Final Report

Feasibility Study for Long-Term Drinking Water Solutions for the Unincorporated Area North of Moss Landing

Final

November 18, 2021

Corona Environmental Consulting, LLC and
KYLE Groundwater, Inc.
in conjunction with Community Water Center

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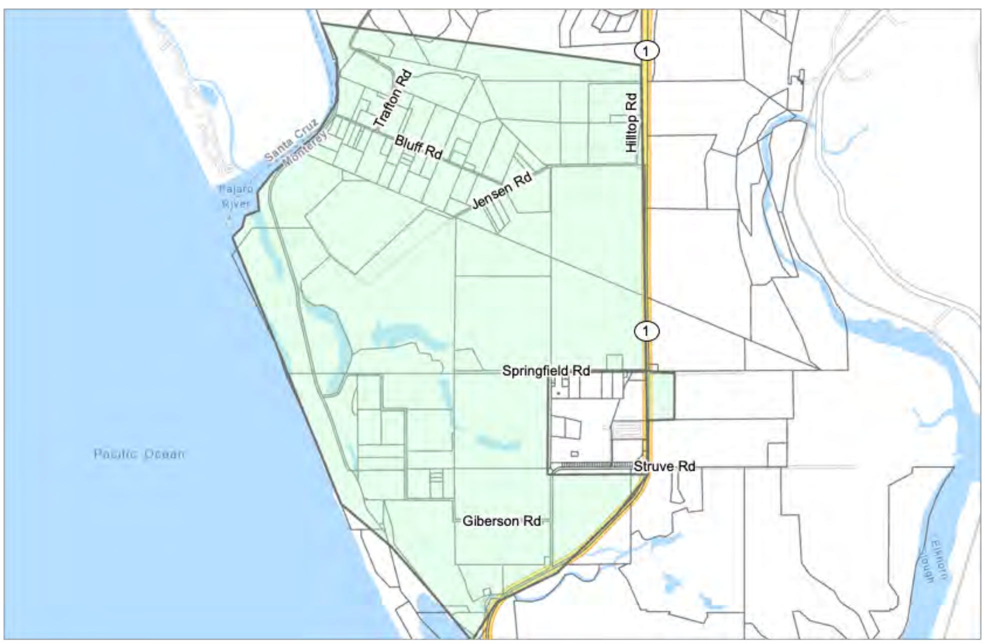
Executive Summary

Background

The Community Water Center (CWC), with funding from the State Water Resources Control Board (SWRCB), provides assistance to communities to develop long-term drinking water solutions to improve both water quality and water supply. One of the communities CWC is currently assisting is the agricultural, low-income area of unincorporated Monterey County north of Moss Landing. The project area is shown in green in the map below (Figure ES-1). This community of approximately 88 households is in need of a long-term drinking water solution as residents are currently receiving drinking water from private and shared wells that have very high levels of chloride (indicating seawater intrusion), total dissolved solids (TDS), nitrate and 1,2,3-Trichloropropane (123-TCP). The following executive summary provides an overview of the study conducted to identify suitable long-term drinking water solutions that could provide safe and affordable drinking water to the community.

Figure ES-1. Project area map. Project area shaded in green. The white square area within the green project area is intended to be served by the Springfield Water System Consolidation Project (Springfield Project) and thus is excluded from the area being considered for this project.



The goals of the study include:

- Conducting an alternatives analysis to evaluate long-term options for supplying safe and affordable drinking water to the community
- Engaging community members and other stakeholders in the evaluation of options
- Supporting community members to make an informed decision and collectively arrive at a preferred drinking water solution
- Selecting a preferred alternative and seeking state grant funding to cover the costs to implement the selected alternative

As part of this project, CWC has engaged with residents and property owners in the project area via virtual community meetings, mailers, phone calls, and one-on-one conversations and surveys to solicit their questions about the project and their feedback on the alternatives being considered. In this Draft Report, Corona Environmental Consulting, with support from CWC, has addressed many questions received from community members. Community feedback is also summarized in detail in Appendix F. CWC and Corona Environmental Consulting have also convened meetings and received feedback from other project stakeholders. Stakeholders for this project whose feedback has informed this Draft Report include nearby water providers (Pajaro Sunny Mesa Community Services District (CSD)), Monterey County Environmental Health Bureau, Monterey County LAFCO, Pajaro Valley Water Management Agency, and the SWRCB.

Alternatives and costs

This study evaluated the technical practicality and associated initial costs (sometimes referred to as capital costs) as well as operation and maintenance (O&M) costs of potential long-term drinking water solutions summarized in Table ES-1, taking into consideration water quality and other local constraints. For the first two alternatives (physical consolidation and new community water system), households would be supplied with water from a piped community water system, which people sometimes call "city water". A pipeline would be installed in the street in front of each property and households would become customers of Pajaro Sunny Mesa Community Services District or a new entity and pay a monthly water bill. Two different ways to connect households to city water (or in other words Physical consolidation) were considered. Both scenarios involved connecting to the Springfield Water System, with Scenario A involving the development of a new well and Scenario B connecting to the Sunny Mesa and Pajaro Systems to provide a second water source.

For the other three alternatives (replace existing domestic wells, wellhead treatment, and point-of-use/point-of-entry [POU/POE] treatment), households would continue to receive water from domestic wells, which are smaller wells on their property or small wells that are shared with other households through state or local small water systems.

Table ES-1. Summary of alternatives considered.

Name	Description	Water Supply
Physical Consolidation	*Connect to the Springfield Project operated by the Pajaro Sunny Mesa Community Services District (CSD)*. The Pajaro Sunny Mesa CSD would be responsible for operating and maintaining the water system. In addition to the Springfield Project well, an additional water source would also be needed for backup or emergency purposes. The new water source could be a new backup well (Scenario A) constructed at a location with potentially good water quality near or within the project area or water from the Pajaro Water System (Scenario B) if the Pajaro Water System is connected to the Sunny Mesa Water System and the Sunny Mesa Water System is connected to the project area. Households could either destroy their wells or keep their wells for non-potable use and install and maintain backflow preventers on them to prevent contaminated water from the wells from entering the water system. A map showing how the project area could be consolidated with the Springfield Water System is shown in Figure ES-2.	Community Piped Water System
New Community Water System	*Develop a new community water system that could be owned and operated by an existing system*. Locations for two new wells would need to be identified in an area with potentially good water quality. For this option, piping would be installed in the street. A new entity or an existing entity, such as Pajaro Sunny Mesa CSD, would be responsible for operating and maintaining the water system.	Community Piped Water System
Replace Existing Domestic Well(s)	*Replace existing wells with new, better constructed wells likely to produce better water quality*. The property owner would be responsible for ongoing operation and maintenance of the new well.	Domestic Well
Wellhead Treatment	*Install treatment systems that remove contaminants to safe levels and that treat all water produced from a well for one or more households.* This option would use water treatment equipment including filters to remove the contaminants so that the water would satisfy drinking water standards.	Domestic Well
Point of Use/Point of Entry Treatment	*Install treatment systems that remove contaminants to safe levels that treat water at the location of consumption (normally the kitchen sink) and/or just prior to entering homes.*	Domestic Well

Figure ES-2. Map of potential physical consolidation with the Springfield Project.

Benefits and disadvantages or challenges for each alternative are summarized in Table ES-2. It is important to note that POU/POE treatment is not certified by the State of California to treat well water with extremely high nitrate concentrations, and therefore it will not be an adequate solution for the majority of households. Also, replacing private wells may not address water quality issues because it is possible that a new well could also be subject to contamination and/or seawater intrusion.

Cost estimates per household have been developed for each alternative and are shown in both Table ES-2 and Table ES-3. Table ES-3 shows total costs over a 20-year period that account for both initial and long-term O&M costs in present-day dollars. By combining initial capital costs and O&M costs, total costs across alternatives can be compared.

Table ES-3 O&M costs assume water used for indoor and outdoor purposes is treated, except for the POU/POE alternative where only water used indoors is treated. Based on quotes from two treatment equipment vendors (A and B), wellhead treatment was estimated to be the most expensive alternative. Physical consolidation with an existing water system and development of a new community water system appear to be the most cost competitive, especially when considering that POU/POE treatment only treats water used for indoor consumption whereas these options provide water for indoor and outdoor use.

The different alternatives are not expected to have the same level of grant funding from the state, which is another important consideration related to cost. Table ES-2, which summarizes initial capital costs and O&M costs on a household basis, has been color coded to reflect anticipated grant funding.

Table ES-2. Summary of the benefits, challenges, and costs per household for each alternative.

(green)	Costs anticipated to be grant funded for the community.
(yellow)	Costs anticipated to be grant funded for households that qualify based on ability to pay.[1]
(red)	It is uncertain which O&M costs may be eligible for state funding.

Alternative	Benefits	Disadvantages and Challenges	System type[2]	Annual O&M per house ($/yr)[3]	Monthly O&M per house ($/month)[3]	Capital Costs per house ($)
Physical consolidation (Connect to Springfield Project)	•Operated by an experienced utility, which will likely improve long-term sustainability. •Storage, booster pumps and one well would be shared with an existing system. •Low estimated O&M costs •Scenario B would regionally consolidate the project area with two additional systems, increasing the reliability of each system. •Scenario B would be more reliable in the long term, because it would rely on more inland wells less vulnerable to seawater intrusion.	•High initial construction costs •Capital cost uncertainties associated with pipelines crossing highways, private land, and protected habitat. •Scenario A would rely only on wells near the coast that could have water quality degrade in the future from seawater intrusion. •Scenario B is dependent on the completion of a consolidation project between Sunny Mesa and Pajaro Water Systems that is without a start date.	CWS	Based on PSMCSD Water Rates[4] (See Table ES-4 for examples)		Scenario A: 154,000; Scenario B: 149,000[6] (Community Infrastructure) Lateral Pipe Installation & Well Destruction: 21,000 Lateral Pipe Installation & Well Isolation: 10,000 + premise plumbing modifications [7]
New CWS	•Another experienced water utility may be able to operate the system, which would likely improve long-term sustainability. •Water quality monitored and reported to the state •Low to moderate estimated O&M costs	•High initial construction costs •Likely only eligible for state funding if physical consolidation is not feasible •If another experienced water utility is not able to operate the system, it would likely be difficult and time consuming to develop a new and sustainable utility. •Requires the development of a new permit or modifying an existing permit that may delay implementation	CWS	Based on PSMCSD Water Rates[4] (See Table ES-4 for examples)		233,000[6] (Community Infrastructure) Lateral Pipe Installation & Well Destruction: 21,000 Lateral Pipe Installation & Well Isolation: 10,000 + premise plumbing modifications[7]
Replace private wells	•Does not require new community-level water infrastructure •Low estimated O&M costs	• Each well owner will be responsible for maintaining their well and water system •Water quality in replacement wells could degrade in the future •Replacement wells with good water quality will likely be infeasible in some portions of the project area	PW	692	58	166,000
			LSWS	294	25	63,000
			SSWS	154	13	37,000
Wellhead treatment	•Can treat other contaminants that may reach wells in the future	•High estimated O&M costs •Requires frequent disposal of waste from treatment systems •Could be difficult to maintain many individual decentralized treatment systems that require substantial O&M costs and support	PW[5]	86,200	7,180	165,000
			LSWS[5]	39,700	3,310	142,000
			SSWS[5]	37,100	3,090	78,900
			PW[5]	13,300	1,110	707,000
			LSWS[5]	12,400	1,030	307,000
			SSWS[5]	10,200	850	165,000

POU/POE	•Low capital costs	•Not an allowable option for compliance ofSSWS and LSWS in Monterey County •Infeasible for 12 of 15 households that need treatment due to high nitrate •Could be difficult to maintain many individual decentralized treatment systems that require substantial O&M costs and support •Growth of microorganisms in granular activated carbon (GAC) filters is a potential concern	PW	9,210 indoor only	770 indoor only	70,500[8]

[1] The State Water Board Division of Financial Assistance (DFA) is in the process of updating their funding policy for work on private property and has provided preliminary guidance with implications for this project (Email Correspondence from the Assistant Deputy Director, DFA, on 10/14/2021). In the updated funding policy, funding eligibility for work on private property will normally be determined on a community basis meaning that most households in this project would be eligible since the area is classified as a disadvantaged community (DAC). There may be some exceptions, such as very costly work on private property or in cases where block group income data is not representative of individual households in the project area. In these cases, funding eligibility would be based on the property owner's ability to pay. DFA is working to formalize this guidance into a written policy and CWC is seeking confirmation whether this policy applies to all costs on private property (lateral, well destruction and backflow preventer, and what the criteria may be identifying exceptions where ability-to-pay information is required).

[2] Community Water System (CWS), Private Well (PW), Local Small Water System (LSWS), State Small Water System (SSWS). For cost estimation, it is assumed that each PW, LSWS and SSWS serve an average of 1.3, 3.4 and 6.5 households respectively based on the average number of households each type of system serves in the area.

[3] O&M costs assume 150 gallons per person per day water use for indoor and outdoor purposes except where indoor only use is noted. Indoor water use only assumes 55 gallons per person per day.

[4] Pajaro Sunny Mesa Community Services District. "Exhibit "A" Pajaro/Sunny Mesa Community Services District Rate Schedule. Effective Date July 1, 2021. http://pajarosunnymesa.com/uploads/Rate%20Schedule%207-2021%20to%206-2022.pdf".

[5] Costs for offsite disposal are the largest component of O&M costs for Vendors A and B and may be avoidable if the Central Coast RWQCB allows onsite disposal of brine.

[6] These capital costs are associated with work not performed on private property such as installation of water mains. Such costs would be eligible for grant funding for all households regardless of economic status. Scenario A involves developing a new well to provide a second water source whereas Scenario B would connect the project area to the Sunny Mesa and Pajaro Systems if they consolidate in addition to connecting to the Springfield Project instead of developing a new well.

[7] These capital costs are associated with work performed on private property such as constructing a service line, demolition of an old well, or the installation of a backflow prevention device. When determining eligibility for state funding for these costs, a property owner's ability to pay for these costs themselves would be considered. If a property owner chooses to keep their well for outdoor water use, they would be responsible for the installation and maintenance of a backflow preventer to keep the well isolated from the public water system as well as any plumbing on their premises needed to avoid blending water from their private well with water from the community water system. The costs shown assume the work is performed by a contractor. If an owner obtains a simple Monterey County construction permit, which costs approximately $240, and installs the service line themselves, the assumed $6,500 cost for service line construction may be substantially reduced. The cost shown for lateral installation and well destruction does not include the full cost of destroying one well, because some wells serve multiple households. The cost shown represents the cost of destroying the approximately 50 wells in the project area divided among the 88 households.

[8] POU/POE capital costs include site assessments, technical oversight, diagnostic water quality sampling, an allowance for improvements to existing wells and storage tanks, project management, and replacement at 10 years.

Table ES-3. Comparisons of initial capital, 20-year O&M, and 20-year total costs per household for each alternative.

Alternative	Capital costs ($/household)[b]	20-year O&M costs ($/household)	20-year total cost ($/household)
Replace Private Well	37,800 to 166,000[a]	15,900 to 27,100[a]	53,700 to 193,000[a]
Consolidation: Scenario A	176,000	27,800	203,800
Consolidation: Scenario B	170,000	27,800	197,800
New CWS	254,000	27,800	281,800
Wellhead Treatment Vendor A	78,900 to 166,000[a]	1,070,000	541,000 to 1,240,000[a]
Wellhead Treatment Vendor B	165,000 to 707,000[a]	127,000 to 166,000[a]	292,000 to 872,000[a]
PW - POU/POE	70,540	112,000 to 115000[a]	182,000 to 185,000[a]

[a]For domestic well solutions, the cost per household will depend on how many houses share a well. For those solutions, a range of costs is provided, with the low end of the range being the cost per household for households in a state small water system serving approximately 6 or 7 households and the high end of the range being the per-household cost for a well serving just one property. [b]A 5% discount rate is assumed when calculating total 20-year costs.

The O&M costs shown in Table ES-3 were calculated using average household water consumption estimates in California and assume an occupancy of 4.7 residents per household, which leads to conservative (i.e., elevated) estimates for daily household water consumption of 705 gal per day per household. This level of water consumption is compared in Table ES-4 with several other possible scenarios assuming indoor water use only as well as average historical indoor and outdoor water consumption in nearby water systems and for individual households. When using the Pajaro Sunny Mesa Community Services District (CSD) water rate structure, monthly water bills would range between $23 and $116 per month per household for these different water consumption levels. Since the O&M costs for physical consolidation and a new CWS shown in Table ES-3 were determined using Pajaro Sunny Mesa CSD water rates and a daily household water consumption of 705 gal per household per day, O&M costs in Table ES-3 are likely conservative. Depending on the water use habits of residents, the number of residents per household, and the extent of landscaping/irrigation demands, water demand and bills could be substantially less in the project area.

Table ES-4. Potential household (HH) water bills for physical consolidation and new CWS alternatives assuming different water consumption scenarios and Pajaro Sunny Mesa CSD's current water rates.

Water Consumption Scenario	ADD (gpcd)	Residents / HH	Daily HH Use (gal/day/HH)	Monthly Bill ($/month)
Average Indoor+Outdoor Use in California[1]	150	4.7	705	186
Average Indoor Only Use in California[2]	55	4.7	259	86
Sunny Mesa Average (2019-2020)[3]	Unknown		281	91
2020 Average for example households in the Sunny Mesa Water System[4]				
Family of 4 w/ Landscaping	92	4	369	116
Family of 4 w/ Minimal Landscaping	61	4	246	88
Family of 2 w/ Landscaping	160	2	320	104
Family of 1 w/ Minimal Landscaping	25	1	25	23

[1]SWRCB. "Initial Statement of Reasons 1,2,3-Trichloropropane Maximum Contaminant Level Regulations. Title 22, California Code of Regulations", Last updated 2/17/19. Water bills calculated assuming the Pajaro Sunny Mesa CSD, "Rate Schedule" Accessed 7/6/21, http://pajarosunnymesa.com/uploads/Rate%20Schedule%207-2021%20to%206-2022.pdf. [2]SWRCB California Water Board, "Fast Facts on the Water Conservation Legislation" Accessed 5/28/21, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/Files/PDFs/Water-Conservation-Legislation-Fact-Sheet_a_y19.pdf. Water bills calculated assuming the Pajaro Sunny Mesa CSD, "Rate Schedule". [3]Water consumption and bills based on personal communication between Kyle Shimabuku (Corona Environmental Consulting) and Judy Vazquez-Varela with Pajaro Sunny Mesa CSD, on July 6th, 2021. [4]Water consumption and water bills based on personal communication between Heather Lukacs (CWC) and Judy Vazquez-Varela with Pajaro Sunny Mesa CSD, on June 15th, 2021.

Summary of the Alternatives Evaluation

Cost and non-cost considerations from Table ES-2 were used to develop criteria to evaluate and rank each alternative. The criteria include funding availability, long-term sustainability/reliability, implementation challenges and considerations, the schedule to implement the alternatives, and the alternative's ability to address water quality issues for all homes in the project area. Also, combinations of alternatives were considered and ranked alongside the standalone alternatives. The combinations of alternatives that were considered include:

- Consolidation or new CWS and replacing existing wells
- Consolidation or new CWS and wellhead treatment
- Consolidation or new CWS and POU/POE treatment
- Consolidation or new CWS and no intervention for wells that are in compliance

Consolidation or a new CWS were considered in combination with other alternatives because the physical consolidation and new CWS solutions had the highest and second highest overall rankings, respectively. These combinations were considered to evaluate whether it may be possible to reduce consolidation or new CWS costs by providing a different solution or no intervention (if water quality standards are currently met) for households that are far away from others. A summary of this ranking is provided in Table ES-5.

Table ES-5. Summary of the alternatives evaluation

	Non-Treatment Alternative			Treatment Alternatives		Combination of Alternatives			
Criteria	**Physical Consolidation with Springfield**	**New Community Water System**	**Replacing Existing Wells**	**Wellhead Treatment**	**POU/POE Treatment**	**Consolidation or New CWS and Replacing Existing Wells**	**Consolidation or New CWS and Wellhead Treatment**	**Consolidation or New CWS and POU/POE Treatment**	**Consolidation or New CWS and No Intervention for some wells in compliance**
Grant funding to cover all homes	Somewhat favorable	Somewhat favorable	Not favorable	Not favorable	Not favorable	Somewhat favorable	Somewhat favorable	Somewhat favorable	Somewhat favorable
Capital cost	Less favorable	Less favorable	Somewhat favorable	Less favorable	Somewhat favorable	Less favorable	Less favorable	Less favorable	Somewhat favorable
Annual operations and maintenance cost	Somewhat favorable	Somewhat favorable	Favorable	Not favorable	Less favorable	Somewhat favorable	Less favorable	Somewhat favorable	Somewhat favorable
Estimated monthly water rate charged to households	Somewhat favorable	Somewhat favorable	Favorable	Not favorable	Less favorable	Somewhat favorable	Less favorable	Somewhat favorable	Somewhat favorable
Schedule to implement, including estimated timeline for relevant permits	Less favorable	Less favorable	Not favorable	Not favorable	Less favorable	Not favorable	Less favorable	Less favorable	Less favorable
Implementation challenges and considerations	Somewhat favorable	Somewhat favorable	Not favorable	Not favorable	Not favorable	Somewhat favorable	Not favorable	Not favorable	Somewhat favorable
Long-term sustainability / reliability	Favorable	Favorable	Somewhat favorable	Not favorable	Not favorable	Somewhat favorable	Not favorable	Not favorable	Somewhat favorable
Addresses all homes	Favorable	Favorable	Not favorable	Favorable	Not favorable	Favorable	Favorable	Favorable	Favorable
Recommended for further consideration	Yes	Yes	No	No	No	No	No	No	Yes
Notes	Recommended alternative	Second choice alternative	Cannot reliably provide safe water to all homes in the project area	Cost prohibitive	Cannot provide safe water to all homes in the project area; grant eligibility depends on income; O&M costs are high	Less sustainable than physical consolidation only and limited opportunities to reduce consolidation costs with a new well	Unable to decrease costs relative to physical consolidation alone. Also has other drawbacks.	Not a long-term solution and may not be grant eligible	Needs further investigation. Could reduce capital and O&M costs, but may be less resilient/sustainable than providing a connection to a community water system for all households.

Key	
(green)	Favorable
(yellow)	Somewhat favorable
(orange)	Less favorable
(red)	Not favorable

Recommended Alternatives for Further Consideration

When considering all of the criteria, the recommended alternative for further consideration is physical consolidation with the Springfield Project. This alternative is ranked above a new CWS because the capital cost is lower, the ongoing cost to residents is the same, and combining with an existing community water system is likely to be more sustainable because infrastructure and technical and managerial capacity would be shared with that system. Also, state grant funding would likely only be available for a new CWS if physical consolidation is not feasible. Both physical consolidation Scenarios A and B should be considered further, though Scenario B is the prefered option. Scenario B ranks better as a long-term and reliable solution as the project area would also be consolidated with systems that have groundwater sources that are further inland and may be less vulnerable to seawater intrusion. However, Scenario B depends on the completion of a consolidation project between the Sunny Mesa and Pajaro Systems, which does not have a start date. Therefore, Scenario A should be considered alongside Scenario B in the event that Scenario B cannot be pursued because, for instance, consolidation between the Sunny Mesa and Pajaro Systems is determined to be infeasible or its implementation timeline is substantially delayed. Also, the ability to implement either scenario is contingent on the successful completion of the Springfield Project. If for some reason this alternative is not viable or is delayed substantially, then the new CWS alternative can be pursued.

It may be advantageous for households to use grant funding that may be available to destroy existing domestic wells if physical consolidation is pursued as it would prevent surface water contamination of the aquifer from the well, avoid well maintenance costs, and potentially provide benefits to the community such as supporting aquifer management to limit seawater intrusion. However, property owners can decide to continue to use their well for irrigation and connect to the Springfield Project for indoor water use. For property owners to continue to use domestic wells for irrigation, a backflow preventer would need to be installed that is estimated to cost $2,340[1]. Modifications to premise plumbing needed to separate outdoor water piping from interior use water piping might incur additional costs that the property owner may need to cover. In addition, the backflow preventer would need to be tested annually, which currently costs $90 per year. When deciding to keep or destroy domestic wells, community members should consider the age of their well, as domestic wells can have an average useful life of 30 to 50 years[2]. Shallow domestic wells in the area may experience sea water intrusion in the future.

Although the other standalone alternatives each have advantages with respect to one or more of the criteria, they are ranked less favorable or unfavorable with respect to their ability to provide a solution for all households, reliably and sustainably provide safe water, and/or provide an affordable solution. Since these criteria are critical, these alternatives on their own are not recommended. In addition, combining these alternatives with physical consolidation or development of a new CWS are not recommended for many of the same reasons they are not recommended as a standalone alternative. Additionally, the combination of alternatives may not be able to meaningfully reduce the costs of consolidation with the Springfield Project or the development of a new community water system.

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[1]Based on the California Water Board, “2021 Drinking Water Needs Assessment” Accessed 8/10/21, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf. It also includes the 1.3 regional multiplier and a 20% contingency.

[2]Re/Max Executive Realty, “Well Inspections: Buying a Home with a Well”, Accessed 5/28/21, https://www.maxrealestateexposure.com/buying-home-with-well/

It may be possible to reduce the capital costs of one of these community water system-based alternatives by not providing an intervention for groups of households that are (i) geographically distant from other households and (ii) served by wells with adequate water quality. Due to the limited availability of water quality data for the wells serving the geographically distant households, it is currently not possible to estimate the location and number of households that could be excluded from the project. Therefore, it is recommended that the water quality in the wells that serve these households be further investigated before this alternative is deemed to be a viable option. Also, even if water quality standards are currently being met, water quality at these wells could change and fall out of compliance with drinking water standards in the future due to seawater intrusion or contaminant plume migration, which should be considered before pursuing this option.

Next Phase of Work

This Final Report is the final deliverable in the phased process to produce a completed project deliverable. A summary of the phases of work is shown in Table ES-6. Prior to this Final Report, Corona Environmental Consulting developed an Public Draft Report, and Administrative Draft Report, and an Overview of Alternatives. The Public Draft Report, Administrative Draft Report, and Overview of Alternatives were reviewed by representatives from the SWRCB, Monterey County Environmental Health Bureau, and Pajaro Sunny Mesa Community Services District (CSD). The Public Draft was also made available to community members for comment. Key findings were also presented at community meetings, during which community members asked questions and provided input. This Final Report incorporates revisions to the PublicDraft Report based on input from stakeholders and community members. Findings from this final deliverable will be presented to community members.

Table ES-6. Project steps and timeline.

Task	Feb	Mar	Apr	May	Jun/Jul	Aug/Sep	Oct/Nov
Scope of Work	[community meeting]						
Overview of Alternatives Draft Report			[deliverable]	[review and comment]	[community meeting] [community comment]		
Administrative Draft Report					[deliverable] [review and comment]		
Public Draft Report						[deliverable] [community meeting] [community comment] [review and comment]	
Final Report							[deliverable] [community meeting]

[deliverable icon] indicates deliverable

[community meeting icon] indicates community meeting

[community comment icon] indicates community comment

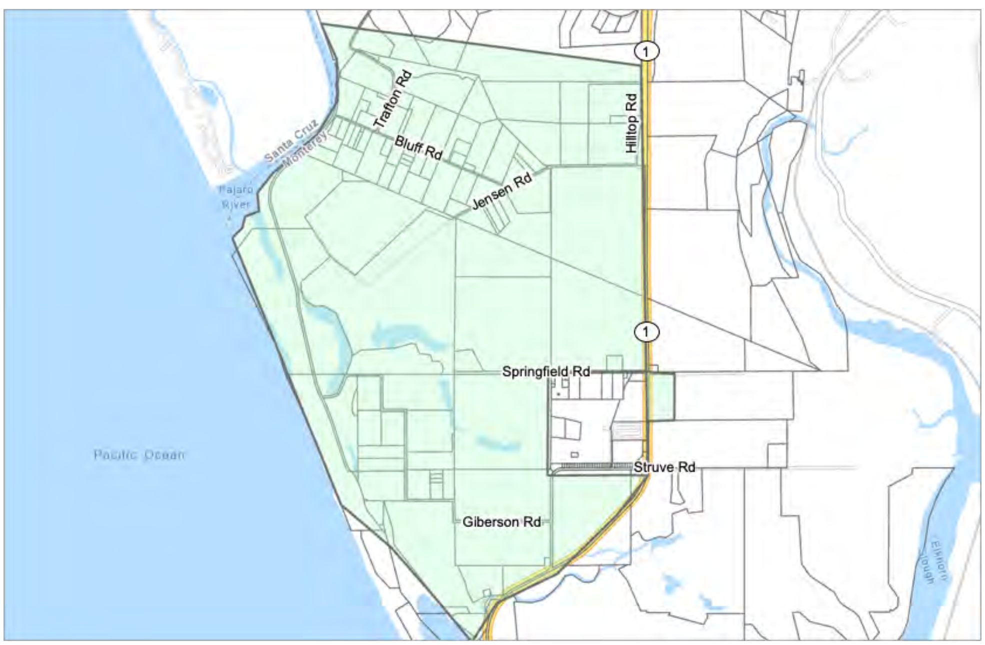
[review and comment icon] State Water Resources Control Board, Monterey County and Pajaro Sunny Mesa Community Services District review and comment

Resumen Ejecutivo

Antecedentes

El Centro Comunitario por el Agua (CWC, por sus siglas en inglés), con fondos de la Mesa Estatal de Control de Recursos Hídricos (SWRCB, por sus siglas en inglés), brinda asistencia a comunidades para desarrollar soluciones de agua potable a largo plazo para mejorar tanto la calidad del agua como el suministro de agua. CWC está asistiendo una comunidad en una área agrícola de bajos recursos del condado de Monterey no incorporado al norte de Moss Landing. El área del proyecto está mostrada en verde en el mapa a continuación (Figura ES-1). Esta comunidad de aproximadamente 88 casas necesita una solución de agua potable a largo plazo, ya que los residentes actualmente reciben agua desde pozos privados y pozos compartidos que tienen niveles muy altos de cloruro (señalando intrusión del agua del mar), sólidos disueltos totales (TDS, por sus siglas en inglés), nitratos y 1,2,3-Tricloropropano (123-TCP). El siguiente resumen ejecutivo muestra una descripción general del estudio realizado para identificar soluciones adecuadas de agua potable a largo plazo que pueden brindar agua sana y económica a la comunidad.

Figura ES-1. Mapa del área del proyecto. El área del proyecto está en verde. El área del cuadro blanco dentro del área verde del proyecto va ser parte del Proyecto de consolidación del sistema de agua de Springfield (Proyecto de Springfield) y, por lo tanto, está excluido del área considerado para este proyecto.



Las metas de este estudio incluyen:

- Realizar un análisis de alternativas para evaluar las opciones a largo plazo para brindar agua sana y económica a la comunidad.
- Involucrar a los miembros de la comunidad y otras partes interesadas para que puedan evaluar las opciones

- Apoyar a miembros de la comunidad para que tomen una decisión informada y lleguen colectivamente a una solución de agua potable preferida.
- Seleccionar una alternativa preferida y buscar fondos del estado para cubrir los costos para implementar la alternativa elegida.

Como parte de este proyecto, CWC ha involucrado a residentes y propietarios en el área del proyecto a través de reuniones comunitarias virtuales, folletos de información mandados por correo, llamadas telefónicas, y conversaciones y encuestas individuales para solicitar sus preguntas y opiniones sobre las alternativas que se están considerando. En este Informe Preliminar, Corona Environmental Consulting, con apoyo de CWC, ha respondido a muchas preguntas recibidas de miembros de la comunidad. Las preguntas y opiniones de la comunidad se resumen en detalle en el Apéndice F. CWC y Corona Environmental Consulting también han convocado reuniones con y recibido retroalimentación de otras partes interesadas en el proyecto. Las partes interesadas de este proyecto cuyos comentarios han informado este Informe Preliminar incluyen proveedores de agua potable cercanas (el Distrito de Servicios a la Comunidad de Pájaro Sunny Mesa), la Oficina de Salud Ambiental del Condado de Monterey, la Comisión de Formación de Agencias Locales (LAFCO por sus siglas en inglés) del Condado de Monterey, La Agencia de Manejo de Agua del Valle de Pájaro, y la Mesa Estatal del Control de Recursos Hídricos.

