Attachment T1

SAFE DRINKING WATER STATE REVOLVING FUND APPLICANT ENGINEERING REPORT

Water System Name: **Sheep Creek Water Company**

Project Number: 5207-A

Agreement No.: D16-12810

Principal Contact: Ed Marlow, Senior Project Engineer
Name and Title

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C72369
California Civil Engineering License Number

Preliminary Engineering Report

Sheep Creek Water Company

Prepared for:
State Water Resources Control Board
Division of Financial Assistance

Proposition 1
Technical Assistance Program
November 19, 2018

California Rural Water Association

California
Rural Water Association

November 19, 2018

David Chan, Grant Manager
State Water Resources Control Board
Office of Sustainable Water Solutions
1001 I Street, Sacramento, CA 95814

Re: Sheep Creek Water Company
Preliminary Engineering Report

Dear Mr. Chan,

The California Rural Water Association (CRWA) appreciates this opportunity to submit the Preliminary Engineering Report for Water System Improvements at the Sheep Creek Water Company. This report has been prepared in accordance with Work Plan No. 5207-A under Grant Agreement No. D16-12810 of the Proposition 1 Technical Assistance Program. The report presents the results of analysis of issues facing the system through data review, hydrogeological analysis, hydraulic modeling and other investigations to identify near- and long-term proposed water system improvements in response to the Request for Technical Assistance submitted to the State Water Resources Control Board by the Sheep Creek Water Company. Specifically, the report recommends drilling of additional wells, storage tank improvements, a new booster pump station, upgrade of undersized pipelines, new water meters and a new SCADA system to address the issues in the Request for Technical Assistance.

We look forward to your review comments and continuing to assist the Sheep Creek Water Company with their drinking water needs.

Sincerely,

CALIFORNIA RURAL WATER ASSOCIATION

Dustin Hardwick

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Table of Contents

List of Tables

List of Figures

A. WATER SYSTEM INFORMATION

Describe the water system and its facilities. Include details relating to source, storage, treatment, and distribution system.

A.1 – Water Demand (Service Area and Population)

Sheep Creek Water Company (SCWC) was formed on December 5, 1913 as a stock holder-owned private water company mainly serving the community of Phelan located on the southwest side of San Bernardino County south of Highway 18. It also serves customers outside of this main area, generally along State Highways 2 and 138, as shown in Figure 1. SCWC supplies treated groundwater to a community of over 3,300 people through 1,191 service connections, of which 109 are commercial, 50 are agricultural and the remaining are residential. The supply tunnel, wells and two of the storage tanks are located on the southeastern slope of the San Gabriel mountains. The elevation difference between the source supply and the service area is sufficient to allow the entire distribution system to be fed by gravity without booster pump stations. There are 43 pressure reducing stations throughout the service area to reduce pressure in the main line to an acceptable range.

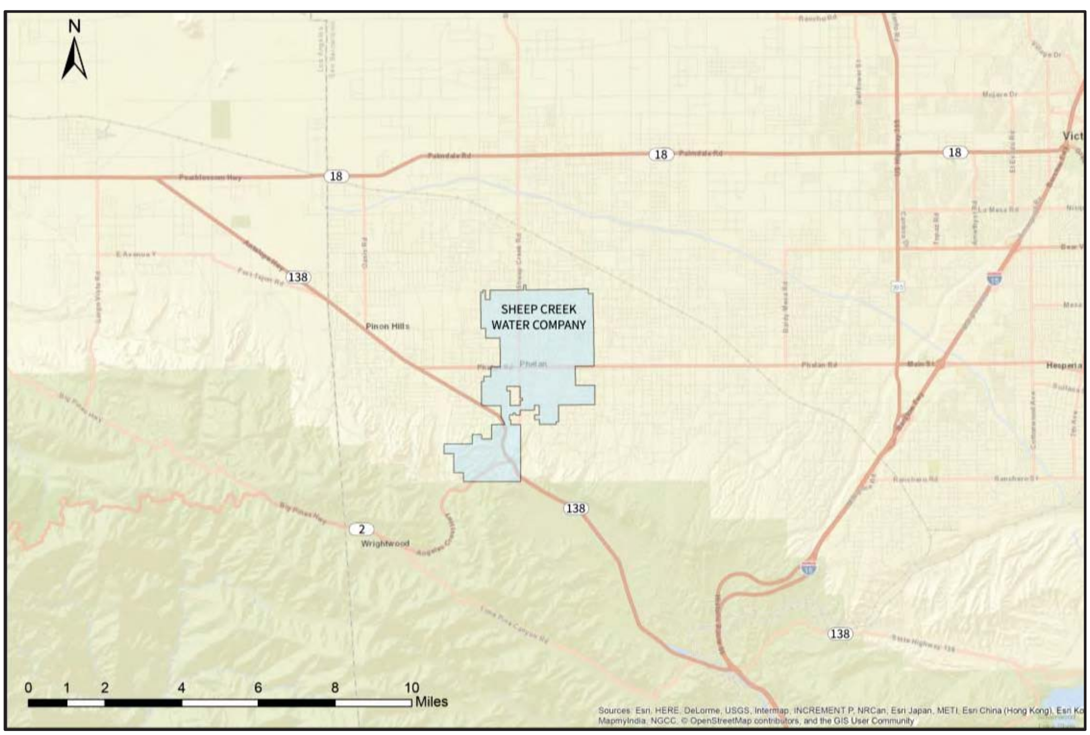

Figure 1: Sheep Creek Water Company location and service area

A.1.1 – Company Shares and Water Allocation

Sheep Creek Water Company is a privately held shareholder owned water company. At the time of its formation in 1913, 8,000 shares were allocated for a total of $10,000, each share was thus worth $1.25. All residents or service accounts in the area need to own shares of the company to receive water. Currently, all shares are held by about 1,400 shareholders.

Water allocation for each share is determined based on the production level from the tunnel and wells. Although not all shares currently use water, allocation is determined based on the total number of shares, i.e., 8,000, not just the active ones. The current allocation as of September 2018 is 750 cubic feet (CF) for the first share and 150 CF for each subsequent share.

Historically, water allocation has been cut to control demand in response to declining water production levels experienced by the water company. In 2015, allocations were also reduced by 25% as mandated by the State of California due to historic drought conditions in the state.

In the future, build out may bring more people into the area, but the numbers of shares will remain at 8,000. It is expected that more of the dormant shares may become active as growth occurs. This may not impact the demand significantly since all shares are already taken into account while estimating allocation per share. Further, Sheep Creek expects to be able to match supply with demand by controlling this allocation.

A.1.2 – Maximum Daily and Peak Hour Demand

Daily water consumption data for the last 10 years (2008 – 2017) was used to estimate the Maximum Daily Demand (MDD) for the system. Per Section 64554 of the California Code of Regulations (CCR), the MDD is the highest demand experienced by the system in a day over the last ten years. For SCWC, the MDD is 2.09 million gallons per day (MGD) or 1,451 gpm. Table 1 shows a summary of the water demands for the system. The Peak Hourly Demand is 0.13 MGD or 90 gpm.

Table 1: Water demand for SCWC service area

Parameter	Flow Data		
	Daily Basis (MGD)	Monthly Basis (MGD)	Annual Basis (MGD)
Maximum Day Demand	2.09	1.675	2.05
Average Daily Usage	--	--	0.91
Peak Hourly Demand	0.13	--	0.13

It is important to note that demand in the SCWC service area has dropped in the last several years due to conservation efforts implemented by the system. As discussed above, consumption is controlled by reducing the allocation per share for customers. However, Section

64554 of the CCR requires that a public water system must have enough source capacity to meet its MDD at all times.

A.2 – Source (Groundwater, Water Rights, Pump Stations, Tanks)

SCWC receives its water supply from a tunnel and five groundwater wells located on southeast side of the service area within San Gabriel mountains as shown in Figure 2. The company operates the water system under domestic water supply permit, Permit No. 78-007, granted by the California Department of Public Health on February 6, 1978.

The tunnel is a primary source of water for the system and is located in Swarthout Canyon in the San Gabriel mountains. It was constructed in the 1920s. It is 3,800 feet long and serves as a primary source of water for the community to date. Historically, its water flow has been sufficient to meet service demand for four to five months during winter, from October/November through March/April. This water source lies within the El Mirage basin, outside the boundaries of Mojave and Antelope Valley basins. For recharge, the El Mirage basin relies primarily on infiltration of run off from the San Gabriel mountains through many small washes and stream channels in the area, including Sheep Creek Wash. Recharge through direct infiltration of precipitation or snow is estimated to be very small owing to the small amount of average rainfall in the area and high evapotranspiration rates. SCWC owns water rights of up to 3,000 acre-foot/year (AFY) in the Swarthout Canyon.

All five of SCWC's groundwater supply wells are located in a 20-acre Wrightwood well field on the northeastern slope of the San Gabriel mountains within the Sheep Creek drainage channel. A sixth well, Well No. 11 has been drilled but is not in service at the time of this report. The creek flows from south to north across the eastern portion of the well field. The tunnel is located along the Sheep Creek watercourse approximately 0.6 miles south of the well field.

Groundwater beneath the Sheep Creek drainage occurs within the unconsolidated alluvial material. Figure 2 shows the location of the well field and other infrastructure within the service area. Well depth and pumping capacity is shown in Table 2.

Well 11 was drilled in April, 2018 on Walnut Road, west of Monte Vista Road, as shown in Figure 2. Pipelines are currently being laid out to connect this new water source to the existing distribution system. Pumped water will be fed directly into the distribution system. Since this well is located at an elevation lower than all of the existing storage tanks, water would have to be pumped up to the tanks when needed. The drinking water source assessment document, well logs and the well completion document are included in Appendix A.

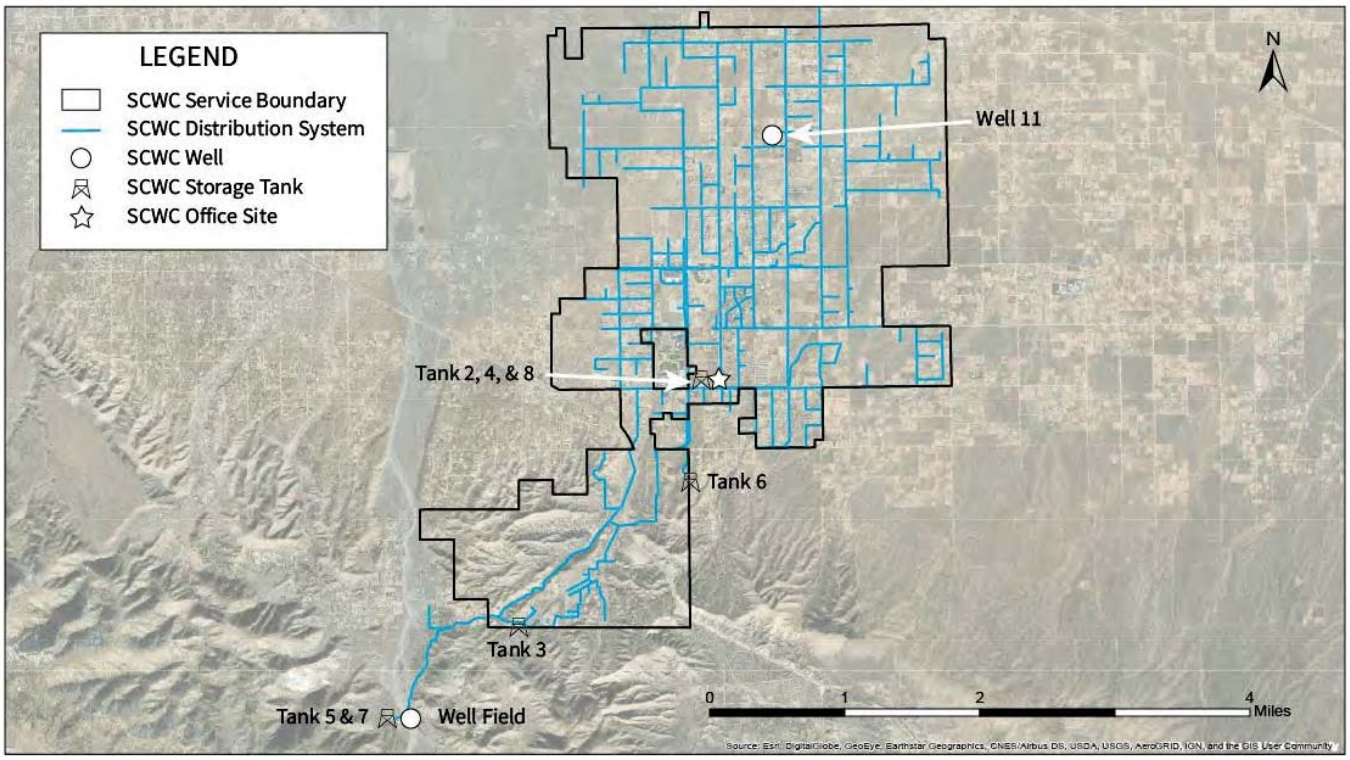

Figure 2: Locations of SCWC facilities

Table 2: Groundwater well details

Well No.	Year drilled	Drill Depth (bgs[1])	Casing Diameter (in.)	Pump Depth (bgs[1])	Casing Depth (bgs[1])	Rated Capacity (gpm)	Motor hp
2A	2012	735	16		725	400	300
3A	2003	507	16	460	500	450	100
4A	2004	503	16	440	500	1,000	150
5	1991	535	10	471	429	540	40
8	2005	489	16	420	480	450	150
11	2018	1,500	14/16	1,100	1,460	275	150

Notes:
[1] Below ground surface

Figure 3 illustrates the flow diagram for the system and shows the flow of water from wells to the tanks and into the distribution system.

A.3 – Water Quality and Treatment

The groundwater quality is in compliance with state water quality standards. Apart from disinfection, no other treatment is required. Lead and Copper sampling is also done every three years per the Lead and Copper Rule (LCR).

Chlorine in the form of liquid sodium hypochlorite (12.5% strength) is dosed immediately upstream of Tank 7 using two peristaltic chemical injection pumps for chlorine dosing. Chlorine injection into the tunnel flow is maintained continuously while the injection port for wells is opened only when the pumps are in operation. Chlorine residual is measured daily at a sampling location on the main distribution main exiting Tank 7 (Figure 4) using a handheld chlorine analyzer. Dosing is adjusted to maintain a chlorine residual of 0.8 mg/L within the distribution system.

CT Calculations:

Effective disinfection with chlorine is dependent on the water temperature, pH, and the contact time (CT) with the concentration of free available chlorine. For systems chlorinating groundwater, the Groundwater Rule (GWR) requires that enough CT be provided to ensure 4.0 -Log inactivation of viruses. The contact time is measured as the time passed between chlorine dosing and the first customer connection in the system. For SCWC, as mentioned earlier, chlorine is dosed immediately upstream of Tank 7 and the chlorine residual is measured as the water exits the tank. The first customer connections are located approximately 1 mile downstream of this point.

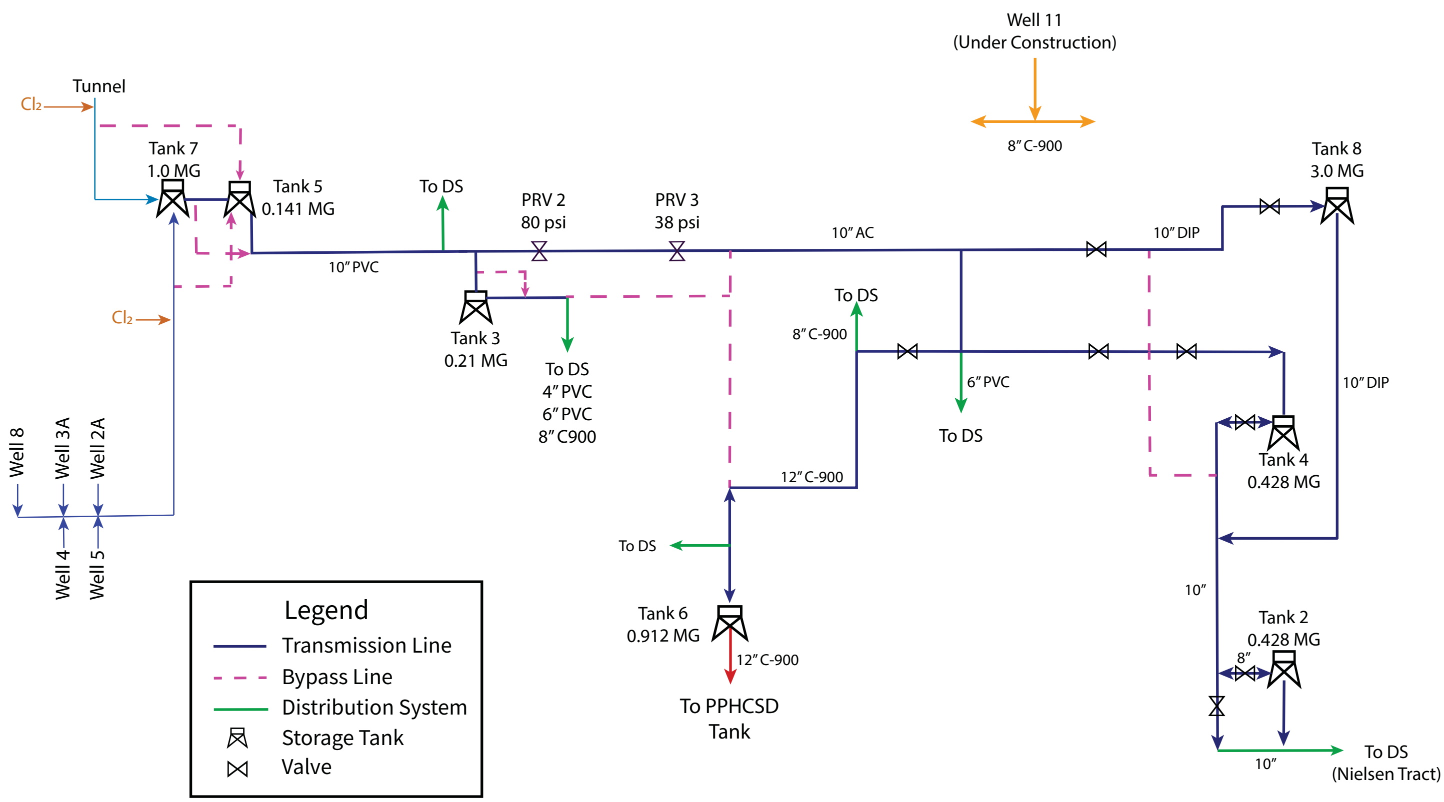

Figure 3: Flow diagram for Sheep Creek Water Company

The following calculations show the CT calculations for the contact time within the 10-inch transmission main between Tank 7 and the first customer connection. The contact time achieved within Tanks 7 and 5 is difficult to characterize and quantify since these are not equipped with any baffles or mixers for uniform mixing within the tank.

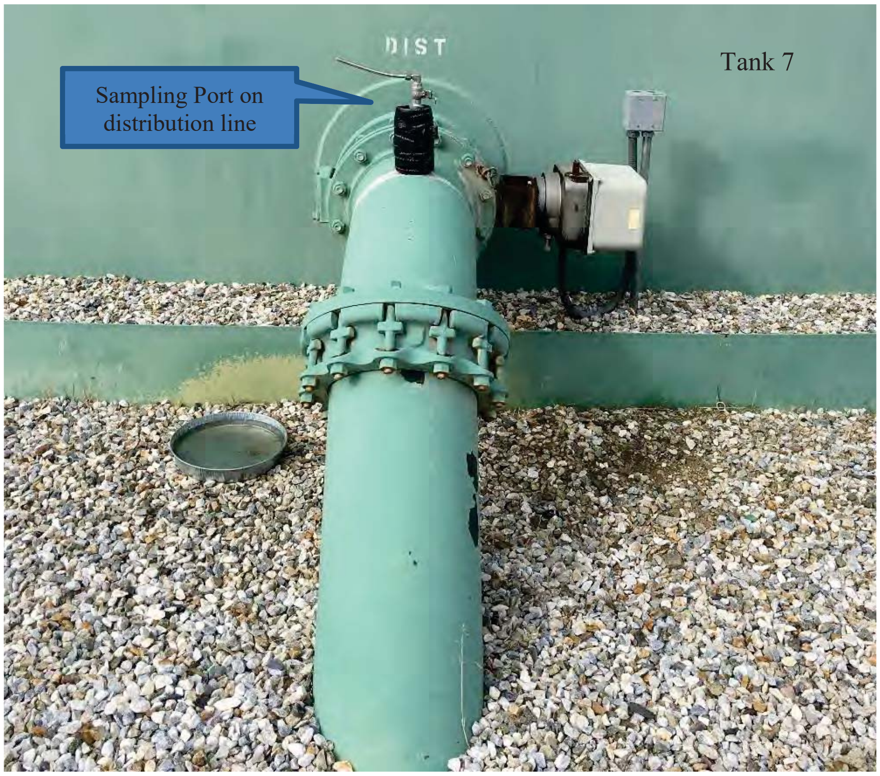

Figure 4: Chlorine sampling port on Tank 7

For Sheep Creek, following are the basic parameters used:

Average pH: 7.5

Temperature range: Water temperature ranged from 12 – 17 deg C. Therefore, a conservative value of 10 deg C is used to calculate the required CT value.

Length of 10-inch transmission main from Tank 5 to first customer: 0.95 mile

Length of 6-inch distribution main from transmission main to first customer: 550 feet

<u>CT Required:</u>

The Groundwater Rule requires a 4-log inactivation of viruses for all systems using groundwater. For the given pH and water temperature:

CT_{Reg} = 6.0

<u>CT Actual:</u>

Volume of 10-inch main = 3.14*((10/12)^2)*0.95*5280/4

= 2,648 cu. ft

Volume of 6-inch pipe = 3.14*((6/12)^2)*550/4

= 108 cu. ft.

Total Volume = 2,756 cu. ft.

= 2,756 * 7.48 = 20,614.91 gal

Maximum Daily Demand (MDD) for Sheep Creek = 2,090,000 gal per day (gpd)

= 1,451 gpm

Peak Hourly Demand for Sheep Creek = 130,000 gpd

= 90 gpm

Therefore, use MDD for flow.

Contact time in pipe, T_{Act} = Vol/flow

= 20614.91/1451 = 14.21 mins

C = 0.8 mg/L

Therefore, CT_{Act} = 14.21 * 0.8

= 11.4 mg.min/L

Hence, the CT achieved in the transmission main is adequate to achieve 4.0 log inactivation of viruses.

The tank does not have a mixer to provide uniform mixing of chlorine. Based on the locations of inlet and outlet pipes, short circuiting of water can be expected as discussed later in Section B.3. The chlorine dose rate may have to be changed if a mixer is added to the tanks.

A.4 – Storage Tanks

Seven storage tanks are located throughout the SCWC system. The tanks are located at various sites and at different elevations that allows for distribution system to be fed completely by gravity without the need for any booster pumps. Tank 5 and 7 are located at the highest elevations at the well field, as shown in Figure 3.

The pipeline configuration allows Tank 3 to be bypassed when needed. Tank 6 can be fed either through the main 10-inch transmission line or a through a secondary bypass from Tank 3. Tanks 2, 4 and 8 are located within the yard at SCWC office site. Table 3 shows a summary of volume, age and construction types for the tanks. The total storage capacity is 6.119 MG, which provides 2.93 days of storage at system MDD.

Table 3: Storage tank details

Tank ID	Diameter X Height (ft)	High Water El (HWL, ft)	Material and Type	Manufacturer	Install Year	Volume (MG)
2	55' X 24'	23	Bolted flange, Steel	Tri-State	1979	0.428
3	47' X 16'	15'	Bolted flange, Steel	Unknown	1983	0.210
4	55' X 24'	23'	Bolted flange, Steel	Unknown	1984	0.428
5	39' X 16'	15'	Bolted flange, Steel	Unknown	1985	0.141
6	80' X 24'	23.17'	Bolted flange, Steel	Unknown	1989	0.912
7	103' X 16'	15'1"	Welded Steel, AWWA D100	Pittsburgh Des Moines Steel	1993	1.0
8	150' X 24'	23'	Welded Steel, AWWA D100	Crosno Construction	2009	3.0
Total						**6.119**

A.5 – Distribution System

A.5.1 – Distribution System Pipelines

There are approximately 70 miles of pipelines throughout the system varying in size from 4-inch to 12-inch. Materials of construction include steel, asbestos cement (AC), and PVC including C900. Limited information is available regarding installation dates of individual pipelines throughout the system.

Table 4: Pipe diameters and lengths within distribution system

Pipe Diameters	Length (ft)	Length (miles)
<= 4"	62,792	12
6"	133,918	25
8"	135,898	26
>=10"	33,893	6
Total	**366,502**	**69**

A.5.2 – Water Meters

All service connections have a water meter to measure consumption, which is read manually every month. Some of the meters have been replaced within the last few years, but most of the meters are over 30-years old. Without a formal meter replacement plan, meters are replaced based on availability of budget and available staff time. Approximately 18-20% of the water produced in the service area is unaccounted for, and faulty water meters are considered to be a major contributor to that problem.

A summary of existing water meters by service is shown in Table 5.

