TECHNICAL MEMORANDUM

PREPARED FOR: Jason Yim, Shadi Bader | SCV Water

PREPARED BY: Matt Elsner, Jehan Anketell | Woodard & Curran

REVIEWED BY: Tom Richardson | Woodard & Curran

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RE: **Recycled Water Seasonal Storage Study**

1. BACKGROUND AND PURPOSE

Santa Clarita Valley Water Agency (SCV Water) owns and operates a recycled water system supplying retail customers in the Santa Clarita Valley. The recycled water system currently consists of 15,600 feet of recycled water pipelines, with several planned expansions of the system at various levels of planning through construction. Due to the seasonal variability of recycled water demand, SCV Water has an excess of recycled water supply during the winter months. These excess flows could be stored for use during high demand periods. Excess recycled water flows are discharged into the Santa Clara River.

Through its New Drop Program SCV Water is looking to utilize additional wastewater flows generated from new developments. Since these flows were never discharged to a watercourse, they will not be subject to a Section 1211 wastewater change petition. This program is designed to capture and use all new wastewater flows including during the winter season when demands are low.

One solution to ensure seasonal variations in demand are met is to construct seasonal storage facilities. These facilities can store recycled water during winter months when the demands are low and feed the system with the stored supply in the summer months when demands exceed the operational supply. This would allow SCV Water to use a larger percentage of their tertiary treated water supply and reduce or eliminate the use of potable water for make-up supply.

The 2016 SCV Water (formerly Castaic Lake Water Agency) Recycled Water Master Plan included a high-level evaluation of large regional seasonal storage, with reservoirs sized to meet 2050 seasonal storage needs within a single facility. The purpose of this study is to assess the feasibility of incremental distributed seasonal storage by incorporating smaller facilities which could be constructed as recycled water flows and demands increase. The outcome of this study will be to identify potential small seasonal storage strategies that could be constructed by SCV Water and/or incorporated into future developments, leveraging public/private partnership opportunities. This Technical Memorandum (TM) also presents an alternative seasonal storage strategy using a hybrid aquifer storage and recovery (ASR) concept for non-potable reuse.

2. STUDY APPROACH

This project utilized a systematic approach to evaluating distributed storage options. The general steps to the approach were:

- **Project seasonal storage needs**. A basis for sizing and timing of incremental small-scale seasonal storage implementation was developed.
- **Identify candidate sites categories**. Candidate site categories, along with example candidate sites, were identified as a method to assess a wide array of candidate seasonal storage sites.
- **Screen candidate site categories.** Based on selected criteria, site categories were screened to identify categories worthy of further consideration.
- **Conduct a comparative evaluation of site categories**. A comparative evaluation of "example" candidate sites representing the array of site categories was conducted.
- **Identify potential seasonal storage opportunity associated with Aquifer Storage and Recovery (ASR)**. Acknowledging that SCV Water has studied opportunities for groundwater augmentation (GWA), strategies to leverage a hybrid ASR project to provide seasonal storage benefits were identified.
- **Prepare cost estimates**. Facilities associated with each of the "example" candidate sites were identified and a Class 4 cost estimate was completed for the facilities.
- **Provide findings and recommendations**. Study findings and recommendations were presented.

These steps are described in the following sections.

3. PROJECTING SEASONAL STORAGE NEEDS

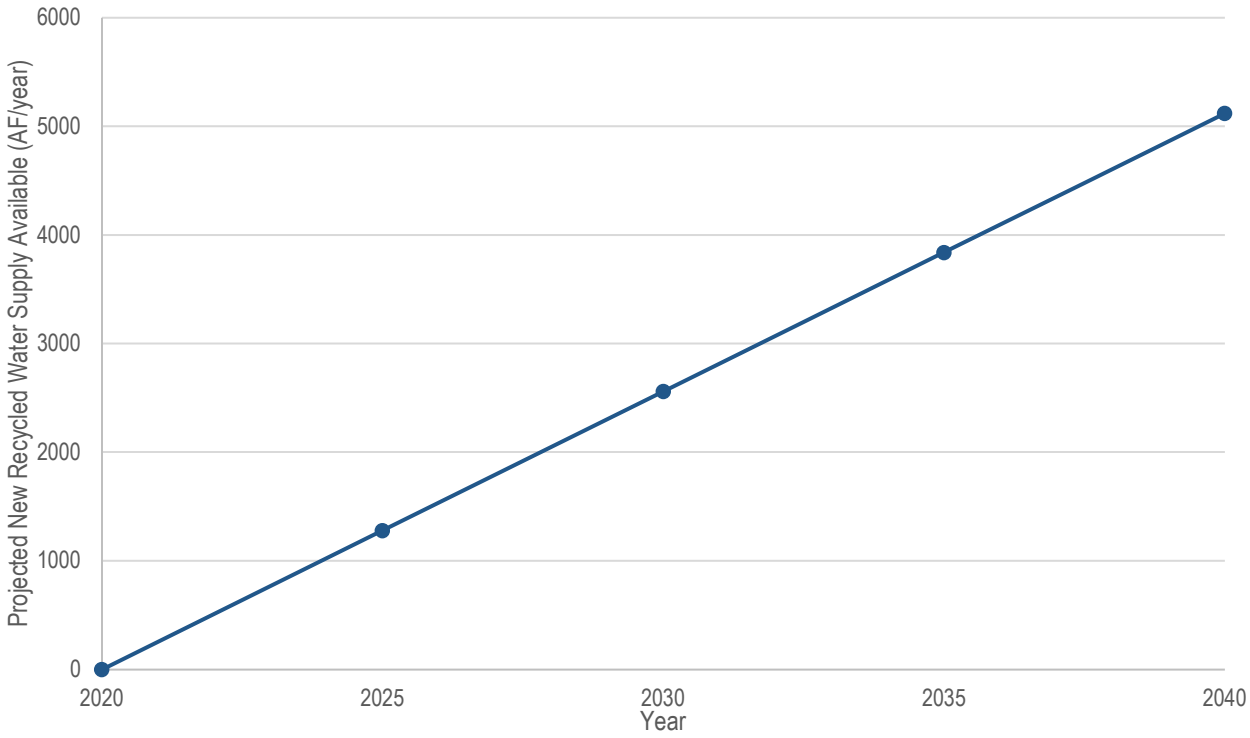
Historically effluent from the Valencia Water Reclamation Plant (WRP) has been used to meet existing recycled water demands with the remainder discharged to the Santa Clara River. A minimum amount of discharge to the Santa Clara River is required to sustain the Santa Clara River's biological resources. Changes to the quantity of water discharged to the river require a wastewater change petition to be filed with the State Water Resources Control Board – Division of Water Rights Division per Water Code Section 1211.

Wastewater flows generated from new developments that have not been previously discharged to a watercourse, however, do not require a Section 1211 wastewater change petition. SCV Water plans to maximize the new development flows through the New Drop concept, wherein new wastewater flows will be tracked so that they can be utilized in the recycled water system without a Section 1211 petition.

Due to the seasonal nature of recycled water demand, however, a portion of the new wastewater flows will have to be discharged to the Santa Clara River when supply exceeds demand if there is no available storage capacity. Any new discharges of wastewater to the river could trigger the need for a Section 1211 wastewater change petition should SCV Water need to increase its recycled water supply in the future. Therefore, to maximize recycled water supply, use of new development wastewater flows should be maximized without discharging to the Santa Clara River. This concept was used to key the size and timing of recycled water seasonal needs in this analysis.

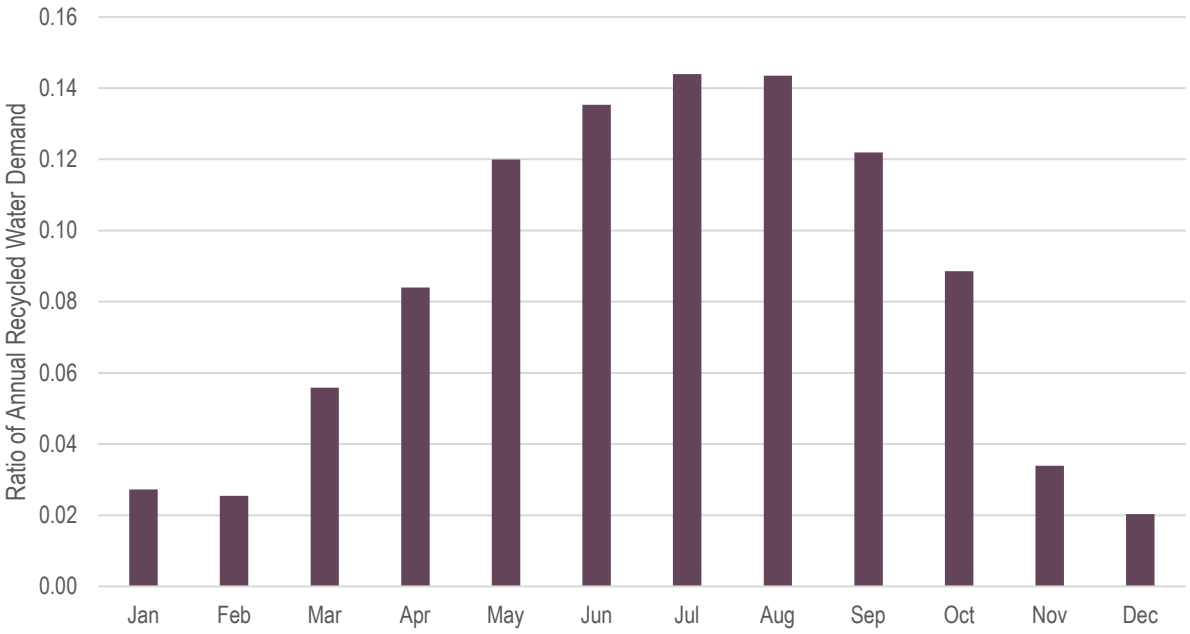
A projection of recycled water supply through the year 2050 was developed in the 2016 Recycled Water Master Plan. The timing of new wastewater supply from new developments, and their resultant recycled water supply, is dependent on a multitude of factors and can therefore be difficult to predict. For the purposes of this high-level analysis, a straight-line increase of recycled water supply was assumed, acknowledging that the timing of new supplies will vary. Using the master plan projections, a recycled water supply curve was developed, show in Figure 1, assuming linear increases through the year 2040. This analysis uses 2020 as the baseline with only supplemental flows on top of the 2020 baseline being incorporated into the seasonal storage calculations.

Figure 1: Projected New Available Recycled Water Supply



The 2016 Recycled Water Master Plan included projected monthly recycled water demands through 2050. The monthly demand variations are typical of a predominantly irrigation-use recycled water system and this curve, shown in Figure 2, was used to project monthly demands in each evaluated year.

Figure 2: Projected Seasonal Demand Curve



Seasonal storage needs were calculated in 5-year increments to estimate the timing of necessary infrastructure. For each evaluated year, the monthly demand for new available recycled water supply was calculated using the ratios from the seasonal demand curve. The estimated supply surplus or deficit in each month was then calculated by comparing the monthly demands to the projected monthly supply. The annual storage required for the year to ensure no discharges of new wastewater flows to the Santa Clara River is then the sum of all months with a supply surplus. The projected seasonal storage needs are summarized below in Table 1.

Table 1: Projected Seasonal Storage Needs

Year	Storage Required	
	(AF)	(MG)
2025	325	90
2030	650	180
2035	975	275
2040	1,300	365

4. SITE CATEGORIES

The focus of this study was to examine the feasibility of smaller distributed seasonal storage facilities. Large scale storage projects require large capital investment and can be accompanied by a host of complications including environmental and permitting issues. Focusing on smaller facilities allows SCV Water flexibility regarding the timing of the capital spending and to build storage only when and where it is needed.

The full breadth of site options was considered at the early stages of the study to capture as many potential opportunities as possible. Starting from all parcels within the SCV Water service area, an array of candidate sites was identified following discussions with SCV Water staff and a review of relevant planning documents and studies. Further review of the sites noted that these sites could be categorized by their key characteristics. These characteristics were used to establish a list of site categories. Example sites were identified within each of the categories on which preliminary evaluations were performed. The purpose of the preliminary evaluations was to identify which category(ies) of sites could best serve as future small-scale seasonal storage. The example site evaluations are discussed in Section 6.

The following sections describe the identified categories of potential seasonal storage sites.

4.1 Public Agency Owned

The public agency owned category includes parcels already owned by SCV Water or another public agency. Parcels owned by another agency would require an agreement between SCV Water and the owner to allow construction of seasonal storage on the site.

4.2 Public-Private Partnership

The public-private partnership category seeks to identify sites where a seasonal storage project can be mutually beneficial to both SCV Water and the private owner. Example partnership opportunities include those where SCV Water can provide financial assistance for site upgrades (i.e. parking lot, sports field renovation) in exchange for permission to construct seasonal storage on the site. Another type of opportunity involves partnering with private owners with existing non-potable reservoirs that can be augmented with recycled water in exchange for favorable water rates or some other incentive.

