



**ROQUET RANCH PROJECT**  
**CITY OF COLTON**  
**WATER SUPPLY ASSESSMENT**  
**FINAL**  
June 2016

**Roquet Ranch Project**  
**City of Colton**  
**Water Supply Assessment**

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**ROQUET RANCH DEVELOPMENT**

**1.0 PROJECT DESCRIPTION**

This Water Supply Assessment (WSA) was prepared to assist Sunmeadows, LLC (Sunmeadows) satisfy the requirements of California Water Code Section 10910 (Senate Bill 610) for the Roquet Ranch Development Project (Project). The proposed development is located in the City of Colton (City), situated between the Santa Ana River and Interstate 215 in San Bernardino County, California. The planned development will span an estimated 1,450 acres, and will include 1,050 dwelling units (DU), as well as recreational and commercial space. The final development population is estimated to be approximately 4,410, with 50 percent build out by 2020 and 50 percent build out by 2040, respectively. The project is currently in the planning approval process. The data used in this WSA was provided by both Sunmeadows and the City. The criteria listed in the City's 2016 Water Master Plan (WMP) was also used as a basis for the hydraulic analysis for this assessment.

**2.0 PURPOSE**

The purpose of this WSA is to determine the impact of the development's water demands on the City's water supply and distribution system. The evaluation criteria developed as part of the City's ongoing WMP project have been utilized for this WSA.

This WSA includes the following:

- Information on the City's water supplies consistent with California Water Code (Water Code) Sections 10620 et. seq. (the Urban Water Management Planning Act) and 10910 et. seq. (Water Supply Planning to Support Existing and Planned Future Users).
- Information on current and projected water demands, based on the City's forthcoming WMP and data provided by Sunmeadows.
- Comparison of water supplies and water demands for normal, single dry, and multiple dry years.
- Pumping and storage capacity analysis.
- Hydraulic distribution system analysis utilizing the projected Roquet Ranch demands to identify major infrastructure needs or upgrades to accommodate the development.

### 3.0 WATER DEMANDS

#### 3.1 Domestic Water Demands

The water demands and future usage assumptions developed as part of the WMP were based on the calculated gallons per capita per day (GPCD) from the 2010 San Bernardino Regional Urban Water Management Plan (UWMP) and an assumed average population density of 4.2 people per DU. These same assumptions were utilized in this WMP to estimate the demands of the Roquet Ranch mixed-use development. A map of the Project is included in Figure 1 of this report.

Based on a total of 1,050 DU for the Project, the total estimated population is approximately 4,410 at full development, currently anticipated by 2030. For connections established after 2020, the estimated demand factor is 193 GPCD. With build out estimated to be at 50 percent in 2025, approximately 2,205 residents will consume at this level. After 2025, the demand factor is projected to remain constant. Additional build out will increase the population by approximately 2,205 people by the year 2030.

The final average day demand (ADD) for the project is estimated as:

$$ADD_{2025} = 193 \text{ GPCD} \times 2,205 \text{ people} \times \frac{1}{10^6} = 0.43 \text{ million gallons per day (MGD)}$$

$$ADD_{2035} = 193 \text{ GPCD} \times 2,205 \text{ people} \times \frac{1}{10^6} = 0.43 \text{ MGD}$$

$$ADD_{Final} = 0.43 \text{ MGD} + 0.43 \text{ MGD} = \mathbf{0.9 \text{ MGD}}$$

Based on a maximum day peaking factor of 1.5, the future maximum day demand (MDD) from the Project is estimated as:

$$MDD = 0.9 \text{ MGD} \times 1.5 = \mathbf{1.3 \text{ MG}}$$

These demands were included as part of the analysis within the WMP, and were included as Central Zone demands. Throughout the analysis in this document, the Project demands will be separately identified. The Citywide demands are as follows, based on the WMP analysis:

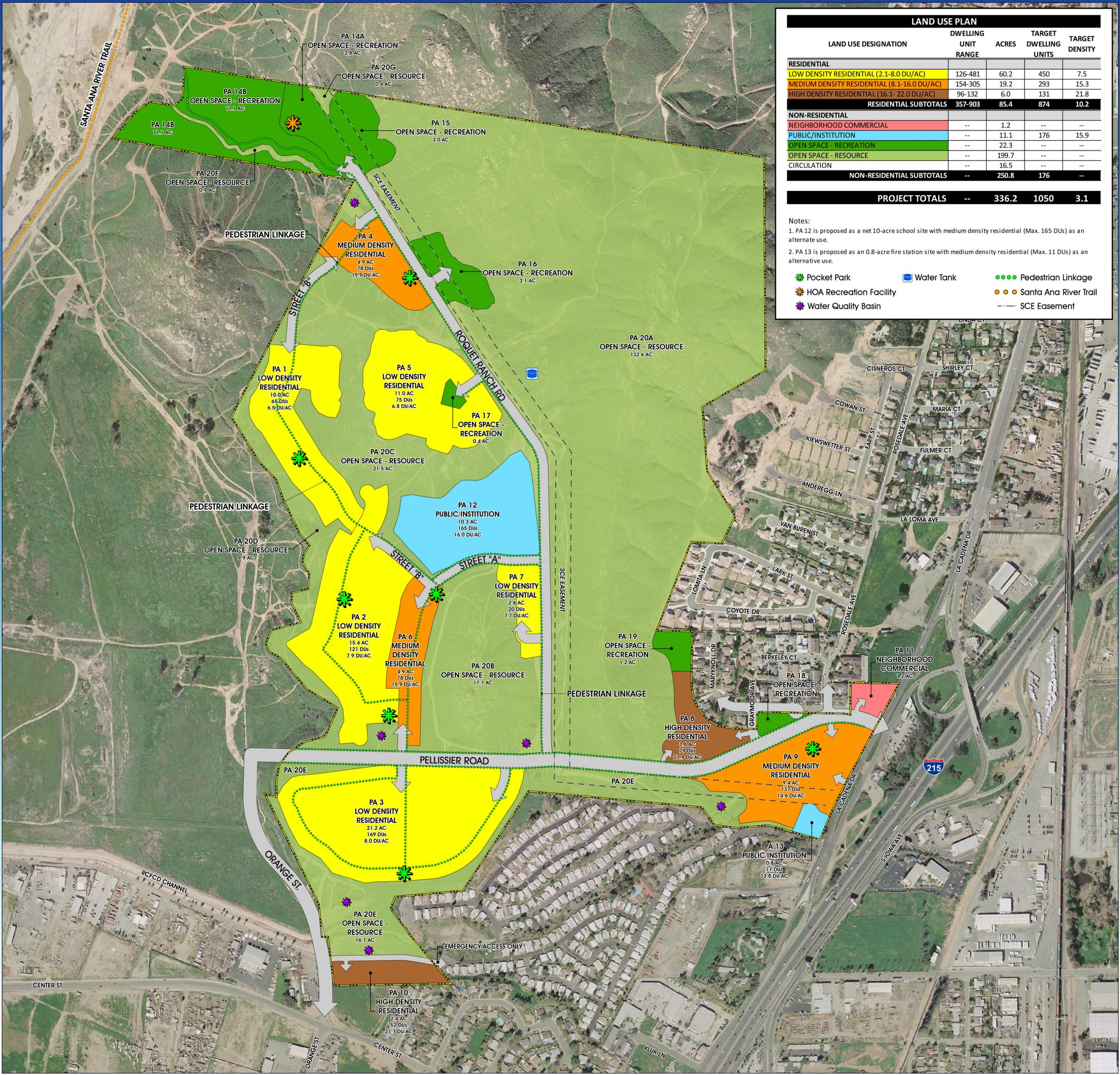
$$Citywide \text{ ADD}_{2030} = 193 \text{ GPCD} \times 61,791 \text{ people} = \mathbf{11.9 \text{ MGD}}$$

$$Citywide \text{ MDD}_{2030} = 11.9 \text{ MGD} \times 1.5 = \mathbf{17.9 \text{ MGD}}$$