Table 5: Number of water meters by service

Type	Count	Metered
Agricultural	50	Yes
Commercial	109	Yes
Residential	1,302	Yes
Total Active Connections	**1,191**	**Yes**

A.6 – Control System

SCWC does not have a Supervisory Control and Data Acquisition (SCADA) system. Each pump has a Local Control Panel (LCP) with a Hand/Off/Auto switch to select the mode of operation. In HAND mode, the pumps can be started and stopped using the START/STOP switch, and speed is adjusted using variable frequency drives (VFD). In AUTO mode, the pumps are turned on and off based on the water level in Tank 7. Each pump is also equipped with a flow meter which is read manually each day for previous day's production. The motors have local alarms for voltage, pressure and temperature protection but the alarm information cannot be relayed to operators.

Tank 7 is equipped with a pressure transducer, which is used to control operation of pumps located in the well field. Falling water level in the tank starts the pumps sequentially in a predefined order and at a specified speed. Pump shutdown follows the same sequence. Pumps can also be operated in Manual mode as discussed above. Each storage tank is equipped with an altitude valve that closes to prevent overflow when water level reaches a certain preset level. The tunnel is a primary source of water and runs continuously by gravity alone. The other wells are turned on and off as required based on water level within Tank 7. Using a time clock setting, they are mostly turned on at night time to fill up Tank 7 when operating in AUTO mode. The auto setting may be bypassed as required during day time to meet high demand. Flow meters are available on the discharge from each pump as well as the transmission main downstream of Tank 5 to record flow information.

A.7 – Jurisdiction

Sheep Creek is a privately-held corporation (California Corporate Number C0075552) owned by shareholders and governed by a five-member Board of Directors. Regulatory oversight is provided by State Water Resources Control Board, San Bernardino District. The District's system number is CA5810006.

B. PROBLEM DESCRIPTION

Describe the ranked problem being addressed by the project and attach supporting documents to justify the ranking. (Include the last two years of water quality data, most recent compliance orders, violations, citations, etc.)

B.1 – Inadequate Source Capacity

Problem Ranking: 1

Inadequate source capacity due to decline in water production is ranked as the most critical issue SCWC currently faces. SCWC has had to purchase water from the neighboring Phelan Pinon Hills Community Service District (PPHCSD) for the last few years to fulfil high summer demand. The system is currently operating under Compliance Order # 05-13-18R-002 issued by State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) for violation of California Health and Safety Code (CHSC), Section 116555(a)(3) and California Code of Regulations (CCR), Title 22, Section 64554 for inadequate source capacity. DDW also imposed a service connection moratorium on the system, including any such service connections for which a 'will serve' letter was issued by the system at any time. This citation was issued on August 30, 2018. A copy is included in Appendix B.

The following section provided details on this issue.

SCWC has experienced a steady decline in water production levels for the last 10 years. Swarthout Canyon, which is the primary source of water for the company, relies completely on run off from San Gabriel mountains and local precipitation for recharge, which has been scant due to drought conditions in California. Figure 5 shows the static and groundwater pumping water levels in one of the wells – Well 4A. As can be seen, the static groundwater level has fallen close to 50 feet from January, 2009 to December, 2017. The pumping water level has shown a similar trend. The most significant drop in the pumping water level was observed at the peak of drought in the summer of 2016, with the water level falling more than 100 feet, or within 10 feet of the pump depth. A similar curve for Well 8 is shown in Figure 6. Similar trends were also observed for the other wells.

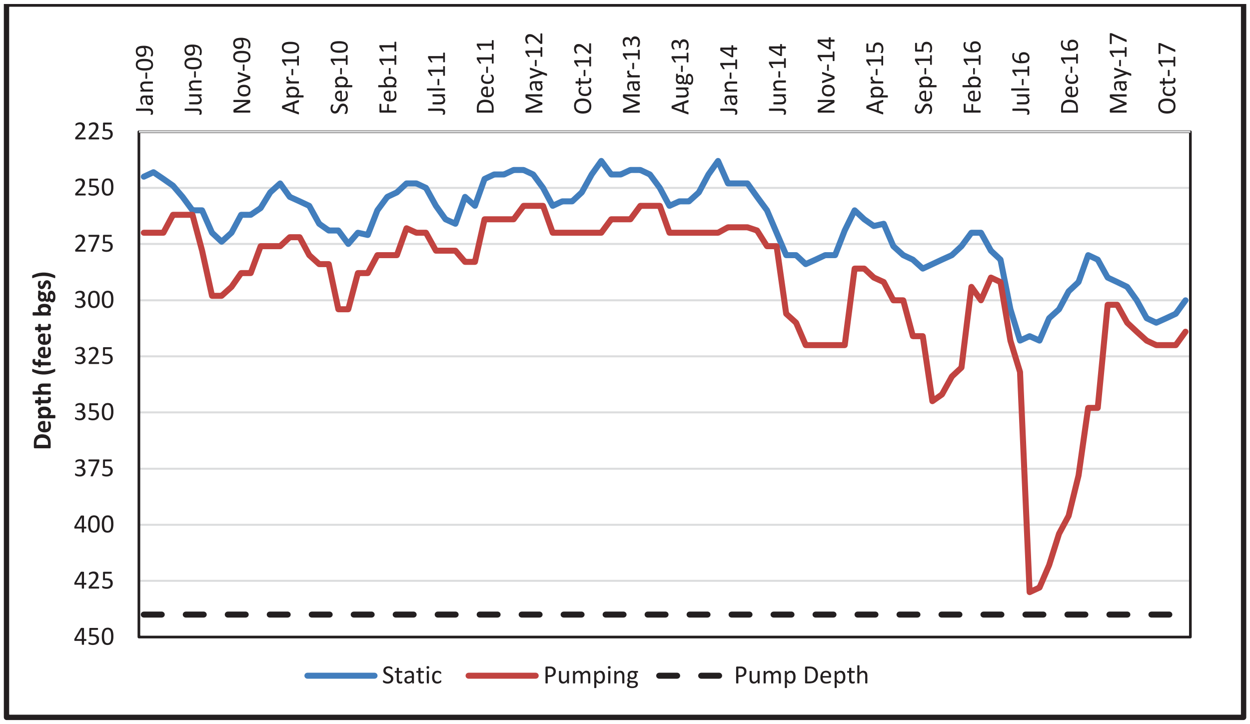

Figure 5 : Static and pumping groundwater levels for Well 4A

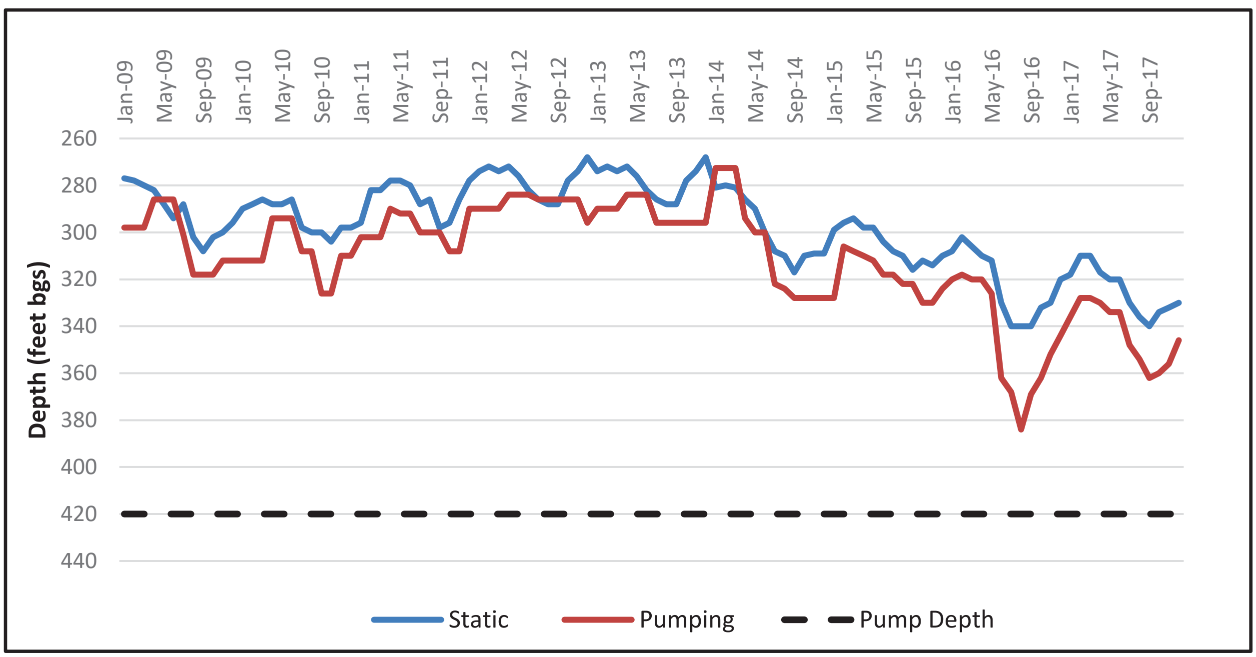

Figure 6 : Static and pumping groundwater levels for Well 8

Figures 7 and 8 show the close correspondence between the declining water level and well production. Water level and production follow nearly parallel curves for each year graphed. As can be seen, summer of 2016 was the most critical time for the system. Water allocation per share was reduced at this time to reduce consumption. In addition, 4 MG of water was imported from PPHCSD to fulfil the demands of the system. Well 5 displays similar drop in production (Figure 9).

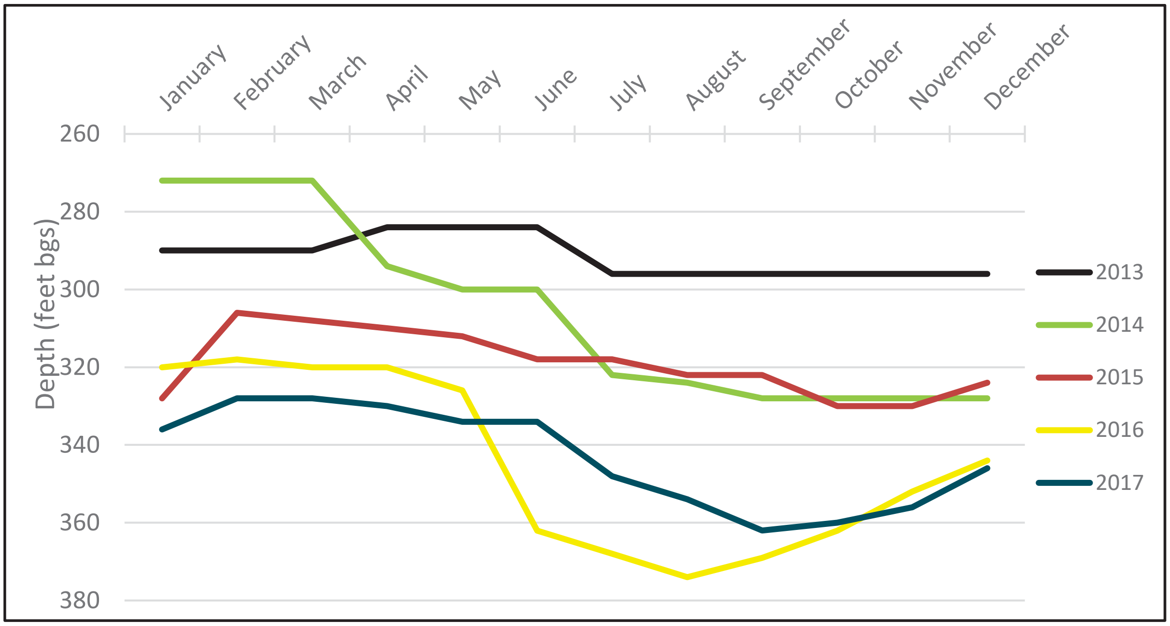

Figure 7 : Pumping water levels for Well 8

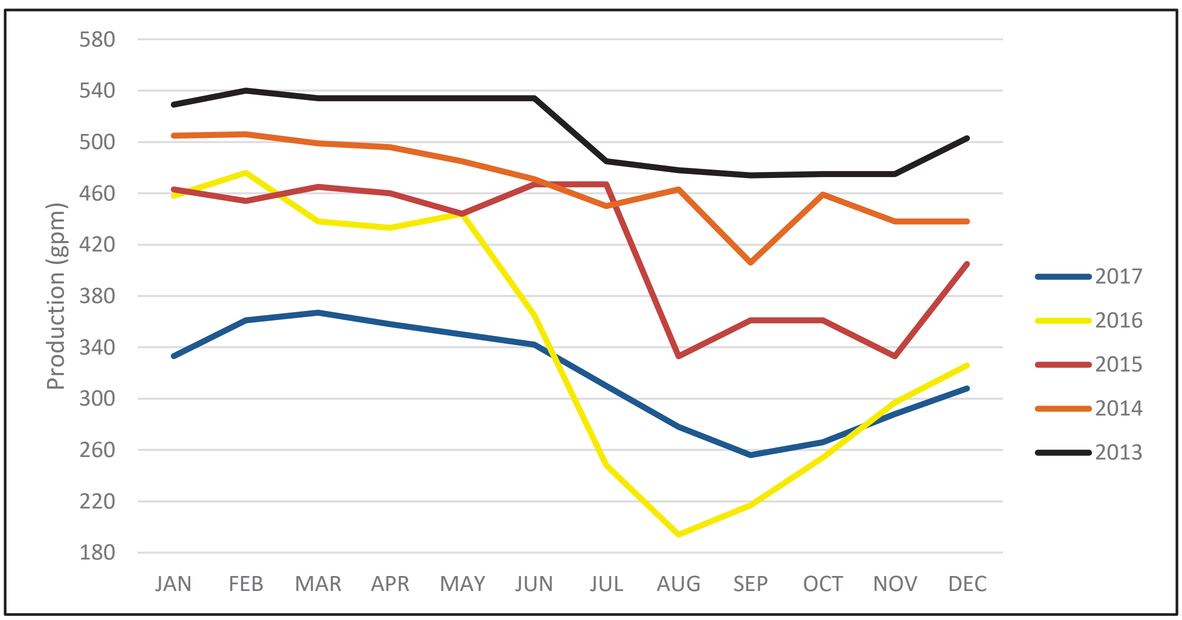

Figure 8 : Production from Well 8 from 2013 – 2017

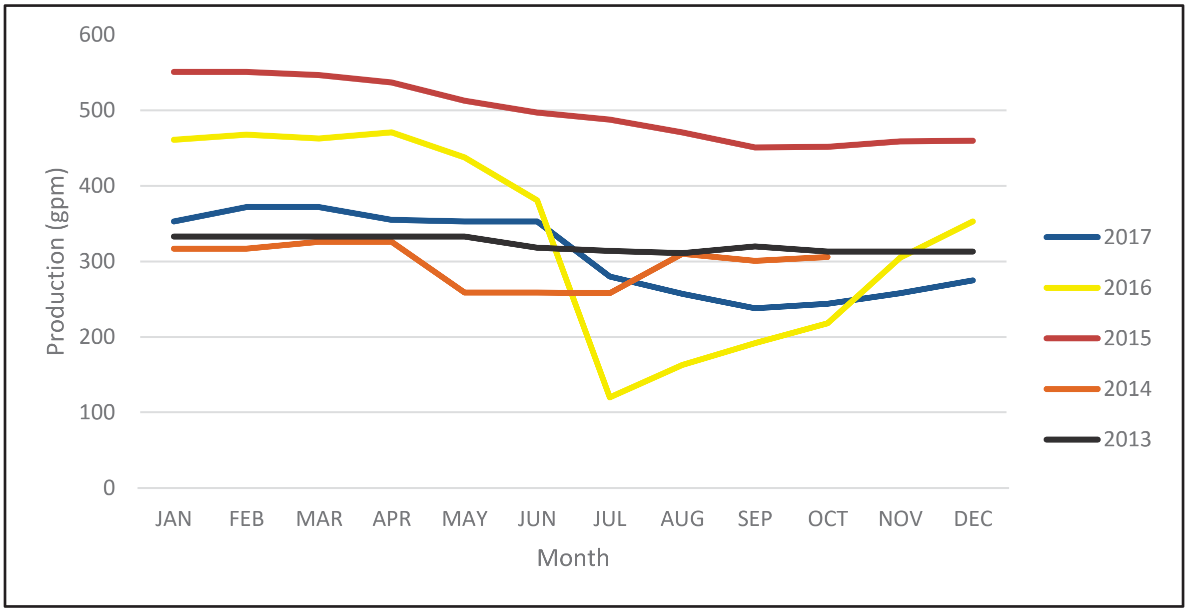

Figure 9 : Production from Well 5, 2013 - 2017

It is difficult to ascertain the actual combined pumping capacity of the well field. Since the wells are in close proximity of each other, their zones of influence overlap. As a result, all wells cannot be operated together.

The impact of the operation of one pump on the rest of the wells is evident from Figure 10. Available data on static water levels for all wells and total system production are plotted for the year 2018. Throughout the year, water levels drop for all pumps in nearly parallel curves, although not all of them are being operated continuously. The levels decrease more dramatically as production is increased. There is only a minor recovery in levels even after production is dropped and Well 2A shows little to no recovery. The curves for Wells 3A, 4A and 5 nearly overlap each other, which shows how closely they influence each other. Well 8 is the highest producing well and runs continuously during summer months. Water levels for this well continue to drop throughout the year.

Through operational experience, the operators have determined that Wells 5 and 8 can be operated together continuously along with Well 2A. Production from Well 3A generally increases during the winter but declines during the summer months, making it unavailable for meeting high summer demand. A similar decline in production has also been observed for well 4A when operated in conjunction with the other wells. As of September 2018, the tunnel and wells 2A, 5 and 8 were producing a total flow of 400 gpm. Combined with the expected production of 250 gpm from Well 11, the total combined capacity of SCWC is 650 gpm, which falls short of the MDD of 1,451 gpm.

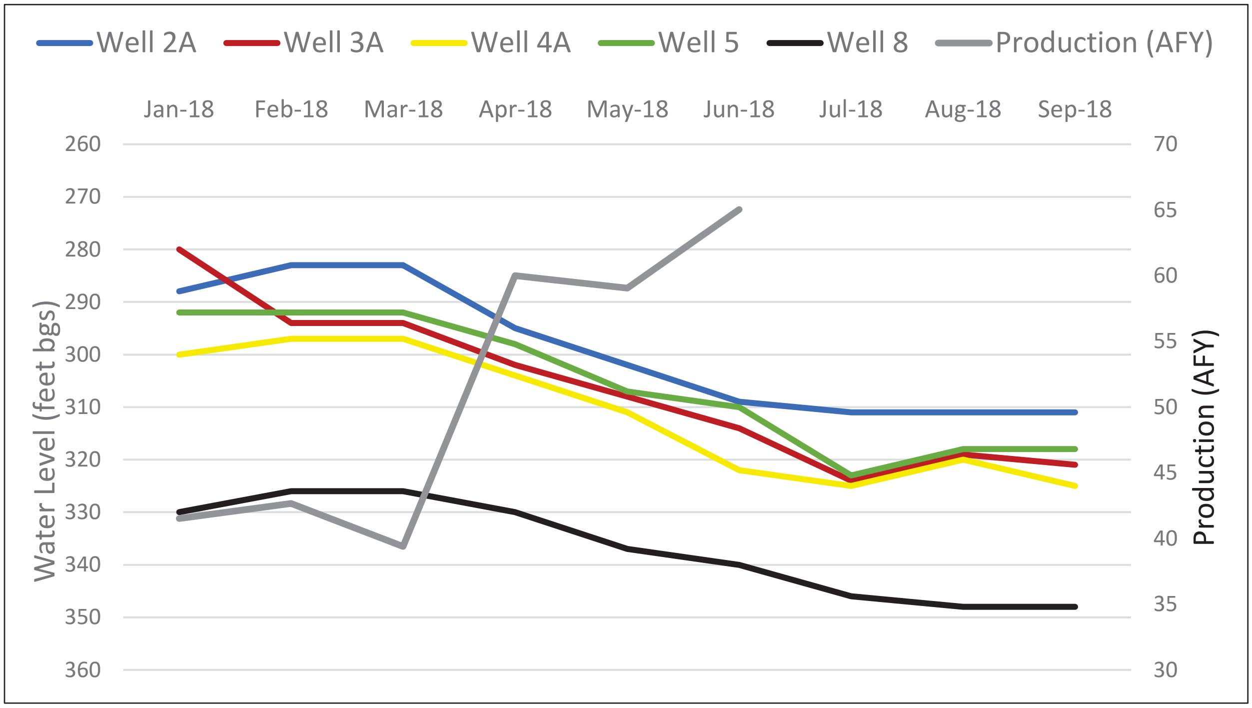

Figure 10: Static water levels for all wells and total system production in 2018

In response to the declining capacity, SCWC has repeatedly reduced allotted water supply for the shares owned by customers. As of September, 2018, the water allocation per share is 750 centum cubic feet (CCF) for the first share and 150 CCF for each subsequent share owned. SCWC had to purchase additional water from PPHCSD to fulfill high summer demand.

B.1.1 Well Investigations

Many factors can affect the production capacity of a well. Improper well design, incomplete well development, encrustation build up, plugged screens, biofouling, corrosion, over pumping and drop in water level within the aquifer due to over pumping and/or lack of recharge are some of the most commonly encountered reasons for loss of water supply.

To better understand the reasons for the steady decline in water production of the SCWC wells, a down hole static video survey of Wells 3A and 4A was performed by BESST, Inc in July, 2018 using a miniaturized camera, measuring 0.74-inches outer diameter (OD) and configured for color imaging. A detailed report on the investigation conducted for both wells is included in Appendices C and D.

Figure 11 shows stills of interior of Well 4A taken with the video camera.

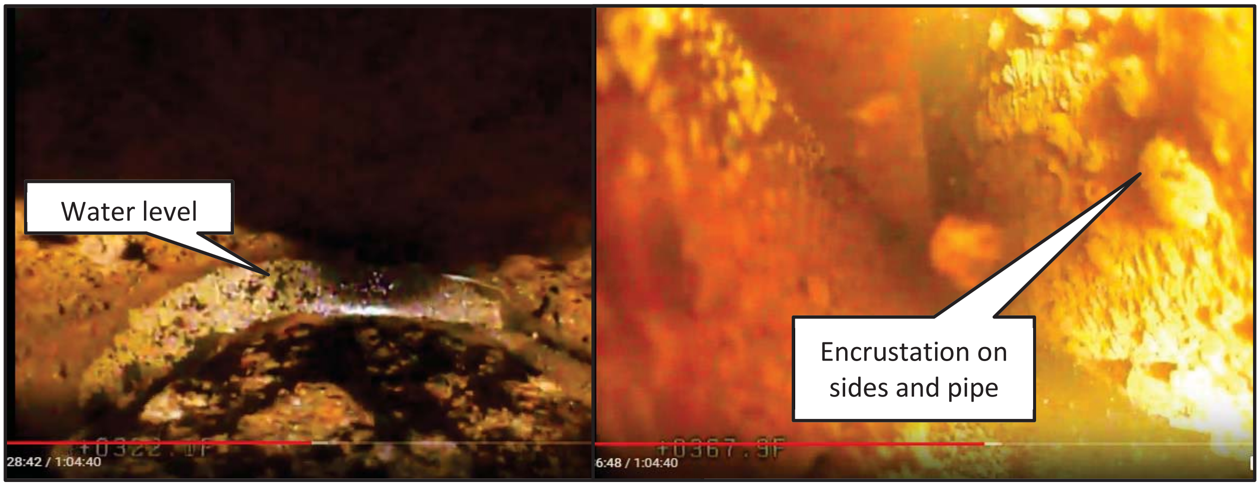

Figure 11: Video survey for Well 4A

The videos revealed that the milled slots in Well 4A are clogged with a white precipitate above the static water level. Some degree of exfoliation and metal peeling was also observed on the casing and pump column. Below the static water level, a significant degree of iron oxide scaling was observed with formation or tubercles. This indicates the presence of iron oxide bacteria. The milled slots also appeared to be clogged due to iron oxide scale. Well 3A was found to be in better condition. A moderate amount of iron scale was present on screen above the static water level, but increased with depth below the water level. The pump casing was found to be in better condition with no exfoliation. Some of the deposits in both wells were easily dislodged by the camera as it passed through the narrow space, suggesting that some of these deposits were formed recently. The clogged screens are likely contributing to the slow recharging of the well column and the diminished supply.

B.2 – Deficient Distribution System

Problem Ranking: 2

Certain areas of SCWC distribution system do not have adequate fire flow due to undersized pipelines. California Fire Code requires that each hydrant should have the capacity to provide 1,500 gpm of flow and adequate pressure for a duration of two hours for fire-fighting purposes. A part of SCWC distribution system currently lacks this capacity.

Further, customer water meters are old and faulty, which makes it difficult for the system to accurately determine usage and estimate water losses. This further exacerbates the water shortage that SCWC is already facing. The recommendation to replace meters is also based on the results of a critical zone leak detection study conducted in the system. The complete leak detection report is included in Appendix E.

The following section provided details on this issue.

