# Appendix L-1
Hydraulic Analysis

SANTA CLARITA VALLEY WATER AGENCY

# LYONS CANYON DEVELOPMENT IMPACT HYDRAULIC ANALYSIS

## FINAL

September 2022

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September 7, 2022

Santa Clarita Valley Water Agency
26521 Summit Circle
Santa Clarita, CA 91350

Attention: Orlando Moreno, P.E.
Senior Engineer

**Subject: Technical Memorandum – Lyons Canyon Development Impact Hydraulic Analysis**

We are pleased to submit this technical memorandum documenting the hydraulic modeling and analysis for the impact of Lyons Canyon Development (development) on the Newhall Water System. This analysis incorporates development information received from Santa Clarita Valley Water Agency (SCVWA) Staff and utilizes SCVWA's distribution system evaluation criteria.

## 1.0 EXISTING WATER SYSTEM

The Newhall Water System is located north of Antelope Valley Freeway, west of Antelope Valley Freeway, and east of Interstate 5. The water system consists of pump stations, storage reservoirs, transmission and distribution mains, fire hydrants, and pressure reducing valves.

The water system is currently divided into six existing pressure zone. The pressure zones are interconnected through booster stations and pressure reducing valves to allow the distribution of water throughout the system. Master Planned future improvements include consolidating Zone 5 (1,732') and Zone 6 (1,654') by installing a new pipeline and PRV and abandoning the existing Zone 6 pump station and storage tank. The pipelines for each zone are shown on **Figure 1**.

## 2.0 EVALUATION CRITERIA

The hydraulic analysis will utilize SCVWA's water system performance and design criteria to identify system capacity deficiencies and for sizing water mains, storage reservoir, and pump stations. **Table 1** documents the SCVWA distribution system criteria.

## 3.0 LYONS CANYON DEVELOPMENT AND WATER DEMANDS

The Lyons Canyon development is approximately 61 acres and it is proposed to connect to the Newhall Water System at the intersection of The Old Road and Calgrove Blvd, which will require a new pipeline along The Old Road.

The Lyons Canyon development demands are based on calculations received from SCVWA staff, which utilizes the SCVWA's water unit factors. The Average Day Demand (ADD) is estimated at 174 gpm and using the provided Lyons Canyon peaking factor of 2.2 the Maximum Day Demand (MDD) is 384 gpm. These demands are included on **Table 2** along with demands for each pressure zone.

# 4.0 2017 NEWHALL WATER SYSTEM MASTER PLAN IMPROVEMENTS

The hydraulic analysis will assume the 2017 WSMP recommended improvements for connecting Zone 6 to Zone 5 are constructed as shown on **Figure 2**. These improvements include a new 18-inch main in Calgrove Boulevard, a pressure reducing valve (PRV), an existing (but inactive) pipeline crossing Interstate 5 to be put in service, and the abandonment of Pump Station 6 and Tank T-6.

Other 2017 WSMP improvements in this area, not related to Lyons Canyon, but shown for completeness, are an existing system Zone 6 fire flow deficiency improvement in the Old Road and additional storage capacity in Pressure Zone 4 and Zone 5.

# 5.0 HYDRAULIC MODELING ANALYSIS AND RECOMMENDATIONS

The hydraulic modeling analysis utilized the existing Newhall hydraulic model developed during the 2017 Newhall Water System Master to evaluate the impact of the Lyons Canyon development demands on the water system pipelines.

## 5.1 Lyons Canyon Connection Analysis

The hydraulic analysis indicates that approximately 4,000 feet of a 12-inch main in The Old Road will be required to supply the Lyons Canyon Development. The pressures during each demand scenario at Lyons Canyon are 1) 148 psi for ADD, 2) 141 psi for MDD, and 3) 141 psi for PHD. The pressure and flow results at the Lyons Canyon connection point are summarized on **Table 3**. Due to the PRV Zone 6 hydraulic grade line (HGL) of 1,662 feet, a PRV will be required for connecting Lyons Canyon. Also, a new zone valve between the Newhall and Valencia Water systems should be installed. These improvements are identified on **Figure 2**.

## 5.2 Existing Distribution System Impacts

The hydraulic analysis indicates only very minor changes in the existing system pressures and pipeline velocities. The one low pressure area west of Tank 4 is an existing system deficiency and was not made worse by the addition of Lyons Canyon. Additionally, a fire flow analysis was performed for the most critical hydrant in Zone 6 and resulted in residual pressures above the 20 psi requirement. The critical fire flow hydrant and system pressures are also documented on **Figure 2.**

# 6.0 PUMP STATION CAPACITY ANALYSIS AND RECOMMENDATIONS

The pump station capacity analysis includes establishing the existing pump station capacities and then determining if additional capacity is required for the Lyons Canyon development. The analysis will include the existing system and consolidated system plus Lyons Canyon.

