Appendix A. Basis of Design Report

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Recycled Water Conveyance Project

Basis of Design Report

DRAFT / May 2024

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SECTION 1 INTRODUCTION

The City of Soledad (City) retained Carollo Engineers, Inc. (Carollo) to develop preliminary and final design documents for the Recycled Water Conveyance Project (Project). This Basis of Design Report (BODR) presents information on existing site conditions, existing and proposed system components, design criteria, and includes technical and engineering decisions to be used for the preparation of the final design documents for the Project.

1.1 Background

The Recycled Water Conveyance Project is part of the City's multi-phase project to provide Title 22 recycled water from the City's Water Reclamation Facility (WRF) to various schools and parks throughout the city. The multi-phase project includes:

- Phase 1 (completed in 2010): Design and construction of a new 5.5 MGD water reclamation facility (WRF) and approximately 10,200 linear feet (LF) of 8-inch diameter recycled water transmission pipeline.
- Phase 2 (completed in 2018): Design and construction of approximately 3,800 LF of 12-inch diameter recycled water transmission pipeline to connect all the existing Phase 1 8-inch pipeline.
- Phase 3 (Project): Design and construction of a city-wide distribution system to irrigated landscaped areas within twenty City's parks and schools. Details of the required facilities are provided below in Section 1.2.
- Phase 4 (Future): New transmission pipeline to provide recycled water to the California Department of Corrections and Rehabilitation (CDCR) facilities within an Incorporated City "Island" 3 miles north of the City.

The existing facilities are shown on Figure 1.1. The pipeline constructed as part of Phase 1 and 2 will be referred to as the transmission pipeline for this report. The Project pipelines to be constructed within the City, as part of Phase 3, will be referred to as the distribution system.

The WRF is owned and operated by the City and treats wastewater from the City and CDCR facilities. It produces disinfected, tertiary treated effluent that meets Title 22, Division 4, Chapter 3, California Code of Regulations (CCR) for recycled water. It is operating around 2.45 MGD average daily flow and the effluent is currently being discharged to rapid infiltration basins adjacent to the WRF for aquifer recharge. The current discharge permit limits recharge to 4.3 MGD with the remaining 1.2 MGD of peak flow capacity designated for non-potable reuse.

Figure 1.1 Existing Facilities

1.2 Project Description

The Project will provide recycled water to the following parks and schools within the City:

- Lum Memorial Park
- Peverini Park
- Santa Barbara Park
- San Antonio Park
- Jack Franscioni Elementary

- Toledo Park (under development)
- Blas Santana Park
- Soledad High School
- Rose Ferrero Elementary
- Frank Ledesma Elementary
- Veterans Park
- Joe O. Ledesma Park
- Main Street Middle School
- Albert Bill Ramus Park
- Little League Park
- Jesse Gallardo Park
- San Vicente/Gabilan Elementary (one service connection)
- Orchard Lane Park
- Aurelio N. Ramirez Park
- Vosti Park

These City parks and schools are currently being served by potable water and the Project will convert or replace the existing on-site irrigation systems. Based on the results and recommendations of the hydraulic modeling discussed in Section 4, the major Project components are listed below and depicted on Figure 1.2.

- Recycled water pump station at the City's WRF
- Approximately 4,000 feet of recycled water transmission pipeline from WRF to Front Street
- Approximately 22,100 feet of recycled water distribution pipelines ranging from 4- to 8-inches in diameter
- Conversion or replacement of existing on-site irrigation systems to meet recycled water standards.

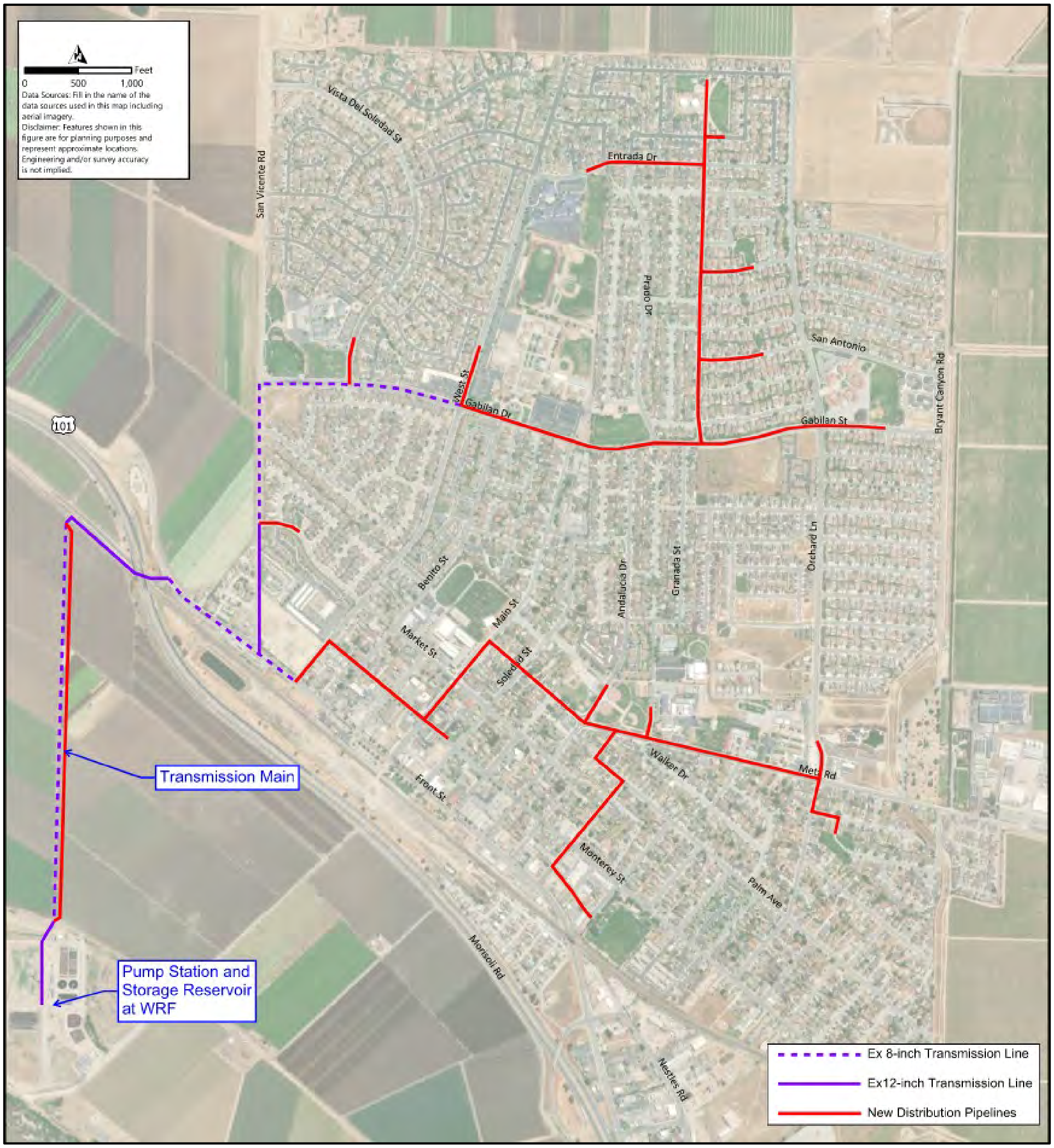

Figure 2.2 Project Map

1.3 Grant Funding Requirements

The Project is being funded by the Department of Water Resources (DWR) under the Urban Community Drought Relief (UCDR) Grant and is subjected to the terms and conditions set forth in the Grant Agreement between the State of California (DWR) and City of Soledad, Agreement No. 4600015016, UCDR Grant. The terms of the Grant Agreement began on July 1, 2022, and will end three (3) years following the final payment, with all work to be completed by December 4, 2025, unless otherwise amended.

As stated in the Grant Agreement, Exhibit A, the Project will replace, at a minimum, 165 acre-feet per year of groundwater pumping with recycled water to offset the use of potable water to irrigate sports fields and reduce groundwater use. This quantity of potable water offset must be met to receive the full grant funding.

1.4 Title 22 Report

The State of California Water Recycling Criteria (Title 22 Section 60323) requires an engineering report (Title 22 Report), approved by the State Water Resources Control Board – Division of Drinking Water (DDW), for all recycled water projects. The Title 22 Report must be submitted to the applicable California Regional Water Quality Control Board (Regional Board) and DDW before recycled water projects are implemented.

Harris & Associates (Harris) recently prepared a Title 22 Report for the Recycled Water Irrigation Retrofit for Veterans Park Project for the City. The City had plans to retrofit the existing irrigation system at Veterans Park, separately from the Project, to convert it from potable water use to recycled water. However, this Veterans Park conversion will be incorporated into this Project.

The Title 22 Report by Harris, which is currently being reviewed by DDW, and after review will be amended by Carollo to include the other nineteen parks and schools to be served by the Project.

1.5 Project Stakeholders

The following are stakeholders that will require close coordination during final design:

- City of Soledad
- Soledad Unified School District
- California Regional Water Quality Control Board (Regional Board)
- State Water Resources Control Board – Division of Drinking Water (DDW)
- Division of State Architect

1.6 Previous Studies

Prior to preparation of the BODR, the following reports were prepared by others for the City:

- City of Soledad Recycled Water Pipeline Project Conceptual Design and Probable Cost Estimate, prepared by Norris Associates June 2012 (Norris Report)
- Conceptual Design and Opinion of Probably Construction Cost for the City of Soledad Wastewater Effluent Reuse Distribution System, prepared by Mark Miller & Associates Civil Engineering April 26, 2015 (2015 Miller Report)
- City of Soledad Reclaimed Wastewater Transmission Pipeline Preliminary Design Report, prepared by Harris & Associates October 2015 (2015 Harris Report)
- City of Soledad Reclaimed Water Distribution Facilities Planning Report, prepared by Harris & Associates September 2018 (2018 Harris Report)

- 2022 Update to the Conceptual Design and Opinion of Probably Construction Cost for the City of Soledad Wastewater Effluent Reuse Distribution System, prepared by Mark Miller & Associates Civil Engineering July 2023 (2023 Miller Report)

SECTION 2 COLLECTION AND REVIEW OF DATA

2.1 Data/Records Provided by the City

Data provided by the City for this Project includes:

- Record drawings and specifications of City of Soledad Wastewater Treatment Plant – 5.5 MGD Upgrade and Expansion Project (2007)
- Record drawings of Reclaimed Wastewater Transmission Pipeline Project (2018)
- Record drawings or sketches of City parks landscaping and irrigation systems
- Record drawings for schools provided by Soledad Unified School District
- Existing Reclaimed Water Line Exhibit prepared by Harris & Associates (2016)
- GIS files of the City's water, sewer, and stormwater facilities
- 2005 Water Master Plan
- 2023 Pavement Management Plan Report
- 100% design plans for WRF Pump Station Improvements and RW Distribution System Improvements prepared by Harris & Associates (2024)
- Bid set plans for Veterans Park RW Irrigation Retrofit Project prepared by Wallace Group (2024)
- Water pressure readings at each park and school connection points
- Water sample analysis results

2.2 Survey and Mapping

Ruggeri-Jensen-Azar (RJA) will obtain aerial photomapping to develop topographic mapping for project pipeline routes and sites for the pump station and storage reservoir. Mapping will be created according to National Map Accuracy Standards.

2.2.1 Basis of Control

The horizontal and vertical survey is based on the North American Datum of 1983 (NAD83), California Coordinate System Zone 4, and North American Vertical Datum of 1988 (NAVD88), respectively.

2.2.2 Supplemental Ground Survey

RJA will perform field supplemental ground survey within the project boundary to obtain horizontal and vertical locations of selected visible aboveground features, manholes, and valves for location and elevation. The information will be included in a base map developed for the project.

2.2.3 Record of Right-of-Way

Most of the distribution pipelines will be constructed within public right-of-way. Right-of-way information is compiled from record data, including tract maps, parcel maps, records of survey, and deeds along the project streets. Horizontal and vertical control will be established for the data and right-of-way will be provided in the project base map. Title reports and boundary surveys were not conducted to establish right-of-way lines because the available right-of-way information is anticipated to be sufficient for establishing property lines.

2.2.4 Existing Utility Research

Existing utility research was conducted by contacting utility companies and the City obtain available information about existing, proposed, and abandoned facilities within the Project area. Available existing utility information is incorporated into the Project base map.

2.3 Geotechnical Investigation

Crawford and Associates, Inc., performed geotechnical investigations and analysis in support of the design and construction of the Project. The draft report is provided in Appendix A.

2.4 Corrosion Investigation

Carollo performed a corrosion investigation to evaluate existing soil conditions for cathodic protection design of the Project.. The draft report is provided in Appendix B.

2.5 ADA Curb Ramp Evaluation

Wallace Group conducted an ADA Curb ramp evaluation adjacent to the Project pipelines in conformance with California Department of Transportation evaluation standards. The draft report is provided in Appendix C.

SECTION 3 SYSTEM DEMANDS

The recycled water system facilities will be sized based on the peak demand over the 8-hour irrigation window. The following discusses the current and future recycled water demands.

3.1 Project Recycled Water Demands

Table 3.1 provides the projected irrigation demands from the 2023 Miller Report. These demands were used in hydraulic modelling to evaluate the alternatives considered for the Project and will be refined during the final design of park and school irrigation systems. The hydraulic model will also be updated during that time to refine the pump station and pipeline sizes.

Table 3.1 Estimated Daily Peak Flow Rate

No.	Location	Daily Peak Flow Rate (gpm)
1	Lum Memorial Park	45
2	Peverini Park	50
3	Santa Barbara Park	44
4	San Antonio Park	47
5	Jack Franscioni Elementry	50

6	Toledo Park (Future)	65
7	Blas Santana Park	72
8	Soledad High School	175
9	Rose Ferrero Elementry	55
10	Frank Ledesma Elementry	48
11	Veterans Park	69
12	Joe Ledesma Park	62
13	Main Street Middle School	120
14	Bill Ramus Park	46
15	Little League Park	50
16	Jesse Gallardo Park	69
17	San Vicente/Gabilan Elementry	79
18	Orchard Park	137
19	Ramirez Park	51
20	Vosti Park	110

3.2 Future Recycled Water Demands

The City has also indicated potential future recycled water demands, which may include Miramonte development (north of Soledad), agricultural, or the Salinas Valley State Prison. The City has a preference to upsize strategic pipelines to account for the future demands, which is further discussed in Section 7. However, these potential future demands are currently unknown and are not part of the recycled water system design.

SECTION 4 HYDRAULIC MODELLING

4.1 Model Development

A hydraulic model was created in InfoWater Pro to assess several alternate recycled water conveyance scenarios and determine preliminary facility sizing for comparing alternative costs. InfoWater Pro, by Innovyze, is a comprehensive hydraulic and dynamic water quality modelling software application that utilizes the EPANET computational engine, which is widely used throughout the industry. InfoWater Pro is run directly within the ArcGIS Pro environment, and therefore offers an enhanced graphical user interface (GUI) and a variety of additional features and functionality.

The following provides an overview of the elements of a hydraulic water model and the required input parameters associated with each:

- **Junction:** Locations where pipe sizes change, pipelines intersect, or where recycled water demands are applied are represented by junctions in the hydraulic model. Required inputs for junctions include service elevation and water demands.
- **Pipes:** Water mains are represented as pipes in the hydraulic model. Input parameters for pipes include length, roughness (Hazen Williams C factor), diameter, and whether or not the pipe is a check valve (i.e., does not allow reverse flow).

- **Storage:**
  - Cylindrical and Variable Area Tanks: Water tanks are included in the hydraulic model as either cylindrical tanks or variable area tanks, depending on the complexity of the tank geometry. Required input parameters for cylindrical tanks include bottom elevation, maximum level, initial level, and diameter. Required input parameters for variable area tanks include bottom elevation, maximum level, initial level, and a curve that varies the cross-sectional area of the tank depending on the tank level (developed as appropriate based on As-built drawings).
  - Fixed Head Reservoirs: For water distribution system modelling, fixed head reservoirs are used to represent a water source with a constant hydraulic grade line (HGL). Typically, fixed head reservoirs are used to represent water sources, such as groundwater or other sources of water.
- **Pumps:** Pumps are included in the hydraulic model as links. Input parameters for pumps include pump curves and operational controls.
- **Valves:** Certain types of valves, such as altitude valves and pressure reducing valves, are represented explicitly as valves in the hydraulic model. Required input parameters for valves include diameter, operational controls, and other settings or headloss curves depending on the type of valve.
- **Demands:** Recycled water demands are applied at specific junctions in the hydraulic model. Up to ten different demands can be assigned at a particular junction. Demands can also include a pattern.
- **Patterns:** Diurnal patterns, also known as diurnal curves, are used to represent the hourly variation in water demand and are used to temporally allocate the demands to the junctions in an extended period simulation (EPS) model scenario. The pattern for recycled water demand includes demands during nighttime hours of 10 PM to 6 AM.

The City's recycled water system hydraulic model combines information on the physical and operational characteristics of any existing facilities in the system as well as planned facilities and performs calculations to solve a series of mathematical equations to simulate flows in pipes.

The model building process consisted of seven steps, as described below:

- **Step 1:** A new project for the City's recycled water model was created in InfoWater Pro.
- **Step 2:** Existing facilities were inserted into the model, and planned facilities including all planned recycled water customers were included based on assumptions for size and location provided by the City.
- **Step 3:** Junctions, or areas where two pipelines meet in the model, are required at every pipe intersection and dead end, as well as other areas in the model where demands are applied. InfoWater Pro's "Append Nodes" feature reviews the model for missing junctions and automatically adds them.
- **Step 4:** Elevations were applied to each modeled junction using Google Earth Pro and an assumed depth of 4-feet below the surface.
- **Step 5:** The hydraulic model contains certain run parameters at the beginning of the project. These include run duration, time steps, reporting parameters, output units, and other technical parameters. Once the run parameters were established, the model was debugged to ensure that it ran without errors or warnings.
- **Step 6:** Unique scenarios were created for each alternative that was assessed including alternative pipeline placement and sizing, pump stations, valves, and tank locations.

- **Step 7:** Operational information such as pump controls and run parameters were input into the model manually based on each alternative configuration.

4.2 Alternate Scenarios

Five alternatives were evaluated for the Project, which are described below.

4.2.1 Scenario 1

Scenario 1 utilizes the layout provided in the 2023 Miller Report with a pump station located at the WRF and a booster pump station and storage tank at Toledo Park. The pump station would fill the storage tank during the non-irrigation hours and the booster station would be used to serve the parks and schools at night during the restricted 8-hour irrigation window between 10 PM and 6 AM (8 hours). Figure 4.1 shows a layout of the system for this scenario.

To provide reliability and redundancy within the system, the pump station and booster station would be sized to meet the system's peak hour demand independently in case either facility is taken offline for repair and maintenance. In addition, a potable backup water supply would be provided to prevent system shutdowns in the event of a long-term water quality issue or long-term pump station failure at the WRF.

