KEELER COMMUNITY SERVICES DISTRICT

Feasibility Study

Water System Improvements to Mitigate Arsenic and Manganese in Drinking Water

Inyo-Mono Integrated Regional Water Management Program

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1.0 INTRODUCTION

The California Rural Water Association (CRWA) is providing technical assistance to the Keeler Community Services District (KCSD) under the State of California 2014 Proposition 1 Integrated Regional Water Management (IRWM) Disadvantaged Community Involvement Program, through the Inyo-Mono IRWM Program. This Feasibility Study evaluates existing system infrastructure and the feasibility of different solutions to mitigate arsenic and manganese issues in drinking water at KCSD. It is prepared and submitted in fulfilment of CRWA's work plan dated April 21, 2020, as approved by the Inyo-Mono Regional Water Management Group.

1.1 Background

KCSD is identified as water system No. 1400036 under the jurisdiction of Inyo County Department of Environmental Health Services. KCSD was established in 1984 and maintains the drinking water system for the Keeler community, a Census Designated Place (CDP) in Inyo County. It is located on the east shore of Owens Lake off of California State Route 136. KCSD serves a population of approximately 65 residents through 58 connections, 54 are residential and four are commercial. A total of 91 service connections are available for future growth.

The water supply has elevated levels of arsenic and manganese that are greater than the Maximum Contaminant Levels (MCLs) set by the State. In 2003, KCSD installed Point-of-Use (POU) units in every home. These units are aging, and it is difficult for KCSD to maintain their treatment performance. Roughly 90% of the residents purchase bottled water and do not rely on their POU units.

On September of 2019, KCSD received a Compliance Order for exceeding the MCL for arsenic (Appendix A).

1.2 Managerial Organization

KCSD is a community services district created by the community residents under State regulations to provide water service for domestic use, irrigation, and fire protection purposes. There are five members on the Board of Directors who meet every month.

1.3 Scope of Feasibility Study

This report evaluates the existing system and analyzes treatment alternatives to achieve State water quality standards for arsenic and manganese. Based on this analysis, KCSD will be able to proceed with the preferred project option to bring its system into compliance.

2.0 SYSTEM INFORMATION

This section reviews KCSD's environmental setting, service area, and existing facilities. In addition, water demand and water quality characteristics are presented.

2.1 Environmental Setting

KCSD has a dry, high desert climate characterized by hot summers and cold winters. Winter temperatures range from the upper-20s to mid-50s, while typical summer days range from the lower-60s to upper-90s. Annual rainfall averages less than six inches, mostly occurring in January and February.

KCSD is situated within Owens Valley, between Owens Lake to the west and the Inyo Mountains to the east. The topography falls from east to west towards the lake.

2.2 Service Area

KCSD serves Keeler, an old mining town of mostly single residence homes, mobile homes, and trailers. The service area covers about 0.1 square miles. There is some light industrial activity, mostly associated with dust mitigation efforts in Owens Lake. It is considered a severely disadvantaged community. Keeler's population average age is greater than 60 with many residents retired.

2.3 Existing Facilities

2.3.1 Well and Pump

KCSD has one groundwater well that serves as its sole water supply. The well is located about 3,000 feet northwest on State Route 136 from its intersection with Malone Street (Figure 1). A shed behind the well houses the controls and disinfection unit. The well was drilled in 1983 and the tested capacity was 312 gallons per minute (gpm) (Appendix B). The well is 125 feet deep with a 10.75 inch casing, perforated from 51 feet to 108 feet below grade. The static water level is approximately 41 feet below grade.

The well has two stainless steel submersible pumps with separate riser pipes (Figure 2). The original pump is a 4-inch diameter 75 gpm pump with a 5-horsepower (Hp) motor set at a depth of 78 feet below grade. The second pump was installed in 2014. It is a 4-inch diameter 150 gpm pump with a 10 hp submersible motor set at a depth of 105 feet below grade.

KCSD uses the 10 hp pump and maintains the 5 hp pump as back-up. The well pumps are partially powered by solar panels. The solar panels were installed in 2013 to reduce the cost of electricity required to operate the well pumps.

2.3.2 Disinfection

Water from the well is chlorinated with a sodium hypochlorite solution fed by chemical feed pump inside the shed. Chlorination only occurs during the warmer months of May through November when coliform bacteria growth has been known to occur in the tank.

2.3.3 Storage

Disinfected water is stored in a 100,000 gallon steel storage tank located on Cerro Gordo Street, about 1,200 feet northeast of the Malone Street/State Route 136 intersection (Figure 1). The tank location is 67 feet higher in elevation than the well, and around 100 feet higher than the service area. The tank is approximately 23 feet in diameter and 32 feet in height. It is unknown when this tank was installed. According to an inspection performed in 2000 (Appendix D), the tank was found to be in good condition, with no leaks or evidence of external corrosion. It is recommended that another inspection be performed on the tank.

2.3.4 Distribution

According to utility surveys performed by CRWA staff on October of 2017 and June of 2020, distribution mains are PVC and 4 inch or 8 inch in diameter. The ages of these pipes are unknown. Customer connections are unmetered. CRWA staff conducted a line-locating survey in May of 2020 and found one major leak at the southern edge of the service area on Maud Street (Figure 1).

Adsorptive media POU filter units were installed in 2003, but they are failing, most likely due to aging and a lack of maintenance. These units were manufactured by Isolux and use zirconium media to reduce arsenic. Isolux recommends that these cartridges be changed every one to two years.

2.4 Water Demand

Available demand data are limited, outdated and of questionable accuracy. The County was able to provide meter read tables from 1995-1997 and 2001-2004. KCSD has some partial data for the years 2016-2018 and began recording their usage again in late July of 2020. The available data are presented in Table 1.

According to the data provided by the County, water demand fell from 1997 to 2001. The Average Daily Demand (ADD) between January 1996 and December 1997 is 84,650 gallons per day (gpd) or 1,302 gallons per capita per day (gpcd). From June 2001 to May 2003, the ADD was 56,053 gpd, or 862 gpcd.

Recent data suggest that usage has increased even compared to the 1995-1997 demands. Current average daily use in the month of July is around 150,000 gpd, while in 1996 it was 112,000 gpd.

Water use is highest during the summer months of June through August, and lowest from November through February. From 2001 through 2004, average daily demand during the summer months was 91,737 gpd, three and a half times the average winter use of 24,957 gpd. While demands usually peak around 3 to 3.5 MG per month during the summer, in April and May of 1997 the demands were 7.9 and 5.6 MG respectively. It is uncertain what caused this excessive use, and it is argued that these numbers are not representative of typical system demands.

According to data from the State Water Resources Control Board (SWRCB), residential water use across California averaged at 86 gpcd in 2019. As such, the water demand at KCSD (approximately 1,400 gpcd) is significantly greater than industry expectations. In 2018, California set water consumption goals of 55 gpcd for indoor use.

2.4.1 Great Basin Unified Air Pollution Control District

KCSD is selling water to Great Basin Unified Air Pollution Control District (GBUAPCD) under an agreement signed in 2014 for use in the Keeler Dunes Dust Control Project and domestic use. The Owens Lake dry lakebed produces large amounts of very fine alkali dust that exceeds federal air pollution standards. This particulate matter (PM-10) is very harmful to respiratory health. The City of Los Angeles is working with GBUAPCD under the dust control project to mitigate the dust with a variety of methods including shallow flooding, planting native grass, and laying gravel.

GBUAPCD pays KCSD $775 per acre-foot and has a two-inch connection with a flowmeter that tees off from the well. As of the beginning of November 2020, GBUAPCD has used 450,000-gallons during the year. This is approximately 23 gpcd at KCSD. The dust control project was initially planned to end in 2017 but is now expected to be completed in June of 2022.

2.4.2 Maximum Daily Demand

The California Code of Regulations (CCR) Section 64554 dictates that water systems “must have storage capacity equal to or greater than the Maximum Daily Demand (MDD), unless the system can demonstrate that it has an additional source of supply or has an emergency source connection that can meet the MDD requirement.” MDD is estimated by taking the average daily use from the maximum month over the past ten years and multiplying by a peaking factor of at least 1.5. Excluding the anomalies of April and May 1997, the maximum month from the available data is 4.8 MG, occurring in July of 2020. From this, the MDD is calculated to be 232,000 gpd, or the equivalent of 160 gpm.

2.5 Water Quality Issues

KCSD is required to meet drinking water standards set forth in Title 22 of the CCR. Available water quality data from the Drinking Water Watch database indicates that KCSD satisfies the drinking water quality standards except those for arsenic and manganese (Table 2).

The groundwater supply has consistently exceeded both MCLs since 2004. The MCL for arsenic is 10-micrograms per liter (µg/L). The secondary MCL for manganese is 50 µg/L. The most recent samples collected on June 24, 2020, contained arsenic at 107 µg/L and manganese at 82.7 µg/L (see Figure 4).

KCSD has also tested the effluent from different POU units throughout 2018 and 2019. Most of the POU units are still out of compliance with the arsenic MCL. Results from the last few dates of testing are shown in Table 3.

The MCL for manganese is a secondary MCL. Secondary MCLs are set to manage aesthetic considerations (e.g., taste, odor, color and staining), as opposed to primary MCLs that are based on health-related criteria. Water that exceeds the manganese MCL may taste bitter and metallic and stain fixtures and laundry. However, high enough concentrations of manganese can cause health problems such as headaches, irritability, and insomnia. The EPA recommends manganese concentrations in drinking water to be below 300 µg/L for chronic exposure. Secondary MCLs are still enforceable and need to be addressed.

3.0 SUMMARY OF KEY DRINKING WATER REGULATIONS

The main purpose of this project is to address the regulations pertaining to drinking water quality. The State has set enforceable MCLs for arsenic and manganese of 10 µg/L and 50 µg/L, respectively, and KCSD is delivering water that exceeds both.

Additionally, the State has regulations for source and storage capacity that KCSD is not meeting. KCSD is required to have storage capacity equal or greater than their MDD, and to be able to meet the MDD with its highest-capacity source off-line. KCSD has only one source, and only 100,000 gallons of storage capacity, compared to its 232,000 gallon MDD.

4.0 FEASIBILITY EVALUATIONS

KCSD is currently unable to provide drinking water that meets the State standards for arsenic and manganese concentrations. Evaluations of viable alternatives are presented in the following sections. These alternatives include drilling a new source well, water treatment using iron-based adsorption media, oxidation filtration using manganese-oxide

media, and reverse-osmosis filtration. The cost evaluations are compared on a net present value (NPV) basis using a 20-year life cycle and a 3% cost of capital. Labor costs are anticipated to be $100/hour when contracted labor is used for the work, typically when the estimated level of effort is less than eight hours per week. When the expected level of effort is more than eight hours per week, it is anticipated that a KCSD employee would conduct the work and $50/hour is used for the labor cost.

4.1 New Water Supply Well

Approach

The drilling of a new supply well could potentially solve KCSD's water quality and water source and storage capacity deficiencies. It may be possible that drilling to a deeper depth could produce water that does not contain elevated concentrations of arsenic or manganese. Additionally, a second source that produces 160 gpm would provide redundancy to the system and relieve the need for more storage required by state regulations.

Advantages/Disadvantages

If the new well produces clean water, then treatment would not be required. A new well would satisfy regulatory requirements for source and storage capacity and make the system more reliable in the event that one of the wells encounters problems. Drilling a new well is expensive, and it is not guaranteed that the new well would produce uncontaminated water. A hydrogeological study will be needed if this alternative is chosen.

Preliminary estimates for a new well are shown below. The new well was estimated to be 100 feet deeper than the current well, final depth would be determined from the test well. The bore hole, casing, and screen diameter were estimated for a production well of 160 gpm and to fit the current operating conditions. Inspection and cleaning of the well is recommended to occur every 5 years.