## 6.1 Pump Station Capacity Analysis

The water system demands by Pressure Zone and the total supply dependent demands are documented on Table 2. The existing pump station inventory was updated based on 2022 SCADA and pump tests as detailed on Table 4, and the pump station capacity analysis is summarized on Table 5.

**Existing System Pump Capacity Requirements:** Using the SCVWA pump station capacity requirements in Table 1, the existing pump station capacity for Zone 4 was found to be deficient due to a combination of 1) increased demand factors, and 2) SCVWA pump station capacity criteria being equal to MDD over 18 hours, which is greater than the 2017 Newhall WSMP pump station capacity criteria of MDD over 24 hours. The existing pump station capacity for Zone 5 was found to be sufficient.

**Consolidated + Lyons Canyon Future Pump Capacity Requirements:** Using the SCVWA pump station capacity requirements for both existing and Lyons Canyon demands, the pump capacity requirements are summarized as follows:

- **Pump Station No. 4** was found to be deficient by 820 gpm and requires a firm capacity of 1,975 gpm.
- **Pump Station No. 5** was found to be deficient by 366 gpm and requires a firm capacity of 1,225 gpm.

## 6.2 Pump Station Transmission Main Impact Analysis

The impact on the pump station transmission mains due to the increased pump station flows was analyzed for each scenario. The pump station capacity requirements are documented in Table 5. The results of the transmission main impact analysis are documented on Figure 3 and summarized as follows:

### Existing System Transmission Main Velocities:

- Pump Station 4: The 12-inch transmission main has an existing velocity of 3.2 feet per second (fps) at the pump station firm capacity
- Pump Station 5: The 12-inch transmission main has an existing velocity of 2.4 fps at the pump station firm capacity.

### Consolidated + Lyons Canyon Transmission Main Velocities:

- Pump Station 4: The 12-inch transmission main velocities increase to 5.6 fps (+2.4 fps) with the required new firm capacity.

- Pump Station 5: The 12-inch transmission main velocities increase to 3.5 fps (+1.1 fps) with the required new firm capacity.

### 6.3 On-Site Pump Station Pipeline Impact Analysis

The Lyons Canyon development will require upsizing booster pumps at both the Zone 4 and Zone 5 pump stations to account for the additional demands. This section will analyze the on-site pump station pipelines. The analysis results are documented on **Figure 4** and summarized as follows:

**Existing System:**

- Pump Station 4: On-site pipeline velocities reach up to 9.5 fps in the 6-inch mains.
- Pump Station 5: On-site pipeline velocities reach up to 5.6 fps in the 6-inch mains.

**Consolidated + Lyons Canyon Pump Capacity:**

- Pump Station 4: On-site pipeline velocities reach up to 12.6 fps in the 8-inch mains and 11.2 fps in the 6-inch mains. These velocities exceed the 10 fps pipeline velocity criteria and require an upsize of the following onsite pipelines:
    - 50 feet of 6-inch piping to 8-inches.
    - 190 feet of 8-inch to piping 10-inches.
- Pump Station 5: On-site pipeline velocities reach up to 7 fps in the 6-inch mains.

The recommended pipeline improvements are anticipated to occur within the pump station property or existing rights-of-way

## 7.0 STORAGE REQUIREMENTS

Storage requirements were identified for each pressure zone and are summarized in **Table 6**. The table lists the domestic water demands, and identifies the operational, emergency, and fire storage for each pressure zone and for each development phase. The storage deficiencies documented are for the existing system and not attributed to the Lyons Canyon Development since it will have its own on-site storage.

**Existing System Storage Requirements:** Zone 5 requires an additional 0.65 MG of storage and Zone 6 requires an additional 0.75 MG of storage.

**Future System Storage Requirements:** The consolidated Zone 5 and Zone 6 requires an additional 1.30 MG of storage in Zone 5.

**Lyons Canyon On-Site Storage Requirements:** For the Lyons Canyon storage requirements, refer to Jensen's addendum.

## 8.0 ANALYSIS SUMMARY

With the addition of the Lyons Canyon Development, the hydraulic model indicated only minor pressure and pipeline velocity impacts to the existing system. However, the development will trigger capacity upgrades in both Pump Station 4 and 5, along with some 2017 WSMP recommended improvements for the abandonment of Pump Station 6 and Tank T-6. The distribution system improvements required for the Lyons Canyon Development are documented in **Figure 2** and summarized as follows:

- New Zone Valve between Newhall and Valencia in the Old Road
- 4,000 feet of 12-inch main in the Old Road
- Pump Station 4 Upgrades:
    - 1,975 gpm firm capacity (820 gpm increase)
        - Upsize 50 feet of on-site 6-inch pump station pipelines to 8-inch
        - Upsize 190 feet of on-site 8-inch pump station pipelines to 10-inch
- Pump Station 5 Upgrades:
    - 1,225 gpm firm capacity (366 gpm increase)