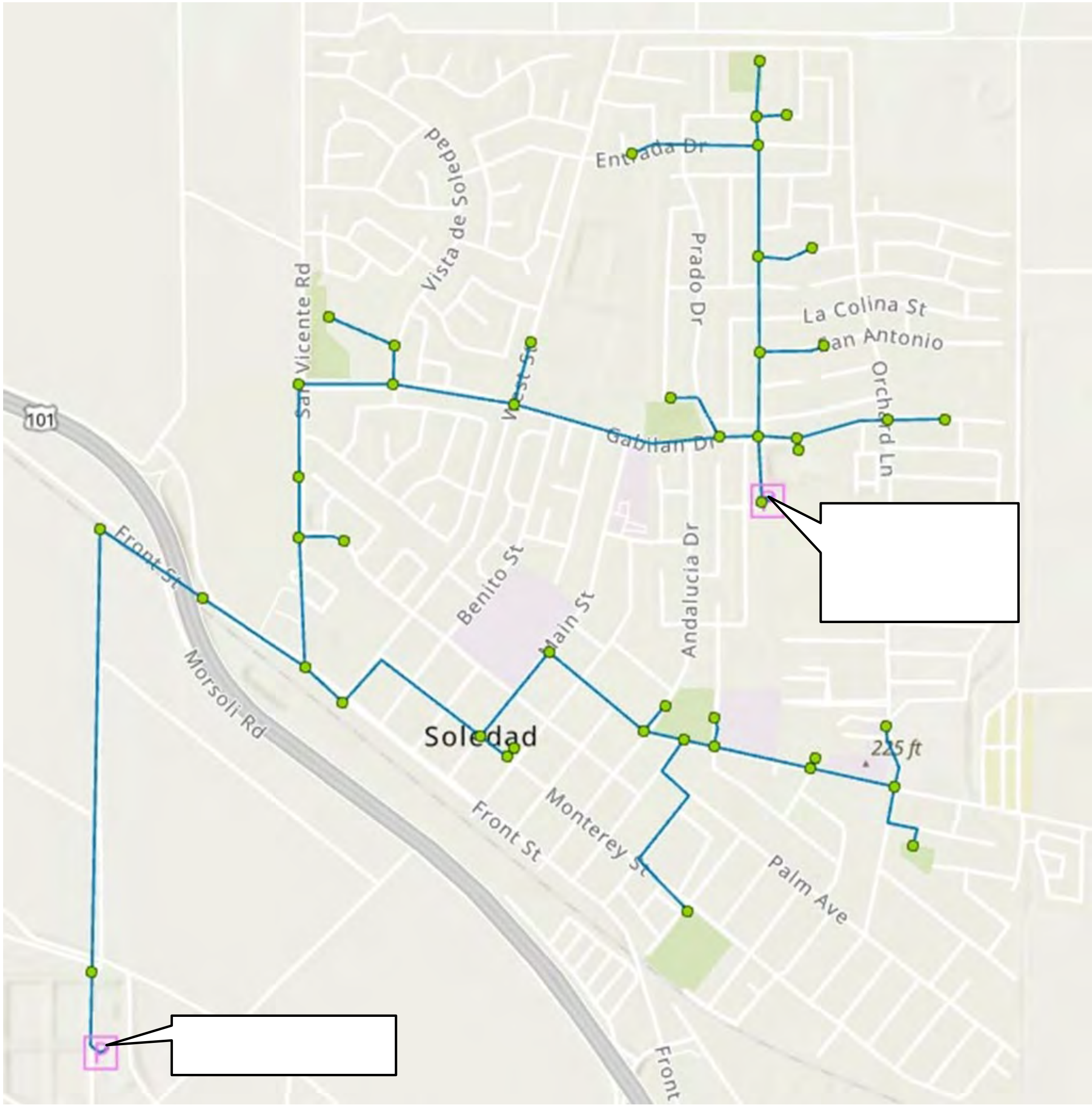

Figure 4.1 Scenario 1 System Layout

4.2.2 Scenario 2

The second scenario, as shown on Figure 4.2, is similar to Scenario 1; however, the booster station and storage tank are located at Peverini Park which is at a higher elevation in the system.

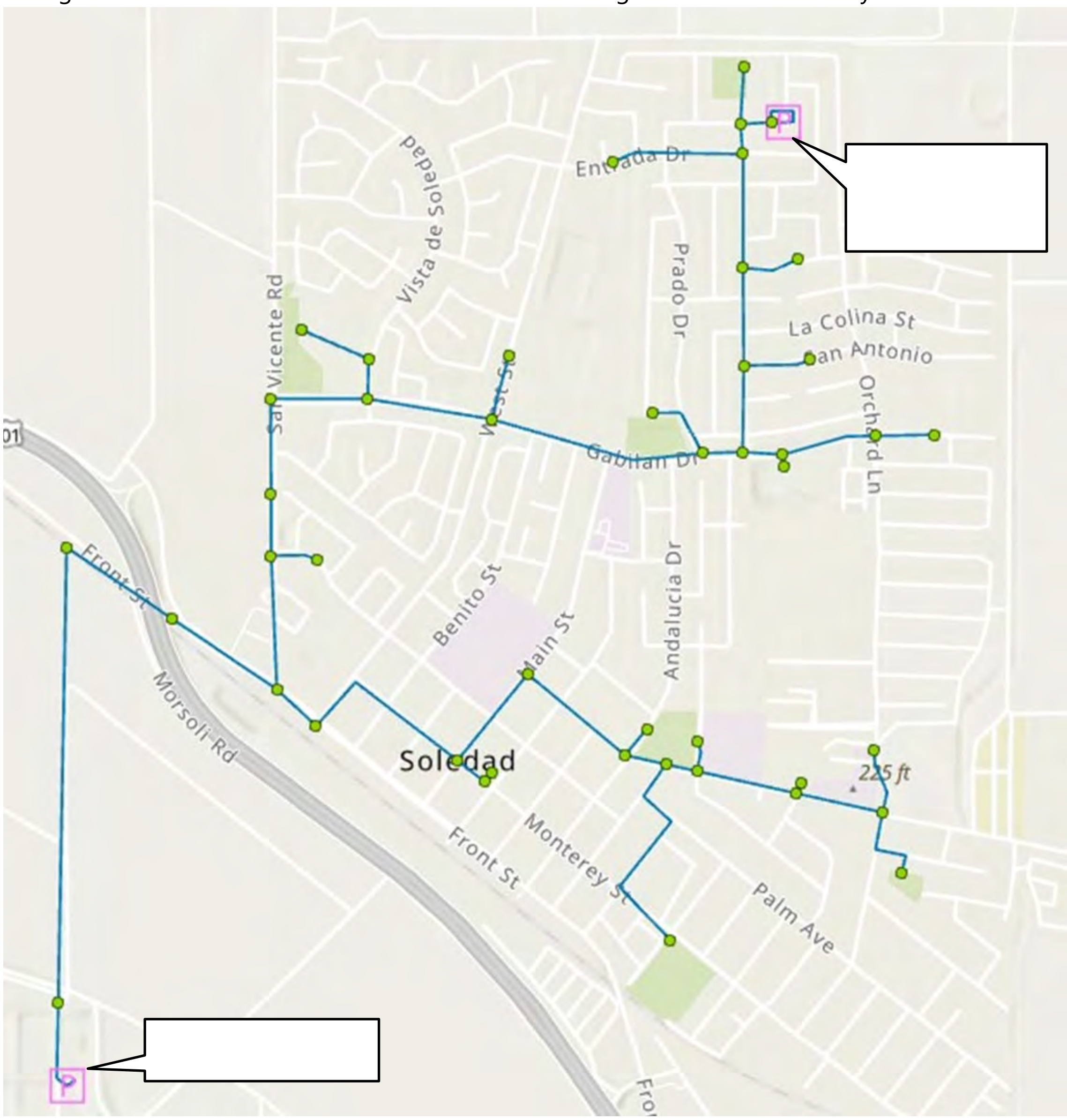

Figure 4.2 Scenario 2 System Layout

4.2.3 Scenario 3

Scenario 3 focused on locating the storage tank north of the system adjacent to City's potable water reservoirs, Reservoirs B1 and B2. The pipeline alignment to and from the storage tank would run along Orchard Lane instead of Toledo Street. A pump station is required at the WRF fill the storage tank during the non-irrigation hours for service from the storage tank during the 8-hour irrigation window. At this higher elevation, the storage reservoir would serve the system by gravity and eliminate the need for a booster station. To provide reliability and redundancy within the system, the pump station would be sized to meet the system's peak hour demand in case the storage tank is taken offline for repair and maintenance. See Figure 4.3 for the layout of the system for Scenario 3.

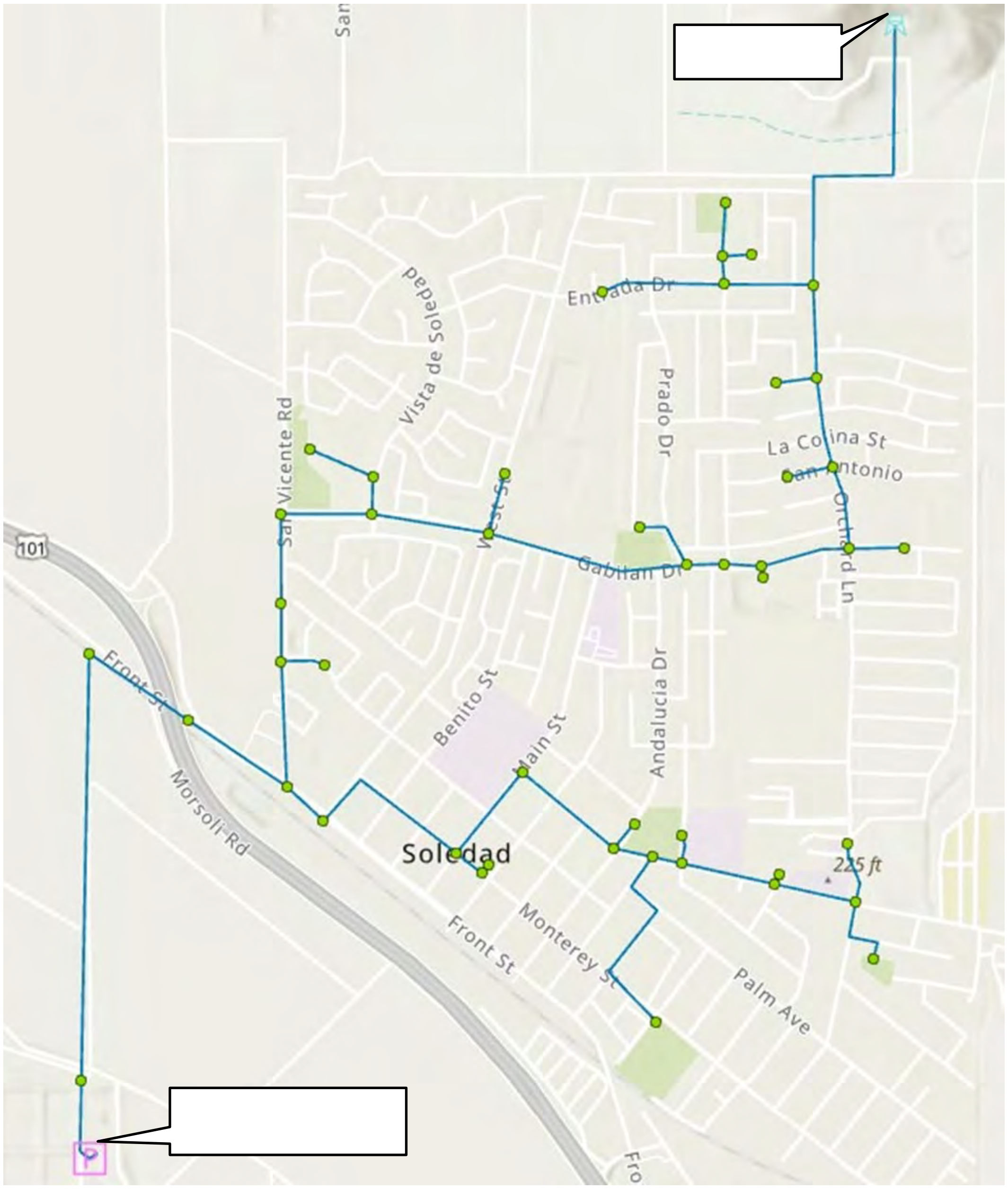

Figure 4.3 Scenario 3 System Layout

4.2.4 Scenario 4

Scenario 4 includes a pump station at the WRF, eliminates the booster station, and locates the storage tank at the WRF with the pump station. The storage tank would store the backup potable water supply in the event of a long-term water quality issue at the WRF. Since potable water is not available at the WRF, a new potable water line would be constructed to provide the backup supply to the storage tank. Figure 4.4 shows a layout of the system for this scenario.

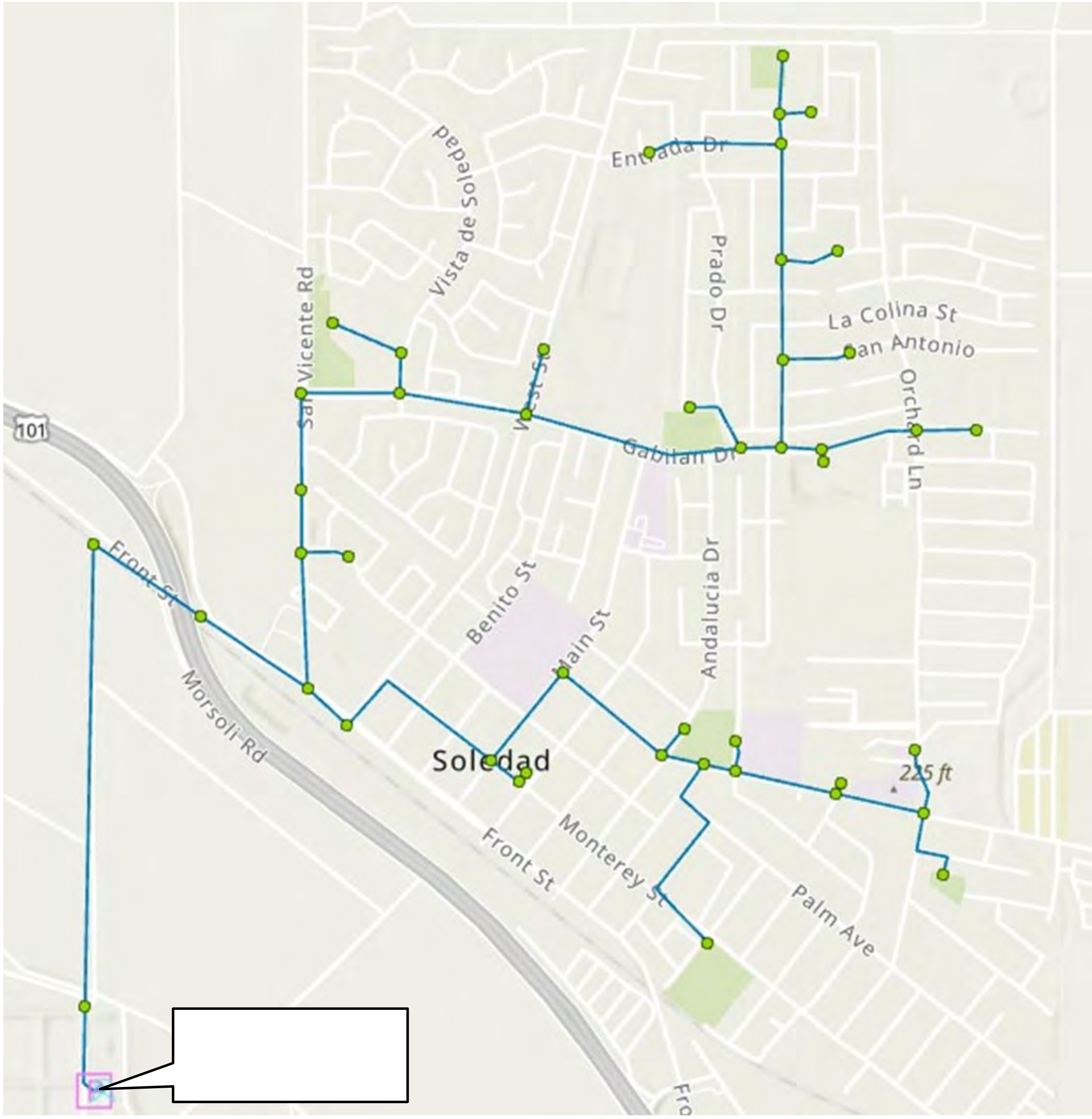

Figure 4.4 Scenario 4 System Layout

4.2.5 Scenario 5

Scenario 5 utilizes an existing elevated tank at Vosti Park with a pump station at the WRF to fill the storage tank and a booster pump station at Vosti Park to serve the parks and schools. Under this configuration, the pump station would only be connected to the Vosti Park storage tank and not be connected to the rest of the system except through the Vosti Park booster station. See Figure 4.5 for a layout of the system for Scenario 5.

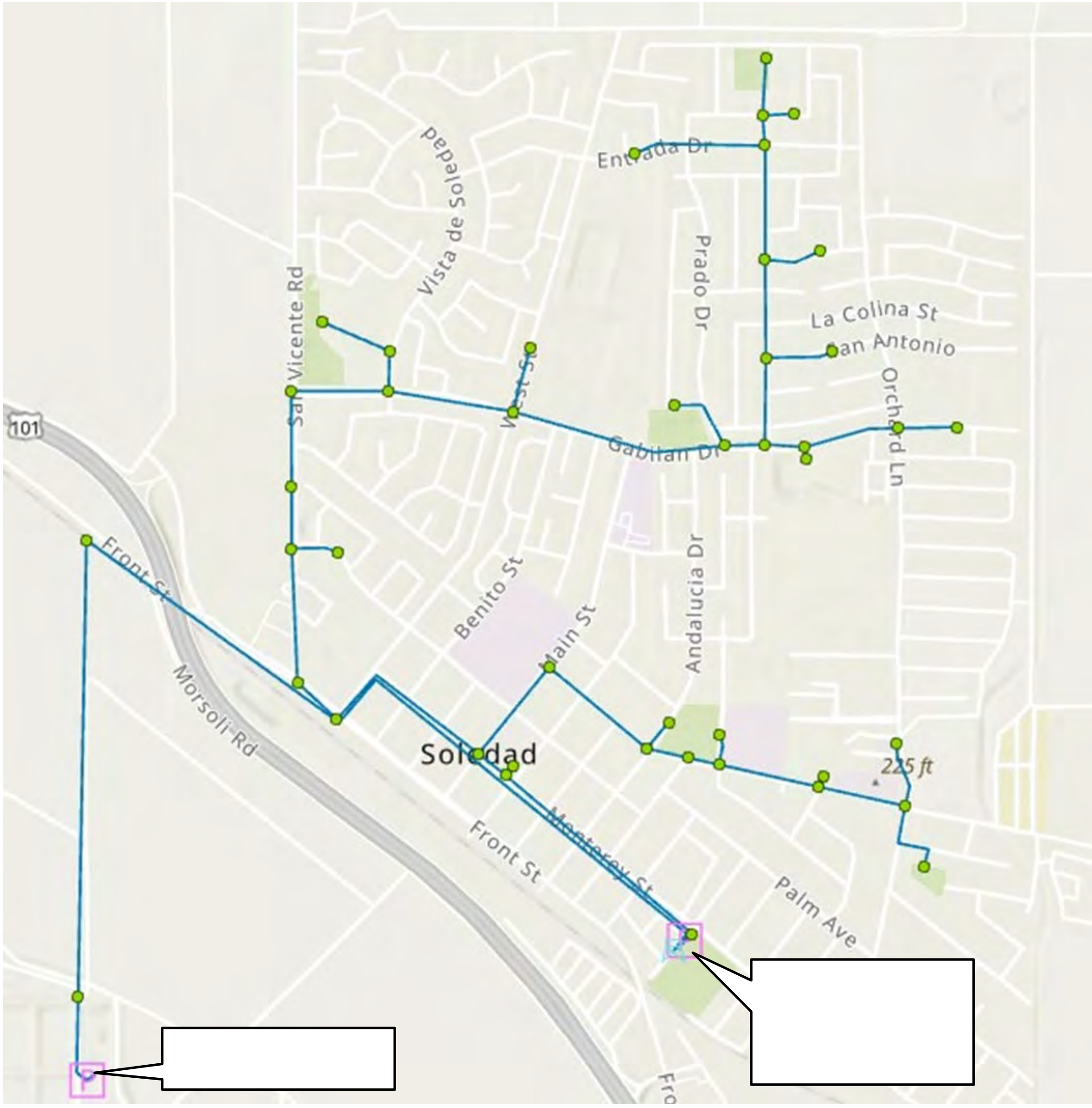

Figure 4.5 Scenario 5 System Layout

4.3 Hydraulic Design Criteria

The alternatives were modelled and compared under several operating conditions, including:

- Normal operations
  - Pump station at WRF operated to fill the storage tank during non-irrigation hours
  - Booster station operated to serve parks and schools during 8-hour irrigation window
- Booster station and storage tank offline
  - Only pump station at the WRF operated to serve parks and schools during 8-hour irrigation window

- Pump station at WRF offline
  - Only booster station operated to serve parks and schools during 8-hour irrigation window
  - Backup potable water supply at storage tank

The hydraulic model was primarily used to determine pump station, booster station, storage tank, and pipeline sizes to compare the different scenarios. To ensure model results were comparable for each scenario, a series of design criteria were used to roughly calibrate the model under each configuration. The design criteria and parameters were as follows:

- Demand at each recycled water site would only be met between the hours of 10 PM and 6 AM.
- Pressure at the demand sites must be above 40 psi.
- Working pressure within the pipeline must be below 200 psi.
- Velocity in the pipelines must not exceed 7 fps.