Alternative No. 1 – New Water Supply Well

Cost Item	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
Mobilization	1	ls	$25,000	$25,000
Test Bore Drilling, 6" diameter	225	ft	$100	$22,500
Water Sampling and Analyses	1	ls	$30,000	$30,000
Sanitary Seal and Conductor Casing	50	ft	$450	$22,500
Final Bore Hole Drilling, 18" diameter	225	ft	$350	$78,750
Geophysical logging	1	ls	$6,500	$6,500
Well Casing and Screen, 10" diameter	175	lf	$200	$35,000
Well Development	1	ls	$20,000	$20,000
Well Pump, Riser and Shaft	1	ls	$20,000	$20,000
Alignment Testing	1	ls	$1,000	$1,000
Video Survey	1	ls	$1,000	$1,000
Well Disinfection	1	ls	$10,000	$10,000
	Construction Subtotal			**$272,250**
Engineering Design			30%	$81,675
Hydrogeologic Study	1	ls	$30,000	$30,000
Admin, Permitting and Legal			15%	$40,838
Contingencies			30%	$81,675
	Total Capital Cost			**$506,438**
ANNUAL O&M COSTS				
Inspection and cleaning ($10,000/5 yrs)				$2,000
Labor (1 hour/week)	52	Hrs	$100	$5,200
Power (10 Hp approx. 10 hrs/day)	75	Kwh/d	$0.10	$2,700
	Total Annual O&M Costs			**$9,900**
	NPV of O&M Costs[1]			**$147,300**
	TOTAL COST			**$653,738**

[1] Net Present Value (NPV) based on 20 years and 3% cost of capital.

4.2 Centralized Treatment with Iron-Based Media

Approach

Arsenic can be removed from water by passing through adsorptive granular media within a pressurized vessel. With sufficient contact time, the negatively charged arsenic ions are

adsorbed onto the surfaces of the positively charged media particles. Adsorptive media systems are simple to use and install, and highly efficient at removing arsenic, given the right conditions. Spent media will need to be disposed of and replaced.

Iron-based media does not treat manganese. While KCSD's water exceeds the MCL for manganese, it will not cause health problems, as explained in Section 2.5. As such, the iron-based media alternatives are still evaluated in this feasibility study because they are one of the most common and simplest methods for treating arsenic.

The conceptual design of a centralized treatment system uses Bayoxide E-33 iron-based granular adsorption media to remove arsenic in the water. Water from the well would be chlorinated to convert any As (III) to As (V) that will bond better with the media. A skid-mounted treatment unit with two 54-inch diameter pressure vessels containing the E-33 media would be used to remove the arsenic. The skid unit would likely be located outside at the existing well site. Approximately every 30 to 45 days the media must be backwashed. Media is estimated to be replaced every year and a half. Spent media is disposed of as non-hazardous waste.

The estimated backwash volume is approximately 4,350 gallons every 30 to 45 days. For purposes of this report 30 days was chosen to calculate the area needed for this backwash to evaporate. Using the minimum average monthly evaporation rate from nearby Death Valley station, obtained from the Western Regional Climate Center, 3.75 inches, the area needed to discharge the backwash is approximately 1,900 square feet, or 50-foot by 40-foot area.

Advantage/Disadvantage

This approach would bring KCSD's water in compliance with the State MCL for arsenic. This system, however, does not treat manganese, and therefore KCSD would continue to be out of compliance with the secondary MCL for manganese. Centralized systems would treat all the of the water used, including landscape irrigation that accounts for a majority of the water used at KCSD.

Alternative No. 2 – Centralized Treatment with Iron-Based Filtration Media

Cost Item	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
Mobilization				$20,000
AdVantEdge E33 Centralized Adsorption Packaged System for 160 gpm flow (including vessels, skid, media, Process valves/piping and warranty)	1	ea	$170,000	$170,000
OPTIONAL H2Zero Backwash Recycle System	1	ea	$34,500	$34,500
Concrete Slab	3	cy	$300	$900
Chain Link Fence	80	ft	$100	$8,000
			Construction Subtotal	**$233,400**
Engineering Design			30%	$70,000
Admin, Permitting and Legal			15%	$35,000
Contingencies			30%	$70,000
			Total Capital Cost	**$408,400**
ANNUAL O&M COSTS				
Inspection and cleaning of treatment equipment				$10,000
Labor (10 hour/week)	520	Hrs	$50	$26,000
Power (10 Hp approx. 10 hrs/day)	75	Kwh/d	$0.10	$2,700
			Total Annual O&M Costs	**$38,700**
			NPV of O&M Costs[1]	**$575,740**
			TOTAL COST	**$984,140**

[1] Net Present Value (NPV) based on 20 years and 3% cost of capital.

Preliminary estimates for the iron-based centralized system are based on ADD of approximately 95,000 gpd. The concrete slab and chain link fence were estimated from the system's footprint, approximately 16 feet by 13 feet. The O&M costs were estimates obtained from a national system supplier and include the media replacements.

4.3 Centralized Treatment with Chemical Addition and Manganese-Oxide Media

Approach

Oxidation filtration is a pressurized filtration process that can be used to remove arsenic and manganese. In this treatment process, water is passed through a column of manganese-oxide media that adsorbs and catalyzes the oxidation of iron and manganese. The granular media retains the precipitated iron, manganese, and arsenic until it is backwashed out of the vessel.

A conceptual design of the centralized treatment system is similar to that of the iron-based media design. Chlorine would be added to oxidize any As (III) to As (V), and ferric chloride and a pH adjustment step are also common with this treatment process. Water with the applied chemicals will be sent to two 54-inch diameter pressure vessels containing a manganese dioxide media. Because the media must be backwashed every three days, the system and backwashing process will be automated with automatic valves, a programmable logic controller (PLC) and human machine interface (HMI). The backwash will be held in a conical sludge tank with a recycle pump to return the decant water to the treatment plant influent. The media will be replaced every ten years or so.

Advantage/Disadvantage

This alternative would bring KCSD's water in compliance with the MCLs for arsenic and manganese. There are some savings because the media itself only needs to be replaced every ten years. However, because of the chemical addition, additional automation and equipment, and increased backwashing, this alternative is more expensive than centralized treatment with iron-based media. As with the previous centralized system, this system would treat all the water used, including landscape irrigation.

Alternative No. 3 – Centralized Treatment with Chemical Addition and Manganese-Oxide Media Filtration

Cost Item	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
Mobilization				$20,000
AdVantEdge AD26 Centralized Oxidation-Filtration Packaged System for 160 gpm flow (including vessels, skid, media, Process valves/piping, backwash system and warranty)	1	ea	$240,000	$240,000
H2Zero Backwash Recycle System	1	ea	$150,000	$150,000
Concrete Slab	4	cy	$300	$1,200
Chain Link Fence	90	ft	$100	$9,000
	Construction Subtotal			**$420,200**
Engineering Design			30%	$126,060
Admin, Permitting and Legal			15%	$63,030
Contingencies			30%	$126,060
	Total Capital Cost			**$735,350**
ANNUAL O&M COSTS				
Labor (20 hours/week)	1040	Hrs	$50	$52,000
Power (10 Hp approx. 10 hrs/day)	75	Kwh/d	$0.10	$2,700
Chemicals and Other Supplies				$5,200
	Total Annual O&M Costs			**$59,900**
	NPV of O&M Costs[1]			**$891,132**
	TOTAL COST			**$1,626,482**

[1] Net Present Value (NPV) based on 20 years and 3% cost of capital.

Preliminary estimates for the manganese-oxidation centralized system are based on ADD of approximately 95,000 gpd. The backwash system will be needed approximately every 3 days due to the coagulation process. The concrete slab and chain link fence were estimated for the system's approximate footprint of approximately 19 feet by 13 feet. For a conservative approach, the O&M costs were calculated to happen every year.

4.4 Point-Of-Use Treatment with Manganese Oxide and Iron-Based Media Filtration

Approach

Under this approach, POU units would be installed in every resident's home at the kitchen sink. These units will provide a single source of treated water within each home for drinking and cooking. AdEdge's dual-stage EHC-2S-2710-01 units are selected for this alternative, each supplied with one Adox2710 manganese dioxide cartridge and one AD2710S E-33 cartridge. The Adox2710 cartridge will remove iron and manganese, as well as some of the arsenic, and the AD2710S cartridge will remove arsenic further.

Before this feasibility study was conducted, KCSD conducted their own pilot study with AdEdge POU filter cartridges in three residences. In this study, they replaced their failing zirconium media cartridges with AdEdge AD2710S cartridges using E-33 media. The study began in May 2020 but was halted prematurely in August 2020. The results from the pilot study appear successful; all of the samples taken during the study were below the 10 µg/L MCL for arsenic, and most of them below the practical quantitation limit (PQL). Manganese levels were not tested during the pilot study, and it can be assumed that manganese was not reduced significantly because the E-33 media does not treat manganese.

Advantage/Disadvantage

Only the water that is being used for drinking and cooking would be treated which would be more energy efficient than the centralized or POE systems. However, this alternative would require entering residents' homes for installation, replacing filters, and periodic testing. Some residents have expressed great resistance to this idea. Furthermore, every resident must agree to POU for the County to accept POU as treatment option. This system has a rated flow of approximately 0.5 gpm that is considered suitable for drinking and kitchen use. The useful life is approximately 800 gallons depending on the water characteristics. As such, two or three change outs are anticipated per year. This is an important consideration since the POU system previously used in KCSD have not periodically replaced.

Preliminary estimates for the POU iron-based and manganese oxide media are presented below. The media replacements costs were obtained from an industry supplier and the labor costs were conservative estimates from similar projects. The replacement cartridges include both the arsenic and manganese costs. The labor hours were estimated to take approximately two hours per connection. The cartridges are recommended to be replaced every year.

Alternative No. 4 – POU Treatment with Manganese-Oxide and Ion-Based Media Filtration

Cost Item	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
Dual Stage Arsenic and Manganese Filter System	58	ea	$350	$20,300
Installation	58	ea	$500	$29,000
	Construction Subtotal			**$49,300**
Engineering Design			30%	$14,800
Admin, Permitting and Legal			15%	$7,400
Contingencies			30%	$14,800
	Total Capital Cost			**$86,300**
ANNUAL O&M COSTS				
Replacement Cartridges (2/yr)	116	ea	$220	$25,520
Power (10 Hp, 10 hrs/day)	75	Kwh/d	$0.10	$2,700
Labor	240	hours	$100	$24,000
	Total Annual O&M Costs			**$52,220**
	NPV of O&M Costs[1]			**$776,877**
	TOTAL COST			**$863,177**

[1] Net Present Value (NPV) based on 20 years and 3% cost of capital.

4.5 Point-of-Entry Treatment with Iron-Based Media Filtration

Approach

Point-Of-Entry (POE) units are also being considered to avoid installing POU systems inside the customers' homes. Larger treatment units using E-33 media would be installed outside of each home, treating all the household water use. Water enters the unit through a control valve and into the mineral tank containing approximately three cubic feet (cf) of media. The water is collected into the distributer tube and is directed back up the control valve and into the home. The POE units will be housed in cabinet enclosures that will be accessible for maintenance workers without having to enter the home.

The unit has automatic controls programmed to backwash the media every 28-days for fourteen minutes. In backwash mode, the piston within the control valve moves to direct incoming water into the distributer tube up into the media bed, cleaning any trapped

sediment. The backwash water is then sent down the drain line. POE units need to be connected to water, wastewater, and electricity.

Advantage/Disadvantage

This alternative would allow arsenic to be treated without the need of entering the residential homes for maintenance. However, manganese would still be an issue. Additionally, this alternative will treat all the indoor household water. This unit has a rated flow rate of approximately 6 to 8 gpm that should be adequate for household use.

Installation and construction of the freeze-proof enclosures are also additional costs. Residents' properties are crowded with various belongings, and the District would need to work with residents to make sure sufficient space is cleared for the housing structure and access.

Alternative No. 5 – POE Treatment with Iron-Based Media Filtration

Cost Item	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
AdVantEdge POE-7-1354 Unit	58	ea	$2,000	$116,000
Installation	58	ea	$1,500	$87,000
Freeze-Proof Enclosure	58	ea	$3,000	$174,000
	Construction Subtotal			**$377,000**
Engineering Design			30%	$113,100
Admin, Permitting and Legal			15%	$56,550
Contingencies			30%	$113,100
	Total Capital Cost			**$659,750**
ANNUAL O&M COSTS				
Replacement E-33 Media	40	cf	$425	$17,000
Power (10 Hp approx. 10 hrs/day)	75	Kwh/d	$0.10	$2,700
Labor	120	hours	$100	$12,000
	Estimated O&M per Year			**$31,700**
	NPV of O&M Costs[1]			**$471,600**
	TOTAL COST			**$1,131,350**

[1] Net Present Value (NPV) based on 20 years and 3% cost of capital.

The POE units themselves are relatively expensive and the freeze-proof enclosures add substantial costs. Media replacement would occur every two years, although the costs are

presented as distributed on an annual basis. The labor hours were estimated to require approximately two hours per connection.