The Citywide demands without the incremental demands of the Project are as follows:

$$Citywide \text{ ADD with Project}_{2030} = 11.9 \text{ MGD} - 0.9 \text{ MGD} = \mathbf{11.1 \text{ MGD}}$$

$$Citywide \text{ MDD with Project}_{2030} = 17.9 \text{ MGD} - 1.3 \text{ MGD} = \mathbf{16.6 \text{ MGD}}$$



LAND USE PLAN				
LAND USE DESIGNATION	DWELLING	ACRES	TARGET	TARGET
	UNIT RANGE		DWELLING UNITS	DENSITY
<b>RESIDENTIAL</b>				
LOW DENSITY RESIDENTIAL (2.1-8.0 DU/AC)	126-481	60.2	450	7.5
MEDIUM DENSITY RESIDENTIAL (8.1-16.0 DU/AC)	154-305	19.2	293	15.3
HIGH DENSITY RESIDENTIAL (16.1- 22.0 DU/AC)	96-132	6.0	131	21.8
<b>RESIDENTIAL SUBTOTALS</b>	<b>357-903</b>	<b>85.4</b>	<b>874</b>	<b>10.2</b>
<b>NON-RESIDENTIAL</b>				
NEIGHBORHOOD COMMERCIAL	--	1.2	--	--
PUBLIC/INSTITUTION	--	11.1	176	15.9
OPEN SPACE - RECREATION	--	22.3	--	--
OPEN SPACE - RESOURCE	--	199.7	--	--
CIRCULATION	--	16.5	--	--
<b>NON-RESIDENTIAL SUBTOTALS</b>	<b>--</b>	<b>250.8</b>	<b>176</b>	<b>--</b>
<b>PROJECT TOTALS</b>	<b>--</b>	<b>336.2</b>	<b>1050</b>	<b>3.1</b>

- Notes:
- PA 12 is proposed as a net 10-acre school site with medium density residential (Max. 165 DUs) as an alternate use.
  - PA 13 is proposed as an 0.8-acre fire station site with medium density residential (Max. 11 DUs) as an alternative use.
- Pocket Park
  - Water Tank
  - Pedestrian Linkage
  - HOA Recreation Facility
  - Water Quality Basin
  - Santa Ana River Trail
  - SCE Easement

# ROQUET RANCH SPECIFIC PLAN

# LAND USE PLAN

## 4.0 WATER SUPPLY ANALYSIS

The City acquires 100 percent of its potable water supply from groundwater in three different basins. These three basins are adjudicated as follows:

- **San Bernardino Basin** is adjudicated as part of the San Bernardino Basin Area (SBBA), which covers surface water and groundwater extractions. It has been adjudicated as part of the Western Judgment of 1969. The City currently takes no surface water from SBBA, and its groundwater pumping is located within the Bunker Hill Sub-basin. As a member of the Non-Plaintiffs' group of the Western Judgment (covering agencies within San Bernardino County), the City shares 167,238 acre-feet per year (AFY) with neighboring agencies, which is approximately 72.1 percent of the estimated operating safe yield (OSY) for SBBA. When extractions exceed OSY, agencies must collectively purchase imported water for system replenishment. When extraction falls below OSY, that difference is credited to the member agencies. Based on this adjudication, the City is not strictly limited in its withdrawals. However, collective withdrawals must fall below OSY, or additional costs will be incurred.
- **Rialto-Colton Basin** extractions are governed by the Rialto Basin Decree and the Western Judgment outlined above in the SBBA discussion. While there is no defined OSY in AF terms for the Rialto-Colton Basin as part of the Western Judgment or any other agreement, three index wells within the basin must remain above a threshold level from March to May each year. Similar to the SBBA adjudication, San Bernardino County agencies can take unlimited groundwater supplies, as long as the groundwater surface level does not fall below the threshold index. If this occurs, agencies must purchase imported water for replenishment purposes.
- **Riverside North Basin** is adjudicated in the same fashion as the Rialto-Colton Basin, and is also governed under the Western Judgment. Three index wells are used to monitor groundwater surface depth, and extractions for San Bernardino County agencies are unlimited up to this threshold. If it is exceeded, additional replenishment water must be purchased.

Given the adjudications associated with each of the three groundwater basins that the City relies upon, there is no anticipated supply shortage at this time. If the City, along with the other users of the three basins, exceeds the safe yield for groundwater pumping, additional imported water can be purchased for replenishment purposes allowing the City to continue to meet its supply needs solely through groundwater. The actual and projected groundwater supplies are outlined in Table 1. The 2010 and 2014 groundwater volumes are based on actual production values provided by the City, while the projected supplies for 2020 and

beyond were developed as part of the Upper Santa Ana River Watershed Integrated Regional Water Management Plan.<sup>1</sup>

<b>Table 1 Groundwater Supply Availability and Projections Water Supply Assessment Roquet Ranch Development</b>						
<b>Groundwater Basin</b>	<b>2010</b>	<b>2014</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>2035</b>
Bunker Hill	4,741	7,455	6,783	6,994	7,408	7,991
Rialto-Colton	3,920	1,607	4,375	4,511	4,778	5,154
Riverside North	1,375	1,099	1,450	1,495	1,584	1,708
<b>Total (AFY)</b>	<b>10,036</b>	<b>10,161</b>	<b>12,608</b>	<b>13,000</b>	<b>13,770</b>	<b>14,853</b>
<b>Average Production (MGD)</b>	<b>9.0</b>	<b>9.1</b>	<b>11.3</b>	<b>11.6</b>	<b>12.3</b>	<b>13.3</b>
<b>Notes:</b>						
(1) 2005 through 2014 are based on actual water supply volumes provide by the City. Years 2020 through 2035 have been obtained from the 2015 Upper Santa Ana River Watershed Integrated Regional Water Management Plan.						

A supply assessment was conducted using the City’s recent supply production data, and consumption data from 2007 to 2013 as outlined in the WMP. The demands were projected forward in the WMP under a 2040 population assumption of 68,601 and a targeted demand rate of 193 GPCD. This results in a 2040 demand estimate of 14,881 AFY.

As shown in Table 2, the City’s 2030 projected normal year demand is approximately 12,401 afy, after deducting the incremental demands from the Project (0.9 MGD, or 953 AFY).

Single dry year and multiple dry year scenarios were also reviewed for the supply analysis. Based on the criteria set forth in the 2010 UWMP, the demands in a single dry year and multiple dry years are 10 percent higher than demands in a normal year.

<sup>1</sup> Upper Santa Ana River Water Resources Association. *Upper Santa Ana River Watershed Integrated Regional Water Management Plan*. January 2015. Accessed April 10, 2016 at <http://www.sbvwd.dst.ca.us/docman-projects/upper-santa-ana-integrated-regional-water-management-plan/3802-usarw-irwmp-2015-ch1-9-final/file.html>.