Alternativas y costos

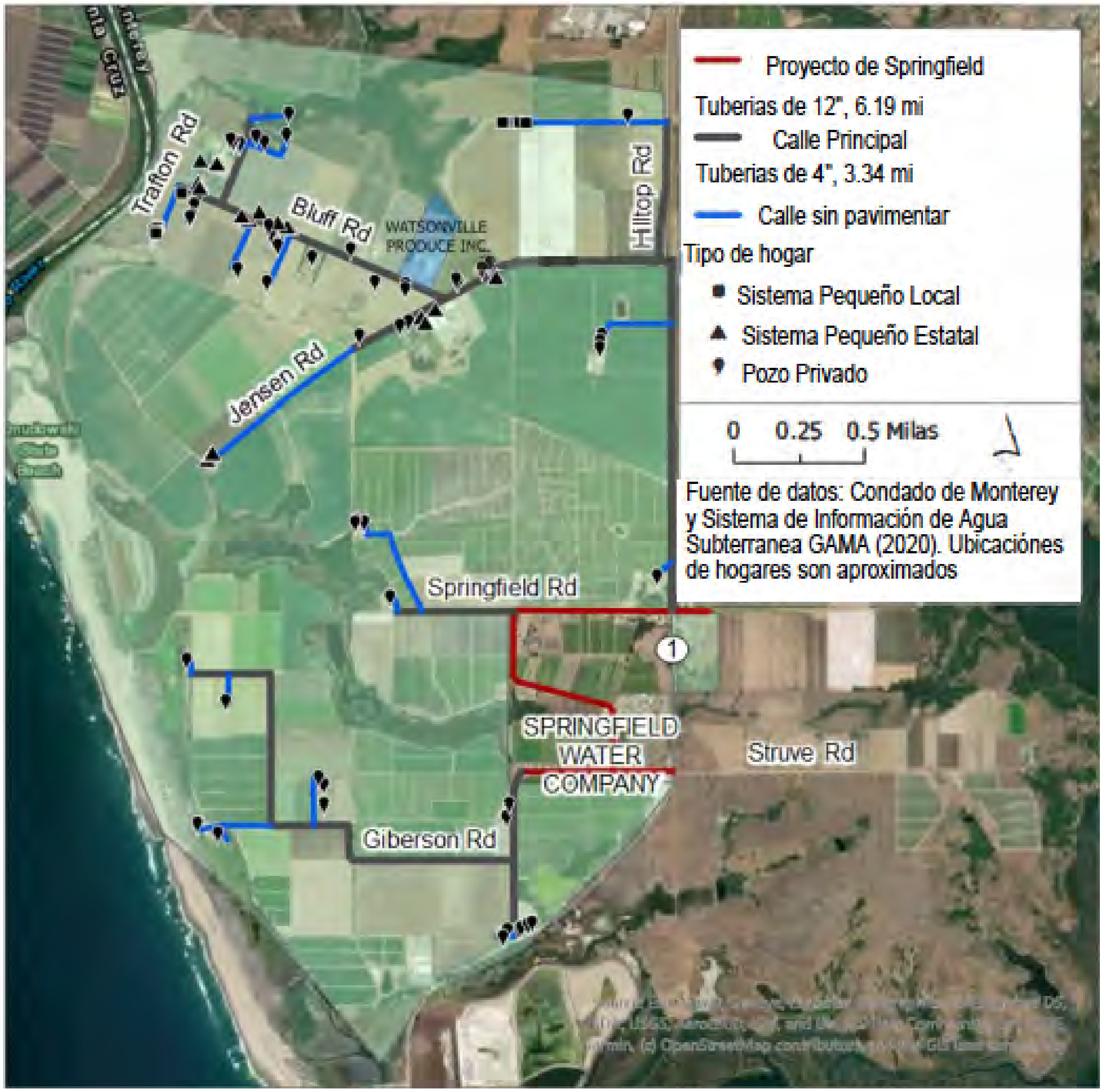
Este estudio evaluó la practicidad técnica y los costos iniciales (lo que a veces se lo denomina como costos de capital) y también costos de operación y mantenimiento (O&M) de las posibles soluciones de agua potable a largo plazo resumidas en la Tabla ES-1, tomando en cuenta la calidad de agua y otras limitaciones locales. Para las dos alternativas primeras (consolidación física y un nuevo sistema comunitario de agua entubada), hogares serían suministrados con agua desde un sistema comunitario de agua entubada, lo cual algunas personas llaman “agua de la ciudad''. Se instalaría tubería en la calle al frente de cada propiedad y los hogares serían clientes del Distrito de Servicios a la Comunidad de Pajaro Sunny Mesa o una nueva entidad y pagarían una factura mensual de agua. Se consideraron dos formas diferentes de conectar los hogares al agua de la ciudad (o en otras palabras, la consolidación física). Ambas opciones involucran la conexión al Sistema de Agua de Springfield, con Opción A se involucró el desarrollo de un nuevo pozo y con Opción B se conectaría a los Sistemas de Sunny Mesa y Pajaro para brindar una segunda fuente de agua.

Para las otros tres alternativas (reemplazo de pozos domésticos existentes, tratamiento del agua donde sale del pozo, y tratamiento en el punto de uso/punto de entrada [POU/POE, por sus siglas de ingles]), los hogares continuarían recibiendo agua de pozos domésticos, que son pozos más pequeños en su propiedad o pozos pequeños que se comparten con otros hogares a través de pequeños sistemas de agua estatales o locales.

Tabla ES-1. Resumen de alternativas consideradas

Nobre	Descripción	Fuente de Agua
Consolidación Física	*Conectar al Proyecto de Springfield operado por el Distrito de Servicios a la Comunidad (CSD, por sus siglas en inglés) Pajaro Sunny Mesa.* El CSD de Pajaro Sunny Mesa sería responsable de la operación y el mantenimiento del sistema de agua. Además del pozo del Proyecto de Springfield, sería necesario tener una fuente de agua adicional para fines de respaldo o emergencias. La nueva fuente de agua puede ser un nuevo pozo de respaldo (Opción A) construido en una ubicación con una calidad de agua potencialmente buena cerca de o dentro del área del proyecto o agua del Sistema de Agua Pajaro (Opción B) si el Sistema de Agua de Pajaro está conectado con el Sistema de Agua de Sunny Mesa y el Sistema de Agua Sunny Mesa, está conectado al área del proyecto. Los hogares podrían destruir sus pozos o mantenerlos para uso no potable e instalar y mantener dispositivos de prevención de reflujo para evitar que el agua contaminada de los pozos ingrese al sistema de agua. En la Figura ES-2 se muestra un mapa que muestra cómo se podría consolidar el área del proyecto con el Sistema de Agua de Springfield.	Sistema Comunitario de Agua Entubada
Un Nuevo Sistema Comunitario de Agua Entubada	*Desarrollar un nuevo sistema de agua comunitario que podría ser propiedad de un sistema existente y operado por él.* Las ubicaciones para dos nuevos pozos deberían identificarse en un área con una calidad de agua potencialmente buena. Para esta opción, la tubería se instalaría en la calle. Una entidad nueva o una entidad existente, como Pajaro Sunny Mesa CSD, sería responsable de operar y mantener el sistema de agua.	Sistema Comunitario de Agua Entubada
Reemplazo de Pozos Doméstico(s) Existentes	*Reemplazar pozos existentes por pozos nuevos y mejor construidos que probablemente produzcan una mejor calidad de agua.* El propietario(a) sería responsable por la operación y mantenimiento continuo del nuevo pozo.	Pozo Domestico
Tratamiento del Agua Donde Sale del Pozo	*Instalar sistemas de tratamiento que reduciría los niveles de los contaminantes a niveles seguros y que traten toda el agua producida desde el pozo para uno o más hogares.* Esta opción usaría equipo de tratamiento de agua incluyendo filtros para quitar los contaminantes para que el agua cumpla con los estándares de agua potable.	Pozo Domestico
Tratamiento de Punto de Uso/Punta de Entrada	*Instalar sistemas de tratamiento que reduciría los niveles de los contaminantes a niveles seguros por el punto de uso (normalmente por el fregadero) y/o justo antes de entrar en los hogares.*	Pozo Domestico

Figura ES-2. Mapa de consolidación física potencial con el Proyecto de Springfield



Los beneficios y desventajas o desafíos de cada alternativa están resumidos en la Tabla ES-2. Es importante tener en cuenta que el tratamiento de (POU/POE) no está certificado por el Estado de California para tratar agua del pozo con concentraciones extremadamente altas de nitratos, y por lo tanto, no serán soluciones adecuadas para la mayoría de hogares. Además, es posible que reemplazar pozos privados no aborde los problemas de calidad del agua porque es posible que un pozo nuevo también esté sujeto a contaminación y / o intrusión de agua de mar.

Se han desarrollado estimaciones de costos por hogar para cada alternativa y se muestran en la Tabla ES-2 y la Tabla ES-3. La Tabla ES-3 muestra los costos totales durante un período de 20 años que representan los costos de operación y mantenimiento a largo plazo y los costos iniciales en dólares actuales. Al combinar los costos de capital iniciales y los costos de operación y mantenimiento, se pueden comparar los costos totales entre las alternativas.

Los costos de O&M de la Tabla ES-3 asumen que se tratara el agua que se usa adentro y afuera de la casa, excepto para la alternativa de tratamiento de POU/POE donde solo se trataría el agua que se usa adentro. Según las cotizaciones de dos proveedores de equipos de tratamiento (A y B), el tratamiento del agua que sale del pozo se estimó que era la alternativa más cara. La consolidación física con un sistema de agua existente y el desarrollo de un nuevo sistema de agua comunitario parecen ser los más competitivos en cuanto a costos, especialmente si se considera que el tratamiento POU/POE solo trata el agua utilizada para el consumo dentro de la casa, mientras que estas opciones proporcionan agua para uso interior y exterior.

No se espera que las alternativas diferentes tengan el mismo nivel de becas del estado, lo cual es una consideración importante relacionado con el costo. La Tabla ES-2, que resume los costos de capital iniciales y los costos de operación y mantenimiento por hogar, ha sido codificada por colores para reflejar la financiación de becas anticipadas.

Tabla ES-2. Resumen de los beneficios, desafíos y costos por hogar para cada alternativa.

	Se anticipa que los costos se financiarán con becas para la comunidad.
	Se anticipa que los costos se financiarán con becas para los hogares que califiquen según su capacidad de pago.[1]
	No está claro qué costos de O&M pueden ser elegibles para financiamiento estatal.

<table>
<tr><th>Alternativa</th><th>Beneficios</th><th>Desventajas y Desafíos</th><th>Tipo de Sistema[2]</th><th>O&M anual por casa ($/año)[3]</th><th>O&M mensual por hogar ($/mes)[3]</th><th>Costos de capital por hogar ($)</th></tr>
<tr><td rowspan="2">Consolidación física
(Conectar al Proyecto de Springfield)</td><td rowspan="2">• Operada por una empresa de servicios públicos con experiencia, lo que probablemente mejorará la sostenibilidad a largo plazo.
• El almacenamiento, las bombas de refuerzo y un pozo se compartirán con un sistema existente.
• Bajos costos estimados de operación y mantenimiento.
• Opción B consolidaría regionalmente el área del proyecto con dos sistemas adicionales, aumentando la confiabilidad de cada sistema.
• Opción B sería más confiable a largo plazo, porque dependería de pozos ubicados más lejos del mar, los que son menos vulnerables a la intrusión de agua de mar.</td><td rowspan="2">• Altos costos iniciales de construcción.
• Incertidumbres de costos iniciales asociados con tuberías que cruzan carreteras, terrenos privados y hábitats protegidos.
• Opción A dependería solo de pozos cerca de la costa que podrían tener una degradación de la calidad del agua en el futuro debido a la intrusión del agua del mar.
• Opción B depende de la finalización del proyecto de consolidación entre los Sistemas de Agua Sunny Mesa y Pajaro que no tiene fecha de inicio.</td><td rowspan="2">CWS</td><td rowspan="2" colspan="2">Basado en las tarifas de agua del Distrito de Servicios a la Comunidad PSM[4] (Consulte la Tabla ES-4 para ver ejemplos)</td><td>Opción A: 154,000;
Opción B: 149,000[6]
(Infraestructura Comunitaria)</td></tr>
<tr><td>Instalación de tuberías laterales y destrucción de pozos: 21,000
Instalación de tuberías laterales y aislamiento de pozos: 10,000 + modificaciones de plomería en las instalaciones [7]</td></tr>
<tr><td rowspan="2">Un nuevo Sistema Comunitario de Agua Entubada</td><td rowspan="2">• Es posible que otra empresa de agua con experiencia pueda operar el sistema, lo que probablemente mejoraría la sostenibilidad a largo plazo.
• La calidad del agua sería monitoreada y reportada al estado.
• Los costos estimados de operación y mantenimiento se consideran bajos a moderados.</td><td rowspan="2">• Altos costos iniciales de construcción.
• Sólo sería elegible para becas estatales si la consolidación física no es viable
• Si otra empresa de agua con experiencia no puede operar el sistema, probablemente sería difícil y requeriría mucho tiempo desarrollar una empresa nueva y sostenible de agua.
• Requiere el desarrollo de un nuevo permiso o la modificación de un permiso existente que puede retrasar la implementación.</td><td rowspan="2">CWS</td><td rowspan="2" colspan="2">Basado en las tarifas de agua del Distrito de Servicios a la Comunidad PSM[4] (Consulte la Tabla ES-4 para ver ejemplos)</td><td>233,000[6]
(Infraestructura Comunitaria)</td></tr>
<tr><td>Instalación de tuberías laterales y destrucción de pozos: 21,000
Instalación de tuberías laterales y aislamiento de pozos: 10,000 + modificaciones de plomería en las instalaciones [7]</td></tr>
<tr><td rowspan="3">Reemplazar pozos privados</td><td rowspan="3">• No requiere nueva infraestructura de agua a nivel comunitario.
• Bajos costos estimados de operación y mantenimiento.</td><td rowspan="3">• Cada propietario que tiene un pozo doméstico será responsable de mantener su pozo y sistema de agua.
• La calidad del agua en los pozos de reemplazo podría degradarse en el futuro.
• Es probable que los pozos de reemplazo con agua de buena calidad no sean factibles en algunas partes del área del proyecto.</td><td>PW</td><td>692</td><td>58</td><td>166,000</td></tr>
<tr><td>LSWS</td><td>294</td><td>25</td><td>63,000</td></tr>
<tr><td>SSWS</td><td>154</td><td>13</td><td>37,000</td></tr>
</table>

Tratamiento del agua donde sale del pozo	• Puede tratar otros contaminantes que puedan llegar a los pozos en el futuro.	• Altos costos estimados de operación y mantenimiento. • Requiere la eliminación frecuente de desechos de los sistemas de tratamiento. • Podría ser difícil mantener muchos sistemas de tratamiento individuales y descentralizados que requieren costos sustanciales de operación y mantenimiento y apoyo técnico.	PW[5]	86,200	7,180	165,000
			LSWS[5]	39,700	3,310	142,000
			SSWS[5]	37,100	3,090	78,900
			PW[5]	13,300	1,110	707,000
			LSWS[5]	12,400	1,030	307,000
			SSWS[5]	10,200	850	165,000
Tratamiento de POU/POE	• Bajos costos capitales	• No es una opción permitida para el cumplimiento de SSWS[2] y LSWS[2] en el condado de Monterey. • Debido al alto contenido de nitratos, no es factible para 12 de 15 hogares que necesitan tratamiento. • Podría ser difícil mantener muchos sistemas de tratamiento individuales y descentralizados que requieren costos sustanciales de operación y mantenimiento y apoyo técnico. • El crecimiento de microorganismos en los filtros de carbón activado granular (GAC, por sus siglas en inglés) es una preocupación potencial	PW	9,210 solo por el uso dentro de la casa	770 solo por el uso dentro de la casa	70,500[8]

[1]La División de Asistencia Financiera (DFA, por sus siglas en inglés) de la Mesa Estatal del Control de Recursos Hídricos está en el proceso de actualizar su política para financiar el trabajo en la propiedad privada y ha dado indicaciones preliminares que tienen implicaciones para este proyecto (Comunicación por correo electrónico con la Subdirectora General Adjunta de la DFA, el 14 de octubre del 2021). En la política actualizada, la calificación para becas para el trabajo en la propiedad privada normalmente se determinará por comunidad, con la implicación que la mayoría de los hogares en este proyecto se calificarían debido a que el área se clasifica como una comunidad de bajos recursos (DAC, por sus siglas en inglés). Podrían haber algunas excepciones a esta política, como si el trabajo en la propiedad privada es muy costoso o en casos donde los datos de ingresos para el bloque de censo no son representativos de los hogares en el área del proyecto. En estos casos la calificación para becas estatales se basaría en la capacidad de pago del propietario. La DFA está trabajando para formalizar estas indicaciones preliminares como una política escrita y CWC está intentando confirmar si esta política aplicaría a todos los trabajos en la propiedad privada (tuberías laterales, destrucción de pozos, y la instalación de dispositivos antirreflujos) y cuáles criterios se podrían usar para identificar excepciones donde se necesitaría información sobre la capacidad de pago del propietario.

[2]Sistema Comunitario de Agua Entubada (CWS, por sus siglas en inglés), Pozo Privado (PW, por sus siglas en inglés), Sistema de Agua Pequeño Local (LSWS, por sus siglas en inglés), Sistema de Agua Pequeño Estatal (SSWS, por sus siglas en inglés). Para la estimación de costos, se asume que cada PW, LSWS y SSWS atiende un promedio de 1.3, 3.4 y 6.5 hogares respectivamente, con base en el número promedio de hogares que cada tipo de sistema atiende en el área.

[3]Los costos de operación y mantenimiento se asumen basando el uso de 150 galones de agua por cada persona por día. Este uso de agua es para el uso dentro y fuera de la casa, excepto donde se indique el uso exclusivo por dentro de la casa. El uso de agua dentro de la casa solo asume 55 galones por persona por día.

[4]El Distro de Servicios a la Comunidad Pajaro Sunny Mesa. "Anexo "A" La Lista de Tarifas del Distro de Servicios a la Comunidad Pajaro/Sunny Mesa. Fecha de vigencia 1 de julio de 2021. http://pajarosunnymesa.com/uploads/Rate%20Schedule%207-2021%20to%206-2022.pdf".

[5]Los costos para la eliminación de desechos (salmuera) fuera del sitio de los sistemas de tratamiento es el componente más grande de los costos de operación y mantenimiento para los proveedores A y B, y pueden evitarse si la Mesa Regional de Control de Recursos Hídricos permite la eliminación de salmuera en el sitio.

[6]Estos costos iniciales están asociados con trabajos que no se realizan en propiedad privada, como la instalación de tuberías de agua en la calle. Dichos costos serían elegibles para becas para todos los hogares, independientemente de sus situación económica. Opción A implica el desarrollo de un nuevo pozo para proporcionar una segunda fuente de agua, mientras que la opción B conectaría el área del proyecto a los sistemas de agua Sunny Mesa y Pajaro (si se consolidan), además de conectarse al Proyecto de Springfield en lugar de desarrollar un nuevo pozo.

[7]Estos costos iniciales están asociados con el trabajo realizado en propiedad privada, como la construcción de una línea de servicio, la demolición de un pozo antiguo o la instalación de un dispositivo antirreflujo. Cuando se determine la elegibilidad para becas estatales para financiar estos costos, se considerará la capacidad de pago del propietario. Si el propietario elige mantener su pozo para el uso de agua de afuera de la casa, sería responsable de la instalación y el mantenimiento de un dispositivo antirreflujo. Este dispositivo antirreflujo mantiene el pozo aislado del sistema público de agua, así como de cualquier plomería en sus instalaciones necesaria para evitar mezclar el agua de su pozo privado con el agua del sistema comunitario de agua entubada. El costo que se muestra para la instalación de tuberías laterales y destrucción de pozos no incluye el costo completo de destruir un pozo, porque algunos pozos abastecen a más de un hogar. El costo que se muestra representa el costo de destruir los aproximadamente 50 pozos en el área del proyecto dividido entre los 88 hogares.

[8]Los costos iniciales de tratamiento de POU/POE incluyen evaluaciones del sitio, supervisión técnica, muestreo de diagnóstico de la calidad del agua, una asignación para mejoras a los pozos y tanques de almacenamiento existentes, gestión del proyecto y reemplazó a los 10 años.

Tabla ES-3. Comparaciones de costos iniciales, de operación y mantenimiento a 20 años y costos totales a 20 años por hogar para cada alternativa.

Alternativa	Costos iniciales ($/hogar)[b]	Costo de operación y mantenimiento por 20 años ($/hogar)	Costo total por 20 años ($/hogar)
Reemplazar pozo privado	37,800 a 166,000[a]	15,900 a 27,100[a]	53,700 a 193,000[a]
Consolidación: Opción A	176,000	27,800	203,800
Consolidación: Opción B	169,000	27,800	196,800
Nuevo sistema comunitario de agua entubada	254,000	27,800	281,800
Proveedor A de Tratamiento del agua donde sale del pozo	78,900 a 166,000[a]	1,070,000	541,000 a 1,240,000[a]
Proveedor B de Tratamiento del agua donde sale del pozo	165,000 a 707,000[a]	127,000 a 166,000[a]	292,000 a 872,000[a]
Tratamiento de POU/POE de un Pozo Privado	70,540	112,000 a 115000[a]	182,000 a 185,000[a]

[a]Para las soluciones de pozos domésticos, el costo por hogar dependerá de cuántas casas comparten un pozo. Se estima que los costos serán más bajos para pozos que sirven a 6-7 hogares por ejemplo comparado con un pozo que sirve solo a un hogar. [b]Se asume una tasa de descuento de 5% al calcular los costos totales a 20 años.

Los costos de operación y mantenimiento que se muestran en la Tabla ES-3 se calcularon usando estimaciones del promedio del consumo de agua doméstico en California y suponen una ocupación de 4.7 residentes por hogar, lo que lleva a estimaciones conservadoras (es decir, elevadas) para el consumo diario de agua en el hogar de 705 galones por dia. Este nivel de consumo de agua se compara en la Tabla ES-4 con otros niveles posibles que asumen que el uso de agua es por consumo dentro de la casa únicamente, así como el consumo histórico de agua por uso dentro de la casa y al exterior promedio en sistemas de agua cercanos y para hogares individuales. Al utilizar la estructura de tarifas de agua del Distrito de Servicios a la Comunidad Pajaro Sunny Mesa, las facturas mensuales de agua oscilarán entre $23 y $116 por mes por hogar para estos diferentes niveles de consumo de agua. Dado que los costos de operación y mantenimiento para la consolidación física y un nuevo sistema de agua comunitaria que se muestran en la Tabla ES-3 se determinaron utilizando las tarifas de agua del Distrito de Servicios a la Comunidad Pajaro Sunny Mesa y un consumo de agua doméstico diario de 705 galones por hogar por día, los costos de operación y mantenimiento en la Tabla ES-3 probablemente son conservadores. Dependiendo de los hábitos de uso del agua de los residentes, el número de residentes por hogar y el alcance de las demandas de jardinería / riego, la demanda de agua y las facturas podrían ser sustancialmente menores en el área del proyecto.

Tabla ES-4. Facturas potenciales de agua del hogar (HH, por sus siglas en inglés) para las alternativas de consolidación física y un nuevo sistema de agua comunitario, asumiendo diferentes niveles de consumo de agua actuales del Distrito de Servicios a la Comunidad Pajaro Sunny Mesa.

Niveles de Consumo de Agua	ADD (gpcd)	Personas por hogar	Uso diario por hogar (gal/dia/ Hogar)	Factura mensual ($/mes)
El uso promedio dentro y fuera de la casa en California[1]	150	4.7	705	186
El uso promedio solo dentro de la casa en California[2]	55	4.7	259	86
Promedio de Sunny Mesa (2019-2020)[3]	Desconocida		281	91
Promedio de 2020 por ciertos hogares en el Sistema de Agua de Sunny Mesa[4]				
Familia de 4 con Jardín	92	4	369	116
Familia de 4 con un Pequeño Jardín	61	4	246	88
Familia de 2 con Jardín	160	2	320	104
Familia de 1 con un Pequeño Jardín	25	1	25	23

[1]Mesa Estatal del Control de Recursos Hídricos. "Initial Statement of Reasons 1,2,3-Trichloropropane Maximum Contaminant Level Regulations. Title 22, California Code of Regulations", Última actualización 2/17/19. Se calcularon las tarifas de agua asumiendo la "Programación de Tarifas" del Distrito de Servicios a la Comunidad Pajaro Sunny Mesa. Accedido 7/6/21, http://pajarosunnymesa.com/uploads/Rate%20Schedule%207-2021%20to%206-2022.pdf. [2]Mesa Estatal del Control de Recursos Hídricos, "Fast Facts on the Water Conservation Legislation" Accedido 5/28/21, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/Files/PDFs/Water-Conservation-Legislation-Fact-Sheet_a_y19.pdf. Las facturas de agua se calculan asumiendo el "Programa de tarifas" del CSD de Pajaro Sunny Mesa. [3]Consumo de agua y facturas basadas en comunicación personal entre Kyle Shimabuku (Corona Environmental Consulting) y Judy Vazquez-Varela con Pajaro Sunny Mesa CSD, el 6 de julio de 2021. [4]Consumo de agua y facturas de agua basadas en comunicación personal entre Heather Lukacs (CWC) y Judy Vazquez- Varela con Pajaro Sunny Mesa CSD, el 15 de junio de 2021.

Resumen de la Evaluación de Alternativas

Se utilizaron consideraciones de costo y no costo de la Tabla ES-2 para desarrollar criterios para evaluar y clasificar cada alternativa. Los criterios incluyen disponibilidad de fondos, sostenibilidad / confiabilidad a largo plazo, desafíos y consideraciones de implementación, la línea de tiempo para implementar las alternativas y la capacidad de la alternativa para solucionar los problemas de calidad del agua para todos los hogares en el área del proyecto. Además, se consideraron y clasificaron combinaciones de alternativas junto con las alternativas independientes. Las combinaciones de alternativas que se consideraron incluyen:

- Consolidación o Nuevo Sistema Comunitario de Agua Entubada y el Reemplazo de Pozos Existentes
- Consolidación o Nuevo Sistema Comunitario de Agua Entubada y Tratamiento del agua donde sale del pozo
- Consolidación o Nuevo Sistema Comunitario de Agua Entubada y Tratamiento de POU/POE

- Consolidación o Nuevo Sistema Comunitario de Agua Entubada y no intervenir con algunos pozos que actualmente no tienen problemas

Se consideró la consolidación o un nuevo sistema comunitario de agua entubada en combinación con otras alternativas porque las soluciones de consolidación física y un nuevo sistema comunitario de agua entubada tenían la clasificación general más alta y la segunda más alta, respectivamente. Estas combinaciones se consideraron para evaluar si es posible reducir los costos de consolidación o un nuevo sistema comunitario de agua entubada proporcionando una solución diferente o ninguna intervención (si se cumplen los estándares de calidad del agua) para hogares que están lejos de otros. La Tabla ES-5 tiene un resumen de esta clasificación.

Tabla ES-5. Resumen de la evaluación de las alternativas

	Alternativas sin Tratamiento		Alternativas de Tratamiento			Combinación de Alternativas			
Criterios	**Consolidación Física con Springfield**	**Nuevo Sistema Comunitario de Agua Entubada**	**Reemplazar Pozos Existentes**	**Tratamiento del agua donde sale del pozo**	**Tratamiento de POU/POE**	**Consolidación o Nuevo Sistema Comunitario de Agua Entubada y Reemplazar Pozos Existentes**	**Consolidación o Nuevo Sistema Comunitario de Agua Entubada y Tratamiento del Agua Donde Sale del Pozo**	**Consolidación o Nuevo Sistema Comunitario de Agua Entubada y Tratamiento de POU/POE**	**Consolidación o Nuevo Sistema Comunitario de Agua Entubada y No Intervenir con Algunos Pozos que Actualmente no Tienen Problemas**
Becas para cubrir todos los hogares									
Costos iniciales									
Costos anuales de operación y mantenimiento									
Tarifa de agua mensual estimada para cada hogar									
Tiempo de implementación, incluso el tiempo estimado para los permisos relevantes									
Consideraciones y desafíos de implementación									
Sostenibilidad / fiabilidad a largo plazo									
La solución aplica a todos los hogares									
Recomendado para mayor consideración	Si	Si	No	No	No	No	No	No	Si
Resumen	Alternativa recomendada	Segunda alternativa recomendada	No se puede proporcionar agua potable de manera confiable a todas las casas en el área del proyecto	Tiene un costo muy alto	No se puede proporcionar agua potable de manera confiable a todas las casas en el área del proyecto; eligibilidad de becas depende de ingresos; costos de O&M son muy altos	Menos sostenible que solamente la consolidación física. Y solo hay oportunidades limitadas para reducir los costos de consolidación con un pozo nuevo	No se pueden reducir los costos en relación con la consolidación física. También hay otros inconvenientes	No es una solución a largo plazo y puede que no sea elegible para becas estatales	Necesita más investigación. Podría reducir los costos iniciales y de operación y mantenimiento, pero puede ser menos resistente / sostenible que proporcionar una conexión a un sistema comunitario de agua entubada para todos los hogares.

	Descripción
	Favorable
	Algo favorable
	Menos favorable
	No favorable

Alternativas recomendadas para mayor consideración

Al considerar todos los criterios, la alternativa recomendada para mayor consideración es la consolidación física con el Proyecto de Springfield. Esta alternativa se clasifica por encima de un nuevo sistema comunitario de agua entubada porque el costo inicial es más bajo, el costo continuo para los residentes es el mismo y es probable que la consolidación con un sistema comunitario de agua entubada existente sea más sostenible porque la infraestructura y la capacidad técnica y administrativa se compartirían con ese sistema. También, un nuevo sistema comunitario de agua entubada probablemente sólo calificaría para becas estatales si la consolidación física no es viable. Ambas Opciones A y B para la consolidación física deben considerarse más a fondo, aunque la Opción B es la opción preferida. Opción B se clasifica mejor como una solución confiable y de largo plazo, ya que el área del proyecto también se consolidaría con sistemas que tienen fuentes de agua subterránea que están en zonas más alejadas de la costa y pueden ser menos vulnerables a la intrusión de agua de mar. Sin embargo, la Opción B depende de la finalización de un proyecto de consolidación entre los sistemas Sunny Mesa y Pajaro, que no tiene una fecha de inicio. Por lo tanto, la Opción A se debe considerar junto con la Opción B en el caso de que la Opción B no pueda llevarse a cabo porque, por ejemplo, se determina que la consolidación entre los sistemas de Sunny Mesa y Pajaro no es factible o su línea de tiempo de implementación se retrasa sustancialmente. Además, la capacidad de implementar cualquiera de las opciones depende de la finalización exitosa del Proyecto de Springfield. Si por alguna razón esta alternativa no es viable se retrasara sustancialmente, entonces se puede considerar la otra alternativa de formar un nuevo sistema comunitario de agua entubada.

Puede ser ventajoso para los hogares utilizar becas del estado que puedan estar disponibles para destruir pozos domésticos existentes si se elige la consolidación física, ya que evitaría la contaminación del agua superficial del acuífero del pozo, evitaría los costos de mantenimiento del pozo y potencialmente proporcionaría beneficios a la comunidad como el apoyo a la gestión de los acuíferos para limitar la intrusión de agua de mar. Sin embargo, los propietarios pueden decidir continuar usando su pozo para riego y conectarse al Proyecto de Springfield para el uso de agua dentro de sus hogares. Para que los propietarios continúen usando pozos domésticos para el riego, se necesitaría instalar un dispositivo antirreflujo que se estima en $2,340[3]. Las modificaciones a la plomería de las instalaciones necesarias para separar las tuberías de agua exteriores de las tuberías de agua de uso interior pueden generar costos adicionales que el propietario podría tener que cubrir. Además, el dispositivo antirreflujo debería probarse anualmente, lo que actualmente cuesta $90 por año. Al decidir mantener o destruir pozos domésticos, los miembros de la comunidad deben considerar la edad de su pozo, ya que los pozos domésticos pueden tener una vida útil promedio de 30 a 50 años[4]. Los pozos domésticos poco profundos en el área pueden ser afectados por la intrusión de agua de mar en el futuro.

Aunque las otras alternativas independientes, como el reemplazo de pozos existentes, tratamiento del agua donde sale del pozo, y tratamiento de POU/POE, tienen ventajas con respecto a uno o más de los criterios, se clasifican como menos favorables o desfavorables con respecto a su capacidad para proporcionar una solución para todos los hogares, proporcionar agua potable de manera confiable y

[3]En base de: California Water Board, “2021 Drinking Water Needs Assessment” Accedido el 10 de agosto del 2021, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf. Esta cifra incluye un factor multiplicador regional de 1.3 y una contingencia de 20%.