4.6 Point-of-Use Reverse Osmosis Treatment

Approach

The reverse osmosis (RO) process forces water through a membrane, with pores small enough to allow water molecules through but not larger molecules such as arsenic, manganese, and most other compounds. RO systems require less maintenance than the other alternatives and no additional chemicals. The process, however, is inefficient and approximately 75% of the water supplied to the RO unit will be rejected as wastewater to the septic systems. The reject water will have higher concentrations of arsenic and other compounds than the supply water.

In this alternative, under-the-sink RO POU units would be installed in each residence. The APEC Water RO-PUMP model is considered in this report for costs; however, many different brands and models are available. The system works by first pressurizing the water with a small pump. Then the water is passed through a polypropylene sediment filter, then de-chlorinated through two activated carbon cartridges. Then the water is pushed through the reverse osmosis membrane, removing the arsenic, manganese, and other contaminants. The treated water is stored in a four-gallon pressure tank. The tank is needed because the reverse osmosis treatment process is quite slow, producing only 0.03 to 0.06-gpm of water or approximately 50 to 90 gpd. Water from the tank is passed through a final activated carbon filter to remove any unpleasant taste and odor from the tank before being dispensed at the sink.

Advantage/Disadvantage

This alternative treats both arsenic and manganese, and only treats water that will be used for drinking and cooking. The four-gallon tank is small enough to fit in the common residential kitchen. The RO treatment process, however, is inefficient because three gallons of water is rejected for every gallon of treated water produced. This may increase customers' water demand, although the increase is relatively insignificant when comparing the kitchen water use to the overall water use that includes landscape irrigation. This alternative requires entering the homes for maintenance, including changing the pre-treatment filters every year and the membrane and post-treatment filter every three to five years.

Alternative No. 6 – POU RO Treatment

Cost Item	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
APEC Water RO-PUMP POU unit w/ 4 gal pressure tank	58	ea	$400	$23,200
Installation	58	ea	$1,000	$58,000
	Construction Subtotal			**$81,200**
Engineering Design			30%	$24,360
Admin, Permitting and Legal			15%	$12,180
Engineering Design			30%	$24,360
	Total Capital Cost			**$142,100**
ANNUAL O&M COSTS				
Pre-Filter Set (1 sediment filter and 2 activated carbon cartridges)	58	ea	$40	$2,320
RO Membrane and Carbon Filter	20	ea	$60	$1,160
Power (10 Hp approx. 10 hrs/day)	75	Kwh/d	$0.10	$2,700
Labor	180	hours	$100	$18,000
	Estimated O&M per Year			**$24,180**
	NPV of O&M Costs[1]			**$359,726**
	TOTAL COST			**$501,826**

[1] Net Present Value (NPV) based on 20 years and 3% cost of capital.

POU RO systems are relatively inexpensive and have the lowest O&M costs. The O&M costs were calculated with yearly pre-filter replacements and additional membrane and post-filter replacements every three years. The labor hours were estimated to take approximately two hours for the pre-filter replacements and three hours for the membrane and post-filter replacements.

4.7 Point-of-Entry Reverse Osmosis Treatment

Approach

In this alternative, the RO treatment would be installed outside the home, treating all indoor water use. The APEC Water RO-PRO-SYSTEM model or similar POE unit will be installed outside the home within a freeze-proof enclosure. Water from the distribution system will enter a separate de-chlorinating pre-treatment unit before being treated within the POE unit. The unfiltered water will be stored within a 100-gallon tank within the

enclosure and a pump will re-pressurize the treated water into the home. The pre-treatment and RO units will be supplied by APEC; the storage tank, pump and enclosure must be furnished separately.

Advantage/Disadvantage

This alternative would treat both arsenic and manganese and would not require entering the home for installation or maintenance. However, because the units are at the entrance of the house, they will treat much more water which is not cost or energy efficient. Installation and construction of the freeze-proof enclosures are also additional costs. Like the Iron-based POE system, the District would need to work with residents to make sure sufficient space is available to install the housing structures. To install the POE units, water mains in the street would have to be isolated, stopping water service to ten homes or more at a time.

The treated water will be stored in a 14-gallon pressure tank, as this is the largest option provided by APEC. This system is rated to produce up to 90 gpd, which will satisfy indoor water use for ADD but will not be able to handle peak flows. Since the majority of the water demand is used for irrigation, this alternative should still be viable.

Alternative No. 7 – POE RO Treatment

Cost Item	Quantity	Unit	Unit Cost	Total Cost
CAPITAL COSTS				
APEC Water RO-PUMP POU unit w/ 14-gallon pressure tank	58	ea	$500	$29,000
100-gallon storage tank and pump	58	ea	$400	$23,200
Installation	58	ea	$3,000	$174,000
Freeze-Proof Enclosure	58	ea	$3,000	$174,000
	Construction Subtotal			**$402,200**
Engineering Design			30%	$120,060
Admin, Permitting and Legal			15%	$60,300
Engineering Design			30%	$120,060
	Total Capital Cost			**$700,350**
ANNUAL O&M COSTS				
Pre-Filters	58	ea	$60	$3,480
RO Membranes and Carbon Filters	19	ea	$60	$1,160
Power (10 Hp approx. 10 hrs/day)	75	Kwh/d	$0.10	$2,700
Power (RO Booster Pumps)	25	Kwh/d	$0.10	$900
Labor	240	hours	$100	$24,000
	Estimated O&M per Year			**$32,240**
	NPV of O&M Costs[1]			**$479,634**
	TOTAL COST			**$1,179,984**

[1] Net Present Value (NPV) based on 20 years and 3% cost of capital.

The POE RO systems require yearly pre-filter replacements and additional membrane and post-filter replacements every three years. The labor hours were estimated to take approximately two hours for the pre-filters per connection and an additional hour every three years for the membrane and post-filter replacements. The capital costs for the RO POE system are associated with the 100-gallon storage tank, additional pump, and freeze-proof enclosures.

4.8 Alternative Comparison

For comparison purposes the table below shows each alternative along with the capital cost and an approximate yearly O&M cost.

Alternative	Capital Cost	NPV of O&M Cost	Total Cost
New Water Supply Well	$506,000	$147,000	$654,000
Centralized Iron-Based Filtration Media	$408,000	$576,000	$984,000
Centralized Chemical Addition with Manganese-Oxide Filtration Media	$735,000	$891,000	$1,626,000
POU Manganese-Oxide and Iron-Based Filtration Media	$86,000	$777,000	$863,000
POE Iron-Based Filtration Media	$660,000	$472,000	$1,131,000
POU RO Treatment	$142,000	$360,000	$502,000
POE RO Treatment	$700,000	$480,000	$1,180,000

[1] Dollar values rounded to the nearest 1,000s

5.0 RECOMMENDED ALTERNATIVE

The POU systems have the lowest overall cost, while the centralized treatment systems and the POE systems have the highest costs. The centralized systems will require daily attention and therefore have substantially higher labor costs than other alternatives. The POE systems have significant construction costs for each unit and the O&M costs are higher than POU because the POE treats all indoor household water.

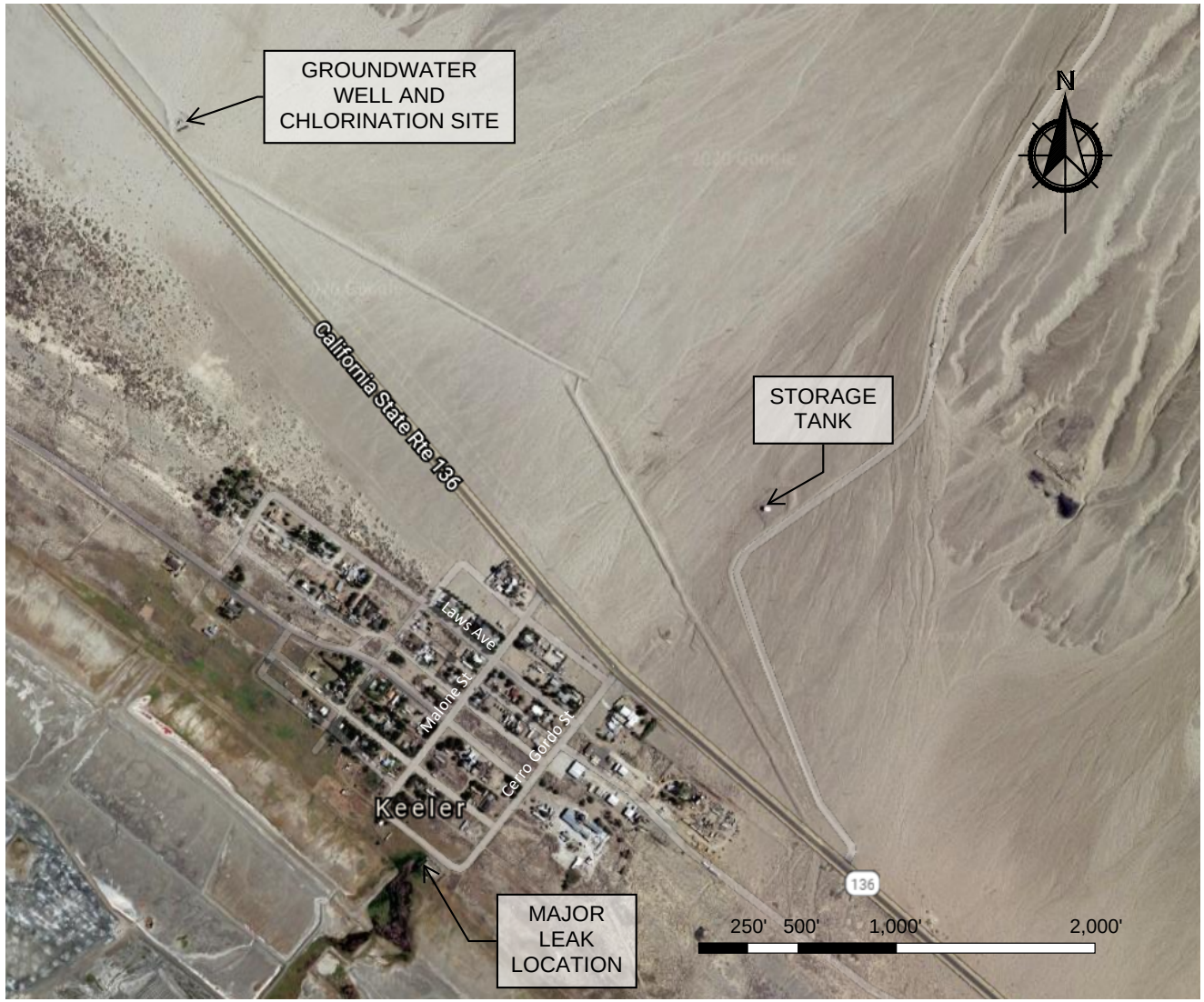
The POU system with a manganese-oxide and iron-based filters, and the POU RO system will both remove the manganese and arsenic to achieve the water quality requirements at lower costs than the other alternatives. The capital costs are similar for the POU systems while the RO is projected to have significantly lower O&M costs. The O&M costs, however, are highly dependent on water characteristics, media run times (useful life), RO clogging, and other site-specific variables. As such, it is recommended to pilot test each system at KCSD.

The pilot tests would involve installing media filters at two resident locations and RO systems in two other residences. Arsenic, manganese, and other water quality parameters should be monitored on a monthly basis, or more frequently if there is any uncertainty in system performance. The tests should also monitor the volume of water processed. Therefore, the installations would require a flow meter/totalizer immediately before or after the treatment units. The totalizers will allow evaluations of daily water use over the course

of a few weeks or months. In addition, the pilot tests can be accelerated by operating the systems continuously for designated time periods.

It is also recommended for KCSD to pursue an additional water supply well. It is likely that a new well will encounter similar water quality to the existing well. For this reason, immediate implementation of POU treatment is recommended. The new water supply well is needed to provide a secondary water source for the community. It would have an additional benefit if the water quality were better in the new well than in the existing well.

