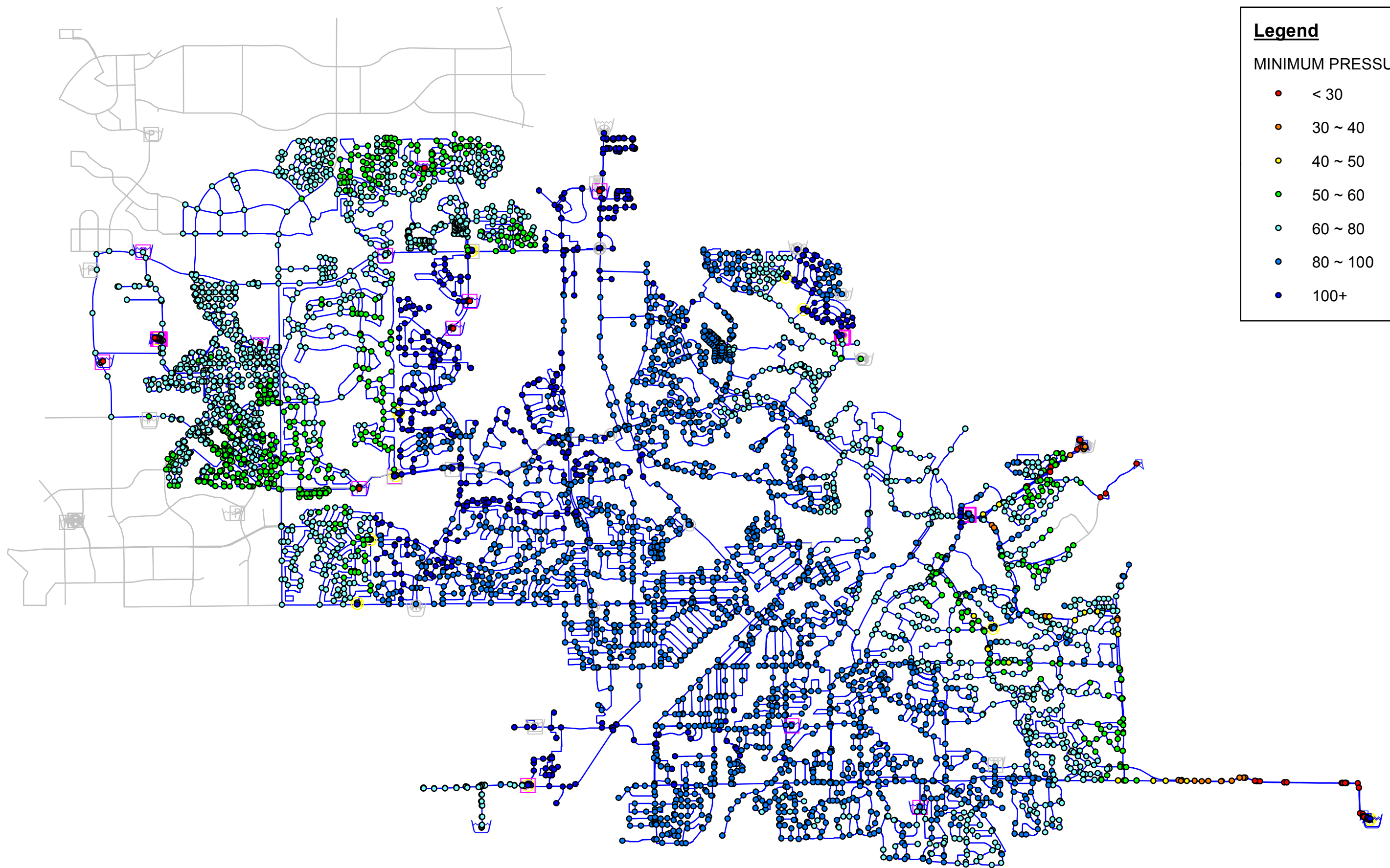
- < 30
- 30 ~ 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 100
- 100+



**Legend**

MINIMUM PRESSURE (psi)