4.3 New Development/Stormwater Capture Parcels

The Santa Clarita Valley is the center of many planned development projects, including the over 6,900-acre Westside Communities development. These new developments will generally include land set aside for stormwater capture and infiltration which is needed to meet local water quality objectives. A review of the land use plans for the Westside Communities found that many such stormwater detention parcels are proposed for the development. These sites present an opportunity for recycled water seasonal storage if communication is established with the developer early in the planning process. An enhanced stormwater infiltration system can be constructed on the site to reduce the amount of land needed to attenuate the design stormwater flows. This could free up the remaining site area for construction of recycled water seasonal storage. Utilizing the same footprint that was already set aside for water management presents an attractive option to partner with developers by eliminating the need to negotiate with developers to earmark additional otherwise developable land for SCV Water use.

4.4 Open Space

The open space category includes large open space parcels with the appropriate size, location, and topography that allows the construction of an engineered reservoir, primarily through the construction of a dam. The 2016 SCV Water (formerly Castaic Lake Water Agency) Recycled Water Master Plan (RWMP) included an evaluation of nine potential sites for recycled water seasonal storage using dammed reservoirs on large open space parcels. The analysis in the 2016 RWMP focused on the construction of large capacity reservoirs (1000 AF to over 9000 AF). For the purposes of this study the nine sites identified in the 2016 RWMP were evaluated to determine the feasibility of building smaller (5 MG to 100 MG) distributed seasonal storage reservoirs.

4.5 Westside Communities Recycled Water Tank Parcels

An expansion of SCV Water's recycled water system is planned to extend into the proposed Westside Communities development. Five new operational storage tanks are planned as part of the recycled water system expansion (Recycled Water Master Plan for Westside Communities, 2015). For this study, these sites were evaluated for their potential for seasonal storage in addition to their planned operational storage use. Alternatives included constructing separate reservoirs for operational and seasonal storage as well as upsizing the planned tanks for dual operational/seasonal storage use.

5. PRELIMINARY SEASONAL STORAGE SITE SCREENING

Example sites for each of the categories were identified for evaluation, each of which is discussed in Section 6. This section presents the evaluation criteria used to compare the example sites. Each site was given an assessment of favorable, neutral, or unfavorable for each criterion. The basis and definition for each criterion is summarized below. The engineering team used its professional experience and judgement in its assessments. The list of criteria are as follows:

- Land Ownership/Acquisition
- Environmental/Permitting
- Level of Treatment Required
- Storage Volume

Conceptual level cost estimates were developed for each site which are discussed in Section 7.

5.1 Land Ownership/Acquisition

Land acquisition and securing agreements with landowners are significant factors on the feasibility of seasonal storage projects. Each site was evaluated on the perceived ease and cost of acquiring the land or obtaining an agreement with the landowner to construct storage on the site.

5.2 Environmental/Permitting

Each site was assessed for potential environmental sensitivity based on Google Earth aerial imagery and general knowledge about local environmental concerns. Environmental studies were not conducted for this assessment. There are several permits that may be required to construct each project which can add to project cost and difficulty of implementation. Sites were evaluated based on the relative anticipated scope of environmental concerns and ease of project permitting.

5.3 Level of Treatment Required

The example sites were evaluated based on the level of treatment needed before reintroducing the stored recycled water back into the system. The recycled water will be sitting in storage for several months which presents potential water quality concerns. For sites with covered storage (i.e. buried tanks, closed steel tanks) it was assumed that chlorination and mixing upon reintroduction to the system are adequate steps for water quality control. Sites with uncovered storage (i.e. open-air reservoirs subject to algae blooms/eutrophication) are assumed to require filtration in conjunction with chlorination. Sites requiring only chlorination were given rated as favorable while those requiring additional treatment were rated as unfavorable. Each of the storage facilities was assumed to have active mixing within the tank/reservoir.

5.4 Storage Volume

Each site was assessed based on the potential volume of storage that can be constructed on the site considering available area, types of storage feasible, and other uses for the site.

5.5 Categories Removed from Consideration

Two of the site categories were removed from further consideration due to fatal flaws. These categories are discussed in this section.

5.5.1 Open Space

The construction of a dam on an open space parcel presents many barriers to the environmental review and permitting processes. These sites tend to be on environmentally sensitive land which increases the difficulty of getting a high impact project such as a reservoir permitted. This is likely to result in a lengthy and expensive environmental review. In addition, a reservoir on the order of size needed for seasonal storage is likely to fall under the jurisdiction of the California Division of Safety of Dams (DSOD). Per California Department of Water Resources website, "if the dam height is more than 6 feet and it impounds 50 acre-feet or more of water, or if the dam is 25 feet or higher and impounds more than 15 acre-feet of water, it will be under [DSOD] oversight, unless it is exempted".

Due to the permitting and jurisdictional challenges of this site category it was removed from further consideration in the evaluation.

5.5.2 Westside Communities Recycled Water Tank Parcels

Planning documents for the Westside Communities including the Recycled Water Master Plan for Westside Communities and development land use plans were reviewed to evaluate the potential of constructing seasonal storage on the proposed recycled water operational storage sites. The review of these tank sites found that minimal additional space was available beyond what is needed for the operational system components. The amount of land required to construct meaningful capacity of seasonal storage is not available on these sites therefore the category was removed from further consideration.

6. SITE EVALUATIONS

Example sites for each of the site categories were selected for evaluation. Site were evaluated in enough detail to identify key opportunities and constraints, and to develop a preliminary cost estimate. The chosen sites were selected to have representative characteristics of their respective site class. The evaluation of these sites therefore can be used as a reference for sites not specifically covered in this TM. The purpose of this study is not only to evaluate these specific example sites but to examine which site categories provide the best opportunities for small-scale seasonal storage.

Facilities were sized based on projected seasonal flows in 2040. The peak surplus and deficits in supply in December and July respectively were relatively similar. A single 12" pipeline for filling and draining the storage reservoir was assumed for all options; sized to meet peak surplus and demands. Any site requiring a booster station was sized based on the peak anticipated 2040 supply deficit (2300 gpm or 10 AF/day) and the TDH needed to pump back into the recycled water system from the static head in the reservoir.

The evaluation criteria were described in Section 5. The example sites evaluated in this TM, by category, are presented below.

Public Agency Owned

- Round Mountain Tank Site
- Rio Vista Water Treatment Plant (WTP)
- Newhall Ranch Water Reclamation Plant (WRP)
- Castaic Creek Floodplain Open Reservoir
- Central Park

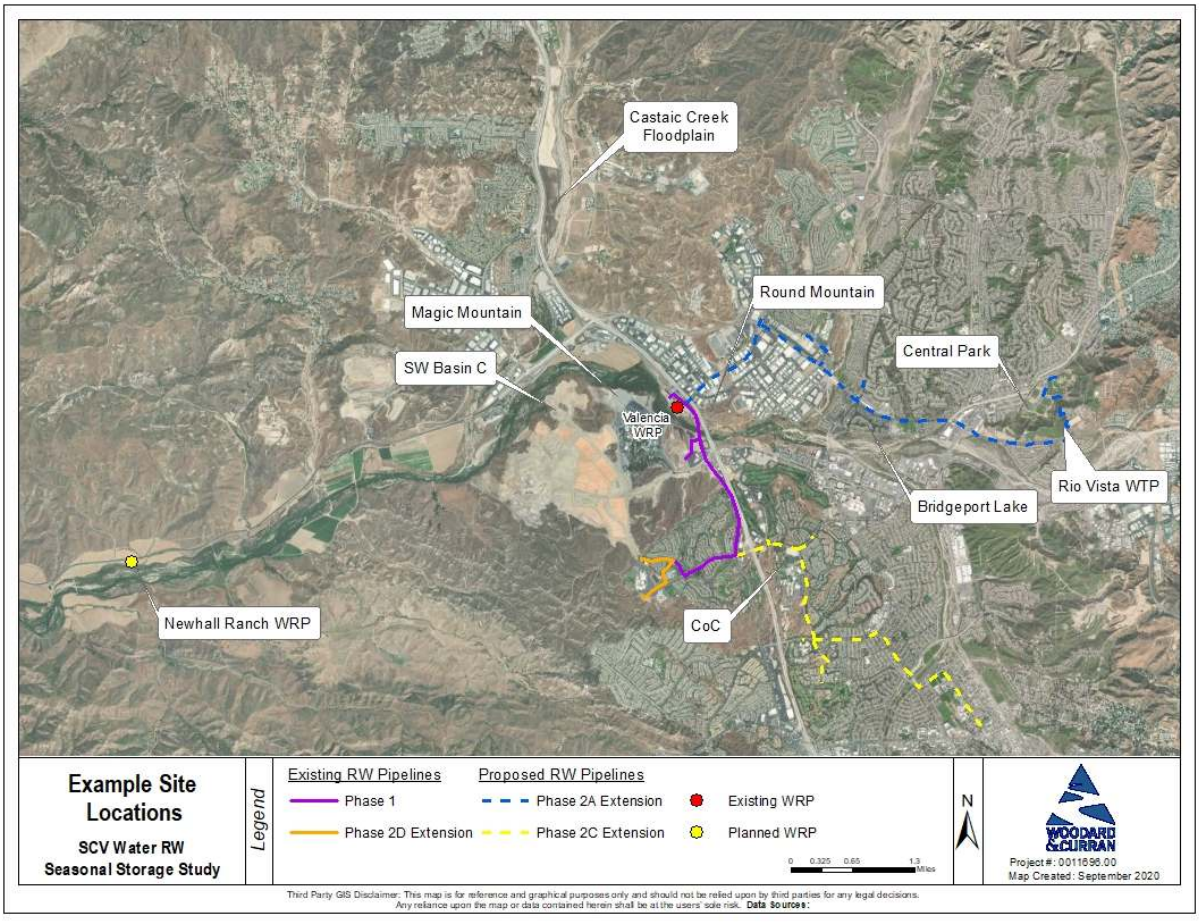
Public-Private Partnership

- Magic Mountain Parking Lot
- College of the Canyons Football Field
- Bridgeport Lake

New Development/Stormwater Capture Parcels

- Mission Village Stormwater Basin C

Figure 3: Example Site Locations



6.1 Public Agency Owned

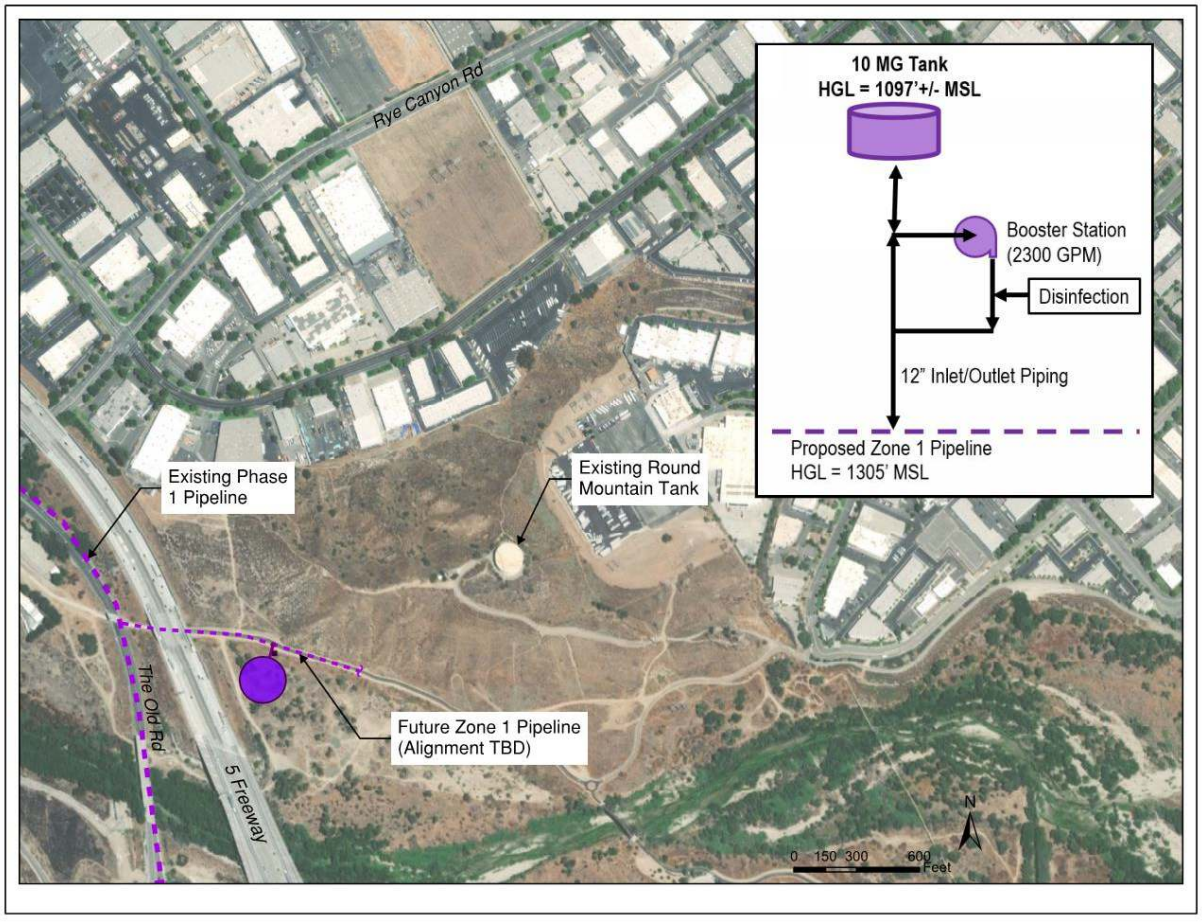
This section contains evaluations of the example sites in the Public Agency Owned category.