4.4 Results

Modeling results for each scenario under any applicable operating conditions are shown below.

4.4.1 Scenario 1

Scenario 1 was modelled under three different operating conditions listed above. In addition to the different operating conditions, one additional pipeline configuration was assessed with a pipeline along Orchard Lane to create a loop system when the booster station is operating alone.

4.4.1.1 Normal Operations

The results for normal operations, shown on Figure 4.6, are as follows:

- Pump station sized to 475 gpm at 300 feet TDH
- Booster station is sized to 968 gpm at 200 feet TDH
- Minimum 500,000-gallon storage tank to meet peak demand
- Velocity in the existing 8-inch transmission main is approximately 3 feet per second (fps)

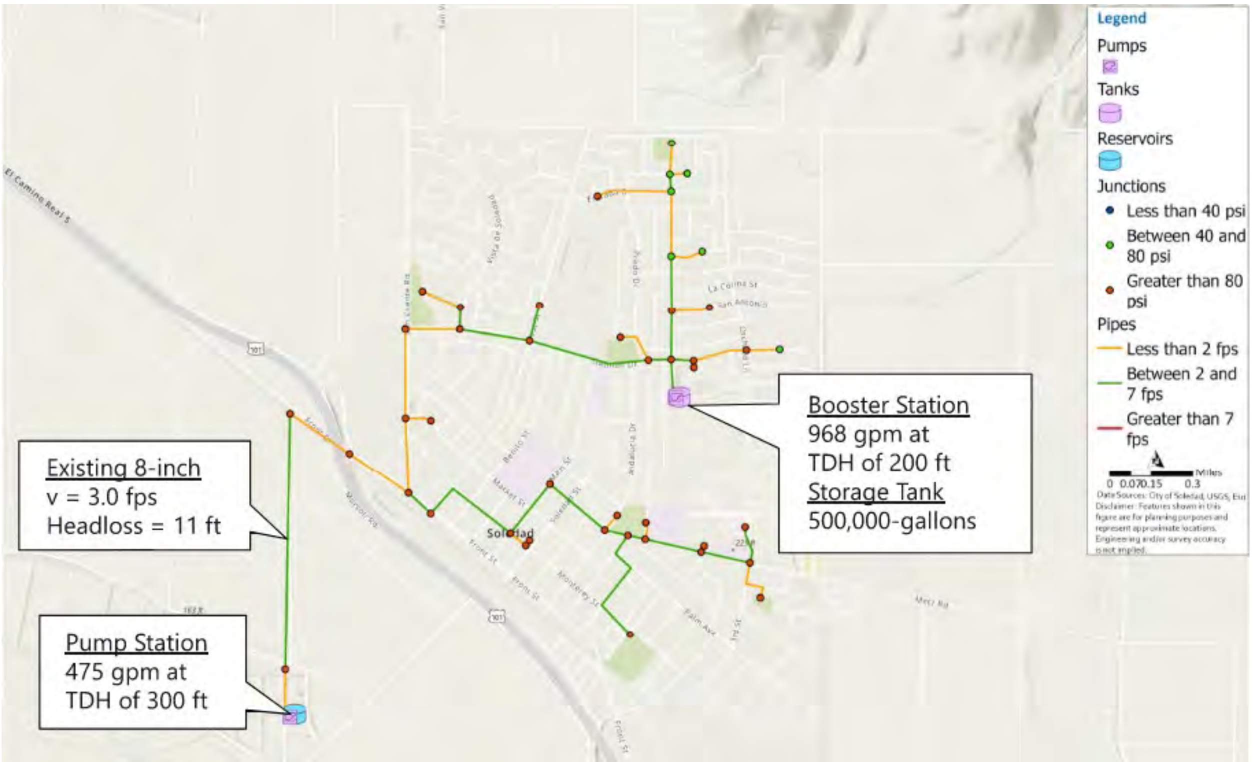

Figure 4.6 Scenario 1 Normal Operations Modeling Results

4.4.1.2 Booster Station and Storage Tank Offline

Figure 4.7 shows the results with the booster station offline and are as follows:

- Pump station sized at 1444 gpm at 350 ft TDH
- Velocity in the existing 8-inch transmission main is approximately 9.2 fps which exceeds the 7 fps maximum velocity criteria

The existing 8-inch transmission main was assumed to be acceptable since this scenario is unlikely to be common operating condition; however, the condition is not ideal because the high velocity creates significant headloss requiring the pump station to use a high level of pumping energy and a larger motor size than would be needed for normal operations.

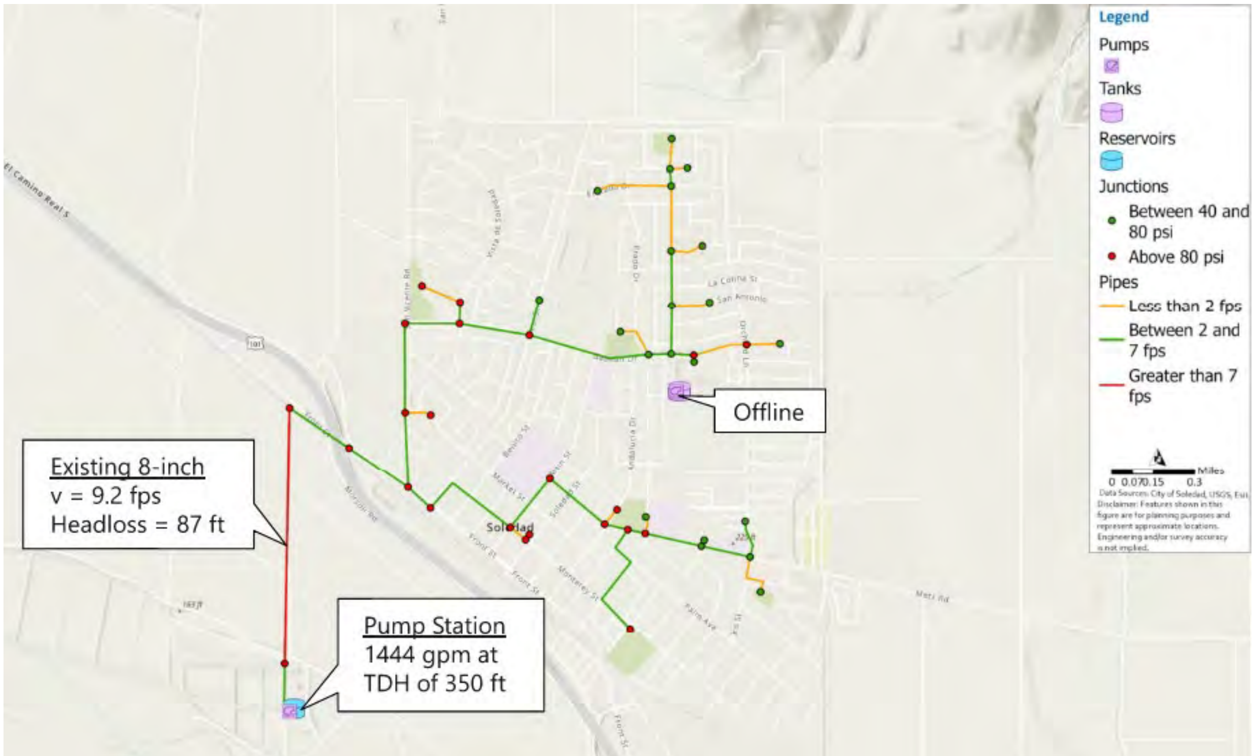

Figure 4.7 Scenario 1 Booster Station and Storage Tank Offline Modeling Results

4.4.1.3 Pump Station at WRF Offline

This operating condition requires a booster station sized at 1444 gpm at 200 feet TDH to meet peak demand. See Figure 4.8.

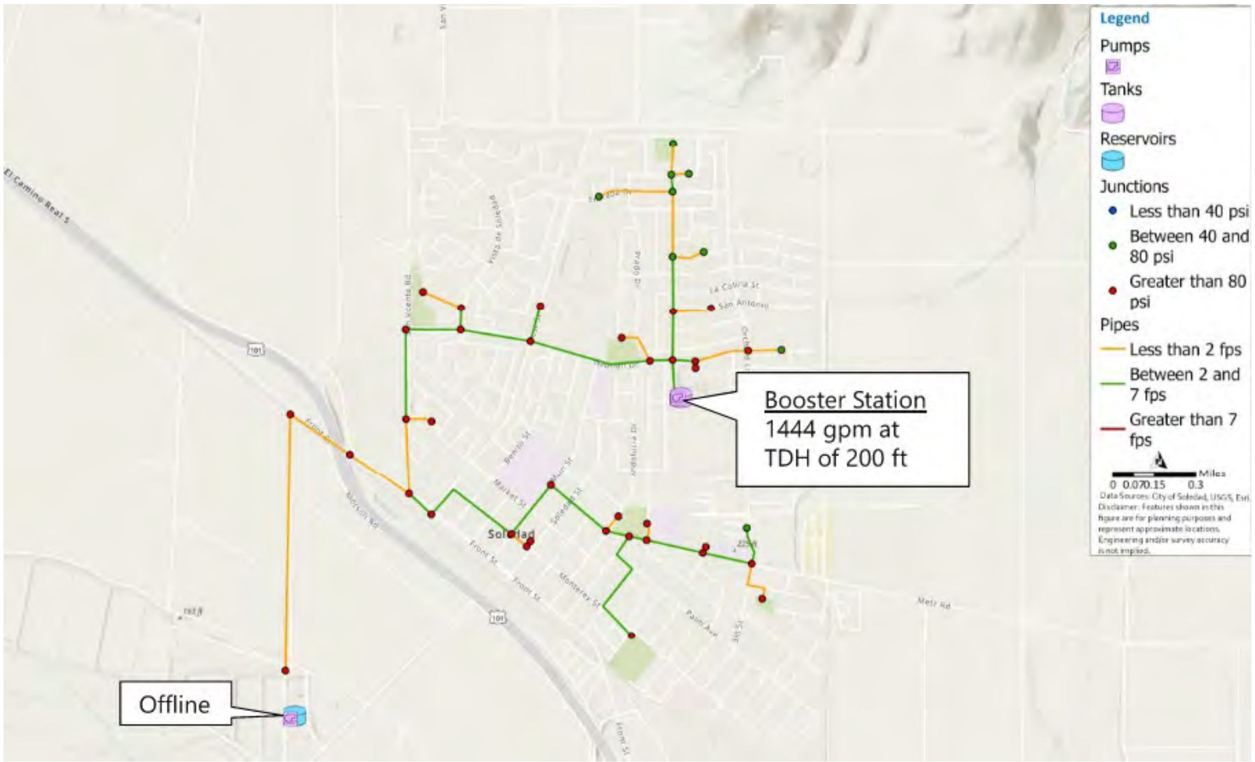

Figure 4.8 Scenario 1 Pump Station at WRF Offline Modeling Results

4.4.1.4 Looped System

A conceptual analysis of creating a loop within the system by adding an additional pipeline on the east side of the system was used to assess potential benefits of this option. It was found that even with a looped system, because so much of the demand is to the north and west of the booster station, the pumps were only able to be downsized by 10 hp. The cost to construct this new pipeline outweighed the potential benefits; therefore, the looped system was not assessed in any further scenarios.

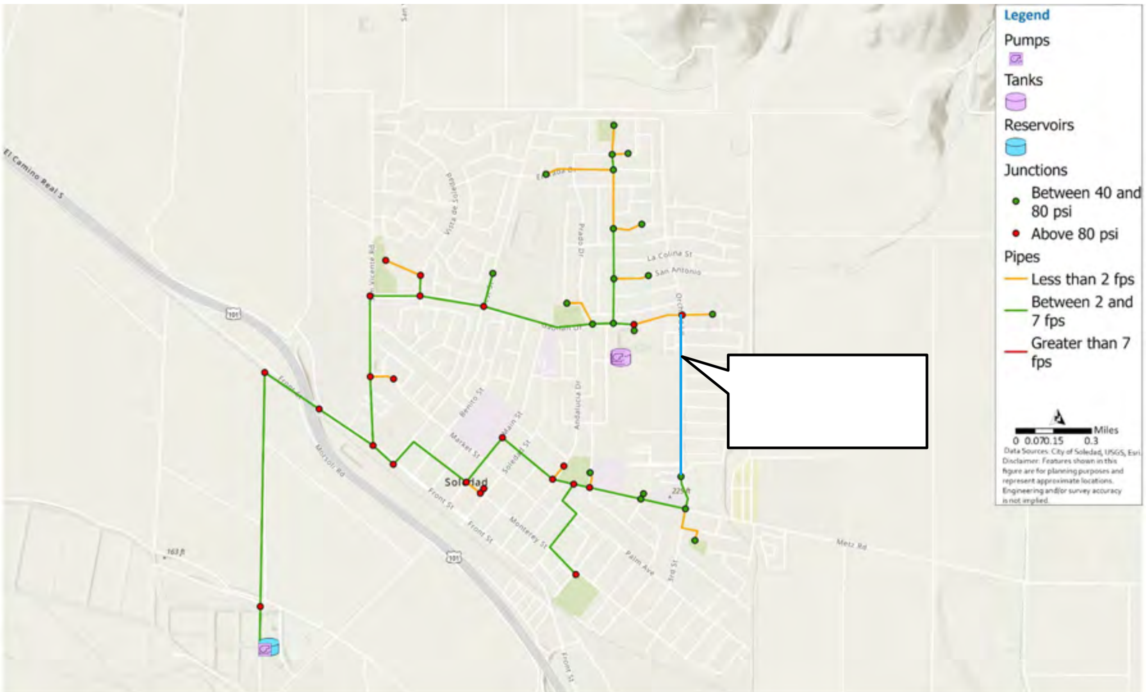

Figure 4.9 Scenario 1 Looped System Modeling Results

4.4.2 Scenario 2

Scenario 2 was modelled under three different operating conditions similar to Scenario 1.

4.4.2.1 Normal Operations

Results with both pump stations operating are shown on Figure 4.10 and are as follows:

- Pump station is sized to 482 gpm at 250 ft TDH
- Booster station at Peverini Park is sized to 960 gpm with 80 feet TDH
- Minimum 500,000-gallon storage tank to meet peak demand
- Velocity in the existing 8-inch transmission main is approximately 3 fps

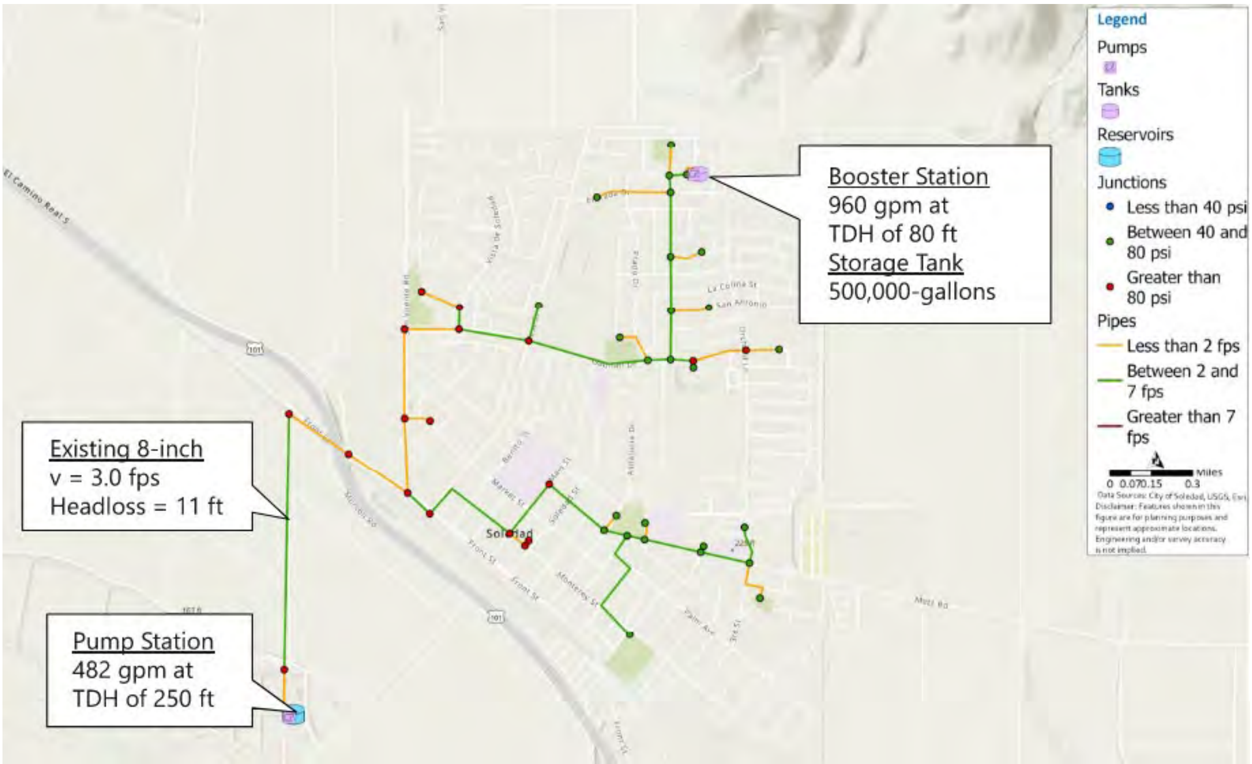

Figure 4.10 Scenario 2 Normal Operations Modeling Results

4.4.2.2 Booster Station and Storage Tank Offline

The results with the pump station operating alone were very similar to the results in Scenario 1 as shown on Figure 4.11. The pump station is sized at 1444 gpm at 350 ft TDH and the velocity in the 8-inch transmission main is approximately 9.2 fps. The existing 8-inch transmission main was assumed to be acceptable since this scenario is unlikely to be common operating condition; however, the condition is not ideal because the high velocity creates significant headloss requiring the pump station to use a high level of pumping energy and a larger motor size than would be needed for normal operations.

