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: Jon McClain, Senior Project Engineer
Name and Title

——

530-227-6082, jmcclain@calruralwater.org_
Phone Number and Email Address

Project Engineer: Archana Bhardwaj, Project Engineer_
Name and Title

*562-773-9134, abhardwaj@calruralwater.org*____
Phone Number and Email Address

*C72369*________________________________
California Civil Engineering License Number

Engineering Report
Sheep Creek Water Company

REGISTERED PROFESSIONAL ENGINEER
ARCHANA JINDAL
No. 72369
Exp. 6/30/20
CIVIL
STATE OF CALIFORNIA

Prepared for:
State Water Resources Control Board
Division of Financial Assistance
Work Plan No. 5207-A

Proposition 1
Technical Assistance Program
July 2, 2019

California Rural Water Association

July 2, 2019

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

Re: Sheep Creek Water Company
Final Engineering Report

Dear Ms. Wu,

The California Rural Water Association (CRWA) appreciates this opportunity to submit the Final 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 consolidation of Sheep Creek Water Company with Phelan Piñon Hills Community Services District (PPHCSD) to address the persistent source capacity deficiency the system is currently facing. Further, a phased approach is recommended to address other issues in the Request for Technical Assistance such as storage tank rehabilitation, booster pump station, upgrade of undersized pipelines, new water meters and a new SCADA system.

The Preliminary Engineering Report (PER) was submitted to Division of Financial Assistance (DFA) on November 19, 2018. CRWA participated in a conference call with representatives from DFA, Division of Drinking Water (DDW) and Sheep Creek Water Company on November 30, 2018 and received preliminary comments. More comments on the PER were received from DFA on January 17, 2019 and addressed in the revised version of the report issued on April 15, 2019. Additional comments were also received on May 1 and June 18, 2019 and are addressed below. This final Engineering Report also incorporates the recommended modifications.

Comments from June 18, 2019

- Separate out Phase II improvements from the Alternative Solutions. Inadequate source capacity is the main purpose of the project as the system is currently under Compliance Order (#05-13-18R-002) and it should be the basis of comparison for the alternatives. Phase II can be its own section such as "C.4 – Future Recommended Improvements" to address deficiencies in a separate funding project.

  CRWA's Response: CRWA agrees that depletion of source capacity is the most critical issue facing SCWC and was prioritized as Phase I work in previous versions of report. Additional improvements such as storage tank rehabilitation, insufficient supply

pressure, pipeline replacement and SCADA were included in Phase II since CRWA's work plan included a comprehensive review and resolution of these issues. These issues are also important for long term system reliability and efficiency.
In any case, based on DFA's comments, all remaining improvements have been moved to a new section, Section C.5 – Future Recommended Improvements.

- Since Sheep Creek's MHI currently qualifies it as a Disadvantaged Community (DAC), only Tables 8 and 9 of the IUP (see attachment) are applicable for determining its financing terms. Specifically, a small DAC, contingent upon a residential water rate of at least 1.5% of the community's MHI, is eligible to receive:
    - Principle forgiveness/Grant funding of up to $5 million (not to exceed $30,000 per connection)
    - Additional funding, in excess of $5 million, in the form of a 0% interest loan with a maximum financing term of 30 years

  Please note the financing terms are the same for consolidation of a DAC with another water system. These terms should therefore be used in estimation of cost per connection/share for both Alternatives 2 and 3.

  <u>CRWA's Response</u>: The cost calculations have been modified to reflect that a principal forgiveness/grant combination of up to $5M would be made available to SCWC and PPHCSD for Alternatives 2 and 3 respectively (residential water rate to MHI ratio is greater than 1.5%). The remainder of the project cost for Alternative 2 would be covered by a zero-percent interest loan for 30-years. The total cost per connection remains below the threshold of $30,000. The cost tables have been updated to reflect this understanding (Sections C.2.2 and C.3.5).

- The report still does not indicate the total rate that the customers will be expected to pay. The cost estimate tables show only monthly cost per connection/share associated with the improvements to the system. Please indicate the total cost that customers are expected to pay with each alternative (ie., current monthly charge + anticipated additional monthly charge associated with the improvement). This should take into account financing terms above.

  <u>CRWA's Response</u>: A new comparison table shows the total cost of water residents of SCWC could be expected to pay for Alternatives 2 and 3 (section C.4).

<u>Comments from May 1, 2019</u>

- This project consists of constructing 3 new wells and rehabbing 5 existing wells to address Source Capacity. This should be an either-or scenario where we would only pursue one option. This is also the case for rehabbing the existing tanks or designing a new storage tank. We will fund the project to correct problem, but not fund upgrades/rehab for future growth.

  <u>CRWA's Response</u>: Well rehabilitation has been removed from final cost calculations. A new storage tank to replace existing Tanks 2 and 4 was included based on recommendations of the tank inspection report. This cost has now been replaced with the cost to repair and rehabilitate Tanks 2 and 4 (Section C.2.5).

- The PER states that the consolidated system will have adequate raw water production capacity to meet the combined MDD without the need to drill any additional wells. However, Table 22 shows **$5,810,950** to drill 3 new wells. This cost should not be in the consolidation alternative which will drop the Phase I project cost from **$7,131,000** to around **$1,319,458**.
    - It is mentioned that the new wells are to support future demand for the consolidated system, however we do not fund for future growth so they will not qualify.

  CRWA's Response: As discussed in the Preliminary Engineering Report (PER), consolidation between SCWC and PPHCSD would likely be a protracted process due to complexity of the ownership structure of SCWC. SCWC is in urgent need of additional water sources to fulfil demand during summer months, and expedited action is required to fulfil the requirements of the citation issued to the system by Division of Drinking Water (DDW). Hence, construction of new wells was recommended.

  Cost to drill new wells has now been removed from the consolidation cost estimate (Section C.3.5).

- Phase II of the consolidation alternative still calls for the rehabilitation of 5 of Sheep Creek's existing wells, and tank improvement/replacements. If Sheep Creek Consolidates and PPHCSD has adequate source capacity to serve the consolidated system, there is no need to rehab the wells.

  CRWA's Response: Currently, the production capacity of the consolidated system with PPHCSD's largest well offline would be 5.57 MGD, while the MDD is 5.58 MGD. SCWC contributes 1.08 MGD to the total production capacity. Any further drop in production capacity of SCWC wells would bring the consolidated system into non-compliance with Section 64554 of the CCR. Well rehabilitation would help the system retain their current production capacity and obviate the need to drill new wells in the interim.

  Based on DFA's comments, well rehabilitation has been removed from final cost calculations (Section C.3.5).

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

Sincerely,

CALIFORNIA RURAL WATER ASSOCIATION

Dustin Hardwick
Director of Resource Development
Phone: (760) 920-0842
Email: dhardwick@calruralwater.org

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, distribution system, and water quality. Attach a schematic/map of the System which includes the existing facilities. Specify the agency that has jurisdiction over the water 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.

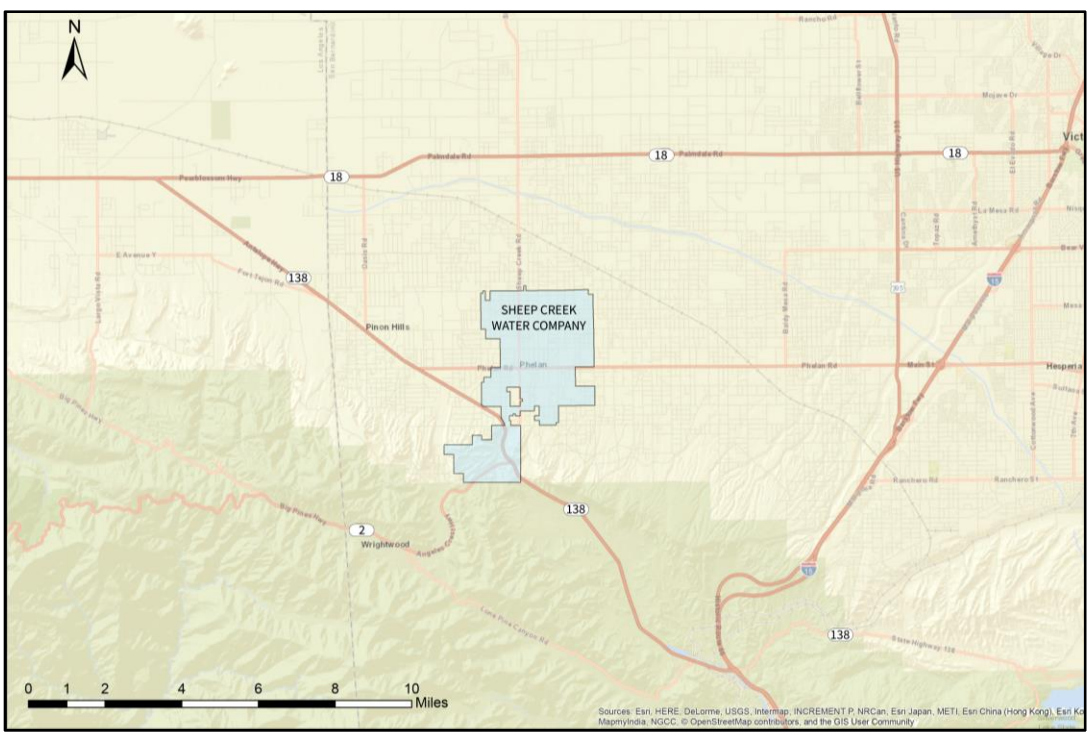


Figure 1: Sheep Creek Water Company location and service area

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 will become active as growth occurs. This may not impact the demand significantly since all shares are already taken into account to determine water allocation per share.

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 1.78 million gallons per day (MGD) or 1,236 gpm. The previously estimated MDD of 2.09 MGD was revised to 1.78 MGD after a recording error was discovered in Well 8's pumping log for the day the maximum demand was observed. The revised estimate for MDD has been approved by Division of Drinking Water (DDW).

Table 1 shows a summary of water demands for the system. The Peak Hourly Demand is 0.13 MGD or 90 gpm.

CCR Section 64554 (d) states that if the capacity of a source varies seasonally, it should be determined at the time of MDD. Hence, SCWC production in July 2018 (the same month as the MDD) will be used to determine compliance.

In July, 2018, SCWC's production capacity was 720,000 gallons per day (gpd). Combined with the expected production of 250 gpm or 360,000 gpd from Well 11, the total production capacity of SCWC for compliance purposes is 1,080,000 gpd or 1.1 MGD.

Table 1: Water demand for SCWC service area

Parameter	Flow (MGD)
Maximum Day Demand	1.78
Average Daily Usage	0.91
Peak Hourly Demand	0.13

It is important to note that demand within 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 the 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.

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. The creek flows from south to north across the eastern portion of the well field. The tunnel is located along Sheep Creek watercourse approximately 0.6 miles south of the well field. Groundwater beneath 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.

A sixth well, Well No. 11 was developed in Fall of 2018 and had started supplying water to southern end of the distribution system at the time of this report (Figure 2). This well is located in the adjudicated Mojave Basin where SCWC does not have any water rights. Water pumped from this well has to be purchased from Mojave Water Agency (MWA), the basin water master. Further, since this well is located at an elevation lower than 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.

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

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.

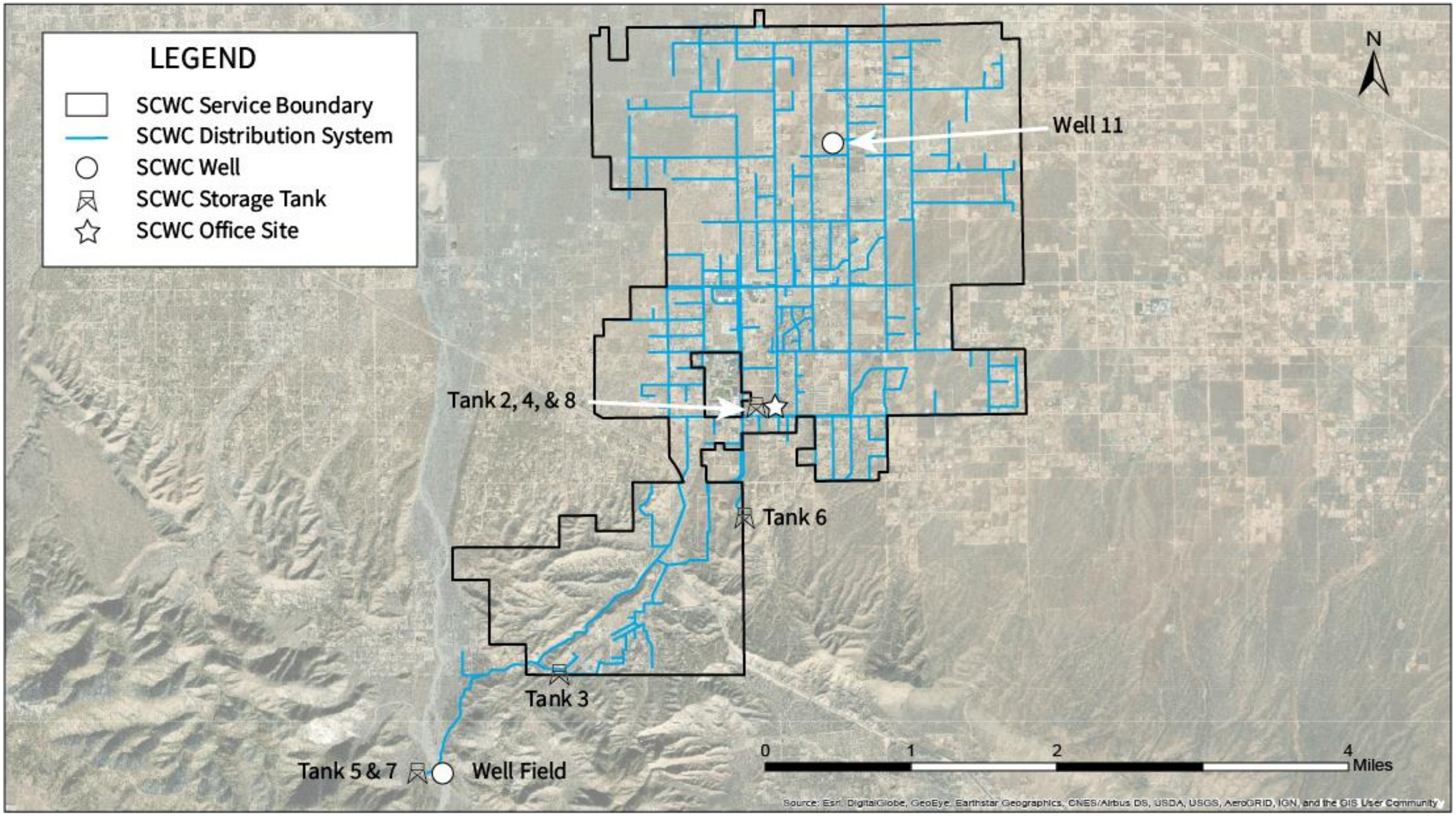


Figure 2: Locations of SCWC facilities

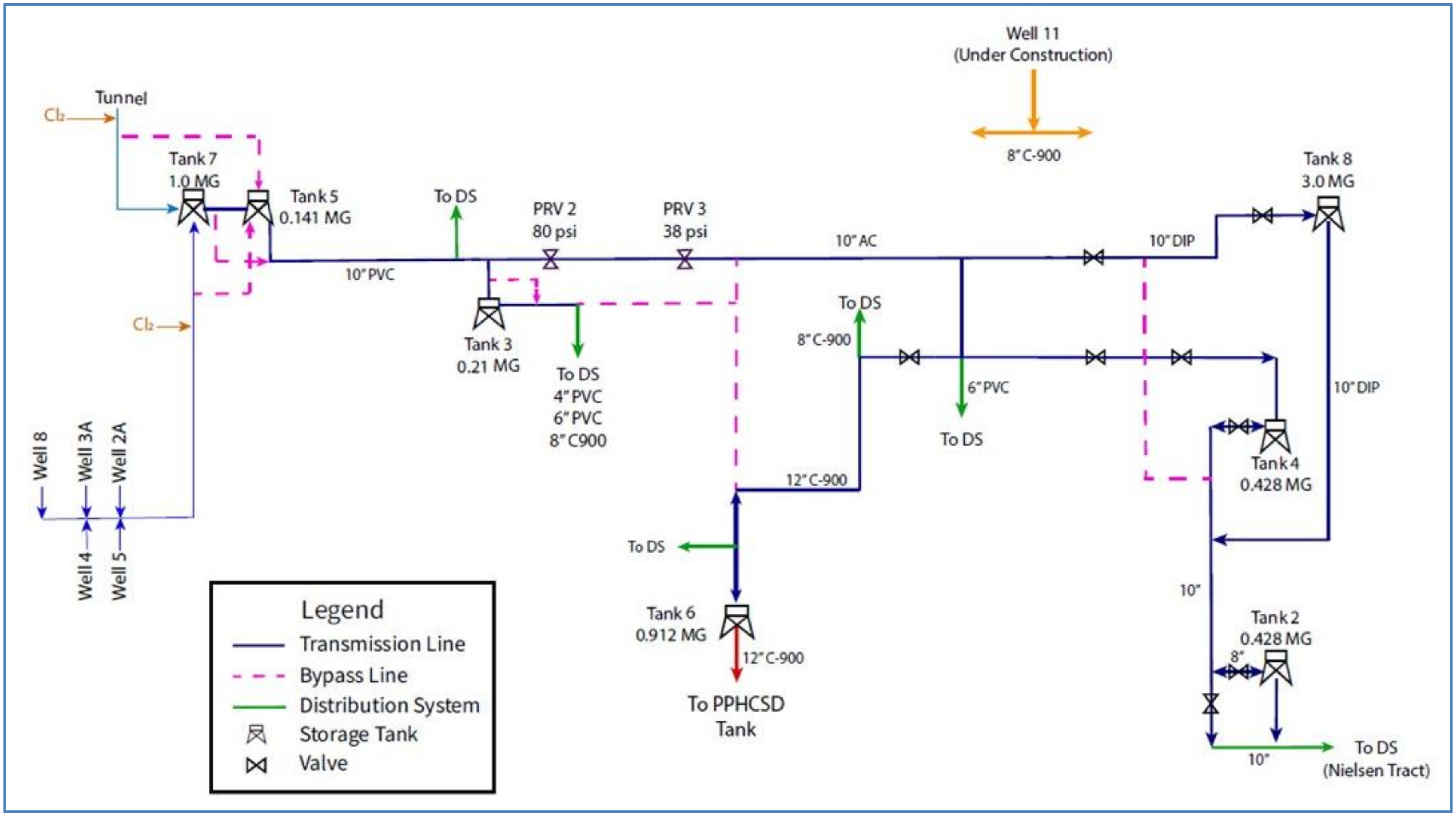


Figure 3: Flow diagram for Sheep Creek Water Company

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.

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.

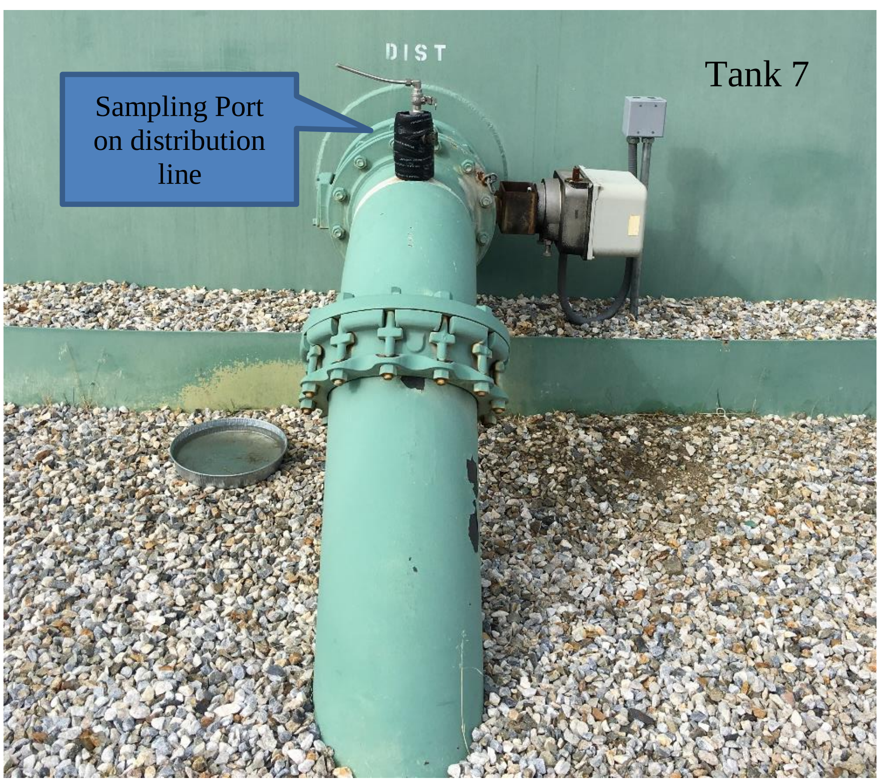


Figure 4: Chlorine sampling port on Tank 7

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

CT Required:

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

CT_{Req} = 6.0

CT Actual:

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 piping 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 pipeline throughout the system varying in size from 4-inch to 12-inch (Table 4). 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 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, they are replaced based on availability of budget and 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 the 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 problems being addressed by the project and attach supporting documents to justify the ranking. (Include 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.

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 insufficient 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.