B.2.1 Insufficient Fire Flow

Fire flow scenarios were modeled at various locations throughout the distribution system with a fire flow demand of 1,500 gpm and a residual pressure of 20psi for a duration of two hours as required by the local fire marshal in the area. Fire flow demand was considered at a single location at a time, concurrent fires at multiple locations were not modeled.

Approximately 60% of the locations modeled were unable to meet the fire flow requirement. Figure 12 shows the distribution system color coded by pipe diameter and flows modeled at fire hydrants. As can be seen in the figure, pipelines in some areas of distribution system are undersized and unable to handle a sustained flow of 1,500 gpm. Approximately 12 miles of pipelines within the system are 4–inch in diameter, which represents 17% of the total length of service lines. Pipes must be upgraded to at least 8-inch to meet the fire flow requirement.

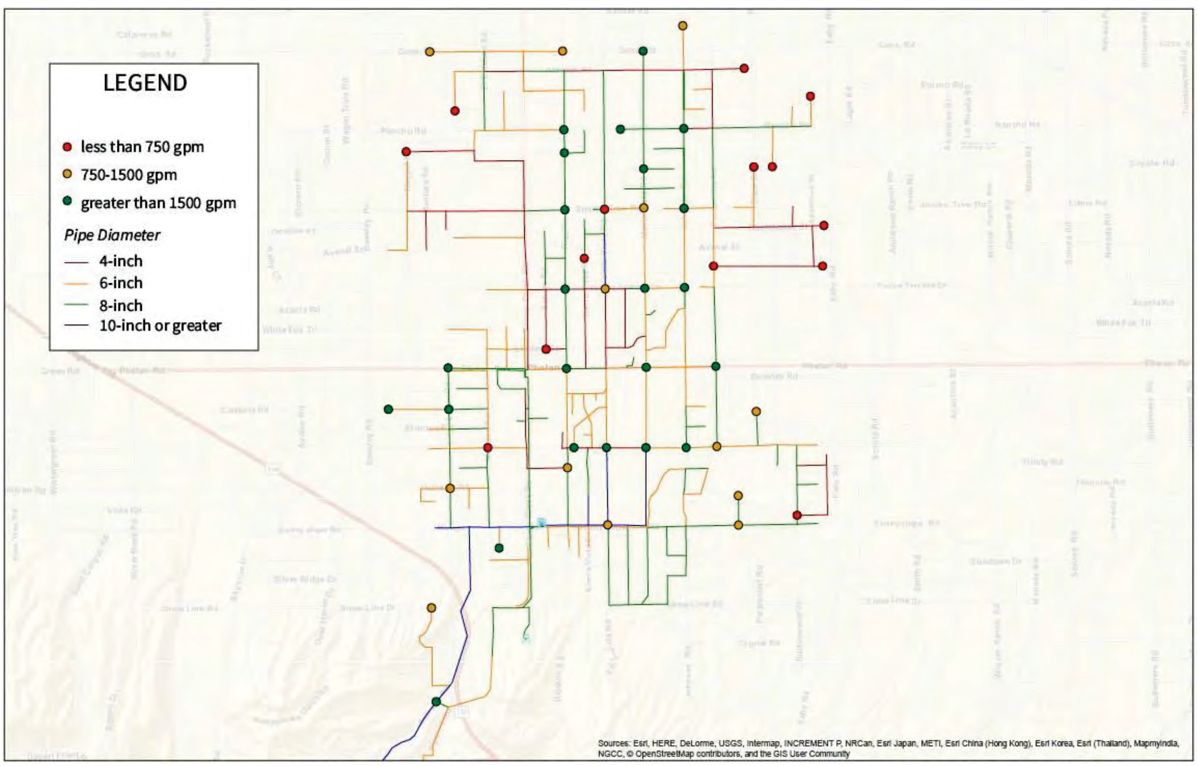

Figure 12: Fire flow inadequacies in distribution system

There are over 110 dead ends throughout the distribution system, as shown in Figure 13. Some of these have no fire hydrant or blow off for flushing. Dead ends allow water to stagnate, which can lead to bacterial growth and poor tasting water. Fire hydrants should be provided at these dead ends to enable periodic flushing.

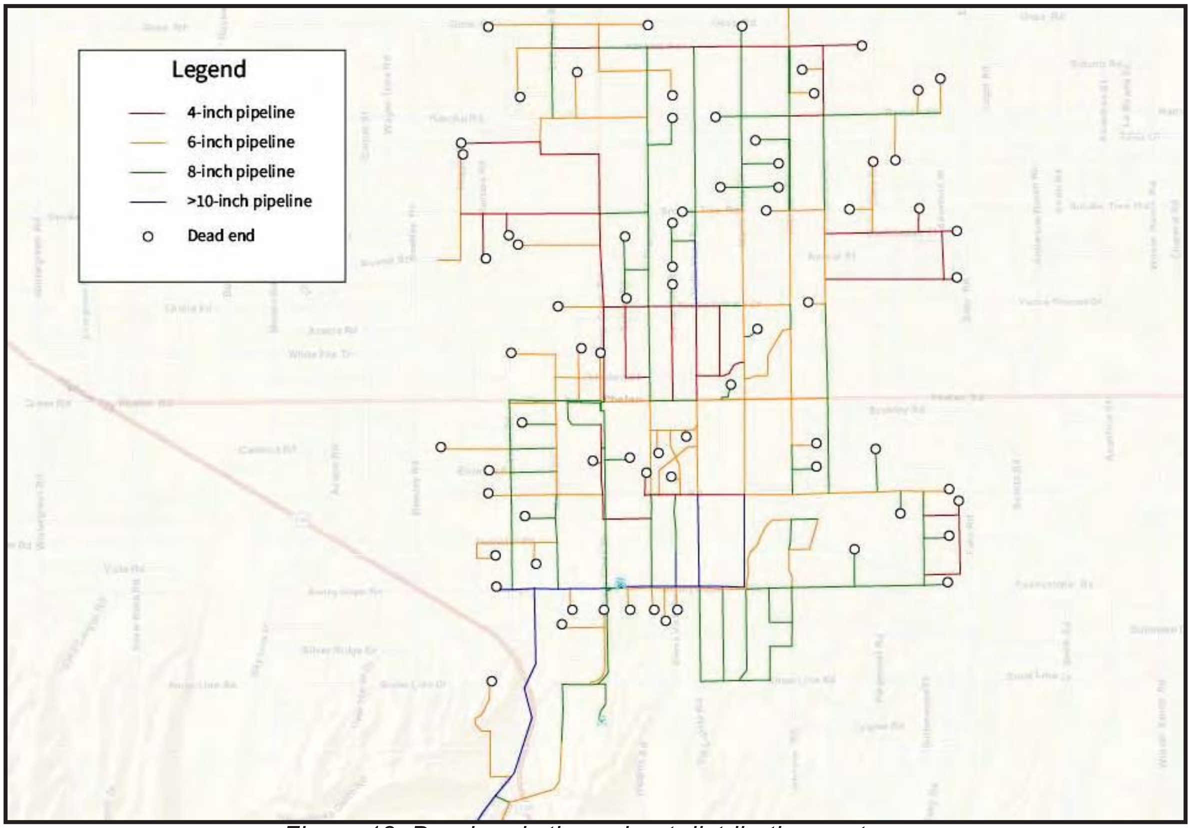

Figure 13: Dead ends throughout distribution system

B.2.2 – Leak Detection Survey

A critical zone leak detection survey was conducted by the CRWA team using an FCS correlator and FCS Acoustic Ground Microphone. Nine meters, 10 hydrants and six valves were used as manual listening points. Approximately 1.75 miles of transmission pipe line was surveyed. Two suspected leaks were found in the system, one of which was confirmed by the operators and repaired. The Leak Detection Report is included in Appendix E. Other recommendations from the report include the following:

1. Replace water service meters throughout the system
2. Replace distribution system pipes and valves that have reached the end of their service lives

DFA approved a full system leak detection survey for the system, which will be performed in November, 2018.

B.2.3 – Water Meters

Existing water meters in the system range from a few to more than 30 years old. Because of the lack of a meter replacement program, the majority of the meters in the system are beyond their useful service lives. SCWC operators estimate that 18-20% of produced water in the system remains unaccounted for, which further exacerbates the water shortage situation SCWC is facing. The high losses are partially attributable to aging water service meters throughout the system, which make it difficult to measure consumption accurately.

B.3 – Insufficient Supply Pressures

Problem Ranking: 3

Some parts of the service area around storage tank 6 have inadequate pressure during periods of low flow. This causes inconvenience to customers, and hence needs to be resolved.
The following section provided details on this issue.

B.3.1 Hydraulic Model

To better understand the reason for inadequate service pressure, CRWA developed a hydraulic model of the system. Drawings provided by SCWC were used to build a computer model of the distribution system using InfoWater® software. All pipes, tanks, valves, wells and other system features were also included along with all associated attributes. Raster data was obtained from United States Geological Survey (USGS) to accurately represent the elevation of the system. Production and consumption data provided by SCWC was used to estimate system demands. Upstream and downstream pressures at pressure reducing stations were used to calibrate the model. The model was used to evaluate flow rates, pressures, pumping demands, and storage levels under a variety of operating conditions.
Based on the results of modeling, flow and pressures throughout the system were found to be adequate for most operating conditions. A small area located east of the SCWC office, known as Nielsen Tract (Figure 14), was identified by the operators as a cause of concern. This area receives potable water in one of two ways – either through Tanks 2, 4 and 8 located at the office site, or through a bypass line from the main 10-inch transmission line. Tanks 2, 4, an 8 and the Nielsen Tract are nearly at the same elevation. Under certain operating conditions the Nielsen Tract experiences insufficient pressures requiring the operators to manually open valves to the bypass line to maintain adequate pressures.

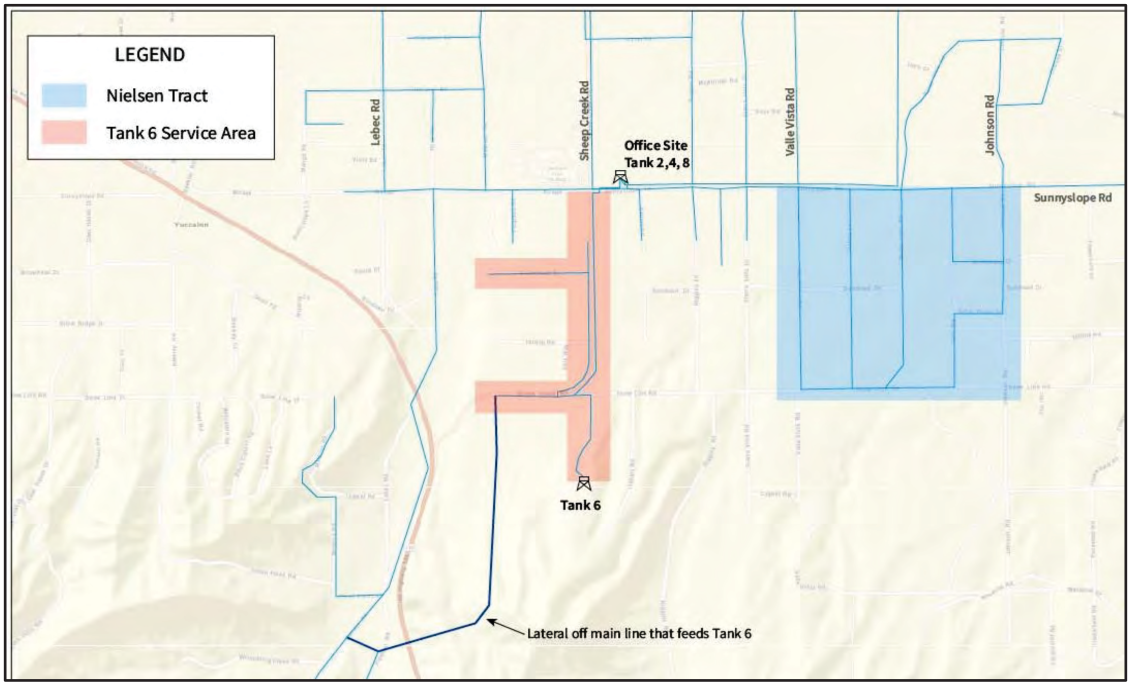

Figure 14: Areas of concern for delivery pressure

Another area of concern is the Tank 6 service area south of the office (Figure 14), which can also be fed in two ways - either by Tank 6 or through a lateral from the 10-inch transmission line. During drought conditions, there is insufficient flow and service pressure to feed Tank 6 and the nearby service area. Further, this area is higher in elevation than storage tanks 2, 4 and 8 and hence cannot be served by them through gravity alone.

A booster pump station is recommended to feed both of these service areas during drought conditions. This booster pump station would also be required to boost service pressures as Well 11 and any future wells installed in the northern part of the distribution system, which is lower in elevation than the southern parts.

B.4 – Storage Tank Deficiencies

Problem Ranking: 4

SCWC has seven storage tanks, which have not been inspected or rehabilitated for more than 10 years. Some of the tanks are over 30 years old and hence, tank maintenance is important to prevent failure. Tanks were inspected as part of the investigations conducted for this report. Inspection revealed multiple deficiencies, including signs of leakage at some of the tanks. The inspection report recommends several improvements to bring the tanks into compliance with the current AWWA standards and OSHA regulations.

B.4.1 Tank Inspections

The majority of the storage tanks located in the system, with the exception of Tank 8, are over 30 years old. An inspection of all tanks was conducted by ACE, Inc. in October, 2018. A brief summary of the results of evaluation are included below, and the complete report is included in Appendix F. The inspection made extensive recommendations for all of the tanks including new coatings, corrosion control and other upgrades necessary to comply with existing OSHA regulations and AWWA standards. The cost of upgrades in discussed in Section C.2.4. Observed deficiencies are summarized in Table 6. Figure 15 shows UV damaged exterior coatings for one of the storage tanks, Tank 5.

Figure 15: Storage Tank 5

Table 6: Summary of storage tanks inspection

Observation	Tank 2	Tank 3	Tank 4	Tank 5	Tank 6	Tank 7	Tank 8
Tank Exterior							
Shell	Fair	Fair	Fair	UV damaged	Fair	Fair	Excellent, some flash rusting
Roof	Fair	Fair	Sporadic UV damage, flash rusting	UV damaged	Severe UV damage	Severe UV damage	Delaminated at weld seams at perimeter
Tank Leakage	Periodic, at vertical seam	Multiple visual signs	Periodic	Multiple visual signs	Multiple signs observed	None observed	None observed
Bellying	12-20" above tank chime, ¼" to ½" out of plane	None observed	None observed	12-20" above tank chime, ¼" to ½" out of plane	None observed	None observed	None observed
AWWA freeboard standards	Not met						
Risk of seismic failure	Risk of fracturing at inlet and outlet	Risk of fracturing at inlet and outlet	Risk of fracturing at inlet and outlet	Risk of fracturing inlet and outlet	Inlet and outlet lines below grade, could not be inspected	--	--
OSHA compliance	Exterior ladder not compliant, handrail on roof is missing					Roof handrail present	Roof handrail present
Other deficiencies	--	Grade band failing	Grade band failing, dry rot in exterior gaskets	Grade band failing	Grade band failing	Overflow too high, roof girder remains submerged	Tank chime needs to be sealed
Tank Interior							
Corrosion	Severe to moderate	Severe to moderate	Not known	Severe to moderate	Severe to moderate	Spot rusting	Spot rusting at rafter ends
Perimeter shell coating	--	Not known[1]	Fair to good condition	Not known[1]	Severely delaminated, recoat	Fair condition below HWL[2],	Good to excellent; spot corrosion

Notes:
[1] Could not be inspected due to lack of an interior ladder or roof vent too small to allow safe access
[2] HWL: High Water Level

B.4.2 Tank Mixers

For all of the tanks, the inlet and outlet pipes are both located at the bottom of the tanks on the same side, as shown in Figure 16 for Tank 7. This configuration does not promote internal water circulation. This can lead to stagnation and depletion of the chlorine residual resulting in microbial growth, as well as taste and odor issues.

It is recommended that mixers be installed inside all of the tanks.

Figure 16: Tank 7 - inlets and outlet

B.5 – Communication and Control Infrastructure - SCADA

Problem Ranking: 5

Due to the lack of a central control and monitoring system, operation of the SCWC system is based on daily manual checks by staff. Implementation of a SCADA system is recommended to enable remote monitoring and process control, electronic data acquisition and storage, and timely notification of problems and alarms.

SCWC does not have SCADA capability to facilitate data collection and control of all pumps and tanks together as one system. Individual processes can be monitored and controlled locally, however these activities can only be performed a few times a day. Continuous monitoring capability to ensure a smooth operation is currently not available. Further, the remote location of SCWC's well field and primary tanks – 5 and 7, can make access difficult during inclement weather. As a result, issues can go unnoticed until the next day, increasing the extent of damage caused and the remedial action required to fix it. A central control and monitoring system would help prevent such issues, and allow the system to run more efficiently.

As a recent example, an altitude valve on Tank 6 froze overnight and did not close after the tank was filled. The water continued to overflow until the problem was discovered and repaired the following morning, resulting in a significant water loss.

Further, data on flows, levels, pump speeds, etc. can only be collected once a day. A more complete analyses can be performed with the availability of a continuous data stream, which allows for improved operational decisions and more efficient operation of the system.

C. ALTERNATIVE SOLUTIONS

Describe the Analysis of alternatives. Include all possible alternative(s) to be considered to correct the ranked problems described above. Include the feasibility of consolidation with one or more water systems.

Alternative 1 – No Action
Alternative 2 – System Upgrades
Alternative 3 – Consolidation

C.1 – Alternative 1 – No Action

This is not a feasible alternative since the issues faced by SCWC need urgent attention. The system has received a citation from SWRCB and is expected to take steps to resolve its source capacity issues. Other issues such as distribution system deficiencies, storage tank rehabilitation, control system etc. are important so the system can continue to provide water to its customers in the long term in a reliable and efficient manner. Hence, this alternative is not considered feasible.

C.2 – Alternative 2 – System Upgrades

This alternative consists of a series of phased improvements to the SCWC infrastructure in response to the Request for Assistance, the deficiencies identified in the Needs Assessment, and to bring the system into regulatory compliance. It is recommended that these improvements be implemented in two phases over multiple years to ease the burden of implementation, and provide the opportunity to segment the cost.

C.2.1 – Source Capacity

SCWC has been systematically reducing water production as water levels in its well field and tunnel have continued to decline for the past several years. The decline in water levels can be attributed to the lack of sufficient precipitation and snowmelt. A well video investigation conducted by CRWA shows that wells 3A and 4A are heavily encrusted, which is likely contributing to the diminished pumping capacity in the wells. With the uncertainty regarding the feasibility of sustaining the required production level from existing well field, it is evident that this system needs to explore additional sources of water. In summer, 2018, SCWC faced a shortage of supply and had to purchase water from PPHCSD to meet high summer demand. The production capacity fell short of the MDD, and as a result, the system received a compliance order from Division of Drinking Water (DDW) due to lack of adequate source capacity. SCWC has been mandated to identify alternatives for increasing source capacity to meet the

MDD.

SCWC has been working to secure additional source of supply for the community outside of the existing well field since 2006. Well 9, drilled in the existing well field was found to be dry.

Since SCWC was not a stipulating party with the Mojave Water Agency at that time (in 2009) and had no water rights in the Mojave basin, they acquired two one-acre parcels in Los Angeles county overlaying the Antelope Valley basin. A well was drilled with an estimated pumping capacity of 1,200 gpm. However, approximately 15 miles of new pipeline would be required to transport this water into SCWC's service area. Further, the well water had levels of Hexavalent chromium (Cr^{6+}) just above the now-defunct MCL of 10 µg/L. Owing to the cost implications of treating and transporting water from this source, the project was abandoned.

A new well, Well 11 (as shown in Figure 2), is currently under development and has a rated capacity of 250 gpm based on test pumping. However, in order to completely satisfy the demands of this community, SCWC needs to continue to develop additional sources of potable water to meet the MDD as required by California Health and Safety Code (CHSC) Section 116655 and California Code of Regulations (CCR) Title 22, Section 64554.

Therefore, CRWA recommends the following actions be taken to help restore source capacity for SCWC.

C.2.1.1 Rehabilitation of Existing Wells

A hydrogeological evaluation of the geology around Swarthout Canyon, Sheep Creek area, and Mojave basin was conducted by CRWA. A complete report is included in Appendix G.

Based on geology, production data from existing well field over last several years, precipitation data, and well videoing results of wells 3A and 4A, it is recommended that a program of well rehabilitation for wells 2A, 3A and 4A be implemented to restore production and extend life of these wells. Water quality from the wells must first be analyzed for certain biological and chemical parameters so the optimum rehabilitation process can be designed.

In general, the procedure recommended for rehabilitation of these wells includes:

1. Brush the wells to remove as much of the mineral incrustations and biomass as possible to expose the screens for further treatment to open the screens and gravel pack.
2. Airlift debris from the bottom of the well.
3. Apply acid treatment to help remove incrustations. The preferred method to treat both carbonate and iron/manganese encrustations would be with phosphoric or oxalic acid. If biofilm is present as well, then oxalic acid would be the best choice to address all three issues without having to apply different rounds of chemicals.

4. Use of a dual surge block to work acid solution into formation.
5. Allow well to sit for 24-48 hours.
6. Remove and neutralize acid solution; verify pH; pump to waste.
7. Dual surge block to loosen mineral incrustations in screen and gravel pack.
8. Video well to determine progress.
9. Vibratory acoustic shock or jetting to address filter pack, if necessary.
10. Dual surge block.
11. Airlift debris from bottom of well.
12. Video log well to confirm well rehabilitation.
13. Upon completion of the well rehabilitation, a pumping step test should be conducted to determine optimal pumping rate, with 4-5 steps of approximately one hour each. Specific capacity should be measured during this testing

The process described above may need to be modified based on diagnostic water chemistry or other data which may become available.

An estimate of cost for rehabilitation work is presented in Table 7. These costs are based on the pump depths obtained from well logs.

Detailed costs can be found in the hydrogeological report in Appendix G.

Table 7: Cost estimate for well rehabilitation

Well ID	Rehabilitation Cost
2A	$75,100
3A	$62,500
4A	$62,500
5	$58,524
8	$61,380
Total	**$320,004**

C.2.1.2 Drill Additional Wells

To meet the source capacity requirement for SCWC, new wells must also be drilled to increase the current production capacity from 0.94 MGD to 2.09 MGD. However, as described previously in Section B.1, the existing wells are located in a single well field and their zones of influence overlap, which impacts overall production level. Further, in recent years, groundwater levels in the area have dropped further impacting overall production. It is therefore recommended that new wells be drilled outside of this area.

Based on a hydrogeological investigation conducted by CRWA (Appendix G), six locations within the main service area of SCWC have been identified where new wells, having a high probability of producing good water quality and acceptable yield, could be drilled. These recommendations are based on evaluation of geology of the area, water master reports on locations and current production levels of existing wells in the area, availability of property, and proximity to existing SCWC infrastructure. A complete discussion on the siting criteria for these wells is discussed in the hydrogeological evaluation. The six alternative locations are shown in Figure 17. All of these are expected to produce flows in the range of 200 – 400 gpm, as indicated by yield from other similar wells in the area. Locations A and D are in close proximity to existing SCWC infrastructure and therefore can be considered more desirable locations than others. The number of new wells needed would depend on flow obtained from each well. CRWA recommends that three locations be selected for pilot test borings and drilled for testing. Depending on the flow and water quality obtained from these wells, the necessity of additional test wells can be determined.