FIGURES



California Rural Water Association

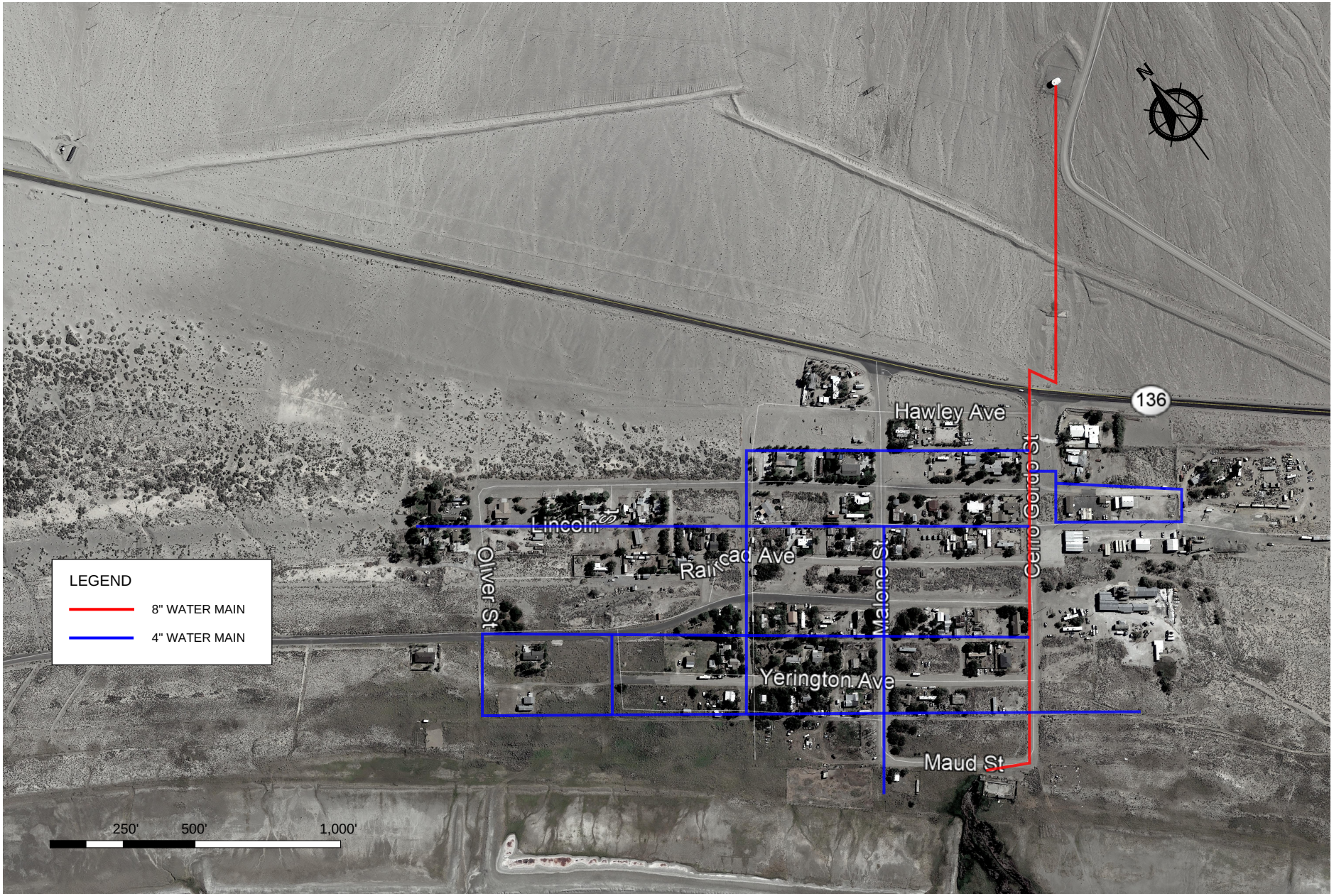
LOCATION MAP

FIGURE
1

California Rural Water Association

WELLHEAD AND
SOLAR PANELS

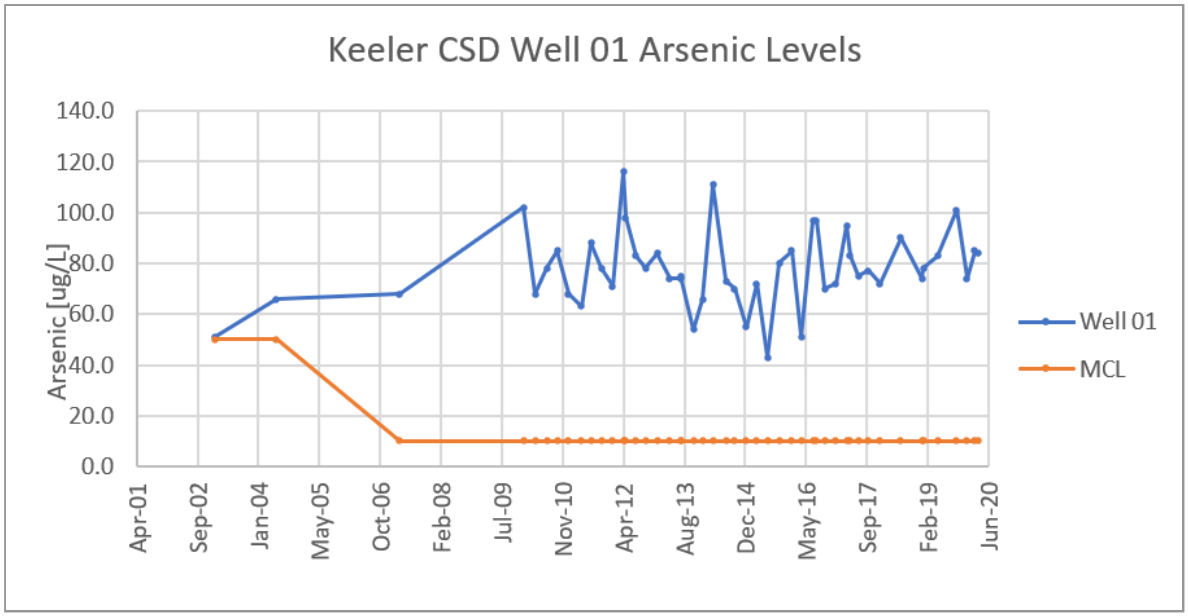
FIGURE
2

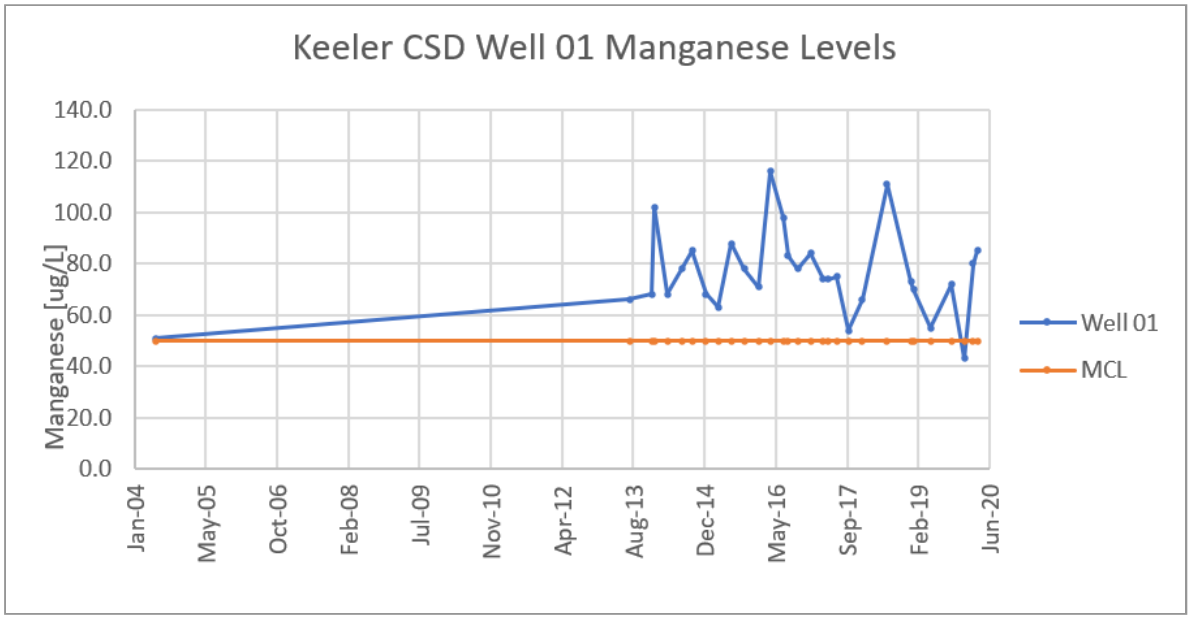


California Rural Water Association

DISTRIBUTION MAP

FIGURE 3





California Rural Water Association

ARSENIC AND MANGANESE CONCENTRATIONS WITH TIME

FIGURE 4

TABLES

Table 1: Available Monthly Demand Data [gal]											
	1995	**1996**	**1997**	**2001**	**2002**	**2003**	**2004**	**2016**	**2017**	**2018**	**2020**
January	-	2,040,190	921,630	-	1,028,660	696,150	580,460	-	1,619,130	-	-
February	870,700	1,687,530	862,550	-	847,410	650,090	745,560	-	1,351,650	-	-
March	1,143,900	1,399,800	3,251,710*	-	1,239,770	772,050	816,600	-	2,354,280	-	-
April	1,661,550	2,059,000	7,854,720*	-	1,638,840	1,000,380	1,528,710	-	-	-	-
May	2,250,600	2,723,660	5,610,040*	-	2,246,770	1,953,100	1,597,280	-	-	4,904,225	-
June	3,661,300	3,102,460	2,997,600	2,812,446	3,041,200	2,158,440	-	-	-	4,189,103	-
July	3,489,550	3,482,070	3,800,590	2,750,960	3,636,300	2,253,110	-	-	-	4,170,250	-
August	3,234,050	3,477,900	3,243,480	2,881,260	2,949,930	-	-	-	-	4,561,309	4,780,733
September	-	3,022,910	1,913,400	2,330,380	2,267,110	-	-	3,052,300	-	3,429,720	4,042,328
October	-	2,234,540	1,943,330	1,739,770	1,545,740	-	-	3,875,830	-	2,817,331	3,633,898
November	-	1,152,200	897,900	790,660	939,020	-	-	2,163,740	-	2,045,384	2,395,481
December	-	1,043,350	863,040	631,540	529,230	-	-	2,309,200	-	-	1,000,566
Yearly Total	**16.3-MG** (for 7-month period)	**27.4-MG**	**34.2-MG**	**13.9-MG** (for 7-month period)	**21.9-MG**	**9.-MG** (for 6-month period)	**5.3-MG** (for 5-month period)	**11.4-MG** (for 4-month period)	**5.3-MG** (for 3-month period)	**26.1-MG** (for 7-month period)	**15.9-MG** (for 5-month period)
* usage was uncharacteristically high and not representative of typical demands											

TABLE 2

Water Quality Results for Primary MCLs			
Constituent	**Result**	**MCL**	**Date**
Inorganic Chemicals			
Aluminum [mg/L]	<.05	1	2017
Antimony [ug/L]	<6	6	2017
Arsenic [ug/L]	107	10	2020
Asbestos [MFL]	0	7	2017
Barium [mg/L]	<.1	1	2017
Beryllium [ug/L]	<1	4	2017
Cadmium [ug/L]	<1	5	2017
Chromium [ug/L]	<10	50	2017
Cyanide [mg/L]	<0.1	0.15	2017
Fluoride [mg/L]	1.2	2	2017
Mercury [ug/L]	<1	2	2017
Nickel [mg/L]	<.01	0.1	2017
Nitrate (as N) [mg/L]	<.4	10	2019
Nitrate+Nitrite (as N) [mg/L]	<.2	10	2017
Nitrite (as N) [mg/L]	<.4	1	2017
Perchlorate [ug/L]	<4	6	2017
Selenium [ug/L]	<5	50	2017
Thallium [ug/L]	<1	2	2017
Volatile Organic Chemicals (VOCs)			
Benzene [ug/L]	<.5	1	2020
Carbon Tetra-chloride [ug/L]	<.5	0.5	2020
1,2-Dichloro-benzene [ug/L]	<.5	600	2020
1,1-Dichloro-ethane [ug/L]	<.5	5	2014
1,2-Dichloro-ethane [ug/L]	<.5	0.5	2014
cis-1,2-Dichloro-ethylene [ug/L]	<.5	6	2020
trans-1,2-Dichloro-ethylene [ug/L]	<.5	10	2020
Dichloromethane [ug/L]	<.5	5	2020
1,2-Dichloro-propane [ug/L]	<.5	5	2020
Ethylbenzene [ug/L]	<.5	300	2020
Methyl-tert-butyl ether [ug/L]	<3	13	2020