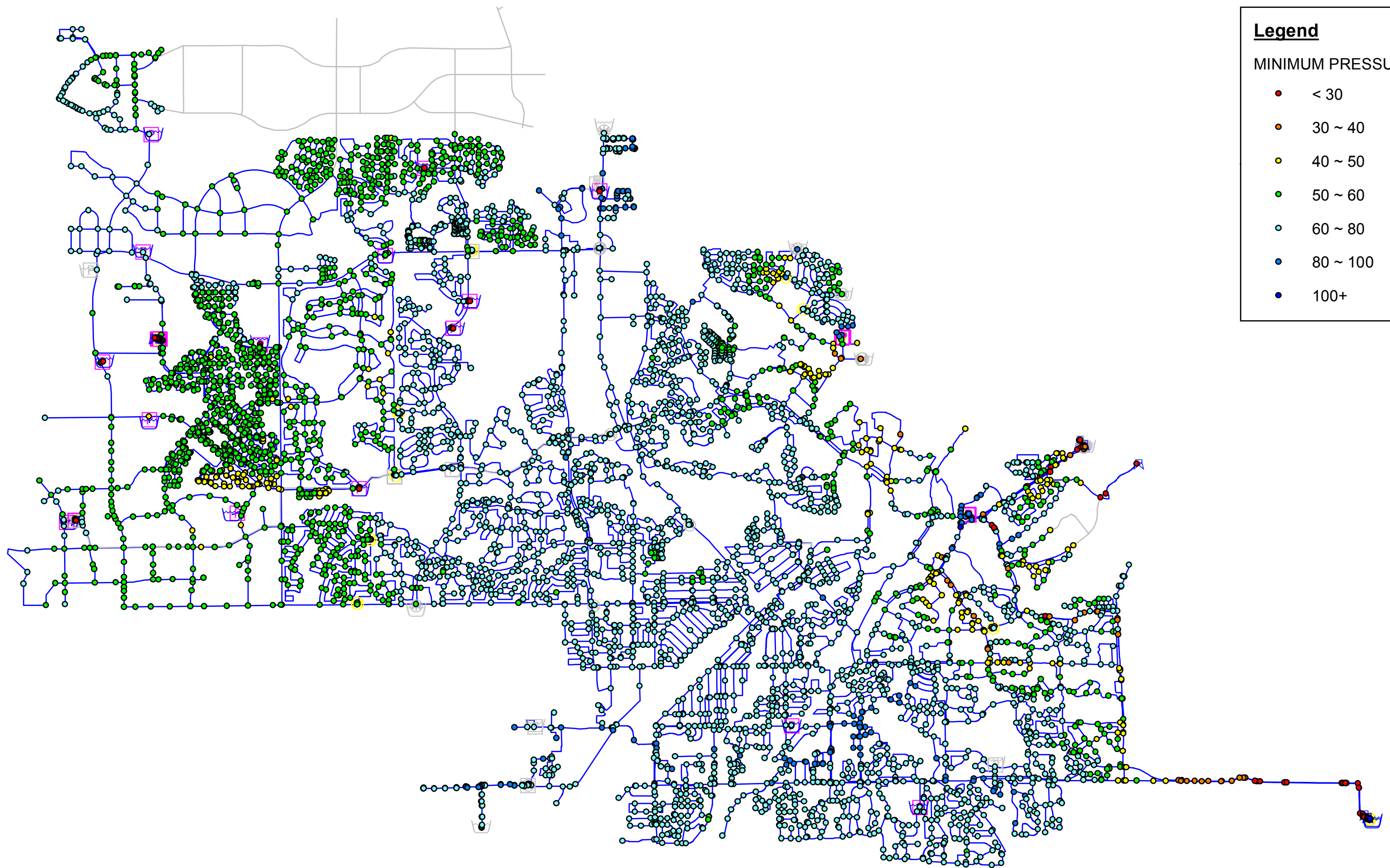
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- 30 ~ 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 100
- 100+



**Legend**

MINIMUM PRESSURE (psi)