<b>Table 2      2030 Supply Analysis Water Supply Assessment Roquet Ranch Development</b>			
	<b>Normal Year (AFY)</b>	<b>Dry Year (AFY)</b>	<b>Multiple Dry Years (AFY)</b>
Supply Total <sup>(1)</sup>	14,881	14,881	14,881
Demand Total, prior to Project Demands <sup>(2)</sup>	12,401	13,641	13,641
<b>Supply Balance, Pre-Project</b>	<b>953</b>	<b>(287)</b>	<b>(287)</b>
Incremental Roquet Ranch Project Demands	953	1,049	1,049
<b>Supply Balance, Post-Project</b>	<b>-</b>	<b>(1,335)</b>	<b>(1,335)</b>
<u>Notes:</u> (1) From 2016 Water Master Plan, Chapter 4. (2) 2013 average annual demand, allocated from billing data. (3) Totals may vary slightly due to rounding.			

Based on the future demand and system supply projection, the City’s projected supply will continue to meet demands for the City following full build-out of the Project in 2030, but will not be able to fully satisfy demands in the single and multiple dry year scenarios, generating supply deficits of 1,335 AFY.

The water supply deficiencies would be addressed through additional groundwater pumping. Should the groundwater basins be pumped beyond their OSY in any year, the City, along with the other users of the three groundwater basins, will need to purchase imported replenishment water.

## **5.0 HYDRAULIC ANALYSIS**

### **5.1 Storage Analysis**

#### **5.1.1 Storage Volume Requirements**

The WMP outlines the storage volume requirement for the City and any anticipated impacts from the Project. There are three storage criteria components:

- **Operational Storage** is defined as the quantity of water required to meet any shortfall between peak demand, and instantaneous water production. Since peak demand can outstrip the pace of water production, storage is needed to ensure a seamless, continuous delivery of water. For the purposes of this analysis, Operational Storage shall be at least 25 percent of MDD, as defined within the WMP.

- **Emergency Storage** is put in place to cover a range of rare, but possible events, such as water contamination, failure at water treatment plants, power outages, transmission pipeline ruptures, widespread fire, or seismic events. The Emergency Storage standard for this analysis is at least 100 percent of MDD, as defined in the WMP.
- **Fire Flow Storage**, determined based on the single greatest fire flow requirement (flow and duration) within each pressure zone group. The needed storage is equal to this required fire flow over the corresponding duration required. The needed flow and timing corresponds with the highest demand land use type. In the case of the Project, this is commercial land use.

For this project, the storage volume requirements from the Project are estimated as follows:

$$\text{Operational Storage} = 25\% \times 1.3 \text{ MG} = 0.3 \text{ MG}$$

$$\text{Emergency Storage} = 100\% \times 1.3 \text{ MG} = 1.3 \text{ MG}$$

$$\text{Fire Flow Storage} = 4,000 \text{ gpm} \times 4 \text{ hours} \times 60 \frac{\text{min}}{\text{hr}} \times \frac{1}{1,000,000} = 1.0 \text{ MG}$$

$$\text{Total Storage Volume Required} = 0.3 \text{ MG} + 1.3 \text{ MG} + 1.0 \text{ MG} = \mathbf{2.6 \text{ MG}}$$

In order to satisfy the storage volume analysis, the Central Zone, where the Project resides, must have sufficient available storage capacity to meet all existing and projected future needs, including incremental storage demands from the Project.

### 5.1.2 Storage Volume Analysis

As calculated in Section 5.1.1 above, the Project has anticipated operational and emergency storage needs of 0.3 million gallons (MG) and 1.3 MG, respectively. The Project has a fire flow storage requirement of 1.0 MG of fire flow storage. Although the fire flow storage requirement within the Central Zone is 1.0 MG, as outlined in the WMP, an additional 1.0 MG was included in the storage analysis for conservative planning purposes. Since the fire flow storage is typically evaluated based on the greatest single need within the pumping zone, the additional 1.0 MG of fire flow storage within the Central pressure zone may not be required.

Based on the storage analysis in the WMP, the Central Zone currently has a storage deficit of 7.6 MG. Therefore, the Project will contribute approximately 2.6 MG to this deficit, and additional storage will be needed to meet both baseline storage needs and incremental needs from the Project. The results of this analysis and needed improvements are outlined in Table 3 and Table 4.

<b>Table 3 Required Storage for Central Zone through the Year 2030 Water Supply Assessment Roquet Ranch Development</b>			
<b>Storage Criteria</b>	<b>Roquet Ranch (MG)</b>	<b>Central Zone (MG)<sup>(1)</sup></b>	<b>Total (MG)</b>
Operational (25% of MDD)	0.3	2.4	2.7
Emergency (100% of MDD)	1.3	9.6	10.8
Fire Flow <sup>(2)</sup>	1.0	1.0	1.9
<b>Total Storage Required <sup>(3)</sup></b>	<b>2.6</b>	<b>12.9</b>	<b>15.5</b>
<u>Notes:</u>			
(1) Does not include incremental demands from Roquet Ranch.			
(2) Fire flow storage requirement is based on the greatest fire flow need for the pumping zone. Since fire flow needs within the Project do not exceed the Central Zone requirements, the Central Zone fire flow need will apply for the Project.			
(3) Totals may vary slightly due to rounding.			

<b>Table 4 Storage Balance for Central Zone through the Year 2030 Water Supply Assessment Roquet Ranch Development</b>			
	<b>Storage Required (MG)</b>	<b>Storage Availability (MG)</b>	<b>Storage Balance (MG)</b>
Central Zone Baseline <sup>(1)</sup>	12.9	3.0	-9.9
Roquet Ranch Project	2.6	0.0	-12.5
<b>Subtotal</b>	<b>15.5</b>	<b>3.0</b>	<b>-12.5</b>
Existing Improvements	0.0	7.5	-5.0
Future Improvements	0.0	5.5	0.5
<b>Subtotal Improvements</b>	<b>-</b>	<b>13.0</b>	<b>+0.5</b>
<b>Total</b>	<b>15.5</b>	<b>16.0</b>	<b>+0.5</b>
<u>Notes:</u>			
(1) Does not include incremental demands from Roquet Ranch.			

To mitigate existing and future storage deficiencies, 13.0 MG of storage capacity improvements have been recommended in the WMP. These improvements are outlined in Section 6.0, along with the Project's allocated share of improvements. These outlined improvements will result in 0.5 MG of surplus storage by 2030. However, the current Project design includes a 1.8 MG reservoir, which would provide a percentage of the storage needed to satisfy the requirements of the new development. If the 1.8 MG reservoir was constructed within the Project area, the allocation for future storage improvements identified in the WMP would need to be updated.

## 5.2 Pumping Capacity Analysis

### 5.2.1 Pumping Capacity Requirements

The pumping capacity analysis evaluates whether the existing pump stations meet MDD under firm pumping capacity conditions. The evaluation criteria defines firm capacity as a period with the largest pump of each pump station out of service, and the largest well of each pressure zone out of service. In addition, the evaluation criteria require that the demands of any upstream zones served by the pump stations are included in the analysis.

### 5.2.2 Pumping Capacity Analysis

Currently, the City has twelve operating wells with capacities ranging from 500 to 3,000 gpm, and one standby well. These wells are outlined in Table 5. Seven wells reside in the Bunker Hill Basin, four in the Rialto-Colton Basin, and two in the Riverside North Basin. The City currently has pumping capacity for 16,875 gallons per minute (gpm), which equates to 24.3 MGD. Given that the City is projected to have a max day demand of 17.9 MGD in 2030, additional pumping capacity is not needed to meet projected demands.