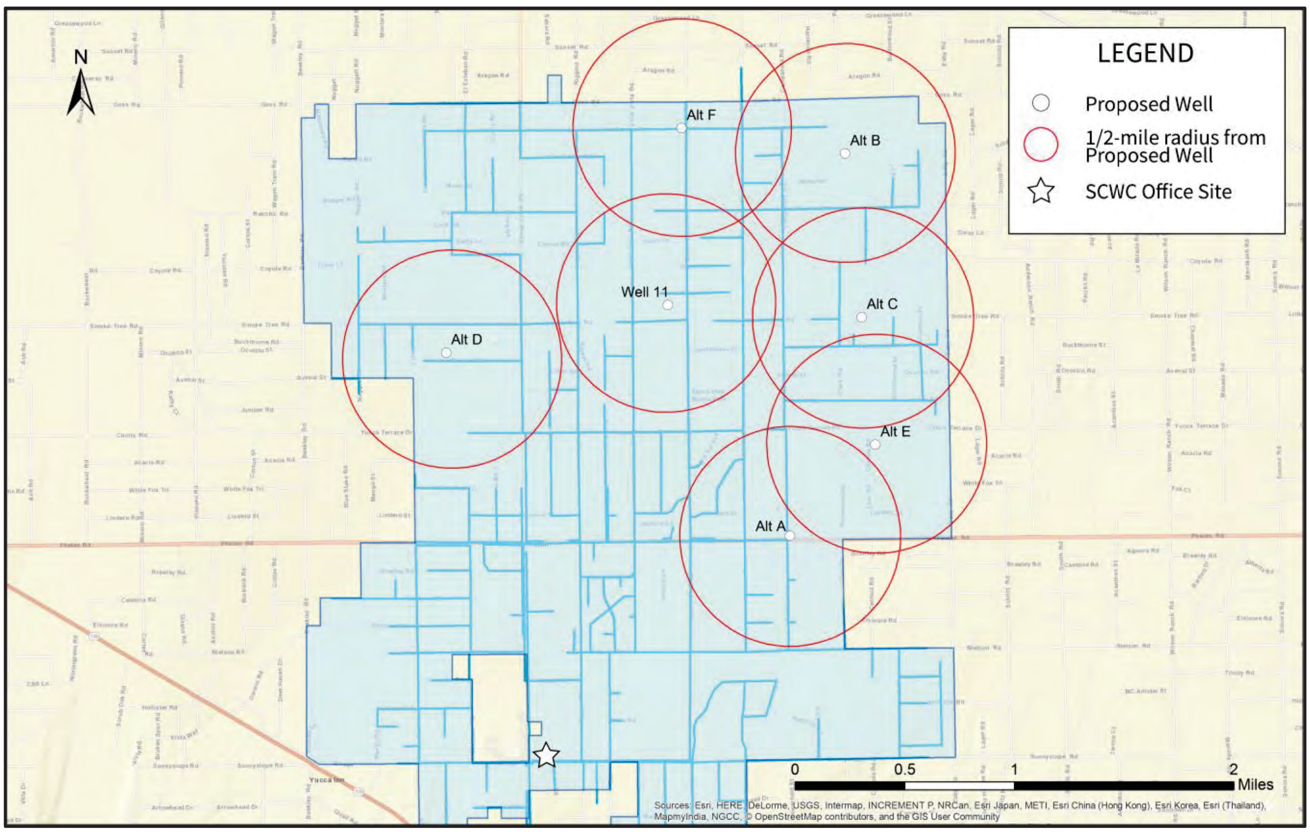

Figure 17: Locations of proposed alternatives for drilling additional wells

A preliminary cost estimate for the development of new wells is presented in Table 8. All of the proposed well sites are located in the Alto sub area of the Mojave Basin. Since SCWC does not own any water rights in the area, it would be required to pay for all of the water pumped. It is expected that the new wells would be used as needed to supplement the production from the existing well field and new Well 11. This additional volume is estimated as a difference of the average annual demand (AAD) from 2008 – 2017 and the AAD from 2015 – 2017. These years were selected because SCWC reduced water allocations per share in response to declining source capacity in 2015. Hence, this difference is the shortfall in supply the system would have experienced without these cuts. It is expected that allocation cuts would no longer be necessary when the new wells are online to fulfill this demand. Electrical cost for the new pumps is calculated based on the following factors:

- Current electrical cost,
- Estimated pumping volume,
- Estimated increase in pumping pressure due to well depth and elevation.

Table 8: Cost estimate for new wells

Item	Qty	Unit	Unit Cost	Total Cost
New Supply Wells - Preliminary Review through Three Pilot Borings	1	LS	$600,000	$600,000
Final Well Design and Construction	3	LS	$703,000	$2,109,000
Pipelines to connect new wells	10,400	ft	$100	$1,040,000
Subtotal - Construction Cost				$3,749,000
Final Design (% of Construction Cost)	8%	LS	$293,920	$299,920
CM, Inspection and Contingency (% of Construction Cost)	20%	LS	$734,800	$749,800
Total Capital Cost				**$4,798,720[1]**
Operation and Maintenance Costs				
Annual Electrical Cost	1	LS	$ 31,000	$ 31,000
Purchase of Water	111	$/AF	$ 700[2]	$54,600
Misc parts and maintenance		LS		$10,000
Annual O&M Cost				**$ 95,600[1]**

Notes:
1. Based on November, 2018 costs
2. Based on Mojave Water Agency's water recharge rate of $600-800/AF

C.2.2 – Distribution System Deficiencies

C.2.2.1 Insufficient Fire Flows

As discussed previously in Section B.2.1, the hydraulic model shows that SCWC does not have adequate fire flow throughout its distribution system. Under this project, 4-inch pipelines serving high density residential neighborhoods and businesses are being recommended for replacement as it will significantly improve fire flow to nearly a third of the system. In addition, CRWA also recommends that SCWC develop and implement a long-term plan to replace the remaining pipelines so adequate fire flow can be provided for the entire service area.

As discussed previously, it is recommended that the pipeline improvements be implemented in two phases as shown in Figure 18. Cost estimates for both phases of work is presented in Table 9.

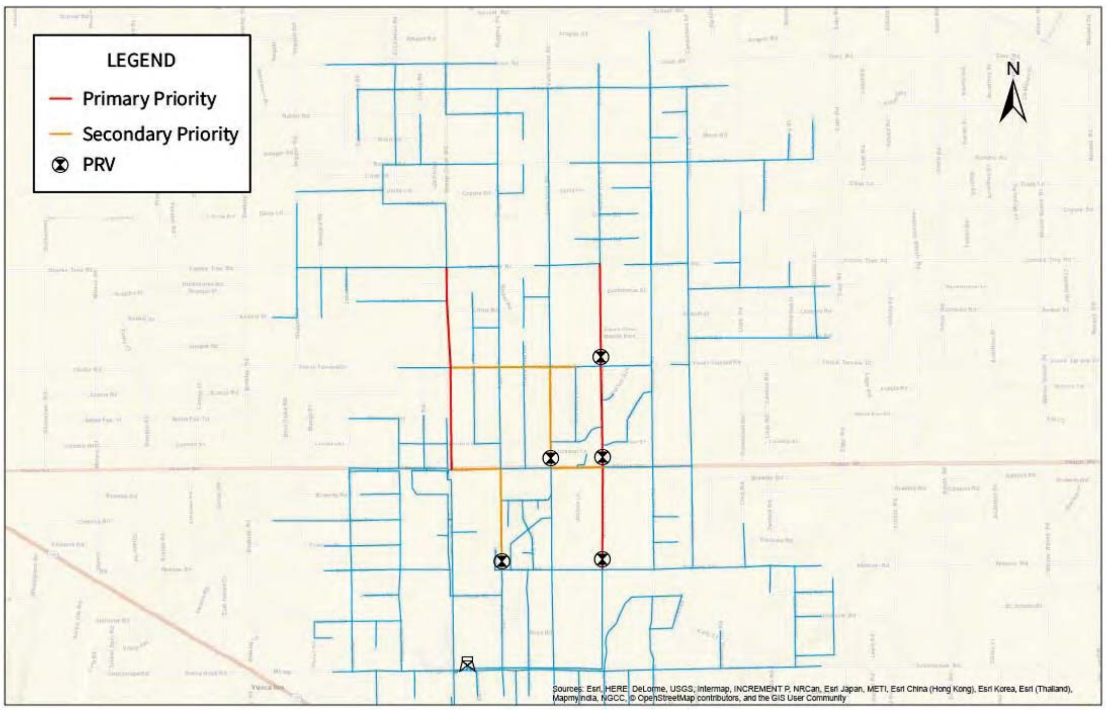

Figure 18: Replacement of distribution system pipelines

Table 9: Cost estimate for replacement of distribution system pipelines

Item	Unit	Qty	Unit Cost	Total Cost
8-inch C900 – Phase I	feet	12,500	$100	$1,250,000
PRV – Phase I	LS	3	$50,000	$150,000
Total Cost – Phase I				**1,400,000**
8-inch C900 – Phase II	feet	13,000	$100	$1,300,000
PRV – Phase II	LS	2	$50,000	$100,000
Total Cost – Phase II				**1,400,000**
Total Cost for all pipeline replacements				**$2,800,000**

SCWC distribution system has 110 dead ends located throughout the system. Of these, 80 have hydrants or blow offs, which are used for periodic flushing. It is recommended that hydrants be installed at the other 30 dead ends to allow flushing of those pipes. The estimated cost of installing the additional hydrants is shown in Table 10.

Table 10: Budget for installing hydrants at dead ends			
Item	**Qty**	**Unit Cost**	**Total Cost**
Hydrant	30	$6,500	**$195,000**

C.2.2.2 – Replacement of Water Meters

It is recommended that an automatic meter reading (AMR) type system be implemented using ultrasonic meters, which can read as little as 0.04 gpm of flow with an accuracy of ± 1.5% under normal flow conditions. AMR metering systems are available that allow operators to read the meters remotely using smartphone applications, and allow the data to be directly downloaded into SCWC's existing billing system. A manufacturer's quote for a representative meter system is included in Appendix H. The total cost estimate for replacing the meters is presented in Table 11.

Table 11: Budget estimate for replacement of water service meters				
Item	**Unit**	**Qty**	**Unit cost ($)**	**Total cost ($)**
1" Ultrasonic Water Meter with Integral Radio	Ea	11166	$ 302.86	$353,135
2" Ultrasonic Meter with Integral Radio	Ea	25	$ 772	$ 19,300
Ready Smartphone Remote Reading Kit: advanced (hardware)	Ea	1	$ 1,800	$ 1,800
Hosted Ready Management Software and Ready App (one-time charge)	Ea	1	$ 3,060	$ 3,060
Total Capital Budget*				**$377,295**
Optional:				
Ready Bluetooth Optical Head (data logger) (hardware)	Ea	1	$ 780	$ 780
Bluetooth capable tablet device	Ea	1	$ 295	$ 295
Billing interface file:	Ea	1	$ 500	$ 500
Total Optional Items				**$ 1,575**
Operation and Maintenance Costs				
Hosted Ready Hosting Subscription Agreement (annual charge) After First Year	Ea	1	$ 1,531	$ 1,531
Annual O&M Cost				$ 1,531

*Construction cost has not been included in the estimate since it is assumed that system operators will perform the replacements.

C.2.3 – Insufficient Supply Pressures

During normal operating conditions, SCWC distribution system was found to have adequate service pressure at all locations, except as discussed in Section B.3. A booster pump station should be provided at the yard located within SCWC office premises to resolve both issues and ensure that adequate service pressure is available within the distribution system under all operating conditions. In the future, this pump station may also be used to bring in water from Well 11 or other proposed new wells to feed southern parts of the service area.

C.2.4 – Storage Tank Deficiencies

C.2.4.1 Tank Inspections

Recommendations for rehabilitation work to be conducted on tanks were made by ACE, Inc based on inspections conducted in October, 2018. The cost of rehabilitation, as well as tank replacement, were presented in the report and are summarized in Tables 12 and 13 respectively for comparison. It must be noted that although most of the tanks are over 30 years old, their useful service lives can be extended by performing the repair work, which is the recommended approach for Phase I. However, tank replacements may need to be considered and are recommended for Phase II of the project. This includes Tanks 2 and 4, which should be replaced with a 1.5 MG welded tank. It is recommended that annual inspections be included in SCWC system maintenance plan going forward.

Table 12: Capital cost estimate for storage tank rehabilitation

Tank ID	Description of Work	Estimated Cost
2,3,4,5,6	Seismic flexible couplings, Roof hand railing, interior ladder	$ 46,700
	Engineer tank for sloshing wave and reduce overflow elevation	$ 17,000
	Subtotal for this work (for five tanks)	$ 318,500
2	Blast interior coating and paint interior	$ 67,700
	Pressure coating and wash exterior (optional)	$ 21,350
	Seismic analysis for tank (optional)	$ 8,500
	Subtotal for Tank 2	$ 97,550
3	Sweep blast interior and recoat	$ 61,900
	Pressure coating and wash exterior (optional)	$ 18,425
	Subtotal for Tank 3	$ 80,325
4	Pressure coating and wash exterior (optional)	$ 21,350
	Subtotal for Tank 4	$ 21,350
5	Sweep blast interior and recoat	$ 58,700
	Pressure coating and wash exterior (optional)	$ 17,350
	Seismic analysis for tank (optional)	$ 8,500
	Subtotal for Tank 5	$ 84,550
6	Sweep blast interior and recoat	$ 79,200
	Pressure coating and wash exterior (optional)	$ 30,005
	Seismic analysis for tank (optional)	$ 8,500
	Subtotal for Tank 6	$ 117,705
7	Remove all interior coatings and recoat	$ 150,500
	Exterior coatings	$ 49,200

Table 12: Capital cost estimate for storage tank rehabilitation		
Tank ID	**Description of Work**	**Estimated Cost**
	Pressure wash and spot repair interior	$ 65,000
	Subtotal for Tank 7	$ 264,700
8	Spot repair all rafter ends	$ 22,000
	Spot repair roof delamination	$ 17,000
	Interior spot repairs - TBD based on detailed interior inspection	
	Subtotal for Tank 8	$ 39,000
	Total for all tank rehab work	**$ 1,023,680**

Table 13 shows the estimated costs of replacing storage tanks 2, 3, 4, 5 and 6 per the inspection report. Tanks 7 and 8 are newer welded tanks and were found to be good condition. The proposed new tanks would be in conformance with applicable AWWA standards and OSHA regulations. Costs for both welded and bolted tanks are included for comparison. CRWA's recommendation is that tanks 2 and 4 should be replaced in Phase II. The other costs are provided here for reference purposes.

Table 13: Capital cost estimate for storage tank replacement		
Tank ID	Description of New Tank	**Estimated Cost**
2, 4	Alternative 1 – Replace Tank 2 with new bolted tank including ring wall with anchorage	$ 400,000
	Alternative 2 – Replace Tank 2 with new welded tank	$ 458,000
	Alternative 3: Demolish Tanks 2 & 4, replace with 1.5MG welded tank	$ 1,050,000
3	Alternative 1: New bolted tank	$ 275,000
	Alternative 2: New welded tank	$ 360,000
5	Alternative 1: New bolted tank with gravel-band foundation	$ 250,000
	Alternative 2: New welded tank, including ring wall with anchorage	$ 345,000
6	New bolted tank	$ 388,000
	New welded tank with gravel-band foundation	$ 475,000
	Total (replace with new welded tanks)	$ 2,180,000

C.2.4.2 Tank Mixers

CRWA recommends installing tank mixers to avoid stratification within the tanks with respect to chlorine residual and temperature, as discussed in Section B.4.2. There are two general types available – one powered by a metered electrical service, and the other by solar charged batteries.

The electric mixer proposed for these tanks is a stainless-steel submersible mixer designed for continuous operation. It can be installed through the roof hatch on each tank without the need for tank entry. A stainless-steel retrieval chain is provided to allow the equipment to be accessed for repairs without entering the tank. The proposed solar powered mixer is a floating device that pulls water in through a thermoplastic rubber intake hose for circulation. It is equipped with a battery, which is charged using solar power and can keep the mixer running for about 7 days without recharge. The initial equipment cost for a solar powered mixer is more than that for an electric mixer but savings are realized over a period of time since there is no electricity cost to operate them. Both types of mixers operate on a 0.5 hp motor. A detailed cost estimate is included in Table 14. A manufacturer's quote for representative equipment is included in Appendix I.

Table 14: Budget estimate for new tank mixers

Item	Qty	Unit cost - Electric ($)	Unit cost - Solar ($)	Total cost - Electric ($)	Total cost - Solar ($)
Mixers for all tanks except Tank 8	6	$ 6,880	$ 19,725	$ 41,280	$ 118,350
Mixer for Tank 8	1	$ 9,580	$ 27,440	$ 9,580	$ 27,440
Estimated Sales Tax		9%	9%	$ 3,715	$ 10,652
Delivery, installation, start up, training	1	$ 60,099	$ 60,099	$ 60,099	$ 60,099
Total Equipment Cost				**$ 115,000**	**$ 217,000**
Engineering, CM, and Admin	25%			$ 28,750	$ 54,250
Total Budget - Capital Cost				**$ 144,000**	**$ 272,000**
Operation and Maintenance Costs					
Annual Electrical Cost	7	10 ¢/KWhr	0	$ 4,906[1]	$ -
Misc parts	5%			$ 2,064	$ 5,918
Annual O&M Cost				**$ 7,000**	**$ 6,000**

Notes:
1. Electrical Usage is based on 800W per mixer

C.2.5 – Communication and Control Infrastructure - SCADA

Most of the monitoring and control in the system is limited to local operator controls. A reliable monitoring and control system is essential to maintain efficient operation of the entire distribution system at all times. CRWA recommends that a new SCADA system be implemented with remote control and monitoring capabilities for all critical equipment, including all wells, storage tanks Pressure Reducing Valves (PRVs) installed on the main 10-inch line that brings water from Tank 5 down the mountain and into the distribution system.

CRWA recommends that the system be cloud-based for the following reasons:

- SCWC has limited office space and staffing to install and maintain new computer servers, UPS systems and data backup equipment that will be needed for a traditional SCADA system.

- Cloud based technology allows users to access the system on their smartphone, tablet or computer. The alarms and other notifications can be delivered immediately in the form of texts and email alerts prompting immediate action.
- The vendor providing cloud-based service is responsible for data storage, backups, security, etc.
- Multiple users can have monitoring and control capability as necessary.

It is recommended that the cloud-based SCADA system be implemented to provide the following functionality:

1. Pumps: Actions available from remote control:
    a. Operation based on tank level
    b. Hand/Off/Auto mode selection
    c. Start/Stop functionality
    d. Set Lead/Lag/Lag Lag status
    e. Set pump speed
    f. Set level for starting/stopping pumps
    g. Flow monitoring
    h. Pump failure alarms
    i. Intelligent alarms based on normal system operating conditions
    j. Pump run time data
    k. Electrical energy used and pump efficiency
2. Flow
    a. Current and historical flow data from flow meters
    b. Intelligent alarms based on normal system operating conditions
3. Tank levels:
    a. Water level monitoring in all tanks
    b. Estimate flow based on rate of tank filling
    c. Intelligent alarms based on normal system operating conditions to identify faulty or leaky valves etc.
4. Pressure Reducing Valves:
    a. Monitor intake and output pressures of two main PRVs located on the 10-inch transmission line that brings water from the main well field into the distribution system (as shown in Figure 3)
    b. Monitor and report position of PRVs

c. FAIL alarm will be generated in case of a problem.

The estimated budget for a new SCADA control system is shown in Table 15. A representative manufacturer's quote is included in Appendix J.

Table 15: Budget estimate for new SCADA system

Item	Unit	Qty	Unit cost ($)	Total Cost ($)
Hardware estimate for six pumps, seven storage tanks, two PRVs	1	1	$ 65,656	$ 65,656
Start up and Technical Support				Included
Total Equipment Cost				**$ 66,000**
Engineering and Construction Management		15%		$ 9,900
Legal and Administration Fees		10%		$ 6,600
Contingency		20%		$ 13,200
Total Budget - Capital Cost				**$ 96,000**
Operation and Maintenance Costs				
Annual fee for cloud-based service	/mo	12	456	$ 5,500
Misc expense/Contingency		5%		$ 3,283
Annual O&M Cost				**$ 9,000**

C.2.6 Alternative 2 Improvement Recommendations - SCADA

The improvements identified in Alternative 2 are necessary to bring the system into regulatory compliance and support future sustainable operation of the system. However, some of these improvements are needed more urgently than others. In order to reduce the burden of implementing all changes at once, a phased approach is recommended as discussed below. Concurrent with making these upgrades, CRWA also recommends that SCWC develop a Capital Improvement Plan (CIP) in order to ensure that all necessary distribution system improvements in the future are scheduled in a timely manner and budgeted for appropriately.

Phase I: This phase includes critical improvements that are essential for this system to continue to operate as a water provider. In general, it includes improvements for four of the five ranked problems discussed in Section B above. The following upgrades are proposed for Phase I of the project.

- Three new wells to provide additional source capacity
- Pipeline upgrades to improve fire flow
- System wide water service meter replacement
- Booster pumps to maintain pressure in Nielsen Tract zone

- Maintenance and improvements to existing tanks

Specific upgrades and associated costs are presented in Table 16.

Table 16: Phase I proposed upgrades and associated cost

Item	Qty	Unit	Unit Cost	Total Cost	Section Reference
New Supply Wells - Preliminary Review through Pilot Borings	1	LS	$600,000	$600,000	C.2.1.2
Final Well Design and Construction	3	LS	$703,000	$2,109,000	C.2.1.2
Pipelines to connect new wells	10,400	ft	$100	$1,040,000	C.2.1.2
New & Replacement Pipelines - Phase I	12,500	ft	$100	$1,250,000	C.2.2
Tank Improvements	1	LS	$904,780	$904,780	C.2.4
Booster Pump Station	400	gpm	$100/gpm	$40,000	C.2.3
Replace all meters (1305)	1	LS	$377,295	$377,295	C.2.2
Subtotal - Construction Cost				**$6,321,075**	
Estimated Design, Environmental and Inspection Cost					
Final Design (% of Construction Estimate	8%	LS	$505,686	$505,686	
Geotech and Surveying	1	LS	$50,000	$50,000	
Environmental Studies	1	LS	$61,181	$61,181	
Funding Application	1	LS	$14,136	$14,136	
CM, Inspection, Contingency (% of Construction Cost)	20%	LS	$1,264,215	$1,264,215	
Subtotal - Miscellaneous Cost				**$1,895,218**	
Total Project Cost				**$8,216,293**[1]	

[1] Cost based on November, 2018 estimates

<u>Phase II:</u> This phase includes improvements which are less urgent than Phase I upgrades, but are necessary for efficient system operation. In general, these improvements include:

- Rehabilitation of existing wells to maintain source capacity
- Replacement of undersized and aged-out pipes in the distribution system
- Tank Replacements – Tanks 2 and 4
- New SCADA system

Specific items to be addressed during this phase along with the associated costs are discussed below in Table 17.

Table 17: Phase II proposed upgrades and associated cost

Item	Qty	Unit	Unit Cost	Total Cost	Section Reference
Rehab Well 2a, 3a,4a, 5 and 8	5	LS	Varies	$320,000	C.2.1.1
New & Replacement Pipelines - Phase II	12,500	ft	$100	$1,250,000	C.2.2
Tank Replacements – Tanks 2 and 4	2	Each	525,000	$1,050,000	C.2.4.1
Tank Mixers	7	LS	315,000	$315,000	C.2.4.2
SCADA Improvements	1	LS	$96,000	$96,000	C.2.5
Subtotal - Construction Cost				**$3,031,000**	
Estimated Design, Environmental and Inspection Cost					
Final Design (% of Construction Estimate)	8%	LS	$242,480	$242,480	
Geotech and Surveying	1	LS	$50,000	$50,000	
Environmental Studies	1	LS	$61,181	$61,181	
Funding Application	1	LS	$14,136	$14,136	
CM, Inspection, Contingency (% of Construction Cost)	20%	LS	$606,200	$606,200	
Subtotal – DES, ENV, CM Cost				**$973,997**	
Total Project Cost				**$4,004,997[1]**	

[1] Cost based on November, 2018 estimates

C.3 – Alternative 3 - Consolidation

A Preliminary Consolidation Report was prepared in May, 2018 based on an initial review of system issues and meetings with general managers from both systems. Well 11 was still under development at the time and there was no information on production levels that could be expected from it. The report recommended that consolidation may be needed if SCWC is not able to secure a reliable source of supply to fulfill their water demands. At the present time, Well 11 has been developed and is capable of producing 250 gpm reliably. Therefore, the need for consolidation is being revisited in light of new information available.

PPHCSD is a retail water provider that serves the unincorporated communities of Phelan and Piñon Hills in San Bernardino County. It was established in 2008 by consolidation of three special districts in the area, encompassing a total area of 128 square miles. It is the largest community services district in San Bernardino County and provides water treatment and supply, park and recreation, solid waste and recycling, and street lighting services to a population of about 20,000 people. The total water demand for this community is about 2,800 AFY.

PPHCSD is under the jurisdiction of Division of Drinking Water (DDW) District 13 and is governed by a five-member Board of Directors who are elected to four-year terms by residents of this community.

As shown in Figure 19, PPHCSD service area surrounds the SCWC system on three sides and hence, consolidation of these two systems is economically feasible due to their physical proximity. Further, the two utilities have a long history of cooperation. They have a 12-inch emergency inter-connection that is capable of handling 1,500 gpm of flow. SCWC has received emergency water from PPHCSD in 2016 and 2018, and in turn, has supplied replacement water to PPHCSD. Figure 19 shows the service areas for the two systems and their respective distribution systems and facilities.