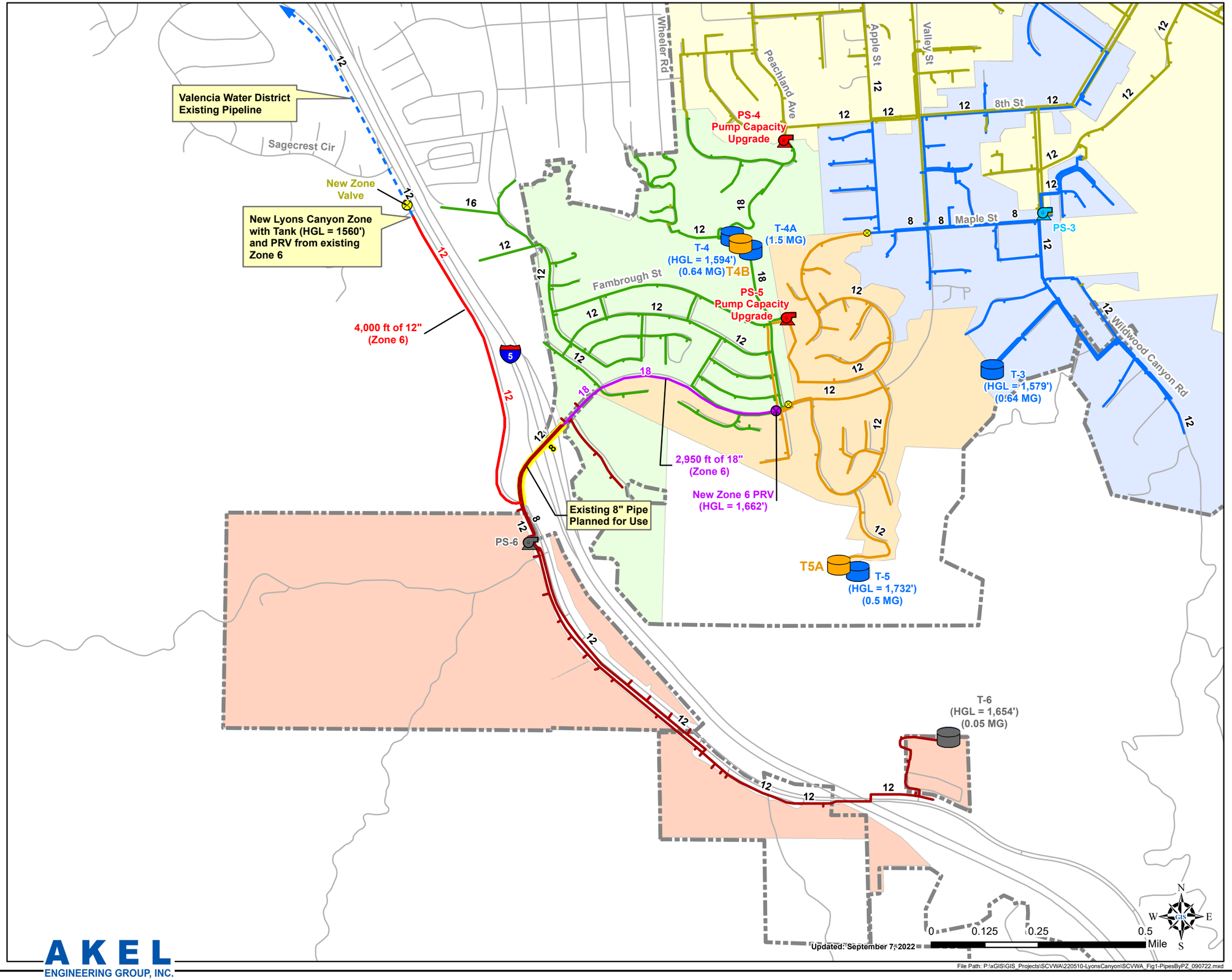
This hydraulic analysis was performed to determine the impacts to the existing Newhall water system and the required on-site development pipelines and other water infrastructure were not included as part of this analysis.

Sincerely,

AKEL ENGINEERING GROUP, INC.

Tony Akel, P.E.
Principal

# FIGURES




## Legend

### Improvements

- Abandoned Tanks
- Abandoned Pump Stations
- Pump Station Capacity Upgrade by the Developer
- PRV by SCVWA
- New Pipe by the Developer
- New Pipe by SCVWA

### Other Master Plan Improvements

- Future Tanks by SCVWA

### Existing System

- Tanks
- Pump Stations
- Valves

### Pipes by Pressure Zone

- Zone 1
- Zone 3
- Zone 4
- Zone 5
- Zone 6
- Valencia Water District Existing Pipeline
- Existing Pipe Planned for Use

### Existing Pressure Zones

- P-ZONE-1 (1,487')
- P-ZONE-3 (1,579')
- P-ZONE-4 (1,594')
- P-ZONE-5 (1,732')
- P-ZONE-6 (1,654')
- Roads
- NCWD Boundary

**PRELIMINARY**

# Figure 1
# Pipes by Pressure Zone

Lyons Canyon Development
Hydraulic Analysis

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Valencia Water District Existing Pipeline