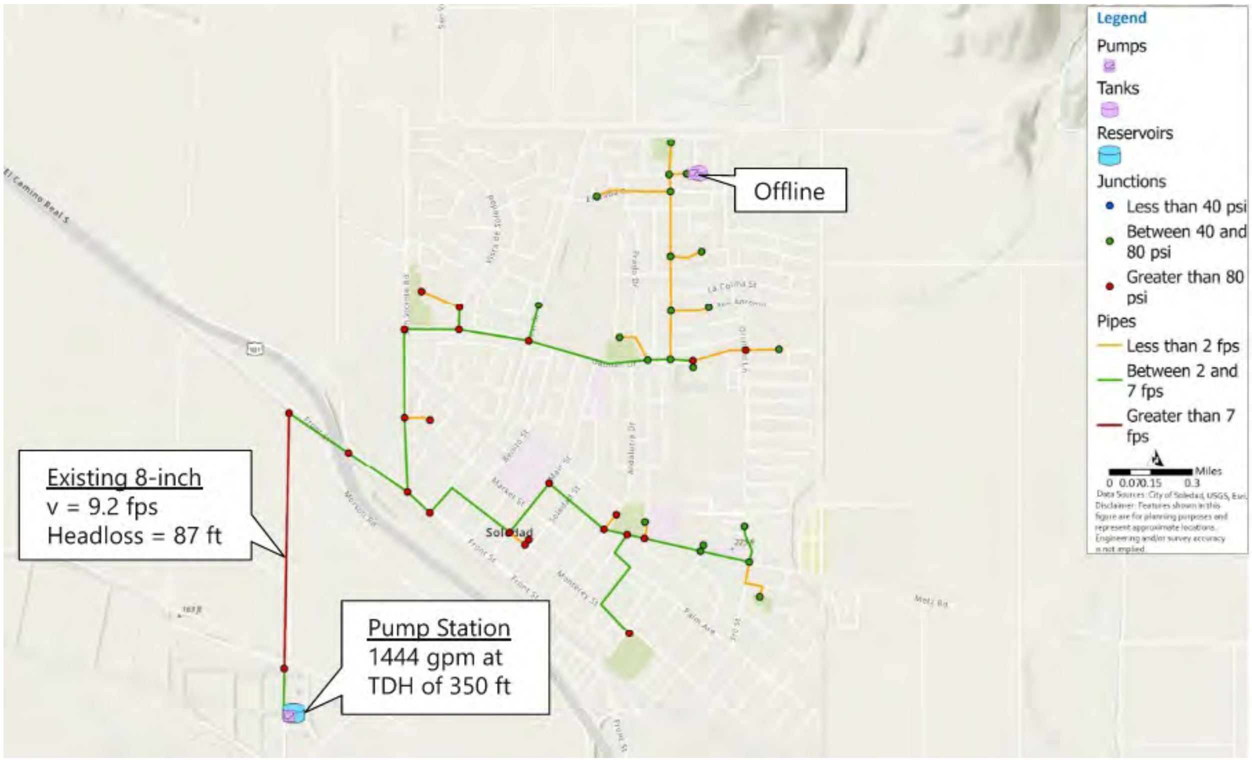

Figure 4.11 Scenario 2 Booster Station and Storage Tank Offline Modeling Results

4.4.2.3 Pump Station at WRF Offline

The booster station operating alone results are very similar to the results with both pump stations operating, except the booster station demands increase to 1444 gpm at 80 feet TDH. The pipelines along Toledo Street, immediately downstream of the booster station would need to be upsized to 12-inch to keep the velocities during peak demand from exceeding the maximum velocity requirements.

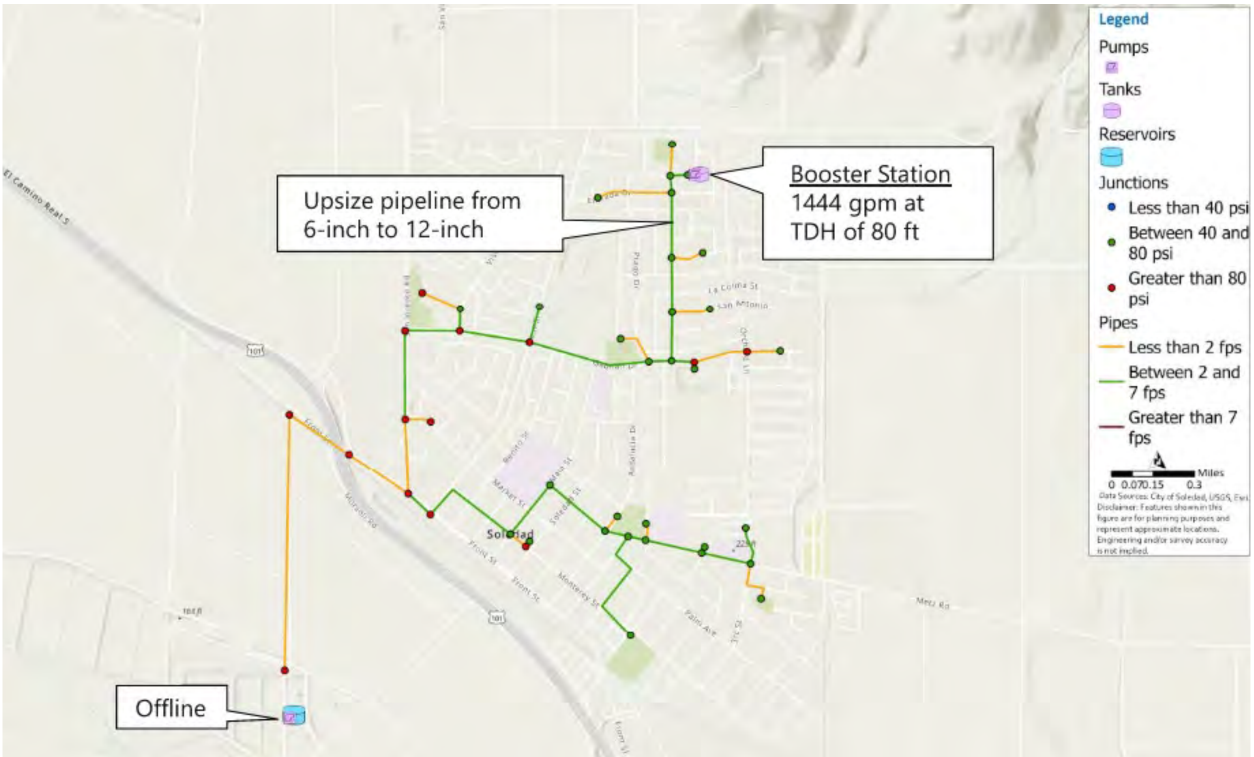

Figure 4.12 Scenario 2 Pump Station at WRF Offline Modeling Results

4.4.3 Scenario 3

Scenario 3 was modelled under three different operating conditions:

- Normal operations – Pump station and elevated tank online
- Elevated tank offline – Pump station operating to serve the system
- Pump station offline – Tank with potable backup water supply to serve the system

4.4.3.1 Normal Operations

Results with both the pump station and elevated tank operating, are shown in on Figure 4.13 and are as follows:

- Pipeline along Orchard Lane, to and from the storage tank, would need to be 12 inches in diameter
- The pipes along Gabilan Drive would need to be upsized to 12-inches to deliver all demand flow from the tank to the rest of the system
- The pump station is sized to deliver 675 gpm at 350 feet TDH to provide a minimum pressure of 40 psi at highest elevation sites
- Minimum 500,000-gallon storage tank to meet peak demand
- Velocity in the existing 8-inch transmission main is approximately 4.3 feet per second (fps)

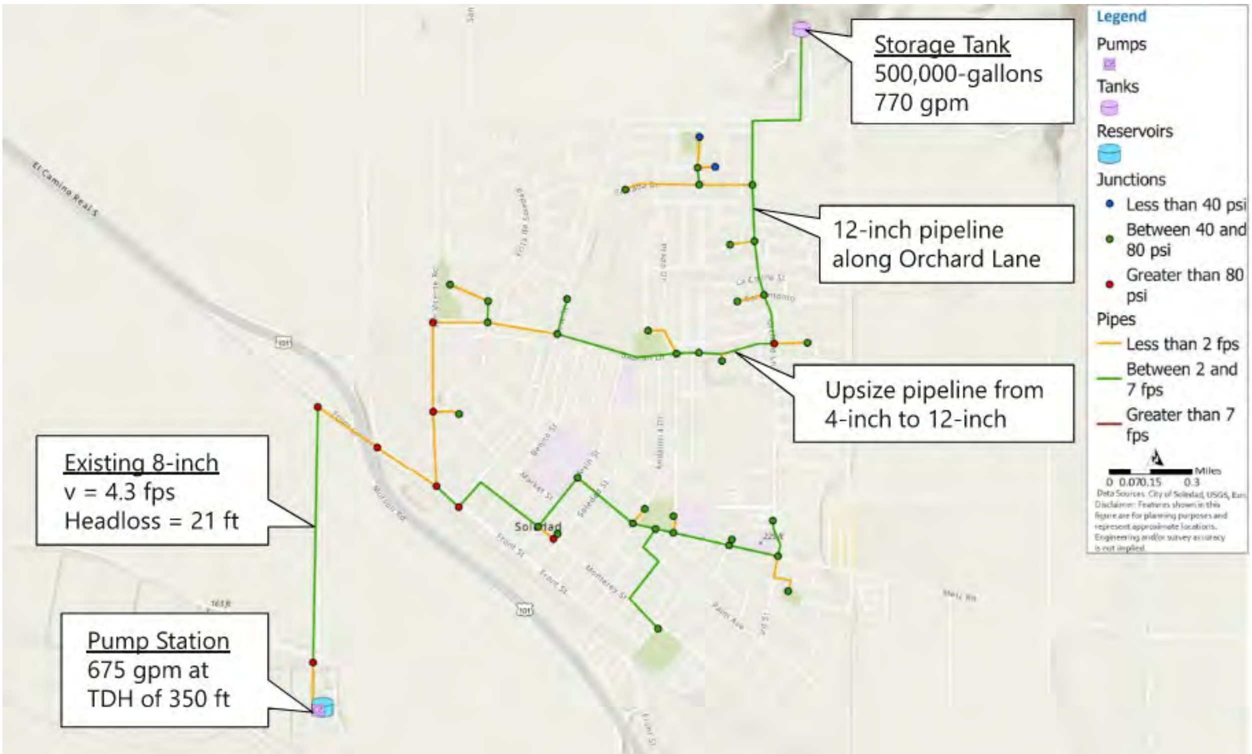

Figure 4.13 Scenario 3 Normal Operations Modeling Results

4.4.3.2 Elevated Tank Offline

The results with the pump station operating alone were very similar to the results under these operating conditions in Scenarios 1 and 2, despite the slight changes to the pipeline layout in the north portion of the system. See Figure 4.14. The pump station is sized at 1444 gpm at 350 ft TDH and the velocity in the existing 8-inch transmission main is 9.2 fps. The existing 8-inch transmission main was assumed to be acceptable since this scenario is unlikely to be common operating condition; however the condition is not ideal because the high velocity creates significant headloss requiring the pump station to use a high level of pumping energy and a larger motor size than would be needed for normal operations.

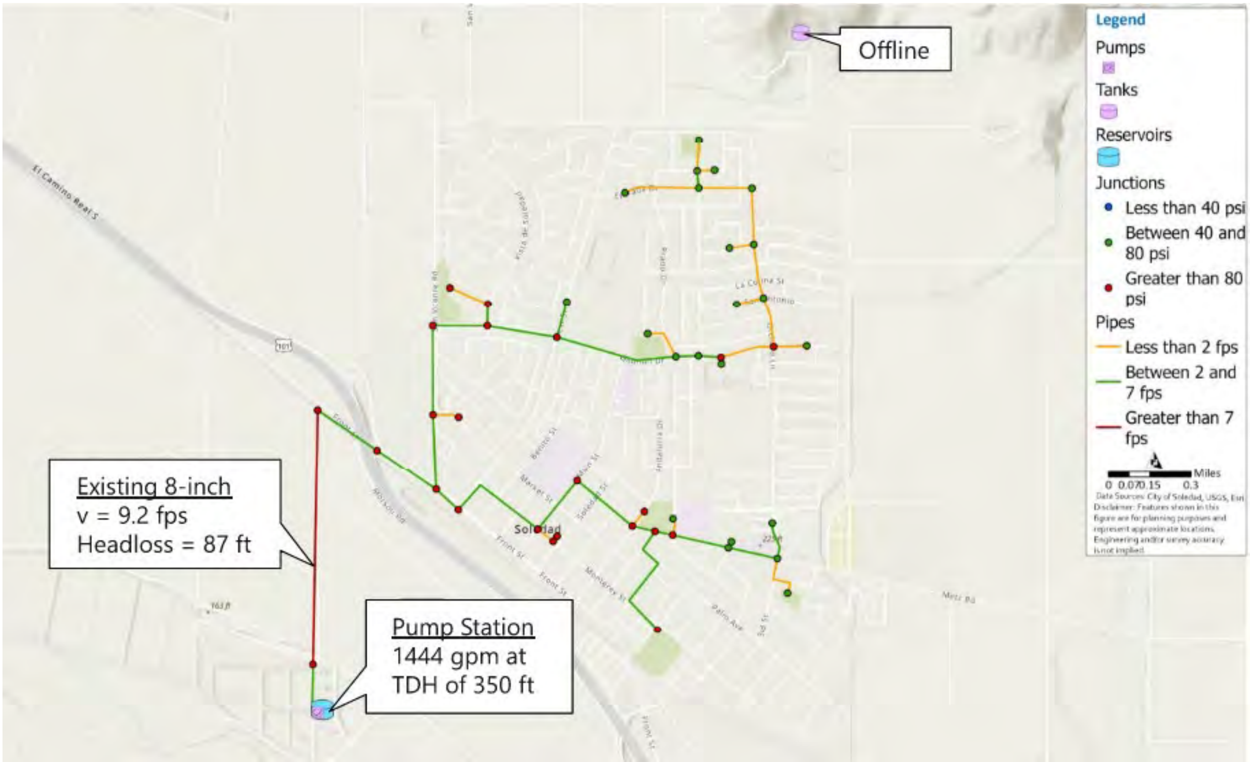

Figure 4.14 Scenario 3 Storage Tank Offline Modeling Results

4.4.3.3 Pump Station Offline

With a potable backup water supply, the elevated tank would be able to serve the entire system and provide the minimum required pressure of 40 psi at each delivery point. Due to the open water system, this scenario provides more moderate pressures in the system. See Figure 4.15.

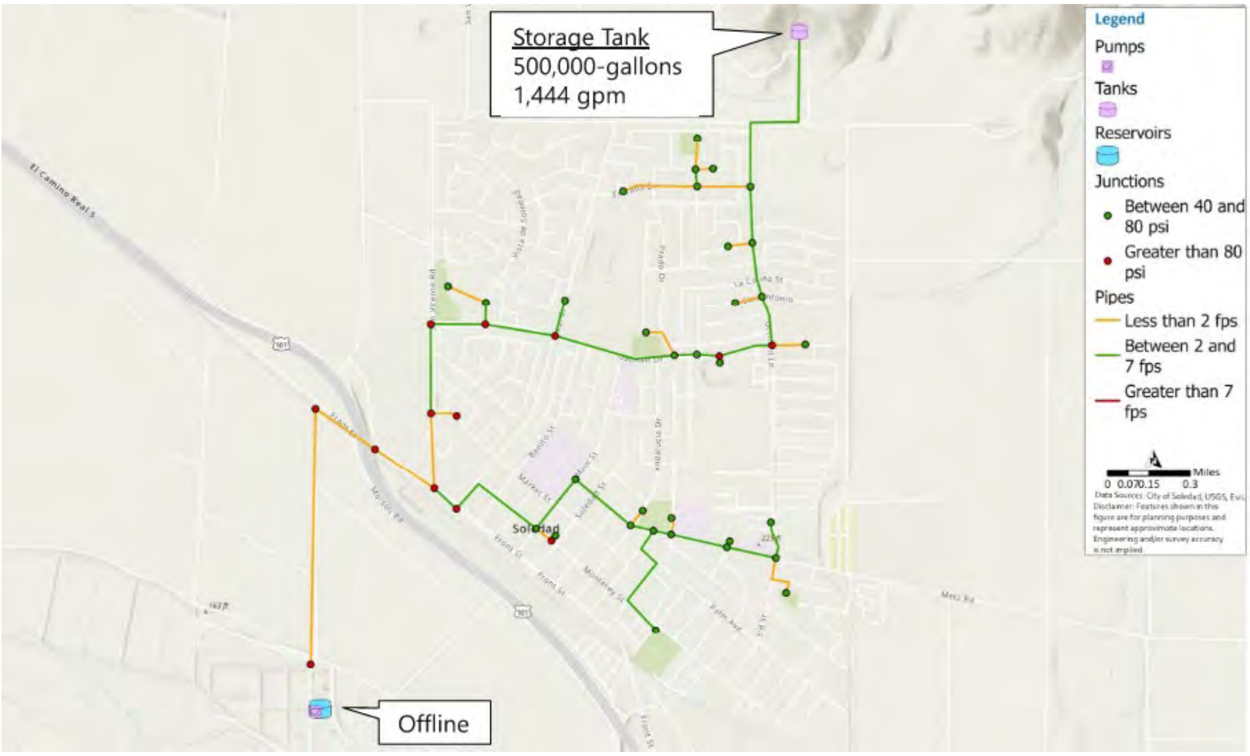

Figure 4.15 Scenario 3 Pump Station Offline Modeling Results

4.4.4 Scenario 4

Scenario 4 was only modelled under one operating condition, as the tank and pump station both being located at the WRF requires the pump station to be online for flow to be delivered to the system. The existing 8-inch transmission main would be used to deliver potable water to the WRF for emergency backup; therefore, a new transmission main is required to deliver recycled water to the distribution system from the WRF. Results are shown in on Figure 4.16 and are as follows:

- A 12-inch pipe is required for the new transmission main as all 1444 gpm of flow would need to be moved through that pipe.
- Velocity in the new 12-inch transmission main is approximately 4.5 feet per second (fps)
- The pump station is sized to deliver all the flow from the WRF or the storage tank, at 1444 gpm and 275 feet TDH
- The tank was assumed to be 360,000 gallons

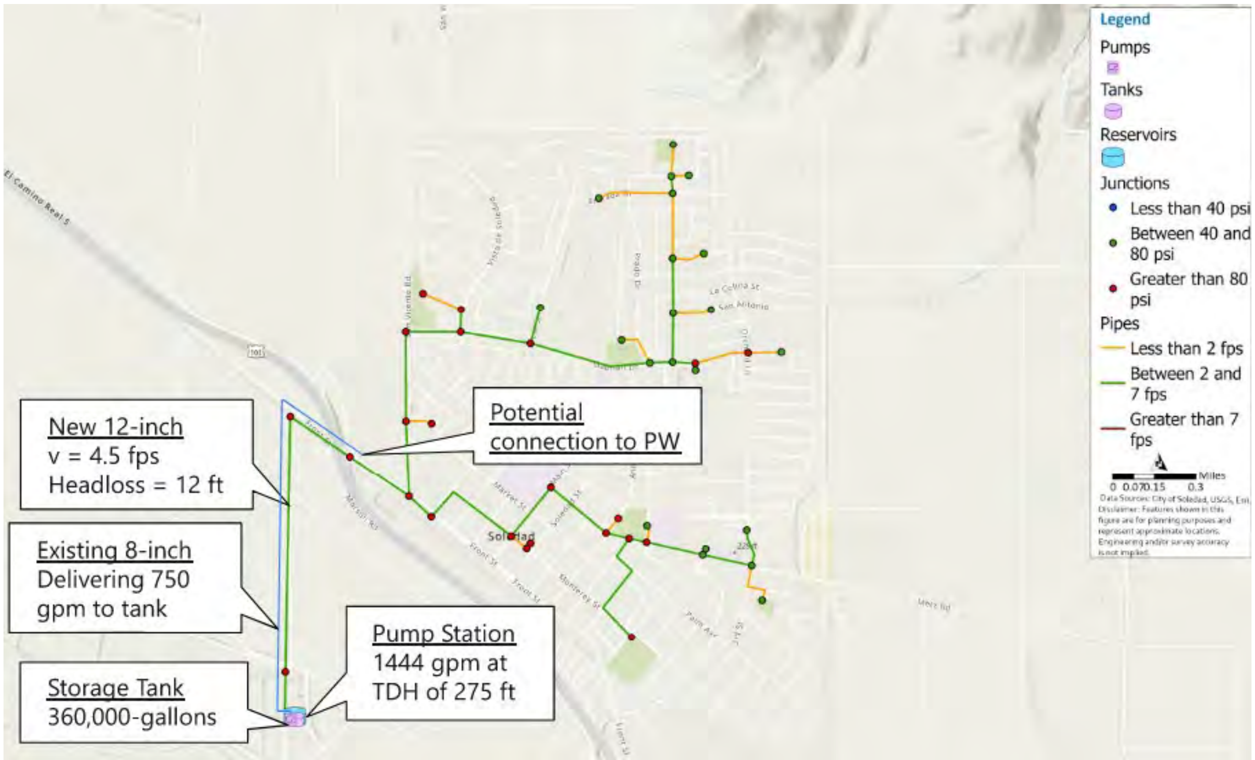

Figure 4.16 Scenario 4 Modeling Results

4.4.5 Scenario Five

The last scenario was also only modelled under one operating condition, as the existing elevated storage tank at Vosti Park is not large enough to store flow to be delivered to the system. The pump station at the WRF would deliver all flow to the existing storage tank, but the booster station would deliver all flow to the system. Results are shown in on Figure 4.17 and are as follows:

- The existing 8-inch transmission main would need to be upsized to a 12-inch
- The pump station would need to deliver 1444 gpm at 150 feet TDH
- The booster station would deliver 1444 gpm at 175 feet TDH
- All pipelines between the pump station to the storage tank and the pipelines immediately downstream of the booster station would need to be sized at 12-inches to allow all the flow for the system to pass through without exceeding the maximum velocity

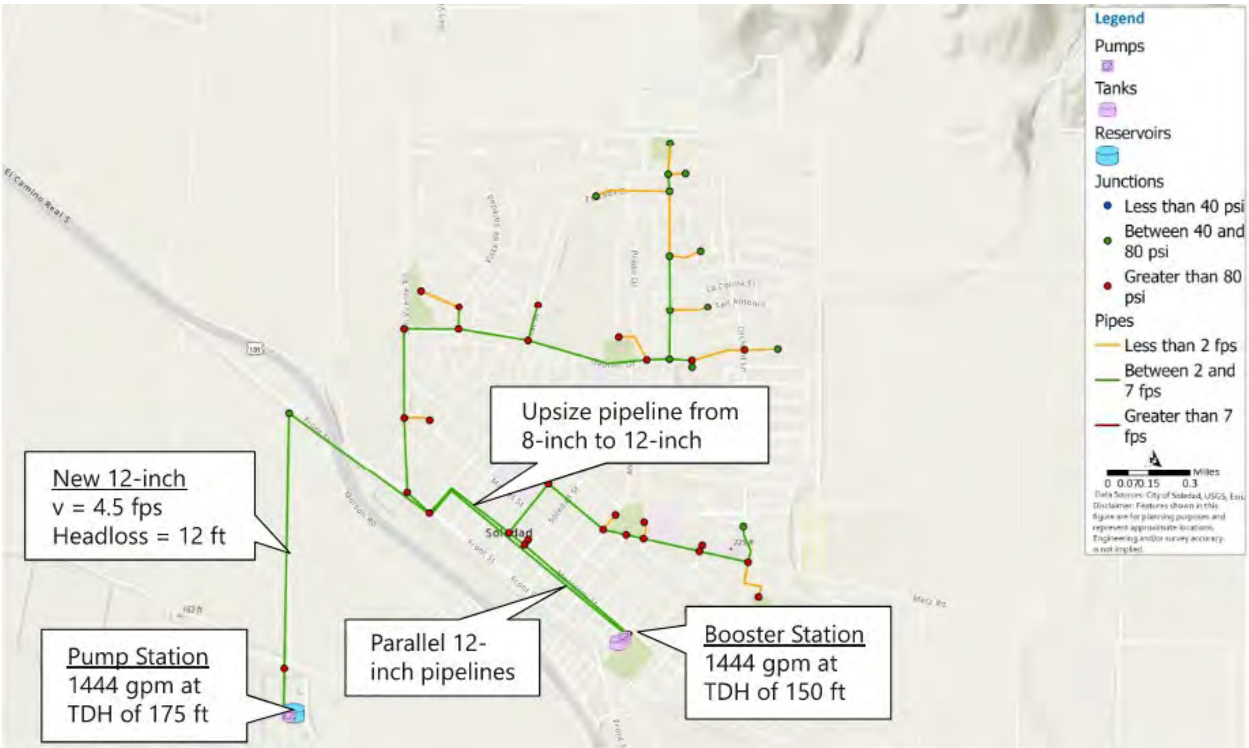

Figure 4.17 Scenario 5 Modeling Results

4.5 Recommendations

A workshop was held with the City staff on January 30, 2024, to review the different scenarios and the subject was subsequently discussed several times. Advantages and disadvantages for each scenario, provided on Table 4.1, were presented during the workshop along with estimated construction costs.

Details of the estimates are provided in Appendix D. The costs are consistent with the Association for the Advancement of Cost Engineering (AACE) Estimate Class 4. AACE Estimate Class 4 is used for project screening, alternative screening, determination of feasibility, concept evaluation, and preliminary budget approval. Typically, engineering is from 1% to 15% complete and based on limited information. Cost estimates use parametric cost models and have wide accuracy ranges. Typical accuracy ranges for Class 4 estimates are -30% to +50%.

Construction cost estimates will be updated through final design and included with the 30% design, 60% design, 90% design, and 100% design deliverables.

The City narrowed the options down to Scenarios 1 and 4 and Table 4.2 further compares both of these scenarios. Based on its advantages, Scenario 4 will be the configuration for the Project. See Figure 1.2.

Table 4.1 Scenario Comparison

Scenario	Description	Pump Station at WRF	Booster Station	Storage Tank	Advantages	Disadvantages	Estimated Construction Costs (Jan 2024)[1]
1	Booster station and storage tank at Toledo Park	✓	✓	✓	-PS and BS can operate independently (provides redundancy) -Storage tank close to a potable water source -Allows bidding flexibility for cost control (tank and booster station can be a bid alternate) -Storage tank and BS located at undeveloped park and at a more central location of the system	-Hydropneumatic zone (not an open water surface)	$15,942,000
2	Booster station and storage tank at Peverini Park	✓	✓	✓	-PS and BS can operate independently (provides redundancy) -Storage tank close to a potable water source -Allows bidding flexibility for cost control (tank and booster station can be a bid alternate) -BS operates at lower required TDH	-Upsizing of piping along Vista Avenue -Storage tank and BS located at developed park; may require removal of existing park facilities	$16,088,000
3	No booster station. Storage tank uphill by existing Reservoirs RB1 & RB2	✓		✓	-Fewer facilities (no booster station) -System serve by gravity from storage tank -Open water system -Provides more moderate pressures in the system	-Pump station operating at a higher required TDH -Storage tank difficult and more costly to construct up the hill -Backup water supply requires a new pump from adjacent potable tank	$18,769,000
4	No booster station. Pump station and tank at WRF	✓		✓	-Fewer facilities (no booster station) -Both recycled water and potable water backup provided at WRF	-Requires a new water backup supply source (Groundwater well or PW pipeline extension) -Requires generator at the WRF	$15,240,000

5	Use existing storage tank at Vosti Park	✓	✓		-Fewer facilities (no new storage tank) -Existing storage tank has a potable water source -Pump and booster station will operate at lower required TDH -Open water system	- No storage capacity in existing storage tank -Lacks redundancy -Storage tank may not meet current design standards -BS located at developed park; may require removal of existing park facilities	$17,861,000

Notes:
(1) Includes 30% contingency

Table 4.2

Scenario	Description	Pump Station at WRF	Booster Station	Storage Tank	Advantages	Disadvantages	Estimated Construction Costs (Jan 2024)[1]
1	Booster station and storage tank at Toledo Park	✓	✓	✓	- Storage tank and BS located at undeveloped park (fewer existing obstructions)	- Day time pumping results in less efficient operations (high peak power costs during day) - Requires approval from planning department - Visual impacts of facilities	$15,942,000
4	No booster station. Pump station and tank at WRF	✓		✓	- Fewer facilities (easier to operate, less to maintain) - Smaller storage tank - Potable water source at plant - Lower construction and operation/maintenance costs	- Risk of flood damage - Tank will take up additional space at the WRF - Additional permitting from Caltrans and UPR (requires casing pipe) - Need to drain tank/line once a week when not used	$15,240,000

Notes:
(1) Includes 30% contingency

4.6 Surge Analysis

A surge analysis will be performed during final design to determine the required protection for the system.

4.7 System Optimization

The irrigation system design will occur during final design which will refine the preliminary irrigation demands used to develop the hydraulic model. During final design, the updated irrigation demands will be incorporated into the model and the pump station and pipeline sizes will be refined.

The City has also indicated a preference to upsize strategic pipelines in the event additional recycled water demand be identified in the future, which is currently unknown. Strategic pipeline upsizing will be identified in final design. This strategy would involve delivering recycled water outside the irrigation window, so the pump station size would not increase.

SECTION 5 PUMP STATION

The pump station will be located at the City's Water Reclamation Facility (WRF) as shown in Figure 1.2. It will draw recycled water from existing WRF facilities and supply the recycled water distribution system to serve the City's parks and schools. This section discusses design elements associated with the pump station including preliminary layout alternatives, type and size of pumps considered, site improvements, and electrical and instrumentation. A list of pump station design recommendations is provided at the end of this section.

5.1 Existing W3 Pump Station

The existing W3 Pump Station draws water from the existing reclaimed water pump station wet well to provide W3 service water to facilities within the WRF and the existing fire suppression system. The W3 Pump Station will not be modified as part of this Project and will continue to be used solely to serve facilities within the WRF. The City's existing W3 pump station is shown in Figure 5.1.

Figure 5.1 Photo of Existing W3 Pump Station at the WRF

5.2 Pump Station Layout

Five alternative recycled water pump station layouts were developed and reviewed with the City. The City has indicated a packaged pump station is preferred for the Project. Key design criteria considered for each alternative includes:

- Minimizing distance from the existing reclaimed water pump station wet well for better pump hydraulics
- Minimizing existing utility crossings and potential relocation
- Minimizing modification to existing WRF facilities and site access
- Minimizing impacts to WRF operations during construction
- Simple integration with existing WRF operations
- Ease of operation

For the conceptual layout, a pump station footprint of 15 feet by 25 feet was assumed. The final footprint will be confirmed during final design and is anticipated to be smaller. The layout also includes a 55-foot diameter backup potable water storage tank and associated piping to provide backup supply to the pump station in the event of a water quality issue at the WRF.

5.2.1 Alternative 1

This alternative locates the new booster pump station immediately south of the existing reclaimed water pump station as shown in Figure 5.2. A short segment of suction piping will convey water from the existing reclaimed water wet well to the pump station. The pump station would be similar to the existing W3 pump station.

Field observations indicate the proposed pump station may encroach upon the access road running east/west and several utilities along its southern edge. As such, realignment of the access road and relocation of existing utilities may be required. In addition, the proposed pump station may conflict with an existing stairway providing access to the reclaimed water pump station and wet well and will need to be relocated.

The backup potable water supply pipeline and discharge header will cross several existing utilities located in the access road to the west of the existing reclaimed water pump station as shown in Figure 5.1. Farther west, the backup potable water supply pipeline will penetrate through two earthen berms and connect to the storage tank. The discharge header penetrates one earthen berm, turns north at the access road, and continues to the existing 12-inch recycled water transmission main identified in Figure 1.1. Pipe penetrations through earthen berms will be watertight and designed to maintain structural integrity of the berm.

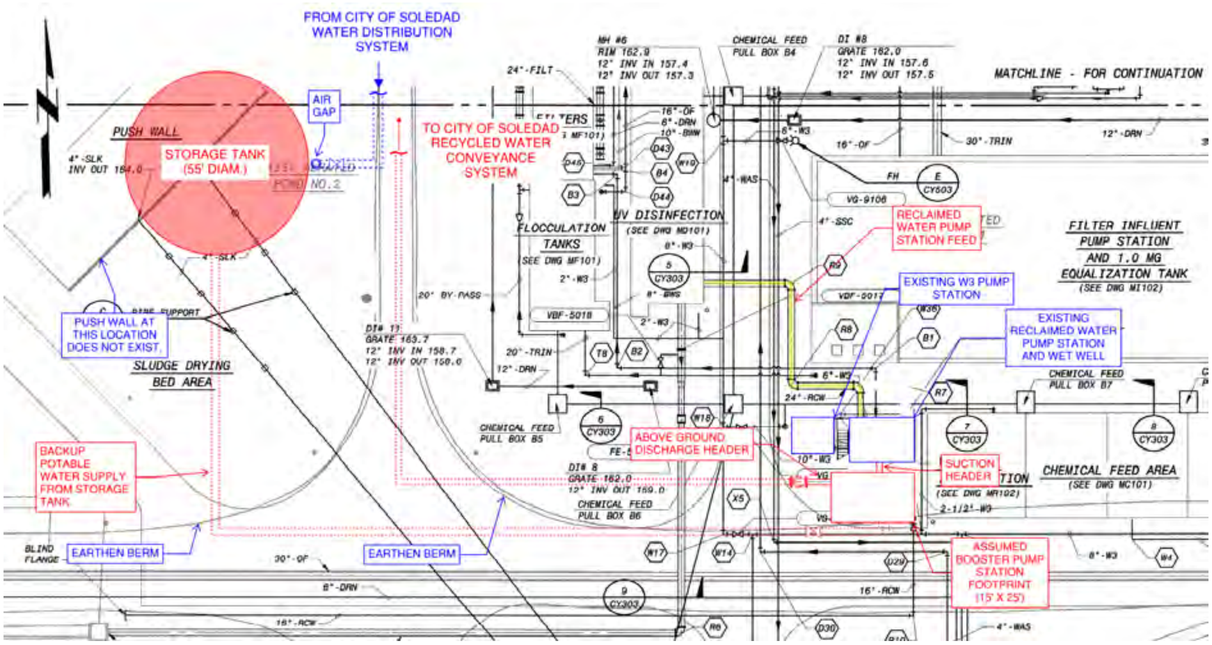

Figure 5.2 Alternative 1 – Layout Sketch

5.2.1.1 Advantages

Alternative 1 has the following advantages:

- Minimizing distance from the existing reclaimed water pump station wet well for better pump hydraulics

5.2.1.2 Disadvantages

Alternative 1 has the following disadvantages:

- Several utility crossings along discharge pipe and backup potable water supply pipe alignments
- Pump station may encroach upon access road and require roadway realignment
- Existing utilities along the southern edge of the pump station footprint may need to be relocated
- Pump station may encroach on stair access to the existing reclaimed water pump station and wet well and will need to be relocated

5.2.2 Alternative 2

This alternative locates the new pump station south of the flocculation tanks and UV disinfection system as shown in Figure 5.3. Suction piping will convey water from the existing reclaimed water wet well to the recycled water pump station crossing several existing utilities. The pump station would be similar to the existing W3 pump station.

Field observations indicate the southwest corner of the proposed pump station may encroach upon an earthen berm. A retaining wall may be required to hold back the berm and to create space for the pump station as shown in Figure 5.4.

The backup potable water supply pipeline and discharge header do not appear to cross existing utilities as shown in Figure 5.3. West of the proposed pump station, the backup potable water supply pipeline will penetrate through two earthen berms and connect to the storage tank upstream. The discharge header penetrates one earthen berm, turns north at the access road, and continues to the existing 12-inch recycled water transmission main. Pipe penetrations through earthen berms will be watertight and designed to maintain structural integrity of the berm.

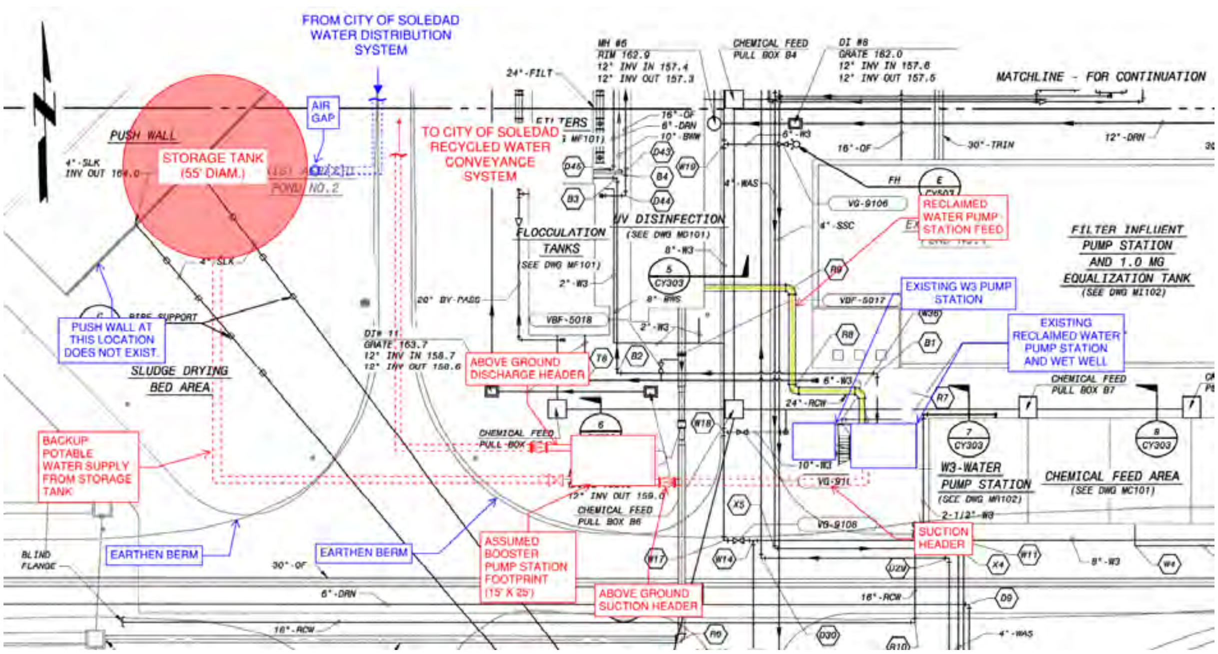

Figure 5.3 Alternative 2 – Layout Sketch

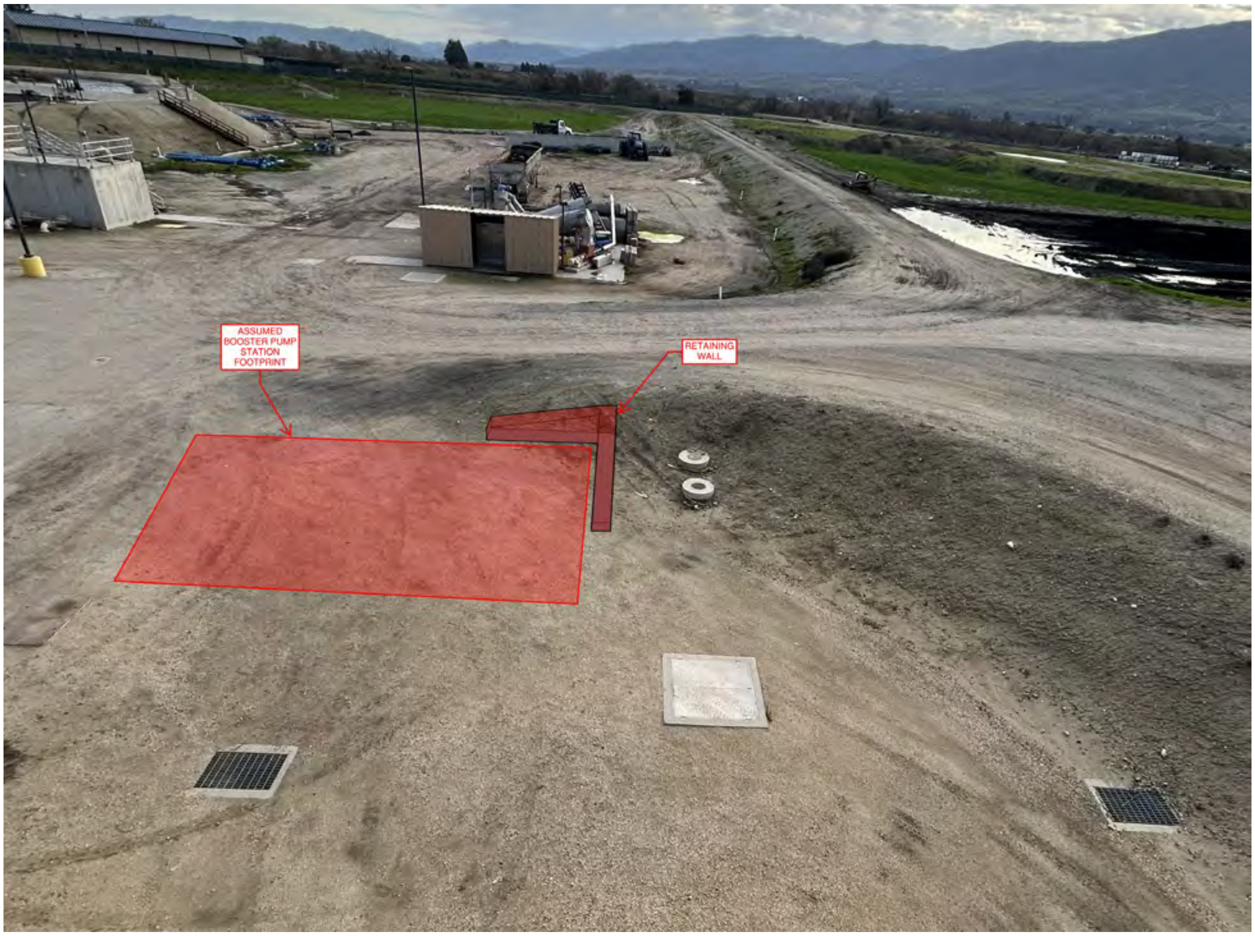

Figure 5.4 Proposed Recycled Water Pump Station Location for Alternatives 2 and 3

5.2.2.1 Advantages

Alternative 2 has the following advantages:

- Anticipated to be the lowest cost alternative
- Pump station is not anticipated to encroach upon access road running east/west
- Relocation of existing utilities is not anticipated

5.2.2.2 Disadvantages

Alternative 2 has the following disadvantages:

- Several utility crossings along the suction pipe alignment
- A retaining wall may be required along the southwest corner of the pump station to accommodate an existing earthen berm along the edge of the roadway

5.2.3 Alternative 3

This alternative matches the configuration of Alternative 2 (see Section 5.1.2) except for suction piping alignment. Suction piping will connect to the existing 24-inch reclaimed water pipe which currently conveys flow from the UV disinfection building to the reclaimed water pump station wet well as shown in Figure 5.5. The proposed location of the suction pipe conveying flow to the pump station is congested with existing utilities. Maintaining required clearance from existing utilities will be challenging and relocation of existing utilities is anticipated.