6.1.1 Round Mountain Tank Site

The Round Mountain tank site is owned by SCV Water and currently has a 3.2 MG potable water tank located at the top of the mountain. The tank is planned for connection to the recycled system and will be converted to serve as operational storage for the future zone 1 recycled water system.

This option proposes constructing a 10 MG above ground steel tank at the flat base of the mountain on SCV Water property. The tank would be connected to the future recycled water pipeline serving the Round Mountain Tank. A booster station would be needed to pump recycled water from the seasonal storage tank back into the zone 1 system.

Figure 4: Round Mountain Example Site



<u>Land Ownership/Acquisition</u> - Favorable

The parcel is already owned by SCV Water; no land purchase or agreement is required.

Environmental/Permitting – Favorable

All construction for this option were assumed to be on SCV Water property so no encroachment permits are required. To comply with California Environmental Quality Act (CEQA), a Mitigated Negative Declaration (MND) would be appropriate based on the construction activities involved in the project. The project is anticipated to have a soil disturbance greater than 1 acre; therefore would require a General Construction NPDES permit (Clean Water Act Section 402) and development of a Storm Water Pollution Prevention Plan (SWPPP).

Level of Treatment Required - Favorable

Residence time in the seasonal storage tank could be on the order of months, at which point the chlorine residual in the recycled water would be substantially reduced. Chlorination of the stored water will be needed before being fed back into the recycled water system. This can be accomplished with an in-line sodium hypochlorite injection system and a static mixer. It is assumed no additional treatment is required.

Storage Volume - Neutral

A 10 MG tank was assumed to be the largest practical above ground steel tank which could be constructed for a seasonal storage project. One 10 MG tank could be constructed on this site, making the potential storage volume for this site 10 MG (30+ AF).

6.1.2 Rio Vista Water Treatment Plant

The Rio Vista Water Treatment Plant is an SCV Water facility which treats imported State Project water from Castaic Lake prior to introduction into its potable water system. The plant is collocated on the same property as the SCV Water offices on Bouquet Canyon Rd. Preliminary plans for the proposed Phase 2A recycled water expansion recommended siting a 3.5 MG recycled water operational storage tank at this site. One alternative for seasonal storage at this location is to upsize the planned tank to incorporate seasonal storage as well. The tank would be at the HGL of the phase 2A system, avoiding a need for additional pumping. This site also has available land area on the "mesa", on which there are existing storage tanks and a solar farm. Constructing storage on the "mesa" would require increased pumping capacity because the surface elevation of the "plateau" is approximately 190 ft higher than the HGL of the planned Phase 2A system.

The evaluated option in this study considers constructing a 10 MG aboveground steel tank at the proposed Phase 2A tank site. The tank would be connected to the Phase 2A system and therefore requires construction of the 2A extension to Rio Vista WTP.

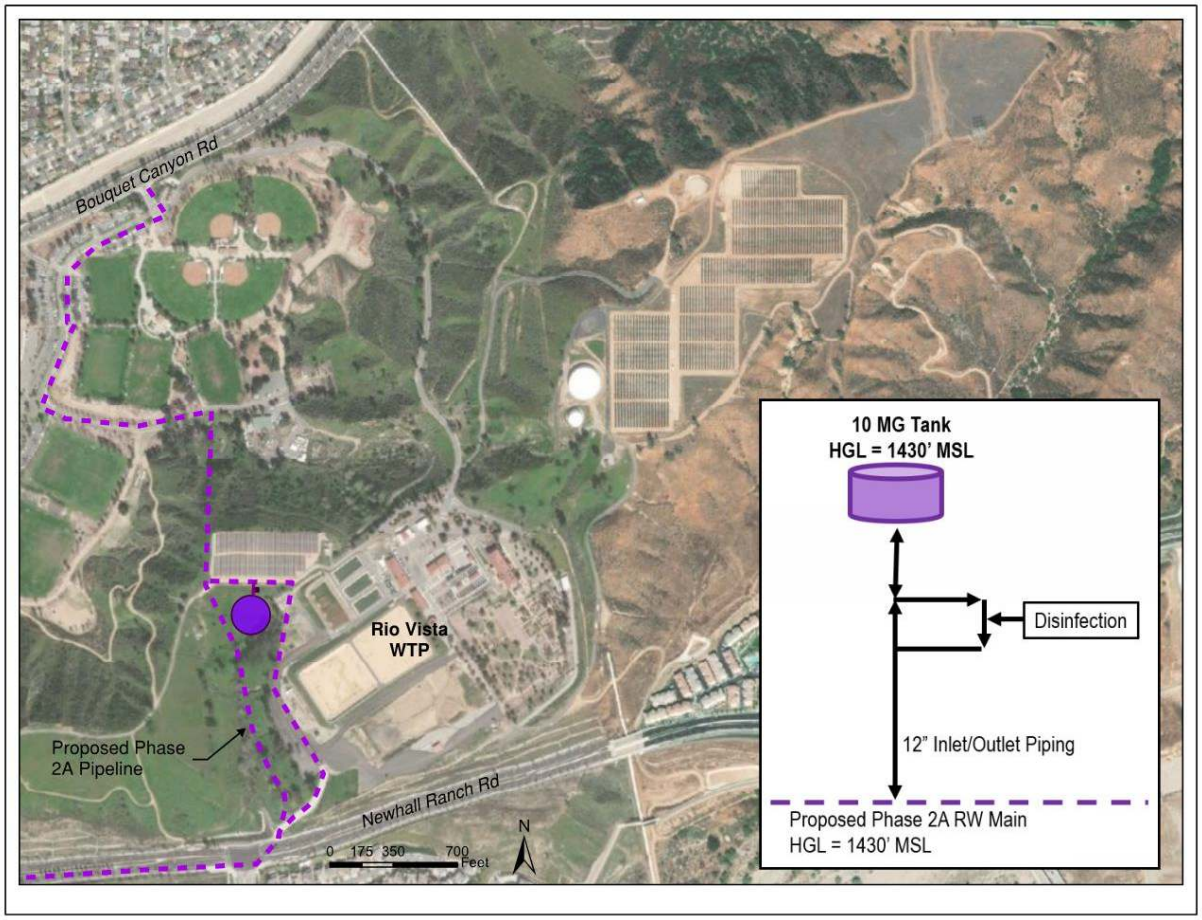
Land Ownership/Acquisition - Favorable

The parcel is already owned by SCV Water; no land purchase or agreement is required.

Environmental/Permitting - Favorable

All construction for this option were assumed to be on SCV Water property so no encroachment permits are required. To comply with California Environmental Quality Act (CEQA), a Mitigated Negative Declaration (MND) would be appropriate based on the construction activities involved in the project. The project is anticipated to have a soil disturbance greater than 1 acre; therefore would require a General Construction NPDES permit (Clean Water Act Section 402) and development of a Storm Water Pollution Prevention Plan (SWPPP).

Figure 5: Rio Vista Water Treatment Plant Example Site



Level of Treatment Required - Favorable

Residence time in the seasonal storage tank could be on the order of months, at which point the chlorine residual would be substantially reduced. Chlorination of the stored water will be needed before being fed back into the recycled water system. This can be accomplished with an in-line sodium hypochlorite injection system and a static mixer. It is assumed no additional treatment is required.

Storage Volume - Neutral

A 10 MG tank was assumed to be the largest practical aboveground steel tank which could be constructed for a seasonal storage project. This evaluation considers constructing a single 10 MG tank at the proposed Phase 2A tank location. As discussed previously, there are additional areas on the site where supplementary storage could be built.

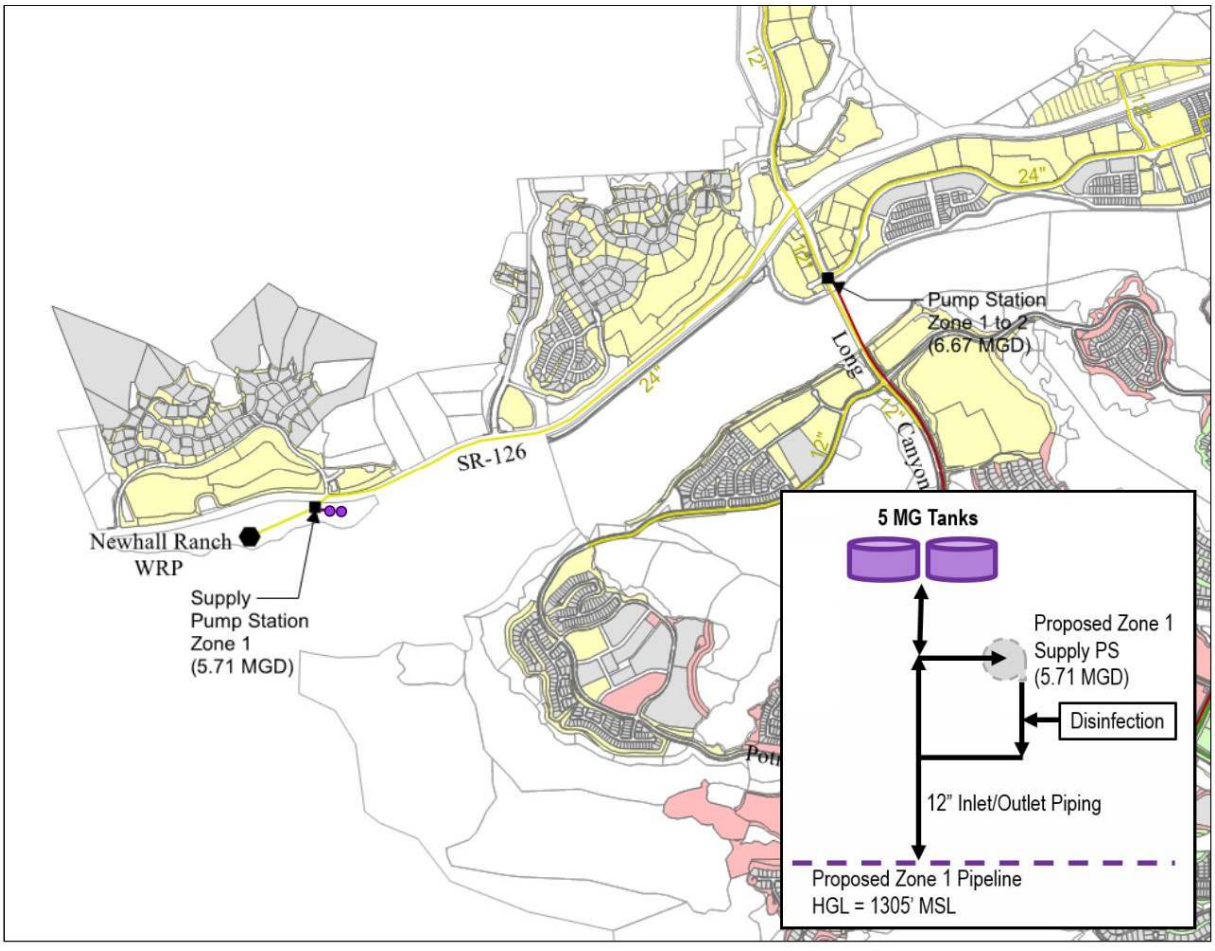
6.1.3 Newhall Ranch Water Reclamation Plant (WRP)

The Newhall Ranch Water Reclamation Plant is a proposed treatment facility that would be located near the western edge of the Westside Communities development, serving the Newhall Ranch Specific Plan area. A new County Sanitation District will be created to operate and maintain the plant. At buildout, the Newhall Ranch WRP is anticipated

to produce 3.75 MGD (4,200 AFY) of recycled which would serve non-potable demands within the new development (RWMP, 2016). The design of the WRP is currently at the preliminary stages. Utilizing this site for seasonal storage assumes that the amount of space for the treatment facilities can be optimized such that there is sufficient space to construct additional storage.

This option proposes building two 5 MG aboveground steel tanks at the WRP. Recycled water from the tanks would be fed into to the future zone 1 system using the WRP's 5.71 MGD zone 1 supply pump station. It is assumed no additional pumping for the seasonal storage project is needed.

Figure 6: Newhall Ranch Water Reclamation Plant Example Site



Basemap Source: Recycled Water Master Plan for Westside Communities, 2015

<u>Land Ownership/Acquisition</u>- Favorable

The parcel will be owned by the Newhall Ranch Sanitation District, but other recycled water facilities are already planned for the site. An agreement between SCV Water and Newhall Ranch Sanitation District would be needed to construct seasonal storage at the plant.

Environmental/Permitting - Favorable

All construction for this option was assumed to be on Newhall Ranch Sanitation District property so no encroachment permits are required. If the tanks can be incorporated into the design and construction of the plant, no additional permitting will be required.

Level of Treatment Required - Favorable

Residence time in the seasonal storage tank could be on the order of months, at which point the chlorine residual would be substantially reduced. Chlorination of the stored water will be needed before being fed back into the recycled water system. This can be accomplished with an in-line sodium hypochlorite injection system and a static mixer. It is assumed no additional treatment is required.