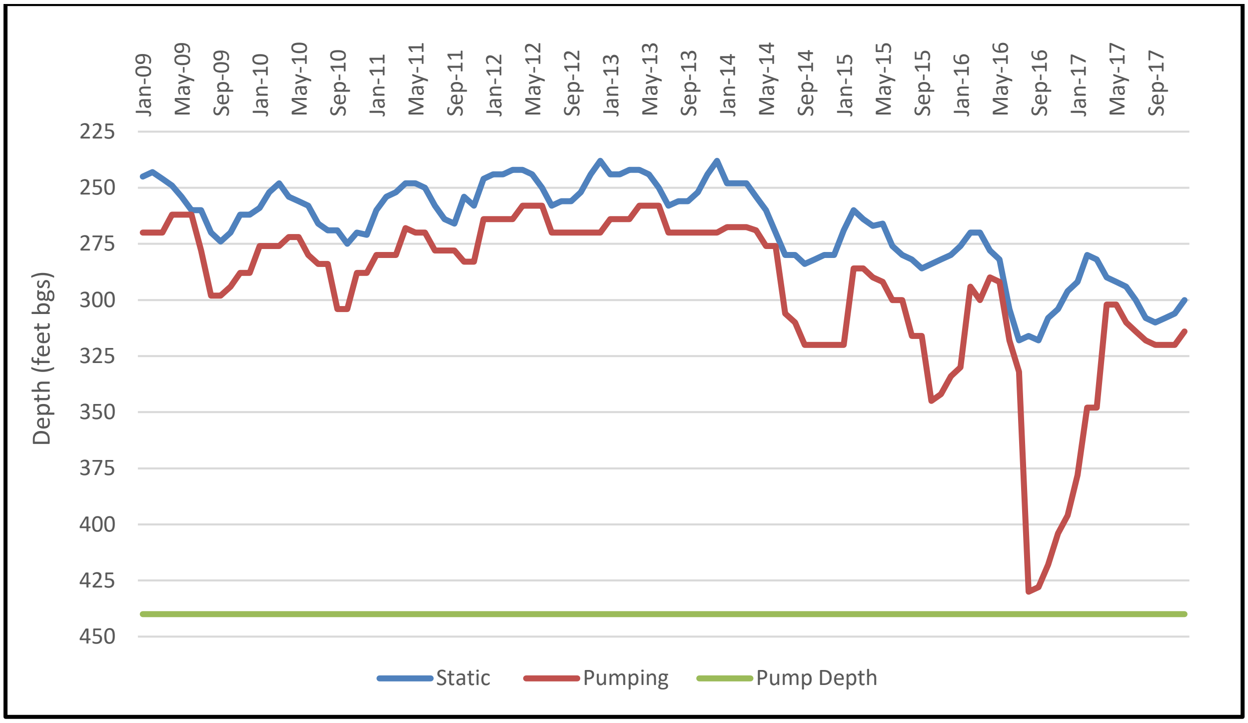


Figure 5 : Static and pumping groundwater levels for Well 4A

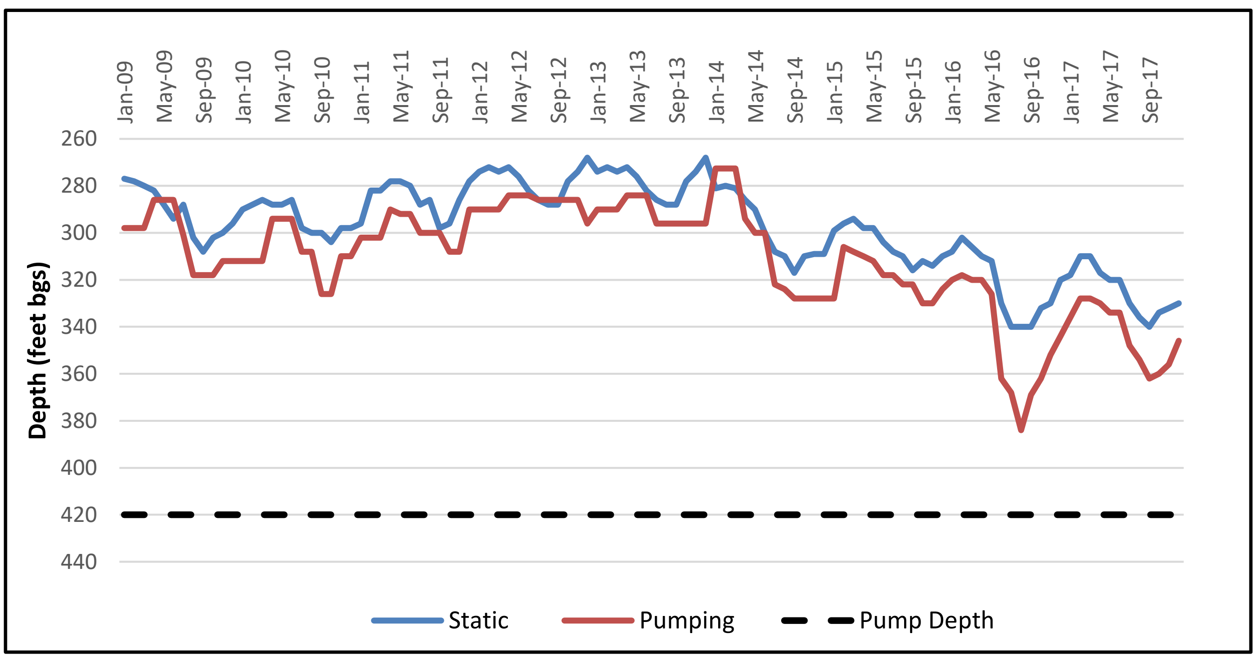


Figure 6 : Static and pumping groundwater levels for Well 8

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, the summer months of 2016 were the most critical time for the system. The 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).

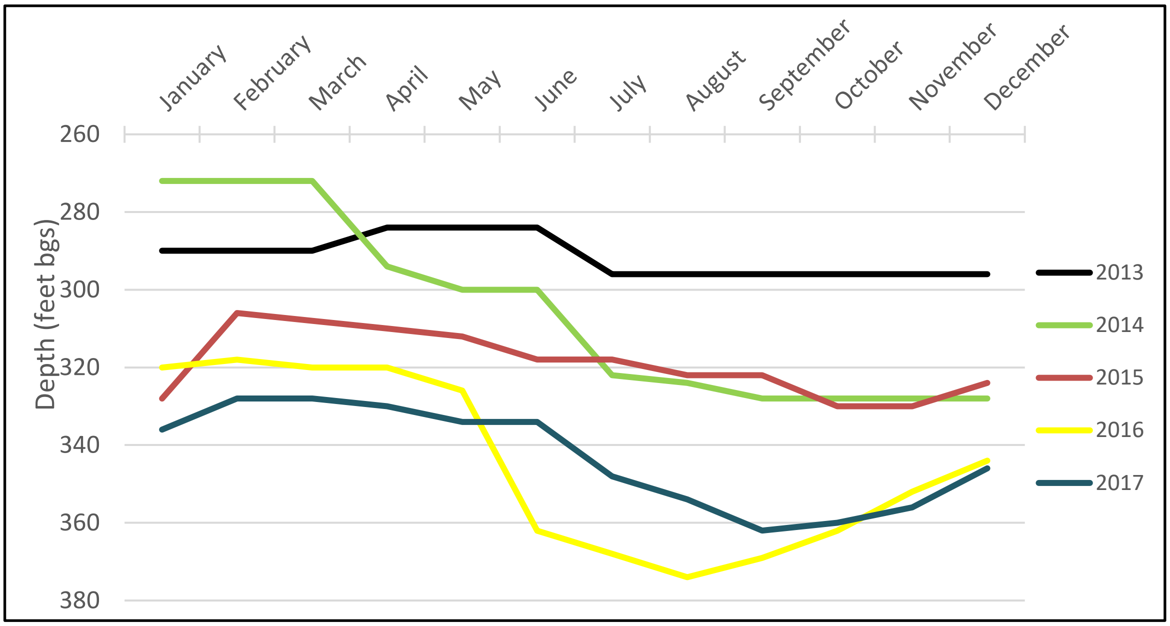


Figure 7 : Pumping water levels for Well 8

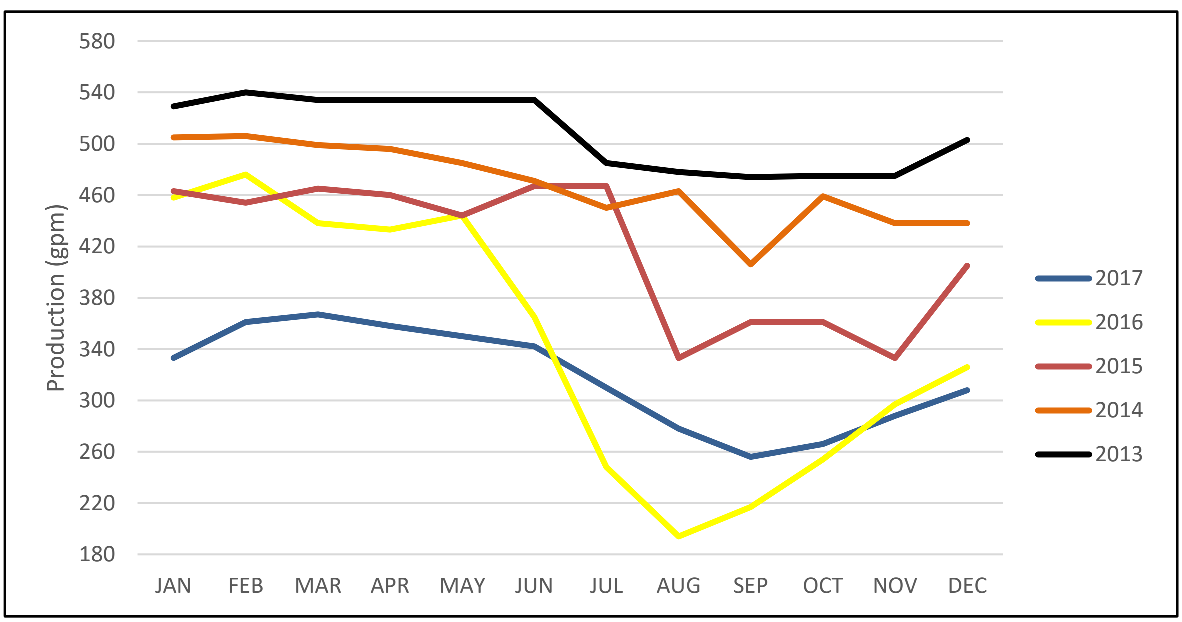


Figure 8 : Production from Well 8 from 2013 – 2017

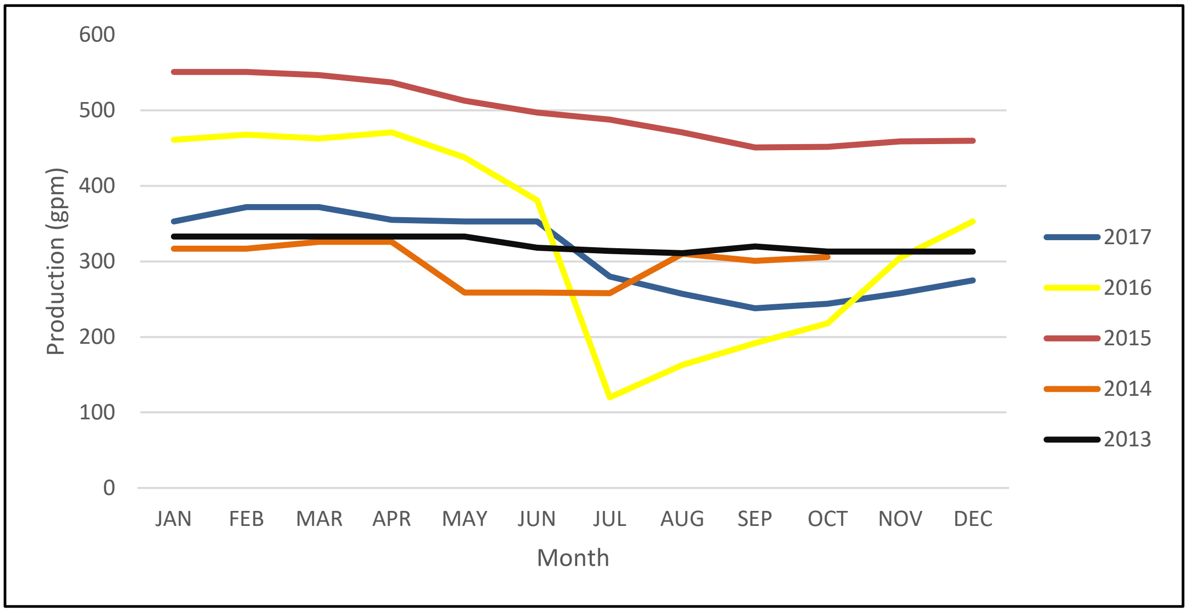


Figure 9 : Production from Well 5, 2013 - 2017

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 simultaneously.

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 level for this well continues 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 pumping capacity of SCWC in September, 2018 was 650 gpm.

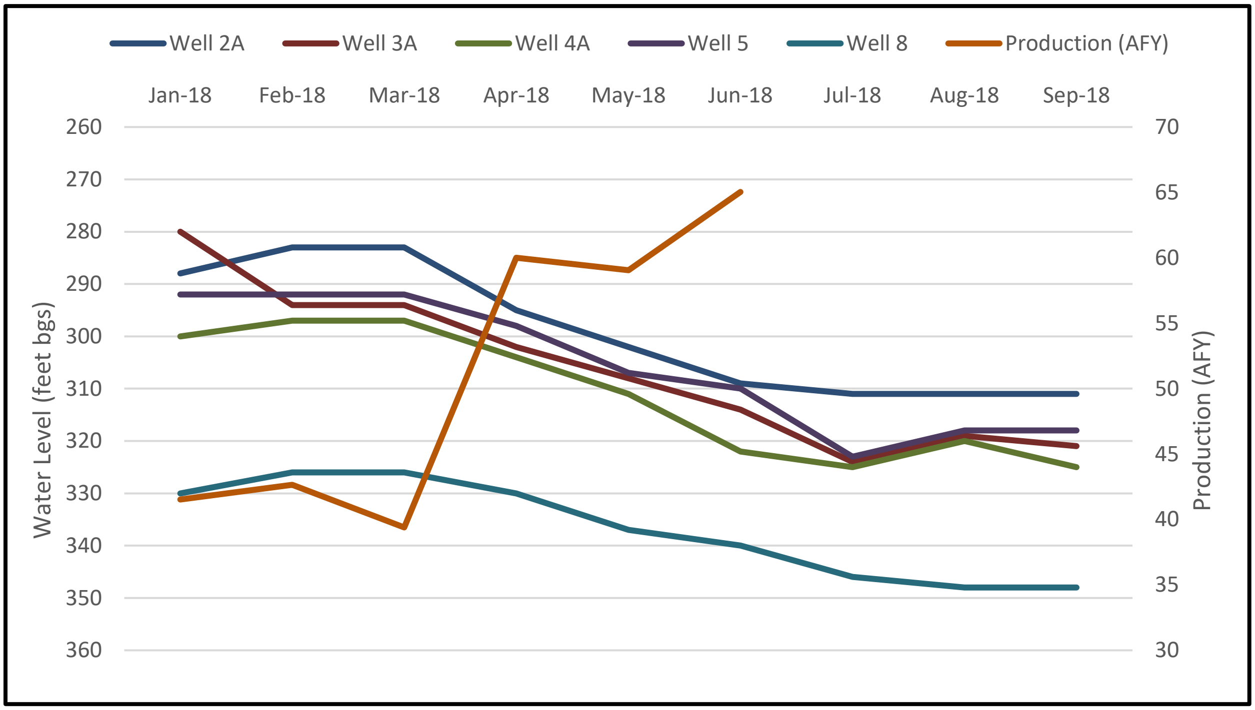


Figure 10: Static water levels for all wells and total system production in 2018

In response to the declining pumping capacity, SCWC has repeatedly reduced allotted water supply for their 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, a significant percentage of customer water meters are beyond their useful service lives, 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. 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. It was determined that minimum pipe size should be of 8-inch if the fire flow requirement is to be met.

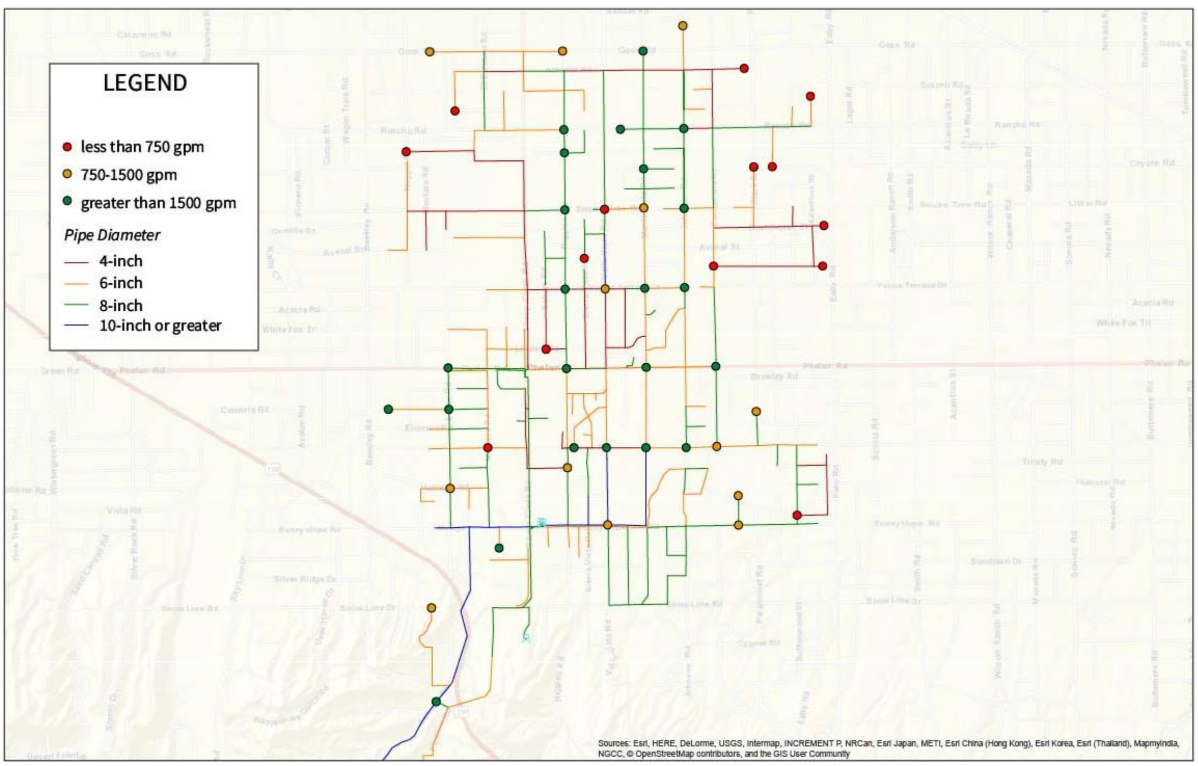


Figure 12: Fire flow inadequacies in distribution system

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.

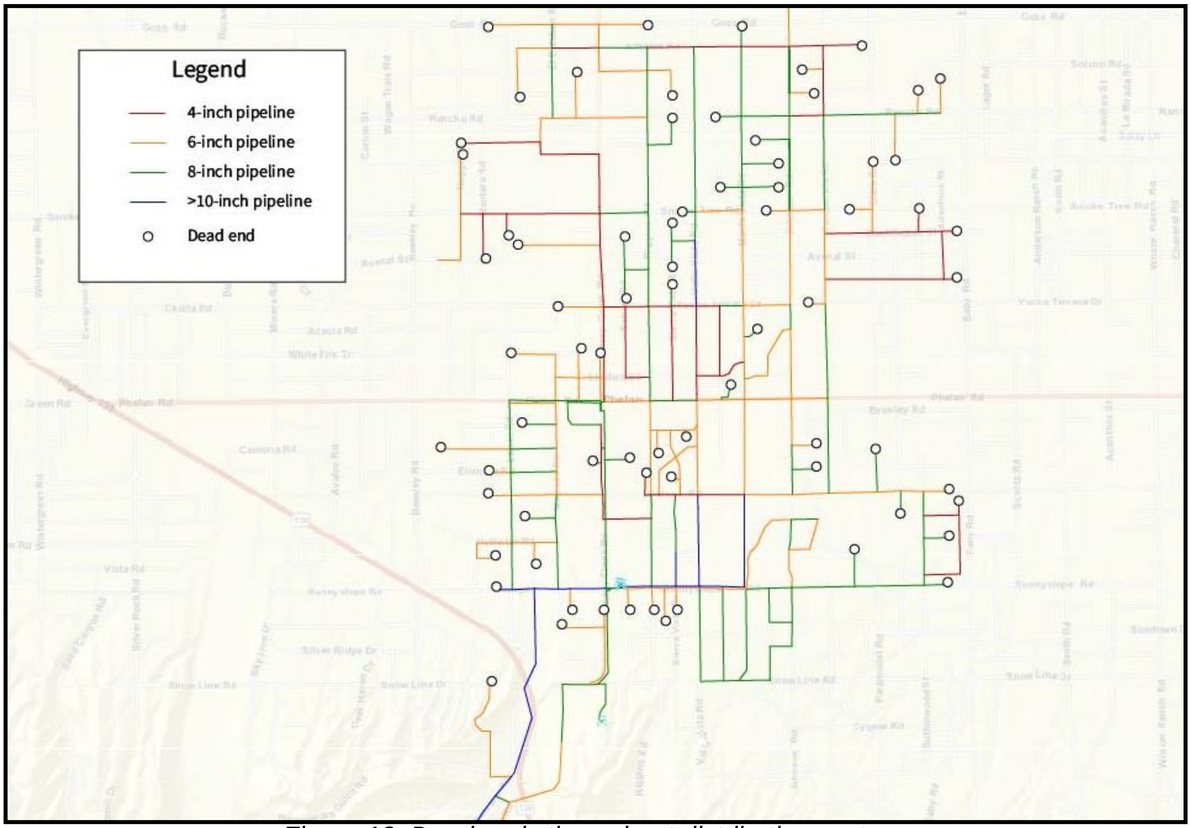


Figure 13: Dead ends throughout distribution system

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

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.

B.3 – Insufficient Supply Pressures

Problem Ranking: 3

The service area around Storage Tank 6 experiences inadequate pressures during periods of low production.

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 pressure 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.

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.

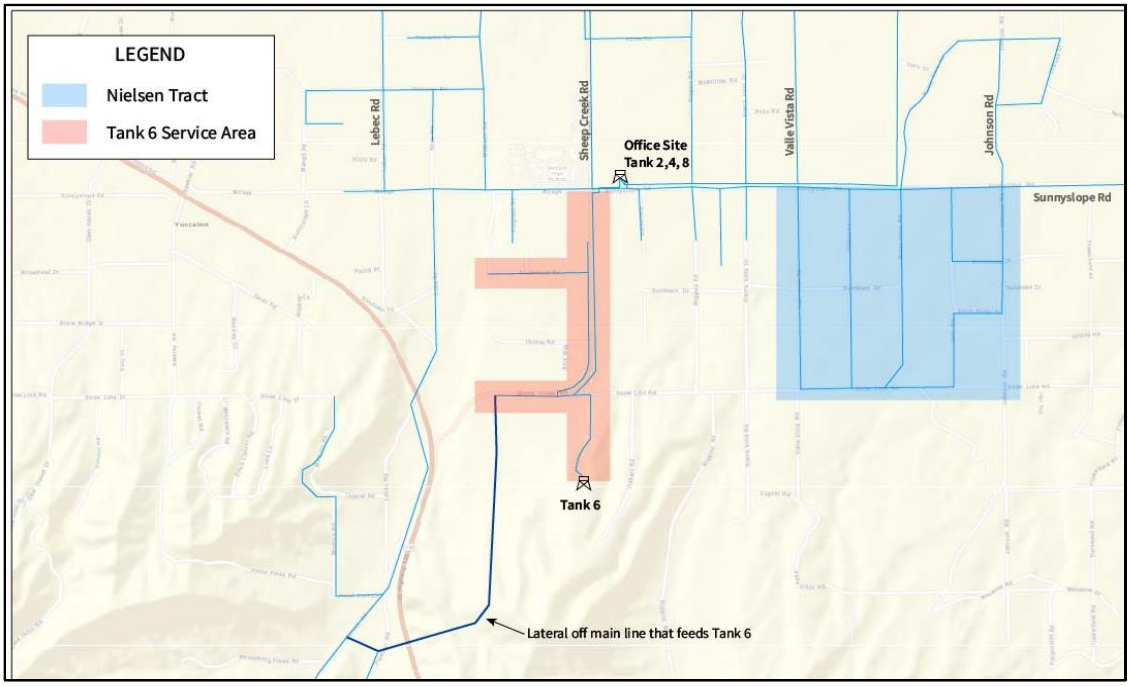


Figure 14: Areas of concern for delivery pressure

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 pressure from 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. The tanks were inspected as part of the investigations conducted for this report. The 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, which can lead to stagnation and depletion of the chlorine residual resulting in microbial growth, as well as taste and odor issues. Although, currently there are no known issues within the system due to lack of circulation, it is recommended that mixers be installed inside all of the tanks. In the interim, the system should monitor chlorine residual in the tank effluent daily to continue to avoid any bacteriological growth within the tanks.