[4]Re/Max Executive Realty, “Well Inspections: Buying a Home with a Well”, Accedido el 28 de mayo del 2021, https://www.maxrealestateexposure.com/buying-home-with-well/

sostenible y / o proporcionar un solución económica. Dado que estos criterios son sumamente importantes, estas alternativas por sí solas no se recomiendan. Además, no se recomienda combinar estas alternativas con la consolidación física o el desarrollo de un nuevo sistema comunitario de agua entubada por muchas de las mismas razones por las que no se recomiendan como alternativa independiente. Además, es posible que la combinación de alternativas no pueda reducir significativamente los costos de consolidación con el Proyecto de Springfield o el desarrollo de un nuevo sistema comunitario de agua entubada.

Puede ser posible reducir los costos iniciales de las opciones de la consolidación física o el desarrollo de un nuevo sistema comunitario de agua entubada al no proporcionar una intervención para grupos de hogares que están (i) geográficamente distantes de otros hogares y (ii) servidos por pozos con calidad de agua adecuada. Debido a la disponibilidad limitada de datos sobre la calidad del agua para los pozos que sirven a los hogares geográficamente distantes, actualmente no es posible estimar la ubicación y el número de hogares que se podrían excluir del proyecto. Por lo tanto, se recomienda que se investigue más a fondo la calidad del agua en los pozos que sirven a estos hogares antes de que esta alternativa se considere una opción viable. Además, incluso si se cumplen actualmente los estándares de calidad del agua, la calidad del agua en estos pozos podría cambiar y no cumplir con los estándares de agua potable en el futuro debido a la intrusión de agua de mar o la migración de la pluma contaminante, lo que debe considerarse antes de optar por esta opción.

Siguiente Fase del Proyecto

Este Informe Preliminar es el tercer objetivo completo en el proceso por fases para producir un Informe Final sobre este estudio. Un resumen de las fases del trabajo se muestra en la tabla ES-6. Antes de este Informe Final, Corona desarrolló un Informe Preliminar, un Informe Preliminar Administrativo, y un Resumen de las Alternativas. Los representantes de la Mesa Estatal del Control de Recursos Hídricos, la Oficina de Salud Ambiental del Condado de Monterey, y el Distrito de Servicios a la Comunidad de Pajaro Sunny Mesa revisaron el Informe Preliminar, el Informe Preliminar Administrativo, y el Resumen de Alternativas. El Informe Preliminar también se hizo disponible a los miembros de la comunidad para que dieran sus comentarios. Los hallazgos claves también se presentaron en pláticas comunitarias, durante las cuales los miembros de la comunidad hicieron preguntas y brindaron información. Este Informe Final incorpora las revisiones del Informe Preliminar basadas en los aportes de las partes interesadas y los miembros de la comunidad.

Los resultados de este producto final se presentarán a los miembros de la comunidad.

Tabla ES-6. Los pasos del proyecto y línea de tiempo.

Tarea	feb	mar	abr	mayo	jun/jul	ago/sep	oct/nov
Alcance de Trabajo	👥						
Informe del Resumen de las Alternativas			📄	💬	👥 🗨		
Informe Preliminar Administrativo					📄 💬		
Informe Preliminar						📄 👥 🗨 💬	
Informe Final							📄 👥

📄 indica un objetivo

👥 indica platica comunitaria

🗨 indica comentarios de la comunidad

💬 Mesa Estatal del Control de Recursos Hídricos, Condado de Monterey, y el Distrito de Servicios a la Comunidad de Pajaro Sunny Mesa revisión y comentarios

1. Background

The Community Water Center (CWC) acts as a catalyst for community-driven water solutions through organizing, education, and advocacy in California. CWC believes all communities should have access to clean, safe, and affordable drinking water. CWC builds strategic grassroots capacity to address water challenges in small, rural, low-income communities and communities of color. CWC currently has offices in Visalia, Watsonville and Sacramento.

CWC has received funding from the State Water Resources Control Board (SWRCB) to provide Technical Assistance services to communities to address drinking water problems. For this project, CWC has engaged Corona Environmental Consulting (Corona) and KYLE Groundwater, Inc. to evaluate the alternatives to address the water quality challenges in a community north of Moss Landing.

1.1 Community and Stakeholder Engagement

CWC has actively been engaged in the project area since 2018, hosting their first community meeting in December of that year. In February 2019, community members formed El Comité para Tener Agua Sana, Limpia, y Económica, or the Committee for Safe, Clean, and Affordable Drinking Water (referred herein as El Comité). El Comité has held monthly meetings that focus on education, organizing, and advocacy efforts. Key highlights of El Comité and CWC's work include:

- 25 households participated in the Central Coast Regional Water Board's free well testing program and received detailed water quality results of their drinking water well.
- Successfully advocated for an interim bottled water program, funded by the State Water Resources Control Board and administered by Pajaro Sunny Mesa CSD, that is currently serving 49 households in the project area (see Section 1.7.4).
- In March of 2020, 27 community members signed a petition to demonstrate their support for an alternatives analysis to explore long-term solution options in the Comité area. That petition resulted in receiving state funding for this study.

As part of this feasibility study, CWC is engaging community members by conducting community outreach with community leaders who are part of El Comité, preparing for and hosting at least five community meetings to encourage participation and get feedback on the alternatives analysis, developing and translating materials, and connecting individually with community residents and property owners.

Community engagement conducted for this project as of August 2021 includes:

- Hosted three virtual community meetings (February 19, 2021, June 6, 2021, and June 15, 2021). Meetings are recorded and available for review on the project website.[5]
- Sent five mailers, each of them to approximately 100 residents and property owners. The mailers included project and community meeting presentation guides, meeting invites, and requests for feedback.
- Outreached by making over 100 phone calls to discuss the project and receive feedback from property owners and residents.
- Knocked on 13 doors of contacts not reachable by phone to discuss the project and receive feedback.

[5] The project website is located at: https://www.communitywatercenter.org/mosslandingwaterproject

- Conducted 15 surveys to understand more about households' water concerns, information regarding their drinking water well, and perceptions of their water quality.
- Conducted 15 surveys to discuss the project and receive specific feedback on each alternative being evaluated, while also gauging each participant's priorities with respect to this project. Some surveys were conducted with owners of multiple residences in the project area.

Feedback and questions received from community members during community meetings and one-on-one surveys are documented in Appendix F.

In addition to engaging with community members, CWC is coordinating and engaging with other stakeholders in this project, including nearby water providers (Pajaro Sunny Mesa Community Services District (CSD)), Monterey County Environmental Health Bureau, Monterey County LAFCO, Pajaro Valley Water Management Agency, and the SWRCB. Four stakeholder review meetings on the following topics were held prior to issuing this Draft Report:

- Introduction to the project and review of Corona Environmental Consulting's scope of work (December 17, 2020)
- Progress meeting to provide updates and receive stakeholder feedback on key project questions (March 23, 2021)
- Review of the Overview of Alternatives (May 6, 2021)
- Review of the Administrative Draft Report (July 20, 2021)

1.2 Project Description and Goals

The project area is a low-income, unincorporated, agricultural area in Monterey County north of Moss Landing and west of Highway 1 near the coast. There are approximately 88 households served by private and shared wells that are in need of a long-term drinking water solution due to very high levels of nitrate and 1,2,3-Trichloropropane (123-TCP) in their drinking water.

The specific project goals are listed below:

1. Conduct an alternatives analysis to understand the feasibility of long-term solutions for communities served by private wells north of Moss Landing in Monterey County. The alternatives analysis will include a cost analysis which considers new types of funding available for operation and maintenance of treatment systems as well as for state and local small water systems and communities served by private wells (e.g. the SAFER program funded through SB200)[6].
2. Engage community members, including those who are part of an established community-based organization, *El Comité Para Tener Agua Sana, Limpia y Económica, or the Committee for Safe, Clean, and Affordable Water (El Comité)*, in information gathering and review of alternatives for long-term solutions.
3. Facilitate communication between community members, decision-makers, and other stakeholders to advance long-term solutions.
4. Select a preferred alternative and seek grant funding from the SWRCB

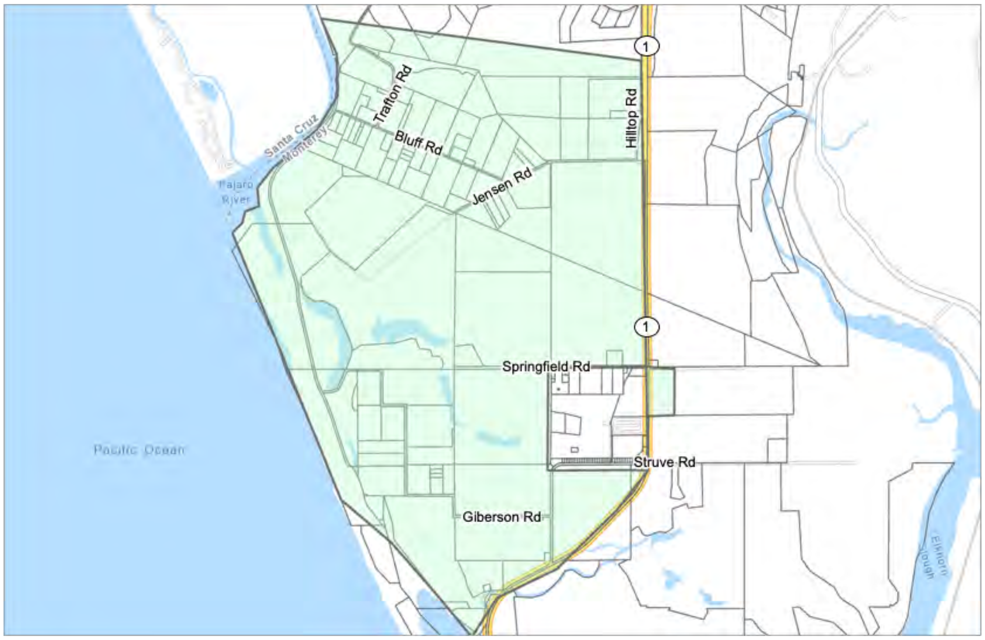
[6] SWRCB, "Safe and Affordable Funding for Equity and Resilience", Accessed: 5/27/21, https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/safer.html

1.3 Project Location

The project area (Figure 1) includes all households bounded by a change in the slope of the land to the north, Moss Landing to the south, Highway 1 and the ocean but excluding the Springfield Water System Consolidation Project (Springfield Project) Area. There are approximately 88 households (or 414 residents) in the project area. Thirty of these households receive their drinking water from 2 state small water systems, 5 local small water systems, while the other 61 households are reliant on private domestic wells.[7] Watsonville Produce, Inc. is a non-transient, non-community water system[8] in the area that may be interested in participating in the project. Watsonville Produce uses water for one house, three offices, and seasonal produce washing. The study area is located in a census block group with a median household income of $54,122 (margin of error: ±8,287), which is designated as a Disadvantaged Community (DAC).[9] All residences are assumed to be served by on-site septic systems. Adjoining land uses consist of agricultural fields, greenhouses, food processing and related businesses, and residential parcels.

[7] Monterey County Environmental Health Bureau's Drinking Water Protection Services regulates all small water systems serving 2-199 connections. Local Small Water Systems serve 2-4 connections. State Small Water Systems serve 5-14 connections. (County of Monterey Department of Health, "Drinking Water Protection Services", Accessed: 5/28/21, https://www.co.monterey.ca.us/government/departments-a-h/health/environmental-health/drinking-water-protection)
[8] A Non-Transient Non-Community Water System (NTNCWS) is defined as a public water system that regularly supplies water to at least 25 of the same people at least six months per year. Some examples are schools, factories, office buildings, and hospitals which have their own water systems. (USEPA," Information about Public Water Systems", Accessed 5/28/21, https://www.epa.gov/dwreginfo/information-about-public-water-systems)
[9] Median Household Income (MHI) from U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates, Detailed Tables. 2019 5-Year Census data indicates 4.7 people per household for the block group. If we assume this same household size for the 88 households in the project area, the estimated population of the project area is 414. For reference, the MHI from 2012-2016 was $39,628 (margin of error ±10,949) (U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Detailed Tables). The DAC Mapping Tool (https://gis.water.ca.gov/app/dacs/) indicates that this area is located within a DAC block group (060530101012) with a population of 2,595 and a total of 565 households, or 4.6 people per household.

Figure 1. Map of Project Area.



1.4 Planning and Zoning Designations

The majority of the project area is located in a Coastal Agricultural Preserve (CAP) zoning district of the Coastal Zone (CZ). The Monterey County Zoning Coastal Implementation Plan, Title 20, restricts development "to preserve and enhance farmlands" and "establish necessary support facilities" for agricultural uses.[10] A minimum 40-acre lot size is required for new developments and a Coastal Administrative Permit is required for most changes in land use, including replacement wells and water tanks for water system facilities serving 14 or fewer service connections. The Pajaro River and McCluskey Slough are in or adjacent to the project area and include properties zoned for Resource Conservation.

The project area is located within North Monterey County and subject to all requirements in the North County Land Use Plan (Coastal) and for the North County Fire Protection District.

1.5 Project Area Water Quality

Many drinking water wells in the project area have multiple contaminants including nitrate and 123-TCP at levels that pose a significant risk to public health. Co-occurring contaminants are also expected to influence the feasibility and cost of installing and maintaining treatment systems. Table 1 outlines California's Maximum Contaminant Level (MCL) or Secondary Maximum Contaminant Level (SMCL) and public health goal for each contaminant of concern in the project area. An MCL or SMCL is the maximum legal level of a contaminant that is allowed in drinking water by the state of California. MCLs are set by considering factors including public health risk as well as economic and technological feasibility. SMCLs are set based on aesthetic (taste and odor) and technical (impact to equipment or treatment

[10] Monterey County, "Title 22 Coastal Implementation Plan", Accessed: 5/28/21http://www2.co.monterey.ca.us/planning/docs/ordinances/Title20/20_toc.htm) Zoning was determined using Monterey County's ArcGIS map accessed on 5/28/21https://montereyco.maps.arcgis.com/home/index.html

effectiveness) effects and only apply to community water systems. The Public Health Goal is the level of a contaminant in drinking water that does not pose a significant risk to health.

Table 1. California's MCLs, SMCLs and Public Health Goals for arsenic, 123-TCP, nitrate, hexavalent chromium, and total dissolved solids.

Analyte	MCL or SCML	Public Health Goal
Arsenic	10 µg/L (MCL)	0.004 µg/L
Hexavalent Chromium	n/a[1]	0.02 µg/L
Nitrate as N	10 mg/L (MCL)	10 mg/L
Perchlorate	6 µg/L (MCL)	1 µg/L
1,2,3 - Trichloropropane (123-TCP)	0.005 µg/L (MCL)	0.0007 µg/L
Total Dissolved Solids (TDS)	**(**SMCL**)**	
• **Recommended**	500 mg/L	--
• **Upper**	1000 mg/L	--
• **Short term**	1500 mg/L	--

[1] The MCL for Hexavalent Chromium is currently under review. The MCL had been previously set at 10 µg/L.

Water quality data was obtained from the SWRCB's GAMA Groundwater Information System[11], including 18 wells sampled through the Central Coast Regional Water Quality Control Board's (RWQCB) private well testing program. The resulting data, along with existing Monterey County water quality data,[12] was analyzed to better understand the water quality issues in the project area. Water quality sampling data from CWC's 123-TCP Point-of-Entry Treatment Pilot Project (see Section 1.6) is also presented in this memorandum in cases where contaminant levels were higher than in other available data. However, sampling conducted for the pilot project did not identify any MCL exceedances that were not already identified by GAMA or Monterey County data. Of the 50 wells in the project, 22 have some water quality data. This data is applicable to 50 of the 88 households. Data from these wells was used to evaluate treatment options and will be used to estimate the treatment needs for the whole community (Table 2). The sample collection dates range from 3/13/2014 to 11/13/2020 for the available water quality data for all of the wells.

Nitrate is one of the primary contaminants of concern in the project area wells. Figure 2 shows the extent to which the wells were above the nitrate regulatory limit.

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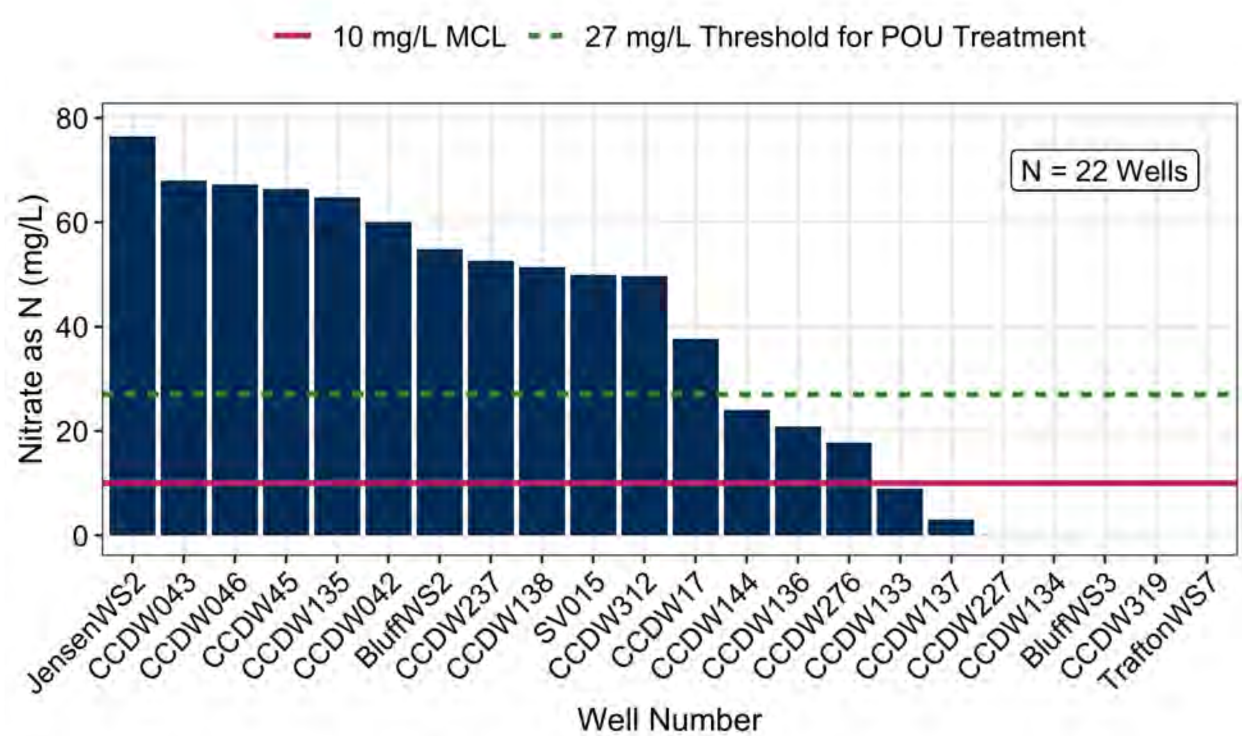
[11] All data from the Central Coast RWQCB's Testing Program can be viewed and downloaded directly from the SWRCB's GAMA Groundwater Information System by selecting "Advanced" and "Local Groundwater Projects." (Accessed: 5/28/21 https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/)

[12] Monterey County Environmental Health Bureau,"Out of Compliance Local & State Small Water Systems (SWS) as of March 2019" Accessed: 4/14/21. (https://www.co.monterey.ca.us/home/showpublisheddocument/67380/636900692857270000) Monterey County Environmental Health Bureau (2021) Response to file request for state and local small water system water quality data received on January 21, 2021.

Table 2. Summary of the highest water quality results.

Analyte	Number of wells tested	Number of wells over MCL or SMCL	Number of households over MCL or SMCL	Number of wells below MCL or SMCL	Notes
Arsenic (MCL)	22	2	2	20	
Hexavalent Chromium (former MCL)	21	1	2	20	Using former 10 µg/L MCL
Nitrate (MCL)	22	15	24	7	
Perchlorate (MCL)	18	0	0	18	
123-TCP (MCL)	18	12	18	6	
TDS (SMCL)	18	12	21	6	Using 1,000 mg/L SMCL

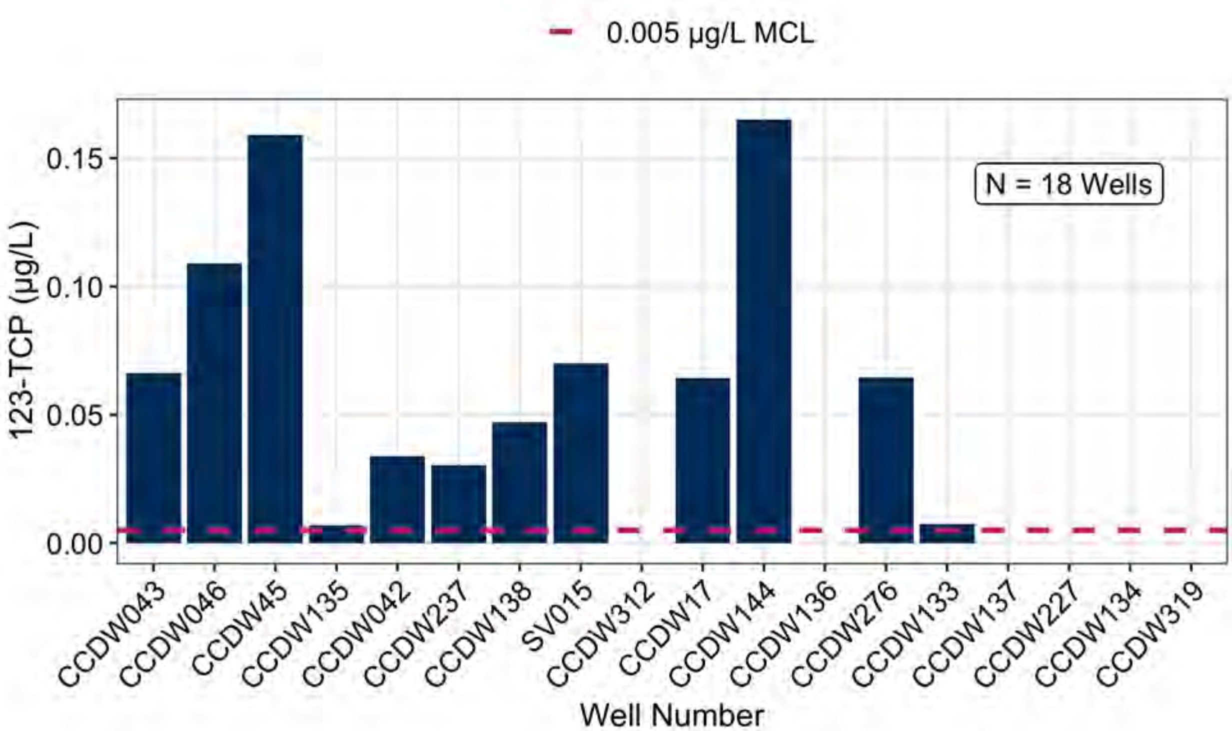
Figure 2. Historically highest nitrate results.



The average nitrate concentration for wells with MCL exceedances was 50.8 mg/L, which is over 5 times the MCL of 10 mg/L. Water with nitrate at, or over, 27 mg/L as N cannot be reliably treated to below the regulatory limit with point of use (POU) reverse osmosis treatment[13]. Of the 22 Wells with nitrate results, 15 are over the MCL and 12 of the wells are over this threshold and 3 could be considered for POU treatment.

In addition to nitrate, 123-TCP is a constituent of major concern in the project area. The regulation for 123-TCP is relatively recent, and was finalized in 2017[14]. Because of 123-TCP's significant health impacts at low levels, it is also the lowest limit in California, with an MCL of 0.005 µg/L, that is micrograms per liter or parts per billion. Figure 3 shows the highest historical 123-TCP results for 18 wells in the project area.

Figure 3. Historically highest 123-TCP results.



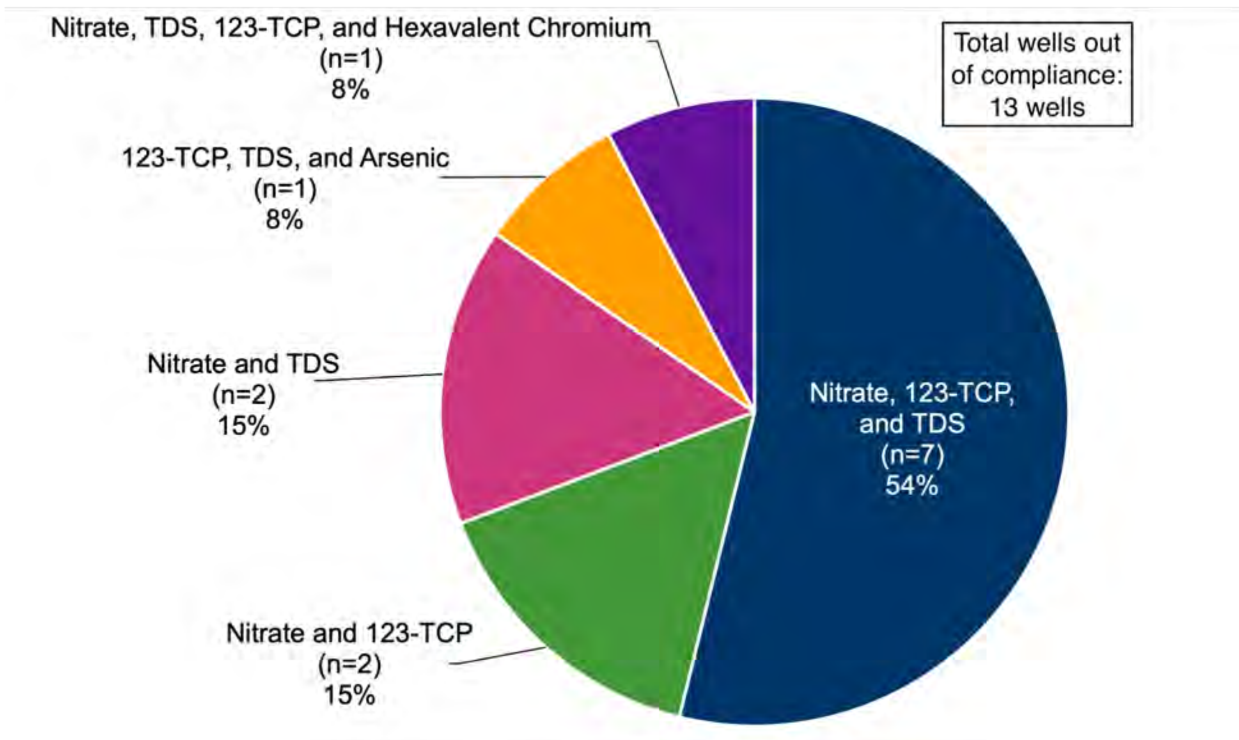
The average 123-TCP levels in these 18 wells tested was 0.045 µg/L, which is 9 times the MCL of 0.005 µg/L. In the most recent round of testing, two wells had undetectable levels of 123-TCP, when previously both wells had results of 0.007 µg/L. Based on input from members of the Technical Advisory Committee for CWC's 123-TCP Point-of-Entry Treatment Pilot Project, this degree of variability in 123-TCP concentrations in drinking water wells is not uncommon in California. Of the 12 wells with 123-TCP over the regulatory limit, 11 are also over the nitrate MCL. These two contaminants require different treatment technologies, which can dramatically increase the cost of treatment.

[13] NSF/ANSI 58 – 2018, *Reverse Osmosis Drinking Water Treatment Systems*. Lists an influent nitrate concentration of 30 mg/L-N to achieve a treated water of 10 mg/L as N in the treated water. A safety factor has been applied to keep the treated water below 10 mg/L as N.

[14] SWRCB, "SBDDW-17-001 1,2,3-Trichloropropane MCL", Accessed: 5/28/21, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/SBDDW-17-001_123TCP_MCL.html

In addition to the co-occurring nitrate and 123-TCP contamination, nitrate occurs with other contaminants of concern. Figure 4 shows the percentage of wells with MCL violations that have co-occurring contaminants over a regulatory limit. Historically high data was used only for wells with Central Coast RWQCB private well testing data.

Figure 4. Combinations of MCL violations in 13 wells that had at least one MCL violation. The upper SMCL value of 1,000 mg/L for TDS and the previous hexavalent chromium MCL of 10 µg/L were used for this analysis.



Of the 17 wells with RWB sampling data, no wells had a violation for just one contaminant, while 13 wells had contaminants that were above at least two MCLs. Only 4 wells with RWB data were in compliance with the analytes measured. Over half of the wells were out of compliance for nitrate, 123-TCP, and TDS, while 15% were in violation for nitrate and 123-TCP, and another 15% were in violation for nitrate and TDS.

There is not currently a legal limit or MCL for hexavalent chromium due to a 2017 court case that challenged the way in which the state conducted an economic feasibility analysis. Previously the MCL for hexavalent chromium was 10 µg/L.[15] Currently hexavalent chromium is regulated under the total chromium MCL, but a regulation for hexavalent chromium is expected in California in 2021. Hexavalent chromium was found in 15 sources at concentrations between 1.12 and 10 µg/L, with seven wells containing between 5 and 10 µg/L. In the future, treatment for this constituent may also be needed.

[15]SWRCB, "Chromium-6 Drinking Water MCL", Accessed: 5/28/21, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chromium6.html

Perchlorate was detected in 8 of the 18 wells sampled for this contaminant. Though the 8 wells with detectable perchlorate were below the MCL, they could potentially be over the regulatory limit in the future if additional samples are collected. The state is currently considering whether or not to lower the regulatory limit for perchlorate[16].

Three local small water systems in this area are on the Monterey County Environmental Health Bureau Out of Compliance List (March 2019):[17]

- Bluff Rd WS #2 (4 connections) - 54.9 mg/L nitrate as N
- Bluff Rd WS #4 (3 connections) - 66.4 mg/L nitrate as N
- Jensen Rd WS #2 (4 connections) - 12 µg/L arsenic in previous sample, currently under the MCL, 74.2 mg/L nitrate as N

In addition, the following small water systems in the project area are also regulated by Monterey County Environmental Health Bureau:

- Jensen Rd WS #1 (6 connections, state small water system)
- Bluff Rd WS #3 (6 connections, state small water system)
- Salinas Rd WS #14 (3 connections, local small water system)
- Trafton Rd WS #7 (4 connections, local small water system)

1.5.1 Location of Water Quality Issues

When considering water quality issues it is helpful to look at how the concentrations of contaminants vary spatially. In Figure 5, the highest historical nitrate and 123-TCP concentrations are shown on separate maps. It is important to note that, for these and subsequent maps, the dots represent approximate household locations and the coloring is based on historical water quality data for the well serving that household. In cases where one well serves multiple households, the same water quality is shown for multiple households. The amount of water quality sampling data available varied across the wells. For some wells, no data was available. Some assumptions were made about which households get water from which wells. Additional water quality maps for other constituents are available in Appendix A.