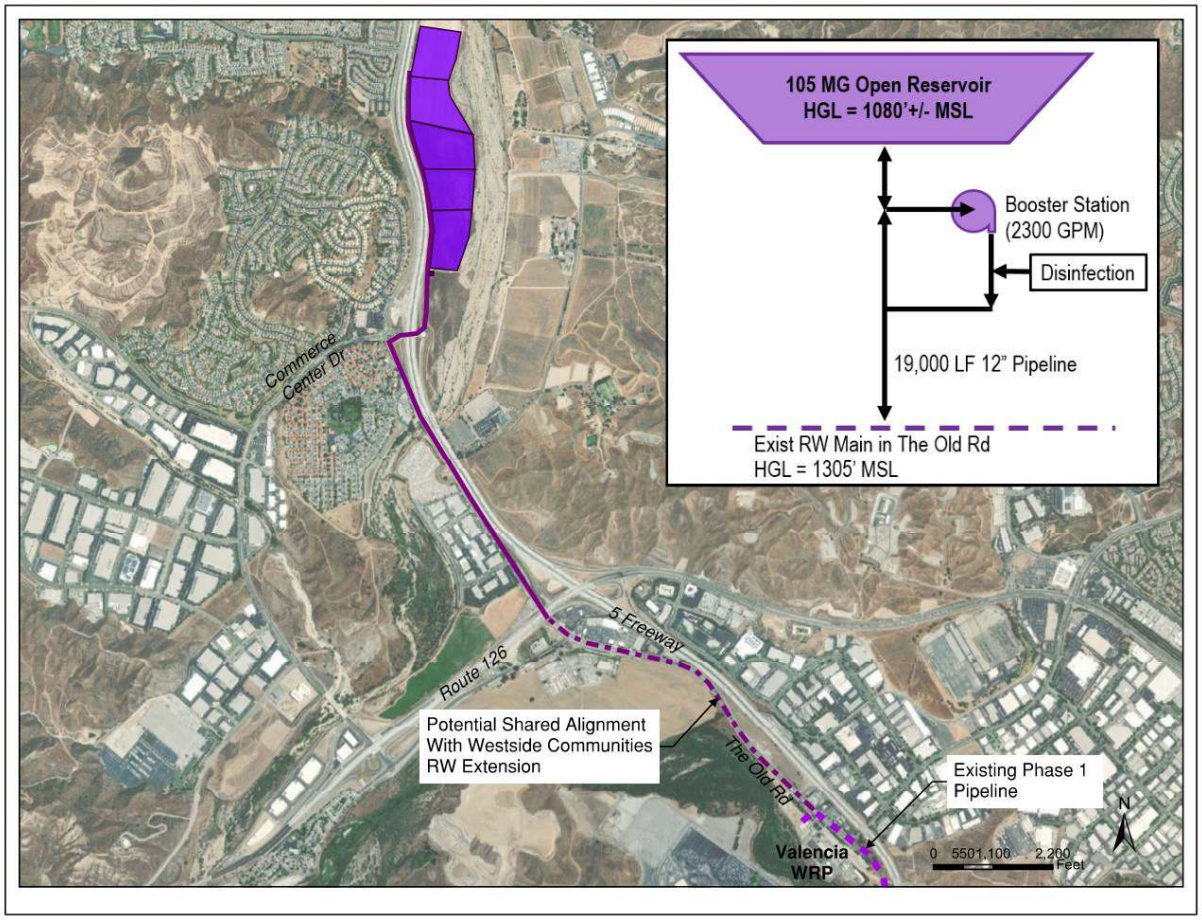
Storage Volume – Neutral

This option assumes that in subsequent layouts of the Newhall Ranch WRP there is adequate space to incorporate seasonal storage. An evaluation of an available preliminary layout of the plant estimated that two 5 MG tanks could be constructed on the site. The actual available space will be contingent on the treatment processes and equipment selected in the final design of the plant.

6.1.4 Castaic Creek Floodplain – Open Reservoir Alternative

This alternative proposes utilizing the Los Angeles County parcel located along the Castaic Creek floodplain for recycled water storage. This alternative includes constructing a series of five lined uncovered reservoirs bordered by a constructed berm, with a total site storage capacity of 105 MG. There are no existing or planned recycled water mains near the site. The closest existing connection point is the Phase 1 pipeline outside of the Valencia WRP on The Old Road. Approximately 19,000 linear feet of 12" pipe would need to be constructed to convey recycled water to and from the reservoirs. A future extension of the recycled water system for the Westside Communities is also planned along The Old Rd to near the intersection of SR-126. A connection to the future extension would reduce the required pipe length to the reservoirs to approximately 13,700 linear feet. A booster station would need to be built to pump the recycled water from the reservoirs into the recycled water system.

Figure 8: Castaic Creek Floodplain Open Reservoir Example Site



<u>Land Ownership/Acquisition</u>- Favorable

The parcel is owned by Los Angeles County and this project would require either securing an easement from the County or acquiring the land outright. The County has also expressed interest in selling the land to developers.

<u>Environmental/Permitting</u> – Unfavorable

A public right-of-way encroachment permit will be required from the City of Santa Clarita for the pipeline construction. The pipeline crossings of the 5 freeway and State Route 126 will also necessitate securing Caltrans Encroachment permits. To comply with California Environmental Quality Act (CEQA), a Mitigated Negative Declaration (MND) would be appropriate based on the construction activities involved in the project. The project is anticipated to have a soil disturbance greater than 1 acre; therefore, it would require a General Construction NPDES permit and development of a Storm Water Pollution Prevention Plan (SWPPP). A US Army Corps of Engineers Clean Water Act Section 404 permit and a California Department of Fish and Wildlife Streambed Alteration Agreement may be needed for construction near Castaic Creek. The berm height would be kept under 6 feet so as to not fall under jurisdiction of the Department of Water Resources Division of Safety of Dams.

Level of Treatment Required – Unfavorable

Storage of recycled in an open-air system will require additional measures to ensure water quality compared to closed storage alternatives. Media filtration followed by chlorination should provide adequate treatment before reintroduction into the recycled water system. For the purposes of this study, it was assumed that the treatment facilities for this alternative consist of a bag filtration system and an in-line sodium hypochlorite injection system with a static mixer.

Storage Volume - Favorable

An extensive amount of land (100+ acres) is available on the site which allows for a wide portfolio of potential storage solutions. To account for the slope of the site, it was assumed the storage would be divided into a series of lined reservoirs at cascading elevations. Based on the estimated slope and assumed height of the berm, each reservoir would have an approximately 15-acre footprint. For the purposes of the evaluation to provide an approximate comparison to a large scale buried tank alternative (such as the Magic Mountain alternative) it was assumed that five of these reservoirs would be constructed on the site for a total capacity of 105 MG. An open reservoir is subject to losses due to evaporation. To account for evaporation of stored recycled water, based on recorded evapotranspiration rates it was assumed that 20% of the capacity would be lost to evaporation resulting in an annual yield of 84 MG from the reservoir. Additional capacity may be available on the site depending on the amount of land that can be acquired from the County.

Additional Considerations

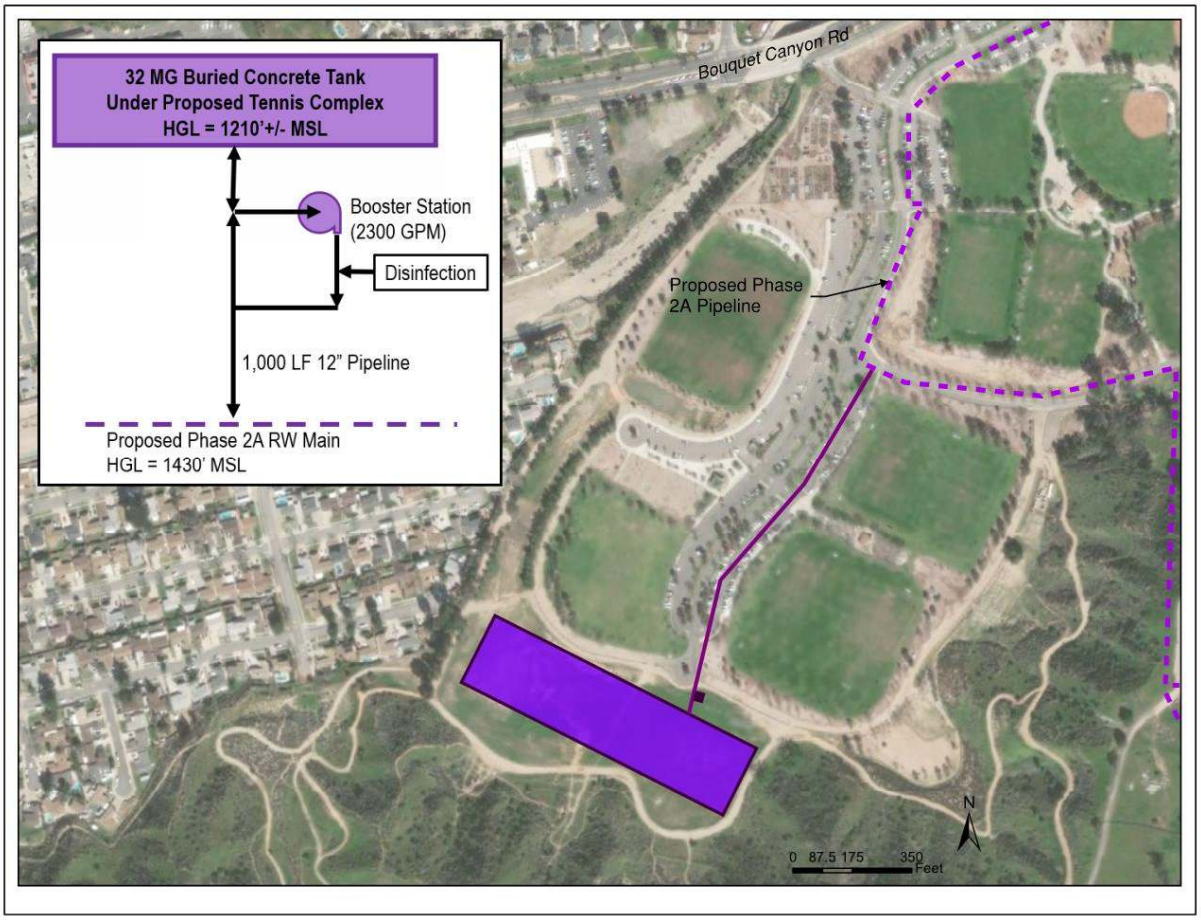
Due to the seasonal nature of the recycled water storage, the reservoir will sit empty for many months of the year. For an uncovered reservoir this can present potential operational and maintenance issues. During the months when the reservoir is empty dust and debris are likely to accumulate in the reservoir. The exposed surface of the reservoir liner may also be vulnerable to damage while empty. An annual cleaning and liner inspection would be required as a result of these potential issues.

6.1.5 Central Park

The Central Park parcel is owned by SCV Water and is located adjacent to the SCV Water offices off Bouquet Canyon Road. There is currently an approximately 7.7-acre unimproved area in the southern portion of the park which, per the City of Santa Clarita's website, will be the site of a future tennis center. Central Park is planned for conversion to recycled water irrigation on the proposed Phase 2A recycled water system extension.

This option proposes constructing a 28 MG buried concrete tank under the planned tennis center. The tank would be connected to the Phase 2A system and therefore requires construction of the 2A extension to Central Park. A booster station would be needed to pump the stored water from the tank back into the 2A system.

Figure 9: Central Park Example Site



<u>Land Ownership/Acquisition</u>- Favorable

The parcel is already owned by SCV Water; no land purchase is required. An agreement with the City of Santa Clarita may be needed to construct the tank at the park. As part of the construction of the tank, the project could incorporate site improvements to facilitate construction of the park's future tennis courts. This presents an opportunity for a partnership between the two agencies.

<u>Environmental/Permitting</u> - Favorable

All construction for this option were assumed to be on SCV Water property so no encroachment permits are required. To comply with California Environmental Quality Act (CEQA), a Mitigated Negative Declaration (MND) would be appropriate based on the construction activities involved in the project. The project is anticipated to have a soil disturbance greater than 1 acre; therefore would require a General Construction NPDES permit (Clean Water Act Section 402) and development of a Storm Water Pollution Prevention Plan (SWPPP).

Level of Treatment Required – Favorable

Residence time in the seasonal storage tank could be on the order of months, at which point the chlorine residual would be substantially reduced. Chlorination of the stored water will be needed before being fed back into the recycled water system. This can be accomplished with an in-line sodium hypochlorite injection system and a static mixer. It is assumed no additional treatment is required.

Storage Volume - Favorable

The buried tank was assumed to be under the 5-acre area of the planned tennis center with a total depth of 20 ft. The potential storage volume for this option is 32 MG.

6.2 Public-Private Partnership

This section contains evaluations of the example sites in the Public-Private Partnership category.

6.2.1 Magic Mountain Parking Lot

Six Flags Magic Mountain is an amusement park owned by the Six Flags Entertainment Corporation, located in the Valencia neighborhood of Santa Clarita. The park has a large open-air parking lot, including an approximately 21-acre unpaved lot, assumed to be for overflow parking. An existing recycled water main runs past the entrance to Magic Mountain on Magic Mountain Parkway.