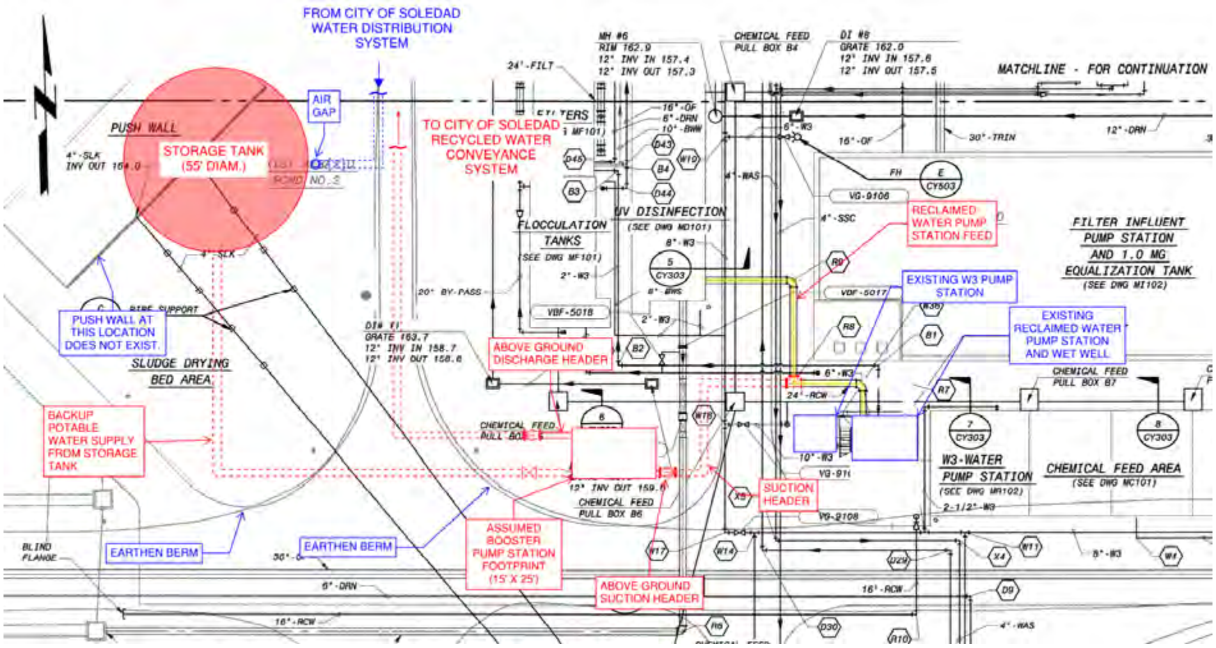

Figure 5.4 Alternative 3 – Layout Sketch

5.2.3.1 Advantages

Alternative 3 has the following advantages:

- Pump station is not anticipated to encroach upon the access road running east/west

5.2.3.2 Disadvantages

Alternative 3 has the following disadvantages:

- Maintaining adequate clearance form existing utilities will be challenging
- Relocation of existing utilities may be required
- Several utility crossings along the suction pipe alignment
- A retaining wall may be required along the southwest corner of the pump station to accommodate an existing earthen berm along the edge of the roadway

5.2.4 Alternative 4

This alternative locates the new pump station at the southeast corner of the sludge drying pond area west of the flocculation tanks as shown in Figure 5.5. The sludge drying pond is at an approximate elevation of 161 feet and the access road along the eastern edge of the sludge drying pond is at an approximate elevation of 169 feet equal to a difference in elevation of 8 feet. The southeast corner of the sludge drying pond would be filled in to match the elevation of the access road for the pump station.

This pump station alternative includes a below ground wet well structure with vertical turbine pumps. The vertical turbine pumps and associated equipment will be mounted on a steel skid similar to what is shown in Figure 5.6. The new wet well will be gravity fed by the existing reclaimed water wet well via the wet well feed pipe shown in Figure 5.5. City operations staff indicated an existing16-inch reclaimed water pipe south of the proposed pump station (shown in Figure 5.5) may be repurposed as the wet well feed pipe. The City is field verifying if the existing 16-inch reclaimed water pipe was constructed. If the 16-inch reclaimed water pipeline was not constructed, a new pipeline will be needed. Design of the pump station and wet well is more complicated than Alternatives 1, 2 and 3, and therefore has a higher construction cost. In addition, the wet well would create a confined space for maintenance staff.

The wet well feed pipe crosses several existing utilities and penetrates through two earthen berms. The discharge header penetrates one earthen berm, turns north at the access road, and continues toward a connection (not shown in Figure 5.5) to the existing 12-inch recycled water transmission main. Pipe penetrations through earthen berms will be watertight and designed to maintain structural integrity of the berm.

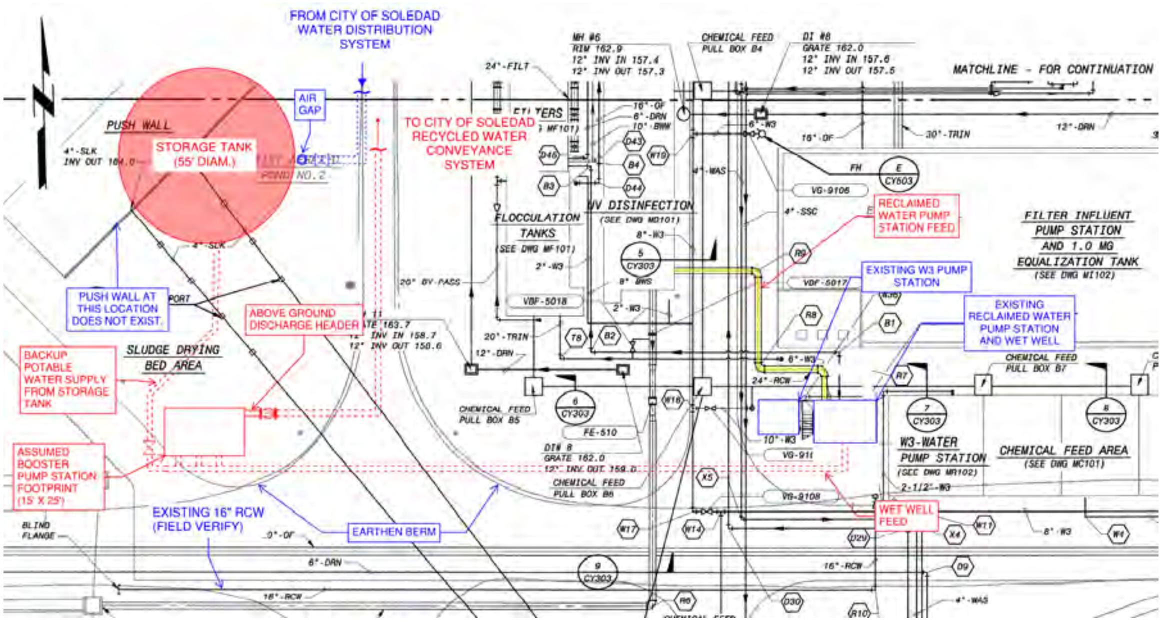

Figure 5.5 Alternative 4 – Layout Sketch

Figure 5.6 Example Pump Station Skid with Vertical Turbine Pumps

5.2.4.1 Advantages

Alternative 4 has the following advantages:

- Pump station footprint is not anticipated to encroach upon access road running east/west
- Relocation of existing utilities is not anticipated
- Potential reuse of existing 16-inch reclaimed water pipeline as wet well feed to simplify design and construction
- Minimizing impacts to WRF operations during construction.

5.2.4.2 Disadvantages

Alternative 4 has the following disadvantages:

- Most challenging hydraulics for pumps
- Site grading required to raise the elevation of the pump station and to accommodate a new buried wet well
- Vertical turbine pumps will be required for this configuration which will result in a more complex design and higher construction cost than Alternatives 1, 2, and 3.
- If a new the suction pipeline is needed, it will cross several existing utilities.
- The wet well would create a confined space for maintenance staff.

5.2.5 Alternative 5

This alternative expands the existing reclaimed water pump station wet well, as shown in Figure 5.7, to accommodate three vertical turbine pumps for the Project. Expanding the existing reclaimed water pump station and wet well is the most complicated and expensive alternative due to structural and hydraulic design needs.

The existing reclaimed water pump station wet well wall between the existing wet well and expanded wet well would need to be partially demolished and connected to the expansion. Structural design is further complicated to ensure the expansion can withstand seismic loads, since the current seismic design standards are more stringent than when the wet well was originally constructed. A shutdown of the reclaimed water pump station and wet well will be required during construction. See Figure 5.8 for a sketch of the reclaimed water pump station wet well expansion.

From the hydraulic design perspective, modelling will be required to ensure the new vertical turbine pumps can operate efficiently concurrently with the existing reclaimed water pump station. Other factors that complicate design and increase cost include potential utility relocation and roadway realignment along the southern edge of the structure expansion.

The backup potable water supply pipeline and discharge header will cross several existing utilities running north/south along the access road to the west of the existing reclaimed water pump station as shown in Figure 5.7. Further west, the backup potable water supply pipeline will penetrate through two earthen berms and connect to the storage tank upstream. The discharge header penetrates one earthen berm, turns north at the access road, and continues toward a connection (not shown in Figure 5.1) to the existing 12-inch recycled water transmission main. Pipe penetrations through earthen berms will be watertight and designed to maintain structural integrity of the berm.

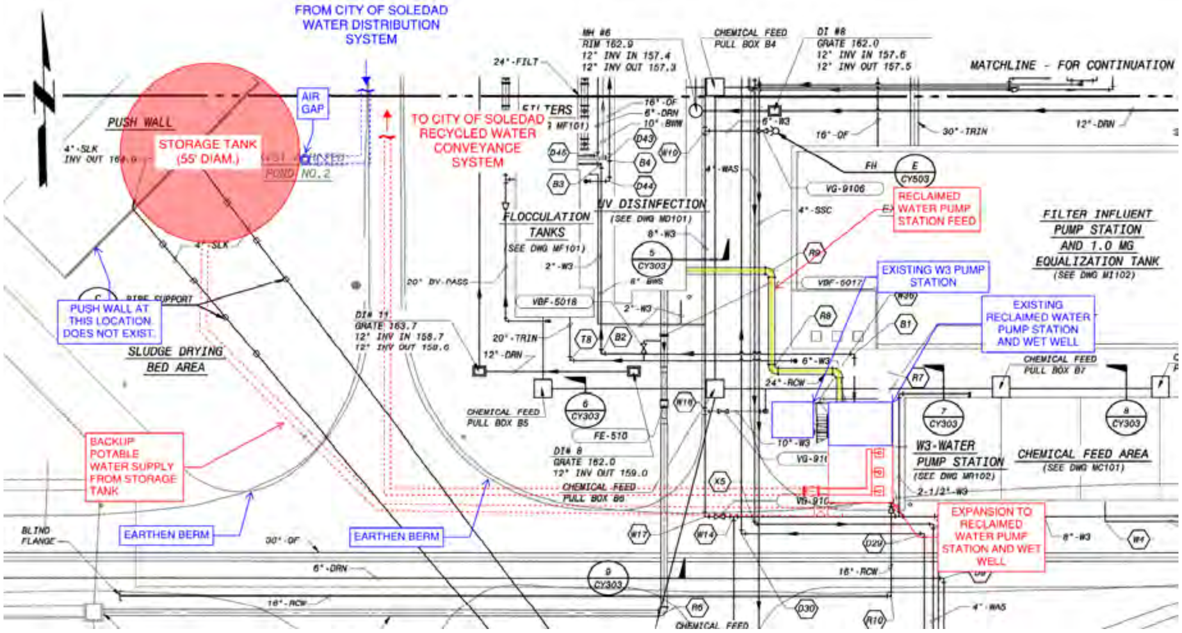

Figure 5.7 Alternative 5 – Layout Sketch

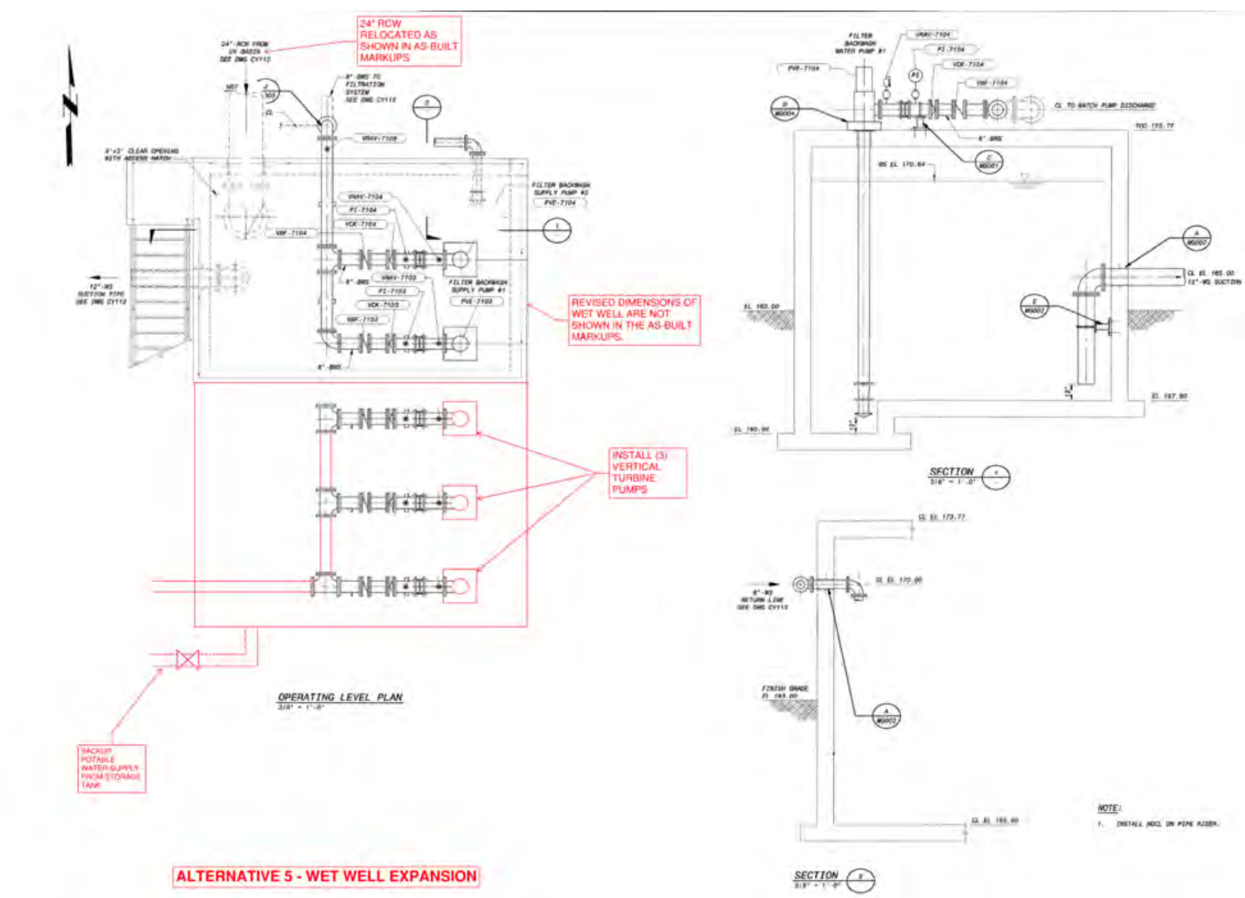

Figure 5.8 Reclaimed Water Pump Station and Wet Well Expansion Sketch

5.2.5.1 Advantages

Alternative 5 has the following advantages:

- Expands the reclaimed water pump station wet well capacity similar to what was intended in the 2007 WWTP Upgrade and Expansion Project
- Matches the existing reclaimed water pump station and wet well configuration for similar operation procedures

5.2.5.2 Disadvantages

Alternative 5 has the following disadvantages:

- Anticipated to be the highest cost alternative
- Wet well expansion complicates design
- Construction of wet well expansion will require extended shutdown of existing reclaimed water pump station
- Vertical turbine pumps will be required for this configuration which will result in a more complex and costly design than most other alternatives
- The discharge pipe and backup water supply pipe cross several existing utilities
- Existing utilities along the southern edge of the expanded structure may need to be relocated

5.2.6 Recommendations

A meeting was held with City operations staff on March 13, 2024, to review the pump station layout alternatives described in Section 5.1. Advantages and disadvantages for each alternative were presented during the meeting. Operations staff narrowed the options down to Alternative 1 and 4.

During a meeting held on March 21, 2024, the City selected Alternative 4 as the preferred alternative because it minimizes construction impacts to WRF operations, it is not located in a congested area, and it may be able to utilize an existing 16-inch reclaimed water pipe further minimizing construction impacts.

5.3 Site Improvements

The pump station will be located at the southeast corner of the sludge drying pond area west of the flocculation tanks as shown in Figure 5.5. The sludge drying pond is at an approximate elevation of 161 feet and the access road along the eastern edge of the sludge drying bed is at an approximate elevation of 169 feet equal to a difference in elevation of 8 feet. The southeast corner of the sludge drying pond will be raised to match the elevation of the access road for the pump station. An existing access ramp on the southeast corner of the sludge drying bed will be relocated to provide access to the pump station.

SECTION 6 POTABLE WATER BACKUP

A backup potable water supply will be provided for the Project in the event that the WRF effluent does not meet Title 22, Division 4, Chapter 3, CCR requirements for recycled water. This section discusses the two potable water backup alternatives that have been evaluated:

- New Potable Water Pipeline to the WRF and Potable Water Backup Tank

- Swivel-Ell Connection

6.1 New Potable Water Pipeline to the WRF and Potable Water Backup Tank

Currently, there is no potable water source at the WRF. This alternative would construct a new potable water pipeline to the WRF and a new potable water backup tank.

6.1.1 New Potable Water Pipeline to the WRF

A new potable water pipeline is needed from the City's potable water distribution system to the WRF.

The existing 8-inch transmission pipeline located from the WRF to Front Street is undersized for the Project and could be used to convey potable water to the WRF, since it has never been put into service. Additional 8-inch pipeline would need to be constructed on each end of the existing 8-inch pipeline to connect to the City's potable water system and to the potable water backup tank at the WRF, as show in Figure 6.1. Permits would be needed from UPRR and Caltrans to construct the additional 8-inch pipeline to the City potable water system.