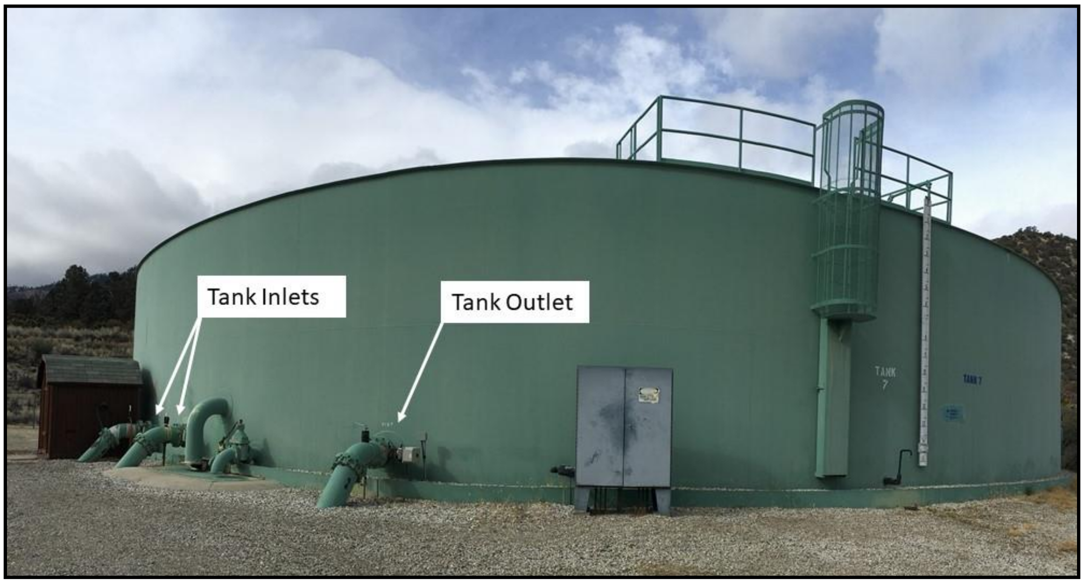


Figure 16: Tank 7 - inlets and outlet

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 for extended periods of time, increasing the extent of damage caused and the remedial action required to fix it. A central control and monitoring system would 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 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. It is recommended that more frequent operational checks be implemented in the interim.

C. ALTERNATIVE SOLUTIONS

Describe the Analysis of alternatives. Include all possible alternative(s) to be considered to correct the ranked problems described above. Provide cost estimates for all alternatives considered including cost to customers and environmental impacts. Include the feasibility of consolidation with one or more water systems.

Overall reliability and efficiency of the SCWC system can be improved with the upgrades discussed in Section B. However, the most critical issue facing SCWC is lack of adequate source capacity to serve its customers. The compliance order issued by DDW requires that this deficiency should be addressed in an expedited fashion and additional water sources secured. DFA has communicated to CRWA that this issue should be prioritized over other system upgrades. Therefore, the solutions proposed below focus only on alternative approaches for augmenting SCWC's water supply. Additional recommended system improvements and associated costs are discussed in Section C.5 for potential implementation in a future funding project.

The following are three alternatives to address SCWC's source capacity issue.

Alternative 1 – No Action

Alternative 2 – Drill New Wells

Alternative 3 – Consolidation

C.1 – Alternative 1 – No Action

This is not a feasible alternative since this issue needs urgent attention. The system has received a citation from SWRCB and is required to take immediate steps to increase source capacity. Hence, this alternative is not considered feasible.

Environmental Impact: There are no environmental impacts of this alternative.

C.2 – Alternative 2 – Drill New Wells

SCWC's water production has been declining as water levels in its well field and water tunnel located in Swarthout Canyon have continued to decline for the past several years. The decline in water levels can be attributed to the lack of snow pack and sufficient precipitation in the region. In addition, 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). SCWC was mandated to identify alternatives for increasing source capacity to meet the MDD and bring the system back into compliance.

SCWC has been working to secure additional source of supply for the community 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), was developed in Fall, 2018, and has a rated capacity of 250 gpm. 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.

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 included in the hydrogeological evaluation (Appendix G).

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 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.

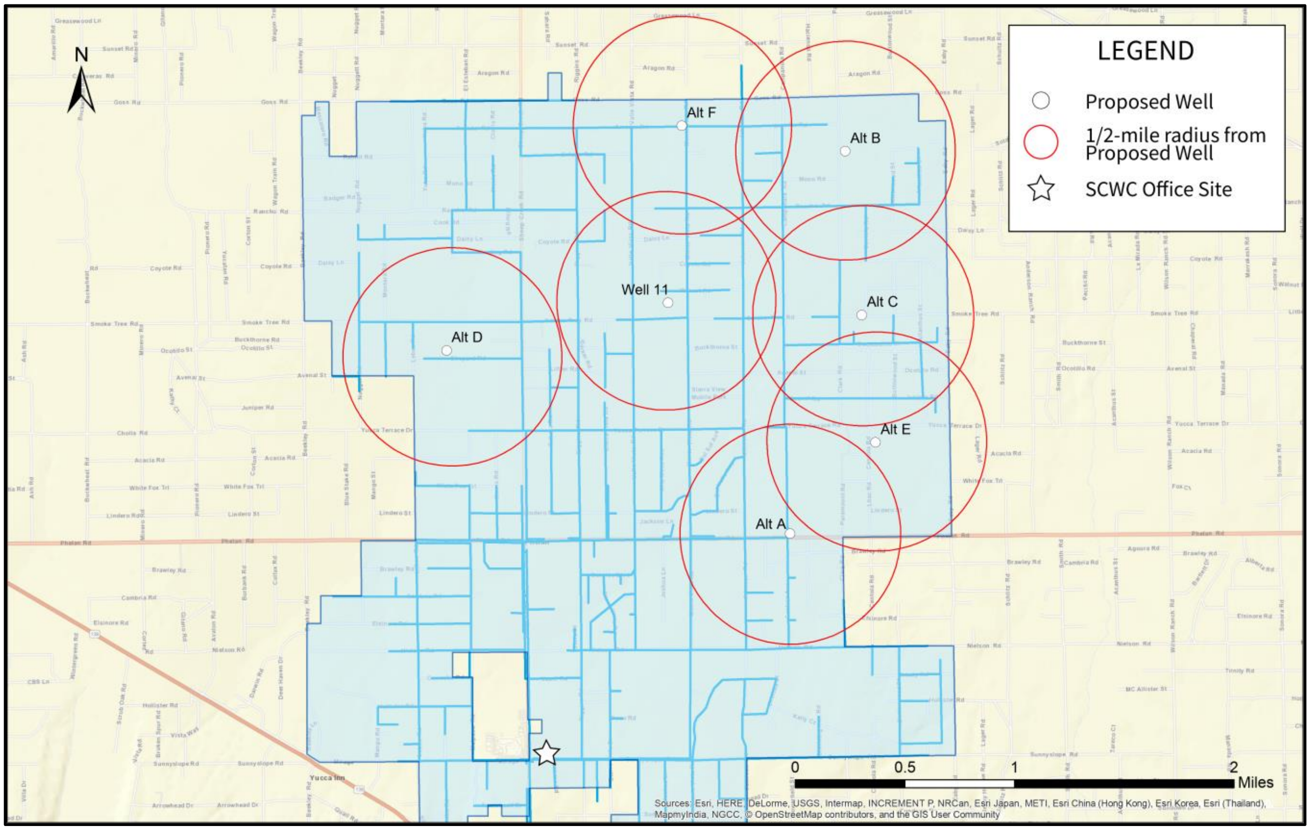


Figure 17: Locations of proposed alternatives for drilling additional wells

A preliminary cost estimate for the development of new wells is presented in Table 7. 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 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.

Further, in order to determine affordability of performing these upgrades for SCWC customers, project cost is apportioned per connection and per share over a 30-year period. The 2018/19 Drinking Water

State Revolving Fund (DWSRF) Intended Use Plan (IUP) classifies SCWC as a Small Community Water System (SCWS – less than 3,300 service connections and a yearlong population of less than 10,000 residents). Based on information provided in Tables 8 and 9 of the IUP and preliminary eligibility information available at this time, SCWC may qualify for a principal forgiveness/ grant up to $5M to drill the new wells. The remaining project cost may be funded through a zero-interest DWSRF loan with a maximum financial term of 30 years. O&M costs over this period were estimated to increase at an inflationary rate of 3%.

In addition, increase in water demand was estimated based on growth projections for this community over the next 30 years. Since no other studies are available for this area at this time, growth forecasts per PPHCSD's 2015 Urban Water Management Plan (UWMP) were used. The UWMP forecasts an annual growth rate of 2 – 3% for the community of Phelan. This rate is not consistent with SCWC's service area historical growth patterns. Therefore, an adjusted growth rate was calculated in proportion to the ratio of service areas of the two systems. This was used to estimate the increase in annual water demand and the corresponding rise in O&M costs for the system.

Area served by PPHCSD = 128 square miles

Area served by SCWC = 11 square miles

Ratio of service areas = 0.086

Adjusted annual growth rate = 2% * 0.086 = 0.17%

Table 7: Preliminary cost estimate for drilling new wells

Item	Qty	Unit	Unit Cost	Total Cost
New Supply Wells - Preliminary Review through Pilot Borings	1	Lump Sum	$600,000	$600,000
Final Well Design and Construction	3	Lump Sum	$703,000	$2,109,000
Pipelines to connect new wells	10,400	Linear feet	$100	$1,040,000
Subtotal - Construction Cost Estimates				**$3,749,000**
Estimated Design, Environmental and Inspection Cost				
Final Design (% of Construction Cost)	10%	Lump Sum	$ 374,900	$ 374,900
Environmental (% of Construction Cost)	10%	Lump Sum	$ 374,900	$ 374,900
CM, Inspection (% of Construction Cost)	10%	Lump Sum	$ 374,900	$ 374,900
Contingency (% of Construction Cost)	25%	Lump Sum	$ 937,250	$ 937,250
Subtotal - Miscellaneous Cost Estimates				**$2,062,000**
Total Estimated Project Cost				**$ 5,811,000**[1]
Annual Operation and Maintenance Costs for New Wells				
Annual Electrical Cost	1	Lump Sum	$ 31,000	$ 31,000
Purchase of Water	80	$/AF	$ 700[2]	$ 56,000
Misc parts and maintenance		Lump Sum		$10,000
Annual O&M Cost				**$ 97,000**[1,2]
DWSRF Principal Forgiveness/Grant				$5,000,000
DWSRF Remaining Loan				$ 811,000
Duration (yrs)				30
DWSRF Interest Rate				0%
Annual Cost (Capital – Debt Service)				$ 27,033[1]
Annual Cost (O&M)				$ 97,000[1]
Total Annual Project Cost				$ 124,033[1]
Annual cost per share				$ 15.50[1]
Annual cost per connection				$ 89.43[1]
Monthly cost per share estimate (8,000 shares)				**$ 1.29**[1]
Monthly cost per connection estimate (1,387 connections)				**$ 7.45**[1]

Notes:
[1] Cost based on November, 2018 estimates
[2] Based on Mojave Water Agency's water recharge rate of $600-800/AF

Figure 18 shows the forecasted positive and negative cash flows generated for SCWC based on this analysis.

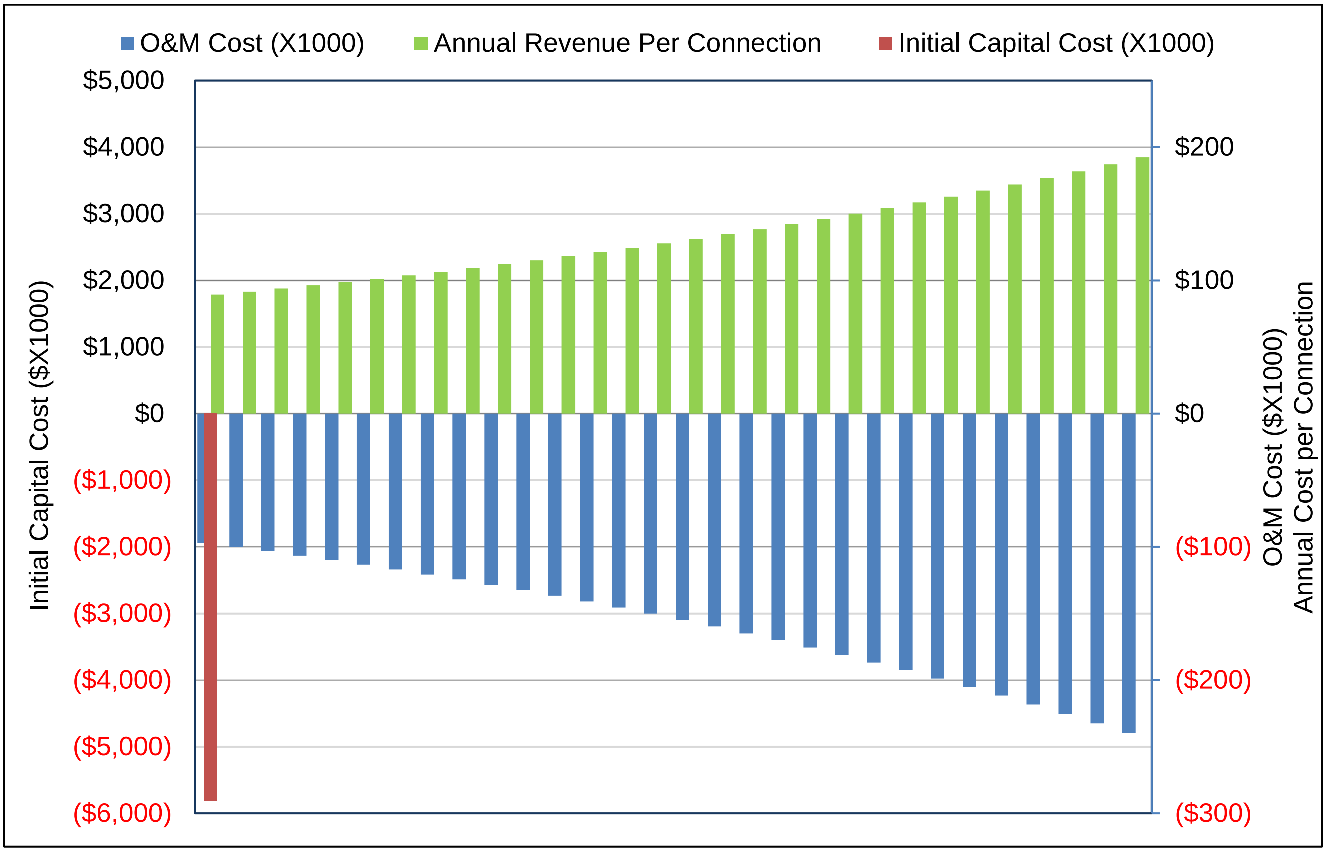


Figure 18: Positive and Negative Cash Flow forecast for SCWC for 30 years

The environmental impact of drilling new wells will need to be investigated but is expected to be minimal since there are no known biological or cultural resources in the area. It is assumed that an Initial Study/ Mitigated Negative Declaration will be the appropriate document to satisfy the requirements of the California Environmental Quality Act (CEQA) compliance and federal cross cutter environmental documentation requirements for this project.

C.3 – Alternative 3 - Consolidation

A Preliminary Consolidation Report was prepared in May, 2018 (Appendix K) 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. A 12-inch emergency inter-connection between the two systems has been in place since December 2009, which allows transfer of up to 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 over the years. Figure 19 shows the service areas for the two systems and their respective distribution systems and facilities.

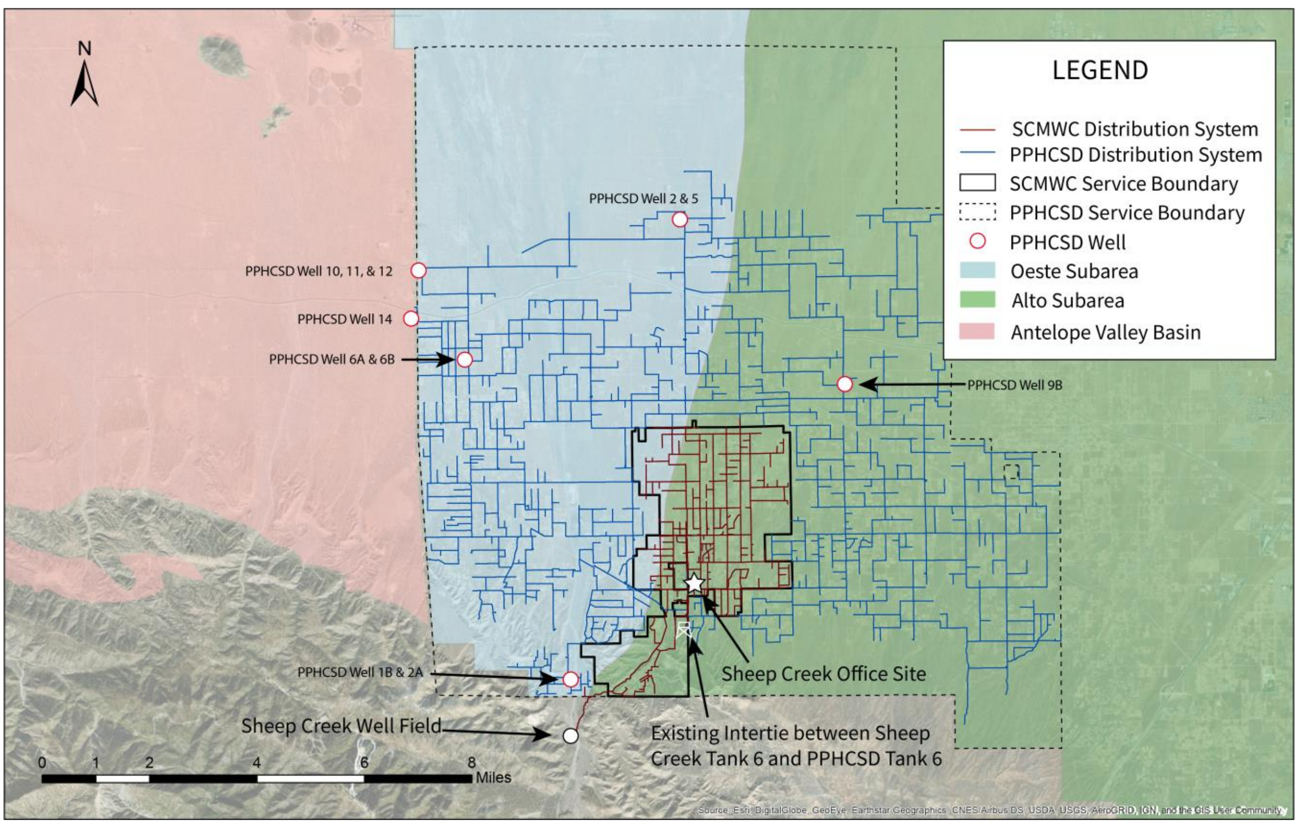


Figure 19: PPHCSD and Sheep Creek distribution systems

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 8 shows the details of water wells and other sources of supply for the CSD.

Table 8: 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	New dairy wells, pending construction	None	Offline
Center well		500		None	Offline
Dairy Corner		150		None	Offline
Total		**3,854**	**For all active wells**		
Victorville WD	**Emergency Interties**	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**		

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.

C.3.2 Water Demand

Section 64554 of the CCR states that production capacity in the same month as the MDD should be used to determine compliance with regulation. The total production capacity of SCWC in July, 2018 was 720,000 gpd (500 gpm). Combined with a production capacity of 250 gpm from Well 11, the total production capacity of SCWC is estimated to be 750 gpm (1.08 MGD).

The current MDD and production capacity of each system is as follows:

- Current MDD for PPHCSD = 3.8 MGD (2,639 gpm)
- Current MDD for SCWC = 1.78 MGD (1,236 gpm)
- Total MDD for consolidated system = 5.58 MGD (3,875 gpm)
- Production capacity for PPHCSD = 5.55 MGD (3,854 gpm)
- Production capacity for PPHCSD with Well 14 (largest well) offline = 4.49 MGD (3,854 gpm)
- Production capacity for SCWC = 1.08 MGD (750 gpm)
- Total production capacity for consolidated system (with largest well offline) = 5.57 MGD (3,869 gpm)

Thus, the consolidated system will have adequate raw water production capacity to meet the combined MDD without the need to drill any additional wells.

Table 9 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 9: 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 8) 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. The estimated cost to improve the wells and construct a conveyance pipeline for the blending project is approximately $17 million.

Currently, the blending project is suspended until a new regulatory limit for Hexavalent Chrome is established. PPHCSD has completed the necessary preliminary planning to implement a blending project to achieve compliance with 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.

The Consumer Confidence Report for the year 2017 is included in Appendix L.

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. Preliminary hydraulic analysis of SCWC system around Tank 6 shows that a booster pump station should be sufficient to meet the average daily demand of the surrounding area. However, at the time of consolidation, a detailed hydraulic analysis of the combined system should be performed to ensure that storage is adequate to meet diurnal demand patterns as well as fire flow requirements in the area.

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.

Table 10 presents a cost estimate for establishing these connections.

Table 10: 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				**$486,000**
Final Design (% of Construction Cost)	10%	Lump Sum	$48,600	$48,600
CM, Inspection (% of Construction Cost)	10%	Lump Sum	$48,600	$48,600
Contingency (% of Construction Cost)	25%	Lump Sum	$121,500	$121,500
Subtotal – Miscellaneous Cost				**$218,700**
Total Project Cost				**$705,000**

Figure 20 shows the proposed connection points.