Water Quality Results for Primary MCLs (cont'd)			
Constituent	**Result**	**MCL**	**Date**
Monochloro-benzene [ug/L]	<0.5	70	2020
Styrene [ug/L]	<.5	100	2020
1,1,2,2-Tetra-chloroethane [ug/L]	<.5	1	2020
Tetrachloro-ethylene [ug/L]	<.5	5	2020
Toluene [ug/L]	<.5	150	2020
1,2,4-Trichloro-benzene [ug/L]	<.5	5	2020
1,1,1-Trichloro-ethane [ug/L]	<.5	200	2020
1,1,2-Trichloro-ethane [ug/L]	<.5	5	2020
Trichloroethylene [ug/L]	<.5	5	2020
Trichlorofluoro-methane [ug/L]	<5	150	2020
Vinyl Chloride [ug/L]	<.5	0.5	2020
Xylenes [ug/L]	<.5	1750	2020
Synthetic Organic Chemicals (SOCs)			
Atrazine [ug/L]	0	1	2004
Bentazon [ug/L]	0	18	2004
Chlordane [mg/L]	0	0.1	2004
2,4-D [ug/L]	0	70	2004
Dalapon [ug/L]	0	200	2004
Dibromochloro-propane [ug/L]	<.01	0.2	2018
Di(2-ethylhexyl)-phthalate [ug/L]	0	4	2004
Dinoseb [ug/L]	0	7	2004
Diquat [ug/L]	0	20	2004
Endothall [ug/L]	0	100	2004
Endrin [ug/L]	0	2	2004
Ethylene Dibromide [ug/L]	<.02	0.05	2018
Glyphosate	0	0.7	2004
Heptachlor [ug/L]	0	0.01	2004
Heptachlor Epoxide [ug/L]	0	0.01	2004
Hexachloro-benzene [ug/L]	0	1	2004

TABLE 2

Water Quality Results for Primary MCLs (cont'd)			
Constituent	**Result**	**MCL**	**Date**
Hexachlorocyclo-pentadiene [ug/L]	0	50	2004
Lindane [ug/L]	0	0.2	2004
Methoxychlor [ug/L]	0	30	2004
Oxamyl [ug/L]	0	50	2004
Pentachlorophenol [ug/L]	0	1	2004
Picloram [ug/L]	0	500	2004
Polychlorinated Biphenyls [ug/L]	0	0.5	2004
Simazine [ug/L]	0	4	2004
Thiobencarb [ug/L]	0	70	2004
Toxaphene [ug/L]	0	3	2004
1,2,3-Trichloro-propane [ug/L]	<.005	0.005	2019
2,4,5-TP (Silvex) [ug/L]	0	50	2004

Water Quality Results for Secondary MCLs			
Constituent	**Result**	**MCL**	**Date**
Aluminum [mg/L]	<.05	0.2	2017
Color [units]	3	15	2017
Copper [mg/L]	<.05	1	2017
Foaming Agents (MBAS) [mg/L]	<.05	0.5	2017
Iron [mg/L]	<.1	0.3	2017
Manganese [ug/L]	82.7	50	2020
Methyl-tert-butyl ether (MTBE) [ug/L]	<1	5	2014
Odor -Threshold [units]	<1	3	2017
Silver [mg/L]	0.01	0.1	2017
Thiobencarb [ug/L]	0	1	2004
Turbidity [units]	2.8	5	2017
Zinc [mg/L]	<.05	5	2017
Total Dissolved Solids [mg/L]	820	1,000	2017
Specific Con-ductance [uS/cm]	1350	1,600	2,017
Chloride [mg/L]	103	500	2017
Sulfate [mg/L]	112	500	2017

Table 3: Most Recent Arsenic Test Results at Point-Of-Use		
POU ID	**Result [ug/L]**	**Sample Date**
#47	11	10/22/2019
#44	510	10/22/2019
#8	24	10/22/2019
#36	12	10/22/2019
#24	10	10/21/2019
#5	33	10/21/2019
#3	96	10/21/2019
#40	22	10/21/2019
#9	6	10/21/2019
#58	15	9/14/2019
#59	10	9/12/2019
#7	8	9/30/2019
#23	16	7/5/2019
#14	<1	7/3/2019
#58	84	6/30/2019

APPENDICES

APPENDIX A

Kathe Barton, REHS
Director

TEL (760) 878-0238
FAX (760) 878-0239

COUNTY OF INYO

DEPARTMENT OF ENVIRONMENTAL HEALTH SERVICES
P.O. BOX 427, INDEPENDENCE, CALIFORNIA 93526

September 30, 2019

System No. 1400036

Keeler Community Service District
Attn KCSD Board Members: Carole Puryear, Dan Dickman, Mike Gibson, Sherry Cosgrove
P.O. Box 107
Keeler, CA 93530

COMPLIANCE ORDER NO. 05-44-19R-063
ARSENIC MAXIMUM CONTAMINANT LEVEL VIOLATION

Enclosed is Compliance Order No. 05-44-19R-063 (hereinafter "Order") issued to Keeler Community Service District (hereinafter "KCSD"), public water system. Please note there are legally enforceable deadlines associated with this Order.

KCSD will be billed at the Inyo County Environmental Health Services (hereinafter "Inyo EHS") hourly rate for the time spent on issuing this Order. California Health and Safety Code (hereinafter "CHSC") Section 116595 provides that a public water system must reimburse Inyo EHS for actual costs incurred by Inyo EHS for specified enforcement actions, including preparing, issuing and monitoring compliance with an order. At this time, Inyo EHS has spent approximately 2 hours on enforcement activities associated with this violation.

KCSD will receive a bill sent from Inyo EHS in August of the next fiscal year. This bill will contain fees for any enforcement time spent on KCSD 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 Inyo EHS 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.

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 Inyo EHS. The date of issuance is the date when Inyo EHS 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 me at (760) 873-7867.

Sincerely,

Kathe Barton

Kathe Barton, REHS
Director of Environmental Health

Enclosures

Certified Mail No. 7017 0190 0000 4499 3833

cc: Eric Zuniga, SWRCB DDW via email at dwpdist13@waterboards.ca.gov.

INYO COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH SERVICES

DRINKING WATER PROGRAM

Name of Public Water System: Keeler Community Service District

Water System No: 1400036

To: Keeler Community Service District

Attention: KCSD Board Members: Carole Puryear, Dan Dickman, Mike Gibson, Sherry Cosgrove

P.O. Box 107

Keeler, CA 93530

Issued: September 30, 2019

COMPLIANCE ORDER 05-44-19R-063

FOR NONCOMPLIANCE

CALIFORNIA HEALTH AND SAFETY CODE, SECTION 116555 AND CALIFORNIA CODE OF REGULATIONS, TITLE 22, SECTIONS 64431

ARSENIC MAXIMUM CONTAMINANT LEVEL VIOLATION

The California Health and Safety Code (hereinafter "CHSC"), Section 116655 authorizes the Inyo County Environmental Health Services (hereinafter "Inyo EHS"), to issue a compliance order to a public water system when Inyo EHS 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.

Inyo EHS, acting by and through its primacy delegation from the State Water Resources Control Board hereby issues Compliance Order No. 05-44-19R-063 (hereinafter "Order"), pursuant to Section 116655 of the CHSC to Keeler Community Service District (hereinafter "KCSD"), for violation of CHSC, Section 116555 and California Code of Regulations (hereinafter "CCR"), Title 22, Section 64431, Maximum Contaminant Levels (hereinafter "MCL") – Inorganic Chemicals.

STATEMENT OF FACTS

KCSD is classified as a Community public water system with a population of 54 persons served through 58 service connections.

CHSC, Section 116555 requires all public water systems to comply with primary drinking water standards as defined in CHSC, Section 116275(c). Primary drinking water standards include maximum levels of contaminants, specific treatment standards, and monitoring and reporting requirements as specified in regulations adopted by Inyo EHS.

CCR, Title 22, Section 64431 – Inorganic Chemicals states that public water systems shall comply with the primary MCLs established in Table 64431-A. The MCL for arsenic is 0.010 milligrams per liter (hereinafter "mg/L").

CCR, Title 22, Section 64432 states that if any one sample would cause the running annual average to exceed the MCL, the system is immediately in violation. If a system takes more than one sample in a quarter, the average of all the results for that quarter shall be used when calculating the running annual average. If a system fails to complete four consecutive quarters of monitoring, the running annual average shall be based on an average of the available data.

Inyo EHS received laboratory results for arsenic samples collected from January 1, 2014 through September 30, 2019 from Well 01. A summary of monitoring results and average arsenic concentrations from those samples are included as Appendix 5: Arsenic Sample Summary.

A summary of KCSD's most recent arsenic monitoring results are presented in the table below:

Well 01 Arsenic Sample Results (pCi/L)

Compliance Period	Sample Date	Result
3rd Quarter 2018	no sample	--
4th Quarter 2018	12/17/2018	0.074
1st Quarter 2019	1/2/2019	0.078
2nd Quarter 2019	4/29/2019	0.083
Running Annual Average (RAA): **0.078**		

The arsenic MCL is 0.010 mg/L

Initial notification to the public of the arsenic violation was performed by KCSD on May 13, 2014 in conformance with CCR, Title 22, Sections 64463.4 and 64465. A copy of this notice is included as Appendix 6: Initial Public Notice with Proof of Notification.

DETERMINATION

Inyo EHS has determined that KCSD has failed to comply with primary drinking water standards pursuant to CHSC, Section 116555 and the arsenic MCL pursuant to CCR, Title 22, Section 64431.

DIRECTIVES

The Keeler Community Service District is hereby directed to take the following actions:

1. By **December 31, 2021**, comply with CCR, Title 22, Section 64431.

2. By **December 31, 2019** and quarterly thereafter, sample for arsenic from Well 01. KCSD shall ensure that the analytical results are reported to Inyo EHS no later than the 10th day following the month in which the analysis is completed. KCSD shall ensure that the results of each sampling event are transmitted from the analytical which conducted the analysis to the State database via the Electronic Data Transfer (EDT) process.

3. By **October 10, 2019**, notify all persons served by KCSD of the violation of CCR, Title 22, Section 64431, in conformance with Sections 64463.4 and 64465. Public notification to the persons served by the KCSD must continue quarterly notification until Inyo EHS determines that the arsenic contamination is resolved. Appendix 1: Notification Template must be used to fulfill this directive, unless otherwise approved by Inyo EHS. The contents of the public notice must be approved by Inyo EHS prior to issuance. The notice must remain posted in place for as long as the violation continues but in no case less than seven days and shall be completed in accordance with the following:
   - Posting of the public notice in conspicuous places within the area served by the water system.
   - By mail or direct delivery of the public notice to each person served by the water system.

4. By **October 21, 2019**, complete Appendix 2: Certification of Completion of Public Notification Form. Submit it together with a copy of the public notice required by Directive 3 to Inyo EHS within 10 days following each public notification.

5. Prepare a Corrective Action Plan for Inyo EHS approval, identifying improvements to the water system designed to correct the water quality problems identified as an exceedance of the arsenic MCL and ensure that KCSD delivers water to consumers that meets primary drinking water standards. The plan must include a time schedule for completion of each of the phases of the project, such as design, construction, and startup, and a date as of which KCSD will be in compliance with the arsenic MCL, which date must be no later than **December 31, 2021**.

6. By **November 15, 2019**, submit the Corrective Action Plan required under Directive No. 5 above, to the Inyo EHS office located at:

kbarton@inyocounty.us

OR

Inyo County Environmental Health Services
P.O. Box 427
Independence, CA 93526

7. Carry out the Inyo EHS-approved Corrective Action Plan, and each element of said plan, according to the time schedule set forth therein.

8. By **December 31, 2019**, and every three months thereafter, submit a report to Inyo EHS in the form provided as Appendix 3, showing actions taken during the previous quarter (calendar three months) to comply with the Corrective Action Plan.

9. By **January 10, 2022**, demonstrate to Inyo EHS that the water delivered by KCSD complies with the arsenic MCL.

10. Notify Inyo EHS in writing no later than five (5) days before the deadline for performance of any directive set forth herein if KCSD anticipates it will not meet the deadline.

11. By **October 10, 2019**, complete and return to Inyo EHS the "Notification of Receipt" form attached to this Order as Appendix 4. Completion of this form confirms that KCSD has received this Order and understands that it contains legally enforceable directives with due dates.