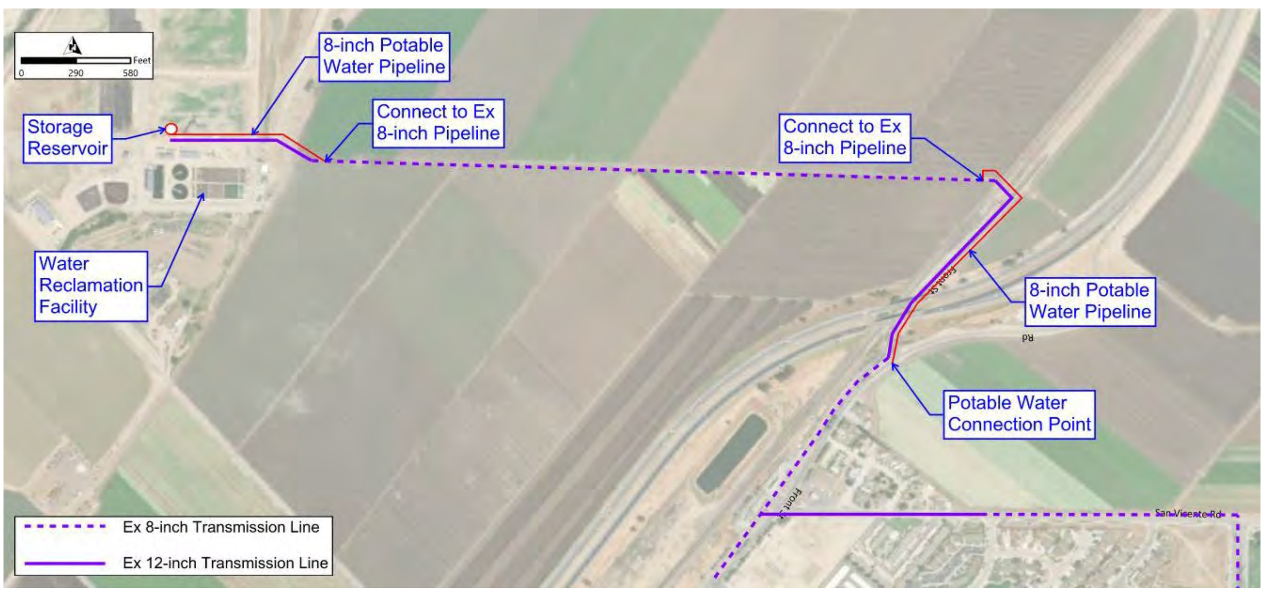

Figure 6.1 Potable Water Pipeline to the WRF

The City's on-call potable water hydraulic modelling consultant, Akel Engineering Group, Inc. (Akel), evaluated the supply availability for a connection to the potable water system at Front Street and Moranda Road. Akel evaluated the potential delivery point based on the following conditions:

- Pressures with High Operational Tank level (29')
- Pressures at Lower Operational Tank Level (15')

Suction pressures versus flow rate curves, shown on Figure 6.2, were provided by Akel for the connection point at Front Street and Moranda Road.

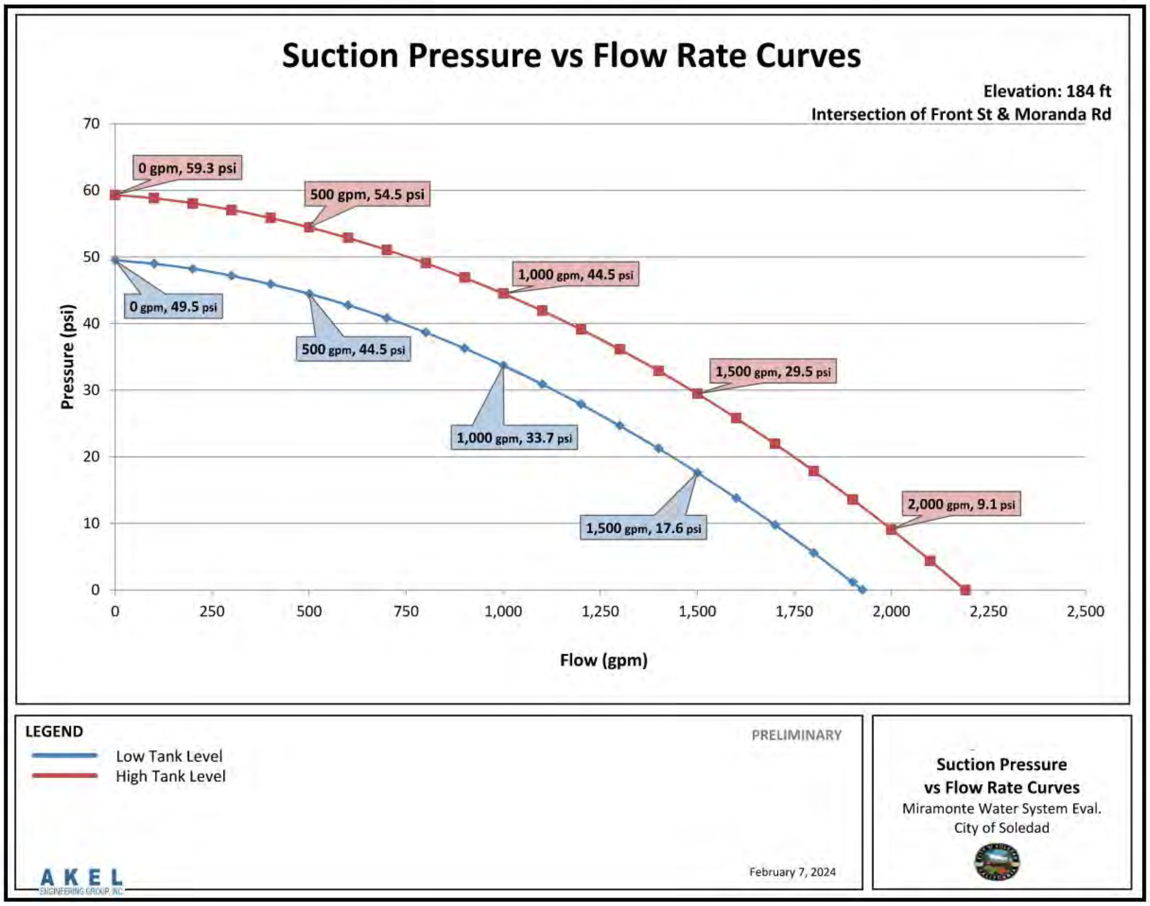

Figure 6.2 Suction Pressure versus Flow Rate Curves at Front Street and Moranda Road (courtesy of Akel Engineering Group, Inc.)

The available flow capacity from the connection point to the storage reservoir was determined by calculating the head loss through the 8-inch pipeline The low level tank curve was used for the available supply capacity, resulting in a maximum flow capacity that could be conveyed through the 8-inch pipeline of approximately 750 gpm, which is about half of the peak day demand.

6.1.2 Potable Water Backup Tank

The potable water backup tank would be initially full to supply the recycled water pump station and continue to fill at during recycled water demand to provide maximum day irrigation demands.

6.1.2.1 Tank Size

The operating tank capacity required is approximately 360,000 gallons using a maximum day system demand of approximately 1,444 gpm over an 8-hour window and a potable water supply of approximately 750 gpm.

The tank diameter would be approximately 55 feet. Final design of the tank would need to account for dead space at the bottom of the tank, free board, or sloshing wave height.

The proposed tank location is south of the wind turbine within the sludge drying pond as shown on Figure 6.3. An area of the pond, south of the wind turbine, will be backfilled to match the elevation of adjacent road to elevate the storage tank and keep it above the pond invert. In addition, the access ramp on the southeast corner of the pond will need to be relocated for construction of the storage reservoir.

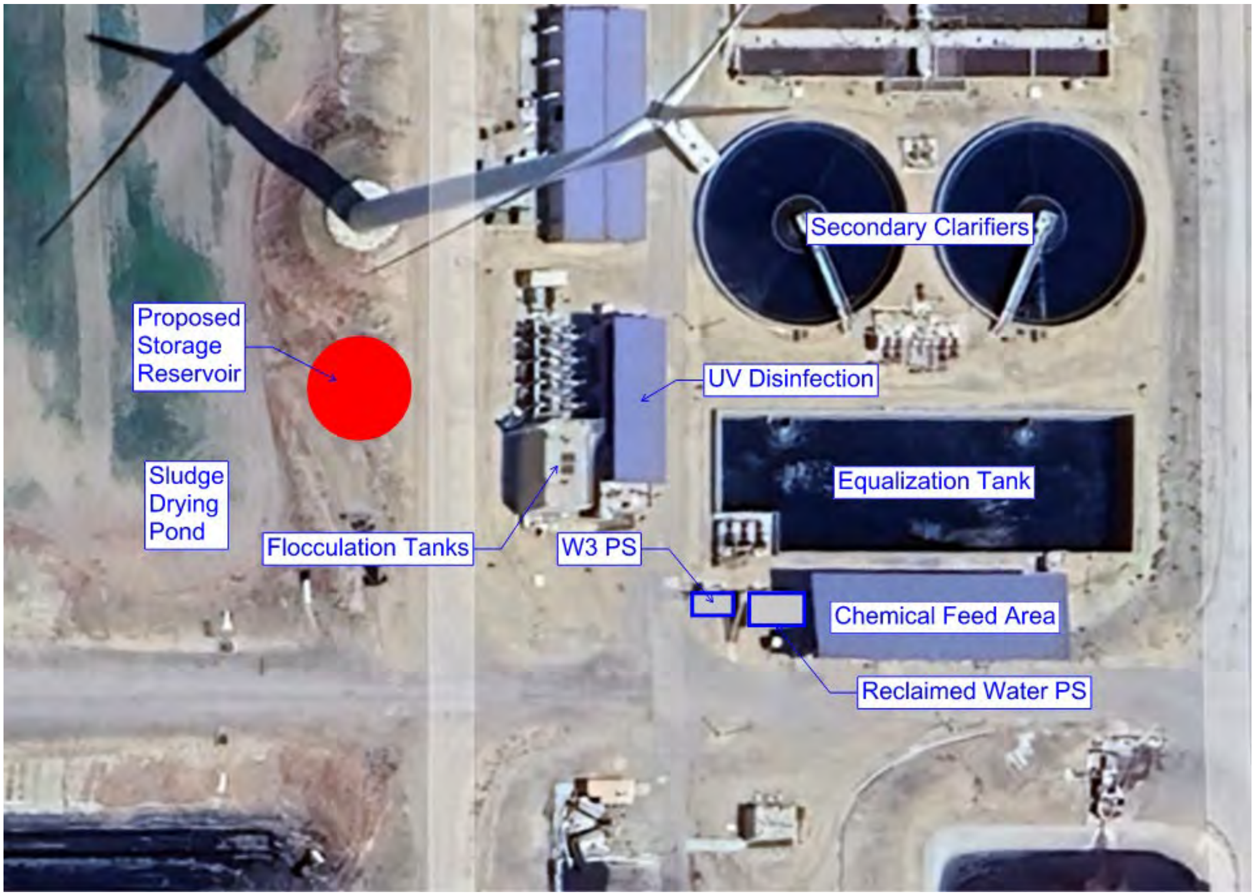

Figure 6.3 Storage Tank Location and Layout

6.1.2.2 Tank Material

A steel tank is the most economical material for this tank size and two types of steel tanks can be constructed:

- Welded steel tanks
- Bolted steel tanks

Welded steel tanks are fabricated onsite by welding steel plates together to form a cylinder and can be specifically sized to the project needs. Design and construction of welded tanks are performed under the guidelines of AWWA D100.

Bolted steel tanks are fabricated onsite by bolting individual steel panels to form a cylinder. Gaskets or sealants are used to achieve a watertight seal at the bolted joints. Bolted tanks are typically offered in incremental sizes depending on the tank manufacturer’s panel size. Design and construction of welded tanks are performed under the guidelines of AWWA D103.

Installing a new tank would require provisions for mixing and potentially periodically draining the tank to keep the potable water from stratifying and losing chlorine residual.

Table 6.1 presents some of the benefits and tradeoffs between the two tank alternatives.

Table 6.1 Tank Alternative Pros and Cons

Welded Steel Tank	Bolted Steel Tank
Pros	
▪ Can be customized to fit specific needs ▪ Less susceptible to corrosion ▪ Requires less frequent inspection and maintenance	▪ Less expensive to construct ▪ Installation process is faster and easier
Cons	
▪ Requires specialized welding equipment and skilled labor	▪ Tanks are offered in incremental sizes (not customizable) ▪ Requires more frequent inspection and maintenance ▪ More susceptible to corrosion

6.2 Swivel-Ell Connection

This alternative would construct two new swivel-ell connections directly to the City's potable water system, one at each of the City's potable water pressure zones to provide an emergency potable water backup. A swivel-ell is an assembly consisting of a reduced pressure principle backflow prevention assembly combined with a changeover piping configuration (swivel-ell connection) to directly connect recycled water users to the potable water system while simultaneously disconnecting the supply side of the recycled water system.

On December 19, 2023, the State Water Resources Control Board adopted the Cross-Connection Control Policy Handbook (CCCPH) with an effective date of July 1, 2024, which allows the use of swivel-ell connections as an emergency potable water backup to recycled water systems.

The minimum acceptable design and construction criteria for a swivel-ell are prescribed in the CCCPH and include:

- Prior to operation of a swivel-ell, the City must receive approval for the design and construction plans of that swivel-ell from the State Water Board
- The drinking water supply must not be directly connected to the recycled water supply, nor be designed such that the recycled water use site could be supplied concurrently by a recycled water supply and a drinking water supply
- The drinking water supply line and the recycled water supply line must be offset in a manner that ensures a tee-connection, spool, or other prefabricated mechanical appurtenance(s) could not be readily utilized in lieu of the swivel-ell connection, nor result in the recycled water use site being supplied concurrently by recycled water and drinking water
- The recycled water supply line used in conjunction with the swivel-ell must be the only recycled water supply to the recycled water use area

- The swivel-ell must be located as close as practical to the public water system service connection, with the swivel-ell connection being located as close as practical to the RP upstream of the swivel-ell
- The swivel-ell must:
  - o be located above ground
  - o be color-coded pursuant to section 116815 of the California Health and Safety Code and its implementing regulations
  - o include appropriate signage, as required by regulation and the State Water Board
  - o be provided the security necessary to prevent interconnections, vandalism, unauthorized entry, etc.
  - o be provided with meters on both the recycled water service and drinking water service connections.

Example schematics of a swivel-ell are presented in Figure 6.4 and an example photo of a swivel-ell is presented in Figure 6.5.

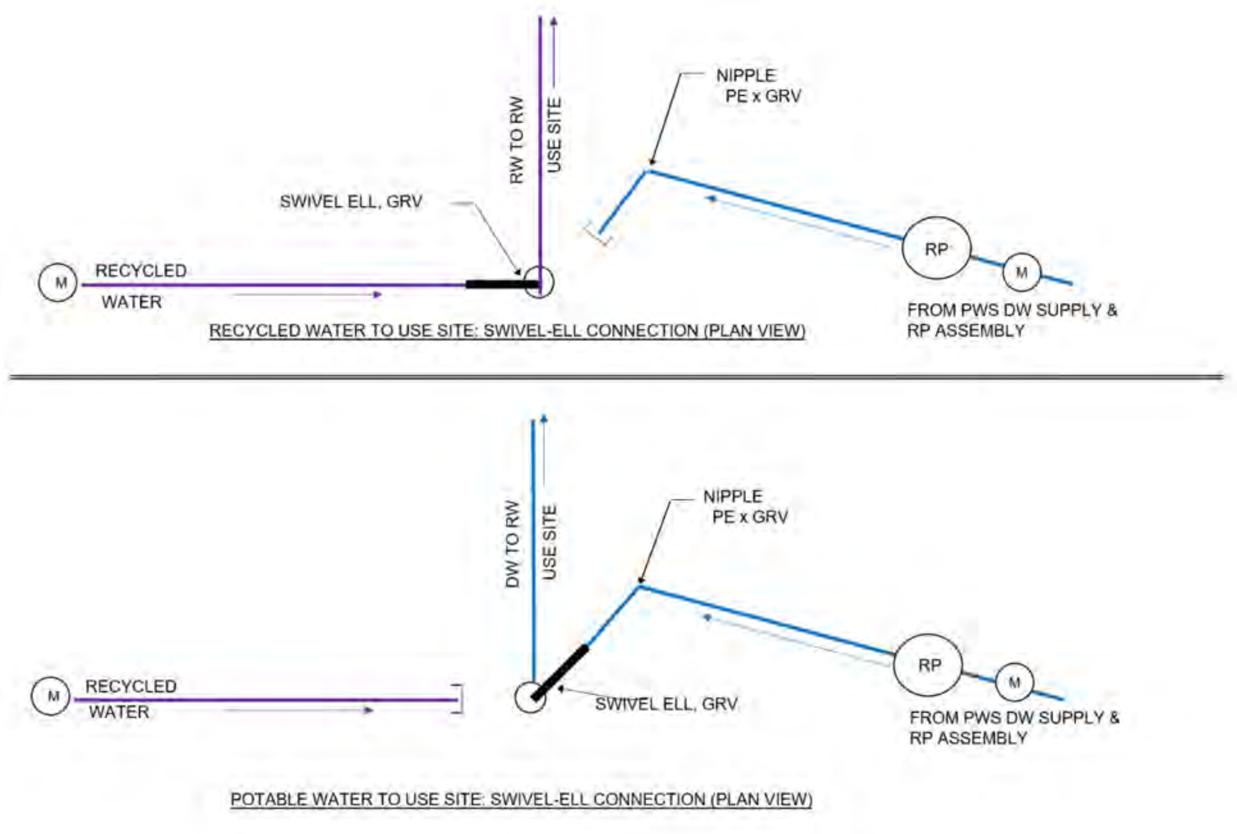

Figure 6.4 Schematics of a Swivel-Ell

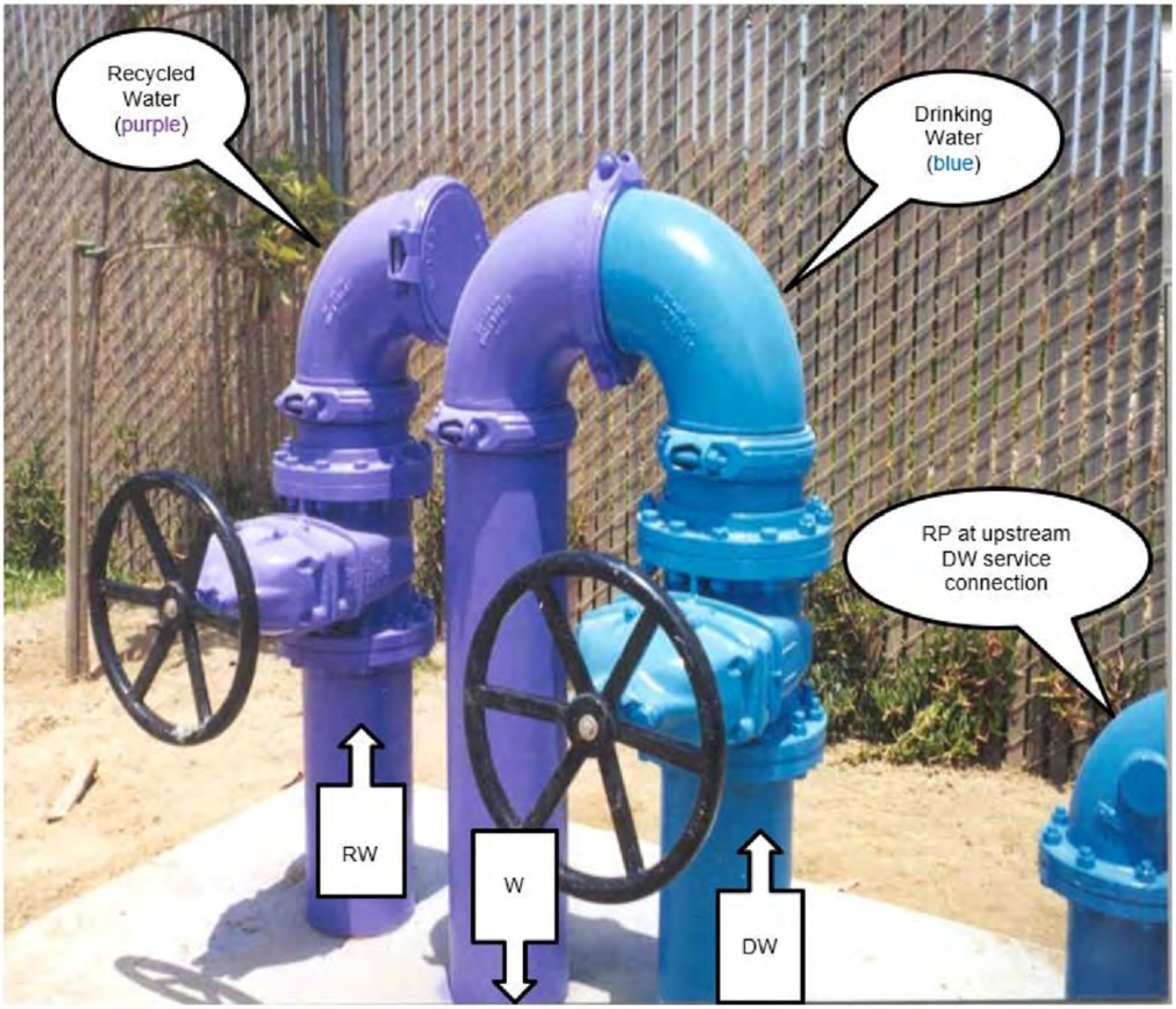

Figure 6.5 Photo of a Swivel-Ell

Akel provided flow and pressure information from the City's potable water hydraulic model at various locations along Gabilan Drive for a swivel-ell connection to the City's upper potable water pressure zone. The best location for swivel-ell connection to the City upper potable water zone is the transition between the upper pressure zone and lower pressure zone and is located at Gabilan Drive and West Street. The swivel-ell connection at the City's lower potable water pressure zone would occur at Front Street and Moranda Road, similar to the new potable water pipeline to the WRF and potable water tank alternative.