Environmental impacts of laying out these pipelines to connect the two systems are considered minimal because the new appurtenances will likely be installed on paved roads and previously disturbed areas within public right of way.

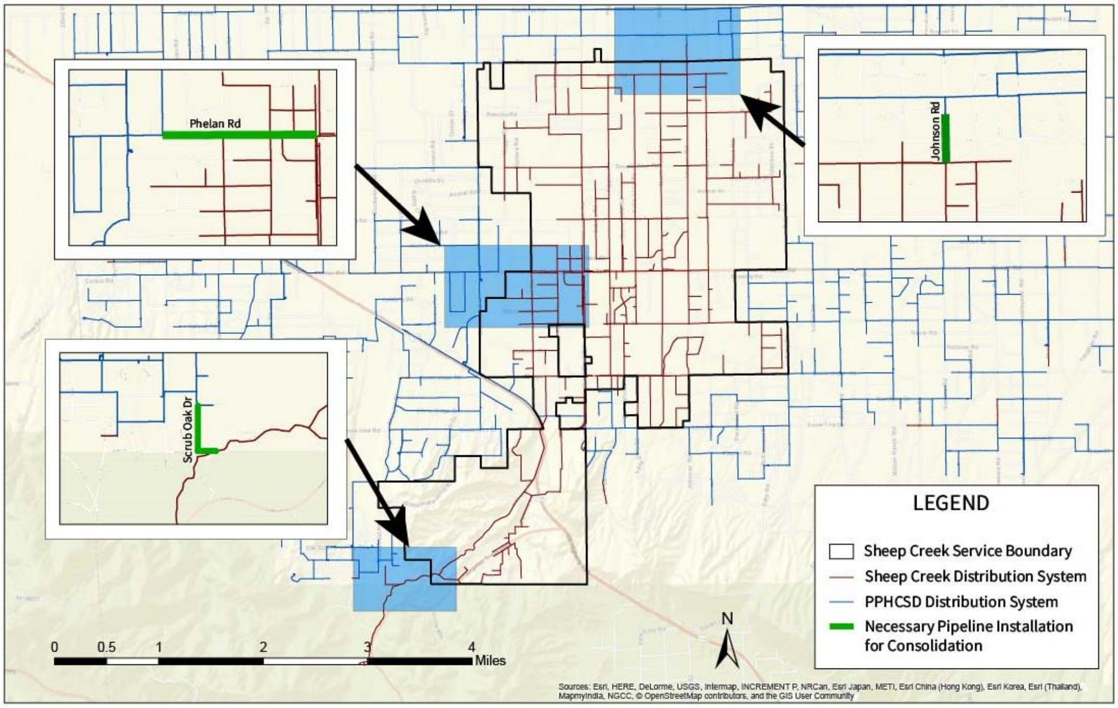


Figure 20: Connection points for consolidation

C.3.5 Infrastructure Improvements

As discussed previously in Section C.3.1, the consolidated system will have adequate production capacity to meet the MDD per Section 64554 of the CCR. Hence, no new wells will be needed at the time of consolidation. Additional piping is necessary to establish multiple connections between the two systems, and a new booster PS to transfer water between tanks would be necessary. Additionally, SCWC water meters will need to be upgraded to match the existing meter-reading and billing procedures within PPHCSD. Although the cost of meters to match PPHCSD existing infrastructure would need to be determined at the time of consolidation, a preliminary cost estimate for meter upgrades is presented in Section C.5.2.1.

Table 11 shows a cost estimate for improvements required in SCWC system at the time of consolidation. DFA has indicated that this consolidation project would be eligible for a principal forgiveness/grant of up to $5M (DFA comments from June 18, 2019 are included in the transmittal letter at the beginning of this report). Based on estimated project costs, it is inferred that there would be no financial impact on SCWC customers for this alternative, since all of the improvement costs are expected to be within $5M. There would be no additional O&M cost for new meters since it will be covered under PPHCSD's existing meter reading and billing system. The electrical cost for operating the booster PS would be a part of PPHCSD's overall O&M expense.

Potential environmental impacts of these upgrades are discussed within the respective sections in

Section C.3.4 and later in Section C.5.

Table 11: Cost estimate for infrastructure improvements for consolidation

Item	Qty	Unit	Unit Cost	Total Cost	Section Reference
Pipelines for Interconnection	4050	ft	$110	$ 445,500	C.3.4
New water meters	1	Lump Sum	$377,458	$ 377,458[1]	C.5.2.1
Booster PS	1	Lump Sum	$ 40,000	$40,000	C.5.3
Subtotal - Construction Cost Estimates				**$ 863,000**	
Estimated Design, Environmental and Inspection Cost					
Final Design (% of Construction Cost)	10%	Lump Sum	$86,346	$86,346	
Geotech and Surveying	1	Lump Sum	$50,000	$ 50,000	
Environmental Studies[2]	1	Lump Sum	$61,181	$ 61,181	
Funding Application[2]	1	Lump Sum	$14,136	$ 14,136	
CM, Inspection (% of Construction Cost)	10%	Lump Sum	$86,346	$86,346	
Contingency (% of Construction Cost)	25%	Lump Sum	$215,865	$215,865	
Subtotal – Miscellaneous Cost Estimates				**$514,000**	
Total Project Cost				**$1,377,000**	
DWSRF Principal Forgiveness/Grant				$1,377,000	
DWSRF Remaining Loan				$ 0	
Duration (yrs)				30	
Rate of interest				0%	
Annual Cost (Capital/O&M)				$ 0	
Total Annual Project Cost				$ 0	
Cost per share/connection				$ 0[4]	

Notes:
[1] Equipment cost to match PPHCSD's infrastructure may be different
[2] From TA Work Plan 5207-A
[3] Cost based on November, 2018 estimate
[4] This is an estimate of cost per connection owing to system improvements. Additional surcharges/costs may be applicable at the time of consolidation as determined by PPHCSD.

C.3.6 Consolidation Issues

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 hydraulic model should 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.

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. Consolidation between SCWC and PPHCSD would likely be a protracted process due to this complexity. A resolution of this issue is beyond the scope of this report.

The monthly water rate structure for SCWC customers post consolidation would need to be determined. PPHCSD customers have been paying a chromium surcharge of $9.71 on their monthly water bill since July 1, 2016. This pays the cost of preliminary engineering work performed in 2014/15 to meet the new chromium regulation proposed at the time. Similarly, SCWC is expected to impose a surcharge on its customers to pay for development of Well 11, although the payment structure would be decided through a shareholder vote to be held in August, 2019.

C.4 – Comparison of Alternatives

Table 12 presents a cost comparison of the two alternatives in terms of cost implications on SCWC customers. The calculation of monthly cost per connection was shown previously in Tables 7 and 11 for Alternatives 2 and 3 respectively.

Based on preliminary estimates shown below, monthly cost for SCWC customers may be lower with the consolidation alternative. Assumptions and exceptions are noted in Table 12.

Table 12: Monthly cost for customers for the two alternatives

ALTERNATIVE 2			ALTERNATIVE 3		
SCWC current ave monthly cost/connection	Estimated increase per connection following improvements[1]	Projected total monthly cost/connection	PPHCSD current ave monthly cost/connection	Estimated increase per connection following consolidation	Projected total monthly cost/connection
$ 58 - $ 60[1,2,3]	$ 7.45	$ 65 – $68	$ 57[4,5]	$ 0	$ 57[4,5]

Notes:

1. Monthly cost per connection (and not per share) is used for SCWC to provide a fair comparison between SCWC and PPHCSD costs.
2. This is the average monthly water bill for a customer, per data provided by SCWC. Since water allotment is determined by number of shares owned, customers with more shares may have high water usage but not a proportionately high water bill. Following consolidation with PPHCSD, billing will be determined by usage.
3. This comparison does not include a surcharge SCWC is expected to levy on its customers to pay for Well 11 development cost. The details of the surcharge would be decided by a shareholder vote scheduled for August, 2019.
4. This cost does not include a monthly chromium surcharge of $9.71 PPHCSD customers are currently paying. SCWC's share of this surcharge, if any, is undetermined at this stage.
5. PPHCSD implements rate increases every year. The actual monthly cost may be higher at the time of consolidation.

C.5 – Future Recommended Improvements

Additionally, CRWA recommends the following system upgrades to remediate deficiencies identified in the original Assistance Request and discussed in detail in Section B. These improvements are necessary to bring the system into regulatory compliance and support future sustainable operation. Owing to the urgency of source capacity deficiency, DFA has advised that the following upgrades be grouped into a separate project to be funded at a later time.

CRWA recommends that SCWC formalize a Capital Improvement Plan (CIP) in order to ensure that all of the necessary distribution system improvements now as well as in the future are scheduled in a timely manner and budgeted for appropriately.

In general, these improvements include:

- Rehabilitation of existing wells
- Fire hydrants and 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
- Replacement of undersized and aged-out pipes in the distribution system
- New SCADA system

C.5.1 – 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, a program of well rehabilitation for wells 2A, 3A and 4A can be implemented to restore production and extend life of these wells.

In general, the recommended rehabilitation of these wells includes:

1. Brush cleaning and acid treatment of the well casings.
2. Dual surge blocking to loosen mineral encrustations from screens and gravel packs.
3. Air lifting debris from wells

Detailed costs can be found in the hydrogeological report in Appendix G. An estimated cost for the rehabilitation work is also presented in Table 13.

SCWC has already completed rehabilitation of Wells 2A and 5. DFA is unlikely to fund remaining rehabilitation work, and hence these costs have not been included in the final cost estimate.

Table 13: Cost estimate for well rehabilitation	
Well ID	**Rehabilitation Cost**
3A	$62,500
4A	$62,500
8	$61,000
Total	**$186,000**

The environmental concerns of well rehabilitation would be minimal since all work will be performed on existing facilities within previously disturbed areas.

C.5.2 Distribution System Deficiencies

C.5.2.1 – 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 14.

Table 14: Budget estimate for replacement of water service meters

Item	Unit	Qty	Unit cost ($)	Total cost ($)
1" Ultrasonic Water Meter with Integral Radio	Ea	1,166	$ 303	$353,298
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*				**$377,000**
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**
Annual Operation and Maintenance Costs for Hosted Software System				
Hosted Ready Hosting Subscription Agreement (annual charge) After First Year	Ea	1	$ 1,531	$ 1,531
Annual O&M Cost				$ 1,531

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

The environmental impact of water meter replacement is considered minimal because the program will primarily replace existing facilities.

C.5.2.2 – 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 formalize a long-term plan to replace the remaining pipelines so adequate fire flow can be provided for the entire service area.

Figure 21 shows the recommended pipeline replacements. Cost estimates for these improvements are presented in Table 15.

Table 15: Cost estimate for replacement of distribution system pipelines

Item	Unit	Qty	Unit Cost	Total Cost
8-inch C900	Linear foot	25,500	$100	$2,550,000
PRVs	Lump Sum	5	$50,000	$250,000
Total Cost for all pipeline replacements				**$2,800,000**

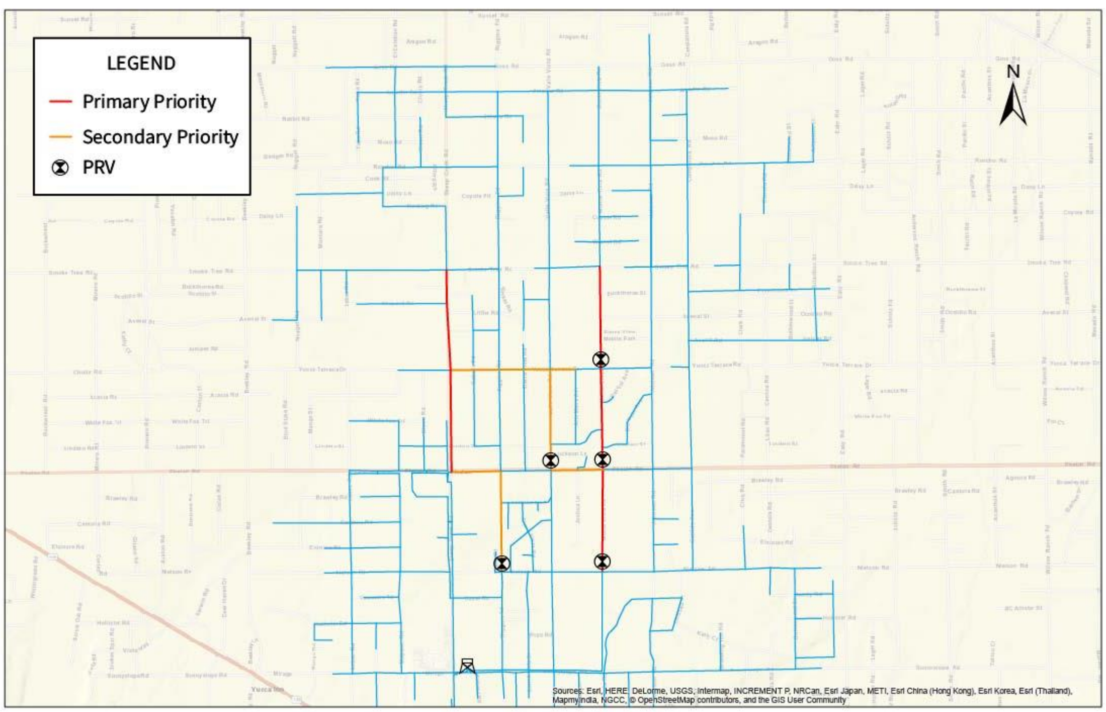


Figure 21: Replacement of distribution system pipelines

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 16.

Table 16: Budget for installing hydrants at dead ends

Item	Qty	Unit Cost	Total Cost
Hydrant	30	$6,500	**$195,000**

The environmental impacts of pipeline replacement and installation of new fire hydrants are considered minimal because the new appurtenances will likely be installed on paved roads and previously disturbed areas within public right of way.

C.5.3 – 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. The estimated budget is shown in Table 17.
The environmental impact of construction of a new pump station is considered minimal since all work will be performed at the office yard site within previously disturbed areas.

Table 17: Estimated budget for booster pump station

Item	Qty	Unit Cost	Total Cost
Booster PS	Lump Sum	$40,000	$40,000
Total Capital Budget			**$40,000**
Annual Operating and Maintenance Cost			
Power Cost	192,528[1] kW-hr	$ 0.10/kW-hr	**$19,253**
Maintenance and Repair		5%	**$ 2,000**
Annual O&M Cost			**$ 21,253**
Notes: [1] Based on flow and head estimations from the hydraulic model			

C.5.4 – Storage Tank Deficiencies

C.5.4.1 Tank Inspections

Recommendations for rehabilitation work to be conducted on tanks were made by ACE, Inc based on inspections conducted in October, 2018. Costs associated with rehabilitation as well as tank replacement are presented in the inspection report (Appendix F). Tables 18 summarizes the cost of rehabilitation for all tanks. It is recommended that annual inspections be included in SCWC system maintenance plan going forward.

The environmental impact of tank rehabilitation and/or replacement work is considered minimal since all work will be performed on existing structures and/or within the boundaries of previously disturbed areas.

Table 18: 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
	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	**$**	**1,023,700**

C.5.4.2 Tank Mixers

CRWA recommends installing tank mixers to maintain a uniform chlorine residual and temperature within the tanks, 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 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. Solar powered mixer, which is the preferred choice for this application, 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. Both types of mixers operate on a 0.5 hp motor. The initial equipment cost for a solar powered mixer is significantly higher than that for an electric mixer. The savings achieved in electrical cost are not significant enough to justify the selection of solar equipment in this case. Hence, electric mixers are recommended for this application. A detailed cost estimate, with costs for both type of equipment for comparison, is included in Table 19. A manufacturer's quote for representative equipment is included in Appendix I.

Table 19: 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				**$ 114,674**	**$ 216,541**
Total Budget - Capital Cost				**$ 115,000**	**$ 217,000**
Operation and Maintenance Costs					
Annual Electrical Cost	7	10 ¢/KW-hr	0	$ 4,906[1]	$ -
Misc. repair/service	5%			$ 2,064	$ 5,918
Annual O&M Cost				**$ 7,000**	**$ 6,000**

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

The environmental impact of these installations is considered minimal since mixers are installed within existing tanks without the need for any new construction.

C.5.5 – 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 and 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 20. A representative manufacturer's quote is included in Appendix J.

Table 20: Budget estimate for new SCADA system

Item	Unit	Qty	Unit cost ($)	Total Cost ($)
Hardware estimate for six pumps, seven storage tanks, two PRVs	Lump Sum	1	$ 65,656	$ 65,656
Start up and Technical Support				Included
Total Budget - Capital Cost				**$ 66,000**
Annual Operation and Maintenance Costs for Cloud Hosting				
Annual fee for cloud-based service	/mo	12	456	$ 5,500
Misc expense/Contingency		5%		$ 3,283
Annual O&M Cost				**$ 9,000**

The environmental impact of providing a SCADA system is considered minimal since all new instruments and probes will be installed for existing infrastructure. A cloud-based system, such as the one being proposed, operates on a wireless internet network and does not need any additional servers or power supplies. It has been shown to be considerably more power efficient when compared to a traditional SCADA system.

C.5.6 – Summary of Costs

Overall cost of these improvements is shown in Table 21. Cost per connection and per share is estimated based on the assumption principal forgiveness/grant of up to $5M would be provided to

SCWC for these improvements as indicated by DFA. The remaining project cost would be covered by a zero-interest loan with a loan duration of 30 years.

Table 21: Future recommended upgrades and preliminary cost estimates

Item	Qty	Unit	Unit Cost	Total Cost	Section Reference
New & Replacement Pipelines	25,500	Linear feet	$100	$ 2,550,000	C.5.1.2
PRVs	5	Lump Sum	$ 50,000	$ 250,000	C.5.1.2
Tank Improvements	1	Each	$ 1,023,700	$ 1,023,700	C.5.3.1
Tank Mixers	7	Lump Sum	Varies	$ 115,000	C.5.3.2
SCADA Improvements	1	Lump Sum	$ 66,000	$ 66,000	C.5.4
Booster Pump Station	400	gpm	$ 100/gpm	$ 40,000	C.5.2
Replace all meters	1	Lump Sum	$ 377,458	$ 377,458	C.5.1.1
Subtotal - Construction Cost Estimates				**$ 4,422,000**	
Estimated Design, Environmental and Inspection Cost					
Final Design (% of Construction Cost)	10%	Lump Sum	$ 442,200	$ 442,200	
Geotech and Surveying	1	Lump Sum	$ 50,000	$ 50,000	
Environmental Studies	1	Lump Sum	$ 61,181	$ 61,181	
Funding Application	1	Lump Sum	$ 14,136	$ 14,136	
CM, Inspection (% of Construction Cost)	10%	Lump Sum	$ 442,200	$ 442,000	
Contingency (% of Construction Cost)	25%	Lump Sum	$ 1,105,000	$ 1,105,000	
Subtotal – Miscellaneous Cost Estimates				**$ 2,116,000**	
Total Estimated Project Cost				**$ 6,538,000[1]**	
DWSRF Principal Forgiveness/Grant				$ 5,000,000	
DWSRF Remaining Loan				$ 1,538,000	
Duration (yrs)				30	
DWSRF Interest Rate				0%	
Annual Cost (Capital – Debt Service)				$ 51,260[1]	
Annual Cost (O&M)				$ 38,784[1]	
Total Annual Project Cost				$ 90,044[1]	
Annual cost per share				$ 11.26[1]	
Annual cost per connection				$ 64.92[1]	
Monthly cost per share estimate (8,000 shares)				**$ 0.94[1]**	
Monthly cost per connection estimate (1,387 connections)				**$ 5.41[1]**	
Current monthly cost per connection				$ 58[1] – $ 60[1]	
Projected monthly cost per connection (current cost + cost due to improvements)				$ 63[1] – $ 65[1]	
Notes: [1] Cost based on November, 2018 estimates					

Should SCWC and PPHCSD consolidate, these improvements would be required to ensure that the resulting water company would be dependable and efficient. As discussed previously in Section C.3.5, it is expected that all existing SCWC water meters would be replaced and a new booster pump station would be installed at the time of consolidation. The remaining improvements in SCWC system may be funded in a follow up project through a DWSRF loan with the same financing conditions as discussed before (principal forgiveness/grant of up to $5M and a zero-interest loan of 30 years for the remaining project cost). Project cost and financial impact on rate payers is shown in Table 22.

Table 22: Cost estimate for future recommended infrastructure improvements for consolidation

Item	Qty	Unit	Unit Cost	Total Cost
All Improvements from Table 21 except water meters and booster PS				$ 4,004,000[1]
Estimated Design, Environmental and Inspection Cost				
Final Design (% of Construction Cost)	10%	Lump Sum	$ 400,400	$ 400,400
Geotech and Surveying	1	Lump Sum	$50,000	$ 50,000
Environmental Studies[1]	1	Lump Sum	$61,181	$ 61,181
Funding Application[1]	1	Lump Sum	$14,136	$ 14,136
CM, Inspection (% of Construction Cost)	10%	Lump Sum	$ 400,400	$ 400,400
Contingency (% of Construction Cost)	25%	Lump Sum	$1,001,000	$ 1,001,000
Subtotal – Miscellaneous Cost Estimate				**$ 1,928,000**
Total Estimated Project Cost				**$ 5,932,000[2]**
DWSRF Principal Forgiveness/Grant				$ 5,000,000
DWSRF Remaining Loan				$ 932,000
Duration (yrs)				30
Rate of interest				0%
Annual Cost (Capital)				$ 31,078[2]
Annual Cost (O&M)				$16,000[2]
Total Annual Project Cost				$ 47,078[2]
Annual cost per share				$ 5.88[2]
Annual cost per connection				$ 33.94[2]
Monthly cost per share estimate (8,000 shares)				**$ 0.49[2]**
Monthly cost per connection estimate (1,387 connections)				**$ 2.83[2]**
Current monthly cost per connection for PPHCSD				$ 66[2]
Projected monthly cost per connection (current cost + cost due to improvements)				$ 66[2] – $ 69[2]

Notes:
[1] Equipment cost to match PPHCSD's infrastructure may be different
[2] Cost based on November, 2018 estimates

D. SELECTED PROJECT

D. SELECTED PROJECT

Describe the proposed project and identify all major components. 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.

Consolidation of PPHCSD and SCWC offers the greatest opportunity to provide long-term resiliency and sustainability for both SCWC and PPHCSD customers, and is the recommended alternative for this project. A principal forgiveness/grant funding of up to $5M may be provided by SWRCB for this consolidation project, with additional monies available in the form of a zero-percent loan. Such funding would be sufficient to cover the expense of consolidation, and consequently no addition assessment for SCWC rate payers.