All submittals required by this Order, unless otherwise specified in the directives above, must be electronically submitted to Inyo EHS at the following address. The subject line for all electronic submittals corresponding to this Order must include the following information: Water System name and number, Order number and title of the document being submitted.

Kathe Barton, Director

kbarton@inyocounty.us

OR

Inyo County Environmental Health Services
P.O. Box 427
Independence, CA 93526

Inyo EHS 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 KCSD 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 KCSD, its owners, shareholders, officers, directors, agents, employees, contractors, successors, and assignees.

SEVERABILITY

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

FURTHER ENFORCEMENT ACTION

The California SDWA authorizes Inyo EHS 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 Inyo EHS to take action 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 Inyo EHS, and to petition the superior court to take various enforcement measures against a public water system that has failed to comply with an order of Inyo EHS. Inyo EHS does not waive any further enforcement action by issuance of this Order.

Kathe Barton

Kathe Barton, REHS
Director of Environmental Health

9/30/19

Date

Appendices:

1. Notification Template
2. Certification of Completion of Public Notification
3. Quarterly Progress Report
4. Notification of Receipt
5. Arsenic Sample Summary
6. Initial Public Notice with Proof of Notification

Certified Mail No. 7017 0190 0000 4499 3833

APPENDIX 1: NOTIFICATION TEMPLATE

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Este informe contiene información muy importante sobre su agua potable.
Tradúzcalo o hable con alguien que lo entienda bien.

Keeler Community Service District Has Levels of Arsenic Above the Drinking Water Standard

Our water system recently violated a drinking water standard. Although this is not an emergency, as our customers, you have a right to know what you should do, what happened, and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Water sample results received on [date] showed arsenic levels of [level and units]. This is above the standard, or maximum contaminant level (MCL), of 0.010 milligrams per liter.

What should I do?

- **You do not need to use an alternative water supply (e.g., bottled water).**
- This is not an emergency. If it had been, you would have been notified immediately. However, *some people who drink water containing arsenic in excess of the MCL over many years may experience skin damage or circulatory system problems, and may have an increased risk to getting cancer.*
- If you have other health issues concerning the consumption of this water, you may wish to consult your doctor.

What happened? What is being done?

- [Describe corrective action]. We anticipate resolving the problem within [estimated time frame].
- For more information, please contact [name of contact] at [phone number] or [mailing address].
- Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this public notice in a public place or distributing copies by hand or mail.

Secondary Notification Requirements

Upon receipt of notification from a person operating a public water system, the following notification must be given within 10 days [Health and Safety Code Section 116450(g)]:

- SCHOOLS: Must notify school employees, students, and parents (if the students are minors).
- RESIDENTIAL RENTAL PROPERTY OWNERS OR MANAGERS (including nursing homes and care facilities): Must notify tenants.
- BUSINESS PROPERTY OWNERS, MANAGERS, OR OPERATORS: Must notify employees of businesses located on the property.

This notice is being sent to you by Keeler Community Service District.

State Water System ID#: __1400036__. Date distributed: _____.

APPENDIX 2: CERTIFICATION OF COMPLETION OF PUBLIC NOTIFICATION

Compliance Order Number: 05-44-19R-063

Name of Water System: Keeler Community Service District

System Number: 1400036

Attach a copy of the public notice distributed to the water system's customers.

This form, when completed and sent to kbarton@inyocounty.us of Inyo County Environmental Health Services, P.O. Box 427, Independence, CA 93526, serves as certification that public notification to water users was completed as required by Title 22, California Code of Regulations, Sections 64463-64465.

Public notification for failure to comply with the **Arsenic MCL** was conducted on:

Notification was made on _____ (date).

For the following monitoring period: **1st** **2nd** **3rd** **4th** quarter(s) of _____ (year).
(Circle appropriate quarter(s))

To summarize report delivery used and good-faith efforts taken, please check all items below that apply and fill-in where appropriate:

For Community and non-transient non-community public water systems

☐ The notice was distributed by mail or direct delivery to each customer on: _____

One or more of the following methods were used to reach persons not likely to be reached by a mailing or direct delivery or persons served by a transient public water system (renters, nursing home patients, prison inmates, etc.):

☐ Posted the notice at the following conspicuous locations served by the water system. (If needed, please attach a list of locations). _____

☐ Publication of the notice in a local newspaper or newsletter of general circulation (attach a copy of the published notice, including name of newspaper and date published).

☐ Posted the notice on the Internet at www._____

☐ Other method used to notify customers. _____

I hereby certify that the above information is factual.

Certified by: Printed Name _____ Title_____

Signature _____

Date _____

Disclosure: Be advised that the California Health and Safety Code, Sections 116725 and 116730 state that any person who knowingly makes any false statement on any report or document submitted for the purpose of compliance with the Safe Drinking Water Act may be liable for, respectively, a civil penalty not to exceed five thousand dollars ($5,000) for each separate violation or, for continuing violations, for each day that violation continues, or be punished by a fine of not more than $25,000 for each day of violation, or by imprisonment in the county jail not to exceed one year, or by both the fine and imprisonment.

APPENDIX 3: QUARTERLY PROGRESS REPORT

Water System: Keeler Community Service District	Water System No: 1400036
Compliance Order No: 05-44-19R-063	Violation: Arsenic
Calendar Quarter:	Date:

This form should be prepared and signed by Keeler Community Service District personnel with appropriate authority to implement the directives of the Compliance Order and the Corrective Action Plan. Please attach additional sheets as necessary. The quarterly progress report must be submitted by the 10th day of each subsequent quarter, to Inyo County Environmental Health Services, to the following email address: kbarton@inyocounty.us titled appropriately.

Summary of Compliance Plan:

Tasks completed in the reporting quarter:

Tasks remaining to complete:

Anticipated compliance date:

Printed Name **Signature**

Title **Date**

APPENDIX 4: NOTIFICATION OF RECEIPT

Compliance Order Number: 05-44-19R-063

Name of Water System: Keeler Community Service District

System Number: 1400036

Certification

I certify that I am an authorized representative of Keeler Community Service District and that Compliance Order No. 05-44-19R-063 was received on _____. Further I certify that the Order has been reviewed by the appropriate management staff of Keeler Community Service District and it is clearly understood that Compliance Order No. 05-44-19R-063 contains legally enforceable directives with specific due dates.

_____ _____

Signature of Water System Representative Date

THIS FORM MUST BE COMPLETED AND RETURNED TO INYO COUNTY ENVIRONMENTAL HEALTH SERVICES NO LATER THAN OCTOBER 10, 2019.

Disclosure: Be advised that the California Health and Safety Code, Sections 116725 and 116730 state that any person who knowingly makes any false statement on any report or document submitted for the purpose of compliance with the Safe Drinking Water Act may be liable for, respectively, a civil penalty not to exceed five thousand dollars ($5,000) for each separate violation or, for continuing violations, for each day that violation continues, or be punished by a fine of not more than $25,000 for each day of violation, or by imprisonment in the county jail not to exceed one year, or by both the fine and imprisonment.

APPENDIX 5: ARSENIC SAMPLE SUMMARY

Quarter	Date Sampled	Result (mg/L)	Running Annual Average (mg/L)
3rd Q 2013	7/17/2013	0.075	--
4th Q 2013	10/30/2017	0.054	--
1st Q 2014	1/10/2014	0.066	--
2nd Q 2014	4/9/2014	0.111	**0.077**
3rd Q 2014	7/20/2014	0.073	**0.076**
4th Q 2014	10/1/2014	0.070	**0.080**
1st Q 2015	1/5/2015	0.055	**0.077**
2nd Q 2015	4/1/2015	0.072	**0.068**
3rd Q 2015	7/1/2015	0.043	**0.060**
4th Q 2015	10/4/2015	0.080	**0.063**
1st Q 2016	1/11/2016	0.085	**0.070**
2nd Q 2016	4/3/2016	0.051	**0.065**
3rd Q 2016	7/5/2016	0.097	**0.082**
3rd Q 2016	8/3/2016	0.097	
4th Q 2016	10/9/2016	0.070	**0.079**
1st Q 2017	1/8/2017	0.072	**0.084**
2nd Q 2017	4/8/2017	0.095	**0.086**
2nd Q 2017	5/8/2017	0.083	
3rd Q 2017	7/12/2017	0.075	**0.081**
4th Q 2017	10/5/2017	0.077	**0.083**
1st Q 2018	1/7/2018	0.072	**0.077**
2nd Q 2018	6/28/2018	0.090	**0.079**
3rd Q 2018	no sample	--	**0.080**
4th Q 2018	12/17/2018	0.074	**0.079**
1st Q 2019	1/2/2019	0.078	**0.081**
2nd Q 2019	4/29/2019	0.083	**0.078**

**Maximum Contaminant Level for arsenic is 0.010 mg/L.*

APPENDIX 6: INITIAL PUBLIC NOTICE WITH PROOF OF NOTIFICATION

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Este informe contiene información muy importante sobre su agua potable.
Tradúzcalo o hable con alguien que lo entienda bien.

The Keeler Community Service District Has Levels of Arsenic and Manganese Above the Drinking Water Standard

Our water system recently violated two drinking water standards. Although this is not an emergency, as our customers, you have a right to know what you should do, what happened, and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Water samples taken on 9 April, 2014 and showed an arsenic level of 0.111 milligrams per liter. The running annual average currently is about 0.076 milligrams per liter. This is above the U.S. EPA standard, or maximum contaminant level (MCL) of 0.010 milligrams per liter.

That same water sample taken on 9 April, 2014 showed a manganese level of 0.0576 milligrams per liter. Correction: not 0.576 as was reported in an earlier notice. The maximum contaminant level EPA standard for manganese (for esthetic purposes) is 0.05 milligrams per liter. Manganese at very high levels can pose neruotoxic risk.

What should I do?

- **You do not need to use an alternative water supply (e.g., bottled water).**
- This is not an emergency. If it had been, you would have been notified immediately. However, *some people who drink water containing arsenic in excess of the MCL over many years may experience skin damage or circulatory system problems, and may have an increased risk to getting cancer.*
- If you have other health issues concerning the consumption of this water, you may wish to consult your doctor.

What happened? What is being done?

These arsenic assay results are greater than the MCL. We will continue to monitor arsenic levels at the well site. PLEASE use your POU units, or another water source known to meet standards, and NOT untreated KCSD water for consumption.

The KCSD will maintain its POU units while looking for funding to obtain other possible arsenic treatment facilities or water sources which meet state approval. We will continue to monitor manganese levels.

For more information, please contact Karen Riggs at 1-714-604-3 300 or P.O. Box 107, Keeler, CA 93530.

Drinking Water Notification to Consumers

PROOF OF NOTIFICATION

Name of Water System: Keeler Community Services District - Public water system number 1400036

Please explain what caused the problem if you have determined what it was and what steps you have taken to correct it. Water samples taken on 9 April, 2014 showed an arsenic level of 0.111 milligrams per liter and manganese level 0.0576 milligrams per liter

Consumers Notified X Yes _____ No

If not, Explain: _____

Date of Notification: May 13, 2014

On the date of notification set forth above, I served the above referenced document(s) on the consumers by:

X Sending a copy through the U.S. Mail, first class, postage prepaid, addressed to each of the resident(s) at the place where the property is situation, pursuant to the California Civil Code. Attach copy of Notice.

_____Newspaper (if the problem has been corrected). Attach a copy of Notice.

_____Personally hand-delivered a copy to each of the consumers. Attach a copy of Notice.

X Posted on a public bulletin board, that will be seen by each of the consumers (for small, non-community water systems with prior Department approval). Attach copy of Notice.

I hereby declare the forgoing to be true and correct under penalty of perjury.

Dated: May 15, 2014 Karen B. Riggs

Signature of Person Serving Notice

Notice: Complete this Proof of Notification and return it **along with a copy of the notification within **10 days** of receipt of giving public notice – mail to:

Inyo County Environmental Health Services
207 W South Street, Bishop, CA 93514

Disclosure: Be advised that the California Health and Safety Code states that any person who knowingly makes a false statement on any report or document submitted for the purpose of compliance with the attached order may be liable for a civil penalty not to exceed five thousand dollars ($5,000) for each separate violation for each day that violation continues. In addition, the violators may be prosecuted in criminal court and upon conviction, be punished by fine of not more than twenty-five thousand dollars ($25,000) for each day of violation, or be imprisoned in county jail not to exceed one year or by both the fine and imprisonment.