New Zone Valve

New Lyons Canyon Zone with Tank (HGL = 1560') and PRV from existing Zone 6

4,000 ft of 12"

2,950 ft of 18"

New Zone 6 PRV (HGL = 1,662')

Existing 8" Pipe Planned for Use

PS-4 Pump Capacity Upgrade

PS-5 Pump Capacity Upgrade

PS-6

PS-3

T-4 (HGL = 1,594') (0.64 MG) T4B

T-4A (1.5 MG)

T5A

T-5 (HGL = 1,732') (0.5 MG)

T-3 (HGL = 1,579') (0.64 MG)

T-6 (HGL = 1,654') (0.05 MG)

Residual Pressure at 1,250 gpm for 2 hours: 20.7 psi

Sagecrest Cir

Wheeler Rd

Peachland Ave

Apple St

Valley St

8th St

Maple St

Fambrough St

Wildwood Canyon Rd

0 0.125 0.25 0.5 Mile

Updated: September 7, 2022

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## Legend

### Improvements

- Abandoned Tanks
- Abandoned Pump Stations
- Pump Station Capacity Upgrade by the Developer
- PRV by SCVWA
- New Pipe by the Developer
- New Pipe by SCVWA

### Other Master Plan Improvements

- Future Tanks by SCVWA
- Future Pipe by SCVWA

### Maximum Day Pressures

- Greater than 100 psi
- 80 - 100 psi
- 60 - 80 psi
- 40 - 60 psi
- Less than 40 psi

### Existing System

- Tanks
- Pump Stations
- Valves
- Pipes
- Valencia Water District Existing Pipeline
- Existing Pipe Planned for Use

### Existing Pressure Zones

- P-ZONE-1 (1,487')
- P-ZONE-3 (1,579')
- P-ZONE-4 (1,594')
- P-ZONE-5 (1,732')
- P-ZONE-6 (1,654')
- Roads
- NCWD Boundary