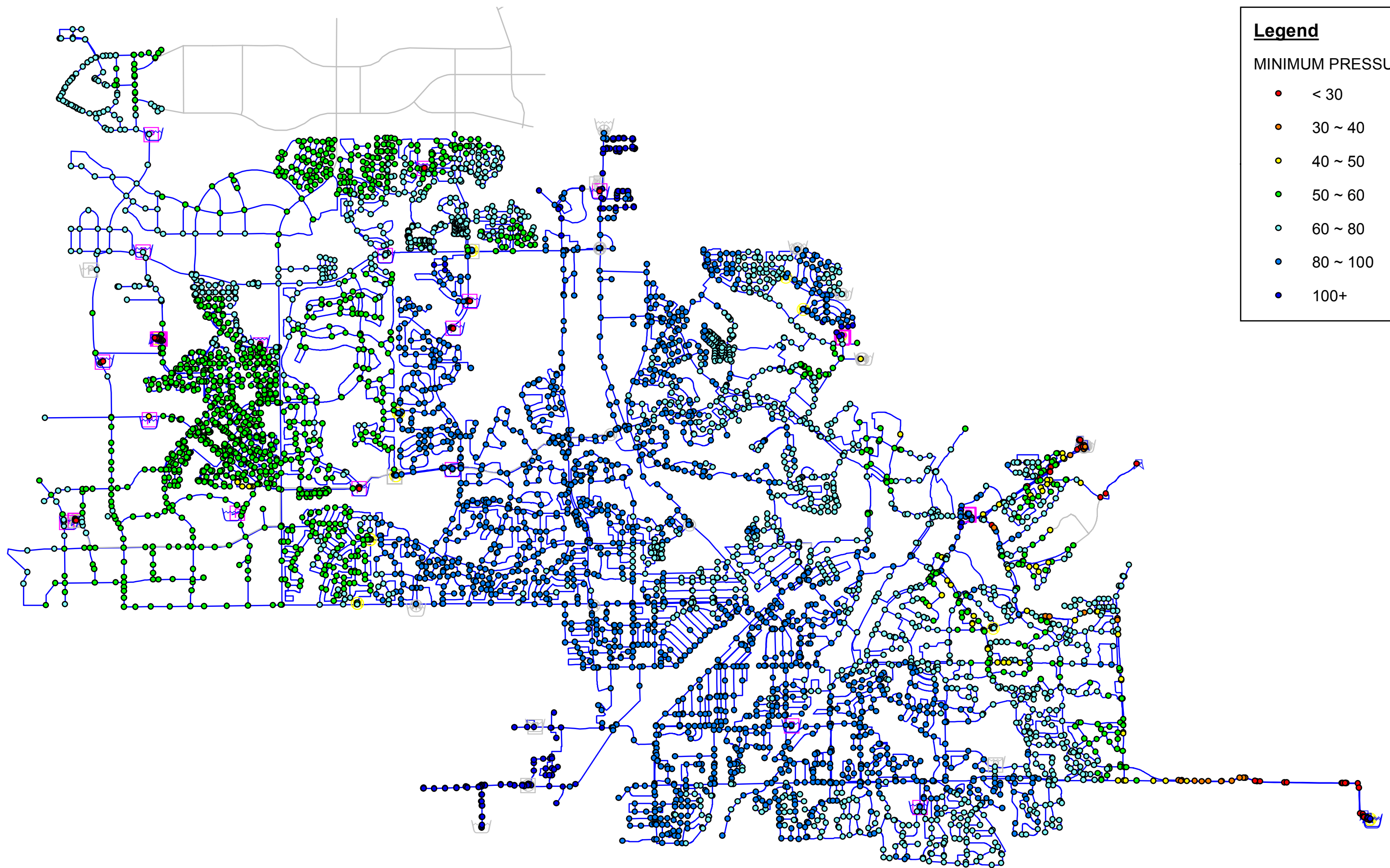
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- 50 ~ 60
- 60 ~ 80
- 80 ~ 100
- 100+



**Legend**

MINIMUM PRESSURE (psi)