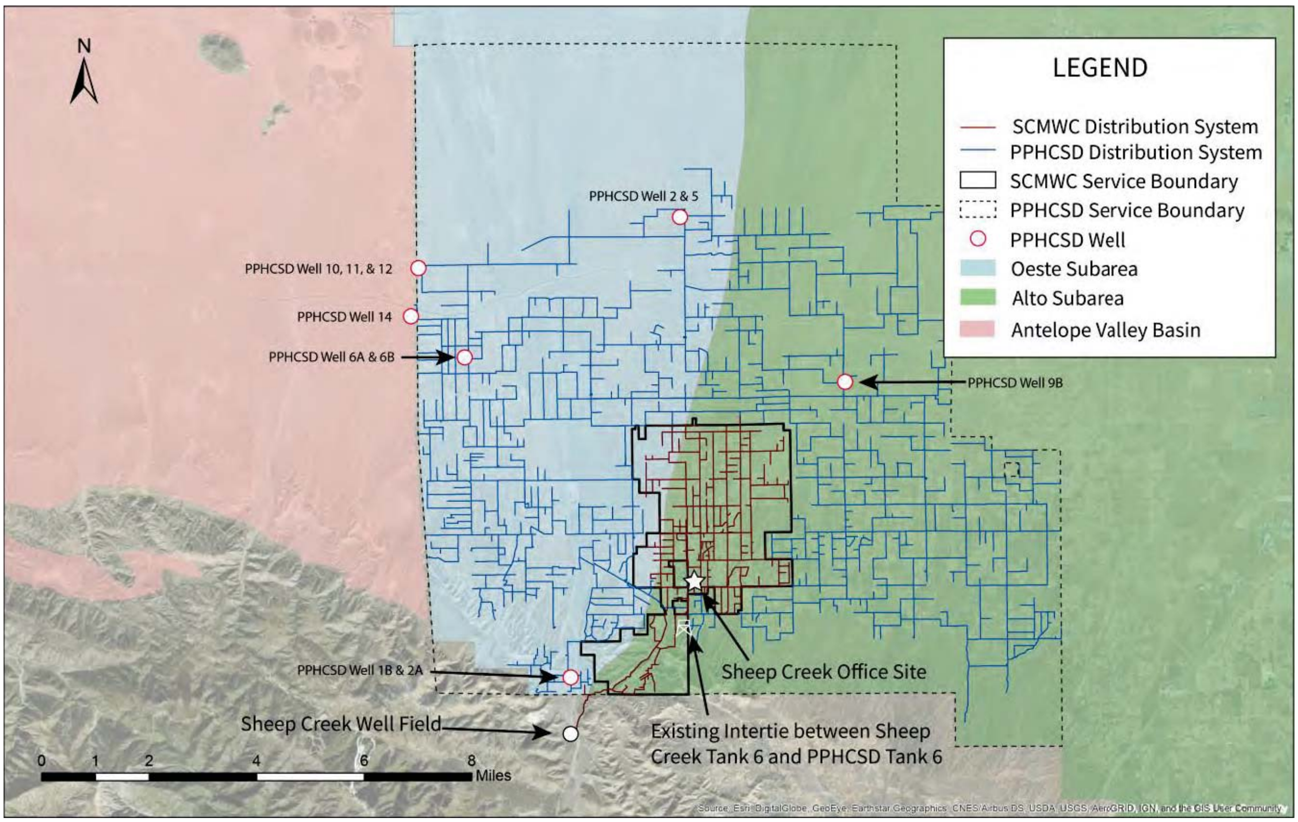

Figure 19: PPHCSD and Sheep Creek distribution systems

C.3.1 Source Capacity

PPHCSD is a stipulating party of the Mojave Water Agency, which allows it a legal right to pump water from the Mojave Basin. Although there is no limit to the amount of water that PPHCSD can pump, any water pumped in excess of its allotment must be replaced by purchasing recharge water from the State Water Project.

The PPHCSD has nine active groundwater wells located within the Oeste subarea of Mojave basin, one active well in the Alto subarea and one active in the Antelope Valley basin. It owns pumping rights to approximately 5,035 acre-foot/year (AFY) (3,122 gpm) of water from the Mojave basin and 1,200 AFY (744 gpm) from the recently adjudicated Antelope Valley basin. In addition, the PPHCSD has two-way interconnections with other neighboring water systems including Sheep Creek, which improve reliability of the system and its ability to provide safe and reliable drinking water supply in case of emergencies such as natural disasters, water shortages, fire flow, etc. Table 18 shows the details of water wells and other sources of supply for the CSD.

There are 35 storage tanks in the system with a combined total capacity of 12 MG, and 63 booster pump stations. The PPHCSD owns and maintains about 353 miles of distribution pipes and serves approximately 6,854 metered accounts. Some of the PPHCSD infrastructure is shown above in Figure 19.

Table 18: Summary of PPHCSD wells

Well ID/ Water Source	Basin Name	Capacity (gpm)	Year Built	Water Quality Issues	Operational Status
1B	Oeste	51	2004	None	Active
2A		89	1982	None	Active
2		180	1979	Hex chrome	Active
5		359	1983	None	Active
6A		289	1985	Hex chrome	Active
6B		400	1990	Hex chrome	Active
10		585	1992	Hex chrome	Active
11		224	1994	Hex chrome	Active
12		709	1998	Hex chrome	Active
9B	Alto	233	1989	None	Active
14	Antelope Valley	735	2004	Hex chrome	Active
George's well	Oeste	1,200		None	Offline
Center well		500		None	Offline
Dairy Corner		150		None	Offline
Total		**3,854**	**For all active wells**		
Emergency Interties					
Victorville WD	--	NA	--	None	As needed
Special District J	--	NA	--	None	As needed
SCWC	--	1,500	--	None	As needed
Total Production Capacity		**5,704**	**Combined for all active and inactive wells**		

C.3.2 Water Demand

The current MDD for the PPHCSD is 3.8 MGD (2,639 gpm). Combined with SCWC's MDD of 2.09 MGD (1,451 gpm), the total MDD for a combined system would be 5.89 MGD, or 4,090 gpm. Notwithstanding the water quality in certain PPHCSD wells, the combined total existing production capacity for both systems is 6.49 MGD (3,854 gpm for CSD and 650 gpm for SCWC). This does not include the 1,850 gpm of pumping capacity currently under development by PPHCSD in the Mojave basin.

Table 19 shows the projected water supply for the existing service area of PPHCSD as reported in their Urban Water Management Plan, 2015. Future infrastructure development planned in both Mojave and Antelope Valley Basins are planned to help fulfill projected demand.

Table 19: Projected water supply (reasonably available volume) for PPHCSD

Water Supply Source	2020 (AFY)	2025 (AFY)	2030 (AFY)	2035 (AFY)	2040-opt (AFY)
Mojave Basin	2,973	3,159	3,714	4,276	4,797
Antelope Valley Basin	897	1,200	1,200	1,200	1,200
Purchased or Imported Water	0	0	0	0	0
Total	**3,870**	**4,359**	**4,914**	**5,476**	**5,997**

C.3.3 Water Quality

Hexavalent Chrome has been detected in six of PPHCSD's wells in the 10 – 16 parts per billion (ppb) range. These wells together produce a flow of 3,122 gpm. The current MCL for Hexavalent Chrome in California is 50 ppb. Although a lower MCL of 10 ppb was adopted briefly in 2014, it was rescinded. It is anticipated that a new MCL will be instated by the SWRCB, although a timeline is unknown.

In 2015, PPHCSD began development of a blending project to address the high Hexavalent Chrome levels. The system acquired three new wells with no detectable chromium (Table 18) in the Oeste sub-basin through the purchase of additional water rights. A feasibility study, environmental review and preliminary design were also completed at an expense of approximately $3.7M. Blending was identified as the most cost-effective alternative for achieving compliance with the new MCL.

Currently, the blending project is suspended until a new regulatory limit for Hexavalent Chrome is established. PPHCSD has completed the necessary groundwork for achieving compliance and has the resources to implement the blending project to meet a new hexavalent chromium regulation. However, implementation of this treatment plan will be necessary following the adoption of the anticipated regulation to provide the additional source capacity required to meet the demand for SCWC service area.

C.3.4 Connection Points

The two systems currently have an intertie between SCWC's Tank 6 and PPHCSD's Tank 6A. However, transfer of water from PPHCSD to SCWC through this intertie requires water level in SCWC's tank to be lowered as this tank is located at a slightly higher elevation. This connection could continue to be used as a permanent water supply to the SCWC system provided that the two existing tanks be replaced with a larger tank, or an inline booster pump be installed to transfer from PPHCSD Tank 6A to SCWC Tank 6.

Additional potential interconnection points include:

- Snowline Joint Unified School District (SJUSD) site where both systems have parallel pipelines on either side of Sheep Creek Road. This connection would need approximately 50 feet of 8-inch pipeline to be laid across Sheep Creek Roads.
- The northeast corner of the SCWC system, along Johnson Road just north of Goss Road. PPHCSD has an existing 8-inch pipeline within 100 feet of SCWC's system. This connection would require replacing approximately 850 feet of 6-inch pipeline with 8-inch pipeline.
- At the western boundary of SCWC's system along Phelan Road. This connection would require 1,650 feet of 8-inch pipeline to replace existing 6-inch pipeline and extend to the PPHCSD 8-inch pipeline on Blue Stake Road.
- At the southwest corner of the SCWC system, near PPHCSD Well 1B and 2A. The existing pipelines of both systems are located within 100 feet of each other. An 8-inch pipeline is required to replace the existing SCWC pipeline along Manzanita Drive and Scrub Oak Drive and to extend to the PPHCSD pipeline along Scrub Oak Drive.

Figure 20 shows the proposed connection points and Table 20 presents a cost estimate for establishing these connections.

Table 20: Cost estimate for interconnecting pipelines for consolidation

Item	Qty	Unit	Unit Cost	Total Cost
Interconnecting Pipelines	4,050	ft	$110	$445,500
Booster Pump Station	400	gpm	$100	$40,000
Subtotal - Construction Cost				**$485,500**
Final Design (% of Construction Estimate	8%	LS	$38,840	$38,840
CM, Inspection, Contingency (% of Construction Cost)	20%	LS	$97,100	$97,100
Subtotal – DES, CM Cost				**$135,940**
Total Project Cost				**$621,440**

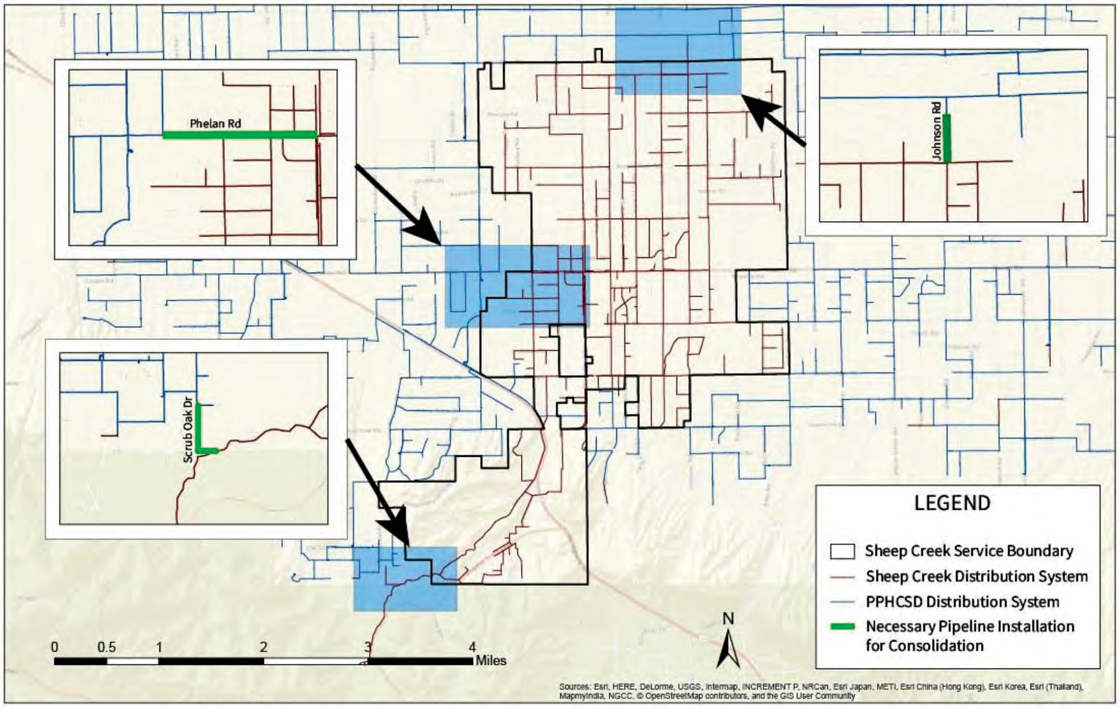

Figure 20: Connection points for consolidation

C.3.5 Infrastructure Improvements

Consolidation of PPHCSD and SCWC would require the infrastructure improvements identified in Alternative 2 to fully utilize PPHCSD's water and to ensure that the surviving water company can be resilient, dependable and safe. As discussed before, the proposed improvements can be implemented in two phases. Overall, these improvements include:

- Drilling of new wells
- Rehabilitation of existing wells
- Replacement of undersized pipelines
- Water meter replacement
- Booster pump station
- Storage tanks rehabilitation and replacement
- Installation of tank mixers
- SCADA controls

The specific issues that should be addressed and associated costs for Phases I and II are presented below in Tables 21 and 22 respectively.

Table 21: Cost estimate for infrastructure improvements for consolidation - Phase I

Item	Qty	Unit	Unit Cost	Total Cost	Section Reference
Pipelines for Interconnection	4050	ft	$110	$445,500	D.5.4
All Improvements from Alt 2 – Phase I				6,321,075	C.2.6
Subtotal - Construction Cost				**$6,766,575**	
Estimated Design, Environmental and Inspection Cost					
Final Design (% of Construction Estimate	8%	LS	$541,326	$541,326	
Geotech and Surveying	1	LS	$50,000	$50,000	
Environmental Studies[1]	1	LS	$61,181	$61,181	
Funding Application[1]	1	LS	$14,136	$14,136	
CM, Inspection, Contingency (% of Construction Cost)	20%	LS	$1,353,315	$1,353,315	
Subtotal – DES, ENV, CM Cost				**$2,019,958**	
Total Project Cost				**$8,786,533**[2]	

Notes:
[1] From work plan
[2] Cost based on November, 2018 estimates

The following improvements are recommended for Phase II.

Table 22: Cost estimate for infrastructure improvements for consolidation - Phase II

Item	Qty	Unit	Unit Cost	Total Cost	Section Reference
All Improvements from Alt 2 – Phase II				$ 3,031,000	C.2.6
Estimated Design, Environmental and Inspection Cost				$ 973,997	C.2.6
Total Project Cost				**$ 4,004,997**[1]	

[1] Cost based on November, 2018 estimates

C.3.6 Consolidation Issues

Following are some additional issues to be addressed or resolved to facilitate a consolidation of the two water systems.

a. Several points of potential interconnection have been identified and it appears the total volume of water available is sufficient for both systems. However, a detailed water model must be developed to analyze the combined system to ensure that adequate pressure, flows and storage are available, and water quality is acceptable for all areas in both systems.
b. SCWC is a privately-owned water company. Any change to the ownership structure would require the distribution of the assets owned by the shareholders to be addressed.

c. Concern has been expressed by SCWC customers regarding the potential introduction of Hexavalent Chrome into the SCWC system from water produced in the PPHCSD system. Implementation of a treatment plan to provide the additional source capacity required to meet the demand for SCWC service area is recommended prior to initiation of consolidation efforts.

C.3.7 Consolidation Recommendations

Consolidation of PPHCSD and SCWC offers the greatest opportunity to provide long-term resiliency and sustainability for both SCWC and PPHCSD customers. However, the complexity of the following issues may result in consolidation being a protracted undertaking:

- Hexavalent Chrome in various PPHCSD water sources
- Additional source capacity needs
- Infrastructure improvements necessary in the SCWC system
- Resolution of ownership of SCWC private assets

Given the severity of the water shortages that SCWC is facing, consolidation of the two systems is recommended. However, the supply, storage and operational infrastructure improvements described in Alternative 2, as well as water quality concerns described in Section C.3.3 should be addressed concurrently while pursuing consolidation.

D. SELECTED PROJECT

D. SELECTED PROJECT

Attach a Scope of Work and Project Budget for the proposed project. The Scope of Work must include an itemized list as well as a brief description of all activities.

The proposed project for SCWC is Alternative 2, which consists of series of phased improvements to the SCWC infrastructure in response to the Request for Assistance, deficiencies identified in the Needs Assessment, and to bring the system into regulatory compliance. Concurrently, consolidation with PPHCSD should be pursued in order to ensure the long-term viability and resilience of this system. Upgrades can be performed in two phases as described previously. The following is a brief overall summary of recommended improvements in both phases:

- **Restore source capacity**: New wells should be drilled to meet the demand of the system. Five potential locations were identified based on hydrogeological investigation, each of which is expected to have a yield of 250 – 300 gpm. Existing wells should also be rehabilitated to restore capacity. With these upgrades, it is expected that the system will achieve a total source capacity of 2.09 MGD, which is the MDD.
- **Improve fire flows and minimize water losses**: Undersized pipelines should be replaced in order to improve fire flows throughout the service area. Aging water meters also need to be replaced to enable accurate water audits and minimize the amount of unaccounted for water. AMR water meters are recommended to save operators time in manual reading.
- **Increase supply pressure**: A new booster pump station should be provided at the office site to boost service pressure in certain parts of the distribution system.
- **Rehabilitate storage tanks**: All storage tanks need to be rehabilitated as discussed in the inspection report. Tanks will need to be removed from service sequentially for the repair work to be performed. Additionally, tanks 2 and 4 should be demolished and replaced with a new 1.5 MG welded tank. Mixers should be provided in all tanks to maintain uniform water age and chlorine residual, and thus avoid bacteriological growth.
- **Provide central control system**: A SCADA system would be provided to enable remote control and monitoring of equipment, data acquisition. This will improve the overall performance and efficiency of the system.

Scope of Work and Project Budget:

The total project capital and O&M cost is presented below for both phases as discussed above in

Section C for all recommended upgrades.

1. The total project cost is $ 8,216,293 for Phase I and $ 4,004,997 for Phase II. Total project cost is $ 12,221,290. For consolidation, an additional budget of $621,440 would be needed to provide connections between the two systems (based on November, 2018 estimates).
2. The eligible project cost is $ 12,221,290.
3. The annual increase in operations/maintenance cost is $ 112,131.

A phased approach is recommended to perform the above-mentioned water system improvements. This will ease the burden of implementing all changes at the same time. The Scope of Work for both phases is presented below.

Scope of Work – Phase I
Task 1 Project Management 1. Organize and attend project kickoff meeting, site visits to collect data on existing system(s) 2. Monitor and track budget and schedule 3. Coordinate sub-consultant activities 4. Prepare monthly progress reports and invoices 5. Quality assurance/quality control
Task 2 Drill New Supply Wells 1. Well Siting Study a. Using sites proposed in this report, collect site-specific data to determine suitability of locations and determine best techniques for well drilling b. Contract with a well driller to drill pilot test borings and perform necessary testing. c. Pilot test three identified sites; conduct geologic logging of the borings, conduct geophysical 3-logging. A caliper log and a deviation log should also be conducted. Zone testing of at least two zones should be conducted. d. Prepare Summary Report 2. Design a. Prepare bid documents for the production well design including installation of new pumps and associated pipe work, control and monitoring facilities including groundwater depth monitoring, all required pump and motor controls and flow meter for a complete system b. Obtain all necessary permits, including CEQA
Task 3 Pipeline and Water Meter Replacement 1. Design a. Confirm location and size of pipelines to be replaced based on hydraulic model b. Obtain and review all record drawings for sections where replacements will be performed, including location of water meters. c. Perform a topographic survey of project area. Prepare plan and profile sheet. d. Perform geotechnical investigation of pipeline routing. Obtain all necessary permits and right-of-way easements, including CEQA

e. Prepare bid documents f. Determine types of meters with remote reading capabilities to be installed to replace existing meters including meter reading software
Task 4 New Booster Pump Station 1. Design a. Determine flow and head for booster pumps based on hydraulic model b. Determine operating criteria and control strategy c. Pump selection d. Perform a topographic survey of project area. Prepare plan and profile sheet. e. Perform geotechnical investigation of pipeline routing, if needed. Obtain all necessary permits and right-of-way easements, including CEQA f. Prepare bid documents
Task 5 Storage Tank Rehabilitation and Mixer Installation 1. Prepare bid documents (bid solicitation, construction plans and specifications) and cost estimate 2. Installation of mixers inside all tanks with suitable control and monitoring equipment
Scope of Work – Phase II
Task 1 Project Management 1. Organize and attend project kickoff meeting and site visits to collect data on existing system(s) 2. Monitor and track budget and schedule 3. Coordinate sub-consultant activities 4. Prepare monthly progress reports and invoices 5. Quality assurance/quality control
Task 2 Well Rehabilitation 1. Prepare bid documents and cost estimate for rehabilitation of all five wells
Task 3 Pipeline Replacement 1. Design a. Confirm location and size of pipelines to be replaced based on hydraulic model b. Obtain and review all record drawings for sections where replacements will be performed, including location of water meters. c. Perform a topographic survey of project area. Prepare plan and profile sheet. d. Perform geotechnical investigation of pipeline routing. Obtain all necessary permits and. right-of-way easements, including CEQA **e.** Prepare bid documents
Task 4 Design New Water Storage Tank 1. Design a. Geotechnical investigation and report for tank foundation design criteria b. Topographic Survey of tank site c. Prepare bid documents and cost estimate for: a. Demolition of existing tanks b. Foundation for new tank c. New water storage tank and interconnecting piping d. Power to tank site for instrumentation and security lighting e. New tank level monitoring system f. Installation of cathodic protection system

PROJECT BUDGET SHEET

Sheep Creek Water Company

Project No. [5207-A]

Phase I: The following upgrades are proposed for Phase I.

- Three new wells to provide additional source capacity
- Pipeline upgrades to improve fire flow
- System wide water service meter replacement
- Booster pumps to maintain pressure in Nielsen Tract zone
- Maintenance and improvements to existing tanks

Detailed cost estimate for Phase I of the work is presented below.

Phase I proposed upgrades and associated cost

Item	Qty	Unit	Unit Cost	Total Cost	Section Reference
New Supply Wells - Preliminary Review through Pilot Borings	1	LS	$600,000	$600,000	C.2.1.2
Final Well Design and Construction	3	LS	$703,000	$2,109,000	C.2.1.2
Pipelines to connect new wells	10,400	ft	$100	$1,040,000	C.2.1.2
New & Replacement Pipelines - Phase I	12,500	ft	$100	$1,250,000	C.2.2
Tank Improvements	1	LS	$904,780	$904,780	C.2.4
Booster Pump Station	400	gpm	100	$40,000	C.2.3
Replace all meters (1305)	1	LS	$377,295	$377,295	C.2.2
Subtotal - Construction Cost Estimate				**$6,321,075**[1]	
Estimated Design, Environmental and Inspection Cost					
Final Design (% of Construction Estimate)	8%	LS	$505,686	$505,686	
Geotech and Surveying	1	LS	$50,000	$50,000	
Environmental Studies	1	LS	$61,181	$61,181	
Funding Application	1	LS	$14,136	$14,136	
CM, Inspection, Contingency (% of Construction Cost)	20%	LS	$1,264,215	$1,264,215	
Subtotal - Miscellaneous Cost				**$1,895,218**[1]	
Total Project Cost				**$8,216,293**[1]	

[1] Cost based on November, 2018 estimates

Phase II:. The following improvements are recommended for Phase II of the project:

- Rehabilitation of existing wells to maintain source capacity
- Replacement of undersized and aged-out pipes in the distribution system
- Tank Replacements – Tanks 2 and 4
- New SCADA system

Associated costs are presented below.

Phase II proposed upgrades and associated cost					
Item	**Qty**	**Unit**	**Unit Cost**	**Total Cost**	**Section Reference**
Rehab Well 2a, 3a,4a, 5 and 8	5	LS	Varies	$320,000	C.2.1.1
New & Replacement Pipelines - Phase II	12,500	ft	$100	$1,250,000	C.2.2
Tank Replacements – Tanks 2 and 4	2	Each	525,000	$1,050,000	C.2.4.1
Tank Mixers	7	LS	315,000	$315,000	C.2.4.2
SCADA Improvements	1	LS	$96,000	$96,000	C.2.5
Subtotal - Construction Cost Estimate				**$3,031,000**	
Estimated Design, Environmental and Inspection Cost					
Final Design (% of Construction Estimate)	8%	LS	$242,480	$242,480	
Geotech and Surveying	1	LS	$50,000	$50,000	
Environmental Studies	1	LS	$61,181	$61,181	
Funding Application	1	LS	$14,136	$14,136	
CM, Inspection, Contingency (% of Construction Cost)	20%	LS	$606,200	$606,200	
Subtotal – DES, ENV, CM Cost				**$973,997**	
Total Project Cost				**$4,004,997**[1]	
[1] Cost based on November, 2018 estimates					

E. PROPOSED SCHEDULE

PROJECT SCHEDULE
FOR PROPOSED PROJECT
Project No. [5207-A]

The proposed schedule will follow be an amendment to the Proposition 1 Technical Assistance Work Plan No. 5207-B. The amended delivery dates have been extended to be in alignment with the Feasibility Study required by the SWRCB DDW as part of a citation for water supply deficiencies.

- Environmental Compliance is the next step with a current proposed completion date of January 31, 2019. This date may be extended depending on the results of the Feasibility Study and possible consolidation.
- The DWSRF Construction Application will follow with a proposed with a current completion date of March 28, 2019. The Application will include information from the Environmental Compliance document and so the delivery date may also need to be extended.
- The last task included in the work plan is Post-Application Support and has a proposed completion date of June 30, 2019, but may be extended based on the same reasons as Environmental Compliance and Construction Application.

F. ATTACHMENTS TO TECHNICAL REPORT

Please attach the following documents to be included with this SDWSRF Applicant Engineering Report. Make sure your water system's name and number are on every additional attachment.