This option proposes constructing a 110 MG buried concrete tank under the unpaved parking lot. Approximately 5,300 linear feet of piping would be needed to connect the tank to the existing recycled water main in Magic Mountain Parkway. A booster station would also need to be built to pump the recycled water from the buried tank into the existing recycled water system (future zone 2).

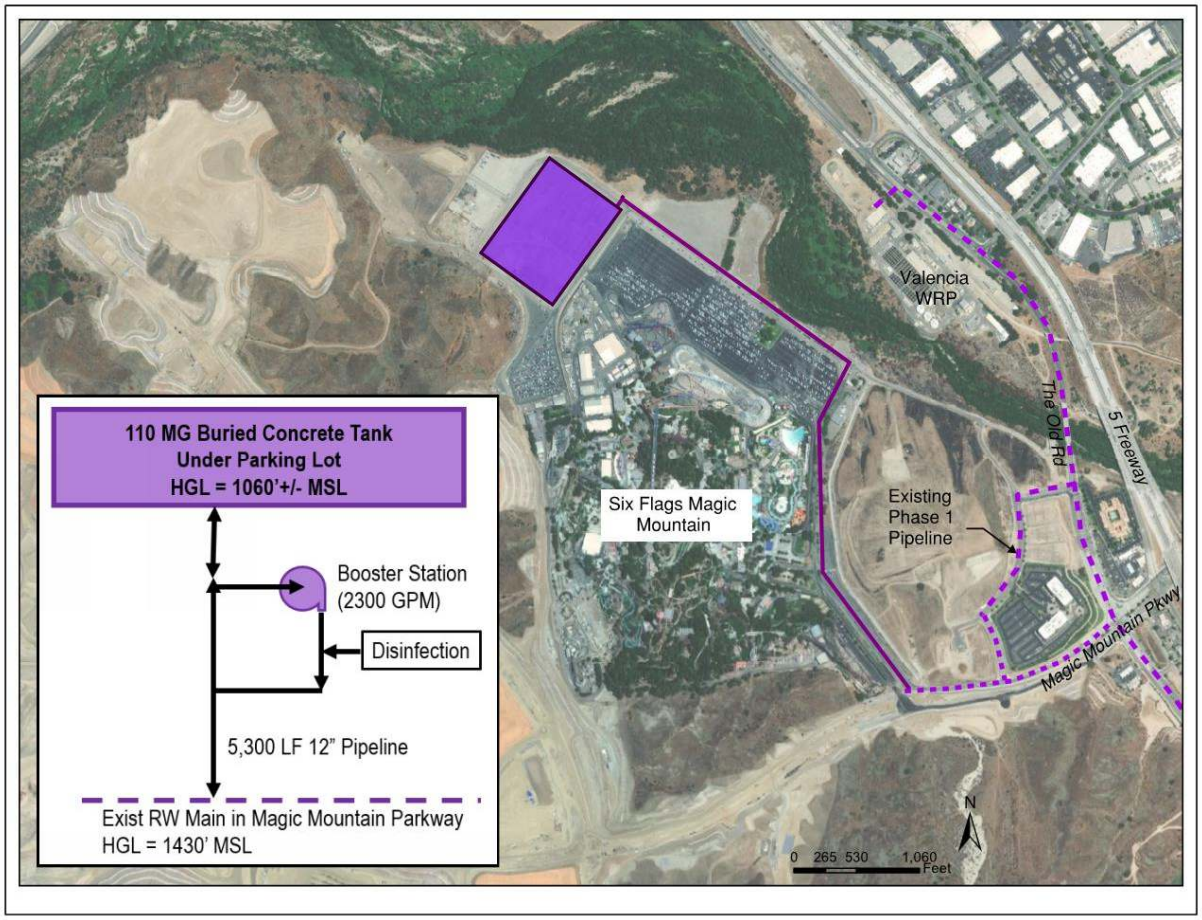
Land Ownership/Acquisition - Unfavorable

The site is owned by the Six Flags Corporation, a private entity. An easement would be required from Six Flags to construct and maintain the tank on the property. One potential opportunity for a partnership between SCV Water and the owner is to include site improvements to the tank construction project to make the project beneficial to both parties. Site improvements may include installation of a paved parking lot on top of the reservoir.

Environmental/Permitting – Favorable

An encroachment permit may be required from the City of Santa Clarita if any pipeline construction is done in the public right-of-way. Encroachment permits will be also be needed for construction on the private property as well as an access easement for maintenance purposes. To comply with California Environmental Quality Act (CEQA), a Mitigated Negative Declaration (MND) would be appropriate based on the construction activities involved in the project. The project is anticipated to have a soil disturbance greater than 1 acre; therefore would require a General Construction NPDES permit (Clean Water Act Section 402) and development of a Storm Water Pollution Prevention Plan (SWPPP).

Figure 10: Magic Mountain Parking Lot Example Site



<u>Level of Treatment Required</u> - Favorable

Residence time in the seasonal storage tank could be on the order of months, at which point the chlorine residual would be substantially reduced. Chlorination of the stored water will be needed before being fed back into the recycled water system. This can be accomplished with an in-line sodium hypochlorite injection system and a static mixer. It is assumed no additional treatment is required.

<u>Storage Volume</u> – Favorable

The buried tank was assumed to be under the 17-acre unpaved section of the Magic Mountain parking lot with a total depth of 20 ft. The potential storage volume for this option is 110 MG.

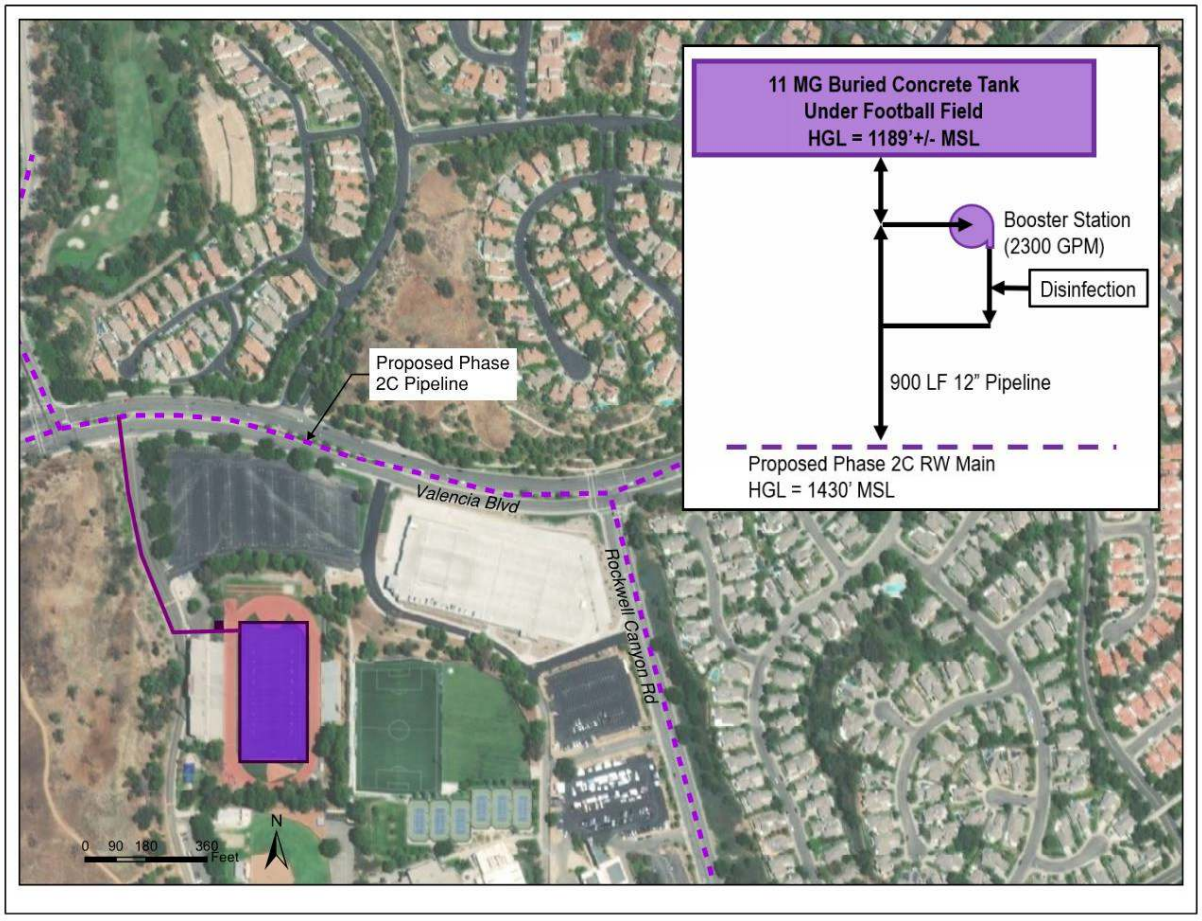
6.2.2 College of the Canyons Football Field

College of the Canyons is a public community college operated by the Santa Clarita Community College District located on Rockwell Canyon Road and Valencia Boulevard. The College of the Canyons football team plays on the artificial turf field located on the campus. The school has been identified as one of the customers for the planned Phase 2C

recycled water system expansion and the proposed alignment for the main will run down Valencia Boulevard and Rockwell Canyon.

This option proposes constructing a 9.8 MG tank under the school's football field. The tank would be connected to the planned Phase 2C system and therefore requires the 2C extension to be built to the College of the Canyons. A booster station would be needed to pump recycled water from the seasonal storage tank into the Phase 2C system.

Figure 11: College of the Canyons Football Field Example Site



<u>Land Ownership/Acquisition</u> – Neutral

The site is owned by the Santa Clarita Community College District. An easement would be required from the District to construct and maintain the tank on the property. To construct the tank at this site will likely require a partnership between SCV Water and the owner to make the project beneficial to both parties. In exchange for an easement on the property, SCV Water could provide financial assistance for a renovation of the football field as part of the tank project.

<u>Environmental/Permitting</u> – Favorable

An encroachment permit may be required from the City of Santa Clarita if any pipeline construction is done in the public right-of-way. Encroachment permits will be also be needed for construction on the property as well as an access

easement for maintenance purposes. To comply with California Environmental Quality Act (CEQA), a Mitigated Negative Declaration (MND) would be appropriate based on the construction activities involved in the project. The project is anticipated to have a soil disturbance greater than 1 acre; therefore would require a General Construction NPDES permit (Clean Water Act Section 402) and development of a Storm Water Pollution Prevention Plan (SWPPP).

Level of Treatment Required - Favorable

Residence time in the seasonal storage tank could be on the order of months, at which point the chlorine residual would be substantially reduced. Chlorination of the stored water will be needed before being fed back into the recycled water system. This can be accomplished with an in-line sodium hypochlorite injection system and a static mixer. It is assumed no additional treatment is required.

Storage Volume - Neutral

The buried tank was assumed to be under the football field with an area of 1.8 acres and a total depth of 20 ft. The potential storage volume for this option is 36 AF (11 MG).

6.2.3 Bridgeport Lake

Bridgeport Lake is a manmade recreational lake owned by the Bridgeport Valencia HOA located near the intersection of Newhall Ranch Road and McBean Parkway. The lake is currently supplied with potable water from SCV Water and stormwater runoff. Private residences are built up to the lake edge, and residents of the HOA use the lake for recreational activities such as canoeing and paddle boarding. Bridgeport Valencia HOA has been identified as a potential customer for the planned Phase 2A recycled water system expansion and the preliminary design of the 2A extension has the pipeline running down Newhall Ranch Rd.

This option proposes using Bridgeport Lake as a receptor for recycled water seasonal storage. Approximately 600 linear feet of inlet/outlet piping would connect the lake to the Phase 2A recycled water system. A booster station would be needed to pump water from Bridgeport Lake into the Phase 2A system.