<b>Table 5 Groundwater Wells and Capacities Water Supply Assessment Roquet Ranch Development</b>			
<b>Well</b>	<b>Groundwater Basin</b>	<b>Pressure Zone</b>	<b>Capacity (gpm)</b>
13	Bunker Hill	Central/West	1,200
16	Bunker Hill	Central/West	975
19	Bunker Hill	Central/West	1,600
21	Bunker Hill	Central/West	1,300
26	Bunker Hill	Central/West	800
27	Bunker Hill	Central/West	1,300
28	Bunker Hill	Central/West	900
15	Rialto-Colton	Western	600
17	Rialto-Colton	Western	1,200
22	Rialto-Colton	Central	500
23	Rialto-Colton	Central	1,300
24	Riverside North	Western	2,200
30	Riverside North	Central	3,000
<b>Total Capacity (gpm)</b>			<b>16,875</b>
<b>Total Capacity (MGD)</b>			<b>24.3</b>

However, the WSA criteria requires that the City has sufficient capacity to meet maximum day demands (MDD), assuming that the largest pump at each pump station and the largest

well within each pressure zone are offline. As outlined in Table 6, the City's Central Zone pumping capacity is deficient under this criteria by approximately 1,376 and 490 gallons per minute (gpm), with and without the demands from the Project, respectively.

The WMP recommends 4,200 gpm for future pump station improvements. These improvements are outlined in Section 6.0, along with Roquet Ranch's allocated share of improvements. This analysis does not include pump station improvements related to pressure deficiencies within the distribution system, which is discussed in Section 5.3.

<b>Table 6 Pump Station Analysis for Central Zone through the Year 2030 Water Supply Assessment Roquet Ranch Development</b>			
	<b>Pump Station Needs (gpm)</b>	<b>Firm Pump Station Capacity (gpm)</b>	<b>Pump Station Balance (gpm)</b>
Central Zone Baseline	8,136 <sup>(1)</sup>	7,797	-490
Roquet Ranch Project	887	0	-887
<b>Subtotal</b>	<b>9,173</b>	<b>7,797</b>	<b>-1,376</b>
Existing Improvements	-	-	-1,376
Future Improvements	-	4,200	+4,200
<b>Subtotal Improvements</b>	<b>-</b>	<b>4,200</b>	<b>+2,824</b>
<b>Total</b>	<b>9,173</b>	<b>11,997</b>	<b>+2,824</b>
<u>Notes:</u>			
(1) Includes 1,651 gpm for upstream pumping to Reche 2 Zone, and excludes incremental pumping needs from the Project. Pump station needs are based on MDD.			

### 5.3 Pipeline Hydraulic Analysis

The hydraulic modeling analysis was performed as part of the WSA to verify the size of the development's transmission pipelines. The hydraulic analyses conducted in this section includes a pressure, velocity, and fire flow analysis. The pressure, velocity, and fire flow requirements, as established in the City's WMP, are listed in Table 7. This section of the report includes the description of the updates to the hydraulic model, and the results of the pressure, velocity, and fire flow analysis. Each analysis in this section includes conclusions and recommendations for the developer.

Table 7 <b>Hydraulic Evaluation Criteria</b> <b>Water Supply Assessment</b> Roquet Ranch Development		
<b>Description</b>	<b>Value</b>	<b>Units</b>
<b>Maximum Pressure</b>		
Without Service Lateral Pressure Regulator	80	psi
With Service Lateral Pressure Regulator	120	psi
<b>Minimum Pressure</b>		
Peak Hour Demand (PHD)	40	psi
Maximum Day Demand (MDD) + Fire Flow	20	psi
<b>Pipeline Criteria</b>		
Maximum Velocity with PHD	7	fps
Maximum Velocity with MDD + Fire Flow	10	fps
Maximum Design Velocity for New Pipelines	5	fps
Hazen-Williams C-factor (new)	110	n/a
Minimum Size for Pipeline Replacement	8	inches
<b>Fire Fighting Capabilities</b>		
Low Density Residential	1,500	gpm for 2 hours
Medium Density Residential	2,500	gpm for 2 hours
High Density Residential	3,000	gpm for 2 hours
Commercial	3,000	gpm for 4 hours
Industrial	3,000	gpm for 4 hours
Heavy Industrial	4,000	gpm for 4 hours
Public/Institution	4,000	gpm for 4 hours
Reche Canyon Specific Plan	2,500	gpm for 2 hours
West Valley Specific Plan	2,500	gpm for 2 hours

### 5.3.1 Hydraulic Model Update

The 2016 Colton Hydraulic Model that was used in the development of the WMP was updated to include a more refined layout of the Roquet Ranch development based on the conceptual land use plan. The hydraulic model included the total demand and population for the Project, along with the 2040 City data. The following updates were made to the future hydraulic model scenario:

- Additional nodes, and pipes were added.

- The development demand was applied to the model nodes.
- The fire flow requirements were assigned to the model nodes.

The 2016 Colton Hydraulic Model represented the Roquet Ranch Development as a single demand node. This was appropriate for a high level planning approach used in the WMP. However, additional details were added utilizing the land use type, pipeline layout, and pipeline sizing that was listed in the conceptual land use plan provided by Sunmeadows, LLC, which is shown on Figure 1. The tentative tract map was used to assign elevations to the nodes connecting the pipeline segments. Proposed pipelines were assumed to have a roughness coefficient of 130. Additional details on the onsite and offsite water plans provided by Sunmeadows are presented in Appendix A and Appendix B.