[16]SWRCB, "Chromium-6 Drinking Water MCL", Accessed: 5/28/21, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Perchlorate.html

[17] Monterey County Environmental Health Bureau,"Out of Compliance Local & State Small Water Systems (SWS) as of March 2019" Accessed: 4/14/21. (https://www.co.monterey.ca.us/home/showpublisheddocument/67380/636900692857270000)

Figure 5. Mapped highest historical nitrate and 123-TCP results. (Sample collection dates range from 3/13/2014 to 11/13/2020 for the available water quality data for all of the wells). *Data Source: Monterey County and GAMA Groundwater Information System (2020). All household locations are approximate.*

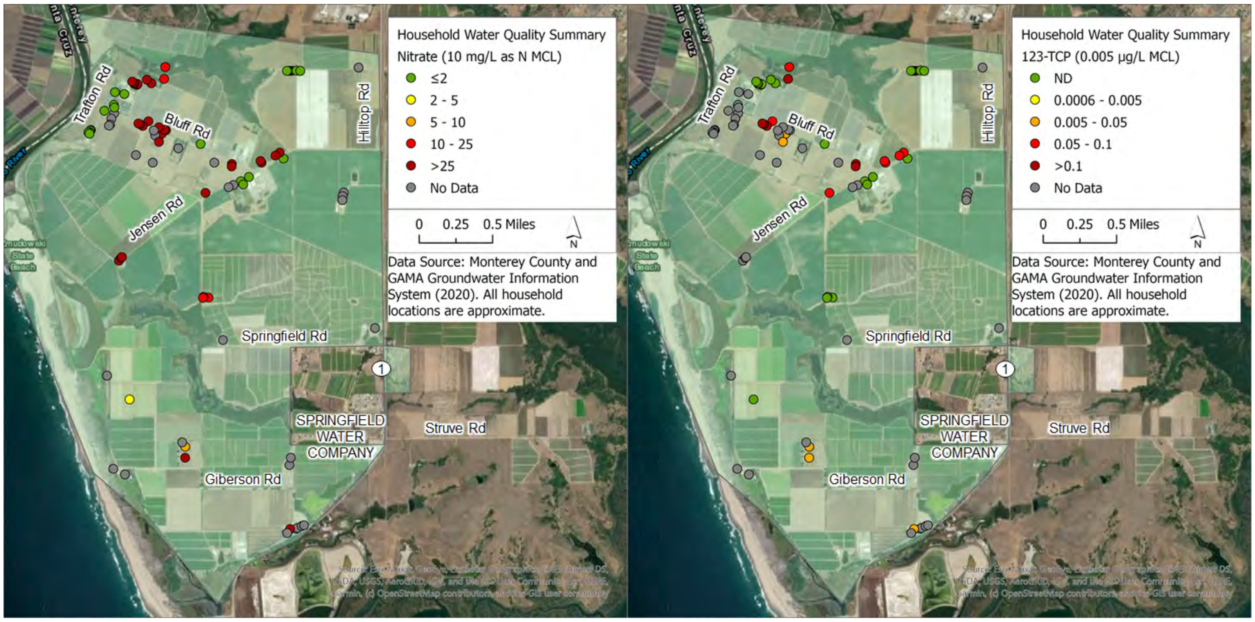
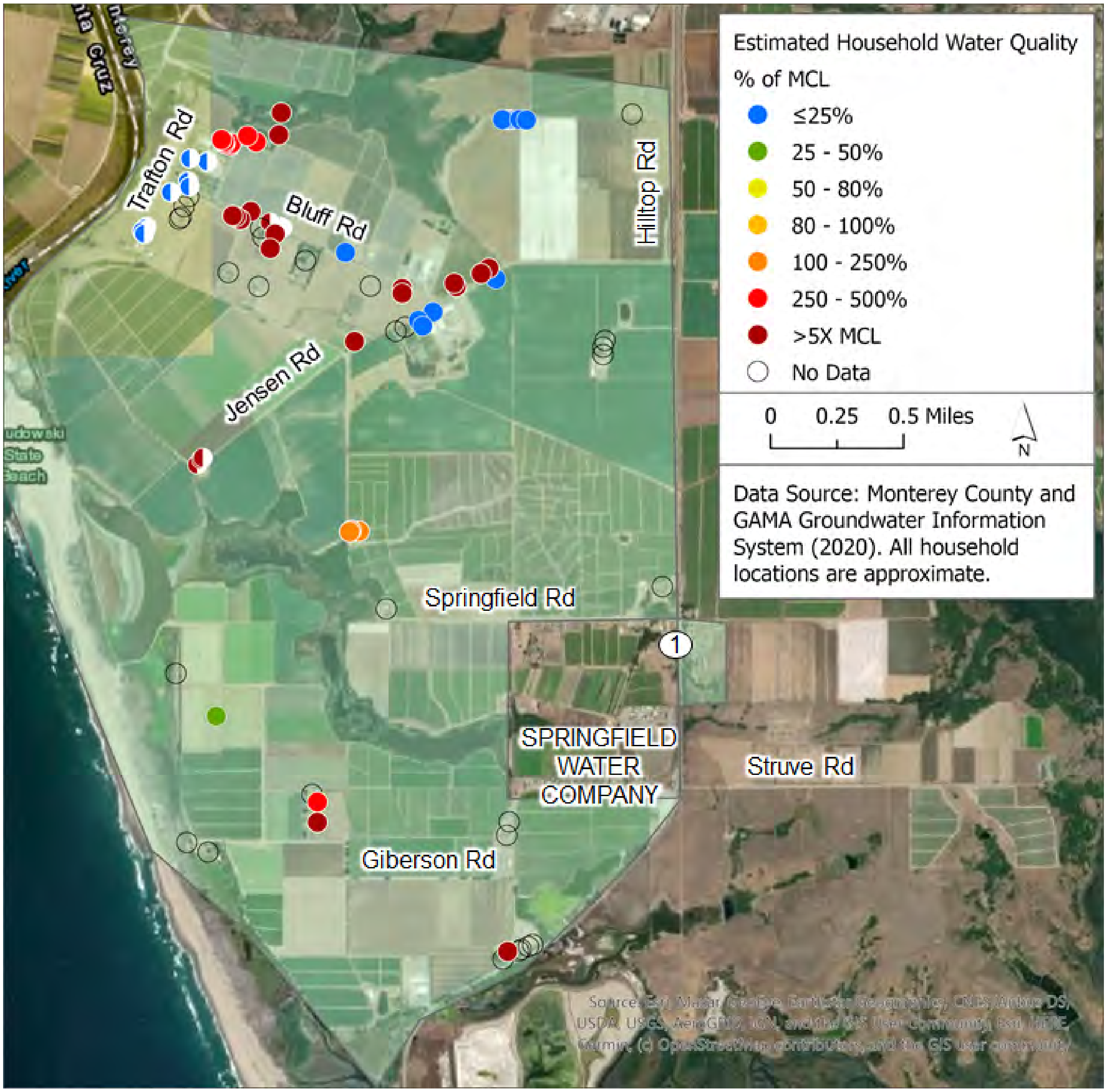


Figure 6 shows which locations have any known water quality issue in comparison to the regulatory limit (MCL or SMCL). Half full circles denote partial water quality data availability, and additional testing could show water quality issues in that location.

Figure 6. Highest contaminant concentration observed as a percentage of the MCL (considering all samples collected for nitrate, arsenic, perchlorate, and 123-TCP). For each well, all sample results were normalized into percentages by dividing by their respective MCLs. The maximum percentage for each site is shown on this figure. Half circles denote sites where sampling data was not available for all four contaminants. *Data Source: Monterey County and GAMA Groundwater Information System (2020). All household locations are approximate.*



Households with high levels of contamination are not grouped in one geographic area, but rather distributed throughout the project area. This indicates that the depth and construction of the well is important in determining the water quality. Not all of the wells in the project area had available well logs, however for the locations where water quality and well logs are available for the same well there is a clear correlation between the depth of the well and the seal and the water quality. Shallow wells with a shallow seal have more water quality issues, when compared to the deeper wells, as shown in Figure 7. This example is for nitrate. Additional maps showing well construction and water quality are in Appendix C.

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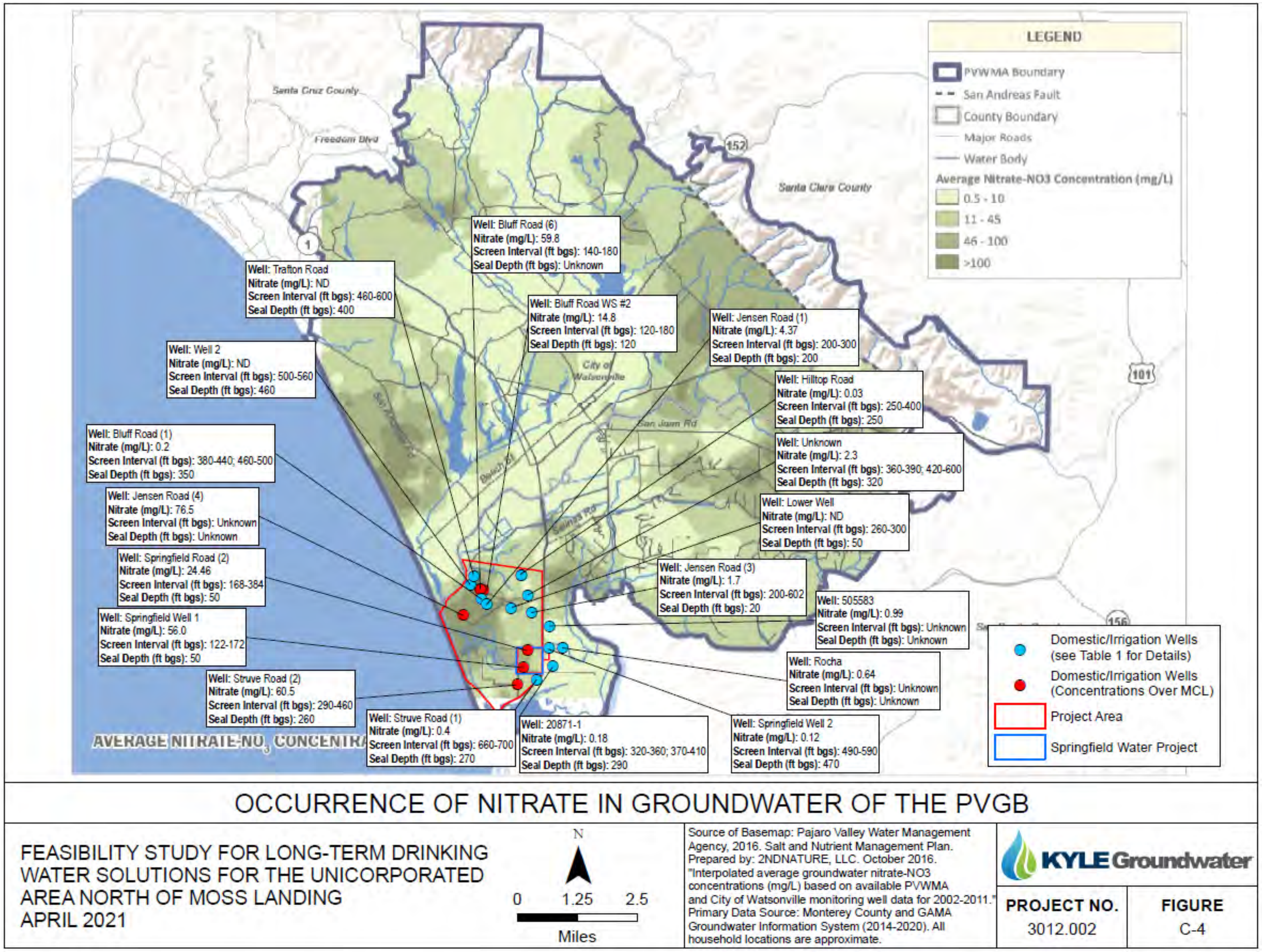
Figure 7. Nitrate concentration, with location, well screen depth, and well seal depth



1.5.2 Bacteriological Water Quality

Total coliform and Escherichia coli (E. coli) are often used as indicators of microbial contamination. Some analytical methods simply test for whether or not these bacteria are in the water; these are known as presence-absence tests. If the bacteria are detected in the water they are reported as present. If they are not detected they are reported as absent. Other methods are semi-quantitative, providing an estimate of the quantity of bacteria that are in the sample. In drinking water systems total coliform and E. coli are monitored at the well and in the distribution system. Both total coliform and E. coli are regulated in drinking water under Article 3 of Title 22 and on July 1, 2021, the California Revised Total Coliform Rule (RTCR) came into effect.[18,19] The bacteriological data for the wells in the project area is summarized in Appendix A. Of the 13 wells tested, 5 have experienced total coliform detections and one well (CCDW043) had an E. coli detection. While total coliform doesn't indicate fecal contamination, it should not be present in deep groundwater, so a detection indicates some source of microbial contamination in the system. The occurrence of E. coli at well CCDW043 is particularly concerning, as it is an indicator of potential fecal contamination. Bacteria in a well can be due to a sanitary defect, and this issue should be investigated and resolved before any treatment is installed. Growth of total coliform or heterotrophic bacteria can create issues for treatment. Bacteria can grow on treatment units, creating fouling, and in the case of granular activated carbon treatment, the bacterial counts can be higher in the treated water, than in the untreated water.

It would be ideal to have additional bacteriological data, because bacteria may sometimes not be detected in a sample, but may still be growing in the well, and having more data increases the chances of detecting this issue. Samples for heterotrophic plate count bacteria should also be collected prior to the installation of any additional treatment.

1.5.3 Seawater Intrusion

Seawater intrusion also poses a threat to long-term water quality in the area as evidenced by levels of total dissolved solids, chloride and conductivity in wells monitored by the Pajaro Valley Water Management Agency (PV Water) and the Monterey County Water Resources Agency.[20] To limit pumping and seawater intrusion near the coast, irrigated agriculture in the project area utilizes recycled water delivered by PV Water through the coastal distribution system (e.g. purple pipes).[21] The PVWMA WY 2019 Annual Report states that approximately 34,255 AF of total agricultural water use in WY2019 came from groundwater extraction and approximately 4,766 AF (i.e., 12%) came from delivered water.

1.6 Hydrogeological Setting

The project area is located within the southern portion of the Pajaro Valley Groundwater Subbasin (hereafter referred to as the PVGB), one of two subbasins of the Corralitos Groundwater Basin (see Figure C-1). The primary geologic units that comprise the PVGB include the Mio-Pliocene Purisima Formation, the Pleistocene Aromas Red Sands Formation, Pleistocene Terrace deposits, and Holocene alluvium and dune deposits (PVWMA, 2014). These alluvial materials overlie Cretaceous granitic basement rock and low-permeability consolidated sedimentary rock and volcanics occurring at depths

[18] SWRCB, "California Regulations Related to Drinking Water", Last updated 4/16/19, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dw_regulations_2019_04_16.pdf
[19] SWRCB, "Revised Total Coliform Rule", Accessed 7/9/21, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/rtcr.html
[20] Pajaro Valley Water Management Agency, "Recycled", Accessed 5/28/21, https://www.pvwater.org/projects
[21] Pajaro Valley Water Management Agency, "Coastal Distribution System", Accessed 5/28/21 https://www.pvwater.org/images/maps/DWZ_Map_Flyer_with_Expanded_F-Line.jpg

ranging from 2,000 to 4,000 feet below ground surface (bgs; Balance Hydrologics, 2018)[22]. A more detailed description of the geologic setting is provided in Appendix C.

The primary aquifers within the PVGB include water-bearing portions of the deeper Purisima Formation, the Aromas Red Sands Formation, and the uppermost terrace, alluvium, and dune deposits. The Aromas Red Sands Formation, ranging in thickness from 100 feet near the foothill areas to 900 feet below sea level near the mouth of the Pajaro River (DWR, 2006), contributes the majority of groundwater extractions within the PVGB and is considered the principal producing aquifer within the subbasin. It has generally been divided into upper and lower Aromas units separated by a fine-grained confining layer (Hanson, 2014).

Groundwater movement within the PVGB generally flows from areas of recharge and topographic highs toward the interior of the subbasin and aquifers extending offshore beneath Monterey Bay. Fall 2019 groundwater elevation contour maps for the Aromas Red Sands aquifer were published by PVWMA as part of their Water Year 2019 Annual Report (PVWMA, 2020; see Figure C-2). Groundwater levels are depressed within the central and southern portions of the PVGB due to over-pumping, and primarily occur at elevations below sea level (PVWMA, 2020). Specifically, groundwater elevations in the project area in Fall 2019 were shown to be slightly below sea level due to over-pumping, resulting in a shallow groundwater gradient from the coast toward the inland areas, a condition that has led to seawater intrusion into freshwater aquifers.

Groundwater within the PVGB has been generally categorized into the following five groups based on the relative concentrations of dissolved ions (DWR, 2006 and Hanson, 2001). Pajaro River water and local runoff has also been characterized into separate groups by USGS (2018).

1) Recent Seawater: groundwater within the Upper and Lower Aromas sands characterized by high concentrations of chloride, sodium, potassium, and sulfate from recent seawater intrusion at the coast due to over-pumping within the basin.

2) Young Groundwater: groundwater with high concentrations of calcium, magnesium, sulfate, chloride, and boron. These waters occur within the alluvium and upper Aromas sands aquifers in the eastern portion of the PVGB, within close proximity to areas of recharge to the basin.

3) Older Groundwater: groundwater with high concentrations of carbonate, bicarbonate, calcium and magnesium and low concentrations of TDS. This is reportedly the best quality water in the PVGB as it is beyond the influence of seawater intrusion and the Pajaro River and is protected from nitrate loading by laterally continuous low-permeability clays.

4) Older Seawater: groundwater with high concentrations of calcium, magnesium, sulfate, and chloride but much lower concentrations of sodium than recent seawater. These waters are found within the Purisima Formation within the western portion of the PVGB, are remnants of seawater left behind by fluctuations in sea level and are not related to over-pumping within the basin.

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[22] Balance Hydrologics, Inc., 2018. Drilling, Water Quality, and Yield Results, Springfield Well No. 2, Pajaro / Sunny Mesa Community Services District, Monterey County, California. Prepared for: MNS Engineers, Inc. May 2018.

5) Very Old Groundwater: groundwater with relatively equal concentrations of sodium, potassium, calcium, and magnesium, and concentrations of sulfate and chloride that are higher than carbonate and bicarbonate. These waters occur within the Purisima Formation in the eastern portion of the PVGB and are the oldest waters in the basin.

Wells used for domestic purposes within the project area would ideally produce groundwater from the older groundwater group although the presence of recent seawater and older seawater groups are also acknowledged. Primary non-point source constituents of concern within the project area of the PVGB include total dissolved solids (TDS), chloride, nitrate, arsenic, perchlorate, 123-TCP, and hexavalent chromium. The presence of elevated concentrations of TDS, nitrate, perchlorate, and 123-TCP can be attributed to widespread agricultural activity within the PVGB while elevated concentrations of chloride and TDS can be attributed to seawater intrusion along the coast. Arsenic and hexavalent chromium are naturally-occurring contaminants within the PVGB and can be released into groundwater through a variety of mechanisms (e.g., changes in pH and dissolved oxygen content of the groundwater). As such, contamination from both anthropogenic and naturally-occurring constituents present risk to potable groundwater within the project area.

1.7 Other Drinking Water Projects in the Vicinity of the Project Area

1.7.1 The Springfield Project

Most of the project area is within the Local Agency Formation Commission (LAFCO) District Boundary of the Pajaro Sunny Mesa Community Services District (CSD).[23] Pajaro Sunny Mesa CSD owns and operates the Springfield Water Company (CA2700771), located in proximity to the project area, which serves 42 connections. The 88 households identified for this project are not part of the Springfield Project that will consolidate the existing Springfield Water System, the Moss Landing Mobile Home Park (Struve Rd WS #2, CA2700772, 81 service connections), and approximately 21 households on Springfield Rd. A construction application for the Springfield Project was submitted to the SWRCB in early 2021. The current engineering design for the Springfield Project includes a pipeline connecting Springfield Rd to Struve Rd with a pipeline to the west of the Mobile Home Park as shown in Figure 8. The Bluff Rd and Jensen Rd areas were not part of the planning project.

[23]County of Monterey, "Pajaro/Sunny Mesa Community Services District", Accessed 5/28/21, LAFCO District Service Areas: https://www.co.monterey.ca.us/home/showdocument?id=72914

Figure 8. Map of the Springfield Project area.

The Springfield Water System Improvements Final Preliminary Engineering Report[24] has preliminary engineering analysis for the Springfield Project and was the basis for the A construction application submitted to the SWRCB in early 2021.

The Drilling, Water Quality, and Yield Results, Springfield Well No. 2 Report[25], has a detailed analysis of the well that has been drilled as part of the Springfield Project. This well met all water quality standards during the second round of sampling. As explained in Appendix C, a reasonable yield for Springfield Well 2 is 250 gallons per minute, operated intermittently.

[24] MNS Engineering Inc., February 14, 2020. Final Preliminary Engineering Report - Springfield Water System Improvements. Prepared for Pajaro Sunny Mesa Community Services District.
[25] Balance Hydrologics, Inc., 2018. Drilling, Water Quality, and Yield Results, Springfield Well No. 2 Report Pajaro Sunny Mesa Community Services District, Monterey County, California

1.7.2 123-TCP Point-of-Entry Treatment Pilot Project

The Community Water Center is leading a treatment pilot project using Point of Entry (POE) Granular Activated Carbon to reduce the concentration of 123-TCP at several households in and near the project area. The POE pilot project has been used to inform the cost and other infrastructure needs for this assessment.

1.7.3 Configuration and Condition of Existing Domestic Wells

As part of CWC's 123-TCP Point-of-Entry Treatment Pilot Project, seven of the wells in the project area have had detailed site evaluations. A summary of these evaluations is provided in Appendix B. Each of the seven sites were found to have space for POE Granular Activated Carbon treatment systems. Two of the wells were in poor condition, two were found to be in moderate condition, and three were in good condition. Issues at the wellsites included potential for surface water contamination and non-functioning pressure gauges.One of the sites indicated it had plans to install an RO system but the remainder either had no treatment or used treatment (e.g., cartridge filtration, softening) that is not anticipated to address many of the contaminants detected in the groundwater. Five of the seven sites also do not have water storage tanks.

1.7.4 Urgent Drinking Water Needs Program (Bottled Water Project) for Interim Solution

Given the serious public health risks posed by the drinking water quality in this area, CWC worked with El Comité, Pajaro Sunny Mesa CSD, and the SWRCB to develop and secure a funding agreement under which the whole project area qualifies for emergency bottled water funding through the Budget Act of 2018 . This program is administered by Pajaro Sunny Mesa CSD. CWC has conducted outreach to enroll 67 households in this program, 49 of which are located in the alternatives analysis project area, and coordinates with Pajaro Sunny Mesa CSD to ensure bottled water delivery for this program.

1.8 Additional References

Additional background relevant to this project can be found in the document listed below.

- Project Proposal: Bluff and Jensen Road Area and Engineers Memorandum (2017). This project proposal and memorandum were completed as part of the Salinas Valley Disadvantaged Community Drinking Water and Wastewater Planning Project by the Greater Monterey County Regional Water Management Group.[26]

[26]Greater Monterey County Regional Water Management Group, November, 2017. http://www.greatermontereyirwmp.org/documents/disadvantaged-community-plan-for-drinking-water-and-wastewater/

2. Alternatives

Two categories of alternatives will be evaluated. The non-treatment options include physical consolidation, new well(s), or a new community water system (CWS). The treatment options that will be evaluated include wellhead treatment and point of use (POU) and point of entry (POE) treatment. The scale that each of these solutions can be considered at is shown in Table 3.

Table 3. Treatment alternatives and the scale for which each can be considered.

Name	Description	Scale
Physical consolidation	Connect to the Springfield Project operated and owned by the Pajaro Sunny Mesa CSD	Community
New CWS	Develop a new CWS that could be owned and operated by an existing system	Community
Replace existing domestic well(s)	Replace existing wells with new wells likely to produce better water quality	Private Well, LSWS[1], and SSWS[2]
Wellhead treatment	Install treatment systems that remove contaminants to safe levels and that treat all water produced from a well for one or more households	Private Well, LSWS[1], and SSWS[2]
Point of use/point of entry treatment	Install treatment systems that remove contaminants to safe levels that treat water just prior to entering homes and/or at the location of consumption	Household

[1]Local Small Water System (LSWS), [2]State Small Water System (SSWS)

2.1 Non-Treatment Options

2.1.1 Physical Consolidation

Based on proximity and the potential for connection to another utility, physical consolidation with a nearby water system has been considered. Pipeline extension of a local service line and subsequent metered connection and service line to each home would be required. Physical consolidation is a solution that can be implemented on a community scale.

During the review of alternatives, the feasibility of different options for consolidating all households in the project area into one or more of five nearby water systems have been evaluated. The four potential receiving systems are the Springfield Project, the Sunny Mesa System (assuming it is connected to the Pajaro System), Moss Landing System, and the California Water Service Las Lomas System. The existing Springfield, Sunny Mesa,Pajaro, and Moss Landing Systems are owned and operated by Pajaro Sunny Mesa Community Services District (Pajaro Sunny Mesa CSD). The majority of the project area is in Pajaro Sunny Mesa CSD's designated service area, as established by the Local Area Formation Commission (LAFCO) of Monterey County. The designation of the service area has legal ramifications. The entity with a designated service area has a right to serve the customers within that service area.[27] Pajaro Sunny Mesa CSD has been consulted as part of this project and they have expressed a willingness to consolidate homes in the project area into the new Springfield Water System after the completion of the Springfield Project. The Springfield Project is also the closest to the project area, which reduced the cost of consolidation. The option of physical consolidation with the Springfield Project is the most viable option, which could be implemented in two different ways, Scenario A and Scenario B. As described below. Scenario A would be a consolidation with just the Springfield Project whereas Scenario B would also involve a more regional consolidation with the Pajaro and Sunny Mesa Systems along with the Springfield Project. Cost estimates have been developed for these two scenarios in the Cost of Alternatives section of this report.

Consolidation of the existing Springfield System with the Moss Landing System was also considered in the Springfield Water System Preliminary Engineering Report.[28] This alternative was not pursued because of the challenges associated with high construction costs as a long pipeline around 7,000 feet would need to be constructed that may need to cross the Moss Landing State Wildlife Area, a decrease in local water supply reliability by placing additional demand on an already developed water system with limited supply, and environmental and encroachment permitting challenges. Also, Pajaro Sunny Mesa CSD indicated that there is inadequate supply from the Moss Landing System to serve the project area as detailed in the Moss Landing Community Plan Update.[29] Therefore, consolidation with the Moss Landing System does not appear to be a viable option and it was not examined further.

Scenario A: Consolidation with the Springfield Project and development of a new community well.

The Springfield Project is anticipated to have one active well that meets all drinking water quality standards. The other well in the existing Springfield Water System does not meet all water quality standards and could only be used in case of an emergency. An additional well that meets all standards is needed for reliability and redundancy. In addition to benefiting the project area, this well would provide reliability and redundancy for the Springfield Project. Figure 9 shows a conceptual map of Scenario A physical consolidation of the project area with the Springfield Project. If this option is selected additional detailed designs will need to be developed. A consolidation route that does not go along Highway 1 should be considered if this is the selected alternative.

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[27] County of Monterey, "Local Agency Services Reviews, Maps & Links", Accessed 5/28/21, https://www.co.monterey.ca.us/government/government-links/lafco/studies-maps

[28] MNS Engineering Inc., February 14, 2020. Final Preliminary Engineering Report - Springfield Water System Improvements. Prepared for Pajaro Sunny Mesa Community Services District.

[29] TODD Groundwater, December 4, 2015. Water Supply Evaluation Moss Landing Community Plan Update.

Figure 9. Conceptual map of Scenario A: Physical consolidation with the Springfield Project.*

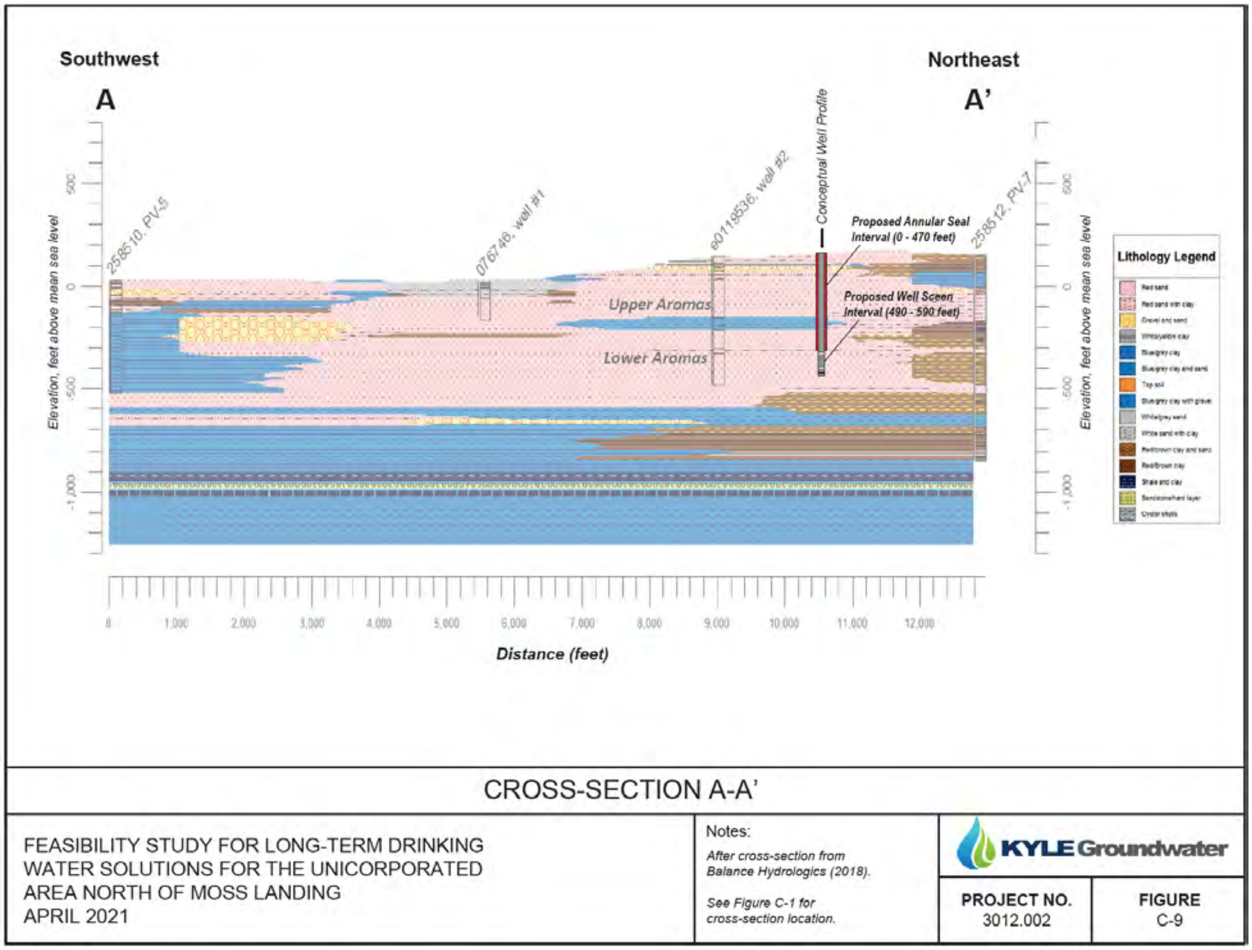
*In some cases, pipe shown in blue will be buried under private roads and will be private infrastructure and likely less than 4” in diameter. However, since the specific situation of each individual property was not considered at this stage, all blue pipes are assumed here to be 4” community pipes to make cost estimates inclusive.

A geologic cross-section, with example well construction is shown in Figure 10. Drilling a new well would not guarantee that the new well will have adequate water quality. As detailed in Appendix C, based on the available well and hydrogeological data, it is considered feasible that one or more wells could be constructed within the project area and designed in such a way as to provide groundwater with acceptable concentrations of TDS, nitrate, chloride, and arsenic. There is limited available data concerning 1,2,3-TCP within the project area - out of 20 wells for which 1,2,3-TCP data was available, including the private, local, and state small wells discussed above, Springfield Well No. 1, and Springfield Well No. 2, only 5 could be matched to well construction information. However, there are five (5) wells without construction details and two (2) wells with construction details of the 20 tested for 1,2,3-TCP in the project area that have reportedly tested non-detect for 1,2,3-TCP and have reported concentrations of arsenic, nitrate, and TDS below their respective MCLs, suggesting the feasibility of constructing wells in the project area that are not impacted by 1,2,3-TCP. One (1) well was identified, Bluff Road 3, that was screened between 360 and 500 ft bgs and had relatively low concentrations of contaminants often associated with surface activities but also contained 1,2,3-TCP in excess of the MCL, which shows that it is possible for 1,2,3-TCP to be present in wells in the area screened relatively deep. As discussed further in Appendix C.2.1, the source of 123-TCP in Bluff Road (3) Well is uncertain and there are many potential reasons it has elevated 1,2,3-TCP (e.g., improper well design, improper well construction, pre-existing contamination).

It should be noted that drilling a community well would be performed with reverse circulation drilling that allows the water quality to be more accurately assessed from different zones in the aquifer compared to rotary mud drilling, which is used to drill domestic wells. Using reverse circulation drilling increases the likelihood that the well will produce water from a depth that meets regulatory standards relative to rotary mud drilling. It is assumed that replacement domestic wells would be constructed using the rotary mud method, since that method is normally used for such wells and a reverse-circulation rotary drilled well would be much more costly to develop.