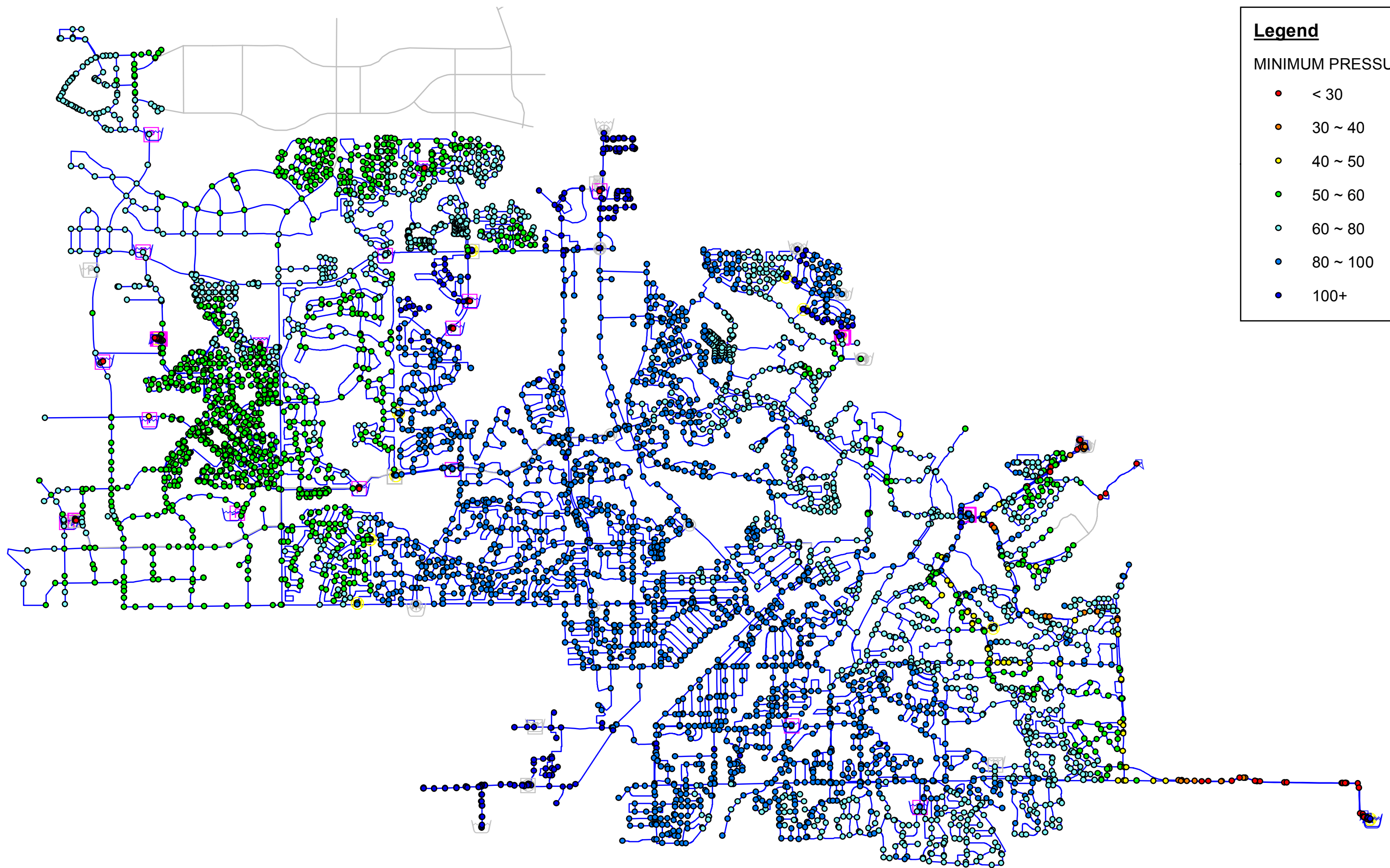
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- 30 ~ 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 100
- 100+



**Legend**

MINIMUM PRESSURE (psi)