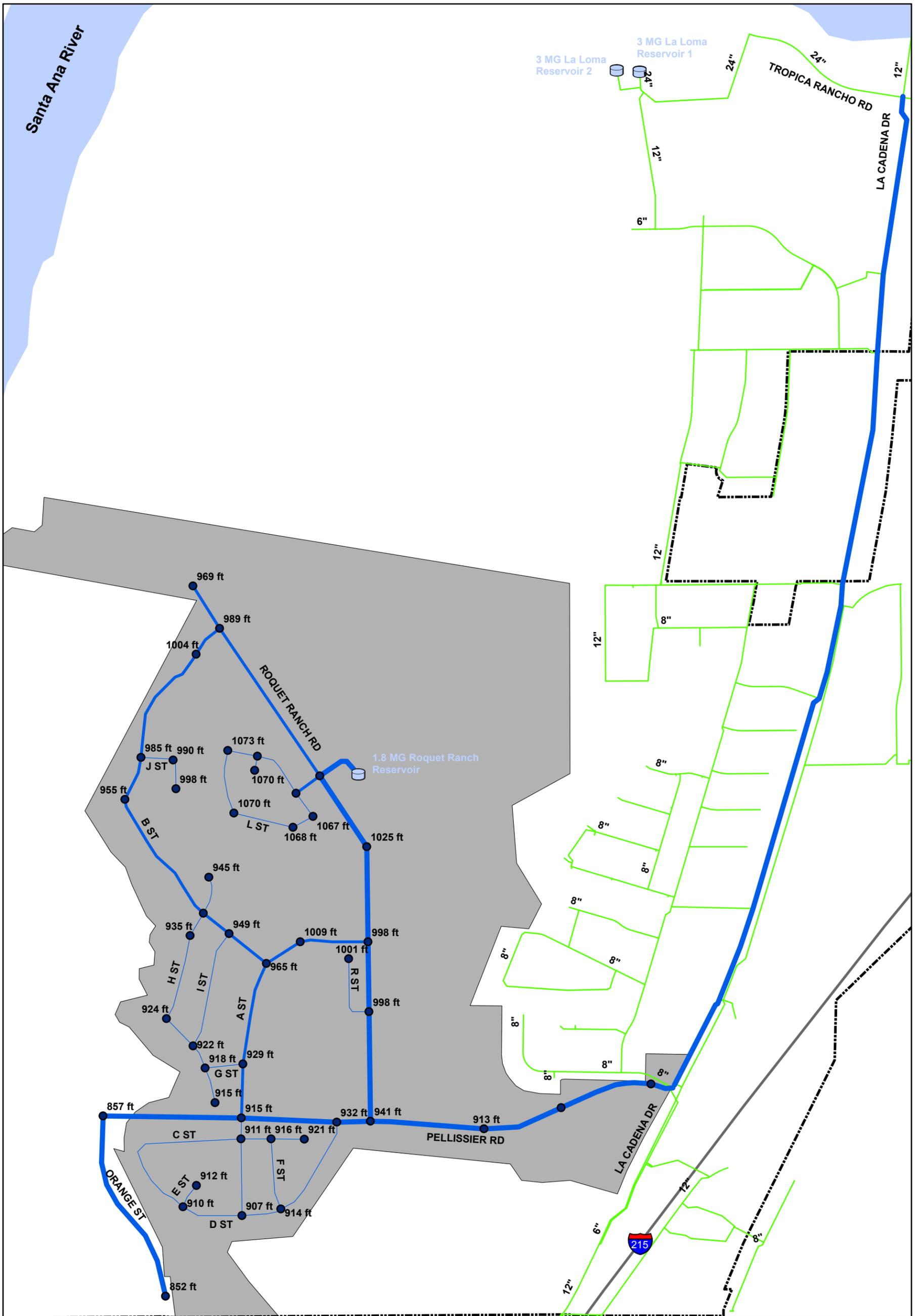
Once the topology of the development transmission mains was entered into the model, the demands were added. The total demand of 591 gpm (or 0.9 mg) was distributed throughout Roquet Ranch based on the target dwelling units within each parcel. The 1.8 MG reservoir shown on the conceptual land use plan was also added near Roquet Ranch Road and the L Street loop. In addition, fire flow assignments were added to model nodes based on the land use type listed in the conceptual land use map shown on Figure 1.

All of the updates to the model are outlined in Figure 2.

### **5.3.2 Fire Flow Analysis**

Fire flow requirements vary based on land use types, which are listed in Table 7. Based on the land use types shown on Figure 1, the water distribution system supplying the proposed development must be capable of supplying a minimum fire flow of 4,000 gpm for a duration of four hours with a minimal residual pressure of 20 psi under Maximum Day Demand (MDD) conditions. This flow rate and duration was selected based on the land use type with the highest fire flow requirement, which is public/institution as shown on Figure 1. Although a public/institution has been planned, the school district and fire department have not yet purchased the land. Therefore, the area may become residential units and the fire flow requirement would be reduced to commercial, which has a minimum fire flow of 3,000 gpm for a duration of 4 hours.

The fire flow analysis was performed under MDD conditions using the hydraulic model and the land use designations shown on Figure 1. The results of the fire flow analysis are presented on Figure 3 and are based on planning level data and assumptions. As shown on Figure 3, the selected nodes on L Street have residual pressures less than 20 psi. Based on the current development layout and nodes selected for the fire flow analysis, residual pressures ranged between 10 psi to 19 psi, which would not meet the minimum fire flow requirements established in Table 7.

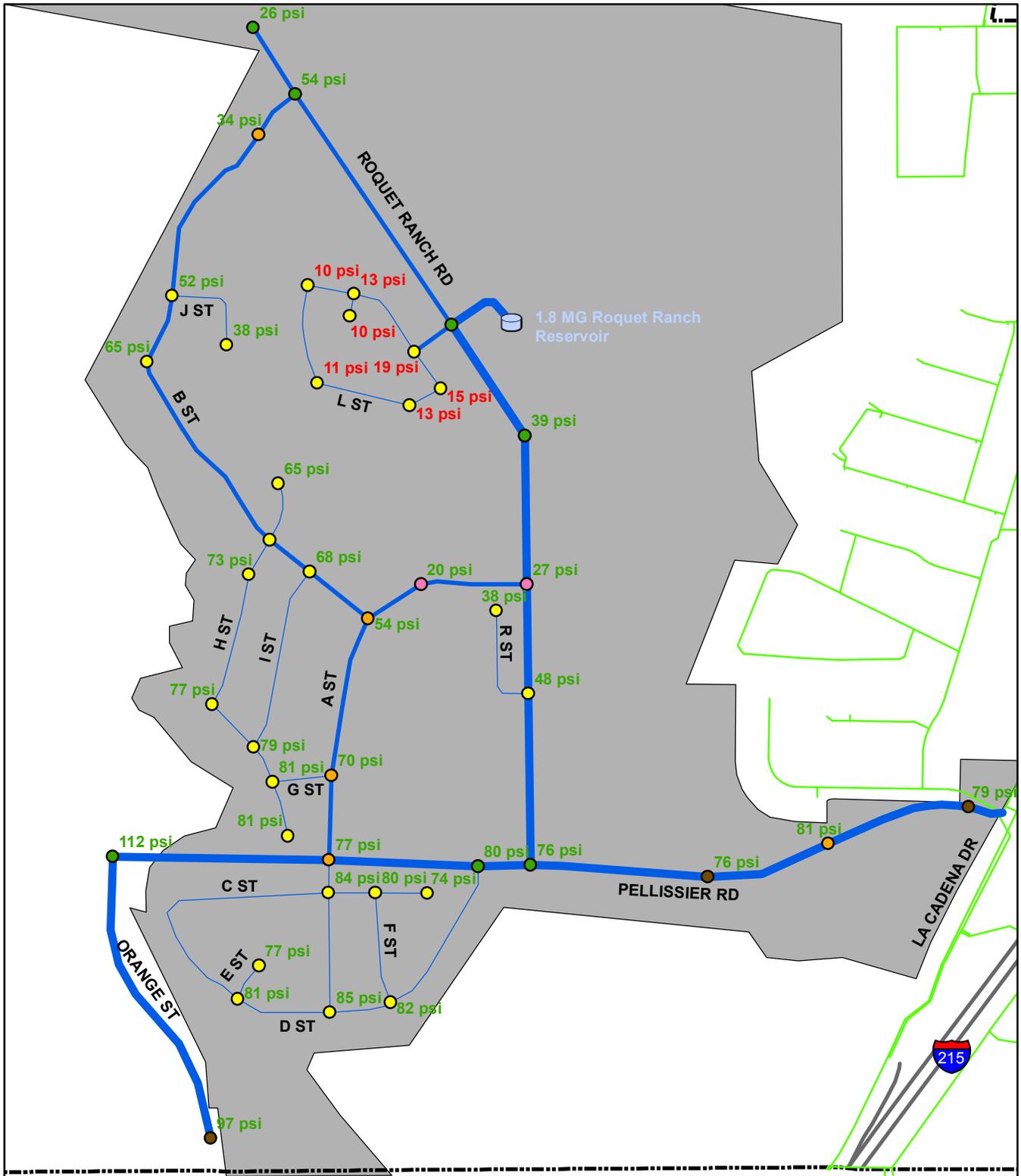


**Legend**

- City Boundary
- Roquet Ranch Boundary
- City of Colton Existing Pipes
- Roquet Ranch Proposed Pipes
- 8 inch diameter
- 12 inch diameter
- 18 inch diameter
- Development Node
- Freeways