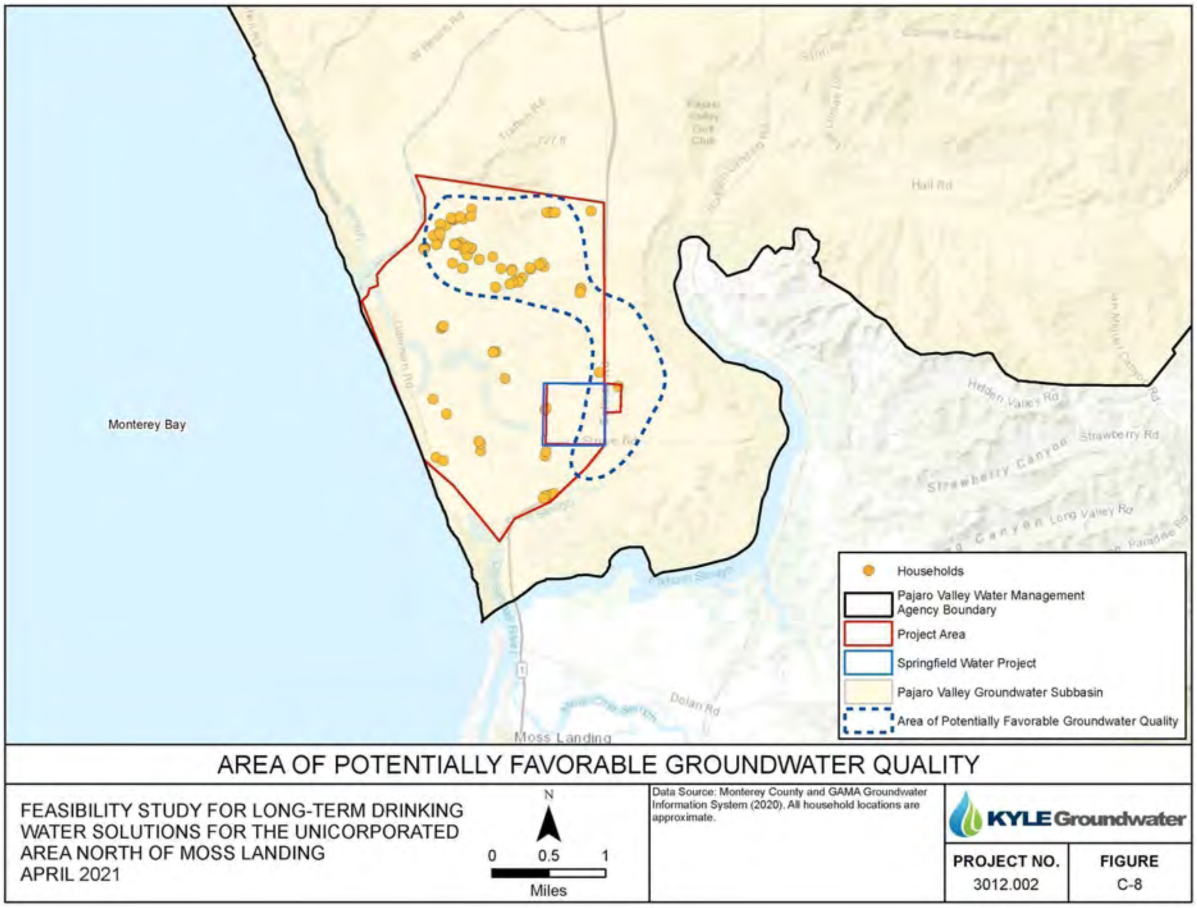
Figure 11 shows the areas that may have favorable water quality for constructing a new community well or replacing an existing domestic well within the dashed blue line. Generally speaking, the overall groundwater quality is likely better in the eastern and northeastern portions of the project area. Additional maps showing the groundwater quality and well construction can be found in Appendix C. The feasibility of any particular site would need assessment on a case-by-case basis and may require test borehole drilling and testing. Potential alternatives include a second well along the eastern boundary of the Springfield Project, and one or more wells along the northern and/or eastern boundaries of the Project Area. Any new wells must be drilled and sealed to a deeper depth, similar to the construction of wells in the area that do not have any water quality issues.

Figure 10. Geologic cross-section of the project area.



It should be noted that although there are regions within the project area that provide relatively good quality groundwater to wells, the long-term viability and sustainability of groundwater pumping is uncertain. Continued pumping of new or existing wells within the project area may eventually induce movement of poor quality water horizontally toward the well from farther afield, including aquifers intruded by seawater, or vertically through less permeable layers and/or through improperly abandoned wells screened across multiple aquifer systems. It is also possible for water to migrate vertically due to improper well construction or if wells are screened in multiple locations of varying pressure, which can cause poor water quality to reach deeper aquifer zones.

Figure 11. Area of potentially favorable groundwater.



Scenario B: Consolidation with the Springfield Project, Sunny Mesa, and Pajaro Systems.

Since the Springfield Project will only have one active well that is anticipated to meet drinking water standards, an additional water source is needed for redundancy to consolidate the project area with the Springfield Project. As discussed above, the additional water source could come from developing a new well as outlined for Scenario A. Alternatively, the project area could be consolidated with the Springfield Project and the Sunny Mesa and Pajaro Systems, which would provide a second water source. Figure 12 shows a conceptual map of Scenario B physical consolidation where the only difference from Scenario A is the construction of a 12" pipeline that is 1.13 miles long and connects the northeast corner of the project area to the Sunny Mesa System at the intersection of Salinas Rd and Bay Farms Rd instead of developing a second well in the project area.

Figure 12. Conceptual map of Scenario B: Physical consolidation with the Springfield Project and Sunny Mesa and Pajaro Systems.*

*In some cases, pipe shown in blue will be buried under private roads and will be private infrastructure and likely less than 4" in diameter. However, since the specific situation of each individual property was not considered at this stage, all blue pipes are assumed here to be 4" community pipes to make cost estimates inclusive.

One challenge to connecting to the Sunny Mesa system is that hexavalent chromium has been detected in the two wells that serve the Sunny Mesa System at levels that exceeded the previous MCL. To bring the Sunny Mesa System into compliance with a future hexavalent chromium MCL, which could be established as soon as 2021, the Pajaro Sunny Mesa CSD has explored the feasibility of consolidating the

Sunny Mesa System with the Pajaro System and blending Sunny Mesa wells with Pajaro wells that have groundwater with hexavalent chromium below the detection limit. Thus, the project area could not connect to the Sunny Mesa System unless the Sunny Mesa system is also connected with the Pajaro System. The capital costs of this project were estimated to be $2.88 million based on the 2016 Sunny Mesa and Vega Road Hexavalent Chromium Project Preliminary Engineering Report.[30] The Pajaro Sunny Mesa CSD does not have the available funds to implement this project and would need external funds as part of a regionalization project, water supply resiliency project, or hexavalent chromium compliance project (once the hexavalent chromium MCL is established).[31]

Pajaro Sunny Mesa CSD has indicated that the Pajaro System would have sufficient capacity to meet the additional demand from the Sunny Mesa System, the project area, and the Springfield Project, which they projected to be 650 gpm.[32] The Pajaro System currently can provide 1,400 gpm and the ADD and MDD were estimated to be 177 and 376 gpm, respectively, in the 2016 Sunny Mesa and Vega Road Hexavalent Chromium Project Preliminary Engineering Report.

Scenario B is the prefered consolidation option because a key benefit of Scenario B is that it would connect the North of Moss Landing project area as well as the Springfield Project area to wells that are further inland and may be less susceptible to seawater intrusion and, as a result, make physical consolidation more sustainable in the long term. In addition, it would provide regional consolidation between the Pajaro, Sunny Mesa, and Springfield systems that could improve the reliability and long-term sustainability of each system.

Pipelines along shared roads

A potential challenge to physical consolidation for both Scenarios A and B is that portions of the 4” pipeline shown in blue in Figures 9 and 12 are on shared private roads. Some of these roads are on private property, but an easement has been granted for households that are further back from the public road that allows these households to use the roads to access their property. Multiple community members have mentioned that it may be difficult for all parties involved to agree to pay to construct and maintain pipelines on these shared roads.

Pajaro Sunny Mesa CSD has indicated[33] that the approach for piping water to homes on these shared private roads would be determined on a case-by-case basis, depending on the length of the shared road and how many customers are located on it. Potential solutions could include:

- Installing a meter at the edge of the public road for each customer, and serving each customer via a separate individual private service lateral. The existing easement on the shared road would need to be modified to include the installation and maintenance of the service laterals.

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[30] MNS Engineering Inc., December 21, 2016. Final Preliminary Engineering Report - Sunny Mesa and Vega Road Hexavalent Chromium Projects.

[31] MNS Engineering Inc., December 21, 2016. Final Preliminary Engineering Report - Sunny Mesa and Vega Road Hexavalent Chromium Projects.

[32] Personal Communication between Kyle Shimabuku (Corona) and Judy Vazquez-Varela with Pajaro Sunny Mesa CSD, on August 6th, 2021. This value assumed the historical MDD for Parajo of 436,084 gal, or 303 gpm, would increase to 637 gpm (rounded to 650 gpm) by increasing the number of Pajaro connections (480) to a total of 1,010 connections from the project area + springfield (251) and Sunny Mesa (279).

[33] Personal Communication between John Erickson (CWC) and Judy Vazquez-Varela with Pajaro Sunny Mesa CSD, on October 28th, 2021.

- Installing a combined water main on the shared road with meters located at the entrance to each property. The CSD would own and operate the water main and would need an easement to install and maintain this main. This scenario would be more feasible in cases where a large number of customers are located on the shared road.

Depending on the situation, eminent domain could be used to acquire easements on shared private roads. However, using eminent domain could lead to legal complications, and pipeline needs should be discussed with landowners before additional steps are taken. In addition, there may already be relevant agreements in place and any deed or easement documents should be reviewed.

It should be noted that in some cases these sections of pipe on shared or private roads could be smaller than 4" in diameter if, for example, they only serve a few homes or a single residence and are private service laterals that are downstream of water meters. They are assumed to be 4" pipes here to make cost estimates conservative.

2.1.2 New CWS in Project Area

One option is the formation of a new CWS (Figure 13). According to California Code of Regulations title 22, Section 64454[34] two groundwater sources are required for all new CWSs that are supplied exclusively by groundwater. Additionally, a storage tank, and distribution piping to connect the homes would be required for this option. Monterey County and the Monterey County Water Resources Agency have been consulted regarding permit requirements. Another variation of this option is the formation of a new CWS that is managerially consolidated with another system, meaning that it could be owned and or operated by another system that has the technical, managerial, and financial capacity to provide safe and compliant water. A new CWS is a community scale solution. This option is technically feasible and cost estimates have been developed for it in the Cost of Alternatives section of this report.

[34]SWRCBard, "California Regulations Related to Drinking Water", Last updated 4/16/19, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dw_regulations_2019_04_16.pdf

Figure 13. Conceptual schematic of a new CWS. Image courtesy of California Water Service.

A conceptual pipeline for a new CWS is illustrated in Figure 14. The pipeline distance is greater with this option than for the physical consolidation option because if the new system remains separate from the Springfield Water System, it will be necessary to construct new piping through the Springfield area rather than connecting to Springfield Water System piping.

Figure 14. Map of pipeline for new CWS.*

**In some cases, pipe shown in blue will be buried under private roads and will be private infrastructure and likely less than 4" in diameter. However, since the specific situation of each individual property was not considered at this stage, all blue pipes are assumed here to be 4" community pipes to make cost estimates inclusive.

2.1.3 Replace Existing Domestic Wells

Developing a new water source will be considered to replace the production from one or more of the existing domestic wells. In most cases, new wells of equal or greater capacity would need to be drilled. In order to avoid the water quality issues in the existing wells, the new well would be drilled and sealed deeper than many of the existing wells in the project area. Deeper wells could provide better water quality by avoiding contaminants associated with surface activity, such as nitrate, but all water quality concerns may not be addressed by developing a deeper well. Therefore, drilling a new well does not guarantee that the new well will not have a water quality issue. Drilling such wells, which typically involves rotary mud drills, does not provide sufficient information to design a well with appropriate depths of well screen and annular seal, such that the best groundwater quality is produced and the well is protected from migration of contaminants related to surface activities. It is assumed that replacement domestic wells would be constructed using the mud rotary method, since that method is normally used for such wells and a reverse circulation well would be much more costly to develop. Figure 11 shows the areas that may have favorable water quality for replacing an existing well within the dashed blue line.

2.2 Treatment Options

2.2.1 Wellhead Treatment

For contaminants that exceed a regulatory limit, the listed Best Available Technologies (BAT) in Title 22 of the California Code of Regulations (Title 22)[35] can be considered for treatment. In the case of hexavalent chromium, it is not currently regulated but is expected to be in the next year or two, so it is considered in the context of which technologies can remove multiple contaminants. BATs for many of the constituents of concern in the project area are summarized in Table 4. Although adsorption is not listed as a BAT for arsenic removal, it will be considered because of the ease of operation. Anion exchange for arsenic removal may be considered for some systems as well. Wellhead treatment is a solution that can be implemented on a community well, or existing well scale.

Table 4. Summary of drinking water Best Available Technologies (BATs) for Wellhead Treatment.

Contaminant	Chemical Class	Best Available Technology
Arsenic[1]	Inorganic	Adsorption, Coagulation/Filtration[2], Lime Softening[2], Reverse Osmosis, Electrodialysis, Oxidation Filtration
Chromium[3]	Inorganic	Ion Exchange, Coagulation/Filtration[2], Reverse Osmosis
Nitrate	Inorganic	Ion Exchange, Reverse Osmosis, Electrodialysis
Perchlorate	Inorganic	Ion Exchange, biological fluidized bed reactor
1,2,3-Trichloropropane (123-TCP)	Organic	GAC
Total Dissolved Solids (TDS)	Inorganic	Reverse Osmosis

[1]Adsorption technology, although not listed as a BAT, will be considered for arsenic treatment in small systems because of the ease of operation
[2]Not considered BAT for systems <500 service connections
[3]Current regulation is for combined or total chromium inclusive of tri- and hexavalent chromium species. A lower hexavalent chromium MCL is expected in 2021.

With the exception of 123-TCP and TDS, each of the contaminants shown in Table 1 have multiple BATs, which means additional consideration is necessary to determine the appropriate technology for site-specific conditions. Key items that will be considered in both process selection and sizing include site

[35]SWRCB, "California Regulations Related to Drinking Water", Last updated 4/16/19, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dw_regulations_2019_04_16.pdf

constraint details, co-occurring water quality constituents, and waste generation. The types of wellhead treatment technologies that have been considered are summarized in Table 5, which can be used to treat water from private- and community-scale wells.

Table 5. Summary of treatment technologies.

	Contaminants removed								
Treatment technology	Arsenic	Cr(VI)	Nitrate	Perchlorate	123-TCP	Arsenic	Description	Benefits	Drawbacks
Strong-Base Anion Exchange (SBA-IX)	•	•	•	•			Inorganic contaminants are transferred from the water to resin. Once the capacity becomes exhausted, resins are either disposed of or regenerated onsite with a brine (salt) solution.	SBA-IX can efficiently remove many inorganic contaminants including arsenic and Cr(VI).	Nitrate exhausts SBA-IX resin quickly, which makes single use resins inappropriate. High levels of sulfate make regenerable resins inefficient for removing nitrate. Due to the high levels of nitrate and sulfate present in the water, SBA-IX is not feasible for this project.
Granular Activated Carbon (GAC)					•		GAC is a porous filtration media with large surface areas that allow it to efficiently transfer organic contaminants from water to its surface through a process called adsorption.	GAC is an established technology for treating 1,2,3-TCP from groundwater that is readily commercially available. It is relatively insensitive to on/off cycles or fluctuations in 1,2,3-TCP concentrations. These aspects make it a feasible technology for this project.	The adsorption capacity of GAC eventually becomes exhausted, requiring it to be periodically replaced, which makes up the majority of O&M costs. GAC can also adsorb and release inorganics, like nitrate, at higher concentrations, which is a concern at the project wells. However, pre-treatment with, e.g., RO could address this issue.
Adsorption	•						Adsorptive media, such as iron oxide, is often used for arsenic removal. An oxidant, such as chlorine, and a pH suppressant is sometimes added to ensure that arsenic is in an adsorbable form.	Adsorption can remove arsenic to levels well below regulated levels and is easy to operate.	Adsorption is ineffective for many of the other inorganic contaminants such as TDS that often co-occur with arsenic in the project wells. As such, it is not considered a feasible option for this project.
Reverse Osmosis (RO)	•	•	•	•	IR[1]	•	High-pressure pumps purify water by forcing it through RO membranes and leaving impurities behind in a concentrated waste brine.	RO is the only established treatment technology that can control each contaminant detected in the project wells, with the exception of 1,2,3-TCP, making it a feasible technology for this project.	Disposal of RO waste brine can be expensive. Treated water often needs minerals to be reintroduced to prevent corrosion in downstream pipes.

[1]IR – Insufficient removal - Although reverse osmosis can remove some 123-TCP, it is not enough removal to meet the drinking water standards for the wells in the Project Area.

Of the four technologies considered, SBA-IX and adsorption were removed from further consideration. Although adsorption is an efficient, low-maintenance treatment alternative to control arsenic, it is limited in its ability to remove the suite of co-occurring contaminants present in wells where arsenic was detected. Likewise, SBA-IX is not able to remove two of the contaminants, TDS and 123-TCP, detected at many of the wellsites. The high levels of nitrate and sulfate in the groundwater wells would significantly increase the frequency at which SBA-IX resin would need to be replaced or regenerated.

RO is able remove all of the contaminants to levels that will comply with regulations with the exception of 123-TCP. Thus, coupling GAC, which is a BAT for 123-TCP, with RO could bring each well into compliance. Pictures of these technologies at the POU/POE scale are shown in Figure 15 and 16. Because most of the wells would require RO and GAC treatment, these two technologies are costed together for the wellhead treatment alternative in the Cost Alternatives section. A more detailed explanation of the wellhead treatment technologies and discussion about technical feasibility can be found in Appendix D.

2.2.2 Residential Treatment using Point of Use / Point of Entry (POU/POE)

Point of use (POU) and point of entry (POE) water treatment devices can be used to address constituents of concern at the residential scale[36]. In 2018, California finalized regulations governing POU and POE treatment for public water systems. These regulations do not apply to private domestic wells, state smalls, or local small water systems serving between 2 and 14 connections. This type of treatment is only allowed when a public water system has demonstrated that centralized treatment is not immediately economically feasible [Title 22 Section 64418 (a) (2) (B) and 64420 (a) (2) (B)][13]. Additionally, each building and dwelling unit must have a treatment unit [Title 22 Section 64418 (a) (6) and 64420 (a) (6)][13].

POU and POE treatment is currently not an allowable strategy for an out of compliance state or local small water system to come into compliance in Monterey County. Draft Monterey County Code 15.06, which details proposed requirements for POU/POE treatment for state and local small water systems, was suspended by Board of Supervisors Order Number 5322[37] in December 2019. However, due to interest from the SWRCB on this topic, this project includes consideration of this alternative.

A POU treatment device is installed for the purpose of reducing contaminants in drinking water at a single tap, typically the kitchen tap (Figure 12). It is appropriate for inorganic constituents, such as arsenic, hexavalent chromium, nitrate, or total dissolved solids, as shown in Table 6. The SWRCB has registered POU devices for sale in California for arsenic, chromium, lead, and nitrate.[38] In most cases the POU treatment technology is reverse osmosis and is capable of treating a variety of co-occurring inorganic contaminants. Since only one tap is treated, POU treatment is not appropriate for any contaminant that poses an inhalation health risk. Therefore, the regulation specifically prohibits POU treatment for the removal of microbes, radon, and volatile organic compounds, such as 123-TCP [Title 22 Section 64418 (a)][39].

[36]SWRCB, "Residential Water Treatment Devices", Accessed 5/28/21, https://www.waterboards.ca.gov/drinking_water/certlic/device/watertreatmentdevices.html
[37]County of Monterey, "Code of Ordinances - Ordinance 5322", Last updated: 12/11/19, https://library.municode.com/ca/monterey_county/ordinances/code_of_ordinances?nodeId=1019868
[38] SWRCB, "Residential Water Treatment Devices". Accessed 4/29/21. https://www.waterboards.ca.gov/drinking_water/certlic/device/watertreatmentdevices.html
[39]SWRCB, "TITLE 22, CALIFORNIA CODE OF REGULATIONS DIVISION 4, CHAPTER 15", Last updated 1/18/18, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/swddw_17_003/2_textofreg.pdf

Figure 15. Example of POU RO treatment.

As mentioned in the Project Area Water Quality section, POU treatment devices registered for sale in California are not capable of removing enough nitrate to meet the regulatory limit in water with more than 27 mg/L as N.[40] Of the 22 wells with nitrate results, 15 are over the MCL and 12 (or 55%) of the wells are over the 27 mg/L as N threshold. For the homes served by these wells, POU treatment for nitrate is not a technically feasible option.

A POE treatment device is installed for the purpose of reducing contaminants in all of the water entering a house or building (Figure 16). It is allowed under Article 2.5 and 2.7 Title 22[41] for the treatment of any constituent that the given unit has been approved to treat or can demonstrate the ability to treat. The most likely use of POE treatment in the Project Area would be whole-house GAC treatment for the removal of 123-TCP. The growth of microbes in the GAC treatment units is a potential concern that will need to be considered and may need to be addressed[42].

[40] SWRCB, "Residential Water Treatment Devices" Accessed: 4/29/21. https://www.waterboards.ca.gov/drinking_water/certlic/device/watertreatmentdevices.html

[41]SWRCB, "California Regulations Related to Drinking Water", Last updated 4/16/19, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dw_regulations_2019_04_16.pdf

[42] US Code of Federal Regulation, "Title 40 Section 141.100 (d) (2)", Accessed 5/28/21, https://www.law.cornell.edu/cfr/text/40/141.100

Figure 16. Example of POE GAC treatment.

2.2.3 Summary of Treatment Technologies

Table 6 summarizes the scale at which different treatment technologies could be implemented, which contaminants could be removed, and other considerations. Due to the number of co-occurring contaminants in the project area and technical limitations of some treatment methodologies, only some technologies are feasible and have been considered in the Cost of Alternatives section.

Table 6. Treatment alternatives.

Treatment	Size	Scale	Arsenic	Hexavalent Chromium	Nitrate	Perchlorate	123-TCP	TDS	Comments
Costing To Be Considered									
GAC	> 10 gpm	Household (POE), Wellhead for community or existing well	–	–	–	–	●	–	-New treatment will require an operator -New treatment may be connected to the distribution system
RO	15 gallons per day	Household (POU)	●	●	●	●	–	●	-Waste discharge to septic -Monterey County will not permit POE/POU for state small and local small water systems -Need to validate performance, particularly for Nitrate > 27 mg/L
RO	> 10 gpm	Wellhead for community or existing well	●	●	●	●	●	–	-Waste discharge physical and permitting feasibility
Technically Non-Feasible Options									
Arsenic Adsorption	Any	Any	●	–	–		–		-The only well with arsenic over the MCL also has TDS and 123-TCP above their MCLs. Therefore arsenic is best treated with a technology that removes multiple contaminants.
SBA-IX, Regenerable	> 10 gpm	Wellhead for community or existing well	–	–	●	–	–	–	-Sulfate concentrations render this infeasible -Brine disposal must be considered -Operations must be accounted for (e.g. salt supply)
SBA-IX, Non-Regenerable	>10 gpm	Wellhead for community or existing well	●	●	–	●	–	–	-Does not treat nitrate, the most common co-occurring contaminant

3. Cost of Alternatives

The cost of the alternatives is subject to change based on the feedback of regulators and stakeholders. Where appropriate the long term operations and maintenance costs are considered separately, as that may have different grant funding eligibility and mechanisms.

3.1 Cost Estimation Methods and Assumptions

3.1.1 Cost Estimation Level of Accuracy

The costs described here correspond with a Class 5 cost estimate as defined by AACE International[43]. Class 5 cost estimates are considered appropriate for screening level efforts and have a level of accuracy ranging from -20% to -50% on the low end and +30% to +100% for an encompassing range of -50% to +100%. For the developed costs, the central tendency of the cost estimates will be shown; however, it is important the reader view each value with the accuracy in mind. For example, if a cost of $100 is presented the corresponding range of anticipated costs is $50 to $200.

3.1.2 Water Demand Considerations

The development of suitable water demand approximations is required for the selection of a successful treatment or non-treatment alternative. Two main categories of water demand must be considered for costing out non-treatment alternatives: the maximum day demand (MDD) and the required fire flow capacity. For treatment options the MDD and average day demand (ADD) calculations are necessary. The MDD calculations are important for sizing the treatment units, and the ADD is used to estimate the ongoing operations and maintenance costs.

3.1.2.1 Estimating Water Demand, Design, and Average Flow Rates

System water demands were calculated based on the methodology outlined in the 1,2,3-Trichloropropane Maximum Contaminant Level Regulations Initial Statement of Reasons[44]. An ADD of 150 gallons per person, per day, has been applied to the system population, assuming 4.7 people per household[45]. This ADD is based on the water usage provided to the SWRCB by 386 California urban water suppliers in June 2014 with an additional 10% demand (SWRCB, 2017). Using 150 gallons per person per day results in an ADD calculation of 705 gallons per day per household, which is a more conservative ADD value than the 521 gallons per day per household proposed in the Springfield Terrace report for the existing Springfield Water System.[46] The 705 gallons per day per household may be conservative for the project area, since it is based on scaling per-capita demand up to 4.7 people per household in the project area (a relatively high number of people per household), and outdoor water use may not increase proportional to the number of people living in a household. For instance, for four households served by

[43] AACE International Recommended Practice No. 17R-97 Cost Estimate Classification System, TCM Framework: 7.3 - Cost Estimating and Budgeting, Rev. August 7, 2020.

[44] SWRCB. "Initial Statement of Reasons 1,2,3-Trichloropropane Maximum Contaminant Level Regulations. Title 22, California Code of Regulations", Last updated 2/17/19. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/123-tcp/sbddw17_001/isor.pdf

[45] The DAC Mapping Tool (https://gis.water.ca.gov/app/dacs/) indicates that this area is located within a DAC block group (060530101012). 2019 5-Year Census data indicates 4.7 people per household for the block group (U.S. Census Bureau, "2015-2019 American Community Survey 5-Year Estimates", Detailed Table).

[46] Section 3 of the memorandum from MNS Engineers, Inc. dated February 23, 2016 in the Springfield Terrace Pre-Planning and Local Entity Formation Assistance Grant Report. The 521 gallons per day per household used in the Springfield Terrace report was based on actual 2011-2014 average water production in the existing Springfield Water System, including water that was lost to leakage. Required production in a new system may be lower if leakage rates are lower and metering of consumption incentivizes conservation.

the Sunny Mesa Water System housing 4 people with landscaping, 4 people with minimal landscaping, 2 people with landscaping, and 1 person with minimal landscaping, ADDs in 2020 were 369, 246, 320, and 25 gal per day per household, respectively.[47]

Another demand alternative is to look at indoor only water use. In California, an indoor water use target of 55 gallons per person per day has been set[48]. If only indoor water use is accounted for, then the average household daily use is 259 gallons.

For treatment planning purposes a more conservative estimate is appropriate because the capital infrastructure is sized based on MDD, and it is better to have a slightly oversized treatment unit, than an undersized treatment unit. The demand values should be assessed in more detail depending on the solution selected. A peaking factor of 1.5 was applied to the ADD to calculate the MDD as stated in the 1,2,3-Trichloropropane Maximum Contaminant Level Regulations Initial Statement of Reasons and in the California Code of Regulations title 22, Section 64454[49].

To ensure that the proposed treatment capacity is conservative and to recognize that it is unrealistic to assume a source continuously operates 24 hours per day, treatment capacity will be calculated by assuming the MDD must be produced during 16 hours of operation. This assumption will result in a 50% increase in capacity for treatment units, storage boosters, and back-up wells. Section 64554 2(a) of Title 22 says the following:

"For systems with less than 1,000 service connections, the system shall have storage capacity equal to or greater than 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."

The last consideration for meeting demand is that a new CWS is required, by Title 22 Section 64552 2(c) to have two groundwater sources and be capable of meeting MDD with the highest capacity source offline. Further discussion with the Division of Drinking Water is needed on the interpretation of the storage requirement if there are two wells that can meet MDD.

Discussions with Watsonville Produce and Pajaro Sunny Mesa CSD are ongoing to determine to what extent Watsonville Produce may want to participate in this project and whether their produce-washing demand could be supplied in addition to their residential demand. The demand for non-residential water use from Watsonville Produce has not been included in the cost of the project, and any additional capital cost for infrastructure capacity to supply Watsonville Produce would most likely not be eligible for state funding.

3.1.2.2 Fire Flow Considerations

If the project area is connected to a community water system, in addition to providing water supply during high demand periods, tanks and booster pumps in the system should also be capable of meeting

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[47]Personal Communication between Heather Lukacs (CWC) and Judy Vazquez-Varela with Pajaro Sunny Mesa CSD, on June 15th, 2021.

[48]SWRCB, “Fast Facts on the Water Conservation Legislation” Accessed 5/28/21, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/Files/PDFs/Water-Conservation-Legislation-Fact-Sheet_a_y19.pdf

[49]SWRCB, “California Regulations Related to Drinking Water”, Last updated 4/16/19, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dw_regulations_2019_04_16.pdf

the required fire flow capacity. The North County Fire Protection District of Monterey County currently requires 1,500 gpm of fire flow for a period of 2 hours[50]. The requirement may be modified by agreement as this flow requirement may not be required at every fire hydrant.[51] Therefore, this option should be further examined in future phases of this project. When sizing pipes to supply the dispersed houses in this project area, capacity for adequate fire protection would need to be balanced with ensuring that long residence times in large pipes do not cause water quality to degrade in the system.

If fire protection is not provided by a community water system , a storage tank of 4,900 gallons is encouraged to provide some fire protection at new homes in Monterey County[52]. This size of tank is much more than would be required to meet the estimated MDD of 1,035 gallons for an average home.

3.2 Physical Consolidation

Physical consolidation with the Springfield Project has been considered for all homes. Estimated costs are discussed below including capital and ongoing costs.

3.2.1 Community-Scale Well

3.2.1.1 Capital cost

The option of a community-scale well is necessary for two of the non-treatment alternatives. Connection to the Springfield Project requires one additional well that can meet MDD, and construction of a new CWS requires two new wells that can each meet MDD in order to comply with Title 22 regulations. The capital costs for the construction of a community well are summarized in Table 7.

Table 7. Capital costs for a community well with a 12" diameter and a 250 gpm production rate.

Drilling, construction, development and testing [1]	$531,000
Electrical upgrades (cost per site) [2]	$440,000
Pump and motor (255 gpm flow) [2]	$155,000
Subtotal	$1,126,000
Construction multiplier (including design, electrical permitting) [2]	1.25
Total	**$1,408,000**

[1] Cost from KYLE Groundwater, Appendix C, Table C-3, with no contingency.

[2] Costs and multiplier from QK, a Central Valley engineering firm.

The ongoing operations and maintenance costs of new wells are handled in the physical consolidation section. The ongoing cost will be accounted for in the rates that are charged by Pajaro Sunny Mesa CSD.

3.2.2 Physical Consolidation Capital Cost

Capital costs and assumptions associated with the physical consolidation alternative are provided in Table 8. Physical consolidation costs can vary widely, depending on a number of factors. For example,

[50] Personal Communication between Tarrah Henrie (Corona) and Joel Mendoza, with North County Fire Protection District of Monterey, on March 16th, 2021.

[51] Personal Communication between Tarrah Henrie (Corona), John Erickson (CWC), and Joel Mendoza, with North County Fire Protection District of Monterey, on June 28th, 2021.

[52] North County Fire Department, "Fire Marshal Notes and Documents, Single parcel fire protection water supply" Accessed: 5/28/21, https://static1.squarespace.com/static/59a0f0d8f14aa15be9ca3f81/t/5b3bc9b5562fa76d4d83086a/1530644918784/SINGLE+PARCEL+FIRE+PROTECTION+WATER+SUPPLY.pdf

capital costs could be lower if fire protection requirements are less than the assumed 1,500 gpm and pipe diameters are reduced accordingly or if some of the pipes along unpaved roads through private property are installed as smaller-diameter private service lines. On the other hand, if a pipeline installation will cross a highway (e.g., Route 1), be diverted around a protected habitat, or cross through private land, capital costs would likely increase. Based on cost estimates for the Springfield Water System Improvements Preliminary Engineering Report, crossing the Route 1 highway would incur about $1,200 per foot of additional costs. In Scenario B, the pipeline connecting the project area to the Sunny Mesa System would need to cross Highway 1 (Figure 12). It is assumed 100 ft of pipeline casing would be installed so that it extends 25 ft beyond both sides of the 50 ft highway. Installing the casing using the bore and jack method is estimated to incur $120,000 in additional costs. As discussed below, it may be possible to avoid these additional costs, like crossing Route 1 in Scenario A. These additional costs are associated with complying with Caltrans standards that require pipes to be installed inside a steel casing. The Springfield Project plans to have a storage tank and boosters capable of meeting some of the fire flow requirements.