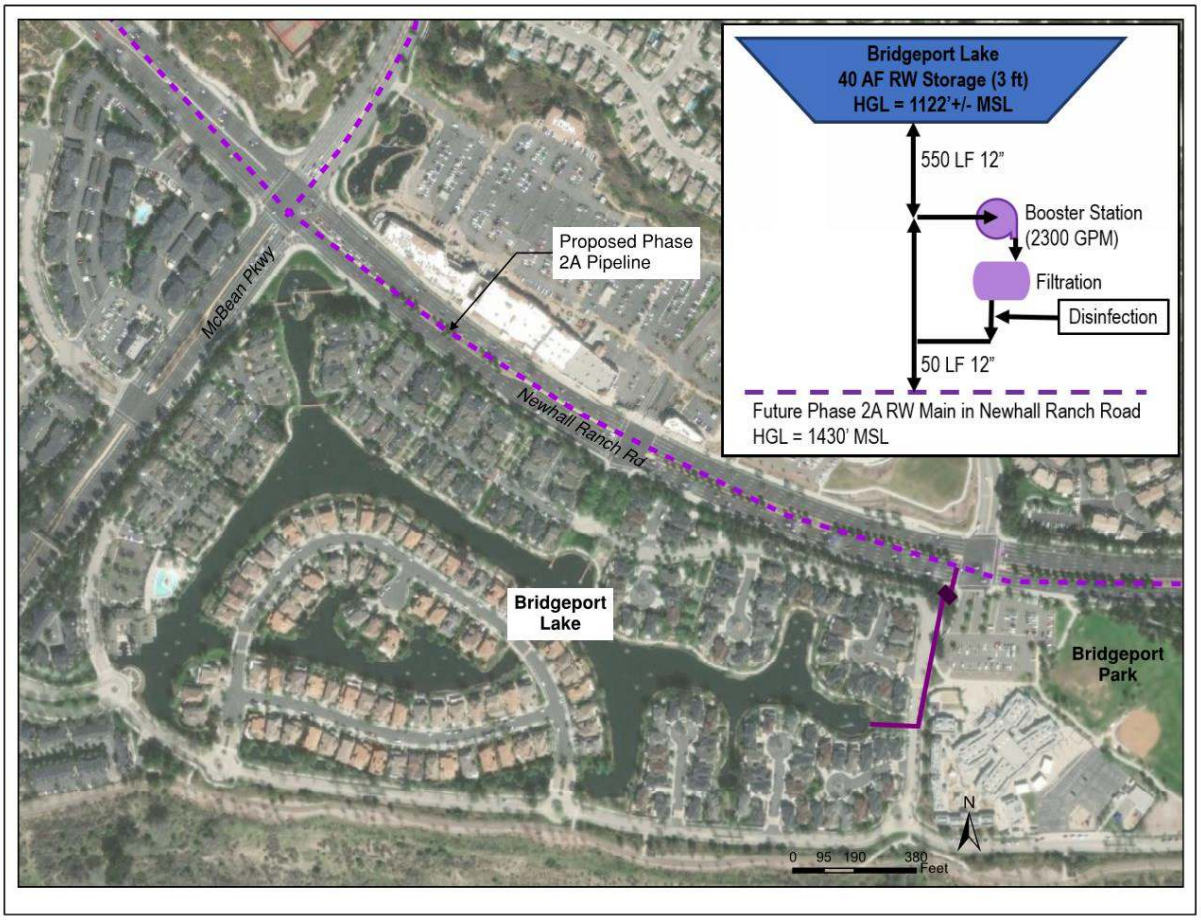
Land Ownership/Acquisition – Neutral

Bridgeport Lake is owned and maintained by the Bridgeport Valencia HOA. An agreement is needed between the HOA and SCV Water for the lake to accept recycled water and an easement would be required to construct and maintain any related facilities on the property. Depending on the final locations of the facilities; an easement may be needed from the City of Santa Clarita for anything built and maintained on Bridgeport Park property. The disturbance to the property is significantly lower than the other engineered storage alternatives presented in this study, requiring only a booster station and treatment facilities. Other potential impacts to the owner include managing the seasonal variations in lake height due to the filling and draining of recycled water. A potential area for partnership in the project is a reconfigured water rate structure that would benefit the HOA in exchange for using the lake for storage.

Environmental/Permitting – Favorable

An encroachment permit may be required from the City of Santa Clarita for any pipeline construction in the public right-of-way. Encroachment permits will be also be needed for construction on the private property as well as an access easement for maintenance purposes. To comply with California Environmental Quality Act (CEQA), a Mitigated Negative Declaration (MND) would be appropriate based on the construction activities involved in the project. The project is anticipated to have a soil disturbance greater than 1 acre; therefore would require a General Construction NPDES permit (Clean Water Act Section 402) and development of a Storm Water Pollution Prevention Plan (SWPPP). Bridgeport Lake is not listed in the Los Angeles Region Basin Plan.

Figure 12: Bridgeport Lake Example Site



<u>Level of Treatment Required</u> – Unfavorable

Storage of recycled in an open-air system such as Bridgeport Lake will require additional measures to ensure water quality compared to closed storage alternatives. Media filtration followed by chlorination should provide adequate treatment before reintroduction into the recycled water system. For the purposes of this study it was assumed that the treatment facilities for this alternative consist of a bag filtration system and an in-line sodium hypochlorite injection system with a static mixer.

<u>Storage Volume</u> – Neutral

The available storage volume in Bridgeport Lake can vary greatly depending on the owner's management strategies for the lake including available capacity, resident feedback, and sensitivity to seasonal depth variation. It was assumed that 3 ft depth of recycled water could be stored in Bridgeport Lake. The approximate surface area of the lake is 13.3 acres, bringing the potential storage volume to 40 AF (11 MG).

6.3 New Development/Stormwater Capture Parcels

This section contains an evaluation of a site in the New Development/Stormwater Capture Parcels category.

6.3.1 Mission Village Stormwater Basin C

The Mission Village project is part of the Westside Communities development and comprises the development of 4,412 dwelling units and 1.55 million square feet of mixed-use/commercial development. Per the Mission Village Environmental Impact Report, there are five planned regional infiltration facilities to capture and treat stormwater runoff in the development. These stormwater infiltration facilities are a part of the suite of stormwater best management practices needed for the development to meet local water quality objectives. Stormwater Basin C was selected for this evaluation because its size (7.2 acres) is representative of a larger stormwater basin which could be incorporated into future developments. As currently designed, the regional infiltration facilities have been sized for the volume of runoff produced from a 0.75 inch storm event per the Los Angeles Regional Water Quality Control Board Standard Urban Storm Water Mitigation Plan (SUSMP) requirements and for 80% capture and treatment of the average annual runoff per the Newhall Ranch Specific Plan Sub-Regional Stormwater Mitigation Plan. Each facility would be designed to incorporate a biofilter in the bottom which would allow for infiltration.

Stormwater capture facilities such as Mission Village Basin C present a unique opportunity for recycled water seasonal storage because the land is already earmarked for water facilities, providing an opportunity for partnership between the developer and SCV Water. The concept for this option is to utilize more advanced methods of infiltration such as vadose zone wells to reduce the footprint of the stormwater facilities, while keeping the same capacity, which creates available space upon which seasonal recycled water storage can be built. Vadose zone recharge systems utilize specially designed dry wells installed in the unsaturated zone to create increased surface area for lateral and vertical infiltration of water into the ground compared to a typical infiltration basin.

For this site vadose zone wells would be constructed, which it was assumed would reduce the stormwater facility footprint by half. The number of wells will be determined based on the hydraulic conductivity of the unsaturated zone. A 16.8 MG buried concrete would be built on the remaining land. The tank would be connected to the planned Westside Communities recycled water system expansion. A booster station would be needed to pump the recycled water back into the system.

Mission Village Basin C was used as an example to examine the feasibility of the concept. Construction has already begun on Basin C and too far along to repurpose the site for seasonal storage. Moving forward SCV Water can use this analysis to work with developers to identify sites early in the design process which can be repurposed for both stormwater capture and seasonal storage. Additional geotechnical investigation would be needed to determine the efficacy of vadose zone wells on any particular site.

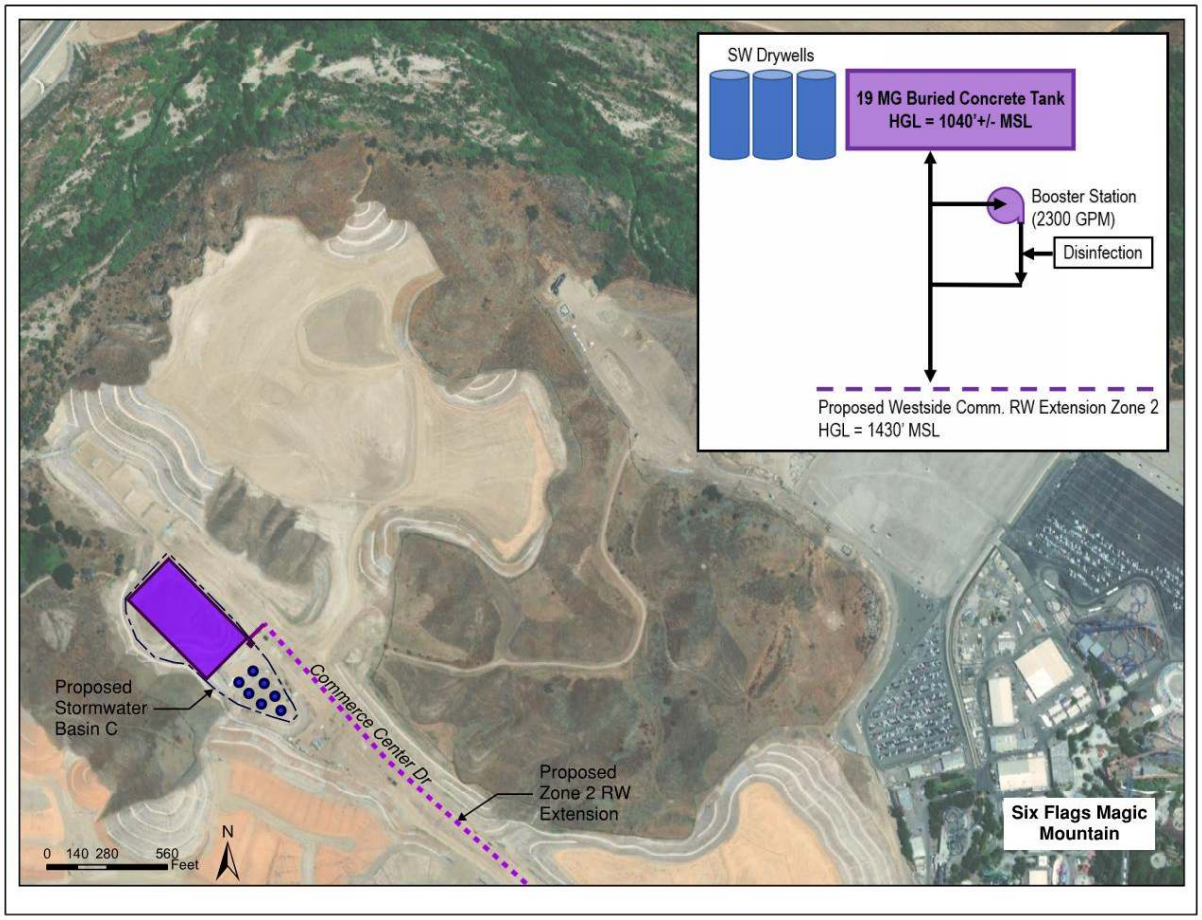
Land Ownership/Acquisition – Neutral

Communication with the developer early in the project lifecycle is critical for implementation of this type of project. The developer will need to account for changes to the stormwater system and evaluate the water quality impacts in its Environmental Impact Report. The benefit of this option, however, is that no additional land needs to be requested from the developer making it an attractive option for both parties.

Environmental/Permitting – Neutral

An encroachment permit may be required from the City of Santa Clarita if any pipeline construction is done in the public right-of-way. To comply with California Environmental Quality Act (CEQA), a Mitigated Negative Declaration (MND) would be appropriate based on the construction activities involved in the project. The project is anticipated to have a soil disturbance greater than 1 acre; therefore would require a General Construction NPDES permit (Clean Water Act Section 402) and development of a Storm Water Pollution Prevention Plan (SWPPP).

Figure 13: Mission Village Stormwater Basin C Example Site



<u>Level of Treatment Required</u> – Favorable

Residence time in the seasonal storage tank could be on the order of months, at which point the chlorine residual would be substantially reduced. Chlorination of the stored water will be needed before being fed back into the recycled water system. This can be accomplished with an in-line sodium hypochlorite injection system and a static mixer. It is assumed no additional treatment is required.

<u>Storage Volume</u> - Neutral

The site area available for seasonal storage is dependent on the geology of the site and the efficiency of the enhanced infiltration system. For Basin C it was assumed that setting aside half of the site area for stormwater facilities was adequate to meet the design stormwater flows, and a buried storage tank with 16 feet depth of storage could be built on the site. Therefore, the available storage volume at Mission Village Basin C is approximately 19 MG.

A summary of the evaluations for each of the example sites is presented in Table 2.

Table 2: Site Evaluation Summary (Non-Cost Factors)

Alternative	Land Ownership/ Acquisition	Environmental/ Permitting	Level of Treatment Required	Storage Volume
Public Agency Owned				
Round Mountain Tank Site	Favorable	Favorable	Favorable	10 MG (36 AF)
Rio Vista WTP	Favorable	Favorable	Favorable	10 MG (36 AF)
Newhall Ranch WRP	Favorable	Favorable	Favorable	10 MG (36 AF)
Castaic Creek Floodplain Open Reservoir	Favorable	Unfavorable	Unfavorable	84 MG (300 AF)
Central Park	Favorable	Favorable	Favorable	32 MG (114 AF)
Public/Private Partnership				
Magic Mountain Parking Lot	Unfavorable	Favorable	Favorable	110 MG (393 AF)
College of the Canyons Football Field	Neutral	Favorable	Favorable	11 MG (40 AF)
Bridgeport Lake	Neutral	Favorable	Unfavorable	11 MG (40 AF)
New Development/Stormwater Capture Parcels				
Stormwater Basin C	Neutral	Neutral	Favorable	19 MG (68 AF)

7. HYBRID ASR AS A SEASONAL STORAGE STRATEGY

Aquifer storage and recovery (ASR) is a technique employed to leverage the storage capacity in groundwater basin, avoiding the construction of surface storage. Although typically employing wells designed for both injection and extraction, the "hybrid" concept considered in this evaluation includes the surface spreading of Title 22 water and the construction of proximate non-potable well(s) that would feed the recycled water system during peak demand months. Because of the operational difficulty of capturing every drop of recycled water and the lack of an established regulatory pathway to permit recycled water ASR projects, the hybrid ASR project considered herein would need to be permitted within the framework of a potable reuse groundwater augmentation (GWA) project.