APPENDIX B

QUADRUPLICATE
Use of complying with local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

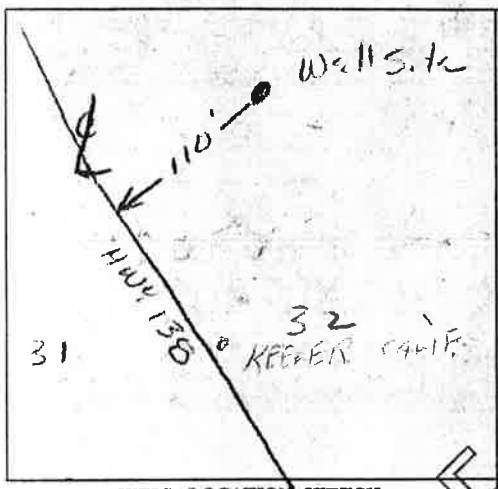
Do not fill in
No. 229831

Notice of Intent No. 202170
Local Permit No. or Date 5-84-03

State Well No.
Other Well No.

(1) OWNER: Name Keeler Community Services Dist
Address P.O. Box 63
City Keeler, Ca. Zip 93530

(2) LOCATION OF WELL (See instructions):
County Inyo Owner's Well Number
Well address if different from above
Township 17S Range 38E Section 4
Distance from cities, roads, railroads, fences, etc. NW 1/4
T16S R38E
T17S R38E



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:
Rotary ☑ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☐ No ☑ Size
Diameter of bore 17 1/2
Packed from 31 to 123 ft.

(7) CASING INSTALLED:
Steel ☑ Plastic ☐ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
+2 1/2	10 1/2	16 3/4	.25	51.1"	108.10"	16 12 1/2
10 1/2	123	10 3/4	SCH 40			

(8) PERFORATIONS:
Type of perforation or size of screen

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 52 ft.
Were strata sealed against pollution? Yes ☐ No ☑ Interval ft.
Method of sealing Neat Cement

(10) WATER LEVELS:
Depth of first water, if known 41 ft.
Standing level after well completion 40.8 ft.

(11) WELL TESTS:
Was well test made? Yes ☑ No ☐ If yes, by whom? Fred F. Wheeler
Type of test Pump ☑ Bailer ☐ Air lift ☐
Depth to water at start of test 40.8 ft. At end of test 42.1 ft
Discharge 312 gal/min after 24 hours Water temperature 72°
Chemical analysis made? Yes ☐ No ☑ If yes, by whom?
Was electric log made? Yes ☐ No ☑ If yes, attach copy to this report

(12) WELL LOG: Total depth 125 ft. Depth of completed well 123 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0-20		Sand, Gravel, Sm. Rocks
10-20		" " Blue Clay Streaks
20-30		" " Sm. Rocks
30-40		" " " "
40-50		" " " " Blue Clay Strks
50-60		" " " " " "
60-70		" " " " " "
70-80		" Coarse Gravel Sm. Rocks
80-100		" " Blue Clay Streaks
100-110		" " Sm. Rocks
110-120		" " White Clay Streaks
120-125		" " " " "

Work started 5-9 19 84 Completed 5-12 19 84

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED (Well Driller)
NAME Kuykendall Well Drilling (Person, firm, or corporation) (Typed or printed)
Address PO Box 115
City Independence Zip 93527
License No. 308262 Date of this report 5-15-84

ONLY FOR PUBLIC USE
NOT FOR PUBLIC USE
WATER CODE SEC. 13752

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

INDEPENDENCE, CALIF. 93526
411

INYO COUNTY HEALTH DEPARTMENT
Division of Environmental Health

207 SOUTH ST.
BISHOP, CALIF. 93514
(714) 873-5891

PAGE 1 OF 2 PAGES

WELL PERMIT APPLICATION

PERMIT NO. S-84-03

TYPE OF WORK (Check)	USE (Check)	EQUIPMENT (Check)
New Well ☑	Domestic ☐ Test Well ☐	Rotary ☑
Repair or Modification ☐	Irrigation ☐ Municipal ☑	Cable Tool ☐
Destruction ☐	Industrial ☐ Other ☐	Other ☐

PROPOSED WELL DEPTH: 125 Feet

PROPOSED CASING: Steel — Other PVC. Diameter 10" Wall or Gage .250, .50

PROPOSED SEALING ZONE(S)
From 0 to 50 Feet
From ____ to ____ Feet
From ____ to ____ Feet

SEALING MATERIAL (Check)
Neat Cement ☑ Puddled Clay ☐
Cement Grout ☐ Concrete ☐

PROPOSED PERFORATIONS OR SCREEN
From 55' to 85 Feet
From 105 to 125 Feet
From ____ to ____ Feet
From ____ to ____ Feet

DATE OF WORK
Start 3-25-83
Completion 3-30-83

NAME OF WELL OWNER: KEELER COMMUNITY SERVICES DISTRICT

ASSESSOR'S PARCEL NO. 27-270-15B T16S R38E / T17S R38E CORNER N.W. 1/4 SEC 4 T17S R38E

MAILING ADDRESS: P.O. BOX 63 KEELER CALIF 93530

NAME OF WELL DRILLER: BLM lease land KIRSCHENMANN'S WELL DRILLING

BUSINESS ADDRESS: P.O. BOX 119 INYOKERN CA 93527

LICENSE NUMBER: 308367

Cash Deposit ☐
Bond Posted ☐

$ 50 Fee paid on 3-20-84 Receipt No 127174

DISPOSITION OF APPLICATION (FOR HEALTH OFFICERS USE ONLY)

☐ APPROVED ☐ DENIED

☒ APPROVED WITH CONDITIONS

Report Reason(s) for Denial or Necessary Conditions Here:

1- Call for inspection during drilling, and before sealing.
D.A. Oldenburg, R.S.
(2) 5-9-84 - sealing inspection 52 Ft. neat cement 2.3 cu. yds in annulus, pumped 2 BBL.
D. Oldenburg, R.S.

Sanitary Seal & Surface Seal completed.
5-11-84

HEALTH OFFICER OR REPRESENTATIVE
D.A. Oldenburg, R.S.
DATE

I hereby agree to comply with all regulations of the Department of the Public Health and with all ordinances and laws of the County of Inyo and of the State of California pertaining to well construction, repair, modification and destruction. Immediately upon completion of work I will furnish the Department of Public Health with a complete and accurate log of the well

Aaron Kirschenmann
APPLICANT'S SIGNATURE
3-20-84
DATE

WHEN SIGNED BY THE HEALTH OFFICER, THIS APPLICATION IS A PERMIT

State of California – Department of Health
Sanitation and Radiation Laboratory
Southern California Laboratory
SAMPLE FOR CHEMICAL ANALYSIS

Date Received: 5/[illegible]/84 (Leave Blank)
Lab. No.: 121 79

Purveyor and Address (include city and county): Keeler CSD

System Number:
Serial Number: C 24846

Sampling Point: New well

Collected by: A.K. D. Oldenburg
Date and Hour Collected: 5/22/84 1630

Type of Sample:
- ☐ Raw Surface Water
- ☒ Drinking Water: ☒ Raw ☐ Treated
- ☐ Wastewater: ☐ Raw ☐ Chlorinated
- ☐ Trade Waste
- ☐ Other

Send Report To:
- ☒ WSS Dist. #
- ☒ County HD Inyo
- ☐ DOT Dist. #
- ☐ National Park Serv.
- ☐ RWQCB #
- ☐ Other

Results are expressed as mg/l unless specified

☒ GENERAL MINERAL ANALYSIS

☐ Ca	38.	☐ Hardness (mg/l as $CaCO_3$)	370.
☐ Mg	67.	☐ HCO_3	480.
☐ Fe Total	<0.05	☐ CO_3	0.
☐ Mn	<0.02	☐ OH	0.
☐ Na	156.	☐ Total Alk.	480.
☐ K	36.	☐ Cl	102.
☐ pH	7.8	☐ SO_4	110.
☐ Total Dissolved Solids	834	☐ F	1.27
		☐ NO_3	0.3

TRACE ELEMENTS

☐ Al	
☐ Ag	
☐ As	<.05
☐ B	
☐ Cd	
☐ Cr	
☐ Cu	
☐ Hg	
☐ Pb	
☐ Ni	
☐ Se	
☐ Zn	
☐	

☐ Other analyses desired (specify):

Date Reported: 5-30-84
Analyst: RS MP MVC MO

☐ Turb. TU	☐ NH_3-N	☐ BOD	☐ Susp. Solids	☐ PO_4
☐ Spec. Cond. µmhos/cm	☐ ORG-N	☐ Grease	☐ Set Solids ml/l/hour	☐ MBAS

Form LAB - 800 (4/74) L34300

State of California – Department of Health
Sanitation and Radiation Laboratory
Southern California Laboratory

SAMPLE FOR CHEMICAL ANALYSIS

Date Received: 5/24/84 (Leave Blank)

Lab. No.: 12180

Purveyor and Address (include city and county): Keeler CSD

System Number:

Serial Number: C 24847

Sampling Point: New well

Collected by: A.K. D. Oldenburg

Date and Hour Collected: 5-22-84 1640

Type of Sample: ☐ Raw Surface Water ☒ Drinking Water: ☒ Raw ☐ Treated ☐ Wastewater: ☐ Raw ☐ Chlorinated ☐ Trade Waste ☐ Other

Send Report To: ☒ WSS Dist. # ☒ County HD Inyo ☐ DOT Dist. # ☐ National Park Serv. ☐ RWQCB # ☐ Other

Results are expressed as mg/l unless specified

☒ GENERAL MINERAL ANALYSIS

		(mg/l as $CaCO_3$)	
☐ Ca	38.	☐ Hardness	365.
☐ Mg	66.	☐ HCO_3	474.
☐ Fe Total	<0.05	☐ CO_3	0.
☐ Mn	<0.02	☐ OH	0.
☐ Na	158.	☐ Total Alk.	474.
☐ K	29.	☐ Cl	96.
☐ pH	7.8	☐ SO_4	110.
☐ Total Dissolved Solids	846	☐ F	1.30
		☐ NO_3	0.4

TRACE ELEMENTS

☐ Al	
☐ Ag	
☐ As	<.005
☐ B	
☐ Cd	
☐ Cr	
☐ Cu	
☐ Hg	
☐ Pb	
☐ Ni	
☐ Se	
☐ Zn	
☐	

☐ Other analyses desired (specify):

Date Reported: 5-30-84

Analyst: BS NP MO HLK

☐ Turb. TU	☐ NH_3-N	☐ BOD	☐ Susp. Solids	☐ PO_4
☐ Spec. Cond. µmhos/cm	☐ ORG-N	☐ Grease	☐ Set Solids ml/l/hour	☐ MBAS

Form LAB - 800 (4/74) 134300

APPENDIX C

Marvin Moskowitz, Director
Environmental Health Services

TEL (760) 878-0238
FAX (760) 878-0239

COUNTY OF INYO

DEPARTMENT OF ENVIRONMENTAL HEALTH SERVICES
P. O. BOX 427, INDEPENDENCE, CALIFORNIA 93526

Water System Inspection Report

System Name	Keeler Community Service District			**PWS#**	1400036
Inspection Date	5/16/2011	**Inspection#**	0000620	**Insp Begin** 2:50 PM	**Insp End** 4:20 PM
EHS Inspector	Kathe Barton, REHS			**Photos taken during inspection:**	No
System Contact	Myrna Tew, Glenn Young			**Contact Title**	Operators

System Description

The Keeler CSD water system provides water to the town of Keeler with approximately 66 active service connections. The system includes a well, storage tank, chlorine equipment, and distribution system.

Source of Supply

Well 01 is the only source of supply and provides approximately 150 gpm. There is a 5 (75 gpm) and 10 hp (150 gpm) pump installed in the well. The well has a new flow meter, new pressure gauge, the electric was recently repaired. Need an anti-siphon on hosebib. Need downturned and screened on level sensor into wellhead. Discharge to waste needs end cap and located above ground level. Well area fenced and locked.

Treatment Facilities

Chlorine equipment for use between May and November. Injector located in vault downstream of well. Twice daily readings. Isolux POU devices installed at approximately 40 homes. POU maintenance and installations done by Glenn. Logs maintained with sampling, repair, replacement data.