Pajaro Sunny Mesa CSD has indicated that if capital costs for the consolidation project are grant funded, they anticipate they would waive connection fees for households participating in the consolidation project.[53] However, if a property owner decides to opt out of connecting initially and wants to connect at a later date, they may be able to do so if Pajaro Sunny Mesa CSD verifies there is sufficient water supply. In addition, property owners would need to pay (i) for the installation of a water meter and the Pajaro Sunny Mesa CSD-owned portion of the service line (i.e., the lateral between the water main and the property line), the cost of which varies depending on the household, but is typically around $12,500, and (ii) a connection fee of approximately $5,400.[54] It is anticipated that property owners, regardless of economic status, would not need to pay these costs if they connected to the consolidation project initially. Also, households that may qualify for grant funding that would cover work performed on private property (see Section 4.1.1.1) including the installation of the privately-owned portion of the service line (i.e., the lateral extending from their property line to existing plumbing) would only be able to receive such financial support initially. Connection of any new future dwellings would be subject to the same costs and verification by Pajaro Sunny Mesa CSD that sufficient supply is available, but it will ultimately be the decision of the County to approve any new development based on the Monterey County General Plan.[55]

[53] Personal Communication between John Erickson, with Community Water Center, and Judy Vazquez-Varela, with Pajaro Sunny Mesa CSD, on June 4th, 2021.
[54] Personal Communication between John Erickson, with Community Water Center, and Judy Vazquez-Varela, with Pajaro Sunny Mesa CSD, on August 20th, 2021
[55] Monterey County Board of Supervisors and Planning Commission. “2010 Monterey County General Plan.” October 26, 2010. https://www.co.monterey.ca.us/government/departments-a-h/housing-community-development/planning-services/resources/2010-general-plan

Table 8. Physical Consolidation Capital Cost Assumptions

Item	Cost Assumption
Pipeline Cost 1 – 12”[1]	$202 per linear foot
Pipeline Cost 1 – 4”[1]	$117 per linear foot
Crossing Highway 1[2]	$1,200 per linear foot
Service Line Cost[3]	$6,500
Allowance for pipeline easements multiplier[4]	1.04
Number of Connections and Wells	88 connections, 50 wells
Land acquisition for new well (1 acre)[5]	$450,000
Well Destruction[6]	$20,000 per well
Number of connections including the Springfield Project and the Project Area	251
People per household	4.7
Water use (gpd per person)	150
CEQA[1]	$85,000 per application
Coastal Development Permitting[7]	$50,000 per permit
Legal and Administrative Costs[8]	$200,000
Contingency	20% applied to total

[1] Costs are based on estimates provided by QK, Inc., an engineering design firm in the Central Valley. They were also used in the California Water Board’s “2021 Drinking Water Needs Assessment” (Accessed 6/13/21 www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf). Since the Central Valley is considered rural, capital costs from QK, Inc., were multiplied by 1.3 to account for Monterey County being classified as a Suburban region based on the report “2021 Drinking.12” C-900 PVC main was selected for the main pipeline in order to achieve 1,500 gpm flow to accommodate fire flow. 4” pipeline was selected for unpaved pipeline distances off the main pipeline. Assumes 3 feet burial; max flow at velocity of 5 ft/sec; C900 rated pipe. Cost includes paving; engineering, design, permitting; mobilization/demobilization; shoring. In some cases, pipeline assumed to be 4” in diameter may be smaller than 4” if, for example, the pipeline serves only one or a few homes. They are assumed here to be 4” pipes to make cost estimates conservative.

[2]Based on installed costs for a Steel Casing for a pipeline under Highway 1 from Springfield Water System Improvements Preliminary Engineering Report.

[3]California Water Board, “2021 Drinking Water Needs Assessment” Accessed 6/13/21, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf The cost shown assumes the work is performed by a contractor. If an owner obtains a simple Monterey County construction permit, which costs approximately $240, and installs the service line themself, the cost for service line construction may be substantially reduced.

[4] Based on a 1.04 multiplier of pipeline capital costs from the Springfield Water System Improvements Preliminary Engineering Report

[5]Comparable properties on Zillow

[6]Well destruction cost is an estimate based on information provided by a local well driller in April, 2021

[7]Local coastal permitting expert estimate

[8]The legal and administrative cost assumption is based on information from an Investor-Owned Utility for recent acquisitions in California.

The estimated capital cost for physical consolidation of all of the homes in the Project Area with the Springfield Water Company is summarized in Table 9 for Scenario A and in Table 10 for Scenario B.

Table 9. Summary of estimated capital costs for physical consolidation with Springfield Project Scenario A.

Springfield Consolidation Cost Estimate	Cost Point Estimate	Cost Range		
12” Pipeline installation (6.2 mi)[1]	$6,580,000	$3,290,000	-	$13,160,000
4” Pipeline installation (3.3 mi)[1]	$2,060,000	$1,030,000	-	$4,120,000
Allowance for pipeline easements[2]	$350,000	$175,000	-	$700,000
Service lines to homes (88)[1]	$572,000	$286,000	-	$1,144,000
Existing well destruction (50)[3]	$1,000,000	$500,000	-	$2,000,000
Administrative costs[4]	$200,000	$100,000	-	$400,000
Land acquisition for the well[5]	$450,000	$225,000	-	$900,000
Additional well[6]	$1,408,000	$704,000	-	$2,816,000
CEQA documentation (assuming separate applications for the pipeline, and well)[1]	$170,000	$85,000	-	$340,000
Coastal Development Permitting[7]	$100,000	$50,000	-	$200,000
20% contingency	$2,578,000	$1,289,000	-	$5,156,000
Total	**$15,468,000**	**$7,734,000**	-	**$30,936,000**
Cost per connection	**$176,000**	**$88,000**	-	**$352,000**

[1] Costs associated with the pipeline installation provided by QK, Incorporated, which is an engineering design firm in the Central Valley, that were modified with a regional cost multiplier of 1.3 according to the report “2021 Drinking Water Needs Assessment” where Monterey is classified as a Suburban region. In some cases, pipeline assumed to be 4” in diameter may be smaller than 4” if, for example, the pipeline serves only one or a few homes. They are assumed here to be 4” pipes to make cost estimates conservative.
[2] Based on the Springfield Water System Improvements Preliminary Engineering Report
[3] Local well driller estimate
[4] Estimate from a California Investor Owned utility for administrative costs associated with new systems.
[5] Comparable properties on Zillow
[6] Estimate from QK, Incorporated and modified with area specific costs by KGI, Inc.
[7] Local coastal permitting expert estimate

Table 10. Summary of estimated capital costs for physical consolidation with Springfield Project Scenario B.

Springfield Consolidation Cost Estimate	Cost Point Estimate	Cost Range		
12" Pipeline installation (7.13 mi)[1]	$7,850,000	$3,925,000	-	$15,700,000
4" Pipeline installation (3.3 mi)[1]	$2,060,000	$1,030,000	-	$4,120,000
Allowance for pipeline easements[2]	$400,000	$200,000	-	$800,000
Service lines to homes (88)[1]	$572,000	$286,000	-	$1,144,000
Existing well destruction (50)[3]	$1,000,000	$500,000	-	$2,000,000
Administrative costs[4]	$200,000	$100,000	-	$400,000
CEQA documentation (assuming separate applications for the pipeline, and well)[1]	$170,000	$85,000	-	$340,000
Coastal Commission Permitting[7]	$100,000	$50,000	-	$200,000
Crossing Highway 1[8]	$120,000	$60,000	-	$240,000
20% contingency	$2,494,000	$1,247,000	-	$4,989,000
Total	**$14,966,000**	**$7,483,000**	-	**$29,932,000**
Cost per connection	**$170,000**	**$85,000**	-	**$340,000**

[1] Costs associated with the pipeline installation provided by QK, Incorporated, which is an engineering design firm in the Central Valley, that were modified with a regional cost multiplier of 1.3 according to the report "2021 Drinking Water Needs Assessment" where Monterey is classified as a Suburban region. In some cases, pipeline assumed to be 4" in diameter may be smaller than 4" if, for example, the pipeline serves only one or a few homes. They are assumed here to be 4" pipes to make cost estimates conservative.
[2] Based on the Springfield Water System Improvements Preliminary Engineering Report
[3] Local well driller estimate
[4] Estimate from a California Investor Owned utility for administrative costs associated with new systems.
[5] Comparable properties on Zillow
[6] Estimate from QK, Incorporated and modified with area specific costs by KGI, Inc.
[7] Local coastal permitting expert estimate
[8] Based on installed costs for a Steel Casing for a pipeline under Highway 1 from Springfield Water System Improvements Preliminary Engineering Report.

The costs for Scenario A and B are similar, with Scenario B estimated to be $6,000 less expensive per connection due to the cost savings associated with avoiding the need to develop a new well. These costs assume that existing domestic wells will be destroyed, which would prevent surface water contamination of the aquifer from the well, avoid maintenance costs, and potentially provide other benefits such as supporting aquifer management to limit seawater intrusion. However, property owners can decide to continue to use their well for irrigation and connect to the Springfield Project for indoor water use only. For property owners to continue to use domestic wells for irrigation, a backflow preventer would need to be installed, which is estimated to cost $2,340[56], and modifications to premise plumbing may be needed to separate outdoor water piping from the interior use water piping that the property owner may have

[56] Based on the California Water Board, "2021 Drinking Water Needs Assessment" Accessed 8/10/21, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf. It also includes the 1.3 regional multiplier and a 20% contingency.

to cover. In addition, the backflow preventer would need to be tested annually.[57] When deciding to keep or destroy domestic wells, community members should consider the age of their well, as domestic wells can have an average useful life of 30 to 50 years[58]. Shallow domestic wells in the area may experience sea water intrusion in the future.

3.2.3 Ongoing Cost

The estimated ongoing monthly cost for physical consolidation with the Springfield Project is anticipated to be consistent with the rate structure of Pajaro Sunny Mesa CSD. Two estimates have been provided, one using the water demand estimate of 150 gallons per person per day (Table 11), and the lower cost estimate using the interior water use target of 55 gallons per person per day (Table 12). The explanation for this range of water demand is provided in Section 3.1.2 Demand Considerations. The estimate of 150 gallons per person per day for indoor and outdoor use is likely a conservative (high) estimate. Other local water use data are provided for comparison purposes in Section 3.2.3.1. Ongoing maintenance of the existing well has been included.

Table 11. Cost for ongoing water service from Pajaro Sunny Mesa CSD for indoor and outdoor water use.[1]

Indoor and Outdoor Water Use Estimate	
Gallons per 100 cu. Ft.	748
Daily household water use (gallons)	705
Average household monthly water use (gallons)	21,444
Average household monthly water use (100 cu ft)	28.7
Domestic charge per 100 cu ft	$4.81
Pajaro Valley Water Management Agency per 100 cu ft	$0.56
PSMCSD collection fee per 100 cu ft	$0.14
3/4" meter charge per month	$28.02
Average monthly water bill	$186
Average annual water bill	**$2,232**

[1] Pajaro Sunny Mesa CSD, "Rate Schedule" Accessed 7/6/21, http://pajarosunnymesa.com/uploads/Rate%20Schedule%207-2021%20to%206-2022.pdf.

[57] Personal Communication between Kyle Shimabuku (Corona) and Judy Vazquez-Varela with Pajaro Sunny Mesa CSD, on August 6th, 2021.

[58] Re/Max Executive Realty, "Wells Inspections: Buying a Home with a Well", Accessed 5/28/21, https://www.maxrealestateexposure.com/buying-home-with-well/

Table 12. Cost for ongoing water service from Pajaro Sunny Mesa CSD for indoor only water use.

Indoor Water Use Only Estimate	
Gallons per 100 cu. Ft.	748
Daily household water use (gallons)	258.5
Average household monthly water use (gallons)	7,863
Average household monthly water use (100 cu ft)	10.5
Domestic charge per 100 cu ft	$4.8
Pajaro Valley Water Management Agency per 100 cu ft	$0.56
PSMCSD collection fee per 100 cu ft	$0.14
3/4" meter charge per month	$28.03
Average monthly water bill	$86
Average annual water bill	**$1,031**
Annual Ongoing Cost per Connection Domestic Well Cost[1]	
Annual operations and maintenance for well, irrigation use only	$400
Pump & motor replacement	$1,000
Annual backflow prevention assembly test	$90[2]
Average annual cost per home served by a domestic well	**$2,180**
Annual Ongoing Cost per Connection Local Small Cost[1]	
Annual operations and maintenance for well, irrigation use only	$500
Pump & motor replacement	$1,000
Annual backflow prevention assembly test	$902
Average annual cost per home served by a Local Small System	**$1,500**
Annual Ongoing Cost per Connection State Small Cost[1]	
Annual operations and maintenance for well, irrigation use only	$500
Pump & motor replacement	$1,000
Annual backflow prevention assembly test	$902
Average annual cost per home served by a State Small System	**$1,280**

[1]To calculate annual ongoing cost per connection for domestic wells, local small water systems and state small water systems for outdoor water use, the well operations and maintenance and backflow prevention testing costs were divided by the average number of connections in each system type (1.3 connections per domestic well, 3.4 connections per local small water system, and 6.5 connection per state small water system) and then added to the estimated annual average water bill per household for indoor water use. [2]Personal Communication between Kyle Shimabuku (Corona) and Judy Vazquez-Varela with Pajaro Sunny Mesa CSD, on August 6th, 2021.

The annual ongoing cost per home for the Domestic Wells, Local Small and State Small accounts for the fact that homes are sharing a well, and can share the cost of maintenance. For the indoor water use scenario, it is assumed that the existing well is used to supply outdoor water only. Pump replacement approximately every 10 years is estimated to cost $10,000 (or $1,000 per year) and is part of the ongoing operations and maintenance expense.

3.2.3.1 Comparison of Ongoing Costs for Different Water Use Scenarios

The daily indoor and outdoor household water use estimate that assumes 705 gallons per household per day in Table 11 is a conservative estimate of household water consumption as described in Section 3.1.2 Water Demand Considerations. Since ongoing costs are sensitive to household water consumption, water bills were calculated for different water use scenarios that could potentially capture the range of monthly water bill costs representative of the project area. The additional water use scenarios examined include average household demand for the existing Springfield Water System between 2011-2014, average household demand for the Sunny Mesa Water System between 2019 and 2020, and individual water consumption by four different households in the Sunny Mesa Water System in 2020 that varied in number of residents and landscaping. Water consumption as well as annual and monthly water bills are compared in Table 13 for these different scenarios.

A comparison of the scenarios in Table 13 supports that the ongoing water costs developed in Table 11, which uses an estimated ADD for the State of California and assumes 4.7 residents per household in the project area, are conservative. Depending on the water use habits of residents, the number of residents per household, and the extent of landscaping/irrigation demands, water demand and bills could be substantially less in the project area.

Table 13. Potential household (HH) water bills for physical consolidation and new CWS alternatives assuming different water consumption scenarios and Pajaro Sunny Mesa CSD's current water rates.

Water Consumption Scenario	ADD (gpcd)	Residents / HH	Daily HH Use (gal/day/HH)	Monthly Bill ($/month)
Average Indoor+Outdoor Use in California[1]	150	4.7	705	186
Average Indoor Only Use in California[2]	55	4.7	259	86
Sunny Mesa Average (2019-2020)[3]	Unknown		281	91
2020 Average for example households in the Sunny Mesa Water System[4]				
Family of 4 w/ Landscaping	92	4	369	116
Family of 4 w/ Minimal Landscaping	61	4	246	88
Family of 2 w/ Landscaping	160	2	320	104
Family of 1 w/ Minimal Landscaping	25	1	25	23

[1]SWRCB. "Initial Statement of Reasons 1,2,3-Trichloropropane Maximum Contaminant Level Regulations. Title 22, California Code of Regulations", Last updated 2/17/19. Water bills calculated assuming the Pajaro Sunny Mesa CSD, "Rate Schedule" Accessed 7/6/21, http://pajarosunnymesa.com/uploads/Rate%20Schedule%207-2021%20to%206-2022.pdf. [2]SWRCB California Water Board, "Fast Facts on the Water Conservation Legislation" Accessed 5/28/21, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/Files/PDFs/Water-Conservation-Legislation-Fact-Sheet_a_y19.pdf. Water bills calculated assuming the Pajaro Sunny Mesa CSD, "Rate Schedule". [3]Water consumption and bills based on personal communication between Kyle Shimabuku (Corona) and Judy Vazquez-Varela with Pajaro Sunny Mesa CSD, on July 6th, 2021. [4]Water consumption and water bills based on personal communication between Heather Lukacs (CWC) and Judy Vazquez-Varela with Pajaro Sunny Mesa CSD, on June 15th, 2021.

3.3 New CWS

3.3.1 Capital Cost

A new CWS must meet the supply requirements outlined in Section 64454 of Title 22[59]. Two wells are required, and the system must be able to meet MDD with the largest source offline. As previously discussed, a storage tank must be able to meet MDD. In this case, the fire flow requirements are larger than the MDD, so that will determine the minimum size of the tank. The requirement for 2 wells and a storage tank add capital cost when compared to the Springfield consolidation option. Estimated capital costs for development of a new CWS are provided in Table 14 based on the conceptual design shown in Figure 14; the higher costs relative to the physical consolidation option are due largely to the need for two new wells, additional pipeline, and other infrastructure needs (e.g., tank, boosters, etc.).

[59]California Water Board, "California Regulations Related to Drinking Water", Last updated 4/16/19, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dw_regulations_2019_04_16.pdf

Table 14. Summary of estimated capital costs for new CWS development.

New System Cost Estimate	Cost Point Estimate	Cost Range		
12" Pipeline installation (7.7 mi)[1]	$8,190,000	$4,095,000	-	$16,380,000
4" Pipeline installation (3.3 mi)[1]	$2,060,000	$1,030,000	-	$4,120,000
Allowance for pipeline easements[2]	$410,000	$205,000	-	$820,000
Service lines to homes (88)[1]	$572,000	$286,000	-	$1,144,000
Existing well destruction (50)[3]	$1,000,000	$500,000	-	$2,000,000
Administrative costs[4]	$200,000	$100,000	-	$400,000
Land acquisition (assuming two properties)[5]	$900,000	$450,000	-	$1,800,000
Two wells[6]	$2,816,000	$1,408,000	-	$5,632,000
250,000 gallon tank (to meet maximum day demand and fire flow)[1]	$813,000	$406,000	-	$1,625,000
Boosters for tank (1 duty, one standby 200 gpm, one 1500 gpm for fire flow)[1]	$329,000	$165,000	-	$658,000
Electrical service for tank[1]	$715,000	$358,000	-	$1,430,000
Generator (ideal, but not required)[1]	$100,000	$50,000	-	$200,000
CEQA documentation (assuming separate applications for the pipeline, wells, and tank)[1]	$340,000	$170,000	-	$680,000
Coastal Development Permitting[7]	$200,000	$100,000	-	$400,000
20% contingency	$3,729,000	$1,864,000	-	$7,458,000
Total	**$22,373,000**	**$11,187,000**	**-**	**$44,747,000**
Cost per connection	**$254,000**	**$127,000**	**-**	**$508,000**

[1] Costs associated with the pipeline installation, tank, booster, electrical service, and generator provided by QK, Incorporated, which is an engineering design firm in the Central Valley, that were modified with a regional cost multiplier of 1.3 according to the report "2021 Drinking Water Needs Assessment" where Monterey is classified as a Suburban region. In some cases, pipeline assumed to be 4" in diameter may be smaller than 4" if, for example, the pipeline serves only one or a few homes. They are assumed here to be 4" pipes to make cost estimates conservative.
[2] Based on the Springfield Water System Improvements Preliminary Engineering Report
[3] Local well driller estimate
[4] Estimate from a California Investor Owned utility for administrative costs associated with new systems.
[5] Comparable properties on Zillow
[6] Estimate from QK, Incorporated and modified with area specific costs by KGI, Inc.
[7] Local coastal permitting expert estimate

3.3.2 Ongoing Cost

Since the project area is in the Pajaro Sunny Mesa CSD service boundary, they are the most likely service provider for a new CWS. The estimated ongoing monthly cost will fall under the same rate structure as the ongoing cost for physical consolidation with Springfield, shown in Table 11.

3.4 Existing Well Replacement

3.4.1 Capital cost

Another option is to replace the existing wells that have water quality issues with new wells that are constructed to better avoid contamination. To avoid contamination, we have assumed that the well would be drilled to a depth of 500 to 600 feet, and sealed to 400 feet. A summary of the estimated cost[60] to drill a replacement well is shown in Table 15.

Table 15. Capital cost to replace an existing well with a well constructed with an 8" PVC casing and a 60 gpm capacity.

Description	Point Estimate	Range		
Well Destruction[1]	$20,000	$10,000	-	$40,000
Coastal Development Permit[2]	$20,000	$10,000	-	$40,000
Well Drilling[1]	$136,000	$68,000	-	$272,000
Pump, Motor and Electrical Upgrades[1]	$40,000	$20,000	-	$80,000
Total per well	**$216,000**	**$108,000**	**-**	**$432,000**
Cost per connection - PW[3]	**$166,000**	**$83,100**	**-**	**$332,000**
Cost per connection - LSWS[4]	**$64,000**	**$32,000**	**-**	**$127,000**
Cost per connection - SSWS[5]	**$33,000**	**$17,000**	**-**	**$66,000**

[1] Cost estimates are based on information from KYLE Groundwater as detailed in Appendix C, Table C-2.
[2] Local coastal permitting expert estimate
[3] Assumes 1.3 connections per well
[4] Assumes 3.4 connections per well
[5] Assumes 6.5 connections per well

3.4.2 Ongoing cost

The ongoing operation and maintenance expense of a new well is expected to be similar to the expense that residents are incurring now. In private domestic wells, an annual cost of $900 for operations and

[60] Cost estimate from local well driller in April, 2021

maintenance has been estimated, while for wells serving local small and state small systems, a value of $1,000 has been used.

3.5 Treatment

Treatment has been considered on two different scales. The larger-scale, and more expensive treatment units, would be sized for existing well treatment at the wellhead. State small water systems and local small water systems can use wellhead treatment to come into compliance with drinking water regulations. Private wells could also use wellhead treatment, but such systems could be smaller and less expensive than those used for state and local small water systems. Treatment on the POU/POE scale would be implemented at each home. As previously discussed, POU/POE treatment units are not considered as a method for compliance with the drinking water regulations in Monterey County. More detailed cost information is provided in Appendix E.

3.5.1 Wellhead

For the purpose of costing out treatment, the most common contaminant scenario of nitrate, 123-TCP, and TDS over regulatory limits has been evaluated. Reverse osmosis treatment is capable of removing the inorganic contaminants, such as nitrate, TDS, arsenic, perchlorate, and chromium. However, it achieves only partial 123-TCP removal, so GAC treatment has been budgeted for that contaminant. For locations without 123-TCP contamination, the GAC treatment line item would not be needed. Locations where 123-TCP is the only water quality issue would have an expected cost similar to the POE treatment cost.

Three different vendors of RO treatment systems were contacted but one of the vendors indicated that they do not market RO systems that treat less than 15 gpm and that they sub-contract such work to Vendor A. Therefore, cost estimates are provided for two different vendors.

3.5.1.1 Capital Cost

Budgetary cost estimates were provided by Vendors A and B for RO treatment systems as well as GAC pre-filter adsorbers that were used to estimate the capital costs shown in Table 16 below. Costs were estimated on a per household basis. Each vendor was provided water quality data from a well that contained some of the highest concentrations of contaminants measured in the project wells. Therefore, the cost estimates for these systems should be able to adequately treat water from each well in the project area. For example, a nitrate concentration of 67 mg/L as N was provided that was near the maximum nitrate concentration detected in any of the wells, which is one of the main contaminants that challenges RO systems.

Table 16. Capital costs for RO and GAC wellhead treatment for two different vendors on a per household basis.

		Vendor A		Vendor B	
	Treatment capacity (gpm)[1]	Cost Point Estimate	Cost Range	Cost Point Estimate	Cost Range
Private Well[2]	2.8	$165,000	$82,500 - $330,000	$707,000	$353,000 - $1,414,000
Local Small Water System[3]	10.5	$142,000	$71,000 - $284,000	$307,000	$154,00 - $614,000
State Small Water System[4]	10.5	$78,900	$39,500 - $157,000	$165,000	$82,500 - $330,000

[1]Treatment capacities assumed by both Vendor A and B are based on both indoor and outdoor water use.
[2]Assumes 1.3 households served by system.
[3]Assumes 3.4 households served by system.
[4]Assumes 6.5 households served by system.

Vendor B RO systems were found to be substantially more expensive from a capital cost perspective, particularly when used to treat private well water. The main reason why the capital costs for Vendor B's system are more expensive is because it is an advanced RO treatment technology designed to reduce rejection rates to less than 10%. Vendor A markets traditional RO systems that have rejection rates between 25 and 50% that require less upfront costs, but are more expensive from an O&M perspective as discussed below.

Vendor A provided quotes for two RO systems of different sizes. One is designed to produce treated water at a flow of 2.8 gpm, which is appropriate for use at private wells, and another larger unit that can treat flows of 10.5 gpm that is appropriate for use in state and local small water systems. Vendor B does not currently manufacture a system designed to produce water with a maximum flow less than 8 gpm, which is why capital costs were estimated to be particularly large when treating private well water using Vendor B's system. Estimates in Table 16 assume sufficient capacity to treat enough water for indoor and outdoor water use. Under certain circumstances, it may be possible to use Vendor A's smaller RO system for local and state small water systems if only indoor water was treated, which would reduce capital costs.

3.5.1.2 Ongoing Cost

The amount of waste generated by the reverse osmosis treatment process is often one of the biggest challenges for implementation. For example, in the case of a State Small Water System (SSWS), assuming Vendor A's rejection rate of 25%, the wellhead treatment process could produce 557,000 gal of brine waste per year. The brine would contain the contaminant detected in the well water but at approximately four times the raw water concentration. Such waste would need to be stored in a double-walled tank that could hold up to 8,700 gal of brine. Because 3,500 gal of brine is the maximum volume a waste hauling truck that can access dirt roads can transport, such a scenario would require nearly 160 waste hauling trips per year.

For a private home owner in the area it may be possible to treat with reverse osmosis and discharge the waste to an irrigation tank or a septic system. For a project that will target grant funding, the land discharge would be subject to the approval of the Regional Water Quality Control Board (RWQCB). At this time, the RWQCB has not approved or denied this discharge. It is important to consider that what is approved can change over time. A conservative assumption of no land discharge being approved has been used pending approval in writing from the RWQCB. Waste is assumed to be hauled, by truck, to the East Bay Municipal Utilities District wastewater treatment facility. Disposal at Monterey One is another option, although this facility tends to be more selective about the discharges that are allowed. A summary of the annual operations and maintenance (O&M) cost for treating water used for indoor and outdoor purposes or indoor use only are shown in Table 17 and Table 18, respectively.

Table 17. Wellhead treatment annual operations and maintenance cost assuming treated water is used for indoor and outdoor use

	Vendor A		Vendor B	
	Cost Point Estimate	Cost Range	Cost Point Estimate	Cost Range
Private Well	$86,200	$42,000 - $169,000	$13,300	$6,000 - $26,000
Local Small Water System	$39,700	$19,000 - $78,000	$12,400	$6,000 - $24,000
State Small Water System	$37,100	$18,000 - $73,000	$10,200	$5,000 - $20,000

Table 18. Wellhead treatment annual operations and maintenance cost assuming treated water is used for indoor use only

	Vendor A		Vendor B	
	Cost Point Estimate	Cost Range	Cost Point Estimate	Cost Range
Private Well	$36,000	$18,000 - $71,000	$9,200	$5,000 - $18,000
Local Small Water System	$17,400	$8,000 - $34,000	$7,300	$4,000 - $14,000
State Small Water System	$15,100	$7,000 - $30,000	$5,200	$3,000 - $10,000

Vendor B provided a quote for a unit that has an estimated 7% waste rate. Vendor A provided a quote for a reverse osmosis unit that has a 50% waste rate when treating water from a private well and a 25% waste rate when treating well water for state and local small water systems. This difference in waste rates is the primary reason why the O&M costs are substantially lower for the system quoted by Vendor B. However, providing RO treatment equipment that achieves such high recoveries (i.e., small waste rates) is associated with much higher capital costs, as the capital costs were estimated to be substantially more expensive for Vendor B's system. Since the two vendors that provided cost estimates differ in terms of providing low waste rates and high capital costs versus high waste rates associated with lower capital costs, these cost estimates show wellhead treatment would be an expensive option regardless of if lower capital or O&M costs were prioritized

Since waste disposal dominates the ongoing O&M costs, whether or not this waste can be discharged on site, or must be trucked to waste, is a central question that could impact the cost competitiveness of wellhead treatment relative to other alternatives. The differences between capital and O&M costs for Vendor A and B systems are compared in Table 19 below for private wells. Similar tables are provided in Appendix E for state and local small water systems.

Table 19. Detailed wellhead treatment costs at private wells.

	Indoor + Outdoor Use		Indoor Use Only	
	Vendor A	Vendor B		
Capital costs				
Construction costs				
RO system ($)[1]	8,100	229,500	Same costs as Indoor + Outdoor Use	
Brine storage[2]	35,400	35,400		
Water Storage[2]	4,550	4,550		
GAC treatment ($)[3]	10,300	10,300		
Anitscalant system ($)[1]	700	Included in RO system		
Calcite contactor ($)[3]	300	300		
Total equipment costs ($)	59,350	280,050		
Construction multiplier[4]	2.7	2.7		
Total constructed costs ($)	159,900	754,700		
Planning, Engineering, Legal, & Admin costs (PEL&A)				
PGE upgrade ($)[5]		20,000		
Well repair ($)[6]	10,000	10,000		
New pump and motor ($)[5]	10,000	10,000		
Engineering Design ($)[6]	10,000	100,000		
Coastal commission ($)[5]	20,000	20,000		
County permitting and O&M plan ($)[6]	5,000	5,000		
CEQA ($)[6]				
Installed costs per system (Total constructed + PEL&A costs) ($/system)	214,900	919,700		
Installed cost per household ($/household)	165,300	707,500		
O&M				
Membrane element ($/yr)[1]	1,000	500	500	250
Chemicals (antiscalant) ($/yr)[1]	100	200	40	100
Prefilter, postfilter changeout ($/yr)[1]	100	Included w/ antiscalant	70	Included w/ antiscalant
Electricity use ($/yr)[7]	224	100	80	40
Waste hauling ($/yr)[5]	101,870	7,700	37,400	2,800
Operator labor & county reporting ($/yr)[6]	5,200	5,200	5,200	5,200
Analytical ($/yr)[8]	2,800	2,800	2,800	2,800
Calcite ($/yr)[3]	60	60	20	20
GAC media replacement ($/yr)[3]	300	300	300	300
Well operation ($/yr)[6]	400	400	400	400
Total O&M ($/yr)	112,100	17,300	46,800	11,900
Total O&M ($/yr/household)	86,200	13,300	36,000	9,200
20 Year O&M ($/household)	1,074,200	165,700	448,600	114,700
Combination of Capital and O&M costs				
NPW 20 year ($/household)	1,239,500	873,200	613,900	822,200

Information sources: [1]Vendor A or B, [2]Vendor C, [3]Vendor A, [4]Table E-3, [5]Local service provider to provide 240 V outlet, [6]Professional judgement, [7]PG&E, [8]Local analytical laboratory

3.5.2 Point of Use/Point of Entry

As previously discussed, Point of Entry Granular Activated Carbon (GAC) treatment is considered in the case of 123-TCP, or other volatile organic compounds to address health impacts of breathing the compounds during exposure in the shower. Point of Use treatment is considered for most commonly occurring inorganic contaminants, such as nitrate, or arsenic, hexavalent chromium, and TDS. Point of Use is not technically feasible for wells with nitrate over 27 mg/L[61] as N. Treatment is not recommended in wells with bacteriological problems, until the bacteriological problems have been resolved.

Limited installations of this type of treatment have been completed in California, and the costs are not always clearly documented. The costs of POU and POE treatment have been developed based on projected costs detailed. Capital costs are the costs associated with the initial and replacement installation. Full replacement of the POU or POE treatment unit at 10 years has been assumed. The estimated capital cost of POE and POU treatment is shown in Tables 20 and 21, respectively. Additional costs for well repair, pump and motor replacement, and an allowance for repair or replacement of some storage tanks are accounted for in Table 22.

Table 20. Capital Costs for POE treatment for 123-TCP per household.

	Point Estimate*	Range		
POE Cost per Unit Installed	$11,500	$5,750	-	$23,000
Analytical	$700	$350	-	$1,400
Site assessment, sampling, technical oversight	$3,000	$1,500		$6,000
Project management	$1,500	$750	-	$3,000
Total + 20% contingency	**$20,000**	**$10,000**	**-**	**$40,100**
Total with Replacement at 10 years	**$40,100**	**$20,000**	**-**	**$80,200**

*Costs based on capital costs for CWC's 123-TCP POE Treatment Pilot Project.