Akel evaluated the potential delivery point based on the following conditions:

- Pressures with High Operational Tank level (29')
- Pressures at Lower Operational Tank Level (15')

Suction pressures versus flow rate curves, shown on Figure 6.6, were provided by Akel for the connection point at Gabilan Drive and West Street.

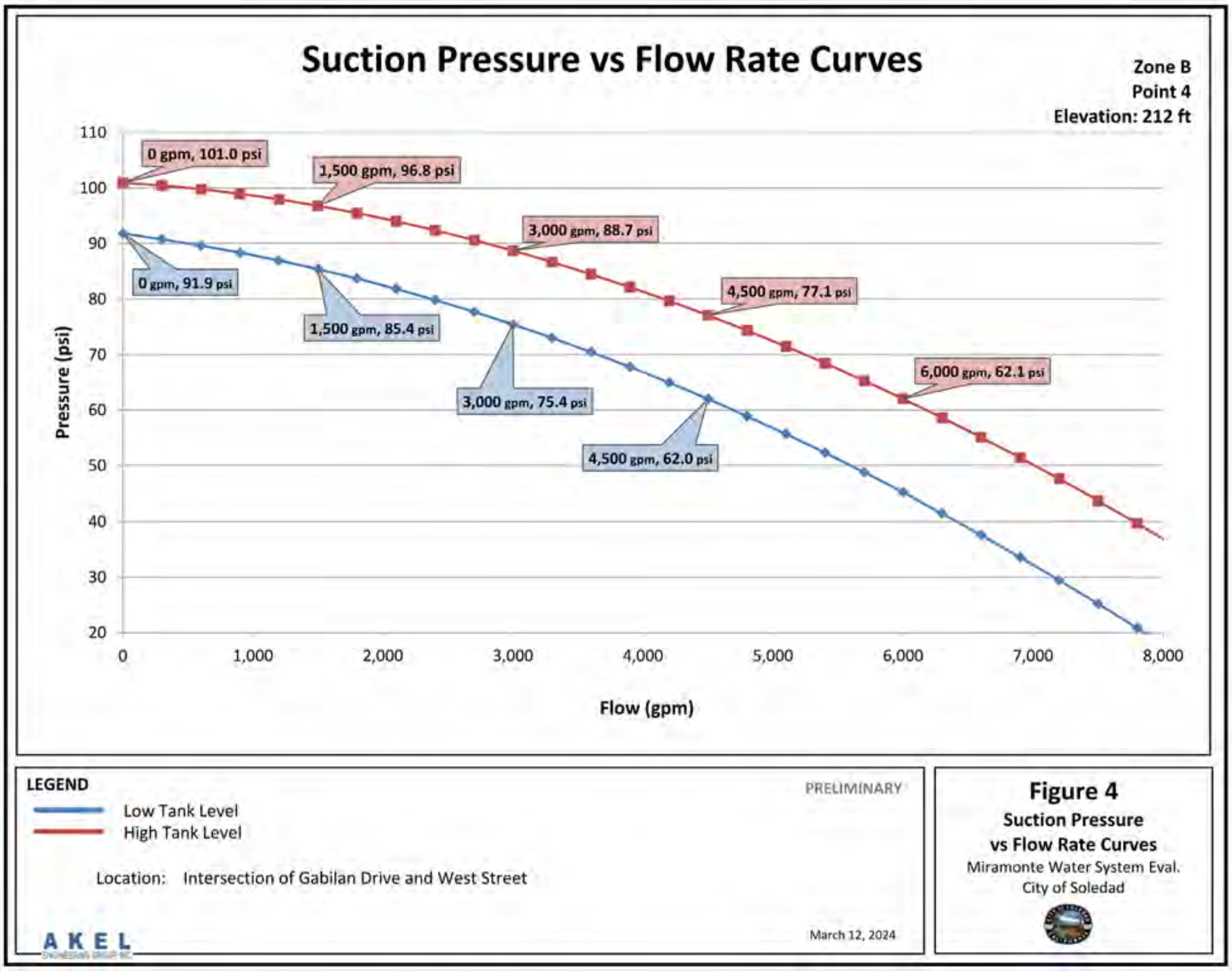

Figure 6.6 Suction Pressure versus Flow Rate Curves at Gabilan Drive and West Street (courtesy of Akel Engineering Group, Inc.)

The two swivel-ell locations would be located at:

- Gabilan Drive and West Street
- Front Street and Moranda Road

The swivel-ell locations would serve each recycled water user with approximately the same pressure as the existing irrigation system and disconnect the upstream recycled water source in conformance with CCCPH requirements. A figure of the recommended locations is presented in Figure 6.7.

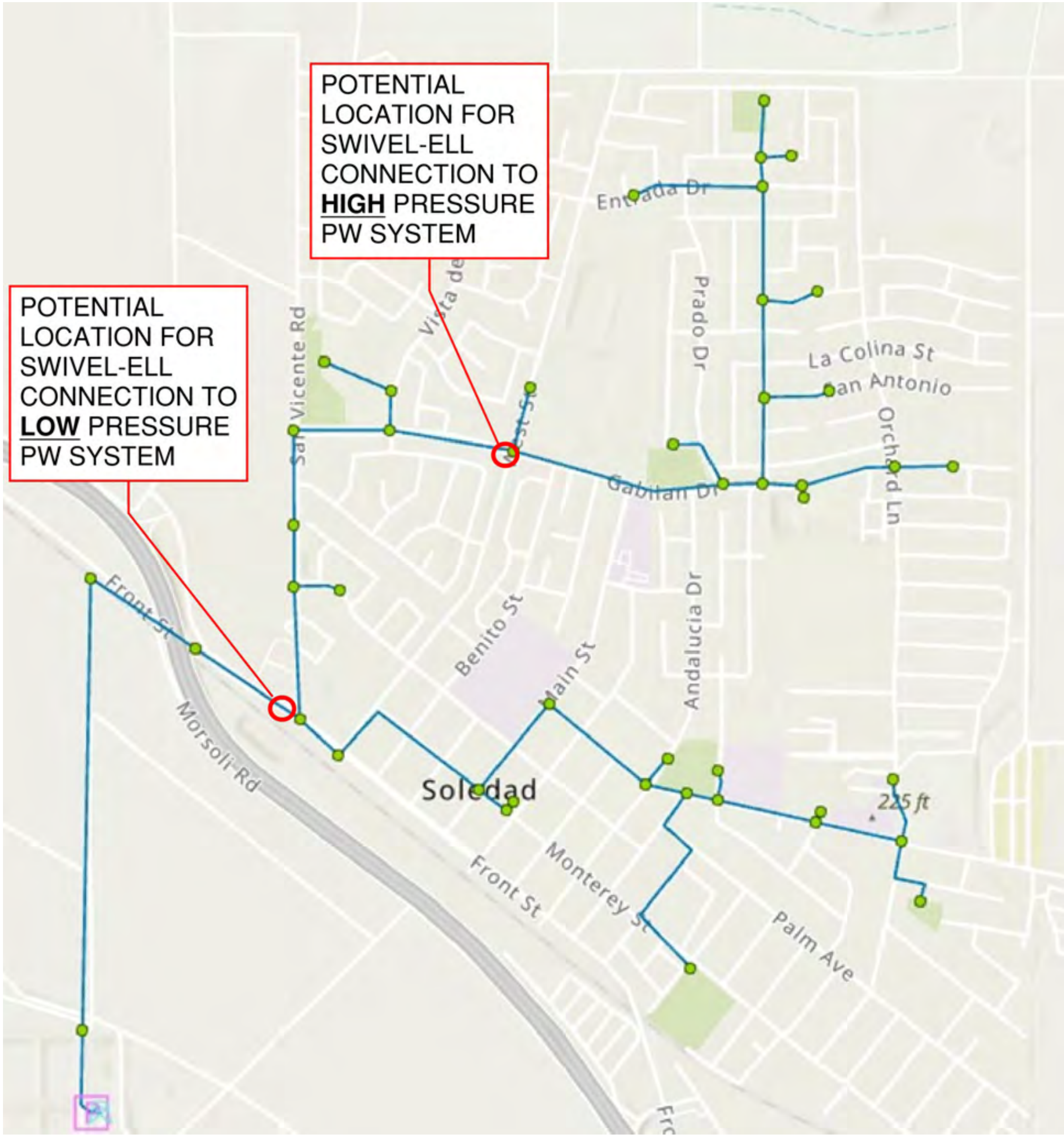

Figure 6.7 Recommended Swivel-Ell Locations

6.3 Recommendation

The alternatives were discussed with the City during project Progress Meetings on March 12, 2024 and March 25, 2024 and the City's preference is to move forward with the swivel-ell alternative primarily because it is significantly less expensive and reduces future O&M needs of a new potable water backup tank.

SECTION 7 PIPELINES

The pipelines for the Project, as depicted on Figure 1.2, include:

- 12-inch transmission pipeline from WRF to Front Street to convey water from the WRF
  - The pipeline diameter may be upsized by the City during final design to strategically provide recycled water to a demand that has yet to be identified
- City-wide distribution system pipelines ranging from 4- to 8-inches in diameter

7.1 Pipeline Alignment

7.1.1 Transmission Pipeline

The existing transmission pipeline is composed of 8-inch and 12-inch diameter pipes as shown on Figure 1.1. The existing 8-inch transmission pipeline from the WRF to Front Street, located within farmland, is undersized for the Project. A new 12-inch pipeline will be constructed parallel to the existing 8-inch pipeline for the Project. It will tie into the existing 12-inch transmission pipeline at WRF on the south end and the existing 12-inch transmission pipeline on the north end before the railroad crossing. Additional easements may be required for the transmission pipeline through the farmland, which will be confirmed during final design In addition, construction work restrictions may include a work window the reduces the impact to farming operations.

7.1.2 City-Wide Distribution System

The distribution system is be divided into two pipeline systems – to the northern and southern parts of the City. At the intersection of San Vicente Road and Front Street, the existing transmission main bifurcates with a pipeline continuing east along Front Street until it intersects West Street and terminates. At this location the distribution pipeline will connect to the existing distribution mains to serve the City parks and schools located in the southern half of the City.

The second segment of the existing transmission pipeline is located north along San Vicente Road then east and along Gabilan Drive until it intersects West Street and terminates. At this point, the distribution pipeline will tie into the existing transmission main to serve the City parks and schools located in the northern half of the City.

The pipeline alignments proposed in the 2023 Miller Report were reviewed and confirmed with the City. The alignments are located along city streets within the public right-of-way. Repair and replacement of pavement during construction will follow the City's 2023 Pavement Management Program Update Final Report prepared by Pavement Engineering Inc., October 2023.

7.2 Pipeline Materials

Several pipeline material were considered such as PVC, ductile iron, fused PVC, and HDPE. The costs for ductile iron, fused PVC, and HDPE are significantly higher the PVC. Therefore, PVC pipe, with ductile iron fittings, is the recommended pipeline material for the following reasons:

- Suitable for the Project size and pressures.
- City familiarity with the materials.

- Same pipe material as the existing transmission main.

C900 DR18 PVC pipe (purple pipe) is recommended for pressures below 200 psi and at locations where pressures are higher than 200 psi, C900 DR14 PVC pipe is recommended.

7.3 Pipeline Separation Criteria

7.3.1 Separation Criteria

The City's recycled water quality is considered disinfected tertiary recycled water as defined in California Code of Regulations (CCR) section 60301.230. As outlined in Chapter 16 - California Waterworks Standards of Title 17 of the CCR, the basic requirements for horizontal separation of recycled water mains from potable water mains are:

- at least 4 feet horizontally from, and one foot vertically below existing potable water mains.
- 1-foot horizontal clear separation from existing potable water mains with special permission and special design (i.e, no pipe joints, concrete encasement, etc.), approved by DDW on a case-by-case basis.

Although Water Works standards do not specify separation requirements between recycled water and non-potable pipelines, 3-feet of separation will be provided to avoid construction impacting adjacent facilities.

To limit the effects of pipeline loading from heavy equipment the pipeline should maintain a minimum cover of 4 feet. The pipeline should also maintain a minimum 1-foot clearance with existing utilities where possible. Pipeline barrels should be centered at utility crossings so rubber gasketed joints are located as far as possible from the utility crossing.

7.4 Appurtenances

Pipeline appurtenances are an essential component for the operation and efficiency of a pipeline. Appurtenances include air valves, blowoffs, and isolation valves. The methodology for the selection and location of pipeline appurtenances is contained in this section. Pipeline appurtenances will be sized and located during the final design phase after the pipeline alignment and profile have been developed.

7.4.1 Air Valves

Air valves are commonly installed on to manage air and vacuum conditions occurring in the pipeline. The installation of combination air valves is recommended along the alignment to perform the function of both air release valves and air/vacuum valves.

Locations of air/vacuum valve assemblies are determined by the topography of the pipeline system with spacing in conformance with recommendations in AWWA M51. Recycled water air valves can be located in below above-ground vaults or above ground enclosures and will be confirmed during final design.

7.4.2 Blow-Offs

Blowoffs will be provided at selected low points and on the up-gradient side of isolation valves to facilitate pipeline dewatering for inspection, maintenance, and emergency conditions. Where feasible, blowoffs will be located near sanitary sewer manholes to facilitate convenient disposal of water. In small diameter distribution systems, blow-offs are often minimized and the need for blow-offs and the locations will be review during final design.

7.4.3 Isolation Valves

Isolation valves will be installed at recommended periodic locations and at strategic locations, such as a branch off a main line. Valves for pipelines smaller than 12-inch in diameter will be resilient wedge gate valves in accordance with AWWA C509 Standards. Isolation valves for pipelines larger than 12-inch in diameter will be evaluated for height restrictions to determine if there is enough clearance to grade to install a gate valve. Butterfly valves in accordance with AWWA C504 Standards may be needed if there is not enough clearance and will be confirmed with the City during final design. The valves will be rated for pressures up to 250 psi.

7.4.4 Service Connections

A typical service connection will include:

- Flanged or threaded outlet from the main line, either field installed as a branch tee or using a tapping saddle.
- Isolation valve or corporation stop at the service outlet.
- Service line to the right-of-way boundary or other defined meter location.
- Meter assembly in meter box or above ground in an enclosure, if needed.
- Pressure reducing valve to protect the customer irrigation system (where needed).
- Consideration of an irrigation pressure boosting system (some existing irrigation systems have pressure boosting systems. Service connections to each school and park will be individually evaluated during final design.

SECTION 8 IRRIGATION SYSTEMS

Siegfried Engineering conducted a site visit to evaluate the existing irrigation systems at the parks and schools. Table 8.1 identifies which irrigation system requires retrofitting or replacement.

Table 8.1 Existing Irrigation Systems

No.	Location	Acreage	Has Booster Pump?	Retrofit or Replace
1	Lum Memorial Park	2.64		
2	Peverini Park	2.9		
3	Santa Barbara Park	1.08		
4	San Antonio Park	0.46		
5	Jack Franscioni Elementary			
6	Toledo Park (Future)	3.78		
7	Blas Santana Park	4.23		
8	Soledad High School			
9	Rose Ferrero Elementary			
10	Frank Ledesma Elementary		✓	

11	Veterans Park	4		
12	Joe Ledesma Park	0.6		
13	Main Street Middle School			
14	Bill Ramus Park	0.45		
15	Little League Park	2.9		
16	Jesse Gallardo Park	4	✓	
17	San Vicente/Gabilan Elementary			
18	Orchard Park	7.98		
19	Ramirez Park	1.25		
20	Vosti Park	6.44	✓	

SECTION 9 PROPERTY ACQUISITION

Facilities located within the City's WRF and in City right of way will not need additional property. An encroachment permit is required for construction, but no additional easements will be acquired for the distribution system.

The City has a 20-foot-wide easement for the existing 8-inch transmission main, from the WRF to Front Street, located within farmland. The new 12-inch transmission pipeline will be constructed parallel to the existing 8-inch transmission main. The existing easement will be reviewed during final design to determine if additional permanent and temporary easements are required for the new 12-inch transmission pipeline.

SECTION 10 CEQA AND PERMITTING

10.1 Agency Reviews and Approvals

The primary regulation governing recycled water use is the California Water Code Regulations, Title 22. The treatment requirement for this project would be tertiary treated recycled water, unrestricted use.

In June 2014, the California legislature passed State Bill 861, which authorized transfer of California Department of Public Health (CDPH)'s drinking and recycled water responsibilities, including the issuance of waste discharge requirements (WDRs), to the State Water Resources Control Board (SWRCB). Now, regulatory authority for projects using recycled water falls to the DDW within the SWRCB, as well as the Regional Water Quality Control Board (RWQCB). The roles of the SWRCB, RWQCB, and DDW are further discussed in the following sections.

10.2 California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) is a statute that was passed to institute a statewide policy of environmental protection. CEQA requires state and local agencies within California to follow a protocol of analysis, to publicly disclose any environmental impacts of proposed projects and to adopt all feasible measures to mitigate those impacts.

CEQA will be completed by Denise Duffy & Associates with the City as the lead agency, to evaluate any potential environmental impacts associated with the City's Recycled Water Conveyance Project. Based on the initial understanding of the project, an Initial Study / Mitigated Negative Declaration (IS/MND) is anticipated for the Project.

10.3 California Division of Drinking Water (DDW)

The DDW is charged with protection of public health and drinking water supplies and with the development of uniform water recycling criteria appropriate to particular uses of water. DDW recommendations are implemented through permits issued by the RWQCB.

The City's WRF produces effluent that meets Title 22 recycled water requirements. A Title 22 Report for the distribution of recycled water must be approved by DDW and the RWQCB before recycled water projects are implemented.

10.4 State Water Resources Control Board (SWRCB)

The SWRCB establishes general policies governing the permitting of recycled water projects consistent with its role of protecting water quality and sustaining water supplies. The SWRCB also exercises general oversight over recycled water projects, including review of RWQCB permitting practices.

The SWRCB is the state agency that has jurisdiction over water quality throughout California. Under the SWRCB, nine RWQCBs have authority to exercise rulemaking and regulatory activities by water basin. The RWQCB is charged with protection of surface and groundwater resources. The City of Soledad is located in the Central Coastal Region.

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