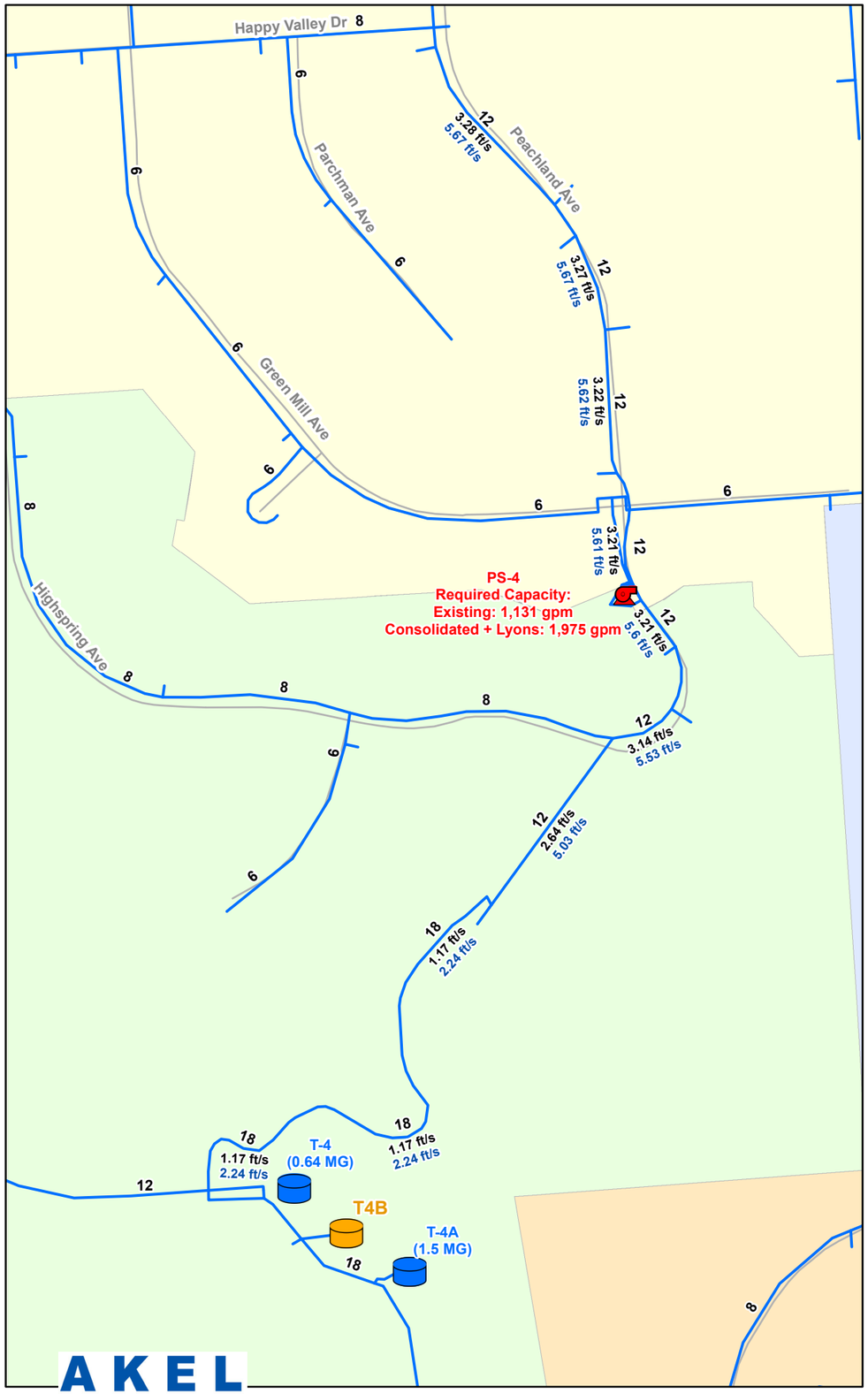
**PRELIMINARY**

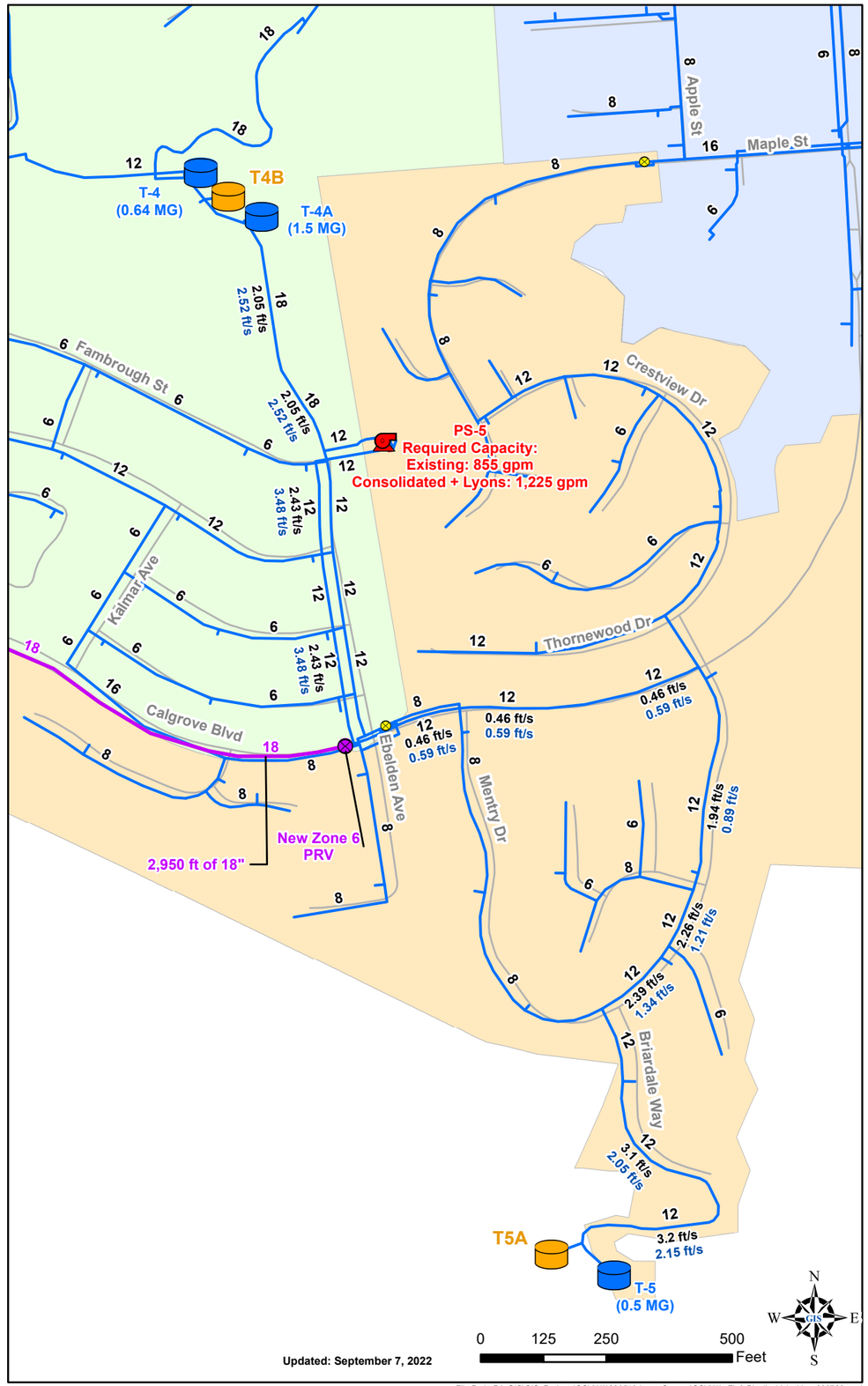
# Figure 2
# Lyons Canyon Hydraulic Analysis