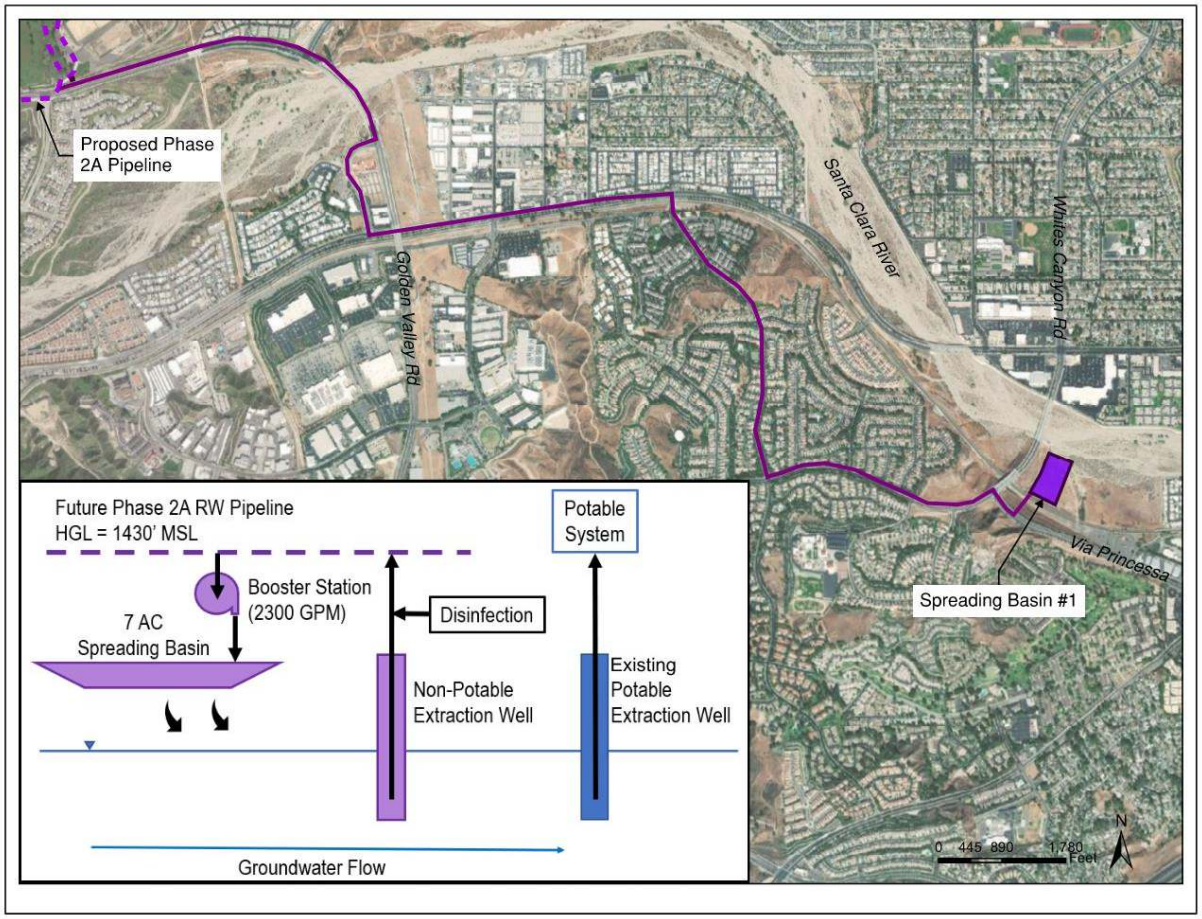
The basis for this alternative draws from SCV Water's previous exploration of groundwater augmentation (GWA) via surface spreading of Title 22 water as a means of potable reuse. The 2016 Recycled Water Master Plan identified potential recharge sites which were studied further in the Upper Santa Clara River Watershed Recharge Feasibility Study (Trussell, 2017). The analysis evaluated key GWA factors including water quality, minimum travel times to potable production wells (groundwater modeling was conducted), and groundwater underflow for dilution requirements.

Acknowledging the seasonal storage component of GWA (winter recharge to store for summer supply augmentation), this example project would incorporate a set of "non-potable" wells to provide more direct seasonal storage functionality. In a typical GWA project Title 22 recycled water would undergo surface spreading at a location that would provide a minimum travel time prior to the closest downgradient potable well. To assure minimum travel time is achieved, GWA projects include a restricted zone whereby new domestic production wells cannot be drilled. If SCV Water were to implement a GWA project, the project could be adapted to support recycled water seasonal storage more directly by adding one or more non-potable extraction wells in the restriction area. The non-potable production well(s) could actually benefit the permitting of this alternative to meet GWA requirements by minimizing the footprint of the restriction zone, while enabling the summertime withdrawal and supplement of the recycled water system.

A cost estimate was developed for this hybrid ASR project to compare with the other alternatives evaluated in this TM. Spreading Site #1 from the RWMP and Recharge Feasibility Study, City of Santa Clarita owned land located near the intersection of Whites Canyon Road and Via Princessa on the south side of the Santa Clara River, was selected due to its relative proximity to proposed recycled water facilities. This project option assumes that the Phase 2A recycled water system expansion will be constructed. Previous studies evaluated the required facilities for the project, however they assumed larger flows than the seasonal storage flows presented in Section 3. Facility sizing needs were reevaluated based on the projected 2040 seasonal storage needs of 1,300 AF/year (365 MG/year) and infiltration rates assumed in the previous studies. A 12-inch diameter pipeline would be required to convey a peak flow of 3.3 MGD from the planned Phase 2A pipeline extension to the 7-acre spreading basin. A booster station would also be needed to pump flows from the recycled water system to the spreading basin. New monitoring wells would be installed to meet regulatory requirements and non-potable extraction wells could be installed if SCV Water chooses to use this as a supply for the non-potable system. The extracted non-potable water would need to be chlorinated before being fed back in the recycled water system. The same pipeline to the spreading basin could be used to convey extracted non-potable water back into the Phase 2A extension. Modeling from the Upper Santa Clara River Watershed Recharge Feasibility Study found that the groundwater underflow at Spreading Site #1 would allow for approximately 1,400 AF/year of recycled water to be recharged without diluent water. At a projected buildout of 1,300 AF/year, this proposed option would not require the direct sourcing of diluent water into the spreading basin.

The estimated project costs are presented in Section 8.

Figure 14: Spreading Site #1 Example Hybrid ASR Site



8. COST ESTIMATES

8.1 Cost Estimates

Conceptual level construction cost estimates were developed to assess the relative cost of each example site. A summary of construction cost estimates is presented in Table 3. Detailed cost estimates for each alternative are presented in Appendix A. Contractor overhead and profit, sales tax, and shipping costs are embedded in unit costs. Unit costs were derived from the following sources:

- R.S. Means 2020 Heavy Construction Cost Data
- Recent bid price tabulations from various SCV Water recycled water pipeline projects
- Price quotes for valves and other piping accessories
- Recycled Water System Phase 2A – Preliminary Tank Siting Study, 2011
- SCV Water Recycled Water Master Plan, 2016
- Engineering allowances for undefined items

8.2 Accuracy of Estimate and ENR CCI

Cost estimates at this stage are Class 4 estimates in accordance with the Association for the Advancement of Cost Engineering (AACE) International Publication 56R-08 Cost Estimate Classification System for a project with early definition with an expected accuracy range of -15% to +30%. A 25% contingency has been applied at this level to account for unknown conditions.

Costs are reported in July 2020 dollars. The corresponding cost index benchmark is the Engineering News Record Construction Cost Index for the Los Angeles Area (ENRLA CCI) for July 2020, which is 12056.44.

8.3 Implementation and O&M Costs

A 15% allowance was included in the estimates to account for implementation costs including but not limited to, engineering design, permitting, environmental documentation, administrative costs, construction management, and inspection. O&M costs include an annual allowance of 2% of capital costs as well as anticipated annual pumping costs.

8.4 Costs Not Included

Costs associated with easement or land acquisition were not included. Additional engineering costs analysis such as geotechnical investigations were also not included.

Table 3: Example Site Cost Estimates

Alternative	Storage (MG)	Storage (AF)	Construction Cost	Design and Implementation (15%)	Total Capital Cost	Annualized Capital Cost	Annual O&M Cost	Total Annual Cost	Unit Cost ($/AF)	Requires Phase 2A
Public Agency Owned										
Round Mountain Tank Site	10	36	$ 16,529,000	$ 2,480,000	$ 19,009,000	$849,000	$ 334,000	$ 1,183,000	$ 32,900	No
Rio Vista WTP	10	36	$ 14,554,000	$ 2,184,000	$ 16,738,000	$748,000	$ 292,000	$ 1,040,000	$ 28,900	Yes
Newhall Ranch WRP	10	36	$ 14,398,000	$ 2,160,000	$ 16,558,000	$740,000	$ 294,000	$ 1,034,000	$ 28,800	No
Castaic Creek Floodplain - Open Reservoir	105	375	$ 14,926,000	$ 2,239,000	$ 17,165,000	$767,000	$ 628,000	$ 1,395,000	$ 3,800	No
Central Park	32	114	$ 53,728,000	$ 8,060,000	$ 61,788,000	$2,759,000	$ 1,084,000	$ 3,843,000	$ 33,800	Yes
Public/Private Partnership										
Magic Mountain Parking Lot	110	393	$ 217,253,000	$ 32,588,000	$ 249,841,000	$11,156,000	$ 3,310,000	$ 14,466,000	$ 36,900	No
College of the Canyons Football Field	11	39	$ 21,349,000	$ 3,203,000	$ 24,552,000	$1,097,000	$ 431,000	$ 1,528,000	$ 39,200	No
Bridgeport Lake	11	40	$ 3,275,000	$ 492,000	$ 3,767,000	$169,000	$ 70,000	$ 239,000	$ 6,000	Yes
New Development/Stormwater Capture Parcels										
Stormwater Basin C	19	68	$ 33,135,000	$ 4,971,000	$ 38,106,000	$1,702,000	$ 672,000	$ 2,374,000	$ 35,000	No
Hybrid Aquifer Storage and Recovery										
Hybrid ASR	364	1300	$ 14,265,000	$ 2,140,000	$ 16,405,000	$733,000	$ 367,000	$ 1,100,000	$ 900	Yes

9. FINDINGS

A range of strategies were identified in this study that could be employed for distributed small-scale recycled water seasonal storage. Among the identified sites there are existing Agency and other public owned land and facilities which would be beneficial to utilize due to ease of site acquisition. The many developments occurring in the Santa Clarita Valley also presents the opportunity for partnering with developers, having seasonal storage integrated in the development planning at an early stage.

Of the example site categories evaluated, three appear to offer some potential and may be worth further consideration.

- Castaic Creek Floodplain Open Reservoir. This option offers a phased (15 MG increment) option ultimately supplying 105 MG (more could potentially be feasible) at a reasonable capital cost, although requiring retreatment prior to entering the recycled water system.

- Bridgeport Lake. Like the Castaic Creek Floodplain option, this option would use an existing open reservoir to accommodate seasonal flows. Although avoiding the construction permitting that would be required for Castaic Creek Floodplain, this option could pose a challenge to the existing functionality and aesthetic/community amenity features of the lake.

- Hybrid ASR. As a comparison, this option offers a groundwater storage option to the array of surface storage examples. By leveraging the regions groundwater basin, the capital investment of seasonal storage largely could be avoided, but the permitting requirement for this project would be relatively substantial as it would need to meet GWA regulation requirements.