**Figure 2**  
**Updated Model Components**  
**Roquet Ranch Project**





**Legend**

- |                  |                                 |                         |
|------------------|---------------------------------|-------------------------|
| Fire Flow Demand | — City of Colton Existing Pipes | ▭ City Boundary         |
| ● 1000 gpm       | — Roquet Ranch Proposed Pipes   | ▭ Roquet Ranch Boundary |
| ● 1500 gpm       | — 8 inch diameter               |                         |
| ● 2500 gpm       | — 12 inch diameter              |                         |
| ● 3000 gpm       | — 18 inch diameter              |                         |
| ● 4000 gpm       | — Freeways                      |                         |

**Figure 3**  
**Fire Flow Analysis Results**  
 Roquet Ranch Project



In an attempt to raise the residual pressures at the nodes along L Street, several alternatives were analyzed. Alternatives evaluated included: upsizing the 8 inch diameter pipeline along the loop; creating a new connection to the L Street loop from Roquet Ranch Road; creating a new connection to the L Street loop from J Street; and creating a new connection to the L Street loop from both Roquet Ranch Road and J Street.

Ultimately, the deficiencies along L Street are based on a low static pressure, which is also highlighted in the pressure and velocity analysis in Section 1.1.1.1. In order to raise the pressure along the L Street loop, the proposed 1.8 MG reservoir would need to be located at a higher elevation to raise the HGL. Alternatively, a small booster pump station could be installed at the intersection of Roquet Ranch Road and L Street, which would supply additional pressure to the L Street loop. This alternative has a lower capital cost than relocating the reservoir to a higher elevation that would be further away and may require additional piping. Therefore, it is recommended that a 100 horsepower (HP) booster pump station be installed at this location. Since the fire flow analysis was based on planning level assumptions, an updated fire flow analysis would be recommended to reevaluate residual pressures within the area when more definitive plans have been established.

### **5.3.3 Pressure and Velocity Analysis**

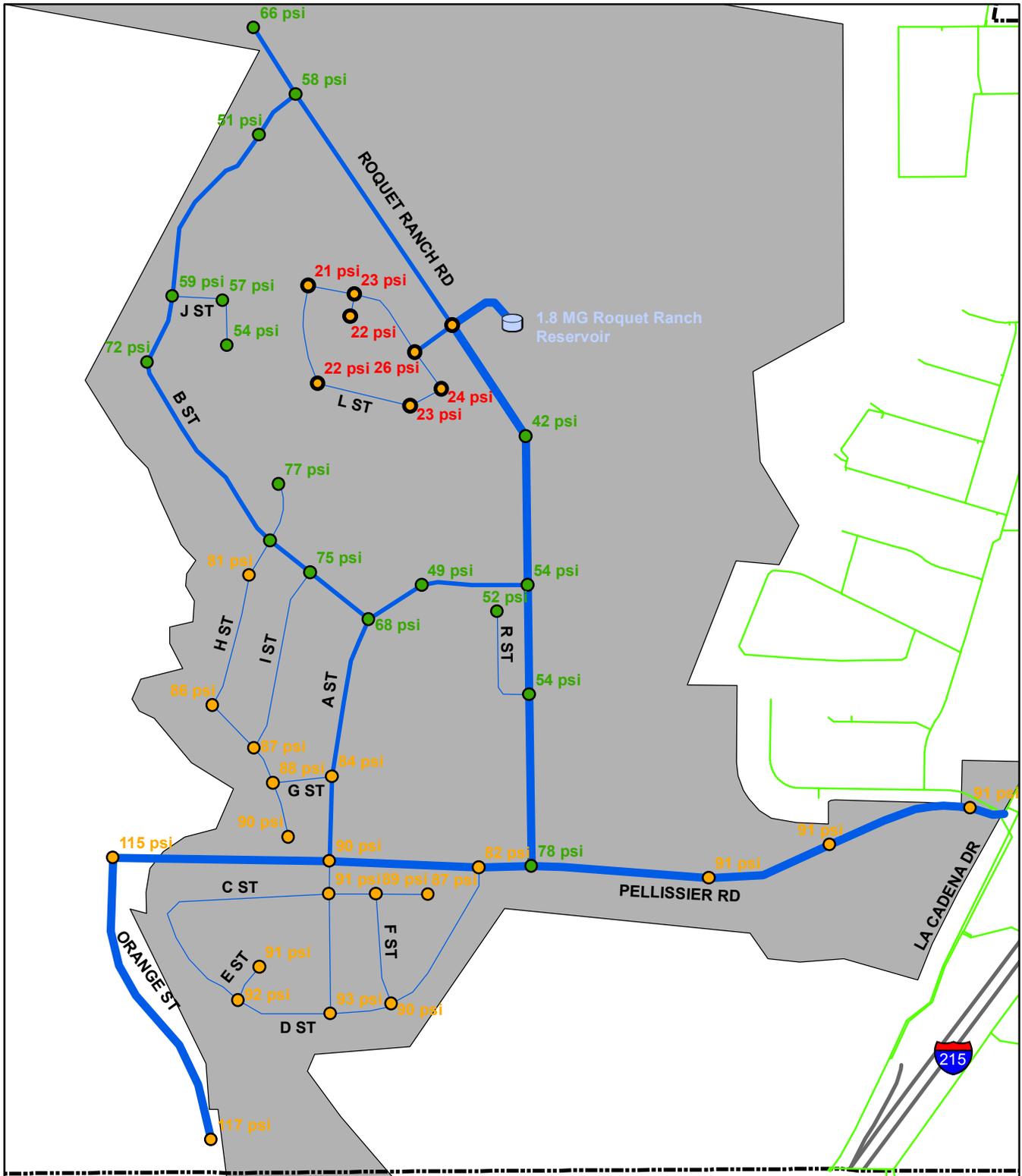
To predict the upper and lower range of pressures and velocities within the distribution system, model runs were performed under both maximum day demand (MDD) and minimum day demand (MinDD) conditions. The model results for the MDD and MinDD hydraulic analysis are discussed below and are presented on and , respectively. The evaluation criteria established an acceptable pressure range of 40 to 80 psi, and a maximum new pipeline velocity of 5 feet per second (fps).

#### **5.3.3.1 *Maximum Day Demand Analysis***

The pressures under MDD conditions ranged between 21 psi to 117 psi. Therefore, areas within the Project area do not meet the pressure requirements specified in Table 7. As shown on Figure 4, majority of the deficiencies within the Project are located in the L Street loop. The pressures within this loop range between 21 to 24 psi. This deficiency is due to low static pressure in the area.

In order to raise the pressures in the L Street loop as well as the areas adjacent to this loop, a new booster pump station would be recommended, which was discussed in Section 5.3.2. To mitigate high pressure deficiencies in locations that exceeded 80 psi, individual pressure regulating stations may be needed on service laterals.

In addition, the pipeline velocity under MDD conditions was 5 fps or less and therefore met the criteria specified in Table 7. As a result, no improvements have been recommended.