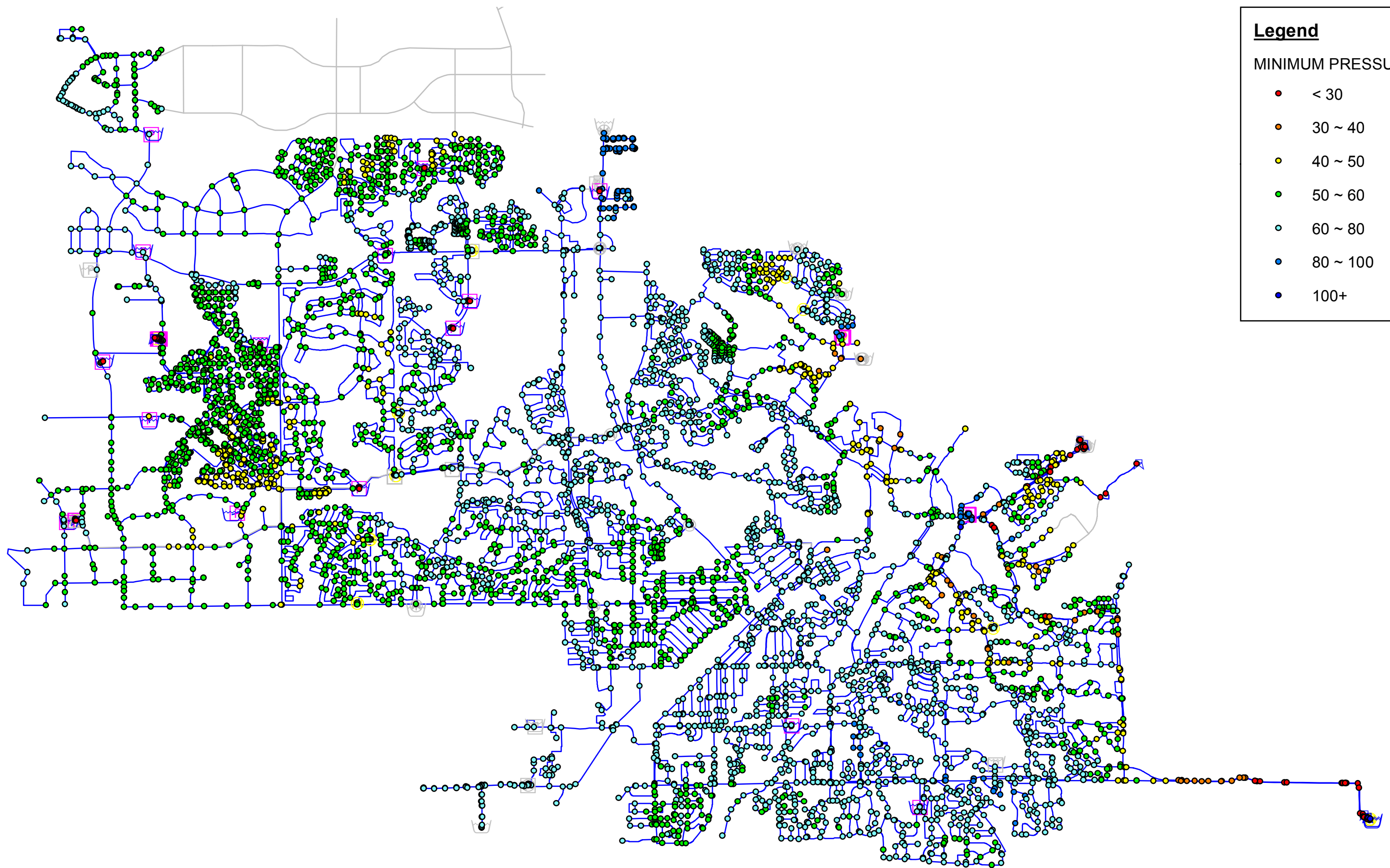
- < 30
- 30 ~ 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 100
- 100+



**Legend**

MINIMUM PRESSURE (psi)