	Attached Information - Appendices
☐	Well 11 E-log, Well Permit and Source Assessment
☐	SWRCB Compliance Order
☐	Final Report for Well Investigation – Well 3A
☐	Final Report for Well Investigation – Well 4A
☐	Leak Detection Report
☐	Tank Inspection Report
☐	Hydrogeological Investigation of Swarthout Canyon
☐	Vendor Quote for New Tank Mixers
☐	Vendor Quote for New Water Meters
☐	Vendor Quote for New SCADA System
☐	PPHCSD – Consumer Confidence Report – 2017

Appendix A – Well 11 E-log, Well Permit and Source Water Assessment

PACIFIC SURVEYS

ELECTRIC LOG
GAMMA-RAY

Job No. 24077	Company	LAYNE
	Well	SHEEP CREEK WATER WELL 11
	Field	PHELAN
File No.	County	SAN BERNARDINO State CA

Location:
SOUTH SIDE OF WALNUT RD
NW OF MONTE VISTA RD AND SMOKE TREE RD
GPS: 34.4423 -117.5608
Sec. Twp. Rge.

Other Services:
CWA
WATER QUALITY

Permanent Datum	T.O.C.	Elevation	Elevation
Log Measured From	G.L. 0'	above perm. datum	K.B.
Drilling Measured From	G.L.		D.F.
			G.L.

Date	4/17/2018		
Run Number	ONE		
Depth Driller	1520'		
Depth Logger	1519'		
Bottom Logged Interval	1519'		
Top Log Interval	20'		
Casing Driller	30" TO 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	BENTONITE		
Density / Viscosity	9.1 / 33		
pH / Fluid Loss	9 / 9		
Source of Sample	CONDUCTOR		
Rm @ Meas. Temp	6.54 @ 60.8°F		
Rmf @ Meas. Temp	6.32 @ 60.8°F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURE		
Rm @ BHT	N/A		
Time Circulation Stopped	14:00		
Time Logger on Bottom	18:50		
Max. Recorded Temperature	N/A		
Equipment Number	PS-1		
Location	LA		
Recorded By	HOFFMAN		
Witnessed By	CAMARENA		

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Comments

Calibration Report

Database File	24077.db
Dataset Pathname	ELOG
Dataset Creation	Tue Apr 17 18:55:30 2018

ELOG Calibration Report

Serial:	ELOG-1
Model:	DTQ
Shop Calibration Performed:	Wed Jan 10 15:03:40 2018
Before Survey Verification Performed:	Wed Jan 10 15:11:46 2018
After Survey Verification Performed:	Wed Jan 10 15:12:17 2018

Shop Calibration

	Readings Zero	Readings Cal		References Zero	References Cal		Results Gain	Results Offset
Short	0.848	51.473		0.500	50.000	Ohm-m	0.978	-0.329
Long	3.217	205.082		2.000	200.000	Ohm-m	0.981	-1.156
IEE	21.320	5750.280	counts	0.023	6.293	A		
VSN	98.980	6539.640	counts	1.888	124.736	V		
VLN	110.720	1659.200	counts	2.112	31.647	V		

Before Survey Verification

	Readings Zero	Readings Cal		References Zero	References Cal		Results Gain	Results Offset
Short	0.000	101.390		413.223	101.225	Ohm-m	-3.077	413.223
Long	0.000	101.409		1848.940	102.729	Ohm-m	-17.220	1848.940
IEE	0.000	5596.300	counts	0.000	6.125	A		
VSN	47.700	6374.860	counts	0.910	121.593	V		
VLN	97.400	1594.020	counts	1.858	30.404	V		

After Survey Verification

	Readings Zero	Readings Cal		References Zero	References Cal		Results Gain	Results Offset
Short	0.000	101.389		0.000	101.390	Ohm-m	1.000	0.000
Long	0.000	101.424		0.000	101.409	Ohm-m	1.000	0.000
IEE	0.000	5631.180	counts	0.000	6.163	A		
VSN	47.660	6414.560	counts	0.909	122.350	V		
VLN	102.800	1604.200	counts	1.961	30.598	V		

After Survey Verification compared to Before Survey Calibration

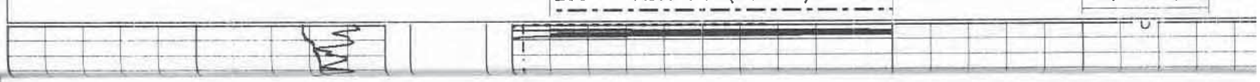
	Zero Before	Zero After		Cal Before	Cal After	
Short	413.223	0.000	Ohm-m	101.225	101.390	Ohm-m
Long	1848.940	0.000	Ohm-m	102.729	101.409	Ohm-m

Gamma Ray Calibration Report

Serial Number:	D4	
Tool Model:	ELOG	
Performed:	Sat Jan 27 14:45:53 2018	
Calibrator Value:	162.0	GAPI
Background Reading:	101.7	cps
Calibrator Reading:	326.7	cps
Sensitivity:	0.7200	GAPI/cps

Database File	24077.db
Dataset Pathname	ELOG
Presentation Format	elog_cwa
Dataset Creation	Tue Apr 17 18:55:30 2018
Charted by	Depth in Feet scaled 1:240

Track 1			Track 2			Track 3	
-160	SP (mV)	40	0	RSN (Ohm-m)	200	0 SPR (Ohm-m)	10
70	Gamma-Ray (GAPI)	170	0	RLN (Ohm-m)	200	Cwa	
			0	RMF (Ohm-m)	200	5000 (uS/cm)	
			200	RSN X 10 (Ohm-m)	2000	Cwa	
			200	RLN X 10 (Ohm-m)	2000	(uS/cm)	



0	RMF (Ohm-m)	200	5000 (uS/cm)
200	RSN X 10 (Ohm-m)	2000	Cwa
200	RLN X 10 (Ohm-m)	2000	(uS/cm)

Log Variables

DatabaseC:\ProgramData\Warrior\Data\24077.db
Dataset field/well/run1/ELOG/_vars_

Top - Bottom

BOREID in	BOTTEMP degF	CASEOD in	CASETHCK in	PERFS	RM_MEAS_R Ohm-m	RM_MEAS_T degF	RMF Ohm-m
17.5	82.07	0	0	0	6.54	60.8	6.32

RSH Ohm-m	SPSHIFT mV	SRFTEMP degF	TDEPTH ft	TempGrad DegF/ft
20	0	63 3	1520	0.01235

Variable Description

BOREID : Borehole I D
BOTTEMP : Bottom Hole Temperature
CASEOD : Casing O.D.
CASETHCK : Casing Thickness
PERFS : Perforation Flag
RM_MEAS_R : Mud Resistivity Measured
RM_MEAS_T : Mud Temperature Measured
RMF : Resistivity of Mud Filtrate
RSH : Resistivity of Shale
SPSHIFT : S.P. Baseline Offset
SRFTEMP : Surface Temperature
TDEPTH : Total Depth
TempGrad : Temperature Gradient

Pacific Surveys

a full service geophysical well logging company

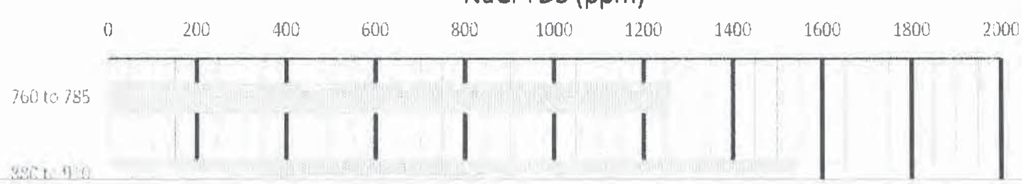
Water Quality Analysis

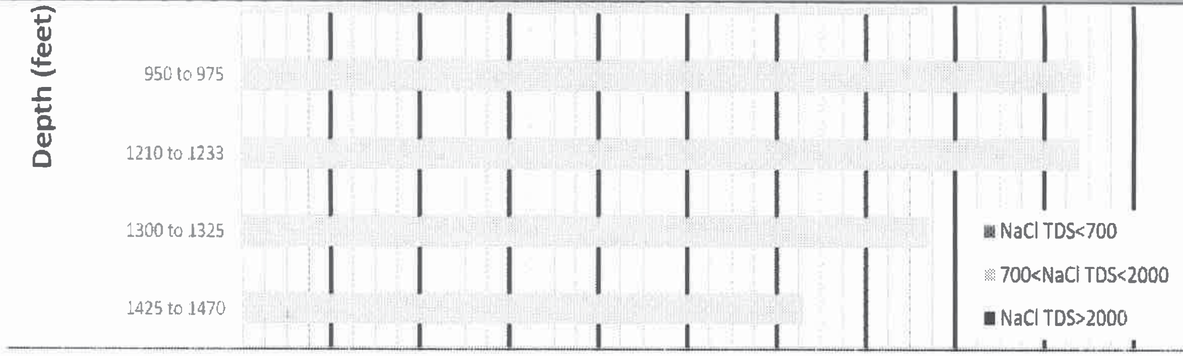
Company: Layne
Well: Sheep Creek Water Well 11
Field: Phelan
State: CA
Date: 17-Apr-18
Run: One
Job Ticket: 24077
Total Depth: 1,519 ft

Rmf @ Temp: 6.32 **Temp:** 60.8
Corrected Rmf @ 75 degree F: 5.2
Rm @ Temp: 6.54

Depth	S.P. mV	Rwe ohm-m	Rw *NaCl* ohm-m	Rw *NaHCO3* ohm-m	EC umhos *NaCl*	EC umhos *NaHCO3*	T.D.S *ppm* NaCl	T.D.S *ppm* NaHCO3	Remarks
760 ft to 785 ft	-10.00	3.8	4.2	4.9	2378.3	2021.5	1260.5	2021.5	Class II
880 ft to 910 ft	-15.00	3.20	3.44	4.05	2904.27	2468.63	1539.26	2468.63	Class II
950 ft to 975 ft	-20.00	2.72	2.82	3.32	3546.59	3014.60	1879.69	3014.60	Class II
1,210 ft to 1,233 ft	-20.00	2.72	2.82	3.32	3546.59	3014.60	1879.69	3014.60	Class II
1,300 ft to 1,325 ft	-15.00	3.20	3.44	4.05	2904.27	2468.63	1539.26	2468.63	Class II
1,425 ft to 1,470 ft	-10.00	3.77	4.20	4.95	2378.27	2021.53	1260.48	2021.53	Class II

NaCl TDS (ppm)





Class I : Less than *700* ppm (mg/l) Excellent to Good Quality
Class II : *700* to *2000* ppm (mg/l) Good to Injurious Quality
Class III: More than *2000* ppm (mg/l) Injurious to Unsatisfactory

This interpretation represents our best judgement based on given values. Since all interpretations are opinions based solely on interference from electrical and other measurements, we can not and do not guarantee the accurancy or correctness of this interpretation and shall not be liable for any cost, damages or expenses that may be incurred from this or any other interpretation.

800.919.7555
909.625.6262

1785 West Arrow Route
Bldg D Suite 3 and 4
Upland, CA 91786

fax: 909.399.3018

State of California

Well Completion Report

Form DWR 188 Submitted 8/22/2018

WCR2018-007054

Owner's Well Number: 11 | Date Work Began: 05/03/2018 | Date Work Ended: 06/30/2018

Local Permit Agency: San Bernardino County DPH - Environmental Health Services Safe Drinking Water Permit Section

Secondary Permit Agency: | Permit Number: WP0033728 | Permit Date: 02/21/2018

Well Owner (must remain confidential pursuant to Water Code 13752)

Name: CLARENCE CARTER

Mailing Address: PO BOX 291820

City: PHELAN | State: CA | Zip: 92371

Planned Use and Activity

Activity: New Well

Planned Use: Water Supply Public

Well Location

Address: 4406 WALNUT RD

City: PHELAN | Zip: 92371 | County: San Bernardino

Latitude: ____ Deg. ____ Min. ____ Sec. N | Longitude: ____ Deg. ____ Min. ____ Sec. W

Dec. Lat.: 34.4425150 | Dec. Long.: -117.5615290

Vertical Datum: | Horizontal Datum: WGS84

Location Accuracy: | Location Determination Method:

APN: 3069321180000

Township: 04 N

Range: 07 W

Section: 12

Baseline Meridian: San Bernardino

Ground Surface Elevation:

Elevation Accuracy:

Elevation Determination Method:

Borehole Information

Orientation: Vertical | Specify:

Drilling Method: Reverse Circulation | Drilling Fluid: Bentonite

Total Depth of Boring: 1500 Feet

Total Depth of Completed Well: 1480 Feet

Water Level and Yield of Completed Well

Depth to first water: 936 (Feet below surface)

Depth to Static Water Level: 936 (Feet) | Date Measured: 07/16/2018

Estimated Yield*: 251 (GPM) | Test Type: Pump

Test Length: 7.5 (Hours) | Total Drawdown: [illegible] (feet)

*May not be representative of a well's long term yield.

Geologic Log - Free Form

Depth from Surface Feet to Feet		Description
0	130	SAND, GRAVEL
130	140	SAND, GRAVEL, CLAY
140	150	CLAY, SAND, GRAVEL
150	180	SAND, GRAVEL, CLAY, ROCK
180	240	SAND, GRAVEL
240	260	GRAVEL
260	290	GRAVEL, SAND
290	310	SAND, GRAVEL
310	320	SAND, GRAVEL, CLAY
320	330	GRAVEL, SAND
330	350	SAND, GRAVEL, CLAY
350	370	SAND, GRAVEL
370	420	CLAY, GRAVEL, SAND
420	450	GRAVEL, SAND, CLAY
450	460	GRAVEL, SAND, CLAY, ROCKS

460	480	CLAY, SAND, GRAVEL
480	490	CLAY, SAND
490	510	CLAY
510	530	CLAY, SAND, GRAVEL
530	540	CLAY, SAND
540	550	SAND, ROCK
550	560	SAND, GRAVEL
560	570	SAND
570	600	SAND, GRAVEL, CLAY
600	610	CLAY, SAND, GRAVEL
610	620	CLAY, SAND
620	630	SAND, CLAY, GRAVEL
630	670	CLAY, SAND
670	680	CLAY, SAND, GRAVEL
680	690	GRAVEL, CLAY
690	700	GRAVEL, CLAY, SAND
700	720	SAND, CLAY
720	740	SAND, GRAVEL, CLAY
740	750	CLAY, GRAVEL
750	760	CLAY, SAND
760	770	CLAY, SAND, GRAVEL
770	790	SAND, GRAVEL
790	800	CLAY, SAND
800	810	CLAY
810	820	CLAY, GRAVEL
820	870	CLAY
870	890	CLAY, SAND
890	900	SAND
900	920	CLAY
920	940	CLAY, SAND
940	1000	CLAY
1000	1010	CLAY, SAND
1010	1020	CLAY
1020	1030	CLAY, SAND
1030	1040	CLAY
1040	1050	CLAY, SAND
1050	1080	CLAY
1080	1090	CLAY, GRAVEL
1090	1110	CLAY
1110	1150	CLAY, SAND
1150	1160	CLAY, GRAVEL
1160	1170	SAND, GRAVEL
1170	1180	SAND, GRAVEL, CLAY
1180	1190	CLAY, GRAVEL
1190	1230	CLAY, SAND
1230	1240	CLAY, SAND, GRAVEL
1240	1280	CLAY
1280	1310	CLAY, SAND

1310	1320	CLAY
1320	1330	CLAY, SAND
1330	1340	SAND, CLAY
1340	1350	CLAY, SAND
1350	1370	CLAY
1370	1380	SAND, CLAY
1380	1390	SAND, GRAVEL, CLAY
1390	1400	CLAY, ROCK, GRAVEL
1400	1430	CLAY, SAND
1430	1440	SAND, GRAVEL, CLAY
1440	1460	SAND, GRAVEL
1460	1470	SAND, CLAY
1470	1490	CLAY, SAND
1490	1500	CLAY

Casings

Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	50	Conductor or Fill Pipe	Low Carbon Steel	Grade: ASTM A53	0.375	30			
1	50	860	Blank	Low Carbon Steel	Grade: ASTM A53	0.312	16			
1	860	870	Other: 16X14 REDUCER	Low Carbon Steel	Grade: ASTM A53	0.312	16			REDUCER
1	870	1020	Screen	Stainless Steel	Grade: ASTM A53	0.312	14	Louver	0.06	
1	1020	1080	Blank	Low Carbon Steel	Grade: ASTM A53	0.312	14			
1	1080	1340	Screen	Low Carbon Steel	Grade: ASTM A53	0.312	14	Louver	0.06	
1	1340	1380	Blank	Low Carbon Steel	Grade: ASTM A53	0.312	14			
1	1380	1460	Screen	Low Carbon Steel	Grade: ASTM A53	0.312	14	Louver	0.06	
1	1460	1480	Blank	Low Carbon Steel	Grade: ASTM A53	0.312	14			

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	100	Cement	10.3 Sack Mix		
100	1500	Filter Pack	Other Gravel Pack		NSWG

Other Observations:

Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	50	48
50	870	26
870	1500	24

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name LAYNE CHRISTENSEN COMPANY
Person, Firm or Corporation

1717 WEST PARK AVENUE	REDLANDS	CA	92673
Address	City	State	Zip

Signed *electronic signature received* 08/22/2018 510011
C-57 Licensed Water Well Contractor | Date Signed | C-57 License Number

Attachments

Sheep Creek - Approved Well Design 4-20-18 .pdf - Well Construction Diagram

24300 cal-view-revised.pdf - Geologic Log

Map - new well Sheep Creek Water Company.pdf - Location Map

Approved Permit 2018030350.pdf - Permit

SHEEPCREEK #11.pdf - Water Quality Analysis

DWR Use Only

CSG #	State Well Number	Site Code	Local Well Number

			N

Latitude Deg/Min/Sec

			W

Longitude Deg/Min/Sec

TRS:

APN:

Presite Done on 2/28/18
ap

www.SBCounty.gov
www.sbcounty.gov/dph/dehs
Phone: (800) 442-2283

SAN BERNARDINO COUNTY

Public Health
Environmental Health Services

APPLICATION FOR WELL PERMIT

THIS SECTION TO BE COMPLETED BY APPLICANT • HEALTH PERMITS ARE NOT TRANSFERABLE

1 – PROPERTY INFORMATION

Property Owner: Clarence Carter			Phone Number: (760) 559-7956
Site Address: Cross Streets Monte Vista Rd and Smoketree Rd	City: Phelan	State: CA	Zip: 92371
Assessor's Parcel Number: 3069-321-18-0000	Email: sheepcreek@verizon.net		
Township — N/S Tier: 4N	E/W Range: 7W	Section: 12	
Well Head — Latitude (decimal): 34.442515	Longitude (decimal): -117.561529		
Property Owner's Mailing Address: PO Box 291820	City: Phelan	State: CA	Zip: 92329

2 – CONSULTANT INFORMATION

Name of Consultant:	Email:		Phone Number:
Address:	City:	State:	Zip:

3 – REGISTERED WELL DRILLER INFORMATION

Name of Driller: Layne Christensen Company		Phone Number: 909-390-2833
Email: duane.trammell@layne.com	PR0035435	C-57 License Number: 510011
Return well permit to ☒ Well Driller ☐ Consultant ☐ Property Owner		Return by ☐ Mail ☒ Email

4 – TYPE OF WORK

☒ New ☐ Reconstruction ☐ Destruction

Date of Work — Start Date: 3-12-2018 — Completion Date: 7-31-2018

5 – WELL TYPE

☐ Agriculture ☐ Geothermal ☐ Industrial
☐ Cathodic ☐ Horizontal ☐ Monitoring/Observation
☒ Community/PWS/City – **Specify Use Below** ☐ Residential – cannot be used as a community well ☐ Test
Use: Public ☐ Other

6 – ANNULAR SEAL

Seal Depth (ft.) 50ft

☒ Driven Conductor Diameter (in.) 30" ☒ Wall (gauge) (in.) .375

☒ Sealing Material Cement ☒ Thickness (in.) 6"

Sealing material shall be placed in one continuous pour. Annular seal thickness must be at least 3 inches for public water supply wells.

ITEMS 7 THROUGH 10 TO BE ESTIMATED FOR NEW WELLS, EXACT FOR ALL OTHER WELLS

7 – DIMENSIONS

Proposed Depth of Well (ft.)	Existing Depth of Well (ft.)	Diameter of Bore (in.)
1,500'		42 / 26" / 1

8 – CASING INSTALLED

☒ Steel ☐ Plastic ☐ Standard Casing ☐ Other ☐ No Casing

From (ft.)	To (ft.)	Diameter (in.)	Wall (Gauge)
Surface	50 / 900'	30 / 16"	.375
900'	1500'	16"	.312

Gravel Pack ☒ Yes ☐ No From (ft.) 100' To (ft.) 1,520'

Specify Other Backfill Material — From (ft.) — To (ft.)

 Rev. 11/6/15

To be determined after elog and zone sample

9 – PERFORATIONS (list all if applicable)

From (ft.) 900'	To (ft.) 1,500'	Well Screen Size .060	Pumping Rate (gpm) Est. 400 GPM

10 – SEALED ZONES (list all if applicable)

From (ft.) TBD after e-log	To (ft.)

11 – PLOT PLAN

a) In perspective to the well site, sketch and label the following items <u>on a separate paper</u>: well lot property lines, other wells (include abandoned wells), sewage disposal systems (sewers, septic tanks, leaching fields, seepage pits, cesspools), lakes and ponds, watercourses and animals or fowl kept.

b) Indicate the distance, in feet, of any of the above which are within 500 ft. of the well site. The plot plan needs to be drawn to scale (½ inch = 100 feet). Show the approximate drainage pattern of the property and show access roads to the well site within 500 feet.

c) ☐ None of the above is within 500 feet.

d) Solid or Liquid Disposal Site within Two Miles ☐ Yes ☒ No Location

12 – METHOD OF CONSTRUCTION OR DESTRUCTION

Provide the method of construction/destruction in the space below or as an attachment if more space is needed. The method shall be in accordance with the standards recommended in the California Department of Water Resources Bulletin No. 74-81 and 74-90. Title 22 standards shall also be followed for public water supply wells. See Attached.

I will submit water well drillers report to Environmental Health Services within 30 days of completion, and will construct or destroy well/borings in accordance with the permit application and Water Well Standards Bulletin 74-81 & 74-90.

13 – AGREEMENT AND SIGNATURE

I have read this application and agree to comply with all laws regulating the type of work being performed

Property Owner's Signature: X C. Carter — Date: February 16, 2018

Print Property Owner's Name: Clarence Carter

C-57 Contractor's Signature: [signature] — Date: February 20, 2018

Print Contractor's Name: Todd Howard

For Office Use Only DISPOSITION OF PERMIT For Office Use Only DISPOSITION OF PERMIT

☐ Sent to Water Agency — Permit Number: 209030350

☐ Water Agency conditions or recommendations attached — Expiration Date: 09/15/18

☐ Denied — WP Number: WP0033428

☒ Approved subject to the following:

A. ☒ Notify the Division's Safe Drinking Water Program at (800) 442-2283 at least seventy two (72) hours in advance to make an inspection of the following operations: (Inspections are conducted Monday – Friday between 8:00 AM to 5:00 PM). Failure to cancel or reschedule appointments may result in an additional hourly fee.

- ☒ Prior to sealing of the annular space or filling of the conductor casing.
- ☒ After installation of the surface protective slab and pumping equipment.
- ☒ After installation of the surface features.
- ☐ During destruction of wells, prior to pouring the sealing material.

PERMIT APPROVED ON CONDITION THAT IT MEETS ALL SETBACK REQUIREMENTS, PER CALIFORNIA STANDARDS.

B. ☒ Submit to the Division, within thirty (30) days after completion of work, a copy of:

☒ Water Well Driller's Report ☒ Bacterial Analysis ☒ Inorganic Chemical Analysis ☒ General Physical
☒ Radiological Analysis ☒ Nitrate as Nitrogen ☒ Organic Chemical Analysis ☒ General Mineral

Comments: Please see attached list of conditions for community grade wells.

For Office Use Only For Office Use Only For Office Use Only For Office Use Only For Office Use Only

Fee: 431.00	FA Number:	Record ID: 82101	PE Number: 0553
Late Fee: ☐ Y ☐ N	Designated Employee: [signature]	Received By: [signature]	Date: 2-21-18
Check One: ☐ New ☐ Transfer ☐ Reactivate		Changes (please specify):	

Online LR. Approval# 000384

Approved with the following conditions:

1. Wellhead must terminate 18 inches above the finished base + 6" concrete base

2. Screened and inverted casing vent

3. Screened and inverted air release vacuum breaker vent

4. Install sounding tube and gravel fill tube if necessary

5. Pump to waste discharge line

6. A non-threaded down-turned sampling tap located on the discharge line between the wellhead and the check valve

7. Totalizer Flowmeter

8. 6' x 6' slab 6 inch thick, slopes away from the casing (extends at least 3' from the edge of the casing)

10. Submit Well Completion report and Title 22 water quality samples

Sheep Creek Water

Sheep Creek Water has put out to bid and contracted the drilling and construction of a new Water Well.

The location is approximately 523' North of Smoke Tree Rd, and approximately 630' West of Monte Vista Rd.

The well is 200+ feet away from nearest Sewer Lateral, Septic Pit or Sewer main line.