10. REFERENCES

Castaic Lake Water Agency Recycled Water Master Plan, Kennedy/Jenks Consultants, April 2016

Recycled Water System Phase 2A – Preliminary Tank Siting Study, RBF Consulting, February 2011

Upper Santa Clara River Watershed Recharge Feasibility Study, Trussell Technologies, September 2017

Valencia Water Company Recycled Water Master Plan for Westside Communities, Dexter Wilson Engineering, November 2015

Appendix A – Conceptual Cost Estimates

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
Round Mountain Tank Site

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost		Total Cost
Divisions 2-16							
	Steel Tank	10 MG	1	LS	$10,000,000	$	10,000,000
	Onsite Inlet/Outlet Piping	12 in	1	LS	$60,000	$	60,000
	Check Valve	12 in	2	EA	$6,875	$	13,750
	Butterfly Valve	12 in	4	EA	$2,075	$	8,300
	Access Road		1000	LF	$110	$	110,000
	Rough Grading		5899	CY	$4	$	24,786
	Pump Station		1	LS	$1,400,000	$	1,400,000
	Chlorination		1	LS	$130,000	$	130,000
	In-Tank Mixer		1	EA	$10,000	$	10,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$	100,000
	Miscellaneous Allowance (1%)		1	LS	$118,568	$	118,568
					Subtotal	**$**	**11,975,000**
Divisions 1							
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$1,197,500	$	1,197,500
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$	50,000
					Subtotal	**$**	**1,248,000**
					RAW CONSTRUCTION COST TOTAL	**$**	**13,223,000**
					CONTINGENCY (25%)	**$**	**3,305,750**
					TOTAL CONSTRUCTION COST ESTIMATE	**$**	**16,529,000**

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
Rio Vista WTP

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost		Total Cost
Divisions 2-16							
	Steel Tank	10 MG	1	LS	$10,000,000	$	10,000,000
	Onsite Inlet/Outlet Piping	12 in	1	LS	$60,000	$	60,000
	Check Valve	12 in	2	EA	$6,875	$	13,750
	Butterfly Valve	12 in	4	EA	$2,075	$	8,300
	Access Road		800	LF	$110	$	88,000
	Rough Grading		5899	CY	$4	$	24,786
	Chlorination		1	LS	$130,000	$	130,000
	In-Tank Mixer		1	EA	$10,000	$	10,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$	100,000
	Miscellaneous Allowance (1%)		1	LS	$104,348	$	104,348
					Subtotal	**$**	**10,539,000**
Divisions 1							
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$1,053,900	$	1,053,900
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$	50,000
					Subtotal	**$**	**1,104,000**
					RAW CONSTRUCTION COST TOTAL	**$**	**11,643,000**
					CONTINGENCY (25%)	**$**	**2,910,750**
					TOTAL CONSTRUCTION COST ESTIMATE	**$**	**14,554,000**

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
Newhall Ranch WRP

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost	Total Cost
Divisions 2-16						
	Steel Tank	5 MG	2	LS	$5,000,000	$ 10,000,000
	Onsite Inlet/Outlet Piping	12 in	1	LS	$60,000	$ 60,000
	Check Valve	12 in	2	EA	$6,875	$ 13,750
	Butterfly Valve	12 in	4	EA	$2,075	$ 8,300
	Chlorination		1	LS	$130,000	$ 130,000
	In-Tank Mixer		1	EA	$10,000	$ 10,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$ 100,000
	Miscellaneous Allowance (1%)		1	LS	$103,221	$ 103,221
					Subtotal	**$ 10,425,000**
Divisions 1						
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$1,042,500	$ 1,042,500
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$ 50,000
					Subtotal	**$ 1,093,000**
					RAW CONSTRUCTION COST TOTAL	**$ 11,518,000**
					CONTINGENCY (25%)	**$ 2,879,500**
					TOTAL CONSTRUCTION COST ESTIMATE	**$ 14,398,000**

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
Castaic Creek Floodplain (LA County) - Open Reservoir

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost		Total Cost
Divisions 2-16							
	Open Reservoir (15 acres)		5	EA	$2,536,852	$	12,684,260
	HPDE Liner		*653,400*	*SF*	*$2*	*$*	*1,542,934*
	Berm		*3550*	*LF*	*$13*	*$*	*47,762*
	Excavation, Hauling, and Rough Grading		*15620*	*CY*	*$15*	*$*	*234,300*
	Access Road		*42600*	*SF*	*$14*	*$*	*591,223*
	Chain Link Fence		*3550*	*LF*	*$34*	*$*	*120,633*
	Onsite Inlet/Outlet Piping	12 in	1	LS	$60,000	$	60,000
	Offsite Piping (Open Trench)	12 in	19000	LF	$280	$	5,320,000
	Offsite Piping (5 Freeway Crossing)	12 in	1	LS	$500,000	$	500,000
	CAV	1 in	10	EA	$5,000	$	50,000
	Blowoff Assembly	2 in	10	EA	$7,000	$	70,000
	Butterfly Valve	12 in	18	EA	$2,075	$	37,350
	Check Valve	12 in	2	EA	$6,875	$	13,750
	Pump Station		1	LS	$1,500,000	$	1,500,000
	Chlorination		1	LS	$130,000	$	130,000
	Media Filter		1	LS	$150,000	$	150,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$	100,000
	Traffic Control		94	DAY	$2,500	$	235,000
	Miscellaneous Allowance (1%)		1	LS	$107,030	$	107,030
					Subtotal	**$**	**10,810,000**
Divisions 1							
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$1,081,000	$	1,081,000
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$	50,000
					Subtotal	**$**	**1,131,000**
					RAW CONSTRUCTION COST TOTAL	**$**	**11,941,000**
					CONTINGENCY (25%)	**$**	**2,985,250**
					TOTAL CONSTRUCTION COST ESTIMATE	**$**	**14,926,000**

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
Central Park

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost		Total Cost
Divisions 2-16							
	Buried Concrete Tank	32 MG	1	LS	$32,000,000	$	32,000,000
	Onsite Inlet/Outlet Piping	12 in	1	LS	$60,000	$	60,000
	Offsite Piping (Open Trench)	12 in	1000	LF	$280	$	280,000
	Butterfly Valve	12 in	4	EA	$2,075	$	8,300
	Check Valve	12 in	2	EA	$6,875	$	13,750
	Excavation and Hauling		182200	CY	$20	$	3,644,010
	Access Road		700	LF	$110	$	77,000
	Pump Station		1	LS	$1,300,000	$	1,300,000
	Chlorination		1	LS	$130,000	$	130,000
	In-Tank Mixer		1	EA	$30,000	$	30,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$	100,000
	Site Improvements (For Tennis Complex)		1	LS	$1,000,000	$	1,000,000
	Miscellaneous Allowance (1%)		1	LS	$386,431	$	386,431
					Subtotal	**$**	**39,029,000**
Divisions 1							
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$3,902,900	$	3,902,900
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$	50,000
					Subtotal	**$**	**3,953,000**
					RAW CONSTRUCTION COST TOTAL	**$**	**42,982,000**
					CONTINGENCY (25%)	**$**	**10,745,500**
					TOTAL CONSTRUCTION COST ESTIMATE	**$**	**53,728,000**

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
Six Flags Magic Mountain Parking Lot

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost		Total Cost
Divisions 2-16							
	Buried Concrete Tank	110 MG	1	LS	$137,500,000	$	137,500,000
	Onsite Inlet/Outlet Piping	12 in	1	LS	$60,000	$	60,000
	DIP Pipe (Open Trench)	12 in	5300	LF	$280	$	1,484,000
	Blowoff Assembly	2 in	2	EA	$7,000	$	14,000
	Butterfly Valve	12 in	10	EA	$2,075	$	20,750
	Check Valve	12 in	2	EA	$6,875	$	13,750
	Excavation and Hauling		626,400	CY	$20	$	12,528,000
	Paving		700,000	SF	$4	$	2,941,153
	Pump Station		1	LS	$1,500,000	$	1,500,000
	Chlorination		1	LS	$130,000	$	130,000
	In-Tank Mixer		1	EA	$100,000	$	100,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$	100,000
	Miscellaneous Allowance (1%)		1	LS	$1,563,917	$	1,563,917
					Subtotal	**$**	**157,956,000**
Divisions 1							
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$15,795,600	$	15,795,600
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$	50,000
					Subtotal	**$**	**15,846,000**
					RAW CONSTRUCTION COST TOTAL	**$**	**173,802,000**
					CONTINGENCY (25%)	**$**	**43,450,500**
					TOTAL CONSTRUCTION COST ESTIMATE	**$**	**217,253,000**

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
College of the Canyons Football Field

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost		Total Cost
Divisions 2-16							
	Buried Concrete Tank	11 MG	1	LS	$11,000,000	$	11,000,000
	Onsite Inlet/Outlet Piping	12 in	1	LS	$60,000	$	60,000
	Offsite Piping (Open Trench)	12 in	900	LF	$280	$	252,000
	Butterfly Valve	12 in	4	EA	$2,075	$	8,300
	Check Valve	12 in	2	EA	$6,875	$	13,750
	Excavation and Hauling		62700	CY	$20	$	1,254,000
	Pump Station		1	LS	$1,300,000	$	1,300,000
	Chlorination		1	LS	$130,000	$	130,000
	In-Tank Mixer		1	EA	$10,000	$	10,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$	100,000
	Site Improvements (Football Field)		1	LS	$1,200,000	$	1,200,000
	Miscellaneous Allowance (1%)		1	LS	$153,281	$	153,281
					Subtotal	**$**	**15,481,000**
Divisions 1							
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$1,548,100	$	1,548,100
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$	50,000
					Subtotal	**$**	**1,598,000**
					RAW CONSTRUCTION COST TOTAL	**$**	**17,079,000**
					CONTINGENCY (25%)	**$**	**4,269,750**
					TOTAL CONSTRUCTION COST ESTIMATE	**$**	**21,349,000**

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
Bridgeport Lake

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost		Total Cost
Divisions 2-16							
	Intake/Discharge Structure		1	LS	$250,000	$	250,000
	Onsite Inlet/Outlet Piping	12 in	1	LS	$60,000	$	60,000
	Offsite Piping (Open Trench)	12 in	600	LF	$280	$	168,000
	Cofferdam		1	LS	$10,000	$	10,000
	Butterfly Valve	12 in	4	EA	$2,075	$	8,300
	Check Valve	12 in	2	EA	$6,875	$	13,750
	Pump Station		1	LS	$1,400,000	$	1,400,000
	Media Filter		1	LS	$150,000	$	150,000
	Chlorination		1	LS	$130,000	$	130,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$	100,000
	Miscellaneous Allowance (1%)		1	LS	$45,801	$	45,801
					Subtotal	**$**	**2,336,000**
Divisions 1							
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$233,600	$	233,600
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$	50,000
					Subtotal	**$**	**284,000**
					RAW CONSTRUCTION COST TOTAL	**$**	**2,620,000**
					CONTINGENCY (25%)	**$**	**655,000**
					TOTAL CONSTRUCTION COST ESTIMATE	**$**	**3,275,000**

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
SW Capture/Detention Basin (Mission Village Basin C)

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost		Total Cost
Divisions 2-16							
	Buried Concrete Tank	19 MG	1	LS	$19,000,000	$	19,000,000
	Onsite Inlet/Outlet Piping	18 in	1	LS	$70,000	$	70,000
	Butterfly Valve	18 in	4	EA	$6,025	$	24,100
	Check Valve	18 in	2	EA	$28,500	$	57,000
	Excavation and Hauling		108200	CY	$20	$	2,164,000
	Pump Station		1	LS	$1,350,000	$	1,350,000
	Chlorination		1	LS	$130,000	$	130,000
	In-Tank Mixer		1	EA	$20,000	$	20,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$	100,000
	Drywell (Vadose Zone Well)		1	LS	$900,000	$	900,000
	Miscellaneous Allowance (1%)		1	LS	$238,151	$	238,151
					Subtotal	**$**	**24,053,000**
Divisions 1							
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$2,405,300	$	2,405,300
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$	50,000
					Subtotal	**$**	**2,455,000**
					RAW CONSTRUCTION COST TOTAL	**$**	**26,508,000**
					CONTINGENCY (25%)	**$**	**6,627,000**
					TOTAL CONSTRUCTION COST ESTIMATE	**$**	**33,135,000**

WOODARD &CURRAN

SCV Water Seasonal Storage Evaluation
Hybrid Aquifer Storage and Recovery (ASR)

Date: 1/14/2021
Prepared By: J. Anketell
Checked By: M. Elsner

Item	Description	Size	Quantity	Unit	Unit Cost	Total Cost
Divisions 2-16						
	Spreading Basin (7 acres)		35	AF	$33,000	$ 1,155,000
	Monitoring Well		3	EA	$175,000	$ 525,000
	Earthwork/Site Development		34000	SY	$10	$ 340,000
	Onsite Piping	12 in	100	LF	$172	$ 17,205
	Offsite Piping (Open Trench)	12 in	18500	LF	$280	$ 5,180,000
	Offsite Piping (Trenchless Construction)	12 in	550	LF	$2,000	$ 1,100,000
	CAV	1 in	10	EA	$5,000	$ 50,000
	Blowoff Assembly	2 in	10	EA	$7,000	$ 70,000
	Butterfly Valve	12 in	22	EA	$2,075	$ 45,650
	Check Valve	12 in	2	EA	$6,875	$ 13,750
	Pump Station - Phase 2A Tank to Spreading Basin		1	LS	$1,300,000	$ 1,300,000
	Electrical Service/Instrumentation and Controls		1	LS	$100,000	$ 100,000
	Traffic Control		132	DAY	$2,500	$ 330,000
	Miscellaneous Allowance (1%)		1	LS	$102,266	$ 102,266
					Subtotal	**$ 10,329,000**
Divisions 1						
	Mobilization, Demobilization, Bonds Insurance (10%)		1	LS	$1,032,900	$ 1,032,900
	NPDES Permit Compliance and SWPPP		1	LS	$50,000	$ 50,000
					Subtotal	**$ 1,083,000**
					RAW CONSTRUCTION COST TOTAL	**$ 11,412,000**
					CONTINGENCY (25%)	**$ 2,853,000**
					TOTAL CONSTRUCTION COST ESTIMATE	**$ 14,265,000**