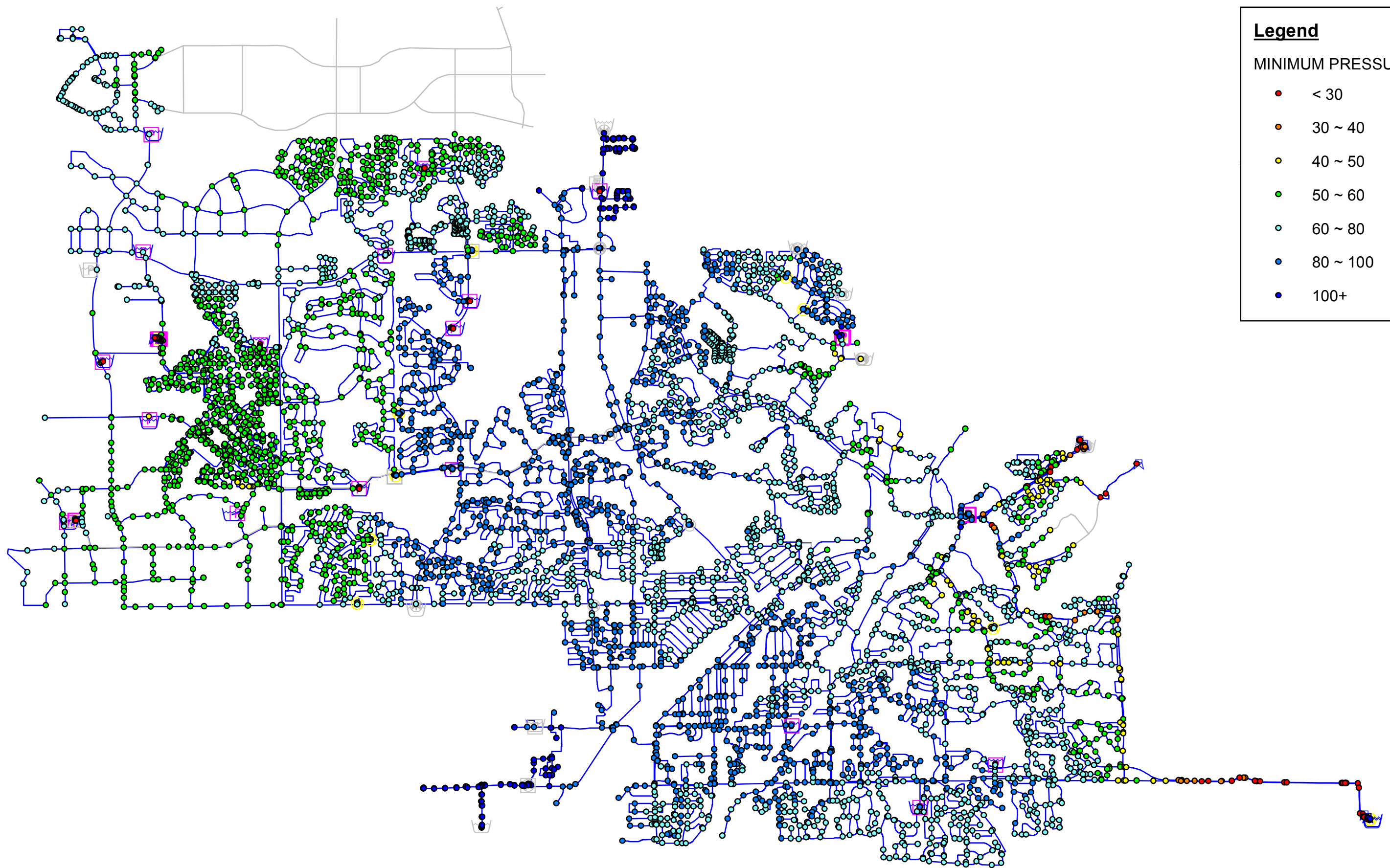
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- 30 ~ 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 100
- 100+



**Legend**

MINIMUM PRESSURE (psi)