Method of Construction:

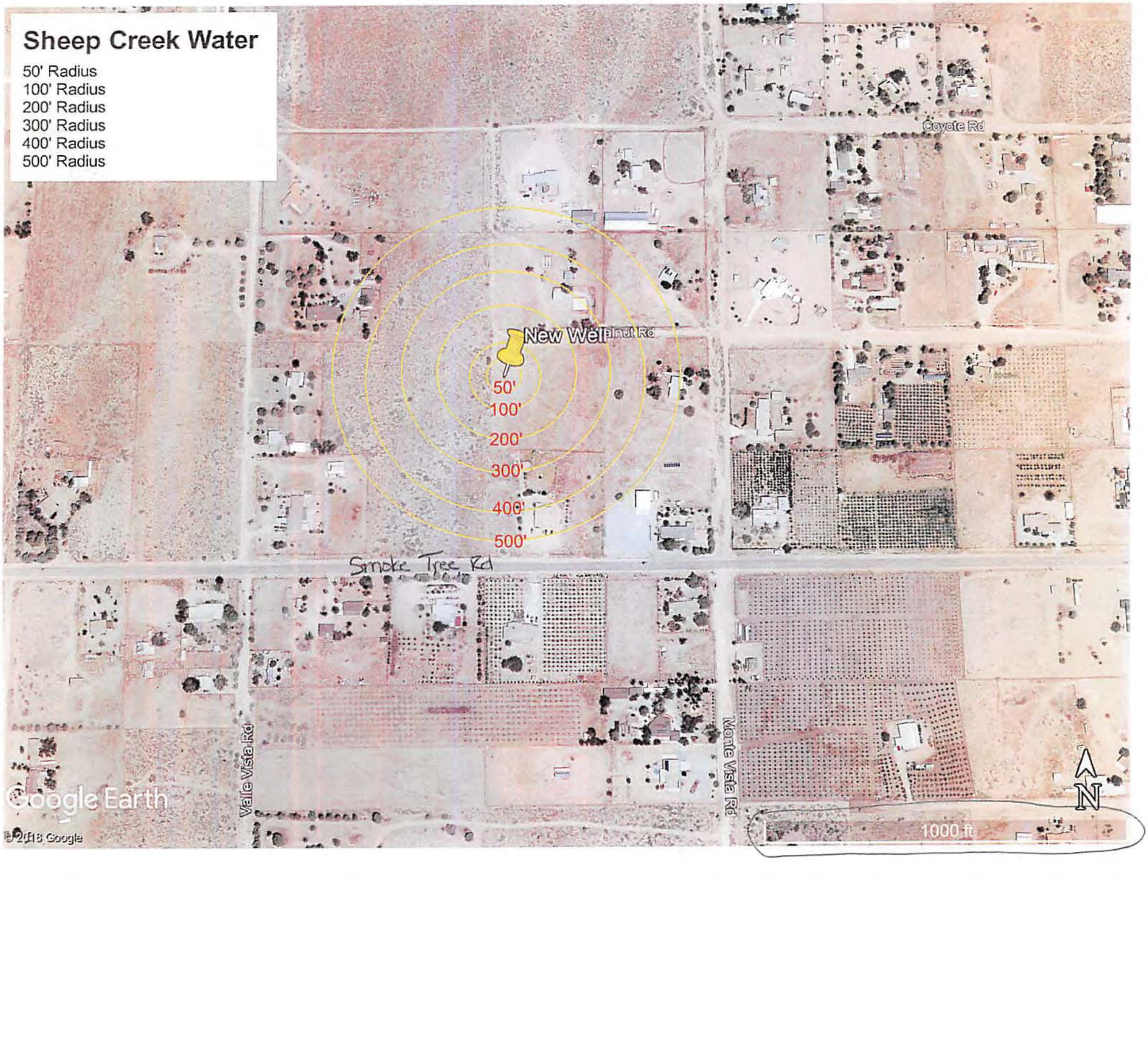
1. With a Bucket Rig, drill a 42" diameter borehole and install a 30" low carbon steel .375" wall thickness set in borehole at 50' bgs, and fill the annular space between the borehole wall and the steel conductor casing with 10.3 sack sand-cement slurry up to finish surface.
2. Bring in Larger Drill Rig and support equipment and drill a 17.5" pilot borehole to 1,520' bgs.
3. Perform a Geophysical Survey
4. Wait for a Well Design
5. Ream out pilot borehole to 26" down to 1,520' bgs.
6. Perform Caliper Survey.
7. Install 16" Low Carbon Steel Blank and 16" LCS Mill Slot casing to the final well design depths.
8. Install Gravel packing around the screen from 100' bgs to 1,520' bgs.
9. Install 10.3 sack, sand-cement slurry Annular Seal from 100' bgs to surface.
10. The well will be mechanically developed by means of swabbing & air lifting.

We would like to get a well permit to begin this work.

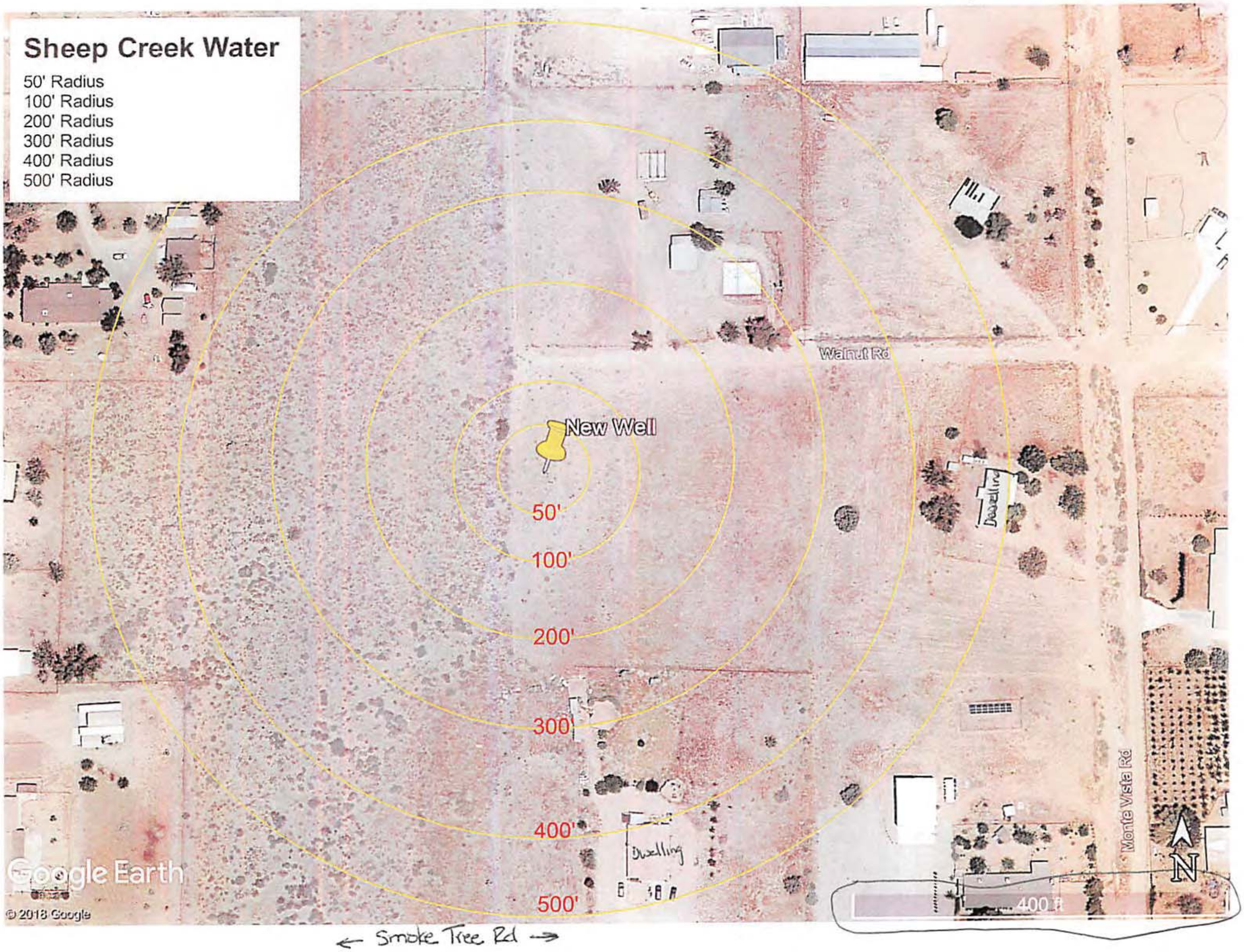
Thanks

Layne Christensen

Well Driller – License #510011



Sheep Creek Water
50' Radius
100' Radius
200' Radius
300' Radius
400' Radius
500' Radius
Coyote Rd
New Well
50'
100'
200'
300'
400'
500'
Smoke Tree Rd
Valle Vista Rd
Monte Vista Rd
Google Earth
© 2018 Google
1000 ft
N



Sheep Creek Water
50' Radius
100' Radius
200' Radius
300' Radius
400' Radius
500' Radius
New Well
50'
100'
200'
300'
400'
500'
Walnut Rd
Dwelling
Dwelling
Monte Vista Rd
N
400 ft
Google Earth
© 2018 Google
← Smoke Tree Rd →

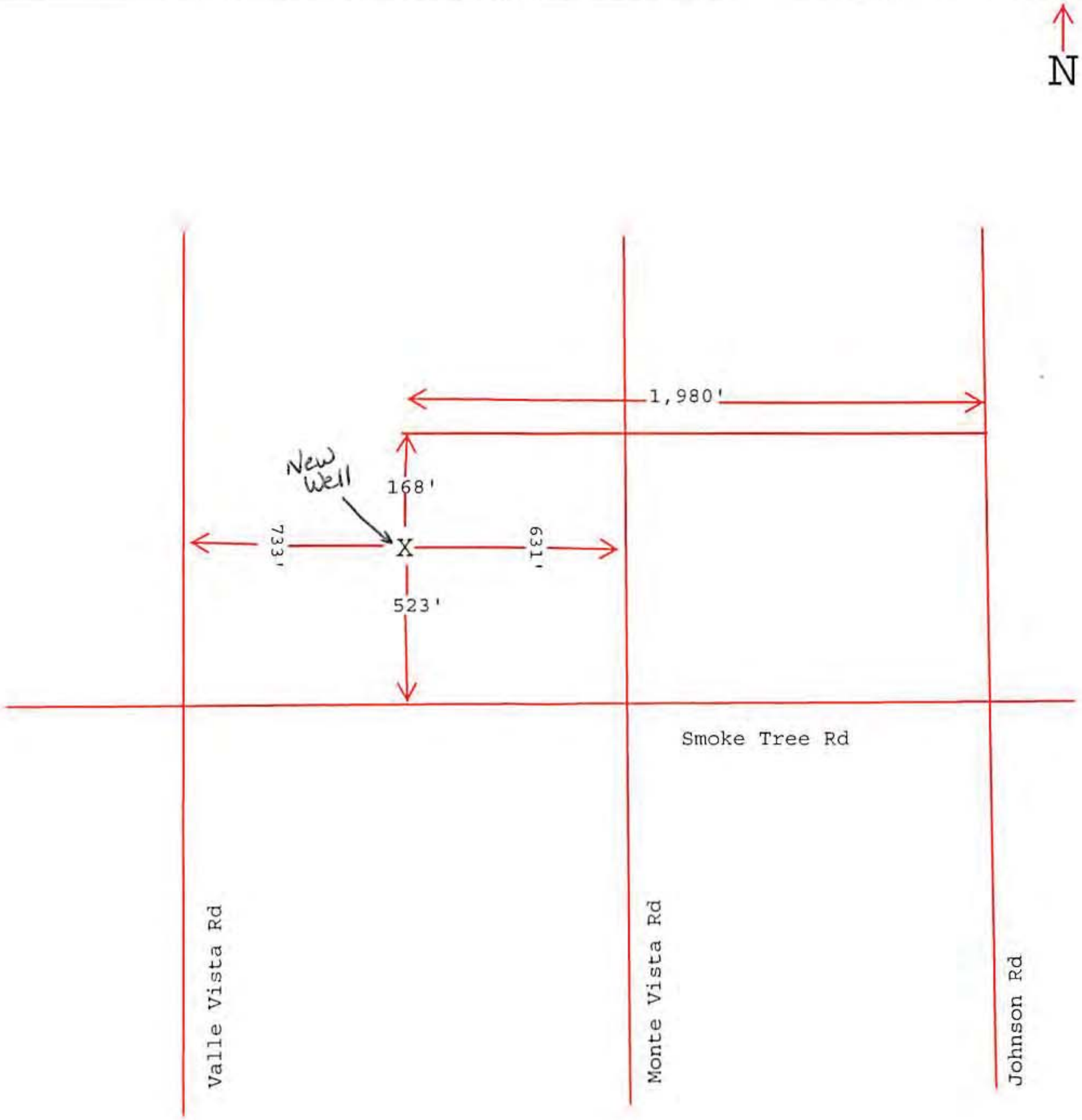
SITE MAP

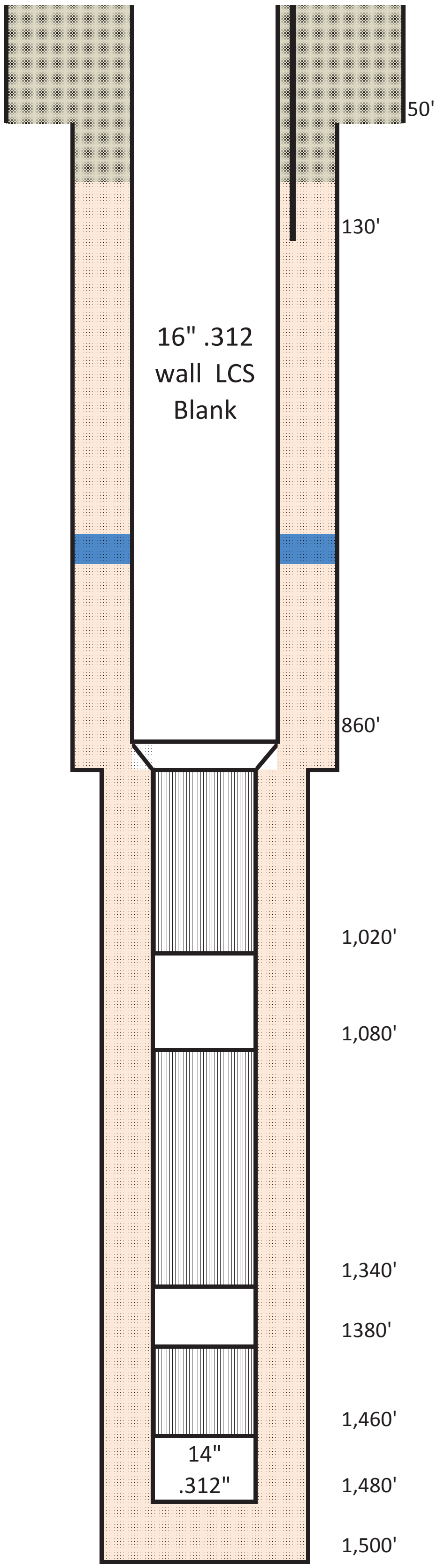
The space below can be used to include a map. <u>All</u> maps must include:

- Major cross-streets associated with the parcel
- Setbacks documented above
- Structures on the parcel
- A directional arrow pointing North

For new wells, that are <u>not replacement wells</u>, include the following on the map:

- Surface water (ponds, lakes and streams) within 300 ft.
- Canals, ditches, pipelines, utility corridors and roads within 2 mi. (Only for wells drilled below Corcoran Clay)





Sheep Creek JN 48721

Conductor Borehole 48" x 50'
Conductor Casing 30" x .375 x 50'

Well was drilled using Flooded Reverse Circulation

Annular cement seal 100' to Surface

3" Gravel Tube 130'

16" .312 LCS Blank Casing 870

Borehole is 26" from 50' to 870' bgs

600' Approximate SWL

16" x 14" Reducer

Gravel Pack
NSWG

14" .312" .060 Slot Ag-Flo Screen 160

14" .312 LCS Blank Casing 60

Borehole is 24" from 870' to 1,500' bgs

14" .312" .060 Slot Ag-Flo Screen 260

Casing Guides

14" .312 LCS Blank Casing 40

14" .312" .060 Slot Ag-Flo Screen 80

14" .312 LCS Blank w/ Cap 20

870 120 500

WELL TEST DATA SHEET

Layne Christensen Company

PROFESSIONAL SERVICES FOR WATER SYSTEMS

1717 Park Ave. Redlands Ca 92376

Job Name	SHEEPCREEK WATER	Job # :	48732	Date	7/16/2018
Location	PHELAN	Well ID:	#11	Tested By	R. WEBER
Dia. of Well	16" &14"			Driver type & HP	RENTAL GENERATOR
Depth of Well	1480 ft.	Orifice Size	Constant Flow	Column & Shaft size	
Length of Airline	1061 ft.	Flowmeter type & Size	4" X 100	Bowl mod & stgs	
Pump Setting	1080 ft.			HOURS	7.5 HRS DAY/ 13.5HRS TOTAL
Static Level	936.26 ft.	Page :	2	GALLONS	143, 600GPD

Time	Piez. (in)	G.P.M.	Air Gauge PSI	Pumping Level	Drawdown	Specific Capacity	Discharge PSI	Sand PPM	Engine RPM	Remarks
7:01	START			#DIV/0!	#DIV/0!	#DIV/0!				555081.7< flow meter
:05		320		973.22	36.96	8.65801	25	3.3	60 Hz	CLEAR - SLIGHT AIR
:10		312		977.84	41.58	7.50361	25	2.7	60	CLR - SL AIR
:20		318		980.15	43.89	7.24539	25	0.56	60	CLR - SL AIR
:30		318		981.3	45.04	7.06039	24	0.88	60	CLR - SL AIR
:45		315		982.46	46.2	6.81818	24	0.57	60	CLR - SL SIR
8:00		312		983.03	46.77	6.67094	27	0.52	60	CLR - SL AIR
:15		314		983.03	46.77	6.71371	28.5	0.35	60	CLR - SL AIR
:30		317		983.61	47.35	6.69483	21	TRACE	60	CLR - SL AIR
:45		317		983.61	47.35	6.69483	21	0.27	60	CLR - TRACE AIR
9:01		319		983.61	47.35	6.73706	20	0.25	60	CLR - TRACE AIR
:15		318		984.19	47.93	6.63468	20	0.25	60	CLR - TRACE AIR
:30		318		984.19	47.93	6.63468	20	TRACE	60	CLR TRACE AIR
:45		318		984.77	48.51	6.55535	20	TRACE	60	CLR - TRACE AIR
10:00		318		984.77	48.51	6.55535	20	TRACE	60	CLR - TRACE AIR
:15		318		985.34	49.08	6.47922	20	TRACE	60	CLR - TRACE AIR
:30		318		985.92	49.66	6.40354	20	0.18	60	CLR - TRACE AIR
11:00		318		985.34	49.08	6.47922	20	0.27	60	CLR - TRACE AIR
:30		317		985.92	49.66	6.38341	20	0.18	60	CLR - TRACE AIR
12:00		318		987.08	50.82	6.25738	20	0.18	60	CLR - TRACE AIR
:30		318		987.08	50.82	6.25738	20	0.18	60	CLR - TRACE AIR
1:00		317		986.5	50.24	6.30971	20	TRACE	60	CLR - TRACE AIR
:30		317		987.08	50.82	6.2377	20	TRACE	60	CLR - TRACE AIR
2:00		317		985.92	49.66	6.38341	20	TRACE	60	CLR - TRACE AIR
:30		317		987.08	50.82	6.2377	20	TRACE	60	CLR - TRACE AIR
:33	END TEST			#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				

WELL TEST DATA SHEET

Layne Christensen Company

PROFESSIONAL SERVICES FOR WATER SYSTEMS

1717 Park Ave. Redlands Ca 92376

Job Name	SHEEPCREEK WATER	Job # :	48732	Date	7/16/2018
Location	PHELAN	Well ID:	#11	Tested By	R. WEBER
Dia. of Well	16" &14"			Driver type & HP	RENTAL GENERATOR
Depth of Well	1480 ft.	Orifice Size	Constant Flow	Column & Shaft size	
Length of Airline	1061 ft.	Flowmeter type & Size	4" X 100	Bowl mod & stgs	
Pump Setting	1080 ft.			HOURS	7.5 HRS DAY/ 13.5HRS TOTAL
Static Level	936.26 ft.	Page :	2	GALLONS	143, 600GPD

Time	Piez. (in)	G.P.M.	Air Gauge PSI	Pumping Level	Drawdown	Specific Capacity	Discharge PSI	Sand PPM	Engine RPM	Remarks
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				
				#DIV/0!	#DIV/0!	#DIV/0!				

INSTRUCTIONS
Complete each sheet in order
ONLY enter data in the cells highlighted in this color
If a sheet does not have any highlighted cells, proceed to the next sheet
When finished, print each sheet with the exeption of this sheet (Genral Info.)

General Information

Person completing this report:	California Rural Water Association
Date:	August, 2018
County:	San Bernardino
District Name:	San Bernardino
District Number:	13
Water System Name:	SHEEP CREEK WATER COMPANY
Water System Number:	3610109
Source Name:	Well 11
Source Number:	11
Primary Station (PS) Code:	3610109-011

Assessment Summary

Assessment by:	California Rural Water Association	District No.	13	County	Saan Bernandino
System Name	SHEEP CREEK WATER COMPANY			System No.	3610109
Source Name	WELL 11	Source No.	11	PS Code:	3610109-011

Completed by	Abbas Amirteymoori	Date	August, 2018

Description of System and Source

The SHEEP CREEK WATER COMPANY water system is located in San Bernardino County.
The drinking water source for the SHEEP CREEK WATER COMPANY water system is Ground Water.
General land use is rural and forested.

Assessment Procedures

The assessment of the source Well No. 11 was conducted by California Rural Water Association. The following sources of information were used in the assessment: water system files, SWRCB files, and files study.

Procedures used to conduct the assessment include: file review, calculations, field review, meet with water system.

Contents of this Assessment

Yes	**Assessment Summary**
Yes	**Source Data Sheet**
Yes	**Delineation of Protection Zones**
Yes	**Physical Barrier Effectiveness Checklist**
Yes	**Inventory of Possible Contaminating**
Yes	**Vulnerability Ranking**
Yes	**Vulnerability Summary**
Yes	**Assessment Map**

Comments

Drinking Water Source Assessment

Water System

SHEEP CREEK WATER COMPANY

San Bernardino County

Water Source

Well 11

Assessment Date

August, 2018

State Water Resources Control Board
Division of Drinking Water
SWRCB San Bernardino District

District No.	**13**
System No.	**3610109**
Source No.	**11**
PS Code	**3610109-011**

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name	Sheep Creek Water Company	*from SWRCB database*
System Number	3610109	*from SWRCB database*
Source of Information (well log, DDW/County files, system, etc)	Well Log, Water System	
Organization Collecting Information (DDW, County, System, other)	SWRCB	
Date Information Collected/Updated	Aug-18	
WELL IDENTIFICATION		
* Well Number or Name	11	*from SWRCB database*
* SWRCB Source Identification Number	3610109-011	
DWR Well Log on File? ("YES" or "NO")		
State Well Number (from DWR)		
Well Status (Active, Standby, Inactive)		*from SWRCB database*
WELL LOCATION		
Latitude	34°26'32.34"N	
Longitude	117°33'39.15"W	
Ground Surface Elevation (ft above Mean Sea Level)	3900ft	
Street Address	4625 Walnut Rd	
Nearest Cross Street	Monte Vista Rd	
City	Phelan	
County	San Bernardino	
* Neighborhood/Surrounding Area *(see Note 1)*	RU, RE	
Site plan on file? ("YES" or "NO")		
DWR Ground Water Basin	6-042	
DWR Ground Water Sub-basin	N/A	
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)	350ft	
Distance to Active Wells (ft)	losest Known Well 2.83 miles	
Distance to Abandoned Wells (ft)	Unknown Abandoned Wells	
Distance to Surface Water (ft)	N/A	
** Size of controlled area around well (square feet)	2.5 acres	
* Type of access control to well site *(fencing, building, etc)*	Fencing	
* Surface Seal? (Concrete slab)("YES", "NO" or "UNKNOWN")	Yes	
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	4/4/2	
* Within 100 year flood plain? ("YES", "NO" or "UNKNOWN")	No	
* Drainage away from well? ("YES" or "NO")	Yes	
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*	None at this time	
Floor material		
Located in Pit? ("YES" or "NO")	No	
Pit depth (feet) (if applicable)	N/A	
WELL CONSTRUCTION		

Date drilled	Apr-18	
Drilling Method	Reverse Circulation	
Depth of Bore Hole (feet below ground surface)	1500 ft	
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning Depth/Ending Depth; 3rd Casing, etc.	0/860; 860/1480	
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	16/14	
Casing Material; 2nd Casing Material; 3rd Casing, etc.	Steel	
Conductor casing used? ("YES", "NO" or "UNKNOWN") *(See Note 2)*	Yes	
Conductor casing removed? ("YES", "NO" or "UNKNOWN")	No	
* Depth to highest perforations/screens (ft below surface) (or "UNKNOWN")	860 ft	
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	860/1020; 1080/1340; 1380/1460	
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)* (or "UNKNOWN")	500 ft	
* Annular Seal?("YES", "NO" or "UNKNOWN") *(See Note 3)*	Yes	
* Depth of Annular Seal (ft)	100 ft	
Material of Annular Seal *(cement grout, bentonite, etc.)*	Cement	
Gravel pack, Depth to top (ft below ground surface)	100 ft	
Total length of gravel pack (ft)	1400 ft	
AQUIFER		
* Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*	Sand, Gravel, Clay, Rock	
* Effective porosity (decimal percent) *(default = 0.2)* (or "UNKNOWN")	Unkown	
* Confining layer (Impervious Strata) above aquifer? ("YES", "NO" or "UNKNOWN")	Unknown	
Thickness of confining layer, if known (ft)	Unknown	
Depth to confining layer, if known (ft below ground)	Unknown	
* Static water level (ft below ground surface)	936 ft	
Static water level measurement: Date/Method	7/2018 Airline	
Pumping water level (ft below ground surface)	987 ft	
Pumping water level measurement: Date/Method	7/2018 Airline	
WELL PRODUCTION		
Well Yield (gpm)	251	
Well Yield Based On (i.e., pump test, etc.)	Test Pump	
Date measured	Jul-18	
Is the well metered? ("YES" or "NO")	Yes- McCrometer	
Production (gallons per year)	24 million	
Frequency of Use (hours/year)	14 hours	
Typical pumping duration (hours/day)	8-12 hours	
PUMP		
Make	Franklin	
Type	Submersible	
Size (hp)	150	
* Capacity (gpm)	251	
Depth to suction intake (ft below ground surface)	1100 ft	
Lubrication Type	Water	
Type of Power: *(i.e., electric, diesel, etc.)*	Electric	

Auxiliary power available? ("YES" or "NO")	Yes	
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	Distribution Pressure & Flow	
Pump to Waste capability? ("YES" or "NO")	Yes	
Discharges to: *(i.e., distribution system, storage, etc.)*	Distribution System	

REMARKS AND DEFECTS (use additional sheets as necessary)

NOTES

1. Neighborhood/Surrounding Area (list all that apply): A= Agricultural, Ru = Rural, Re = Residential, Co = Commercial, I = Industrial, Mu = Municipal, P = Pristine, O = Other
2. Conductor Casing - Oversized casing used to stabilize bore hole during well construction. Should be removed during installation of annular seal.
3. Annular Seal - Seal of grout in the space between the well casing and the wall of the drilled hole. Sometimes called "sanitary seal".