Following consolidation, the storage and operational infrastructure improvements described above in Section C.5 can be pursued through a separate funding project. These upgrades would be needed for SCWC to fully utilize PPHCSD's water and to ensure that the surviving water company can be resilient, dependable and safe.

Following is a brief overall summary of recommended improvements for Alternative 3.

- **Restore source capacity**: As discussed previously, PPHCSD already has the necessary source capacity to meet the MDD of the combined system. Multiple connections will be established between the two systems to allow transfer of water to SCWC.
- **Booster PS**: A new booster pump station will be needed to enable transfer to water from PPHCSD system to SCWC. It will also boost service pressure in parts of the distribution system where service pressure is currently low.
- **New water meters:** New water meters should also be installed at the time of consolidation to match PPHCSD's existing meter reading and billing infrastructure.

The remaining upgrades can be accomplished in a separate funding project as summarized below.

- **Rehabilitate existing wells:** Rehabilitation of existing wells would restore pumping capacity.
- **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. 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 integrate SCWC infrastructure with PPHCSD and enable remote control and monitoring of equipment, as well as data acquisition.

- **Improve fire flows**: Undersized pipelines should be replaced in order to improve fire flows throughout the SCWC service area.

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 estimated to be $1,377,000 for consolidation project. (based on November, 2018 estimates).
2. The eligible project cost for DFA funding is $1,377,000.
3. The annual increase in operations/maintenance cost is estimated to be $21,000.

The Scope of Work for the consolidation project is presented below.

Scope of Work – Consolidation Project
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 Establish Pipeline Connections 1. Confirm location and size of pipelines to be replaced. 2. Obtain and review all record drawings for sections where replacements will be performed. 3. Perform a topographic survey of project area. Prepare plan and profile sheet. 4. Perform geotechnical investigation of pipeline routing. Obtain all necessary permits and right-of-way easements, including CEQA 5. Prepare bid documents (bid solicitation, construction plans and specifications), and cost estimate
Task 3 New Booster Pump Station 1. Determine flow and head for booster pumps based on hydraulic model, select pumps 2. Determine operating criteria and control strategy 3. Perform a topographic survey of project area. Prepare plan and profile sheet. 4. Perform geotechnical investigation of pipeline routing, if needed. Obtain all necessary permits and right-of-way easements, including CEQA 5. Prepare bid documents (bid solicitation, construction plans and specifications) and cost estimate
Task 4 Replace Water Meters 1. Determine type of meters to be installed to match PPHCSD current meter reading and billing practices. 2. Prepare bid documents (bid solicitation, construction plans and specifications) and cost estimate

PROJECT BUDGET SHEET
Sheep Creek Water Company
Project No. [5207-A]

The following upgrades are proposed for this project.

- Construct pipelines to establish interconnection between the two systems
- Construct new booster pump station to enable transfer of water
- System wide service water meter replacement to match PPHCSD infrastructure

Detailed cost estimate is presented below.

Cost estimate for consolidation project					
Item	**Qty**	**Unit**	**Unit Cost**	**Total Cost**	**Section Reference**
Pipelines for Interconnection	4050	ft	$110	$ 445,500	C.3.4
New water meters	1	Lump Sum	$377,458	$ 377,458[1]	C.5.1.1
Booster PS	1	Lump Sum	$ 40,000	$40,000	C.5.2
Subtotal - Construction Cost Estimates				**$ 863,000**	
Estimated Design, Environmental and Inspection Cost					
Final Design (% of Construction Cost)	10%	Lump Sum	$86,346	$86,346	
Geotech and Surveying	1	Lump Sum	$50,000	$ 50,000	
Environmental Studies[2]	1	Lump Sum	$61,181	$ 61,181	
Funding Application[2]	1	Lump Sum	$14,136	$ 14,136	
CM, Inspection (% of Construction Cost)	10%	Lump Sum	$86,346	$86,346	
Contingency (% of Construction Cost)	25%	Lump Sum	$215,865	$215,865	
Subtotal – Miscellaneous Cost Estimates				**$514,000**	
Total Project Cost				**$1,377,000**	
DWSRF Principal Forgiveness/Grant				$1,377,000	
DWSRF Remaining Loan				$ 0	
Duration (yrs)				30	
Rate of interest				0%	
Annual Cost (Capital/O&M)				$ 0	
Total Annual Project Cost				$ 0	
Cost per share/connection				$ 0[4]	

Notes:
[1] Equipment cost to match PPHCSD's infrastructure may be different
[2] From work plan
[3] Cost based on November, 2018 estimate
[4] This is an estimate of cost per connection owing to system improvements. Additional surcharges/costs may be applicable at the time of consolidation as determined by PPHCSD.

E. PROPOSED SCHEDULE

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

The proposed schedule is dependent on the alternative that is preferred by SWRCB. If it is determined that the improvements described in Alternative 3 are the desired course of action, environmental clearance, project development (engineering) and construction would be the major milestones.

The environmental impact of these system improvements is expected to be minimal since all work will be performed within previously disturbed areas (city streets, office yard site, storage tanks, etc.) and covered under Title 14, Chapter 3, Article 19 - Categorical Exemptions for California Environmental Quality Act (CEQA).

Major Milestone	Duration
Environmental documents for CEQA and NEPA	1 – 3 months from funding agreement execution
Engineering for recommended improvements	6 – 12 months from funding agreement execution
Construction for recommended improvements	21 – 36 months from funding agreement execution

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
☐	Consolidation Evaluation – Sheep Creek Water Company
☐	PPHCSD Consumer Confidence Report – 2017
☐	DFA Comments to Preliminary Engineering Report

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	
File No.	Field	PHELAN	
	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		

<<< Fold Here >>>

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			References			Results	
	Zero	Cal		Zero	Cal		Gain	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			References			Results	
	Zero	Cal		Zero	Cal		Gain	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			References			Results	
	Zero	Cal		Zero	Cal		Gain	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			Cal		
	Before	After		Before	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

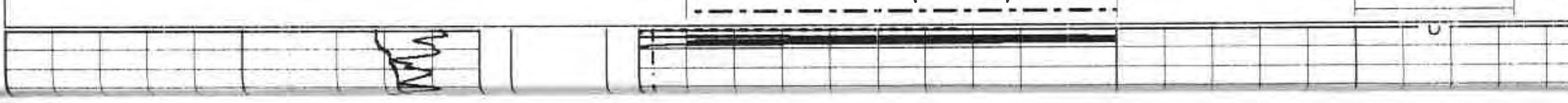
-160	SP (mV)	40
70	Gamma-Ray (GAPI)	170

0	RSN (Ohm-m)	200
0	RLN (Ohm-m)	200
0	RMF (Ohm-m)	200
200	RSN X 10 (Ohm-m)	2000
200	RLN X 10 (Ohm-m)	2000

0	SPR (Ohm-m)	10

Cwa 5000 (uS/cm)

Cwa (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

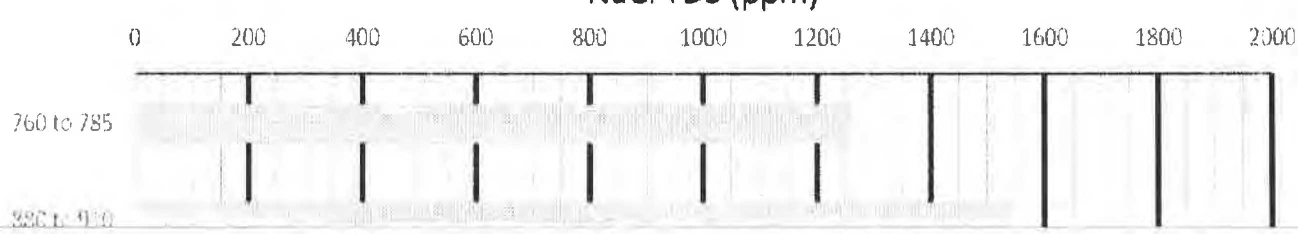
Company: Layne
Well: Sheep Creek Water Well 11
Field: Phelan
State: CA

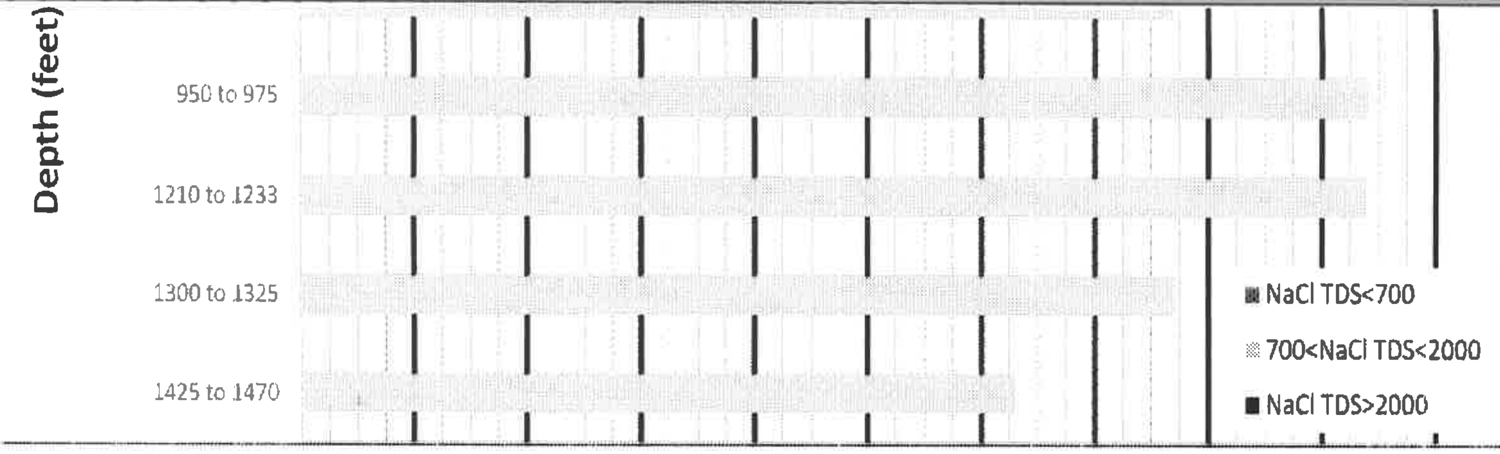
Date: 17-Apr-18
Run: One
Job Ticket: 24077
Total Depth: 1,519 ft

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: 47.[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				W

Latitude Deg/Min/Sec | Longitude Deg/Min/Sec

TRS:

APN:

Presite Done on 2/28/18

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" / '

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.)

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 on a separate paper: 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	X [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:	2080030350
☐ 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: [initials]	Received By: [initials]	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:

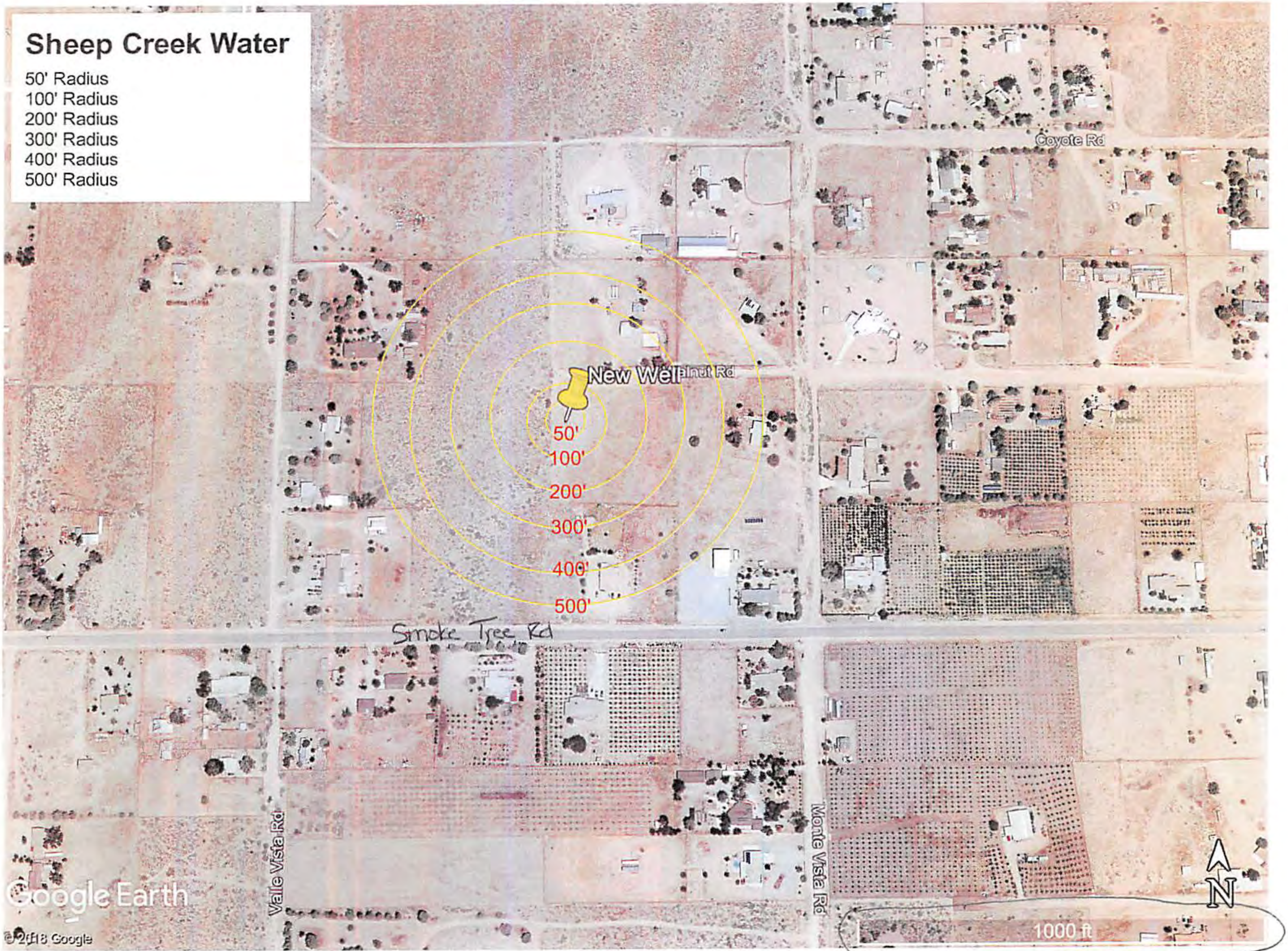
1. With a Bucket Rig, drill a 42" diameter borehole and install a 30" low carbon steel .375" wall thickness set in borehole at 50' bgs, and fill the annular space between the borehole wall and the steel conductor casing with 10.3 sack sand-cement slurry up to finish surface.
2. Bring in Larger Drill 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.

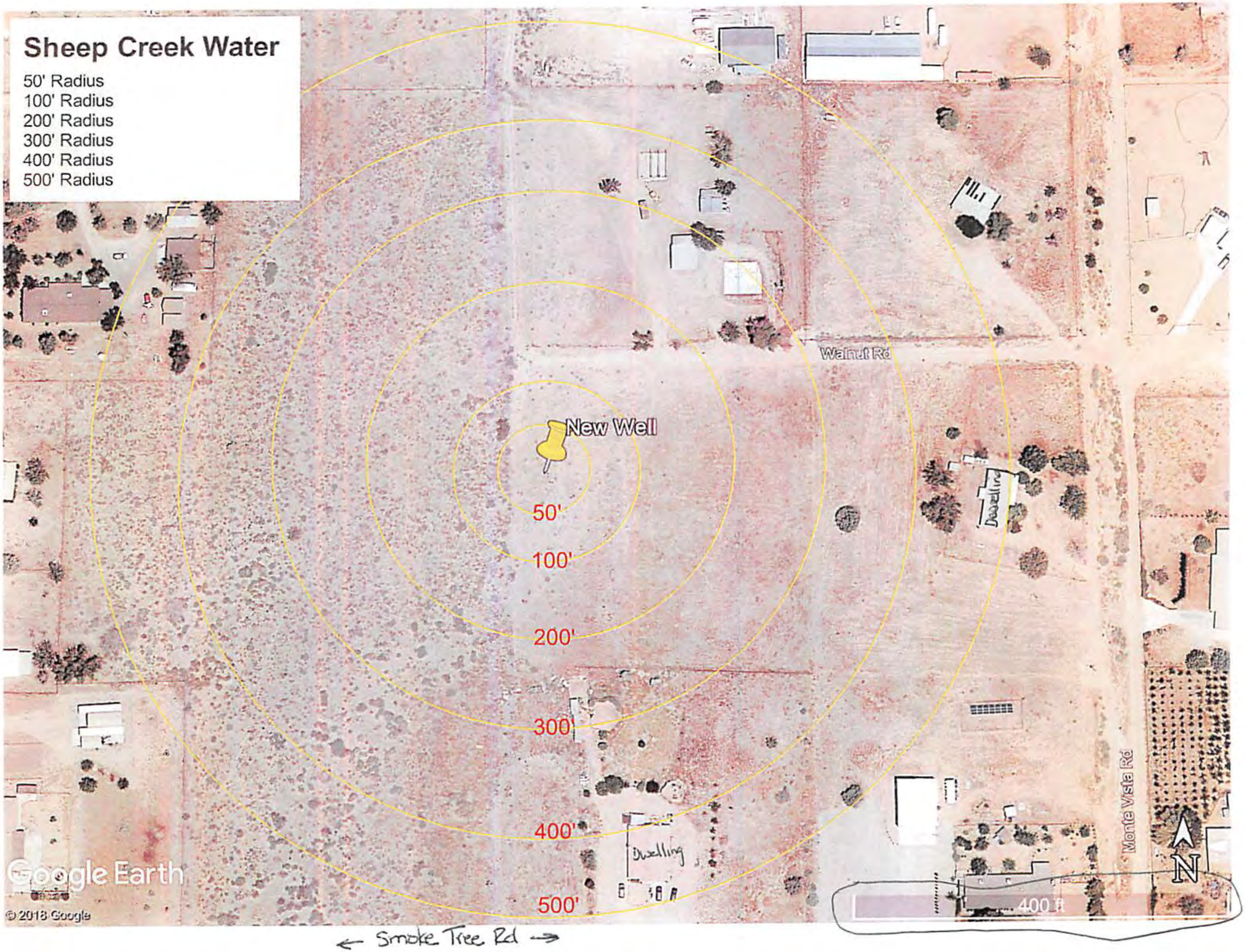
We would like to get a well permit to begin this work.

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

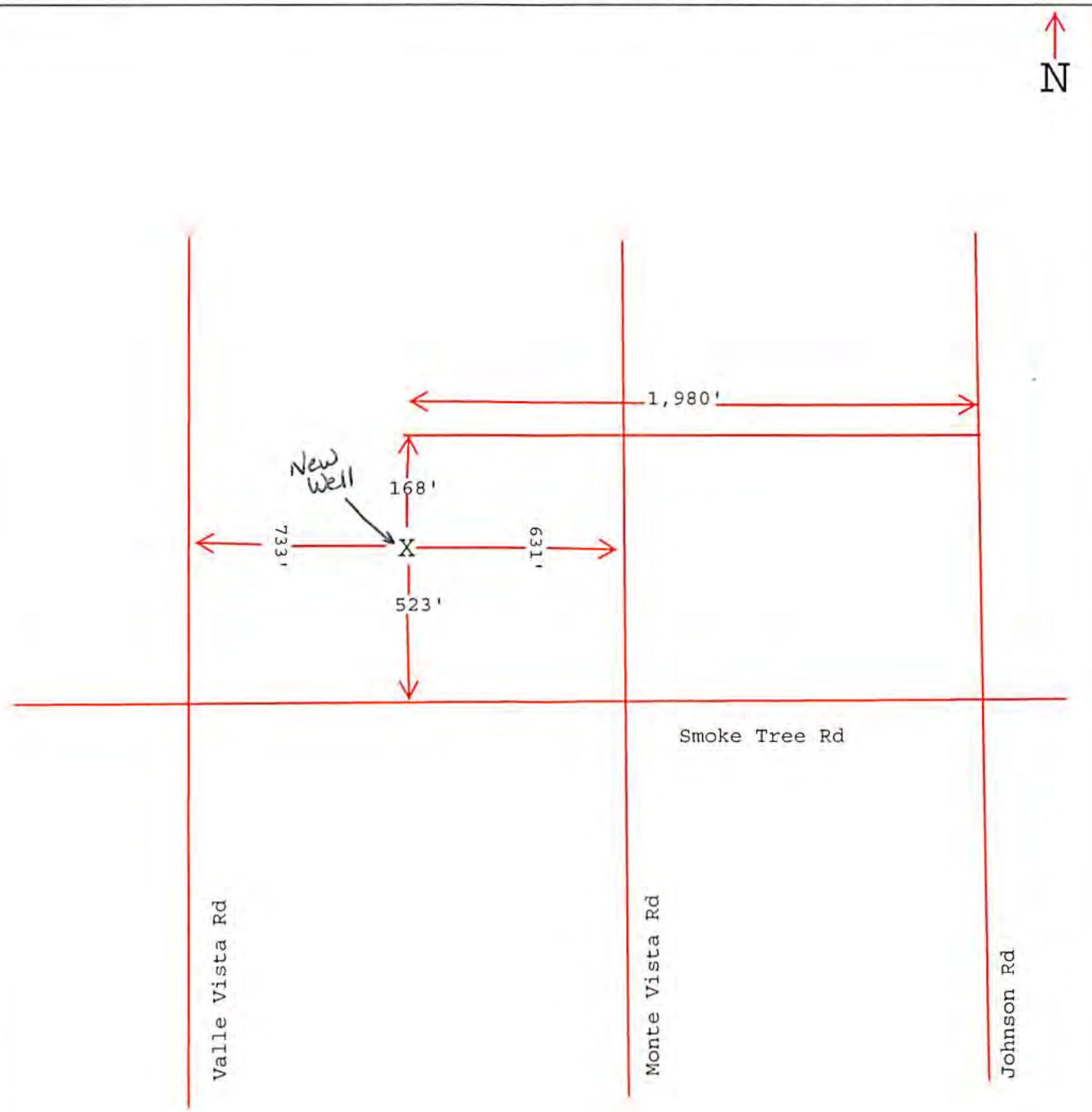
SITE MAP

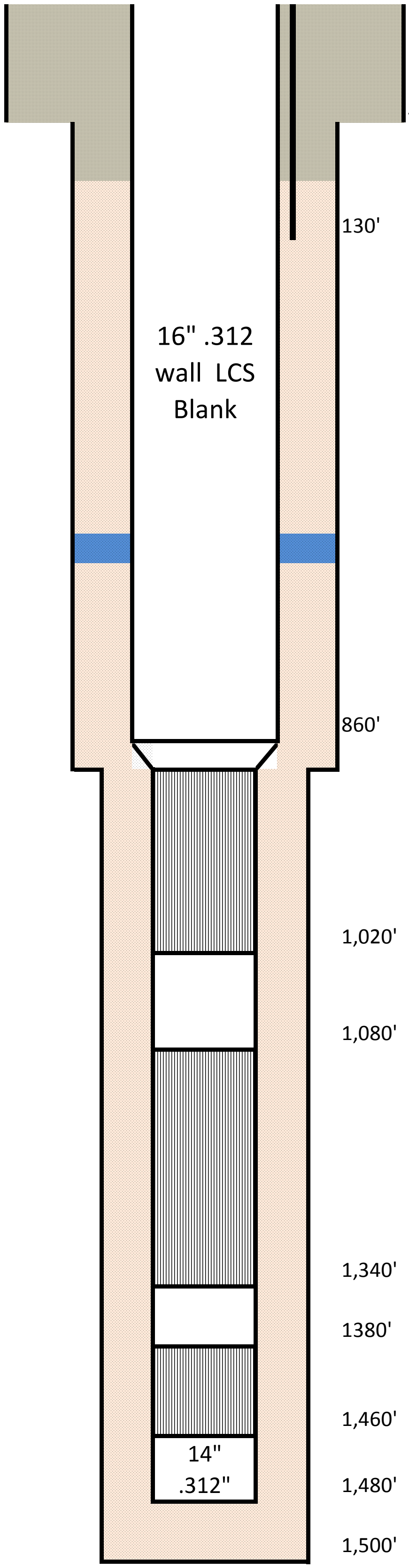
The space below can be used to include a map. All maps must include:

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

For new wells, that are not replacement wells, 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

Compliance Order No. 05-13-18R-002

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.