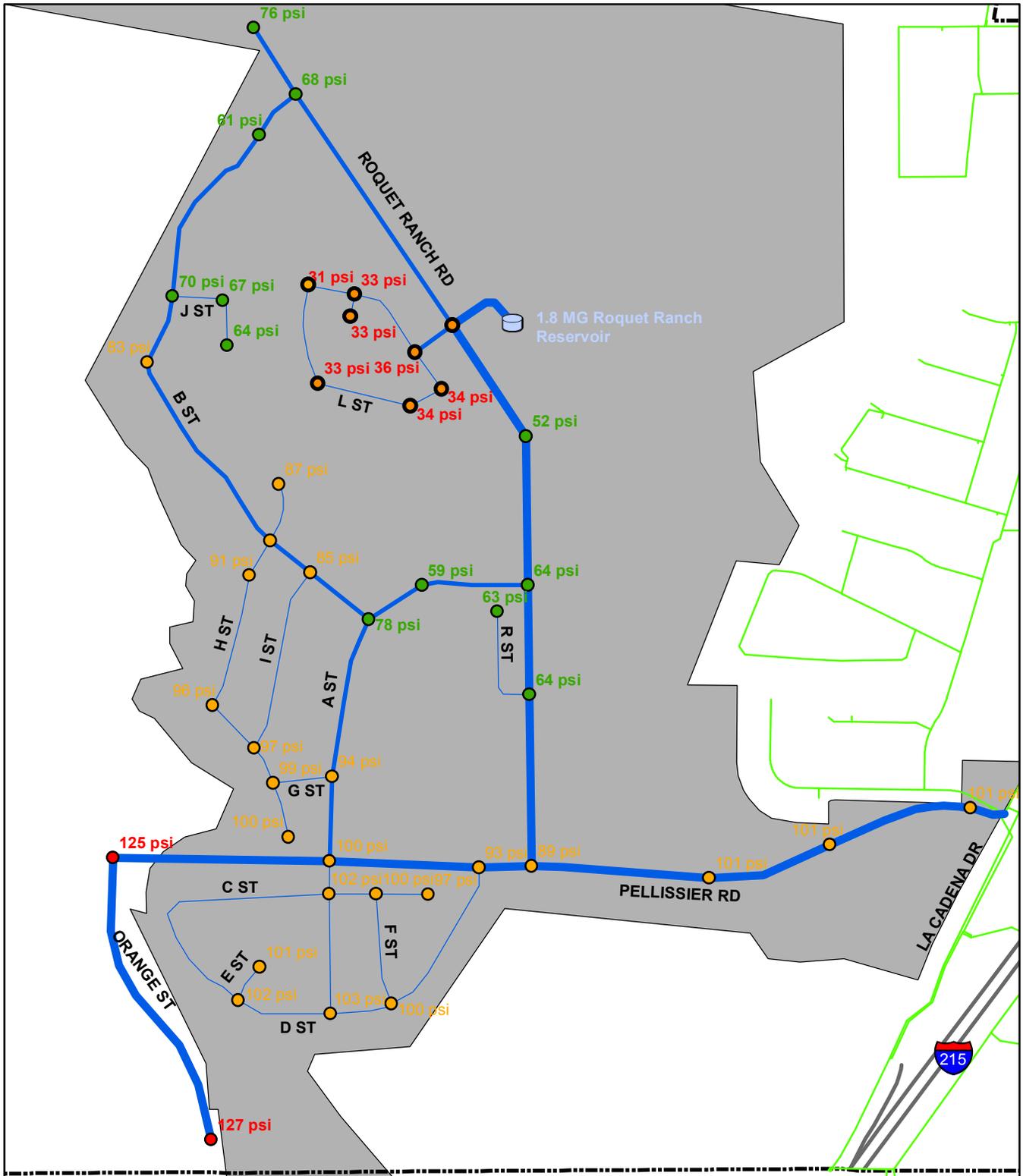


**Legend**

- |                   |                               |                       |
|-------------------|-------------------------------|-----------------------|
| Minimum Pressures | City of Colton Existing Pipes | City Boundary         |
| ● 20 to 40 psi    | Roquet Ranch Proposed Pipes   | Roquet Ranch Boundary |
| ● 40 to 80 psi    | 8 inch diameter               |                       |
| ● 80 to 120 psi   | 12 inch diameter              |                       |
|                   | 18 inch diameter              |                       |
|                   | Freeways                      |                       |

**Figure 4**  
**MDD Pressure Analysis Results**  
 Roquet Ranch Project

0 500 1,000 Feet



**Legend**

Maximum Pressures

- Less Than 20 psi
- 20 to 40 psi
- 40 to 80 psi
- 80 to 120 psi
- Greater Than 120 psi

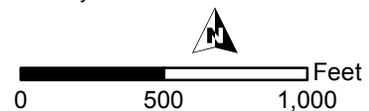
City of Colton Existing Pipes

- Roquet Ranch Proposed Pipes
- 8 inch diameter
- 12 inch diameter
- 18 inch diameter
- Freeways

City Boundary

Roquet Ranch Boundary

**Figure 5**  
**MinDD Pressure Analysis Results**  
**Roquet Ranch Project**



### **5.3.3.2 Minimum Day Demand Analysis**

The pressures under MinDD conditions ranged between 31 psi to 127 psi. Therefore, areas within the Project area do not meet the pressure requirement specified in Table 7. As shown on Figure 5, majority of the deficiencies within the Project are located in the L Street loop. The pressures within this loop range between 31 to 36 psi. This deficiency is due to low static pressure in the area, which was discussed in previous section. The highest pressures occurred along Pellissier Road and Orange Street. The pressures ranged from 101 to 127 psi.

As previously mentioned, to raise the pressures in the L Street loop, a new booster pump station would be recommended. To mitigate high pressure deficiencies in locations that exceeded 80 psi, individual pressure regulating stations may be needed on service laterals.

In addition, the pipeline velocity under MinDD conditions was 7 fps or less and therefore met the criteria specified in Table 7. As a result, no improvements have been recommended.

## **6.0 CONCLUSION**

To determine the impact of the development's water demands on the City's water supply and distribution system, a hydraulic analysis was performed. As part of the analysis conducted, supply, storage, pump station, and pipeline deficiencies were identified along with recommended improvement projects to mitigate the deficiencies. Since the deficiencies identified in the WMP are related to both existing and future system conditions, the percent allocation for the development was assessed. The recommended improvement projects along with the developer's contribution that was identified as part of the WMP are outlined in Table 8 below.

As listed in Table 8, the development would require 13 percent to 20 percent (with 1 MG of additional fire flow storage) of the proposed future storage capacity and 21 percent of the proposed future pump station capacity within the Central pressure zone. Currently, a 1.8 MG reservoir may be constructed as part of the Roquet Ranch development, which would be sufficient to meet the 1.6 MG storage requirement if a single fire flow event within the Central pressure zone was considered. If an additional 1.0 MG of fire flow storage is required, the total storage for Roquet Ranch would increase to 2.6 MG. To meet this total required storage amount, the capacity of the proposed reservoir within the Roquet Ranch development may need to increase to 2.6 MG or 0.8 MG of the La Loma reservoir would be required. If a new reservoir is constructed within the development, there would be an impact to the storage recommendations in the WMP, which would potentially reduce the capacity of the 4 MG La Loma reservoir that would serve the Central pressure zone.