Lyons Canyon Development Hydraulic Analysis

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SCV WATER




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## Legend

**Pipeline Velocities**

- 3.11 Existing System
- 5.67 Consolidated + Lyons

**Improvements**

- Pump Station Capacity Upgrade by the Developer
- PRV by SCVWA
- New Pipe by SCVWA

**Other Master Plan Improvements**

- Future Tanks by SCVWA

**Existing System**

- Tanks
- Pump Stations
- Valves
- Pipes

Existing Pressure Zones

- P-ZONE-1 (1,487')
- P-ZONE-3 (1,579')
- P-ZONE-4 (1,594')
- P-ZONE-5 (1,732')
- Roads
- NCWD Boundary

**Assumptions:**

- Peak Hour Demands
- Tank Levels at 10%
- Pumps On
- Maximum Pipe Velocity: 10 ft/s

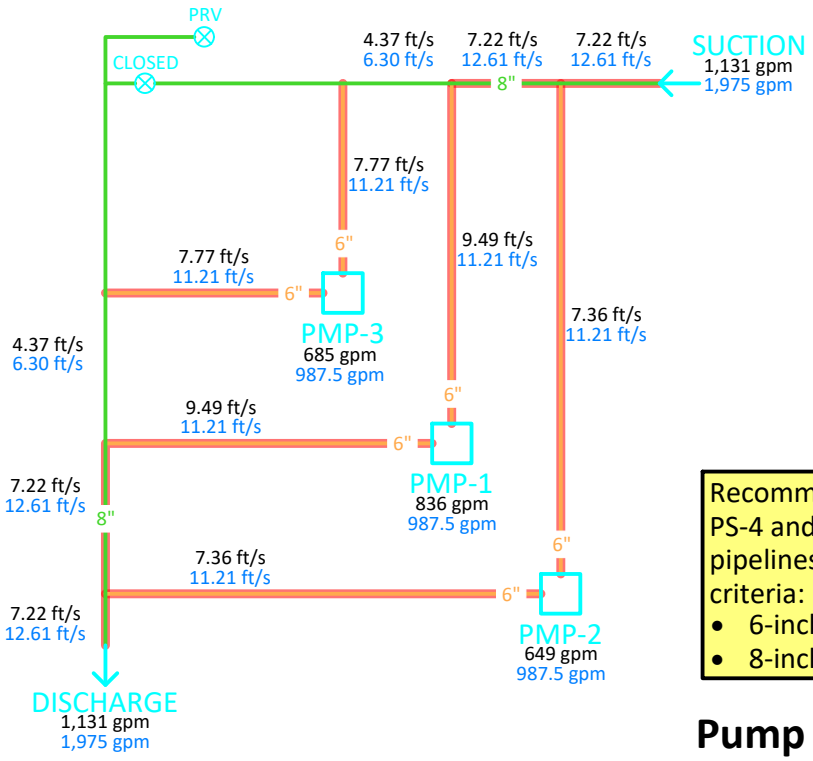
**PRELIMINARY**

# Figure 2
# Pump Impact Analysis Velocities

Lyons Canyon Development
Hydraulic Analysis

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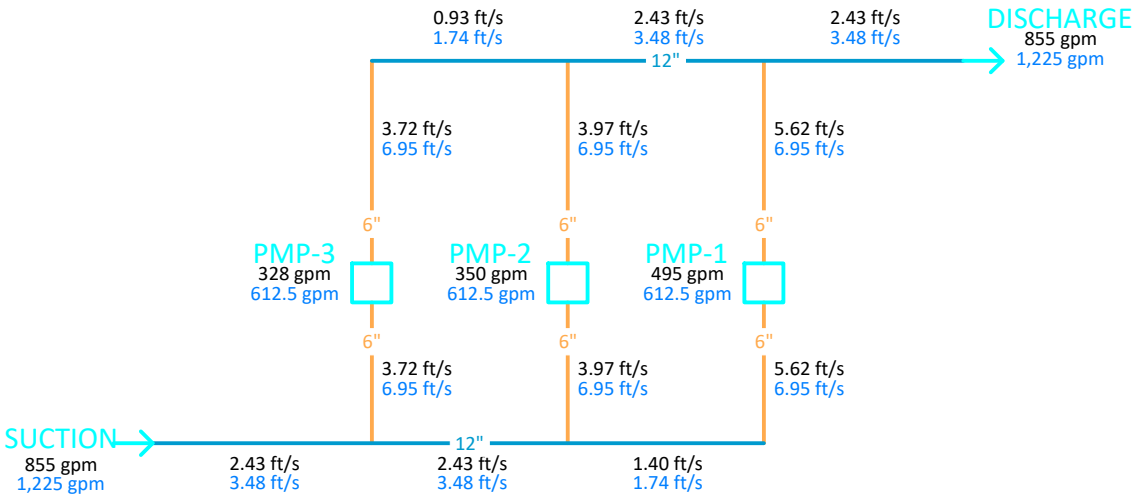



Recommended upsizing of PS-4 and Right-of-way pipelines to meet 10 ft/s criteria:

- 6-inch to 8-inch = 50 LF
- 8-inch to 10-inch = 190 LF

**No Scale**

## Pump Station No. 4




**No Scale**

## Pump Station No. 5

## LEGEND:

- On-site 6-inch Piping
- On-site 8-inch Piping
- On-site 12-inch Piping
- Deficient Pipelines
- 6" Diameter
- 1.23 Velocity (Existing)
- 1.23 Velocity (Consolidated + Lyons)

Assumptions:

1) Pump Station Flows reflect required flows from respective criteria.
2) Velocities for pipelines carrying individual pump flows reflect June 2022 pump tests.
3) Velocities for pipelines carrying multiple pump flows reflect July 2022 SCADA.