4. By **September 28, 2018**, the System must provide to the Division the following documents:

   a) Copies of all "will serve" letters issued by the System at any time for which a service connection has not been made, including the address(es) or parcel number(s) of the respective property(ies);
   b) A list of properties that were provided "will serve" letters and have a building permit(s) by the date of this order, including the address(es) or parcel number(s) of the respective property(ies);
   c) a list of the property owners and applicable planning agencies it notified that its "will serve" letters are null and void along with a certification that the required notification was completed by the System; and
   d) a current list of all service connections, including the address of each.

5. On or before **November 20, 2018**, the System must submit to the Division a completed feasibility study that must review the proposed options for meeting the System's water demand requirements. The Study must include consolidation with nearby public water systems as an option. The feasibility study must discuss cost estimates, including the operation and maintenance (O&M) costs, and the potential environmental impacts of each of the options considered. The report should identify a preferred alternative and include discussion on the reliability of the selected preferred alternative, and an explanation for why the other options were rejected.

6. After Division approval of the preferred alternative, prepare for Division approval a Corrective Action Plan, identifying how it will implement the preferred alternative to ensure that the System delivers an adequate and reliable water supply to its consumers and addresses the System's demand requirements. The plan must

include a time schedule for completion of each of the phases of the project, such as design, financing, environmental review, construction, and startup, and a date as of which the System will be in compliance with source capacity requirements, which must be no later than **May 31, 2019**, unless the System is able to demonstrate why a later compliance date is necessary.

7. On or before **December 20, 2018**, submit the Corrective Action Plan required under Directive No. 6 above, to the State Water Board's office located at 464 W. 4th Street, Room 437 San Bernardino, CA 92401.

8. Perform the State Water Board approved Corrective Action Plan, and each and every element of said plan, according to the time schedule set forth therein.

9. On or before **December 20, 2018** and every three months thereafter, submit a report to the State Water Board in the form provided as Appendix 2 showing actions taken during the previous quarter (calendar three months) to comply with the Corrective Action Plan.

10. On or before **September 20, 2018** complete and return to the State Water Board the "Notification of Receipt" form attached to this Order as Appendix 3. Completion of this form confirms that the System has received this Order and understands that it contains legally enforceable directives with due dates.

All submittals required by this Order, with exception of analytical results, must be electronically submitted to the State Water Board at the following address. The subject line for all electronic submittals corresponding to this Order must include the following information: <u>Water System name and number, compliance order number and title of the document being submitted.</u>

Eric J. Zúñiga, District Engineer
Dwpdist13@waterboards.ca.gov

The State Water Board reserves the right to make modifications to this Order as it may deem necessary to protect public health and safety. Such modifications may be issued as amendments to this Order and shall be effective upon issuance.

Nothing in this Order relieves the System of its obligation to meet the requirements of the California SDWA (CHSC, Division 104, Part 12, Chapter 4, commencing with Section 116270), or any regulation, standard, permit or order issued or adopted thereunder.

PARTIES BOUND

This Order shall apply to and be binding upon the System, its owners, shareholders, officers, directors, agents, employees, contractors, successors, and assignees.

SEVERABILITY

The directives of this Order are severable, and the System shall comply with each and every provision thereof notwithstanding the effectiveness of any provision.

FURTHER ENFORCEMENT ACTION

The California SDWA authorizes the State Water Board to issue a citation or order with assessment of administrative penalties to a public water system for violation or continued violation of the requirements of the California SDWA or any regulation, permit, standard, citation, or order issued or adopted thereunder including, but not limited to, failure to correct a violation identified in a citation or compliance order. The California SDWA also authorizes the State Water Board to suspend or revoke a permit that has been issued to a public water system if the public water system has violated applicable law or regulations or has failed to comply with an order of the State Water Board, or to petition the superior court to take various measures against a public water system that has failed to comply with an order of the State Water Board, including issuance of an injunction to enforce a compliance plan, enjoining further service connections, or any other relief that may be required to ensure compliance with the SDWA and applicable regulations. The State Water Board does not waive any further enforcement action by issuance of this Order.

RIGHT TO PETITION

CHSC section 116701(a) provides that any person aggrieved by this order may, within 30 days of the date of this order, petition the State Board for reconsideration. See Appendix 1 for section 116701(b), which sets out the requirements for a petition.

Sean F. McCarthy, P.E.

August 30, 2018
Date

Chief, South Coast Section

Southern California Field Operations Branch

Appendices [5]:

1. Applicable Statutes and Regulations
2. Quarterly Progress Report
3. Source Capacity Evaluation
4. Notification of impending water shortage from System to Division
5. Notification of Receipt Form

Certified Mail No. 7017 0660 0001 1704 7559

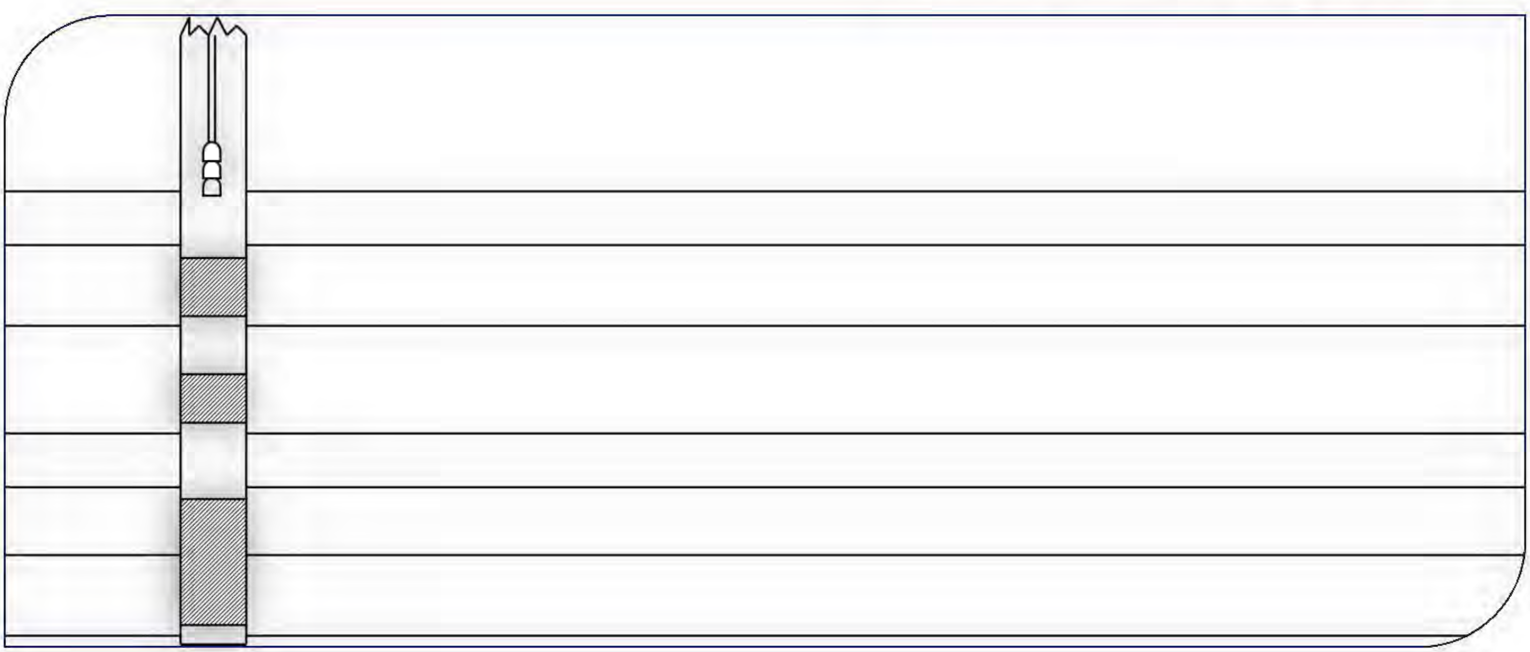
Appendix C – Final Report for Well Investigation – Well 3A

BESST INC.
GLOBAL SUBSURFACE TECHNOLOGIES

Video Camera Survey Report
CRWA Sheep Creek, Well 3A
Date 08/06/2018

Prepared by: Rebecca Yungert

Reviewed by: Noah Heller MS PG (CA 5792)



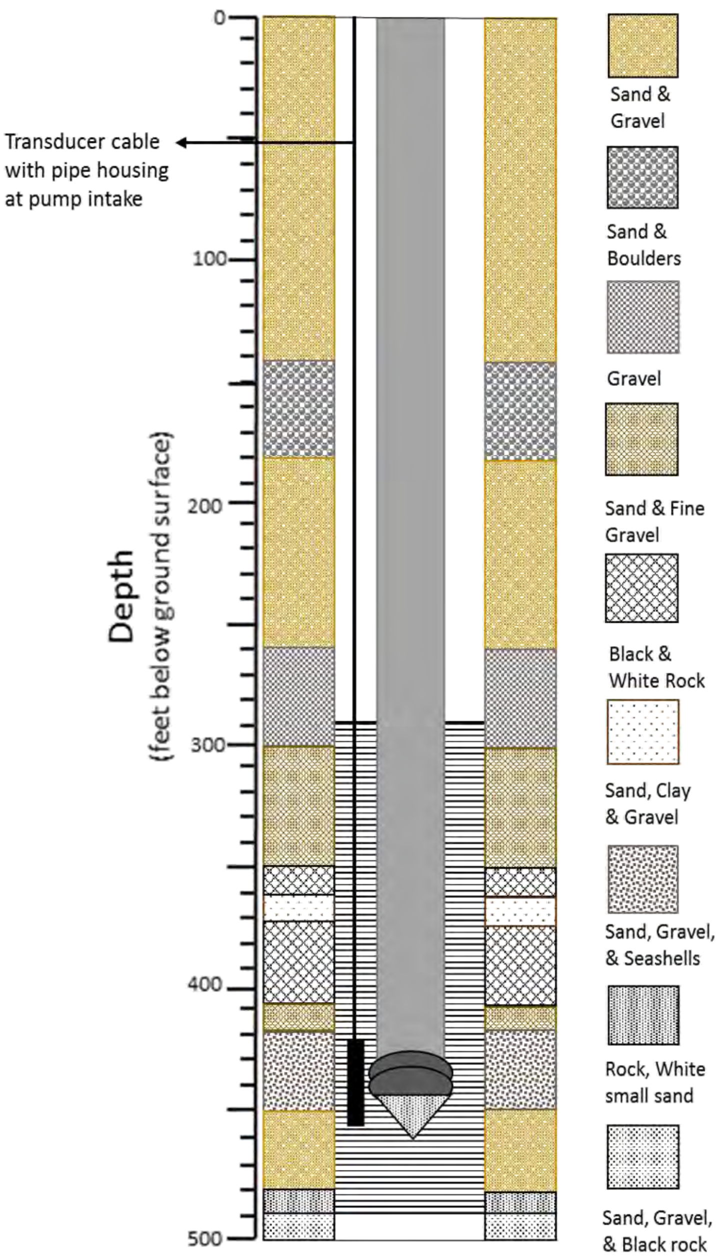
Introduction

A down-hole static video survey was performed by BESST, Inc. inside Sheep Creek Well 3A on July 24th, 2018. The video survey was performed using a miniaturized camera, measuring 0.75" OD and configured for color imaging. The focus of the investigation was to evaluate the condition of the well screen throughout the perforated section to determine the potential cause(s) of production losses; as well as to use the video data to formulate potential remedies for remediating the problem. The intent of the survey was to reach the bottom of the well, located at 500 Ft. BGS, this was not possible due to sediment fill that blocked the camera survey to reach the bottom of the well. As a result, the survey was completed to a depth of 494 Ft. BGS

The video survey showed that the well screen consists of louvered screen. It was discerned that the louvered screen begins at a depth of 290 Ft. BGS and appears to extend continuously to 490 FT. BGS. First water inside the well was observed at a depth of 320 Ft. BGS. The distance from the top of well screen to first water measured 31.5 feet.

Well Information Summary

The well summary provided below provides representative still images from various depths of the video survey, a general schema of the well and the stated soil type from the Driller's report and a summary table providing key dimensional data about the well construction.

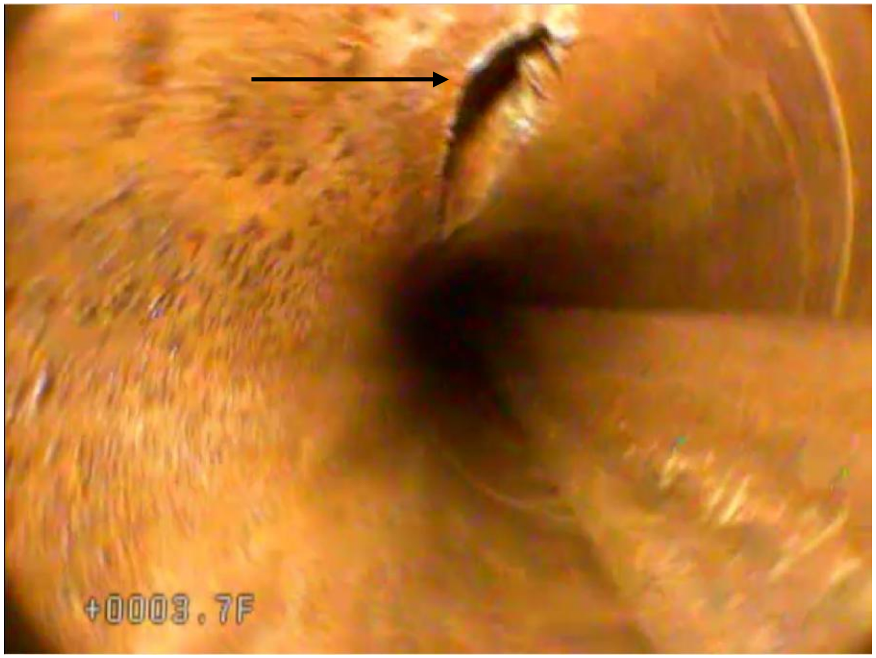


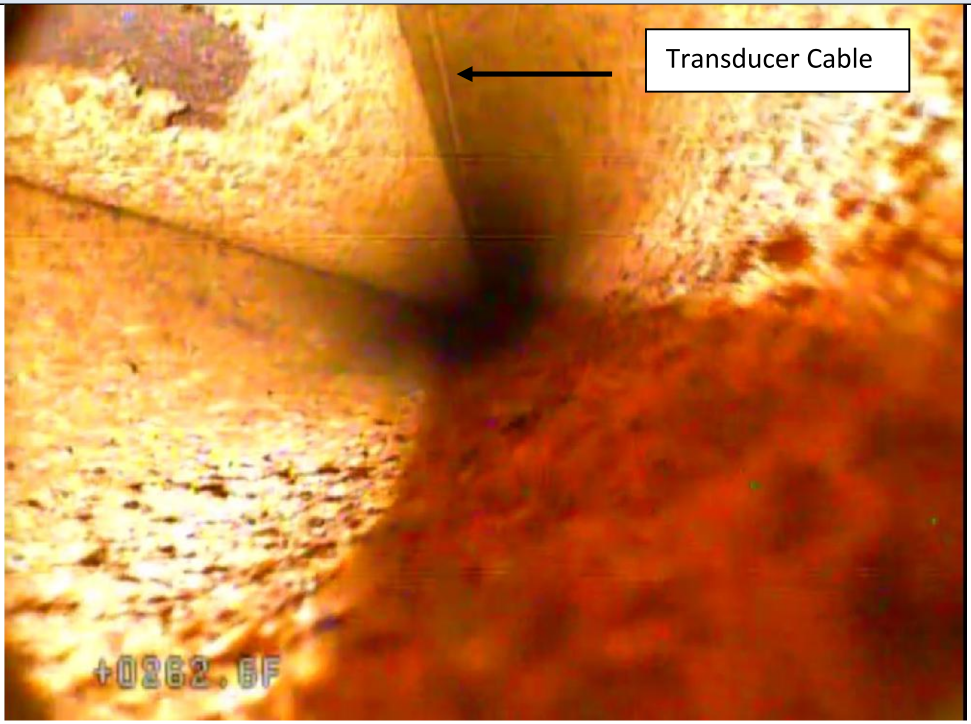
Well Information	Diameter Inches	GPM	Ft. BGS
Total Well Depth			500
Type of Pump: Vertical Turbine			
Pump Diameter	11		
Access Pipe Diameter			
Pump Column Diameter	8		
Pump Intake Depth			460
Static Water Level			320
Pumping Water Level*			Static conditions
Pumping Rate *		Static conditions	
Casing and Well Screen Intervals			
Gravel Pack			50-500
Blank			0-290
Perforated (louvered)	16”		290-490
Blank	16”		490-500

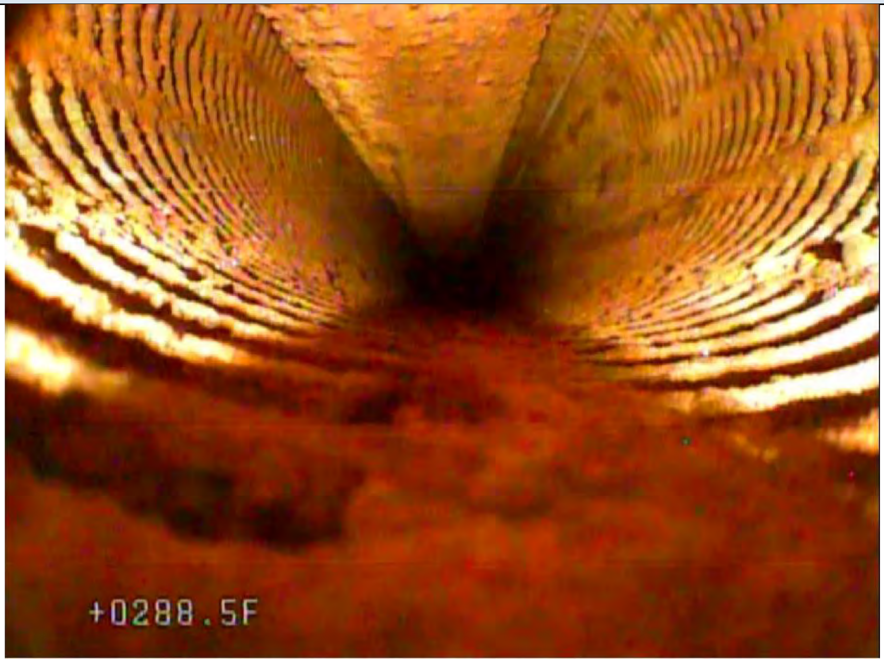
* During the time of testing

Note: Information is based on observed depths.

Video Survey Observations

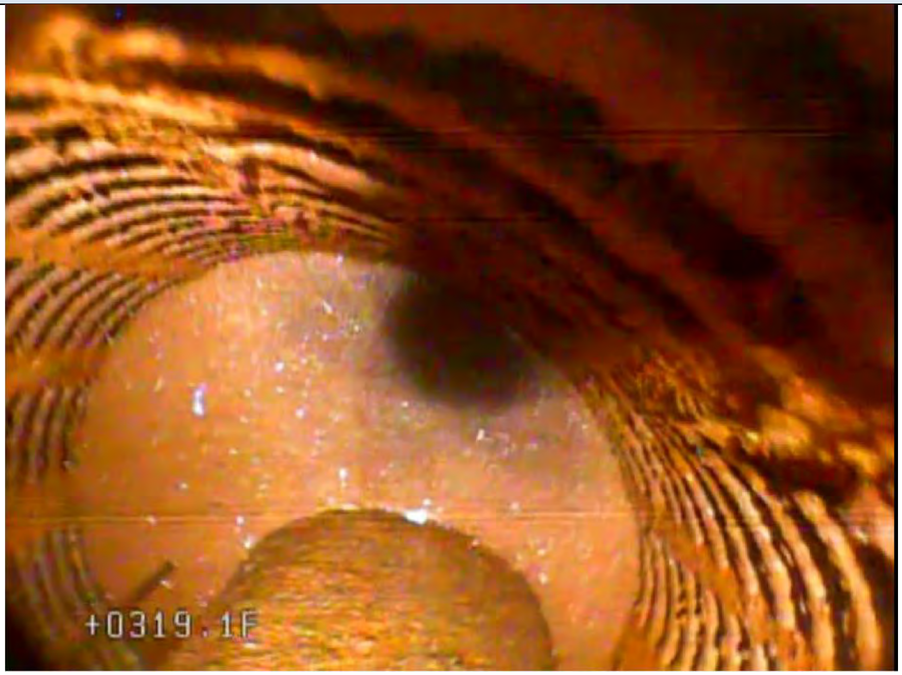
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	3.7 Ft. BGS	00:00:09	 Large gash present in the well casing at the top of the casing. Because of the size of the gash, and its location above the water level, it is unlikely to have been caused by corrosion. Most likely, the gash was created during the installation of the pump into the well when the well was drilled.