Table 21. Capital Costs for POU treatment for other contaminants per household.

	Point Estimate*	Range		
POU Cost per Unit	$1,500	$750	-	$3,000
Installation Labor Cost per Unit ($100/hr)	$300	$150	-	$600
Analytical and sampling	$390	$200	-	$780
Initial Admin/ Project Man.	$700	$350	-	$1,400
Total + 20% contingency	**3,470**	**$1,730**	**-**	**$6,940**
Total with Replacement at 10 years	**$6,940**	**$3,470**	**-**	**$13,870**

*Costs determined by Corona in the study "Developing Equitable and Effective Early Action Plans" (2021)

[61] NSF/ANSI 58 – 2018, *Reverse Osmosis Drinking Water Treatment Systems*. Lists an influent nitrate concentration of 30 mg/L-N to achieve a treated water of 10 mg/L-N in the treated water. A safety factor has been applied to keep the treated water below 10 mg/L-N.

Table 22. Capital costs for well improvements and storage tanks per household.

	Point Estimate*	Range		
Well repair	$10,000	$5,000	-	$20,000
Pump & Motor Replacement	$10,000	$5,000	-	$20,000
Storage tank	$3,500	$1,750	-	$7,000
Total	**$23,500**	**$11,750**	**-**	**$47,000**

*Costs provided by a local service provider, a tank vendor, and professional judgement.

With treatment it is critical to consider the ongoing annual operations and maintenance expenses because these expenses can be high. The new SAFER fund may or may not cover these costs and this portion of grant funding does need further discussion with the state. In small systems and private domestic wells the ongoing operations and maintenance expenses can be a source of treatment failure if maintenance is stopped because the costs become unaffordable. The estimated annual operations and maintenance costs are shown in Tables 23 and 24 for POE and POU, respectively. Since so few of these installations have been completed in California, this is another area that needs further cost data collection in the future. Additional water quality samples should be collected for any well for which POE and or POU treatment are planned. For POE the concentration of total organic carbon (TOC) is important to measure because TOC competes for adsorption sites and can result in the need to replace the GAC media sooner. Any bacteriological growth in the well can cause growth in the GAC media. Parameters like iron, manganese, and silica are important to measure because they will foul the RO membranes used for treatment in the POU devices. Additional water quality results may provide data that will cause an increase in costs.

Table 23. Annual operations and maintenance expenses for POE GAC treatment per household.

	Point Estimate*	Range		
Pre- and post-filter GAC Replacement Cost ($165 every 3 years)	$55	$30	-	$110
Media Replacement (replacement of lead vessels once in 2 years)	$1,500	$750	-	$3,000
Backflush (annual)	$500	$250	-	$1,000
Analytical and Operator Labor ($100/hr)	$3,000	$1,500	-	$6,000
Ongoing Admin/ Project Man.	$1,020	$510	-	$2,030
Annual O&M Costs + 20% contingency	**$7,280**	**$3,640**	**-**	**$14,570**

*Costs estimated based on CWC's 123-TCP POE Treatment Pilot Project.

Table 24. Annual operations and maintenance expenses for POU RO treatment per household.

	Point Estimate	Range		
Pre-filter and Membrane Replacement (2x/year)	$200	$100	-	$400
Operator for Membrane Replacement ($100/hr x 2)	$200	$100	-	$400
Operator Sampling, Data Management, and Admin	$400	$200	-	$800
Analytical (Nitrate only 8x)	$240	$120	-	$480
Ongoing Admin	$310	**$160**		**$620**
Annual O&M Costs + 20% contingency	**$1,620**	**$810**	**-**	**$3,240**

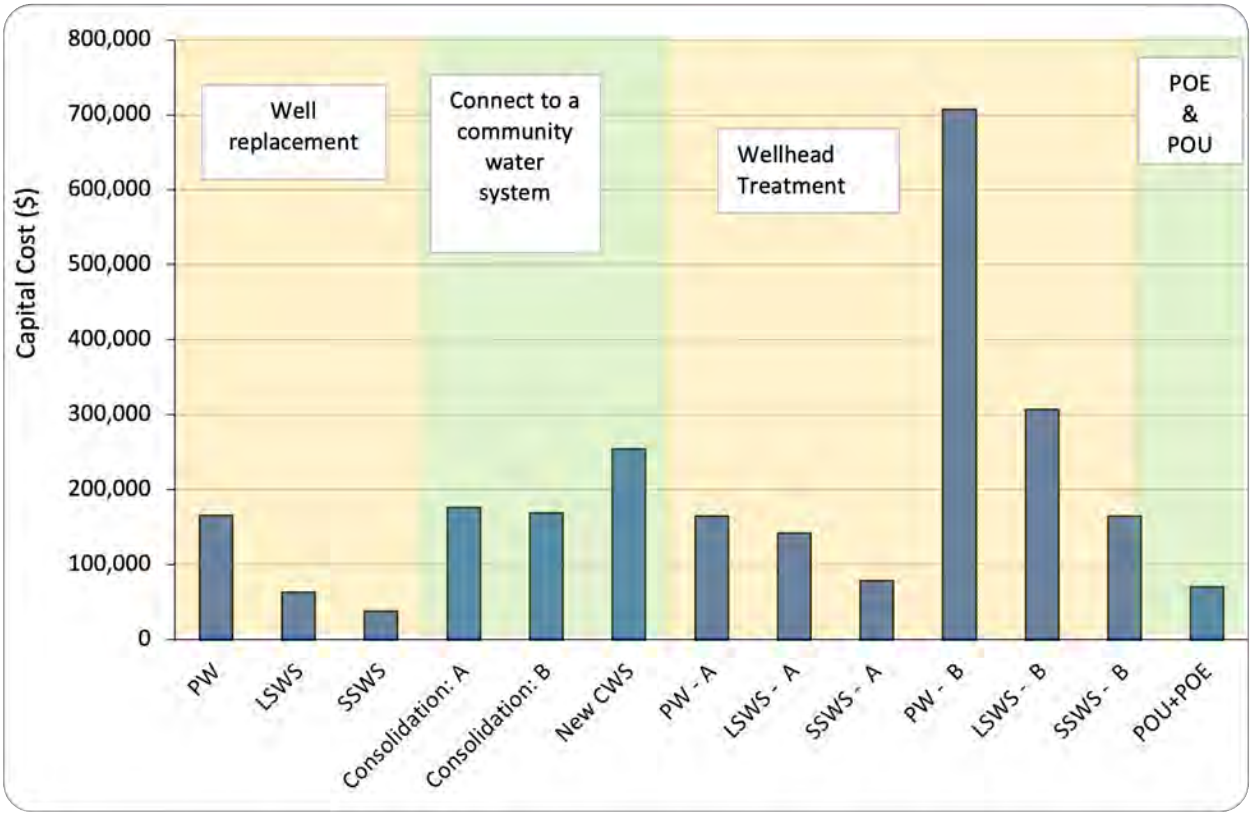
*Costs determined by Corona in the study "Developing Equitable and Effective Early Action Plans" (2021)

3.6 Comparison of Cost on a per Household Basis

When comparing the cost of alternatives, the capital cost must be considered along with the ongoing cost of operation. The capital cost and the ongoing annual operations and maintenance costs are combined into a 20-year net present worth calculation that provides a sense of the lifecycle cost of an option in present-day dollars over 20 years. Figures in this section use the point estimate value from the previous sections for simplicity, but the range of costs still applies to the cost estimates. Grant funding options will be more fully explored in Section 4.

Capital costs are compared for each alternative on a per connection basis in Figure 17.

Figure 17. Capital cost estimates per connection to private wells (PW), local small water systems (LSWS), SSWS. "A" references Vendor A and "B" references Vendor B of wellhead treatment systems.



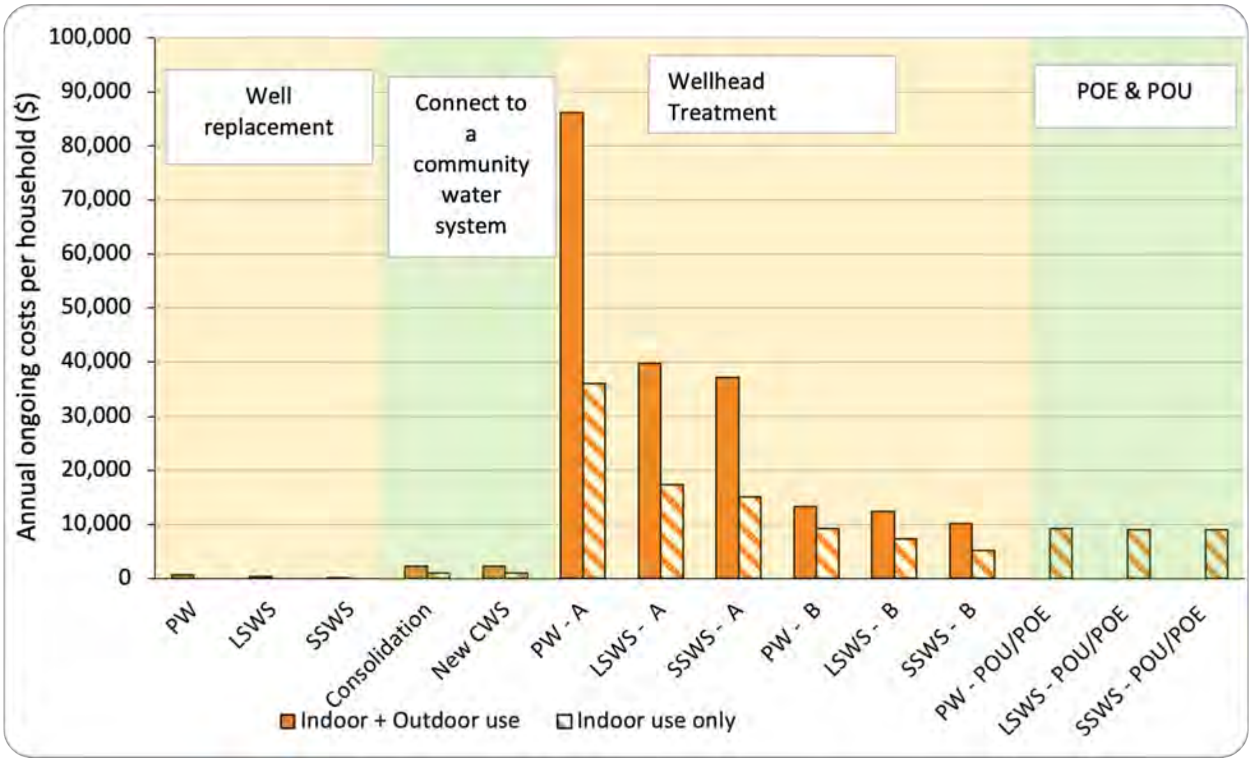
There is a large variation in capital costs, and ten of the thirteen alternatives shown in Figure 17 have estimated costs that exceed $60,000 per connection, which is the guideline maximum in the Drinking Water State Revolving Fund Intended Use Plan.[62] The Intended Use Plan states that capital costs of up to $80,000 per connection can be approved by the Deputy Director of the SWRCB's Division of Financial Assistance (DFA) for good cause. Above that, funding level is subject to SWRCB Board level approval.

POU combined with POE treatment (POU/POE) is one of the least expensive capital cost options. Capital costs for well replacement are also relatively inexpensive, particularly when this cost is shared between multiple households served by a local or state small water system. However, there is no guarantee that drilling a new well will avoid water quality issues and only part of the project area is considered suitable for well replacement. POU/POE treatment is unfeasible in much of the project area and has significant limitations that will be discussed further in the following Summary of Alternatives section.

Annual O&M costs are compared for each alternative on a per connection basis in Figure 18 for both indoor and outdoor use or outdoor use only.

[62]SWRCB, "State of California Drinking Water State Revolving Fund", 6/16/21, https://www.waterboards.ca.gov/drinking_water/services/funding/documents/dwsrf_iup_sfy2020_21_final.pdf

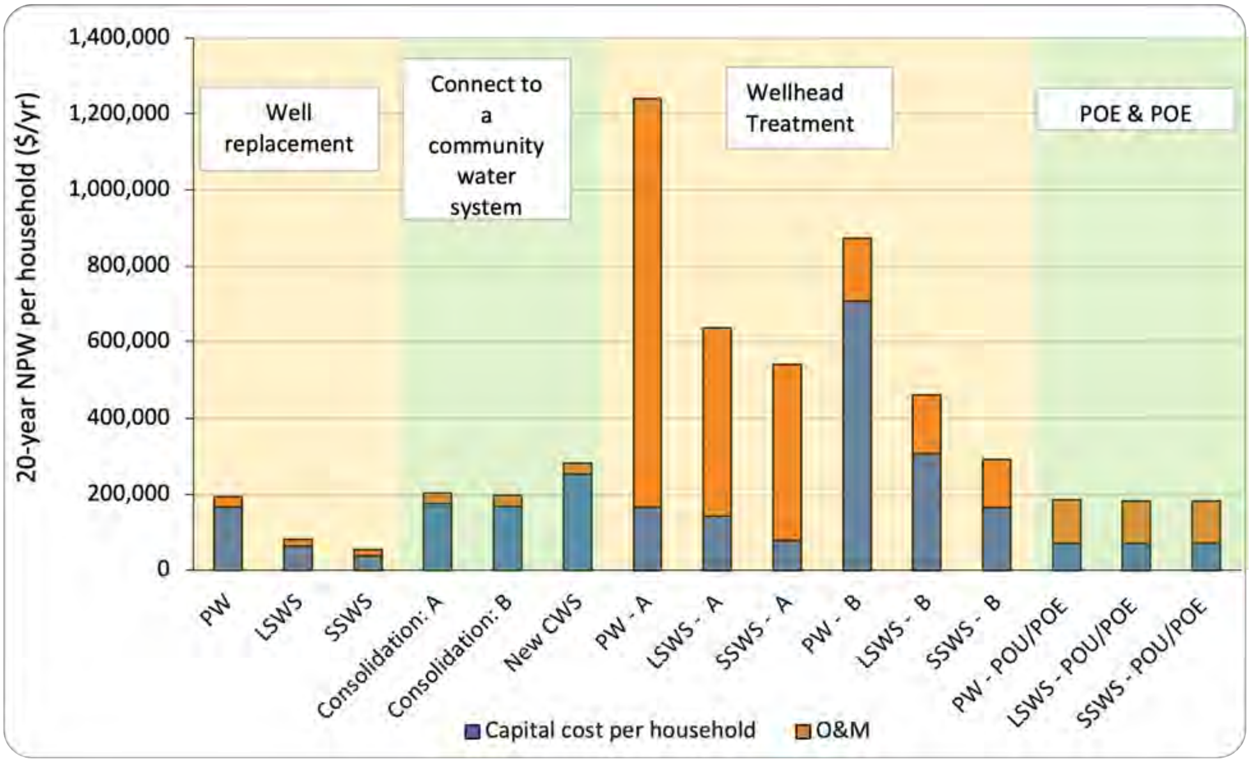
Figure 18. O&M cost estimates per connection to private wells (PW), local small water systems (LSWS), and state small water systems (SSWS). "A" references Vendor A and "B" references Vendor B for the wellhead treatment systems.



Indoor use only assumes that 55 gallons per day, per person, would be used whereas indoor and outdoor use assumes 150 gallons per day, per person, would be used. An average of 4.7 people per household was used for these cost estimates. Figure 18 demonstrates that O&M costs are large for treatment alternatives, especially for the wellhead treatment options. On the other hand, well replacement and connecting with a community water system O&M costs are close to negligible relative to wellhead treatment O&M costs.

O&M and capital costs were used together to estimate 20-year net present worth cost estimates where O&M costs for indoor and outdoor use were converted to present-day dollars by assuming a 5% discount rate. These costs are compared for each alternative in Figure 19.

Figure 19. 20-year NPW cost comparison for the alternatives



Each wellhead treatment alternative examined was more expensive than every non-treatment scenario. Since the two vendors that provided cost estimates differ in terms of providing low waste rates and high capital costs versus high waste rates associated with lower capital costs, these cost estimates show wellhead treatment would be a cost-prohibitive option regardless if lower capital or O&M costs were prioritized. However, if there is approval to discharge RO waste onsite, it may be more feasible to implement wellhead treatment, particularly with the RO system with smaller capital costs.

4. Analysis of Project Alternatives

This section analyzes and compares the project alternatives introduced in Section 2. The criteria used to evaluate these alternatives is detailed below and includes: funding availability, long-term sustainability/reliability, implementation challenges and considerations, the schedule to implement the alternative, and the alternative's ability to address water quality issues for all homes in the project area. A summary of the benefits as well as disadvantages and challenges with respect to the evaluation criteria for each feasible alternative along with cost estimates per household developed in Section 3 and are shown in Table 25. The table has been color coded to reflect anticipated grant funding. Potential combinations of alternatives described in Sections 2 and 3 (e.g., physical consolidation in combination with wellhead treatment) are considered. Individual alternatives and combinations of alternatives are recommended for further consideration by community members and stakeholders. A summary of this alternatives analysis is provided in Table 26.

4.1 Evaluation Criteria

4.1.1 Funding availability

One of the key questions when evaluating the alternatives is determining which alternatives will be eligible for grant funding or low/no interest loans, and to what extent the grant funding will cover the costs. The Drinking Water State Revolving Fund Intended Use Plan[63] and the Fund Expenditure Plan for the Safe and Affordable Drinking Water Fund[64] provide guidance on how state grant funding will be used. The new Safe and Affordable Funding for Equity and Resilience (SAFER)[65] program grant funding allows state funding to be used for purposes for which funding was not previously available, including the potential for funding of operations and maintenance expenses, and individual household solutions, such as POU/POE treatment. However, the Fund Expenditure Plan for the Safe and Affordable Drinking Water Fund states that any direct operations and maintenance funding will be prioritized to facilitate voluntary consolidations by offsetting any increased costs during the interim period while a consolidation is taking place. The Fund Expenditure Plan also states that "On a pilot basis, the State Water Board may also provide direct funding to water systems to offset high-water rates or assist in paying off long-term debt, if debt payments require the imposition of unaffordable water rates."[66]

CWC staff, in conjunction with Corona, are working to better understand what costs will be eligible for state funding. The project team's understanding for funding eligibility for different types of capital costs, based on discussions with the SWRCB, is outlined below.

4.1.1.1 Community water system alternatives

Consolidation with the Springfield Project is the most likely alternative to be approved for funding. The SWRCB' has communicated that if consolidation is found to be a feasible option for the community, it will be the solution SWRCB would most likely fund. SWRCB's intended use plan states "If consolidation is determined to be feasible, grant/principle forgiveness funding may only be available for a consolidation project."[67] California Senate Bill 1263 also states that "...it is the policy of the state to discourage the establishment of new, unsustainable public water systems when there is a feasible alternative" and requires that consolidation be considered before forming a new system.[68]

For community water system alternatives, including consolidation with the Springfield Project or forming a new CWS, costs for community infrastructure (owned by the water system and not on private

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[63] SWRCB, "State of California Drinking Water State Revolving Fund Intended Use Plan", 6/16/21, https://www.waterboards.ca.gov/drinking_water/services/funding/documents/dwsrf_iup_sfy2020_21_final.pdf

[64] SWRCB, "FY 2020-21 Fund Expenditure Plan: Safe and Affordable Drinking Water Fund," 7/7/2020, https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/docs/sadwfep_2020_07_07.pdf

[65] SWRCB, "Frequently Asked Questions Safe and Affordable Funding for Equity and Resilience Program", 5/28/21, https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/faq_safe_drinking_water_program_overview_factsheet.pdf

[66] SWRCB, "FY 2020-21 Fund Expenditure Plan: Safe and AFfordable Drinking Water Fund," 7/7/2020, pp. 33-34. https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/docs/sadwfep_2020_07_07.pdf

[67] SWRCB, "State of California Drinking Water State Revolving Fund Intended Use Plan", 8/10/21, pp. 23, https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/dwsrf_iup_sfy2021_22_final2.pdf

[68] California State Senate, "SB-1263 Public water system: permits." 8/10/21, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1263.

property) would be eligible for grant funding because the project area is classified as a Disadvantaged Community (DAC). These grant-eligible community infrastructure costs, estimated at $144,000 per connection for consolidating with the Springfield Projectand $222,000 per connection for the development of a new CWS, make up the majority of the costs for these solutions. As noted in Section 3.6, costs that exceed $60,000 per connection would require approval from the Deputy Director of the SWRCB Division of Financial Assistance and costs exceeding $80,000 per connection would be subject to SWRCB Board level approval.

For community water system options, the property owner's ability to pay may be considered when determining the amount of grant eligibility for work performed on private property, including an estimated $7,800 for service line installation. The SWRCB Division of Financial Assistance (DFA) is currently updating their funding policy regarding how grant eligibility would be determined for work on private property and in which cases it will depend on property owner ability to pay.[69] Funds to pay for such work would be provided to the water system and would not be provided directly to property owners. Grant funding for well destruction (an estimated cost of $24,000 per well) may also depend on the property owner's ability to pay. If a property owner chooses to keep their well for outdoor water use, they may also be responsible for the installation and maintenance of a backflow preventer to keep the well isolated from the public water system. Specific eligible costs will be approved as the project planning progresses and the actual eligible grant amount will be approved by the State during the construction funding application phase.

The discussion above applies to residential water connections. Non-residential users could also be considered for connection to a community water system alternative, however:

- These users would need to pay Pajaro Sunny Mesa CSD's normal connection fee, the cost of purchasing, installing and connecting a water meter, and the cost of all infrastructure on private property.[70] The state may fund stub-outs for the non-commercial users if they are along the alignment of the water main already being installed to serve residential customers.[71]

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[69] Current SWRCB policy states that for funding of consolidation projects that involve privately-owned water systems serving small or expanded small disadvantaged or extremely disadvantaged communities (DACs/SDACs), "the system owner's ability to pay will be considered for any work occurring on the private property" (SWRCB, "State of California Drinking Water State Revolving Fund Intended Use Plan", 6/15/21, pg. 20. https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/dwsrf_iup_sfy2021_22_final.pdf). DFA staff initially advised CWC that this guidance would apply to work on private property for households involved in this project. However, via email correspondence on 10/14/2021, the DFA Assistant Deputy Director said that the SWRCB is updating their funding policy for work on private property. In the updated funding policy, funding eligibility for work on private property will normally be determined on a community basis, meaning that most households in this project would be eligible since the area is classified as a DAC. The DFA Assistant Deputy Director said there may be some exceptions, such as very costly work on private property or in cases where block group income data is not representative of individual households in the project area. In these cases, funding eligibility would l be based on the property owner's ability to pay. DFA is working to formalize this guidance into a written policy and CWC is seeking confirmation whether this policy applies to all costs on private property (lateral, well destruction and backflow preventer), and what criteria may be used to identify exceptions where ability-to-pay information is required.

[70] SWRCB, "State of California Drinking Water State Revolving Fund Intended Use Plan", 6/15/21, pg. 21. https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/dwsrf_iup_sfy2021_22_final.pdf

[71] SWRCB, "State of California FY 2021-22 Fund Expenditure Plan Safe and Affordable Drinking Water Fund", 10/19/21, pg. 37, https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/docs/2021/final_2021-22_sadwfep.pdf

- If greater than ten percent of total water consumption will go to industrial or commercial customers, state funding may be reduced for costs attributable to industrial or commercial use.[72]

4.1.1.2 Non-community water system alternatives

Grant eligibility for non-community water system options including well replacement, existing wellhead treatment, or POU and POE treatment for a household may be determined based on the owner's and/or tenant's ability to pay for the improvements.[73] The owner's ability to pay is normally used to determine eligibility for improvements that will permanently increase property value, such as well replacement. Tenant ability to pay can normally be used for more temporary improvements such as POU treatment. In the case of SSWSs and LSWSs, the economic status of the households served by such systems will likely determine grant eligibility for well replacement and wellhead treatment systems.[74] This is an important clarification because any household as well as any group of households served by a SSWS or LSWS that does not meet financial eligibility qualifications may not be eligible for funding for these alternatives.

SWRCB staff stated that, in order to provide funding for a non-community water solution, the state would need to involve a third party, such as a non-profit technical assistance provider, to receive and administer funds. Since there currently is no established third party able to serve in this capacity in the project area, the timeline could be extended if a non-community water system alternative was pursued.

4.1.2 Long-term sustainability / reliability

Physical consolidation or a new CWS are considered to be the most reliable and sustainable alternatives because these options are expected to address the water quality issues for all of the homes in the project area at a reasonable ongoing monthly cost to the residents. Of those two options, physical consolidation is likely to be the most reliable and sustainable because it would result in one larger system that would benefit from economies of scale. Pajaro Sunny Mesa CSD would be responsible for ongoing operation and maintenance of the water system to ensure that all state drinking water requirements and water quality standards are met. Drinking water supply would no longer depend on each resident or property owner's maintenance of their private well. These alternatives would provide much more fire protection than the current arrangement of individual wells with very little storage. Deeper community wells would be located and constructed to avoid groundwater contamination and high salinity to the extent possible. Between the two consolidation scenarios considered, Scenario B may be a more reliable solution as the project area would also be consolidated with systems that have groundwater sources that are further inland and may be less susceptible to seawater intrusion. In addition, it would create a regional consolidation that would benefit multiple systems. The SWRCB supports drinking water partnerships, when feasible, to increase water system resilience.[75] Drinking water partnerships include physical consolidation and new water systems owned and operated by a local water provider, which is a type of managerial consolidation.

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[72] SWRCB, "State of California Drinking Water State Revolving Fund Intended Use Plan", 6/15/21, pg. 21. https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/dwsrf_iup_sfy2021_22_final.pdf

[73] Policy for Developing the Fund Expenditure Plan for the Safe and Affordable Drinking Water Fund, pg. 15. https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/docs/2020/final_policy_for_dev_fep_sadwf_12_17_2020_clean.pdf

[74] SWRCB, "State of California Drinking Water State Revolving Fund Intended Use Plan", 6/15/21, pg. 20. https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/dwsrf_iup_sfy2021_22_final.pdf.

[75] SWRCB, "Drinking Water Partnerships and Consolidation", Accessed 5/28/21, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/waterpartnership.html

The solutions that would need to be implemented at individual households are considered to be the least sustainable in the long term for the reasons summarized below.

Replacing existing wells:

- This alternative may not be feasible in some parts of the project area because water of high quality may not be available. Even if high quality water is available in certain areas/aquifers, the mud rotary drilling method will not provide the data necessary to assess depth-specific groundwater quality and may still result in a well that produces poor quality water. It is assumed that replacement domestic wells would be constructed using the mud rotary drilling method, since that method is normally used for such wells and the reverse circulation well would be much more costly.
- In places where high quality water may be found, there is no guarantee that it will continue to be of high quality in the future. (This will also be an issue for community wells mentioned above, but if water quality degrades and treatment is required, it will be easier to add treatment at a community well.).
- Domestic wells that experience water quality issues after the grant funding is secured will not have a solution.

Wellhead treatment:

- The potential high operations and maintenance costs associated with wellhead treatment make this option unsustainable in the long-term. The Central Coast RWQCB has not confirmed if onsite disposal of the brine waste would be allowed, so waste hauling has been budgeted.
- Domestic wells that currently meet regulatory standards but experience new water quality issues, such as increasing levels of nitrate or the discovery of a new contaminant like 123-TCP or perchlorate, after the grant funding is secured will not have a solution.

POU/POE treatment:

- The high operations and maintenance costs associated with POU/POE treatment make this option unsustainable in the long-term.
- Domestic wells that experience new water quality issues, such as increasing levels of nitrate or the discovery of a new contaminant like 123-TCP or perchlorate, after the grant funding is secured will not have a solution.
- Domestic wells for which POU treatment is currently technically feasible may experience increasing nitrate concentrations in the future, and POU treatment may no longer provide water that meets the regulatory standards.

4.1.3 Implementation challenges and considerations

Each alternative faces challenges and barriers to implementation, which are summarized in Table 25, and expanded upon below. The long-term sustainability and reliability issues associated with each alternative are discussed in Section 4.1.2 and are not listed here.

Physical consolidation:

- High estimated capital costs will require SWRCB approval at the Board level because they are above the $80,000 per connection threshold

- Capital cost uncertainties associated with pipelines along Highway 1, private land, and protected habitat
- Dependent on the successful completion of the Springfield Project
- Securing a long-term safe water supply for the secondary water source in Scenario B may depend on the completion of a consolidation project between the Sunny Mesa and Pajaro Systems, which does not have a start date
- Will require a permit amendment with the Division of Drinking Water
- Likely to require property purchase for a new well
- Requires easements through private property for pipeline construction
- Likely to require permitting performed by Monterey County's Local Coastal Program and possibly the Coastal Commission for several aspects of the project

New CWS:

- High estimated capital costs that will exceed that of physical consolidation and require SWRCB approval at the Board level because they are above the $80,000 per connection threshold
- Would require a new water system permit with the Division of Drinking Water
- Likely to require the purchase of two properties for new wells and a storage tank
- Will require the installation of a storage tank
- Requires easements through private property for pipeline construction
- Likely to require permitting performed by Monterey County's Local Coastal Program and possibly theCoastal Commission for several aspects of the project

Replace private wells:

- High estimated capital costs will require SWRCB approval at the Board level for private wells and LSWSss because they are above the $80,000 per connection threshold
- Successful replacement wells will likely be infeasible in some portions of the project area, due to poor water quality. Because of cost constraints, such wells are assumed to be developed using the rotary mud method that may not be able to only produce water from zones of the aquifer that produce high quality water. Therefore, even in locations where there is high quality water, replacement wells may still not produce safe water. Wellhead treatment at private wells:
- High estimated O&M costs
- Requires frequent RO brine disposal
- Sustainability issues with decentralized systems requiring substantial O&M costs and support

POU/POE treatment at households:

- Not an allowable option for compliance for SSWS and LSWS in Monterey County.
- Infeasible for 12 of 22 wells, or 25 of 49 households, for which well testing data is available due to high nitrate
- Largely unproven in California for private well communities
- Growth of microorganisms in GAC filters is a potential concern

Table 25. Summary of the benefits, challenges, and costs per household for each alternative.

Green	Costs anticipated to be grant funded for the community.
Yellow	Costs anticipated to be grant funded for households that qualify based on ability to pay.[1]
Pink	It is uncertain which O&M costs may be eligible for state funding.

Alternative	Benefits	Disadvantages and Challenges	System type[2]	Annual O&M per house ($/yr)[3]	Monthly O&M per house ($/month)[3]	Capital Costs per house ($)
Physical consolidation (Connect to Springfield Project)	•Operated by an experienced utility, which will likely improve long-term sustainability. •Storage, booster pumps and one well would be shared with an existing system. •Low estimated O&M costs •Scenario B would regionally consolidate the project area with two additional systems, increasing the reliability of each system. •Scenario B would be more reliable in the long term, because it would rely on more inland wells less vulnerable to seawater intrusion.	•High initial construction costs •Capital cost uncertainties associated with pipelines crossing highways, private land, and protected habitat. •Scenario A would rely only on wells near the coast that could have water quality degrade in the future from seawater intrusion. •Scenario B is dependent on the completion of a consolidation project between Sunny Mesa and Pajaro Water Systems that is without a start date.	CWS	Based on PSMCSD Water Rates[4] (See Table ES-4 for examples)		Scenario A: 154,000; Scenario B: 149,000[6] (Community Infrastructure) Lateral Pipe Installation & Well Destruction: 21,000 Lateral Pipe Installation & Well Isolation: 10,000 + premise plumbing modifications [7]
New CWS	•Another experienced water utility may be able to operate the system, which would likely improve long-term sustainability. •Water quality monitored and reported to the state •Low to moderate estimated O&M costs	•High initial construction costs •Likely only eligible for state funding if physical consolidation is not feasible •If another experienced water utility is not able to operate the system, it would likely be difficult and time consuming to develop a new and sustainable utility. •Requires the development of a new permit or modifying an existing permit that may delay implementation	CWS	Based on PSMCSD Water Rates[4] (See Table ES-4 for examples)		233,000[6] (Community Infrastructure) Lateral Pipe Installation & Well Destruction: 21,000 Lateral Pipe Installation & Well Isolation: 10,000 + premise plumbing modifications[7]
Replace private wells	•Does not require new community-level water infrastructure •Low estimated O&M costs	• Each well owner will be responsible for maintaining their well and water system •Water quality in replacement wells could degrade in the future •Replacement wells with good water quality will likely be infeasible in some portions of the project area	PW	692	58	166,000
			LSWS	294	25	63,000
			SSWS	154	13	37,000
Wellhead treatment	•Can treat other contaminants that may reach wells in the future	•High estimated O&M costs •Requires frequent disposal of waste from treatment systems •Could be difficult to maintain many individual decentralized treatment systems that require substantial O&M costs and support	PW[5]	86,200	7,180	165,000
			LSWS[5]	39,700	3,310	142,000
			SSWS[5]	37,100	3,090	78,900
			PW[5]	13,300	1,110	707,000
			LSWS[5]	12,400	1,030	307,000
			SSWS[5]	10,200	850	165,000

POU/POE	•Low capital costs	•Not an allowable option for compliance ofSSWS and LSWS in Monterey County •Infeasible for 12 of 15 households that need treatment due to high nitrate •Could be difficult to maintain many individual decentralized treatment systems that require substantial O&M costs and support •Growth of microorganisms in granular activated carbon (GAC) filters is a potential concern	PW	9,210 indoor only	770 indoor only	70,500[8]

[1] The State Water Board Division of Financial Assistance (DFA) is in the process of updating their funding policy for work on private property and has provided preliminary guidance with implications for this project (Email Correspondence from the Assistant Deputy Director, DFA, on 10/14/2021). In the updated funding policy, funding eligibility for work on private property will normally be determined on a community basis meaning that most households in this project would be eligible since the area is classified as a disadvantaged community (DAC). There may be some exceptions, such as very costly work on private property or in cases where block group income data is not representative of individual households in the project area. In these cases, funding eligibility would be based on the property owner's ability to pay. DFA is working to formalize this guidance into a written policy and CWC is seeking confirmation whether this policy applies to all costs on private property (lateral, well destruction and backflow preventer, and what the criteria may be identifying exceptions where ability-to-pay information is required).