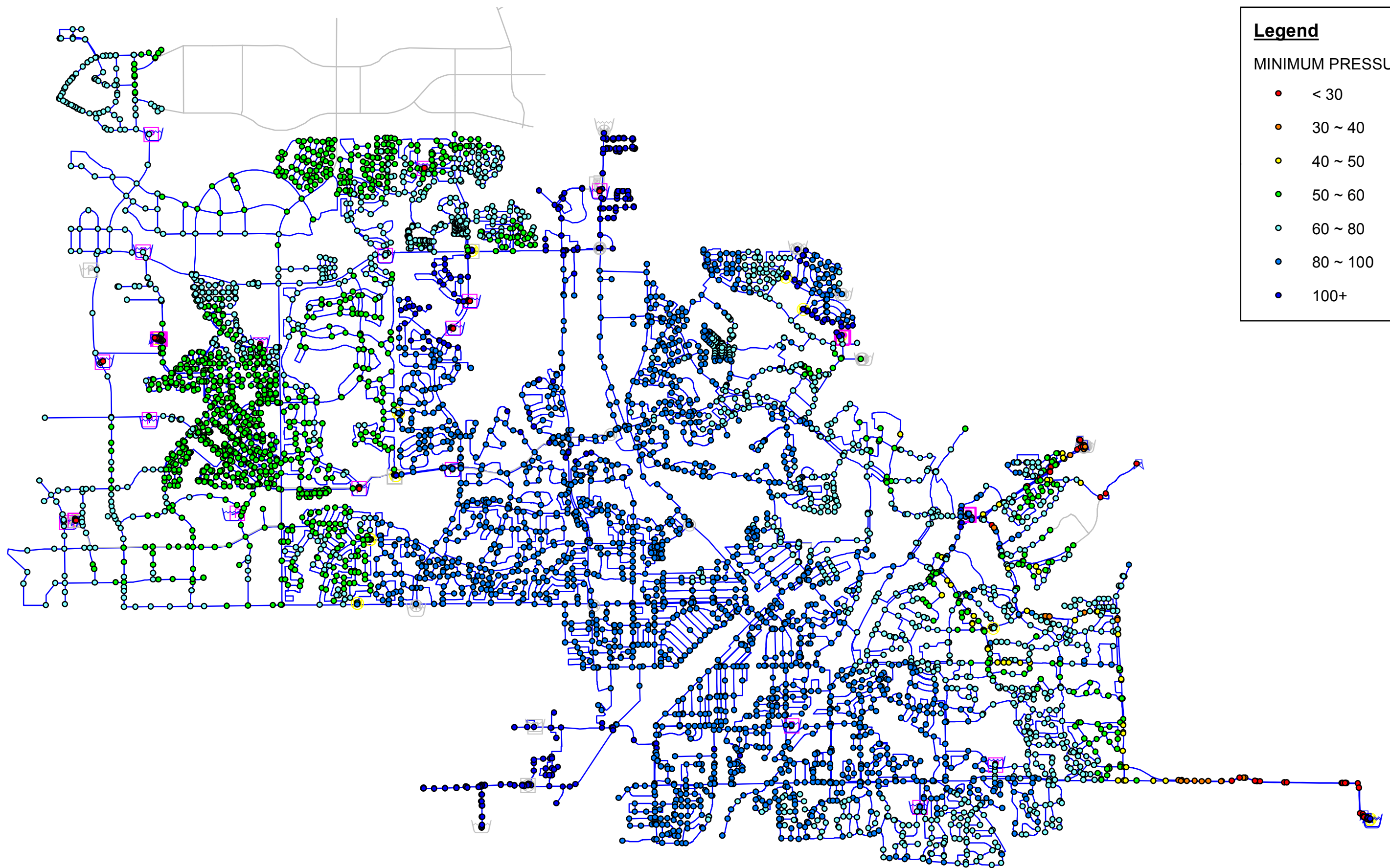
- < 30
- 30 ~ 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 100
- 100+



**Legend**

MINIMUM PRESSURE (psi)

- < 30
- 30 ~ 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 100
- 100+



**Legend**

MINIMUM PRESSURE (psi)