Last Updated: 07/25/22

# Figure 4
# Pump Station Onsite Velocities

Lyons Canyon Development
Hydraulic Analysis

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# TABLES

## Table 1 Performance and Design Criteria

Lyons Canyon Development Hydraulic Analysis
Santa Clarita Valley Water Agency

PRELIMINARY

| Design Parameter | | Criteria[1] |
|---|---|---|
| **Storage Requirement** | Operational Storage | 100% of Maximum Day Demand |
| | Fire Storage | Residential: 0.15 MG (1,250 gpm for 2 hours)<br>Commercial: 0.63 MG (3,500 gpm for 3 hours) |
| | Emergency | 75% of Maximum Day Demand |
| **Pump Stations** | Pump Stations shall meet Maximum Day Demand (on an 18-hour per day pumping schedule) and include one standby pump. | |
| **Pipelines** | Pipelines should be designed to meet the greater of: 1) Peak Hour Demand, or 2) Maximum Day Demand + Fire Flow | |
| | Maximum Velocity: | 10.0 ft/s during Peak Hour Demand<br>10.0 ft/s during Maximum Day Demand + Fire Flow |
| **Service Pressures** | Maximum Pressure | |
| | Average Day Demand | 150 psi |
| | Minimum Pressure | |
| | Peak Hour Demand | 40 psi |
| | Maximum Day Demand + Fire Flow | 20 psi |
| **Demand Peaking Factors** | Maximum Day Demand | $4.6697*(\text{Average Day Demand})^{-0.142}$ |
| | Peak Hour Demand | $23.576*(\text{Average Day Demand})^{-0.287}$ |
| | **Zone 4 Demand Factors** | |
| | Maximum Day Demand | 2.1 x Average Day Demand |
| | Peak Hour Demand | 4.8 x Average Day Demand |
| | **Zone 5 Demand Factors** | |
| | Maximum Day Demand | 2.2 x Average Day Demand |
| | Peak Hour Demand | 5.2 x Average Day Demand |
| | **Zone 6 Demand Factors** | |
| | Maximum Day Demand | 2.8 x Average Day Demand |
| | Peak Hour Demand | 8.6 x Average Day Demand |
| | **Lyons Canyon Demand Factors[4]** | |
| | Maximum Day Demand | 2.2 x Average Day Demand |
| | Peak Hour Demand | 3.3 x Average Day Demand |
| **Fire Flow** | Residential | 1,250 gpm for 2 hours |
| | Commercial | 3,500 gpm for 3 hours |

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Notes:

1. Criteria reflects SCVWA Water Master Plan criteria unless otherwise noted
2. Lyons Canyon demand factors provided by developer on April 19, 2022.

# Table 2 Demands by Pressure Zone

## Lyons Canyon Development Hydraulic Analysis

## Santa Clarita Valley Water Agency

PRELIMINARY

| Pressure Zone | Average Day Demand (gpm) | Maximum Day Demand (gpm) | Supply Dependent Demand (gpm) |
|---|---|---|---|
| **Existing System[1]** | | | |
| Zone 4 - 1549 | 258 | 516 | 464 |
| Zone 5 -1732 | 199 | 398 | - |
| Zone 6 -1654 | 33 | 66 | - |
| **Consolidated System + Lyons Canyon** | | | |
| Zone 4 - 1549 | 258 | 0 | 848 |
| Zone 5 -1732 | 199 | 398 | 450 |
| Zone 6 -1654 | 33 | 66 | |
| Lyons Canyon[2] | 174 | 384 | |

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Notes:

1. Maximum Day Demands for existing users determined using 2017 Newhall WSMP 2.0 peaking factor.
2. Maximum Day Demands for Lyons Canyon determined using SCVWA zone specific peaking factors dependent on average day demands.