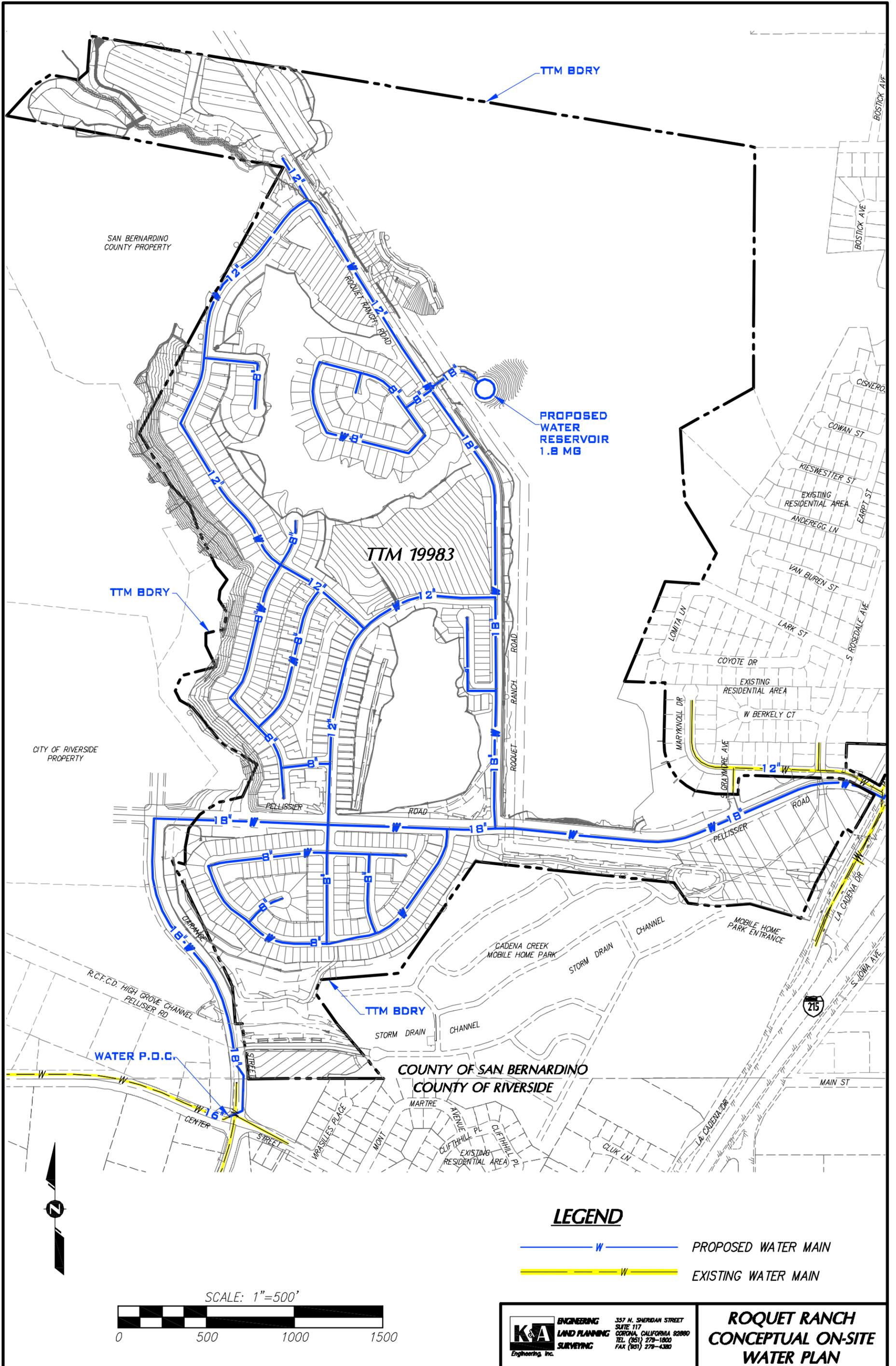
<b>Table 8 Central Zone Improvements Water Supply Assessment Roquet Ranch Development</b>				
	<b>Required Capacity</b>	<b>Future Users Allocation</b>	<b>Roquet Ranch Allocation</b>	<b>Roquet Ranch Capacity<sup>(4)</sup></b>
<b>Storage</b>	<b>MG</b>	<b>%</b>	<b>%</b>	<b>MG</b>
Construct a 4.0 MG at Rialto Well Field with a PS	4.0	-	-	-
Rehabilitate Rialto 2	3.0	-	-	-
Pressure Reducing Station <sup>(2)</sup>	0.5	-	-	-
New 4.0 MG Reservoir at La Loma site <sup>(3)</sup>	4.0	100%	30%	1.2
Pressure Reducing Station <sup>(2)</sup>	1.5	100%	26%	0.4
<b>Total Storage</b>	<b>13.0</b>		<b>13%</b>	<b>1.6</b>
<b>Pump Stations</b>	<b>gpm</b>	<b>%</b>	<b>%</b>	<b>gpm</b>
Well 19 Upgrade	1,200	100%	21%	253
Well 31 Construction	3,000	100%	21%	634
<b>Total Pump Stations</b>	<b>4,200</b>		<b>21%</b>	<b>887</b>
<b>Pipelines</b>	<b>feet</b>	<b>%</b>	<b>%</b>	<b>feet</b>
18" Diameter Transmission Main	11,000	100%	100%	11,000
<b>Total Pipelines</b>	<b>11,000</b>		<b>100%</b>	<b>11,000</b>
<u>Notes:</u>				
(1) Totals may vary slightly due to rounding				
(2) Pressure reducing stations would be used to transfer surplus storage from upper pressure zones to the Central Zone.				
(3) A 1.8 MG reservoir is shown on the Conceptual Land Use Plan (Figure 1). If this is constructed, then the new La Loma Reservoir would be reduced from 4 MG to 3.2 MG.				
(4) It is assumed that the fire flow storage need has been met within the Central pressure zone.				

As part of the hydraulic modeling analysis conducted within the proposed Project area, pressure deficiencies were also identified. To mitigate the low pressure and fire flow deficiencies, a 100 HP pump station would be recommended. To mitigate high pressure deficiencies, individual pressure regulating stations on service laterals would be recommended.

In addition, based on the review of the City's water supply entitlements, water rights, and water service contracts, the City currently has sufficient groundwater to meet existing and future demands. However, if demands exceed the operating safe yield for the groundwater

basins, purchasing additional imported water for replenishment, or relying on any banked water supplies within the basin may be required. To provide the water supply to the Roquet Ranch development, approximately 2 miles of 18-inch diameter pipeline would be needed. The pipeline alignment would span from the intersection of Tropica Rancho Road and La Cadena Drive to the intersection of the proposed Pellisier Road and La Cadena Drive.

## **Appendix A Conceptual On-Site Water Plan**



SAN BERNARDINO COUNTY PROPERTY

TTM BDRY

PROPOSED WATER RESERVOIR 1.8 MG

TTM 19983

TTM BDRY

CITY OF RIVERSIDE PROPERTY

WATER P.D.C.

TTM BDRY

COUNTY OF SAN BERNARDINO  
COUNTY OF RIVERSIDE

**LEGEND**

- W — PROPOSED WATER MAIN
- W — EXISTING WATER MAIN

SCALE: 1"=500'



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**ROQUET RANCH  
CONCEPTUAL ON-SITE  
WATER PLAN**

## Appendix B Conceptual Off-Site Water Plan