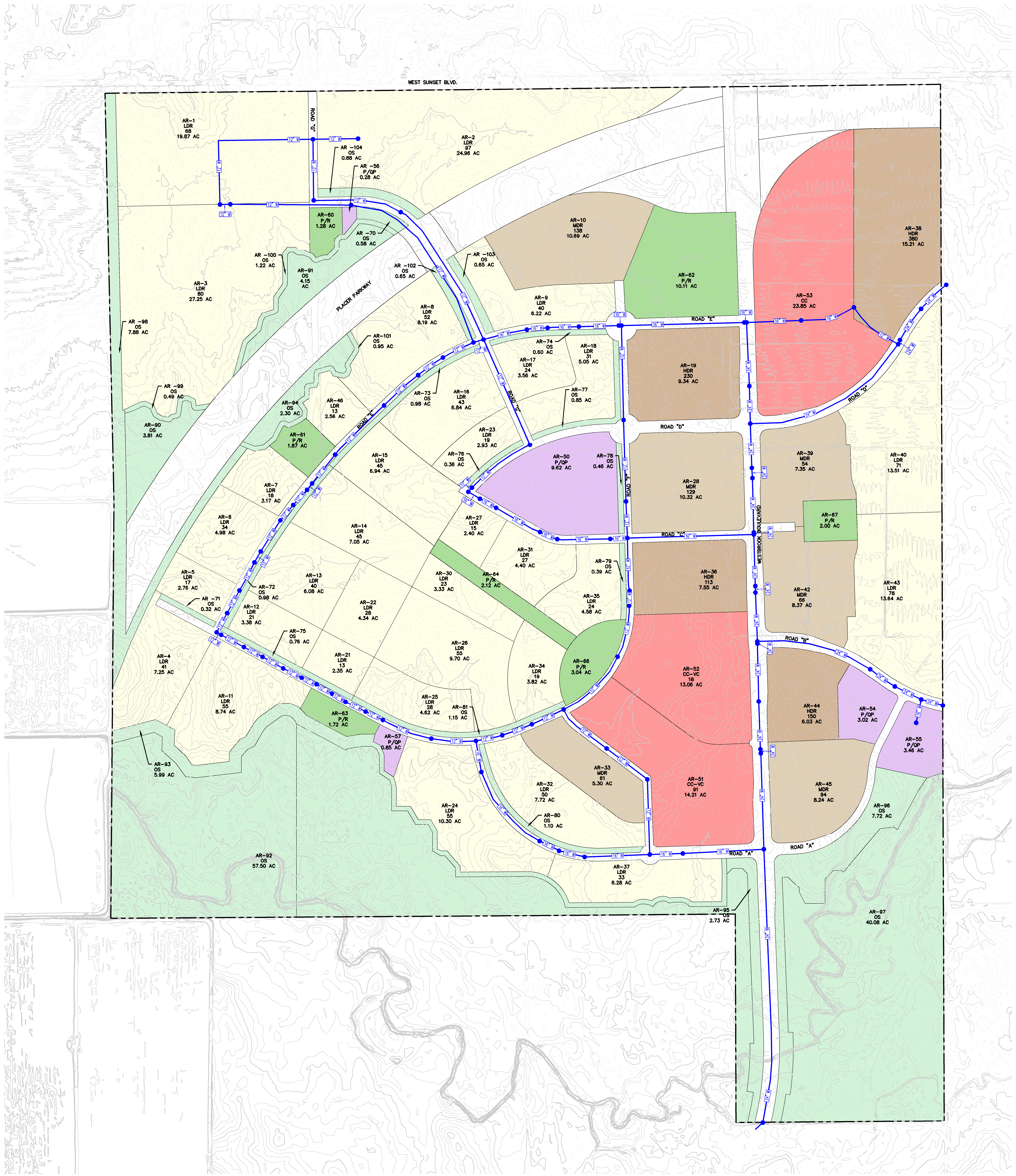
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- 30 ~ 40
- 40 ~ 50
- 50 ~ 60
- 60 ~ 80
- 80 ~ 100
- 100+

# **Amoruso Ranch Specific Plan Area**


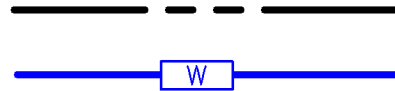

## ***Water Master Plan***

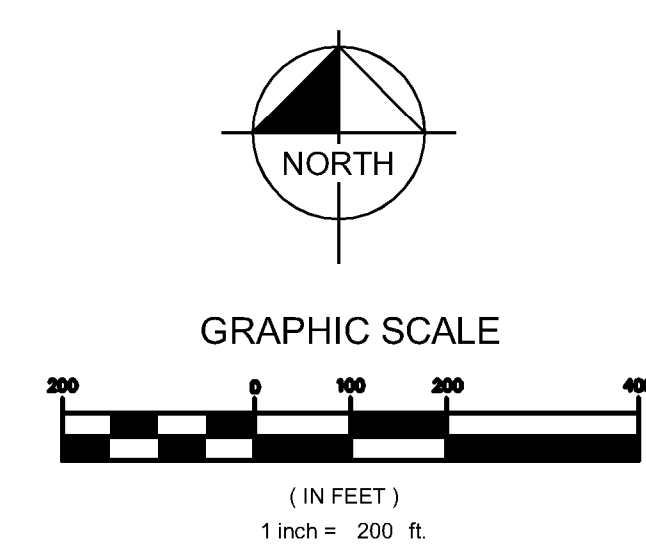
### **Appendix F**

#### ***Water Master Plan Exhibit***



**LEGEND:**

-  PROJECT BOUNDARY
-  WATER LINE
-  NODE



AMORUSO RANCH  
WATER MASTER PLAN EXHIBIT  
APPENDIX F  
JANUARY 2016





# Kimley»Horn

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