## Table 3 Lyons Canyon Pressure Summary

Lyons Canyon Development Hydraulic Analysis
Santa Clarita Valley Water Agency

PRELIMINARY

| Scenario | Flow (gpm) | Pressure (psi) |
|---|---|---|
| **Lyons Canyon Point-of-Connection** | | |
| Average Day | 174 | 175 |
| Maximum Day | 384 | 172 |
| Peak Hour | 576 | 167 |

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## Table 4 Existing Pump Station Inventory

Lyons Canyon Development Hydraulic Analysis

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| Pump Station | Source Pressure Zone | Destination Pressure Zone | 2022 Pump Test Results[1] | | 2022 SCADA[2] | |
|---|---|---|---|---|---|---|
| | | | Individual Booster Pumps | Pump Capacity (gpm) | No. of Operating Pumps | Observed Capacity (gpm) |
| PS No. 4 | Zone 1 - 1487 | Zone 4 - 1549 | P-1 | 836 | 1 | 683 |
| | | | P-2 | 649 | 2 | 1,131 |
| | | | P-3 | 685 | 3 | 1,415 |
| | | | | | Firm Capacity[4] | **1,131** |
| PS No. 5 | Zone 4 - 1549 | Zone 5 - 1732 | P-1 | 495 | 1 | 423 |
| | | | P-2[3] | 350 | 2 | 855 |
| | | | P-3 | 328 | 3 | - |
| | | | | | Firm Capacity[4] | **855** |

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6/28/2022

Notes:

1. Pump capacities reflect pump test results received from SCVWA staff on June 28, 2022.
2. Pump capacities reflect pump flowrate SCADA received from SCVWA staff on June 28, 2022.
3. Zone 5 Pump 2 capacity reflects test results received from NCWD staff on August 23, 2013.
4. Firm capacities reflect pump tests with the largest pump not operating.

## Table 5 Pump Station Capacity Analysis

Lyons Canyon Development Hydraulic Analysis

Santa Clarita Valley Water Agency

PRELIMINARY

| Pump Station | Maximum Day Demand[1] (gpm) | Supply Dependent Demand (gpm) | Total Demand Requirement (gpm) | Pump Station Requirement[2] (gpm) | Pump Station Firm Capacity (gpm) | Surplus/Deficiency +/- (gpm) | Recommended Pump Station Firm Capacity (gpm) |
|---|---|---|---|---|---|---|---|
| **Existing System** | | | | | | | |
| PS 4 - 1549 | 548 | 532 | 1080 | 1,439 | 1,131 | -308 | - |
| PS 5 -1732 | 438 | - | 438 | 584 | 855 | 271 | - |
| **Consolidated System + Lyons Canyon** | | | | | | | |
| PS 4 - 1549 | 548 | 916 | 1,463 | 1,951 | 1,131 | -820 | 1,975 |
| PS 5 -1732 | 438 | 478 | 916 | 1,221 | 855 | -366 | 1,225 |
| PS 6 -1654 | 94 | Abandoned | - | - | - | - | - |
| Lyons Canyon | 384 | By Developers | - | - | - | - | - |

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Notes:

1. Maximum Day Demands calculated using SCVWA zone specific peaking factors dependent on average day demands.
2. Pump Station Capacity requirements consist of Maximum Day Demand over 18 hours.

## Table 6 Storage Analysis

Lyons Canyon Development Hydraulic Analysis

Santa Clarita Valley Water Agency

PRELIMINARY

| Pressure Zone[1] | Demands | | Storage | | Required Storage Capacity | | | | Surplus / Deficiency |
|---|---|---|---|---|---|---|---|---|---|
| | Maximum Day Demands[2] | | Existing | Tank (Volume) | Operational Storage[3] | Emergency[4] | Fire Protection[5] | Total | |
| | (gpm) | (mgd) | (MG) | (MG) | (MG) | (MG) | (MG) | (MG) | (MG) |
| **Existing System** | | | | | | | | | |
| Zone 4 - 1549 | 516 | 0.74 | 2.14 | T-4 (0.64 MG)<br>T-4A (1.50 MG) | 0.74 | 0.56 | 0.63 | 1.93 | **0.21** |
| Zone 5 - 1732 | 398 | 0.57 | 0.50 | T-5 (0.50 MG) | 0.57 | 0.43 | 0.15 | 1.15 | **-0.65** |
| Zone 6 -1654 | 66 | 0.10 | 0.05 | T-6 (0.05 MG) | 0.10 | 0.07 | 0.63 | 0.80 | **-0.75** |
| **Consolidated Zone 6 PRV System** | | | | | | | | | |
| Zone 4 - 1549 | 516 | 0.74 | 2.14 | T-4 (0.64 MG)<br>T-4A (1.50 MG) | 0.74 | 0.56 | 0.63 | 1.93 | **0.21** |
| Zone 5 & 6 Consolidation | 464 | 0.67 | 0.50 | T-5 (0.50 MG) | 0.67 | 0.50 | 0.63 | 1.80 | **-1.30** |

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5/11/2022

Notes:

1. Lyons Canyon Development not included in analysis due to planned on-site storage.
2. Maximum Day Demands extracted from 2017 Newhall WSMP model.
3. Operational Requirements = Maximum Day Demand.
4. Emergency Requirements = 0.75 x Maximum Day Demand.
5. Fire Protection Requirements = 3,500 gpm x 3 Hours (Commercial), 1,250 gpm x 2 Hours (Residential).