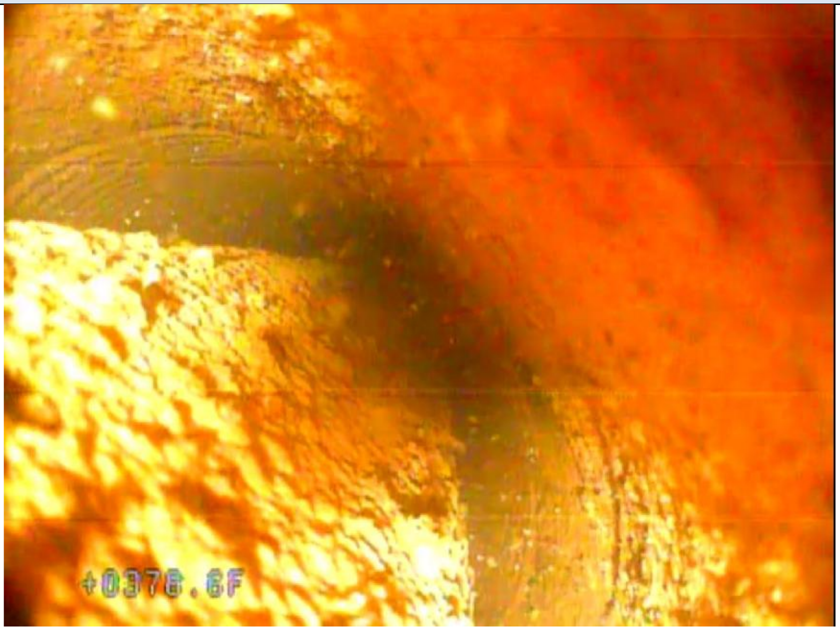
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	262.6 Ft. BGS	00:12:32	 Heavy rust on casing and pump column. Flaking of rust material from the pump column can be seen. Transducer cable visible.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static Conditions	288.5 Ft. BGS	00:15:52	 Top of screen above static water level. 31.5 Ft. of louvered well screen is exposed above the static water level.

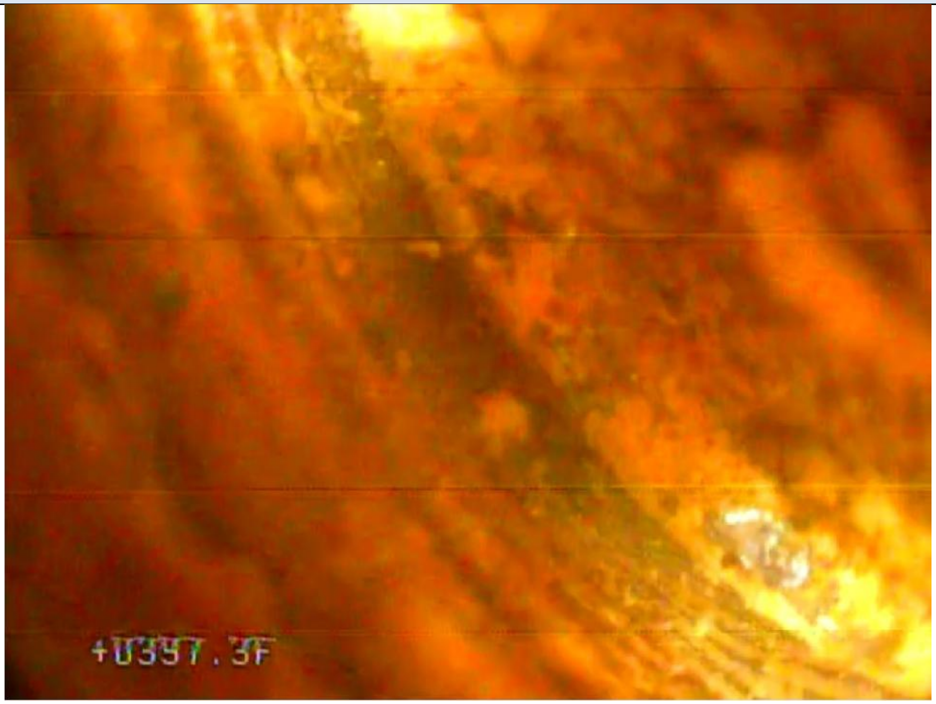
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	298.2 Ft. BGS	00:16:29	 Welded casing joint in well screen indicates that well screen was installed in 10 Ft. sections. Transducer cable still visible.

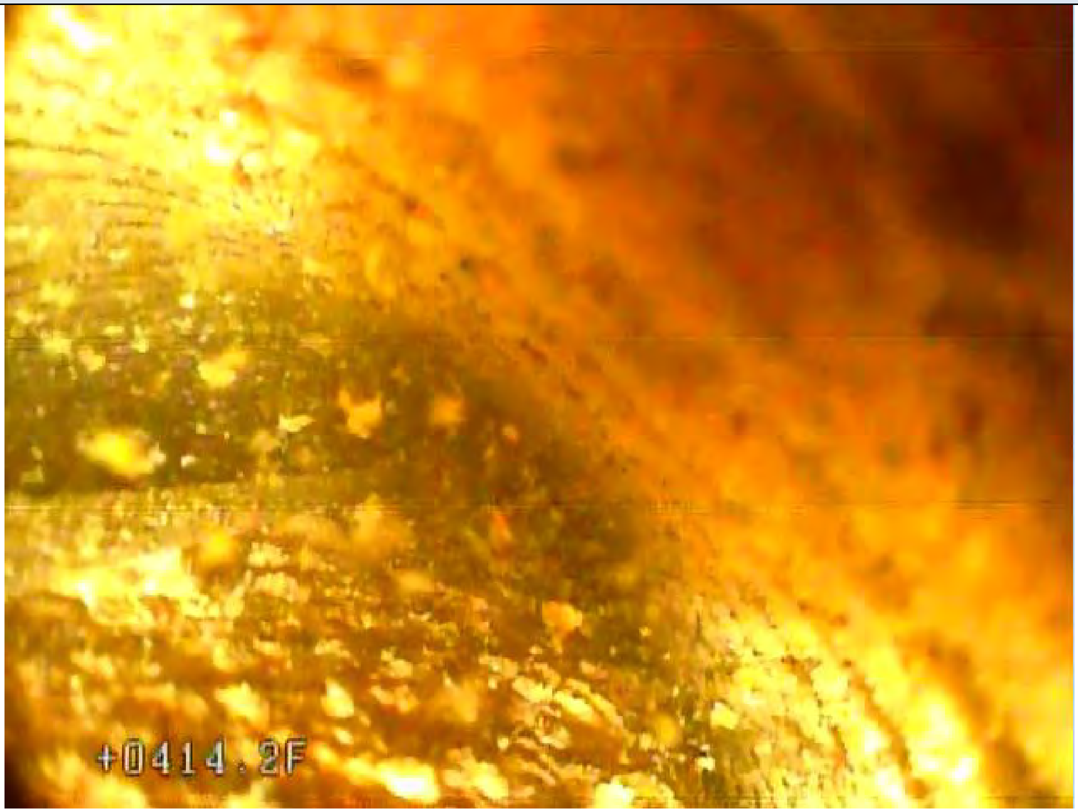
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	300 Ft. BGS	00:17:29	 Screen continues above static water level. Transducer cable still visible.

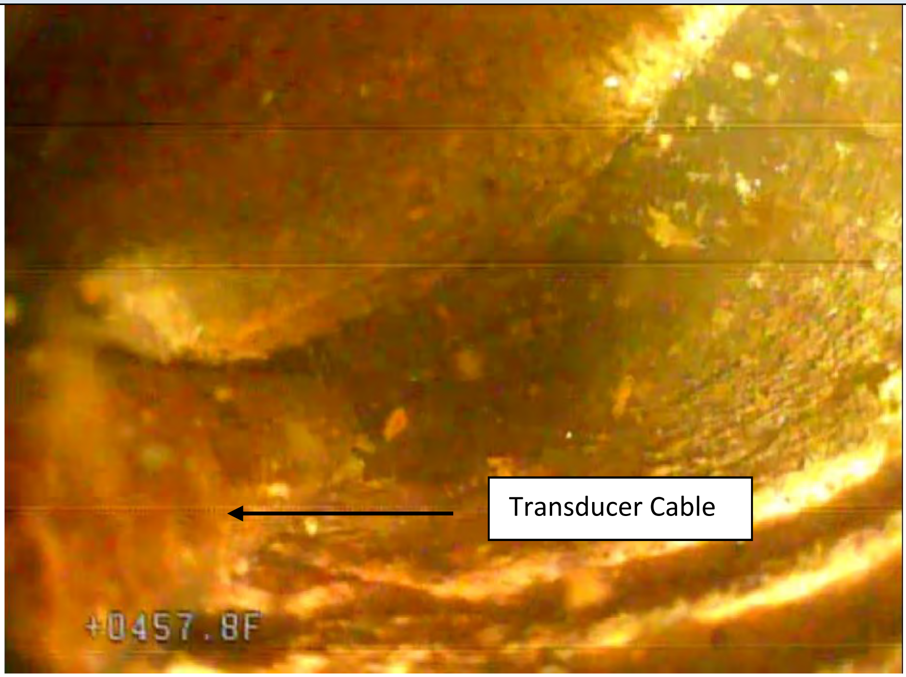
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	319.1 Ft. BGS	00:18:53	 Static water level. Photo still from 319.1 Ft.BGS. Actual static water level was measured at 320.1 Ft. BGS.

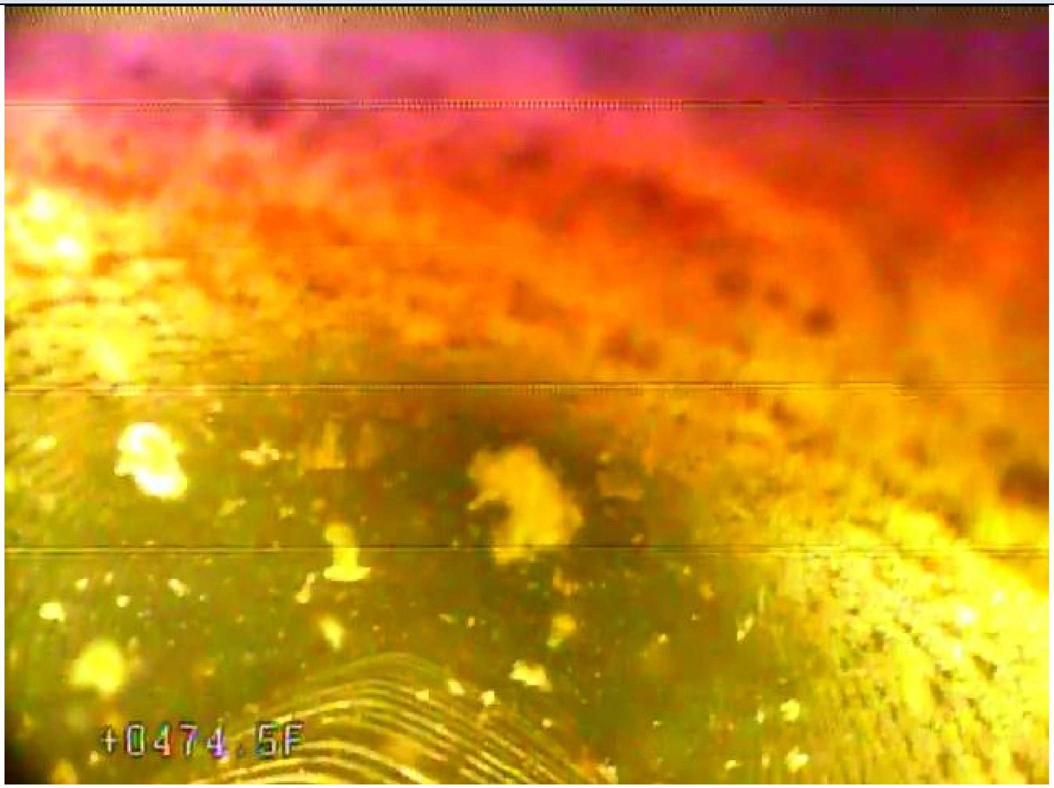
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	378.6 Ft. BGS	00:23:27	 Second welded casing joint in well screen. Transducer not visible at this depth. Heavy build up along well screen, but louver openings are still easily visible.

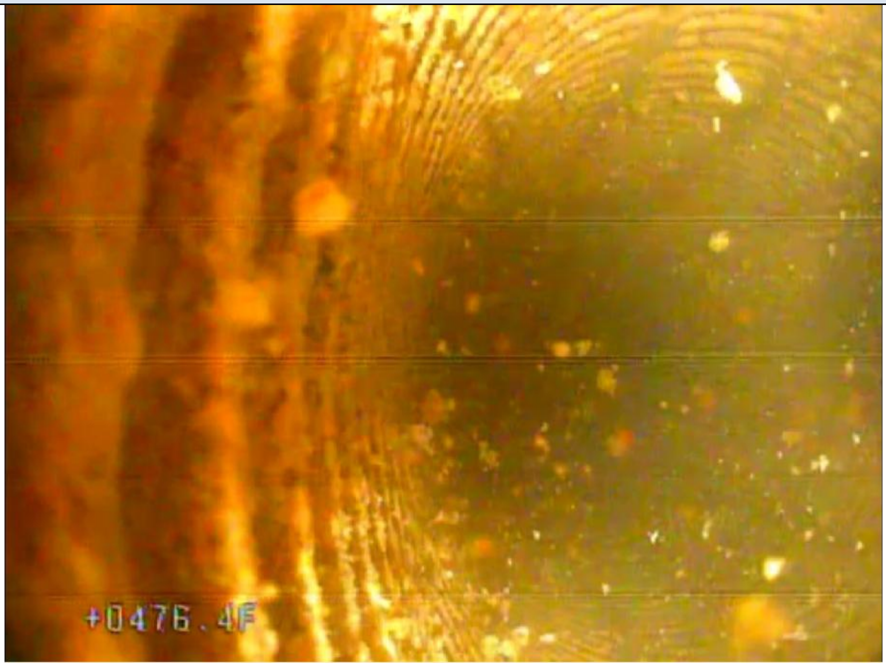
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	379.8 Ft. BGS	00:23:50	 Screen continues, and transducer cable is not visible at this depth.

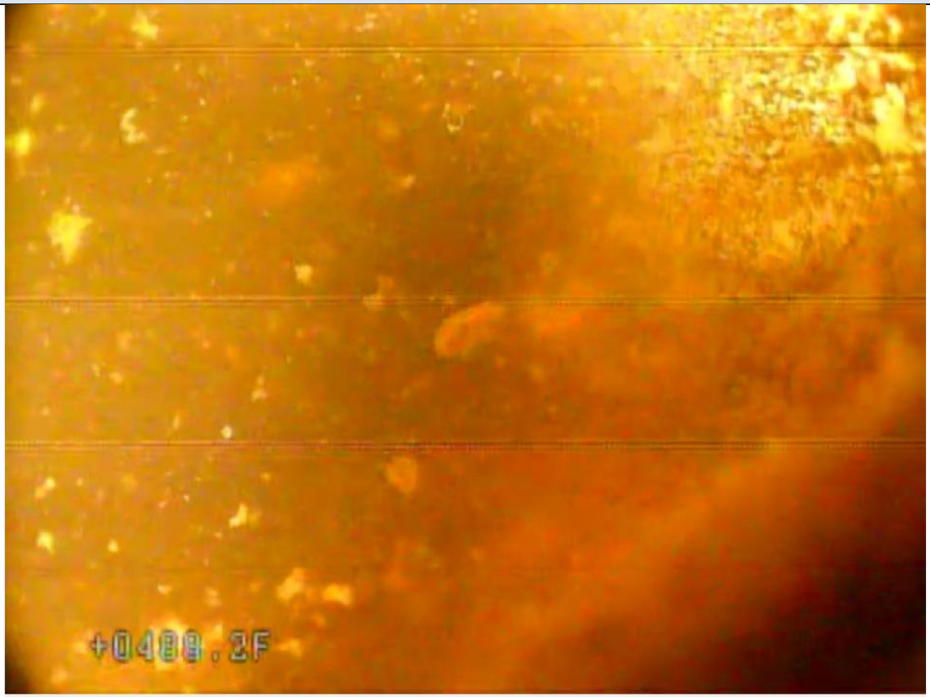
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	397.3 Ft. BGS	00:27:48	 Pinch point between casing and column coupling. Pump had to be shifted to one side to allowing camera to move pass. Heavy build up is still present on screens, but louvers still easily visible.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	414.2 Ft. BGS	00:32:08	 Material build up on screen increases with depth.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	457.8 Ft. BGS	00:36:28	 Top of pump bowls. Housing pipe where transducer cable ends.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	474.5 Ft. BGS	00:38:42	 Top of cone strainer

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	476.4 Ft. BGS	00:38:59	 Bottom of cone strainer (shadow on right side of image).

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	488.2 Ft. BGS	00:40:17	 Bottom of well screen.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	494.1 Ft. BGS	0 0:41:06	 Bottom of well, sediment fill blocking camera past this depth. Well depth indicated in well log is 500 Ft. BGS, meaning that there is approximately 6 Ft. of sediment in-fill.

Observable Results:

Results from the video survey confirm what was reported in the driller's report for Well 3A. Louvred screen starts at 290 Ft. BGS and appears to be continuous to the end depth 490 Ft. BGS. The well screen sections appear to have been installed in 10 Ft. sections. No damage to the louvers was observed, but material build-up is present throughout the screen section of the well, generally increasing with depth. There is a section of the well screen exposed above static water, from a depth of 290 Ft. BGS. to 320 Ft. BGS, with modest amounts of iron oxide scaling present on the well screen. This well shows no exfoliation of the well casing and appears to be much healthier than Well 4A.

Below first water, iron oxide scaling increases slightly and there is a presence of iron bacteria along the well screen and pump column. Similar to Well 4A, as the camera passed by various sections of the submerged scale, some of the scale proved to be soft since it was easily dislodged when bumped into by the camera. It is important to note that the soft scale often represents the newest formations of bacterial colonies. The screen was still visible until the bottom of the screened section at 490 Ft. BGS.

Another feature that was observed was a transducer cable visible from 121 to 457 Ft. BGS. Although the cable was not observed at depths shallower than 121 Ft. BGS, the cable appeared to be taut, and is inferred to have been hidden from view by the pump column at shallower depths. The transducer cable ends at a piped housing unit and seated at the top of the bowls.

Conclusions:

- First water – 320 Ft. BGS.
- Louvered screen has modest iron oxide scaling above first water.
- Well 3A is in better condition structural compared to Well 4A.
- Below first water, iron oxide scaling and biofouling increase substantially.
- The video survey confirms that the louvered screen is continuous from 290 Ft. BGS to 490 Ft. BGS with welded joints between 10 feet sections.
- The well screen itself does not appear to be significantly clogged. However, the condition of the gravel pack behind the well screen is unknown.

Recommendations

There are two possible scenarios with respect to well 3A. The first possibility would be to remove the pump and perform a well rehab. The second possibility would be to first perform a dynamic flow only profile with the USGS tracer flowmeter and then the well rehab to follow.

In either case, the well rehab would first consist of wire brushing the well and likely followed by an acoustical method of treatment. The well would then be pumped clean of debris and the inspected with a video camera.

The use of the flow only survey would provide a better understanding of the gravel pack condition prior to a rehab effort and would help to focus the rehab along sections of the gravel pack where it appears to be most needed. The before rehab profile would then be compared to the post rehab profile to gauge the performance of the rehab effort as it relates to zonal production.

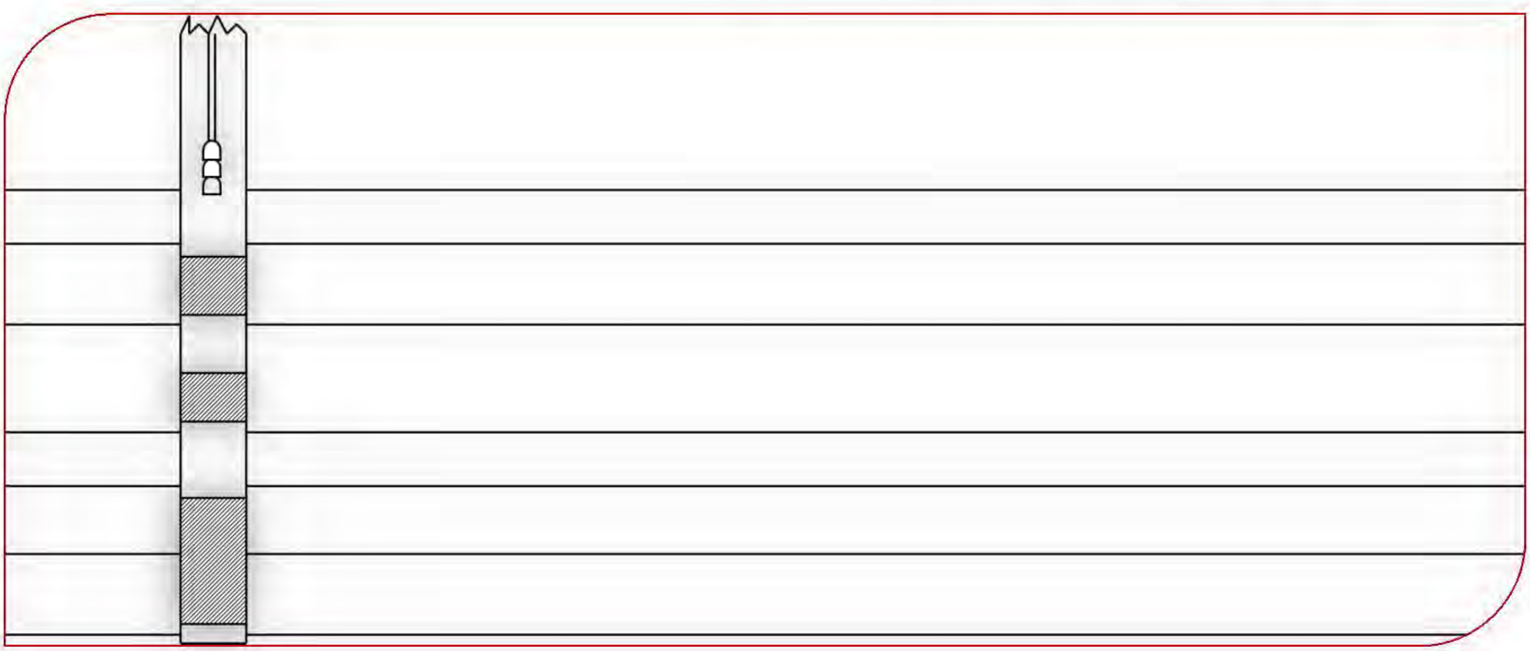
Appendix D – Final Report for Well Investigation – Well 4A

BESST INC.
GLOBAL SUBSURFACE TECHNOLOGIES

Video Camera Survey Report
CRWA Sheep Creek Well 4A
Date 8/6/2018

Prepared by: Rebecca Yungert

Reviewed by: Noah Heller MS PG (CA 5792)



Introduction

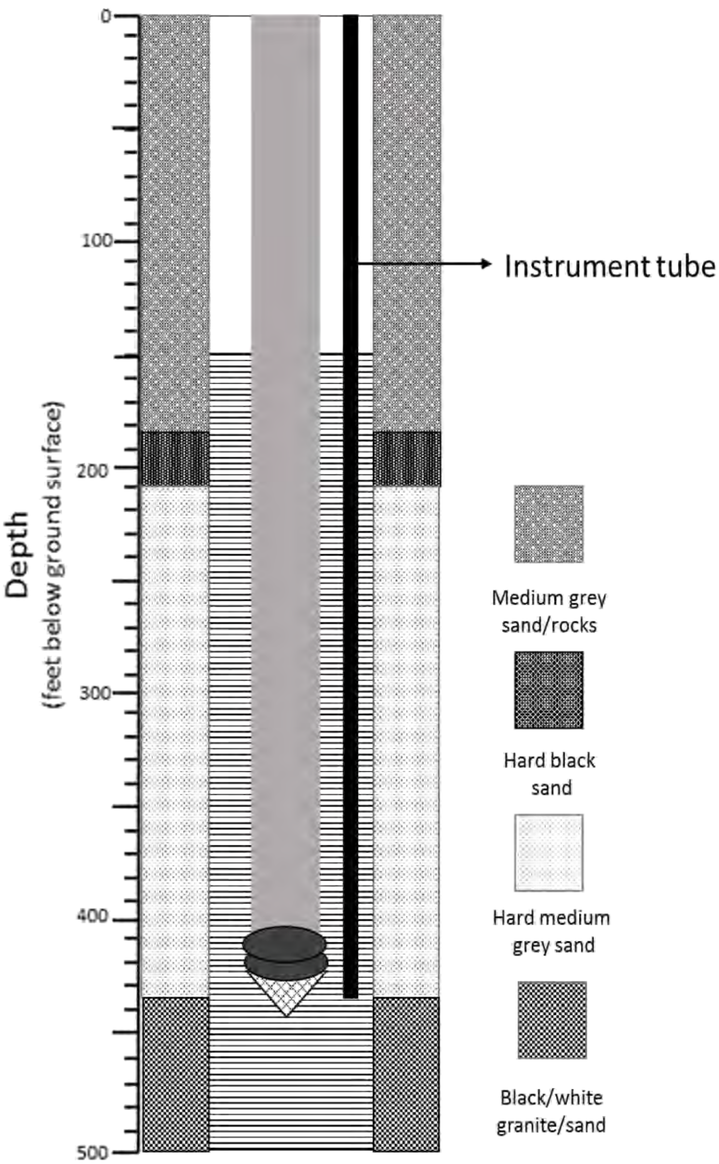
A down-hole static video survey was performed by BESST, Inc. inside Sheep Creek Well 4A on July 24th, 2018. The video survey was performed using a miniaturized camera, measuring 0.75" OD and configured for color imaging. The focus of the investigation was to evaluate the condition of the well screen throughout the perforated section to determine the potential cause(s) of production losses, as well as to use the video data to formulate potential remedies to the problem. Although the intent of the survey was to reach the bottom of the well, located at 500 Ft. BGS, this was not possible due to the limited annulus between the pump bowls and the casing – making passage beyond the top of the pump not feasible. As a result, the survey was completed to a depth of 438.8 Ft. BGS.