REMARKS AND DEFECTS (Use or note these items as appropriate) (** indicates items pertinent to Ground Water Rule)	
Distance (ft) to other sanitary concerns:	
** Type of Sanitary Concern:	
** Type of Sanitary Concern:	
** Type of Sanitary Concern:	
** Type of Sanitary Concern:	
** Type of Sanitary Concern:	
Raw Water Quality concerns? (Yes or No)	
** Microbiological (coliform)	
Chemicals	
Other (list)	
** Continuous Chlorination provided? (Yes or No)	
Condition of enclosure or housing	
Pit Drained? (if applicable)	
Pitless Adaptor? Make and Model	
Height of pump base (inches)	
Casing Vent? (yes or no)	
Air/Vacuum Release? (yes or no)	
Sampling Taps? (yes or no)	
Location of sampling taps	
Wellhead Riser? (yes or no); height above well	
Other	

Delineation of Ground Water Protection Zones

Assessment by:	California Rural Water Association	District No.	13	County	San Bernardino
System Name	SHEEP CREEK WATER COMPANY			System No.	3610109
Source Name	Well 11	Source No.	11	PS Code:	3610109-011

Completed by Abbas Amirteymoori — Date Augus, 2018

Calculate the Delineations using the Calculated Fixed Radius Equation
If a different procedure is proposed, contact the SWRCB and obtain approval

Calculated Fixed Radius Equation

$$Rt = \sqrt{Q\,t / \pi\,\eta\,H}$$

Rt = R2, R5, or R10 corresponding to t (Calculate R for each travel time)
Q = maximum pumping capacity of well (cubic feet per year = gpm X 70,267)
t = time of travel (years), 2, 5 and 10 years
π = 3.1416
η = effective porosity (decimal percent) (If unknown, assume 0.2)
H = screened interval of well (feet) (If unknown, assume 10% of Q gpm, 10 ft minimum)

Note: If source is located in fractured rock, increase zone by 50% (automatically done by choosing aquifer type)

	Aquifer Type	Porous Media
Q	Maximum Pumping Capacity (gpm)	251
η	Effective Porosity	0.2
H	Screen Interval Length (ft)	490

		Radii (ft)		
t	Zone	Calculated	Minimum	Larger
2 years	A	*508*	*600*	**600**
5 years	B5	*803*	*1,000*	**1,000**
10 years	B10	*1,135*	*1,500*	**1,500**

The groundwater assesment map is attached . The map indicates:
-Location of the source
-Protection Zones (Zone A, B5, & B10)

Physical Barrier Effectiveness Checklist - Ground Water Source

Assessment by	California Rural Water Association	District No.	13	County	San Bernardino
System Name	SHEEP CREEK WATER COMPANY			System No.	3610109
Source Name	Well 11	Source No.	11	PS Code:	3610109-011

Completed by	Abbas Amirteymoori	Date	August, 2018

PARAMETER			*POINTS*	
			Unconfined	Confined
A	Type of Aquifer	Unconfined, Semi-confined, Fractured Rock, Unknown	0	N/A
B	Aquifer Material	Porous Media (Interbedded sands, silts, clays, gravels) with continuous clay layer minimum 25' thick above water table within Zone A	20	N/A
C1	Are there improperly destroyed/abandoned wells within Zone A?	No	5	5
C2	Are there improperly destroyed/abandoned wells within Zone B5?	No	3	3
C3	Are there improperly destroyed/abandoned wells within Zone B10?	No	2	2
D	Depth to Static Water (ft)	936 ft	10	N/A
E	Well Operation [(DUP-DTW)/(Q/H)]	0.0	0	N/A
F	What is the relationship in hydraulic head between the confined aquifer and the overlying unconfined aquifer? (i.e. does the well flow under artesian conditions?)	Unknown	N/A	0
G1	Sanitary Seal (Annular Seal) Depth (ft)	100 ft	10	10
G2	Surface Seal (Concrete Cap)	Watertight, slopes away from well, at least 2' laterally in all directions	4	4
G3	Flooding Potential at well site	Not subject to flooding	1	1
G4	Security at well site	Secure (i.e. housing, fencing, etc.)	5	5
TOTAL POINTS			60	N/A
0 to 35 = Low, 36 to 69 = Moderate, 70 to 100 = High				
Physical Barrier Effectiveness			**Moderate**	

Possible Contaminating Activities (PCA) Inventory Form - Ground Water

Only complete the checklist that apply to the specific source. The "Other" Checklist applies to all sources
Proceed to appropriate checklist or checklists. Indicate whether the PCA is located in the zone by placing a **Y** (yes), **N** (no), or **U** (unknown) in the approp

	PCA (Risk Ranking)	PCA in Zone A? Y, N, or U	PCA in Zone B5? Y, N, or U	PCA in Zone B10? Y, N, or U	Comments	PCA Risk Points VH=7 H=5 M=3 L=1	Zone Points A=5 B5=3 B10=1 Unk.=0	PBE Points L=5 M=3 H=1	Total Points If = or > 8, source is vulnerable to PCA
Industrial/Commercial	Automobile- Body shops (H)	N	N	N		0	0	3	3
	Automobile- Car washes (M)	N	N	N		0	0	3	3
	Automobile- Gas stations (VH)	N	N	N		0	0	3	3
	Automobile- Repair shops (H)	N	N	N		0	0	3	3
	Boat services/repair/ refinishing (H)	N	N	N		0	0	3	3
	Chemical/petroleum pipelines (H)	N	N	N		0	0	3	3
	Chemical/petroleum processing/storage (VH)	N	N	N		0	0	3	3
	Dry cleaners (VH)	N	N	N		0	0	3	3
	Electrical/electronic manufacturing (H)	N	N	N		0	0	3	3
	Fleet/truck/bus terminals (H)	N	N	N		0	0	3	3
	Furniture repair/ manufacturing (H)	N	N	N		0	0	3	3
	Home manufacturing (H)	N	N	N		0	0	3	3
	Junk/scrap/salvage yards (H)	N	N	N		0	0	3	3
	Machine shops (H)	N	N	N		0	0	3	3
	Metal plating/ finishing/fabricating (VH)	N	N	N		0	0	3	3
	Photo processing/printing (H)	N	N	N		0	0	3	3
	Plastics/synthetics producers (VH)	N	N	N		0	0	3	3
	Research laboratories (H)	N	N	N		0	0	3	3
	Wood preserving/treating (H)	N	N	N		0	0	3	3
	Wood/pulp/paper processing and mills (H)	N	N	N		0	0	3	3
	Lumber processing and manufacturing (H)	N	N	N		0	0	3	3

	Sewer collection systems (H, if in Zone A, otherwise L)	N	N	N		0	0	3	3
	Parking lots/malls (>50 spaces) (M)	N	N	N		0	0	3	3
	Cement/concrete plants (M)	N	N	N		0	0	3	3
	Food processing (M)	N	N	N		0	0	3	3
	Funeral services/graveyards (M)	N	N	N		0	0	3	3
	Hardware/lumber/parts stores (M)	N	N	N		0	0	3	3
	Appliance/Electronic Repair (L)	N	N	N		0	0	3	3
	Office buildings/complexes (L)	N	N	N		0	0	3	3
	Rental Yards (L)	N	N	N		0	0	3	3
	RV/mini storage (L)	N	N	N		0	0	3	3
Residential/Municipal	Airports - Maintenance/ fueling areas (VH)	N	N	N		0	0	3	3
	Landfills/dumps (VH)	N	N	N		0	0	3	3
	Railroad yards/ maintenance/ fueling areas (H)	N	N	N		0	0	3	3
	Septic systems - high density (>1/acre) (VH if in Zone A,	N	N	N		0	0	3	3
	Sewer collection systems (H, if in Zone A, otherwise L)	N	N	N		0	0	3	3
	Utility stations - maintenance areas (H)	N	N	N		0	0	3	3
	Wastewater treatment plants (VH in Zone A, otherwise H)	N	N	N		0	0	3	3
	Drinking water treatment plants (M)	N	N	N		0	0	3	3
	Golf courses (M)	N	N	N		0	0	3	3
	Housing - high density (>1 house/0.5 acres) (M)	N	N	N		0	0	3	3
	Motor pools (M)	N	N	N		0	0	3	3
	Parks (M)	N	N	N		0	0	3	3
	Waste transfer/recycling stations (M)	N	N	N		0	0	3	3
	Apartments and condominiums (L)	N	N	N		0	0	3	3
	Campgrounds/ Recreational areas (L)	N	N	N		0	0	3	3
	Fire stations (L)	N	N	N		0	0	3	3
	RV Parks (L)	N	N	N		0	0	3	3
	Schools (L)	N	N	N		0	0	3	3
	Hotels, Motels (L)	N	N	N		0	0	3	3
	Grazing (> 5 large animals or equivalent per acre) (H in Zone A, otherwise M)	N	N	N		0	0	3	3

Agricultural/Rural	Concentrated Animal Feeding Operations (CAFOs) as defined in federal regulation1 (VH in Zone A, otherwise H)	N	N	N		0	0	3	3
	Animal Feeding Operations as defined in federal regulation2 (VH in Zone A, otherwise H)	N	N	N		0	0	3	3
	Other Animal operations (H in Zone A, otherwise M)	Y	Y	Y	Horse Properties	5	5	3	13
	Farm chemical distributor/ application service (H)	N	N	N		0	0	3	3
	Farm machinery repair (H)	N	N	N		0	0	3	3
	Septic systems - low density (<1/acre) (H in Zone A, otherwise L)	Y	Y	Y		0	1	1	2
	Lagoons / liquid wastes (H)	N	N	N		0	0	3	3
	Machine shops (H)	N	N	N		0	0	3	3
	Pesticide/fertilizer/ petroleum storage & transfer areas (H)	N	N	N		0	0	3	3
	Agricultural Drainage (H in Zone A, otherwise M)	N	N	N		0	0	3	3
	Wells - Agricultural/ Irrigation (H)	N	N	N		0	0	3	3
	Managed Forests (M)	N	N	N		0	0	3	3
	Crops, irrigated (Berries, hops, mint, orchards, sod, greenhouses, vineyards, nurseries, vegetable) (M)	N	Y	Y		3	3	3	9
	Fertilizer, Pesticide/ Herbicide Application (M)	N	N	N		0	0	3	3
	Sewage sludge/biosolids application (M)	N	N	N		0	0	3	3
	Crops, nonirrigated (e.g., Christmas trees, grains, grass seeds, hay, pasture) (L) (includes drip-irrigated crops)	N	N	N		0	0	3	3
	NPDES/WDR permitted discharges (H)	N	N	N		0	0	3	3
	Underground Injection of Commercial/Industrial Discharges (VH)	N	N	N		0	0	3	3
	Historic gas stations (VH)	N	N	N		0	0	3	3
	Historic waste dumps/ landfills (VH)	N	N	N		0	0	3	3
	Illegal activities/ unauthorized dumping (H)	N	N	N		0	0	3	3
	Injection wells/ dry wells/ sumps (VH)	N	N	N		0	0	3	3
	Known Contaminant Plumes (VH)	N	N	N		0	0	3	3
	Military installations (VH)	N	N	N		0	0	3	3
	Mining operations - Historic (VH)	N	N	N		0	0	3	3

Other Activities

Mining operations - Active (VH)	N	N	N		0	0	3	3
Mining - Sand/Gravel (H)	N	N	N		0	0	3	3
Wells - Oil, Gas, Geothermal (H)	N	N	N		0	0	3	3
Salt Water Intrusion (H)	N	N	N		0	0	3	3
Recreational area - surface water source (H)	N	N	N		0	0	3	3
Underground storage tanks - Confirmed leaking tanks (VH)	N	N	N		0	0	3	3
Underground storage tanks - Decommissioned - inactive tanks (L)	N	N	N		0	0	3	3
Underground storage tanks - Non- regulated tanks (tanks smaller than regulatory limit) (H)	N	N	N		0	0	3	3
Underground storage tanks - Not yet upgraded or registered tanks (H)	N	N	N		0	0	3	3
Underground storage tanks - Upgraded and/or registered - active tanks (L)	N	N	N		0	0	3	3
Above ground storage tanks (M)	Y	Y	Y	Propane Tanks	3	5	3	11
Wells - Water supply (M)	N	N	N		0	0	3	3
Construction/demolition staging areas (M)	N	N	N		0	0	3	3
Contractor or government agency equipment storage yards (M)	N	N	N		0	0	3	3
Dredging (M)	N	N	N		0	0	3	3
Transportation corridors - Freeways/state highways (M)	N	N	N		0	0	3	3
Transportation corridors - Railroads (M)	N	N	N		0	0	3	3
Transportation corridors - Historic railroad right-of-ways (M)	N	N	N		0	0	3	3
Transportation corridors - Road Right-of- ways (herbicide use areas) (M)	N	N	N		0	0	3	3
Transportation corridors - Roads/ Streets (L)	Y	Y	Y		1	5	3	9
Hospitals (M)	N	N	N		0	0	3	3
Storm Drain Discharge Points (M)	N	N	N		0	0	3	3
Storm Water Detention Facilities (M)	N	N	N		0	0	3	3
Artificial Recharge Projects - Injection wells (potable water) (L)	N	N	N		0	0	3	3

	Artificial Recharge Projects - Injection wells (non-potable water) (M)	N	N	N		0	0	3	3
	Artificial Recharge Projects - Spreading Basins (potable water) (L)	N	N	N		0	0	3	3
	Artificial Recharge Projects - Spreading Basins (non-potable water) (M)	N	N	N		0	0	3	3
	Medical/dental offices/clinics (L)	N	N	N		0	0	3	3
	Veterinary offices/clinics (L)	N	N	N		0	0	3	3
	Surface water - streams/ lakes/rivers (L)	N	N	N		0	0	3	3
	Wells - monitoring, test holes (L)	N	N	N		0	0	3	3

Vulnerability Ranking

Assessment by:	California Rural Water Association	District No.	13	County	San Bernardino
System Name	SHEEP CREEK WATER COMPANY			System No.	3610109
Source Name	Well 11	Source No.	11	PS Code:	3610109-011

Completed by	Abbas Amirteymoori	Date	August, 2018

This source is considered most vulnerable to the following PCAs:

1. Septic systems - low density (<1/acre)
2. Transportation corridors - Roads/ Streets (L)
3. Above ground storage tanks (M)
4. Transportation corridors - Roads/ Streets (L)

Vulnerability Summary

Assessment By	California Rural Water Association	District No.	13	County	San Bernardino
System Name	SHEEP CREEK WATER COMPANY			System No.	3610109
Source Name	Well 11	Source No.	11	PS Code:	3610109-011

Completed by Abbas Amirteymoori Date August, 2018

THE FOLLOWING INFORMATION MUST BE INCLUDED IN THE CONSUMER CONFIDENCE REPORT

A source water assessment was conducted for the Well 11 of the SHEEP CREEK WATER COMPANY in August, 2018.

The source is considered most vulnerable to the following activities associated with contaminants detected in the water supply:

None

The source is considered most vulnerable to the following activities not associated with any detected contaminants:

Septic systems - low density (<1/acre)
Transportation corridors - Roads/ Streets (L)

Discussion of Vulnerability

There have been no contaminants detected in the water supply, however the source is still considered vulnerable to activities located near the drinking water source.

Appendix B – SCWC Source Capacity Citation

State Water Resources Control Board
Division of Drinking Water

August 30, 2018

System No. 3610109

Chris Cummings, General Manager
Sheep Creek Water Company
P.O. Box 291820
Phelan, CA 92329

COMPLIANCE ORDER NO.05-13-18R-002
SOURCE CAPACITY VIOLATION

Enclosed is Compliance Order No.05-13-18R-002 (hereinafter "Order"), issued to the Sheep Creek Water Company public water system (hereinafter "System"), public water system. Please note there are legally enforceable deadlines associated with this Order.

The System will be billed at the State Water Resources Control Board's (hereinafter "State Water Board"), hourly rate for the time spent on issuing this Order. California Health and Safety Code (hereinafter "CHSC"), Section 116577, provides that a public water system must reimburse the State Water Board for actual costs incurred by the State Water Board for specified enforcement actions, including but not limited to, preparing, issuing and monitoring compliance with an order. At this time, the State Water Board has spent approximately 2 hour(s) on enforcement activities associated with this violation.

The System will receive a bill sent from the State Water Board in August of the next fiscal year. This bill will contain fees for any enforcement time spent on the System for the current fiscal year.

Any person who is aggrieved by a citation, order or decision issued under authority delegated to an officer or employee of the state board under Article 8 (commencing with CHSC, Section 116625) or Article 9 (commencing with CHSC, Section 116650), of the Safe Drinking Water Act (CHSC, Division 104, Part 12, Chapter 4), may file a petition with the State Water Board for reconsideration of the citation, order or decision. Appendix 1 to the enclosed Citation contains the relevant statutory provisions for filing a petition for reconsideration (CHSC, Section 116701).

Petitions must be received by the State Water Board within 30 days of the issuance of the citation, order or decision by the officer or employee of the state board. The date of issuance is the date when the Division of Drinking Water mails a copy of the citation, order or decision. If the 30th day falls on a Saturday, Sunday, or state holiday, the petition is due the following business day by 5:00 p.m.

Information regarding filing petitions may be found at:

http://www.waterboards.ca.gov/drinking_water/programs/petitions/index.shtml

If you have any questions regarding this matter, please contact Hector Cazares of my staff at (909) 383-4312 or me at (909) 383-4328.

Sincerely,

Eric J. Zúñiga, P.E.
District Engineer
San Bernardino District
Southern California Field Operations Branch

Enclosures

Certified Mail No. 7017 0660 0001 1704 7559

cc: Joy Chakma, San Bernardino County EHS, via email at Joy.Chakma@dph.sbcounty.gov
Diana Almond, San Bernardino County EHS via email at Diana.Almond@dph.sbcounty.gov

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF DRINKING WATER

Name of Public Water System: Sheep Creek Water Company
Water System No: 3610109

Attention: Chris Cummings, General Manager
P.O. Box 291820
Phelan, CA 92329

Issued: August 30, 2018

COMPLIANCE ORDER FOR VIOLATION OF CALIFORNIA HEALTH AND SAFETY CODE SECTION 116555(a)(3) AND CALIFORNIA CODE OF REGULATIONS, TITLE 22, SECTION 64554

SOURCE CAPACITY VIOLATION
2018

The California Health and Safety Code (hereinafter "CHSC"), Section 116655 authorizes the State Water Resources Control Board (hereinafter "State Water Board"), to issue a compliance order to a public water system when the State Water Board determines that the public water system has violated or is violating the California Safe Drinking Water Act (hereinafter "California SDWA"), (CHSC, Division 104, Part 12, Chapter 4, commencing with Section 116270), or any regulation, standard, permit, or order issued or adopted thereunder.

The State Water Board, acting by and through its Division of Drinking Water (hereinafter "Division"), and the Deputy Director for the Division, hereby issues Compliance Order No.05-13-18R-002 (hereinafter "Order") pursuant to Section 116655 of the CHSC to the Sheep Creek Water Company (hereinafter "System"), for violation of CHSC, Section 116555(a)(3), requiring a reliable and adequate supply of pure, wholesome, healthful, and potable water, and California Code of Regulations (hereinafter "CCR"), Title 22, Section 64554, setting source capacity requirements.

A copy of the applicable statutes and regulations are included in Appendix 1, which is attached hereto and incorporated by reference.

STATEMENT OF FACTS

The System is classified as a community public water system with a population of 3,354 serving 1,183 connections. The System operates under Domestic Water Supply Permit No. 78-007 issued by the State Water Board on February 9, 1978.

The System relies on five (5) groundwater wells: Wells 2A, 3A, 4A, 5, 8 and one (1) tunnel source which is also classified as groundwater. The System submitted production yield records to the Division on August 1, 2018, which demonstrated a significant decrease in the capacity of all sources over the past ten (10) years.

Based on the most recent ten (10) years of production data, the System reported the highest MDD as 2,090,000 gallons per day in 2014. The lowest MDD was reported by the System in 2017 as 1,060,000 gallons per day. In accordance with California Code of Regulations, Title 22, Section 64554(a), a public water system must at all times have adequate source capacity to meet the highest 10-year MDD, which here would be 2,090,000 gallons from 2014. Using the System's most current production yield records from July 2018, the System is producing a combined source flow of 720,000 gallons per day, and therefore does not meet the maximum day demand (MDD) requirements. Summaries of production data, system demand data, and a source capacity evaluation were used to determine compliance with source capacity requirements and are included in Appendix 4.

A water exchange agreement was signed on July 31, 2018 for an emergency interconnection for the System with Phelan Pinon Hills CSD (hereinafter "CSD"). Because the agreement between the System and the CSD does not specify a minimum flow that will be provided to the System and the water flow is intended to be used for emergencies, the water flow from the interconnection cannot be considered when calculating the System's compliance with source capacity MDD requirements.

On August 22, 2018 the System notified the Division of an impending water production shortage. The System reported that on August 10, 2018 they began to receive water from the CSD through their interconnection. After notifying the Division of the impending water shortage, the System stated that they will continue relying on water purchased from the CSD. The notification sent to the Division has been attached to this Order as Appendix 4.

CHSC, Section 116555(a)(3) requires all public water systems to provide a reliable and adequate supply of pure, wholesome, healthful, and potable water and CCR, Title 22, Section 64554(a) requires that public water systems shall at all times have the capacity to meet the System's maximum day demand (MDD) as established by Section 64554 subsection (b).

DETERMINATION

Based on the above Statement of Facts, the State Water Board has determined that without additional source capacity, the System may not be able to provide an adequate and reliable supply of water to its customers and has failed to comply with requirements from CHSC, Section 116555(a)(3) and CCR, Title 22, Section 64554. The Division has the authority under Sections 116655 (a)(2) and 116655 (b)(4) of the CHSC to take steps necessary to prevent increasing water demands for the System until such time that an adequate and proven source capacity is provided.

DIRECTIVES

To ensure that the water supplied by the System is at all times reliable and adequate, the System is hereby directed to take the following actions:

1. Effective immediately, upon receipt of this Order, the Division imposes a service connection moratorium on the System and directs the System to not make any additional service connections to its water system, including any such service connections for which a "will serve" letter was issued at any time by the System, but for which a building permit was not issued prior to the date of this Order. As used in this Order, "will serve" letter means any form of notice, representation or agreement that the System will supply water to a property, parcel or structure.

2. By **September 20, 2018**, the System must identify any and all properties for which "will serve" letters have been issued, but a service connection has not been made.

3. By **September 20, 2018**, the System must advise the owner(s) of those properties that were issued will serve letters, and all appropriate local planning agencies that the "will serve" letter issued for such property is null and void and may not be relied upon for any purpose.