Distribution System

Schematic is being updated with valves and piping as they work on system. Exercise valves routinely. Most likely many leaks still need to be found and repaired. Usage has been 25 mg/yr. Dedicated samples tap in distribution system.

Cross Connection

Need to evaluate. May have some private wells in town. Many deadends.

Storage Tanks

One 100,000 gallon vertical tank. Hatch, ladder, fence locked. Vent has new screen, hatch should be watertight. They conduct annual inspections for last three years. Sample tap ok.

Pumps and Controls

Well pump electric panels located inside fenced well area.

Monitoring and Reporting

Current. Well exceeds arsenic MCL.

Bacteriological

Satisfactory bacteriological samples since chlorine equipment installed and used in summer months.

Management and Operation

Need to do leak detection in town to reduce water usage.

Water System Inspection Report

System Name	Keeler Community Service District			**PWS#**	1400036
Inspection Date	5/16/2011	**Inspection#**	0000620	**Insp Begin**	2:50 PM	**Insp End**	4:20 PM
EHS Inspector	Kathe Barton, REHS			**Photos taken during inspection:**	No
System Contact	Myrna Tew, Glenn Young			**Contact Title**	Operators

Records Monthly meter readings. Daily chlorine readings. POU maintenance logs.

Complaints None since last inspection.

Permit Status Will need to do amended permit after arsenic treatment or new source of supply has been determined.

Emergency Provisions No backup emergency generator.

Certified Operators Myrna Tew is D3 and T2 operator.

Notes

Inspector Signature: Kathe Barton, REHS Date: 9/30/11

APPENDIX D

FRED E. FINKBEINER
Consulting Civil Engineer

Phone: (760) 873-4302 P.O. Box 322, Bishop, California 93515 LIC: California and Nevada

November 4, 2000

Keeler Community Services District
Attention: Board of Directors
P.O. Box 63
Keeler, California 93530

On Friday, November 3, 2000 an on-site inspection was made of the Keeler Community Services District's Disinfection and Storage Facility. As a result of that inspection, you will find enclosed a detailed **Engineering Report** containing both assessments as well as recommendations.

Respectfully submitted,

Fred E. Finkbeiner
Consulting Engineer

cc: Gerald Gewe, LADWP (Room 1455)
Peter Kavounas, LADWP (Room 1469)
Kathe Barton, Inyo County Environmental Health Services
Paul Rice
Sam Wasson
Alan Akin
Alice Robertson
Richard and Myrna Tew

ENGINEERING REPORT
Inspection of Keeler Community Services District Water System
November 3, 2000

On November 3, 2000, a Water System Inspection was conducted to evaluate and make recommendations regarding KCSD Disinfection and Storage Facilities.

Inspection of the Disinfection Facility.

The Disinfection Facility includes a wood frame enclosure, constant feed hypochlorinator injection pump, and two (2) 30 gallon storage containers with connection tubing and injector.

Those in attendance during the inspection included:

Kathe Barton	(Inyo County Environmental Health Services)
Richard and Myrna Tew	(KCSD Board of Directors)
Fred Finkbeiner	(Consulting Engineer)

The following are my recommendations and comments:

1. The wood frame enclosure should be insulated with **R-11 insulation** between the studs and rafters with foil facing out and secured with a staple gun. This will provide significant freeze protection benefits in exchange for a small capital outlay.

2. The **window** of the enclosure should be covered, both inside and outside, and insulated. This will help eliminate the intrusion of wind-blown dust and provide additional insulation benefits. Wind-blown dust results in an abrasive environment that can reduce the service life of the injector pump.

3. The **solution storage containers** should be connected in parallel, thus doubling storage capability of hypochloride. This will reduce the frequency of facility visits.

4. **Heat Tape** should be installed around the connection tubing and fluid components of the injector pump. This will provide adequate freeze protection of the critical disinfection components.

5. The **existing tubing** from the injector pump to the injector should be replaced with nylon-reinforced tubing (tygon) to eliminate potential rupture hazard.

6. The existing **4" Flow Meter** should be repaired or replaced so the District can maintain accurate consumption data.

7. As specified in the original engineering drawing for the Disinfection System, a **sample tap / fill hose bibb** should be installed on the 4" discharge pipe between the check valve and injector. The hose bibb should be located near the storage container and have sufficient height to allow for an air gap from the top of the containers.

8. Currently, the **well casing** is not vented. However, a ¾" plug is available on the well seal to allow for the installation of a screened vent.

9. The **stroke on the existing injection pump** should be altered to reduce stroke length, allowing for increased solution concentration, resulting in reduced site visits.

10. When **disinfection** is initiated, it should be continuous, maintaining a residual between .2 and .5 ppm.

Inspection of the Storage Facility

The Storage Facility consists of a 100,000 gallon steel water storage tank that is 30' in diameter and 32' high. The exterior coating appears to be sound with no evidence of cracking, blistering, or UV deterioration. There appeared to be no leaks nor any evidence of corrosion on the external shell.

Those present for the internal inspection were:

Kathe Barton	(Inyo County Environmental Health Services)
Alice Robinson	(KCSD Board of Directors)
Myrna Tew	(KCSD Board of Directors)
Sam Wasson	(Interested Citizen)
Alan Akin	(Interested Citizen)
Fred Finkbeiner	(Consulting Engineer)

My observations and recommendations are as follows:

1. The **interior coating** looked to be in excellent condition with minimal evidence of iron oxidation or corrosion around the roof rafters, ladder, fill and discharge pipe, center pole and upper three rings. There was evidence of coating blistering, primarily confined to the lower 18" of the shell. The blistering was probably caused by solvent saturation during coating application. *(As the material is being applied, solvents vaporize and, being heavier than air, will accumulate at the bottom of the tank causing coating material to be saturated. As this saturated material 'skins over' during the curing process, it will entrap this excess solvent which eventually leads to blisters.)* The blisters that I observed were between ½ and 2 cm in diameter. Most of the blisters had not ruptured, and showed no evidence of iron oxide bleeding. Upon rupturing several blisters, it was observed that the steel was black in color, confirming no oxidation. It is speculated that the existence of the solvent and water in the absence of oxygen inhibited oxidation from occurring. In the areas where the blisters had failed, iron oxide tuberculations were evident. Removing the oxide, it appeared there was little or no pitting of the shell.

2. The **shell coating** at the air-water interface appeared to be sound and intact with no evidence of corrosion.

3. The **shell from the high water mark to the bottom** was discolored with a black water-soluble material. I would speculate that this staining is a mineral precipitate, possibly manganese-dioxide. There was additional speculation by members of the inspection team that the material could be an algae growth as a result of sunlight intrusion through the roof vent. Since there were no facilities or equipment to retrieve samples, confirmation of the material cannot be made at this time.

4. The **bottom of the tank** was covered with a thin film of a reddish-brown gelatinous material. In conferring with Mr. Roger Biale (Chairman of the Steel Tank Committee for American Water Works Association), speculation was made that this material is the carcasses of flying ants. He indicated that this is a common occurrence in tanks found in desert and arid locations. *(The ants apparently seek out moisture and can access the interior through the very smallest of openings.)* He further speculated that these carcasses were the source of the coliform contamination. There was no other evidence within the interior of the tank that would promote or harbor bacterial colonies. It was recommended that the tank floor be cleaned of all debris, rinsed and treated with a 200 ppm hypochloride solution.

I further recommend that the vent be screened with a fine mesh window screen and adequately fastened, either mechanically or with approved mastic, eliminating any openings or passages for entrance into the tank. In addition, the roof access cover should be retro-fitted with an approved seal, eliminating any openings for insect infestations. A thorough inspection should be made of the tank, focusing on overflow, etc., to ensure adequate screening.

5. Since less than 1% of the shell is impacted with any corrosion activity, the structural integrity has not been compromised. Obviously, the oxidation/ corrosion occurring at the ruptured blisters will eventually need to be addressed. I am recommending that ...

* the tank be inspected and cleaned annually;
* the progression of corrosion and extent of pitting be monitored;
* in the future the possibility of cathodic protection be initiated; and
* possibly, the floor and lower 3' of the shell be relined.

The total coating would be about 1,000 sq. ft. and at current coating costs would be $3 to $5 per sq. ft. However, I am not recommending this action at this time.

6. I strongly recommend that during future planned inspections or tank outages, the **Distribution System** be kept charged by placing the source pump in a manual 'ON' position, allowing excess water be bled from hydrants near the lower end of the Distribution System. This will eliminate potential bacterial contamination from water infiltration.

APPENDIX E

AGREEMENT BETWEEN THE GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT AND THE KEELER COMMUNITY SERVICE DISTRICT FOR WATER FOR THE KEELER DUNES DUST CONTROL PROJECT

July 7, 2014

I. WATER USE AND PIPELINE UNDER STATE ROUTE 136

1. Cost of Water. The Great Basin Unified Air Pollution Control District (Great Basin) will pay the Keeler Community Service District (KCSD) for the amount of water used for the Keeler Dunes Dust Control Project from August 2014 through December 31, 2017. Great Basin estimates that up to 12.5 Acre-Feet of water will be used during the course of the project. Water will be paid at a rate of $775.00 per metered acre-foot of water with payments made quarterly.

   Note: The water used for the project will be metered with a water meter provided by Great Basin. The amount of water used will be rounded to the nearest 10th of an acre-foot. KCSD will be responsible for reading the meter and sending quarterly invoices to Great Basin.

   Cost estimate: approximately $10,000

2. Monitoring. Great Basin will be responsible for monitoring the water level and for chemical analysis of the water from the well during the course of the project.

   Prior to the use of the Keeler Dunes irrigation system, Great Basin will collect an initial water sample and will have it analyzed for general and trace element chemistry. Water sampling and analyses will also be conducted by Great Basin twice per year during the course of the project. One sampling and analysis will be completed in the spring and the second completed in the fall of 2015, 2016, and 2017. Great Basin will continue to support the current water level monitoring system currently being used in the KCSD well including purchasing a replacement pressure transducer and regular telemetry of data to Great Basin's Keeler Field Office. The water level data will be reviewed regularly and provided to the KCSD quarterly during the course of the project.

   Cost estimate: $1,000 for transducer and $4,000 for chemical analyses = $5,000

3. Pipeline under State Route 136 and Caltrans Right of Way Permit. As part of construction of the Keeler Dunes Dust Control Project, Great Basin will contract with a licensed contractor for installation of a 6-inch diameter pipeline under State Route 136. The pipeline under the highway will be left in place at the end of the project and capped for possible future use by KCSD. Great Basin will either have a joint permit with Caltrans for the pipeline under State Route 136 or, if that is not possible, transfer the right-of-way permit to KCSD at the conclusion of the project.

The pipeline casing under the highway will have the capability to bring the fiber optic cable from Digital 395 under the highway into Keeler.

Cost – work to be paid by Great Basin as part of construction contract for project.

II. OTHER

In addition to paying for the cost of the water used and for monitoring of the water level and water chemistry, Great Basin will pay the KCSD a lump sum of $25,000 for OTHER projects associated with operation, maintenance and improvements for the KCSD water system. OTHER projects are at the sole discretion of the KCSD and Great Basin's obligation for projects in the OTHER category shall not exceed $25,000. OTHER projects may include, but are not limited to, the following:

1. Tank Inspection. General inspection of the KCSD water tank. After review of the inspection results and recommendation. Great Basin will work with KCSD to complete any maintenance work needed for the tank.

2. Pump. Purchase of a backup 10 horsepower pump.

3. Generator. Purchase of a generator for use at the well when line power is not available.

4. Replacement valves for water distribution system.

5. Straw Bale Placement for sand movement at north end of Keeler. Up to 400 bales are to be supplied by Great Basin at no cost to KCSD.

6. Kubota Tractor listed on Great Basin's 2014 surplus equipment list will be given to KCSD by Great Basin at no cost to KCSD.

7. Point of Use Filters for Keeler Residents

8. Tires for KCSD Backhoe

9. Review of KCSD Water System

AGREEMENT BETWEEN THE
GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT
AND THE
KEELER COMMUNITY SERVICE DISTRICT
FOR WATER FOR THE KEELER DUNES DUST CONTROL PROJECT

7th IN WITNESS THEREOF, THE PARTIES HERETO HAVE SET THEIR HANDS AND SEALS THIS DAY OF JULY, 2014.

GREAT BASIN

By: _____
Ron Hames, Board Chair

Dated: _____

KCSD

By: _____
Signature

_____
Print or Type Name

Dated: _____