The video survey showed that the well screen consists of vertical mill slots. It was discerned that the mill slots begin at a depth of 150 Ft. BGS, and appear to extend continuously to the survey end depth of 438.8 Ft. BGS. Well records for Sheep Creek Well 4A, provided by CRWA, show that the mill slots extend to a depth of 500 Ft. BGS., which coincides with the bottom of the well. First water inside the well was observed at a depth of 322.7 Ft. BGS. The distance from the top of well screen to first water measured 171 feet.

Generally, the video survey showed that there were multiple points of hard water scaling along the pump column and well casing, and that the scaling increased with depth heading towards the bottom of the well.

Well Information Summary

The well summary provided below provides representative still images from various depths of the video survey, a general schema of the well and the stated soil type from the Driller's report and a summary table providing key dimensional data about the well construction.

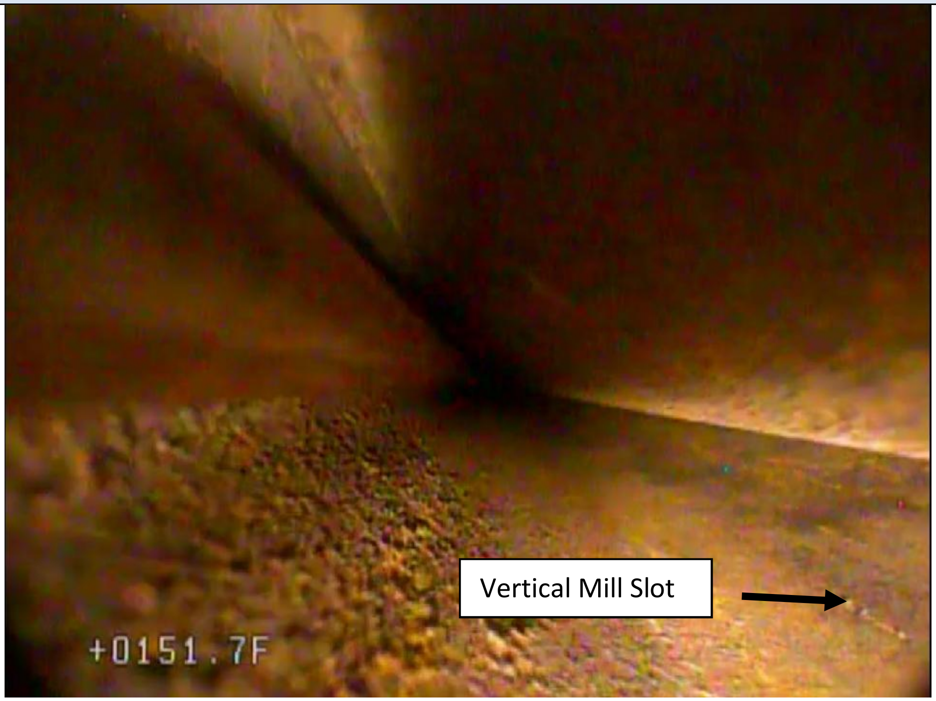


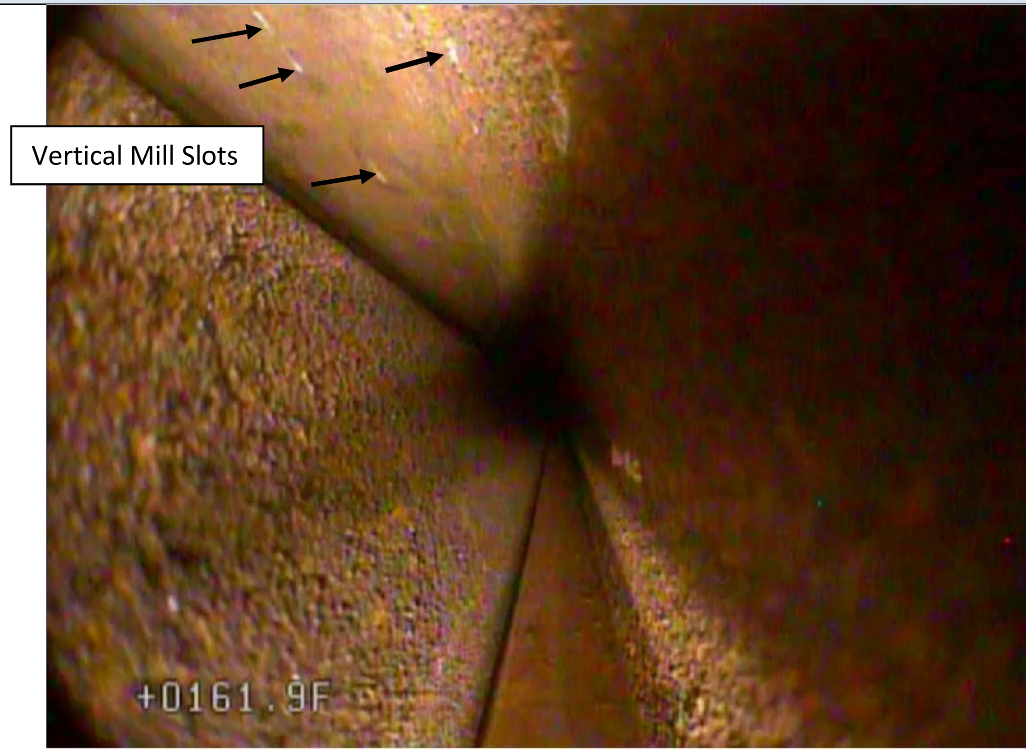
Well Information	Diameter Inches	GPM	Ft. BGS
Total Well Depth			500
Type of Pump: vertical turbine			
Pump Diameter	12		
Access Pipe Diameter			
Pump Column Diameter	10		
Pump Intake Depth			440
Static Water Level			323
Pumping Water Level*			Static conditions
Pumping Rate *		Static conditions	
Casing and Well Screen Intervals			
Gravel Pack			69-503
Blank	16"		0-150
Perforated (Mill-Slots)	16"		150-500

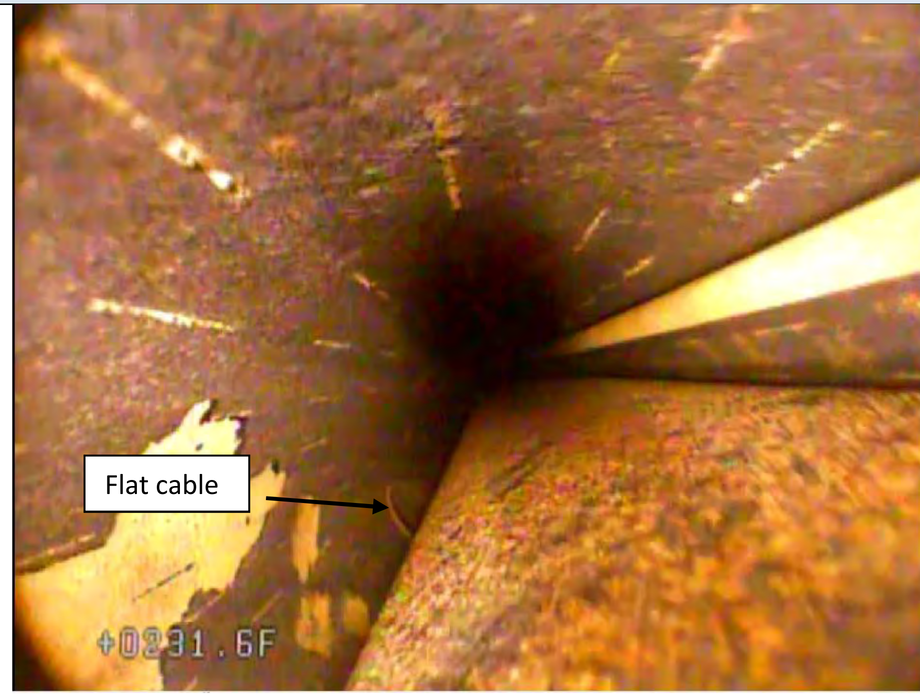
* During the time of testing.

Note: Information is based on observed depths.

Video Survey Observations

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	151.7 Ft. BGS	00:8:51	 First slots observed in the screen, screen may start sooner but could not be seen (arrow where slot was visible). Instrument tube can be seen on left side of image.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	161.9 Ft. BGS	00:10:23	 Slots in screen are clearly visible (arrows where slots are visible).

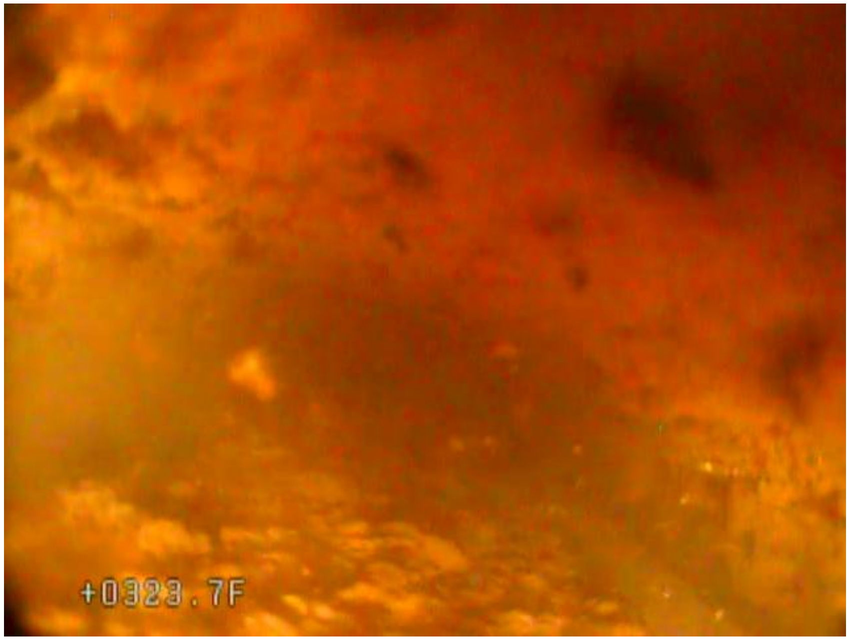
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	231.6 Ft. BGS	00:18:36	 Possibly starting point where scaling from hard water begins. Similar patches of scaling continue until 243.1 Ft. BGS were scaling becomes denser. A flat cable can be seen just below scaling. End of cable was not seen.

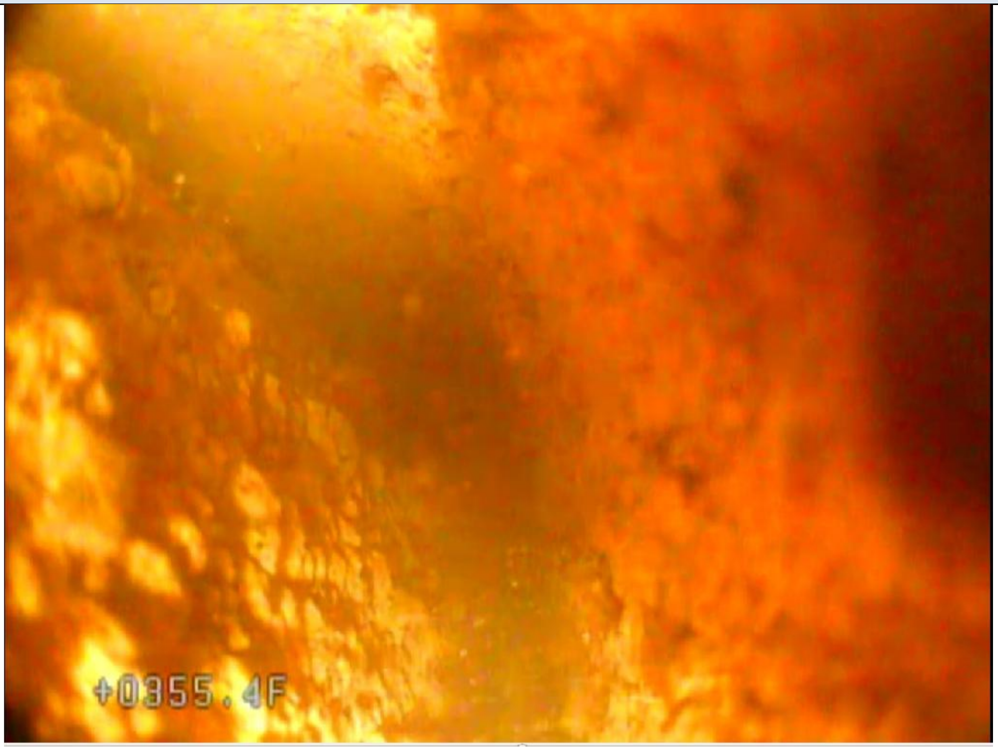
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	243.1 Ft. BGS	00:19:42	 Hard water deposits continue in patches along casing. Flat cable still present.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	246.4 Ft. BGS	00:21:19	 Hard water scaling starts to become dense.

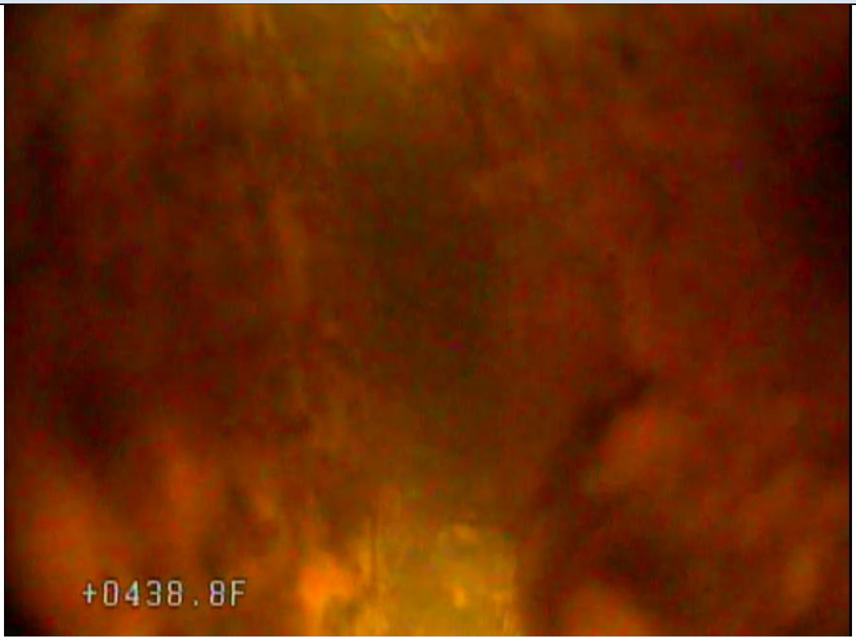
Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	300.2 Ft. BGS	00:25:13	 Hard water scaling increases in density.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	322.4 Ft. BGS	00:28:47	 Static water level. Photo still from 322.4 Ft. BGS. Actual water level at 322.7 Ft. BGS.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	323.7 Ft. BGS	00:29:46	 Large amounts of scaling still present beneath static water level.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	355.4 Ft. BGS	00:33:37	Scaling continues to be dense.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	363.2 Ft. BGS	00:35:31	 Slots in screen start to become visible again through scaling.

Pumping Rate (GPM)	Depth (Ft. BGS)	Video Time (hh:mm:ss)	Image & Description
Static conditions	438.8 Ft. BGS	00:55:56	 Sticking point between the column and the casing. The video camera could not pass this point to reach the bottom of the well. Instrument tube can no longer visible past 437 Ft. BGS.

Observable Results:

Results from the video survey confirm what was reported in the driller's report for Well 4A. Mill slots start at 150 Ft. BGS and appear to be continuous to the end depth of the video survey. Mill-slots throughout the observed area appear to be clogged. There is a section of well screen above static water, from a depth of 150 Ft. BGS. to 322.7 Ft. BGS. A whitish salt was consistently observed to occupy the space of the mill slots and appears to be the primary clogging agent. The casing and pump column above first water is mildly scaled over with iron oxide, and in the depth range from 240 to 250 Ft. BGS. there also appears to be some exfoliation and peeling of the metal.

Below first water, iron oxide scaling increased substantially, showing a significant enlargement of tubercles and rusticles with a bubbly to mammillary shape. The bulbous structures themselves also show exfoliation and more severe iron-oxide effected deterioration of the casing. Most likely, the cause of the deterioration is related to the presence of iron bacteria feeding on the casing metal. As the camera passed by various sections of the submerged scale, some of the scale proved to be soft, as evidenced by the fact that it was easily dislodged when bumped into by the camera during its descent. It is important to note that the soft scale often represents the newest formations of bacterial colonies. Once below first water, very few mill slots were observable. It appears this may have resulted from abundant iron oxide scale having grown over the slots and obscuring their view.

A couple of other features observed inside well 4A include what appeared to be a portion of an instrument cable located from 231 to 243 Ft. BGS., and an instrument tube from the surface down to at least the top of the pump (at 438.8 Ft. BGS.). The cable appears to be white in color and flat in shape. A portion of the cable has been grown over by new iron oxide encrustations.

Conclusions:

- First water – 322.7 Ft. BGS.
- Mill slots are mineralized above first water with a whitish colored precipitate.
- Below first water, iron oxide scaling and biofouling increase substantially and are represented by pervasive, bulbous structures obscuring much of the mill slotted section to a depth of 438.8 Ft. BGS.
- The video survey confirms that the slotted section of the well is continuous.
- Production losses appear to be related to two key factors:
    - A substantial portion of the well screen (171 feet) under static conditions is located above first water.
    - There is extensive clogging of the submerged portion of the well screen.

Recommendations

There are two possibilities as to what the first course of action should be with respect to Well 4A. One possibility is that the pump is pulled, with great care, so that a video survey be performed on the remainder of the well from 438.8 to 500 Ft. BGS. The second possibility is that the pump is left in place so that a dynamic flow-only profile using the USGS tracer can be performed to quantify the degree of production and associated clogging along the length of the well screen prior to rehab. The results of the pre-rehab survey would then form the baseline production curve to which the results of all rehab efforts are compared. The before and after production curve going forward will be useful and potentially save monies used for rehab in the future – beyond the general measure of specific capacity. For example, we have concerns that rehab efforts will be performed in areas of the well that don't offer much production to begin with. The driller's report refers to a "granitic" sand zone in the bottom section of the well. It is unclear what this means. On the one hand, granite has poor production. However, reworked granitic material could have excellent production. Mechanically and chemically weathered granitic material could have poor production. Regardless of the answer, the flow profile will help guide the rehab effort.

Following either approach above, the pump should be removed and a scraper survey completed to obtain representative samples of the scale and the associated water sample with the host bacteria. The samples should be sent to a qualified laboratory to determine the type of scale and bacteria present inside the well. The data from the analysis can then be used to design a chemical treatment formulation – only to be used if brushing the well is ineffective and acoustical methods cannot be used. In the case of chemical treatment, we recommend using Water Systems Engineering, located in Kansas City, MO to perform the analysis scale and water analysis.

The first step in mechanical cleaning should be attempted with a nylon brush. This will hopefully remove most of the scale (if soft enough) and make the mill slots below first water more observable to inspection. If nylon brushing does not work (including the removal of clogging from the slots themselves), then we recommend using a wire brush - with great care – considering the degree of corrosion and the potential diminishment of casing integrity below first water. We are not optimistic that brushing will be successful at improving production since we believe based on our experience that most of the clogging will likely be inside the gravel pack surrounding the well screen. Moreover, the whitish precipitate inside the mill slots may be hardened and not amenable to removal by brushing. Therefore, a choice will need to be made as to whether acoustical or chemical means should be used as a next step. If considering an acoustical method such as Air Burst, Bore Blast or other, then we recommend first performing a casing thickness survey using a CTI (casing thickness inspection tool). If the CTI survey shows that the casing is of sufficient integrity, then an acoustical method could be employed.