[2] Community Water System (CWS), Private Well (PW), Local Small Water System (LSWS), State Small Water System (SSWS). For cost estimation, it is assumed that each PW, LSWS and SSWS serve an average of 1.3, 3.4 and 6.5 households respectively based on the average number of households each type of system serves in the area.

[3] O&M costs assume 150 gallons per person per day water use for indoor and outdoor purposes except where indoor only use is noted. Indoor water use only assumes 55 gallons per person per day.

[4] Pajaro Sunny Mesa Community Services District. "Exhibit "A" Pajaro/Sunny Mesa Community Services District Rate Schedule. Effective Date July 1, 2021. http://pajarosunnymesa.com/uploads/Rate%20Schedule%207-2021%20to%206-2022.pdf".

[5] Costs for offsite disposal are the largest component of O&M costs for Vendors A and B and may be avoidable if the Central Coast RWQCB allows onsite disposal of brine.

[6] These capital costs are associated with work not performed on private property such as installation of water mains. Such costs would be eligible for grant funding for all households regardless of economic status. Scenario A involves developing a new well to provide a second water source whereas Scenario B would connect the project area to the Sunny Mesa and Pajaro Systems if they consolidate in addition to connecting to the Springfield Project instead of developing a new well.

[7] These capital costs are associated with work performed on private property such as constructing a service line, demolition of an old well, or the installation of a backflow prevention device. When determining eligibility for state funding for these costs, a property owner's ability to pay for these costs themselves would be considered. If a property owner chooses to keep their well for outdoor water use, they would be responsible for the installation and maintenance of a backflow preventer to keep the well isolated from the public water system as well as any plumbing on their premises needed to avoid blending water from their private well with water from the community water system. The costs shown assume the work is performed by a contractor. If an owner obtains a simple Monterey County construction permit, which costs approximately $240, and installs the service line themselves, the assumed $6,500 cost for service line construction may be substantially reduced. The cost shown for lateral installation and well destruction does not include the full cost of destroying one well, because some wells serve multiple households. The cost shown represents the cost of destroying the approximately 50 wells in the project area divided among the 88 households.

[8] POU/POE capital costs include site assessments, technical oversight, diagnostic water quality sampling, an allowance for improvements to existing wells and storage tanks, project management, and replacement at 10 years.

4.1.4 Schedule to implement, including estimated timeline for relevant permits

Any of the alternatives are expected to take years to implement. Replacement of existing domestic wells, wellhead treatment, and POU/POE are ranked as not favorable for schedule. Although initiating implementation of these alternatives is likely to take less time, the one-on-one outreach, enrollment, ability-to-pay verification, and implementation (including securing access agreements, installation, monitoring, and maintenance) required to complete these solutions for all households in the area is likely to take years, and solutions may be infeasible or too costly for some households. A visual representation of example timelines can be found in Figures 20 through 22. Note that timing of physical consolidation with the Springfield Project is dependent upon the completion of that project, and for the Scenario B consolidation it relies on the completion of a consolidation project between the Sunny Mesa and Pajaro Systems

Figure 20. Example timeline for physical consolidation or new CWS.

Phase of work	2022	2023	2024	2025	2026	2027
Design	30%		60%, 90%, 100%			
Grant funding						
Land acquisition for well (Scenario A only)						
Negotiate and acquire easements						
County planning permitting						
CEQA permitting						
Coastal development permitting						
Community well construction						
Pipeline construction						
Monterey County Environmental Health Bureaupermitting/approval						
Division of Drinking Water permitting/approval						

Figure 21. Example timeline for replacement of existing wells and wellhead treatment

Phase of work (alternative(s) it applies to)	2022	2023	2024	2025	2026
Design	30%		60%, 90%, 100%		
Grant funding					
County planning permitting					
CEQA permitting					
Coastal development permitting					
Monterey County Environmental Health Bureau drinking water system permit (new well) or permit amendment (wellhead treatment)					
Beginning of installation					

Figure 22. Example timeline for POU/POE treatment.

Phase of work	2022	2023	2024	2025
Design				
Grant funding				
Monterey County Environmental Health BureauCoordination				
Beginning of installation				

4.1.5 Addresses all homes in the project area

Physical consolidation with the Springfield Project, a new CWS, and wellhead treatment are considered technically feasible for all impacted wells and households in the project area. Replacement of existing wells is not a feasible option for the entire project area, as shown in Figure 11. By contrast, POU treatment is only technically feasible for 3 of the 15 wells that need treatment and if nitrate concentrations in those wells are increasing, then POU treatment would be even less feasible in the future. Not enough water quality data is available to determine if nitrate concentrations in a given well are increasing.

Both physical consolidation and the new CWS options will provide water that meets regulatory standards to all homes in the project area that choose to participate. Replacing existing wells and wellhead treatment are unlikely to address all of the water quality issues in the project area because the grant funding will be dependent on the household's ability to pay, which will likely limit who will choose to participate in the project. Alternatives that do not address all homes will not be considered further, except as in combination with another alternative where the two alternatives together would address all homes.

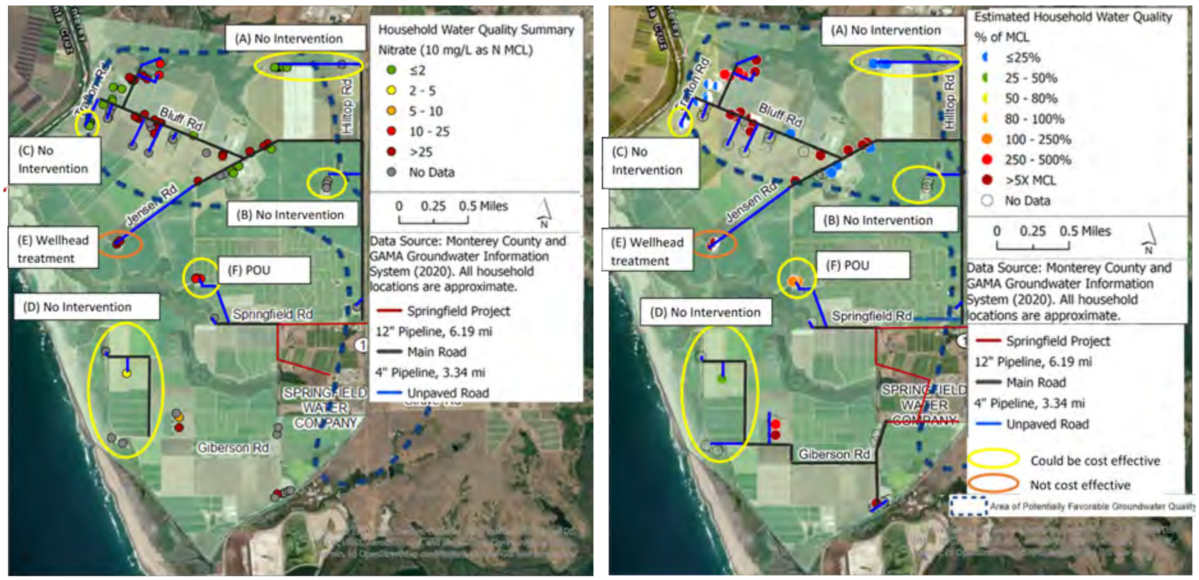
4.2 Combinations of Alternatives

The combination of POE and POU treatment is a cost competitive option from a capital cost perspective. However, it is limited in its potential application. Of the 23 wells tested for nitrate, 12 have concentrations above the treatable thresholds, while 3 wells are above the regulatory limit and below the treatable threshold for POU treatment. So out of the 15 wells that need nitrate treatment, only 3 wells could be considered for POU treatment. Additionally, the O&M costs are greater than any of the non-treatment alternatives if only indoor water use is planned. In the past, grant funding has only covered capital costs and not the ongoing annual O&M. Also, as previously discussed above, POU/POE treatment units are not considered as a method for compliance with the drinking water regulations for State Small Water Systems and Local Small Water Systems in Monterey County.

Well replacement, consolidation with the Springfield Project, or the development of a new CWS appear to be the options that are the most viable from a community cost perspective, as O&M costs are the least expensive and capital costs are somewhat competitive with the other alternatives. Existing domestic well replacement has the disadvantage of grant funding being contingent on the household's financial eligibility, whereas physical consolidation and a new CWS would benefit the entire community. Additionally, some parts of the project area are not suitable for drilling a replacement well due to possible poor water quality and drilling in the areas that may be suitable does not guarantee acceptable water quality. Therefore, consolidation with the Springfield Project or the development of a new CWS may be the most favorable alternatives.

Corona evaluated whether the capital cost of physical consolidation with Springfield Project or the cost of a new CWS could be reduced by combining a consolidation alternative with non-consolidation alternatives for homes that are further away from other homes. For wells that meet all water quality standards and are geographically separated from other homes, not providing an intervention is an option that could also be considered with a consolidation alternative for households served by wells that are out of compliance. However, complete water quality data is not available for many of the homes where not providing an intervention could be feasible. Further water quality testing is needed before this option should be considered further as discussed below. Homes that were considered for a non-consolidation alternative based on distance to reduce overall costs are shown in Figure 23.

Figure 23. Map of nitrate concentrations and highest contaminant concentration observed as a percentage of the MCL. It could be cost effective to omit the locations circled in yellow (Could be cost effective) from the possible physical consolidation project by providing a different solution or no intervention for the circled region n. It would not be cost effective to omit the location circled in orange (Not cost effective) from the consolidation project and instead use wellhead treatment, which is the only feasible non-consolidation alternative for this location.



Consolidation with wellhead treatment.

Figure 23 Location (E) has a cluster of three homes relying on a LSWS. If a non-consolidation alternative was used here to avoid the need to extend the pipeline by approximately 0.55 miles from the next closest home as well as a service line, well destruction, and meter installations, a capital cost savings of approximately $471,000 would be realized. Because nitrate concentrations are far above the threshold that is acceptable for POU treatment and the location is outside the area of potentially favorable groundwater quality, the only viable option would be wellhead treatment. The capital costs of the Vendor B Wellhead Treatment System, which has a lower 20-year NPW cost relative to the Vendor A system (Figure 19), would still be more expensive at a cost of approximately $1.04 million. Moreover, the O&M costs would be more than 4.5-times as expensive as that of physical consolidation (Figure 18). Therefore, including this location in a consolidation alternative will be more cost effective than implementing wellhead treatment at this location. Since, in comparison to this location, all other locations that would require wellhead treatment are closer in distance to the rest of the distribution system and thus would be less expensive to consolidate, consolidation will be more cost effective than wellhead treatment at other locations as well.

Consolidation with POU treatment.

Figure 23 Location (F) has a cluster of three homes that have nitrate at concentrations that could be treated by POU treatment to an acceptable level, and POE treatment is unnecessary because 123-TCP sample results from the well supplying these homes were below the detection limit. The total capital costs and 20-year NPW costs to provide POU treatment at these households would be approximately $51,000 and $1142,000, respectively. These costs would be less than the capital and 20-year NPW costs to provide physical consolidation with the Springfield Project, which would be approximately $872,000 and $955,000, respectively. Therefore, POU treatment at this location in combination with consolidation in the rest of the system could reduce costs. However, for the reasons discussed above under Section 4.1.3 Implementation Challenges/Barriers, POU treatment is not recommended and should only be considered as a temporary solution prior to a more permanent solution.

Consolidation with No Intervention for Households with Adequate Water Quality

In Figure 23, locations (A), (B), (C), and (D) are far enough away from the other homes that non-consolidation options should be considered, and preliminary water quality data suggests that it is possible that their drinking water is in compliance and not providing an intervention might be appropriate. By avoiding the consolidation costs at these locations the capital costs savings would be around $1.30 million, $240,000, $264,000, and $1.76 million, respectively, for a total cost savings of approximately $3.57 million or 23%. In addition, households that utilize their existing wells would maintain lower O&M costs.

While a reduction in total costs would be realized by not consolidating these distal locations, the costs of consolidation normalized by the number of consolidated households could increase slightly if locations (A), (B), and (C) were not included but would decrease if location (D) was not included in the consolidation project. For example, if all 88 households were consolidated, the total capital costs would be $15.47 million corresponding to $176,000 per household, which would change as follows by omitting from the consolidation project:

- Location (A) with 8 households would result in consolidation costs of $14.17 million for 80 households or $177,000 per household
- Location (B) with 3 households would result in consolidation costs of $15.23 million for 85 households or $179,000 per household
- Location (C) with 6 households would result in consolidation costs of $15.20 million for 82 households or $185,000 per household
- Location (D) with 4 households would result in consolidation costs of $13.71 million for 84 households or $163,000 per household

Thus, reductions in total consolidation costs by omitting one of these locations should be considered alongside changes in capital costs on a per-consolidated-household basis. Also, only location (C) has water quality data for the well serving all six households. In location (B) there is no water quality data for the well serving this location, location (D) has data for only 1 of 4 wells, and location (A) is missing data for 1 of 2 wells. Prior to deciding to leave locations (A), (B), and (D) out of any consolidation projects, groundwater sampling must be performed to ensure adequate water quality. In the case of location A, however, the cluster of households served by a SSWS that have adequate water quality could avoid the need for consolidation even if the household without water quality data to the east was unable to proceed with the no-intervention alternative due to contamination. However, pursuing a no-intervention alternative at any location may not be sustainable as the water quality at these wells could change due to seawater intrusion, contaminant plume migration, or other factors. Therefore, even in the case of location (C), it may still be advantageous to consolidate these households.

4.2.1 Water Quality Data Gaps

For wells to be considered for a no-intervention alternative and to not be consolidated with the Springfield Project or a new CWS, the following water quality analyses are required at a minimum to demonstrate water quality is adequate to proceed with no intervention:

- General mineral, general physical, and inorganic testing
- Metals
- Hexavalent chromium
- Perchlorate
- 123-TCP, low level method
- Volatile organic compounds
- Heterotrophic plate count
- A semi-quantitative analysis for total coliform and *E. coli*, such as Quanti-Tray
- Perfluorinated compounds

Some of the wells that could be considered for a no-intervention alternative have not been tested for many of these constituents. Some wells that could be considered for no intervention have been shown to have acceptable levels of some of these contaminants (e.g., 123-TCP) but no data exists for any of these wells for several contaminants (e.g., perfluorinated compounds).

4.3 Summary of feedback from community meetings and surveys with community members.

As discussed in Section 1.1, community meetings and one-on-one surveys were conducted with community members to answer questions and receive feedback on the alternatives. That feedback is summarized in Appendix F.

4.4 Summary of the Alternatives Analysis and Recommended Alternatives for Further Consideration

Considerations of the criteria above for each alternative and combination of alternatives are summarized in Table 26.

Table 26. Summary of the alternatives analysis

	Non-Treatment Alternative			Treatment Alternatives		Combination of Alternatives			
Criteria	**Physical Consolidation with Springfield**	**New Community Water System**	**Replacing Existing Wells**	**Wellhead Treatment**	**POU/POE Treatment**	**Consolidation or New CWS and Replacing Existing Wells**	**Consolidation or New CWS and Wellhead Treatment**	**Consolidation or New CWS and POU/POE Treatment**	**Consolidation or New CWS and No Intervention for some wells in compliance**
Grant funding to cover all homes	Somewhat favorable	Somewhat favorable	Not favorable	Not favorable	Not favorable	Somewhat favorable	Somewhat favorable	Somewhat favorable	Somewhat favorable
Capital cost	Less favorable	Less favorable	Somewhat favorable	Less favorable	Somewhat favorable	Less favorable	Less favorable	Less favorable	Somewhat favorable
Annual operations and maintenance cost	Somewhat favorable	Somewhat favorable	Favorable	Not favorable	Less favorable	Somewhat favorable	Less favorable	Somewhat favorable	Somewhat favorable
Estimated monthly water rate charged to households	Somewhat favorable	Somewhat favorable	Favorable	Not favorable	Less favorable	Somewhat favorable	Less favorable	Somewhat favorable	Somewhat favorable
Schedule to implement, including estimated timeline for relevant permits	Less favorable	Less favorable	Not favorable	Not favorable	Less favorable	Not favorable	Less favorable	Less favorable	Less favorable
Implementation challenges and considerations	Somewhat favorable	Somewhat favorable	Not favorable	Not favorable	Not favorable	Somewhat favorable	Not favorable	Not favorable	Somewhat favorable
Long-term sustainability / reliability	Favorable	Favorable	Somewhat favorable	Not favorable	Not favorable	Somewhat favorable	Not favorable	Not favorable	Somewhat favorable
Addresses all homes	Favorable	Favorable	Not favorable	Favorable	Not favorable	Favorable	Favorable	Favorable	Favorable
Recommended for further consideration	Yes	Yes	No	No	No	No	No	No	Yes
Notes	Recommended alternative	Second choice alternative	Cannot reliably provide safe water to all homes in the project area	Cost prohibitive	Cannot provide safe water to all homes in the project area; grant eligibility depends on income; O&M costs are high	Less sustainable than physical consolidation only and limited opportunities to reduce consolidation costs with a new well	Unable to decrease costs relative to physical consolidation alone. Also has other drawbacks.	Not a long-term solution and may not be grant eligible	Needs further investigation. Could reduce capital and O&M costs, but may be less resilient/sustainable than providing a connection to a community water system for all households.

Key	
(green)	Favorable
(yellow)	Somewhat favorable
(orange)	Less favorable
(red)	Not favorable

When considering all of the criteria, the recommended alternative is physical consolidation with the Springfield Project. This alternative is ranked above a new CWS because the capital cost is lower and the ongoing cost to residents is the same. Also, consolidation with the existing Springfield System would likely be more sustainable as it would be a single, larger system to manage and bring mutual benefits to the existing system such as providing well redundancy. Lastly, state grant funding would likely only be available for a new CWS if physical consolidation is not feasible. Both physical consolidation Scenarios A and B should be considered further, though Scenario B is the preferred option. Scenario B ranks better as a long-term and reliable solution as the project area would also be consolidated with systems that have groundwater sources that are further inland and may be less susceptible to seawater intrusion. However, Scenario B depends on the completion of a consolidation project between the Sunny Mesa and Pajaro Systems, which does not have a start date. Therefore, Scenario A should be considered alongside Scenario B in the event that Scenario B cannot be pursued because, for instance, consolidation between the Sunny Mesa and Pajaro Systems is determined to be infeasible or its implementation timeline is substantially delayed. Also, both scenarios are contingent on the successful completion of the Springfield Project. If for some reason this alternative is not viable or its timeline is delayed substantially, then the new CWS alternative can be pursued.

Although the other standalone alternatives each have advantages with respect to one or more of the criteria, they are ranked less favorable or unfavorable with respect to their ability to provide a solution for all households, reliably and sustainably provide safe water, and/or provide an affordable solution. Since these criteria are most critical, these alternatives on their own are not recommended. In addition, combining these alternatives with physical consolidation or development of a new CWS are not recommended for many of the same reasons they are not recommended as a standalone, project-wide alternative and/or they may not be able to meaningfully reduce the costs of consolidation with the Springfield Projector a new CWS.

As discussed in section 4.2, it may be possible to reduce capital costs of one of these consolidation or community water system-based alternatives by not providing an intervention for groups of households that are (i) geographically distant from other households and (ii) served by wells with adequate water quality. However, incomplete or no water quality data is available to confirm if providing no intervention would be feasible for any of the potential locations that might fit this criteria. Therefore, it is recommended that the water quality in the wells that serve these households be further investigated before this alternative is deemed to be a viable option.

5. Next Phase of Work

A summary of the phases of work is shown in Table 27, which shows that this Final Report was developed using several iterations of community and stakeholder feedback through report reviews and meeting. In the final iteration, the Public Draft Report was reviewed by community members and representatives from Monterey County, the SWRCB, Pajaro Sunny Mesa Community Services District, and Pajaro Valley Water Management Agency. Revisions were made and this FinalReport was issued. The findings in this Final Report will be presented to community members at a community meeting.

Table 27. Project steps and timeline.

Task	Feb	Mar	Apr	May	Jun/Jul	Aug/Sep	Oct/Nov
Scope of Work	[community meeting]						
Overview of Alternatives Draft Report			[deliverable]	[review and comment]	[community meeting] [community comment]		
Administrative Draft Report					[deliverable] [review and comment]		
Public Draft Report						[deliverable] [community meeting] [community comment] [review and comment]	
Final Report							[deliverable] [community meeting]

[deliverable icon] indicates deliverable

[community meeting icon] indicates community meeting

[community comment icon] indicates community comment

[review and comment icon] State Water Resources Control Board, Monterey County and Pajaro Sunny Mesa Community Services District review and comment

Appendix A - Water Quality Maps and Supplemental Data

Table A-1. Summary of bacteriological data. *Data source: Monterey County and CWC POE pilot project.*

Water System	**2020-2021 Total Coliform/ *E.coli***	**2019-2020 Total Coliform/ *E.coli***	**2018-2019 Total Coliform/ *E.coli***	**2017-2018 Total Coliform/ *E.coli***	**2016-2017 Total Coliform/ *E.coli***
Bluff Rd WS #2	No data available	No data available	Absent/ Absent	Absent/ Absent	Present/ Absent
Bluff Rd WS #3	Absent/ Absent	No data available	Absent/ Absent	Present[1]/ Absent	Absent/ Absent
Bluff Rd WS #4	No data available	No data available	Absent/ Absent	No data available	Present/ Absent
Jensen Rd WS #1	Absent/ Absent	No data available	Absent/ Absent	Absent/ Absent	Present[2]/ Absent
Jensen Rd WS #2	Absent/ Absent	Absent/ Absent	Absent/ Absent	Absent/ Absent	No data available
Salinas Rd WS #14	No data available	No data available	Absent/ Absent	Present[3]/ Absent	Present[4]/ Absent
Trafton Rd WS #7	No data available	No data available	Absent/ Absent	Absent/ Absent	Absent/ Absent
Private Domestic Wells	**2020 Total Coliform/ *E.coli* (Colony Forming Units/100 mL)**				
CCDW046	133.4/<1				
SV015	<1/<1				
CCDW043	150/2				
CCDW133	<1/<1				
CCDW135	<1/<1				
CCDW042	<1/<1				

[1]After the present result for total coliform in quarter 1 for Bluff Rd WS #3, a repeat sample was collected approximately 3 weeks later that was absent for total coliform and *E.coli*. All other quarterly sample results for 2017/2018 were absent for total coliform and *E.coli*.
[2]Routine sample results in quarter 2 and quarter 3 were present for total coliform, but absent for *E.coli*. Repeat tests were taken a few days later and the results were absent for total coliform and *E.coli* in both quarters. All other quarterly sample results for 2016/2017 were absent and *E.coli*.
[3]After the present result for total coliform for Salinas Rd WS #14 in 2017/2018, a repeat sample was collected 5 days later that found total coliform and *E.coli* were below the detection limit (absent).
[4]After the present result for total coliform for Salinas Rd WS #14 in 2016/2017, a repeat sample was collected approximately two weeks later that found total coliform and *E.coli* were below the detection limit (absent).

Figure A-1. Map of highest historical arsenic results. (Sample collection dates range from 3/13/2014 to 11/13/2020 for the available water quality data for all of the wells). Number of wells tested = 22.

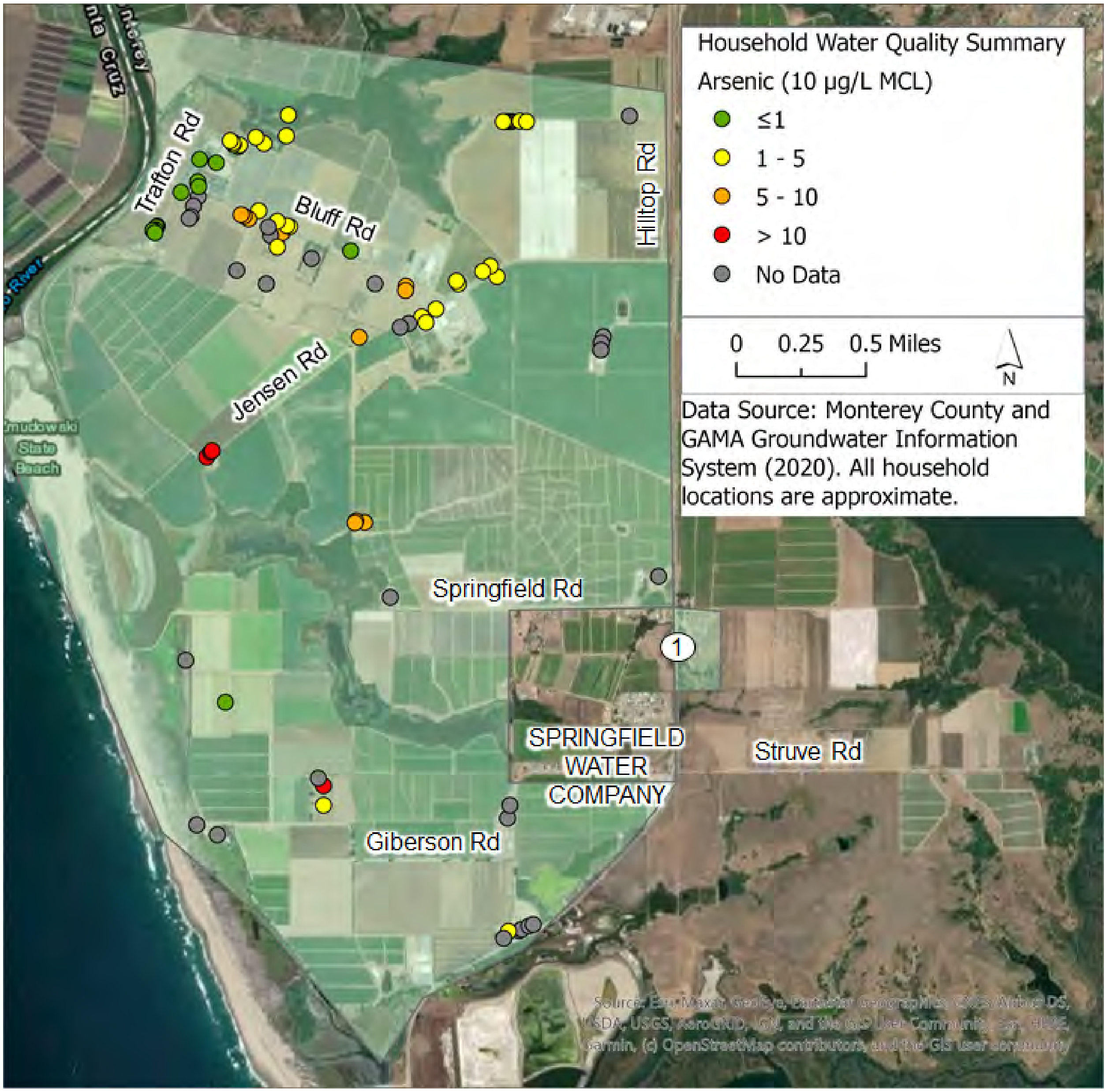


Figure A-2. Map of highest historical nitrate results. (Sample collection dates range from 3/13/2014 to 11/13/2020 for the available water quality data for all of the wells). Number of wells tested = 22.

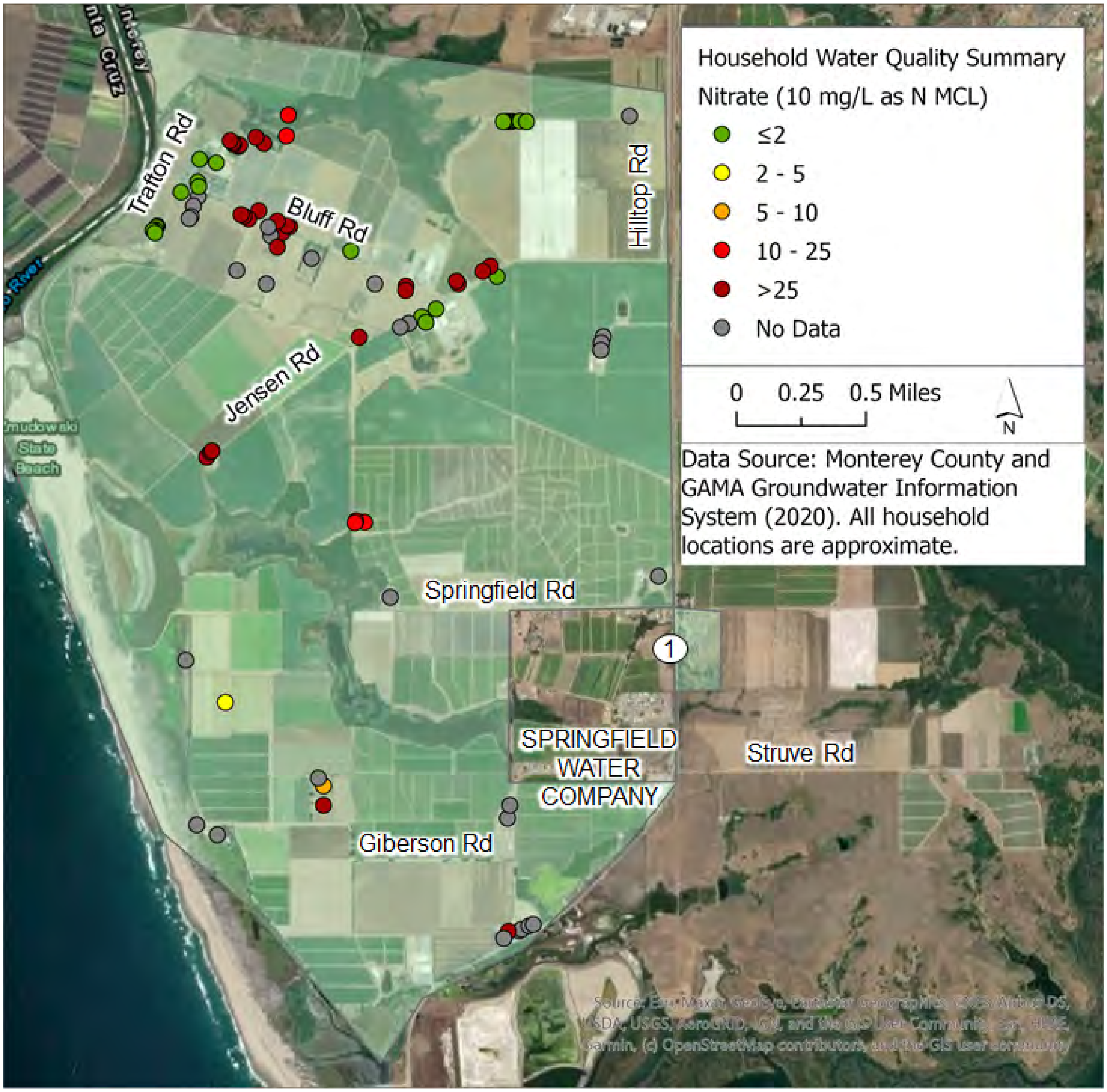


Figure A-3. Map of highest historical 123-TCP results. (Sample collection dates range from 3/13/2014 to 11/13/2020 for the available water quality data for all of the wells). Number of wells tested = 18.

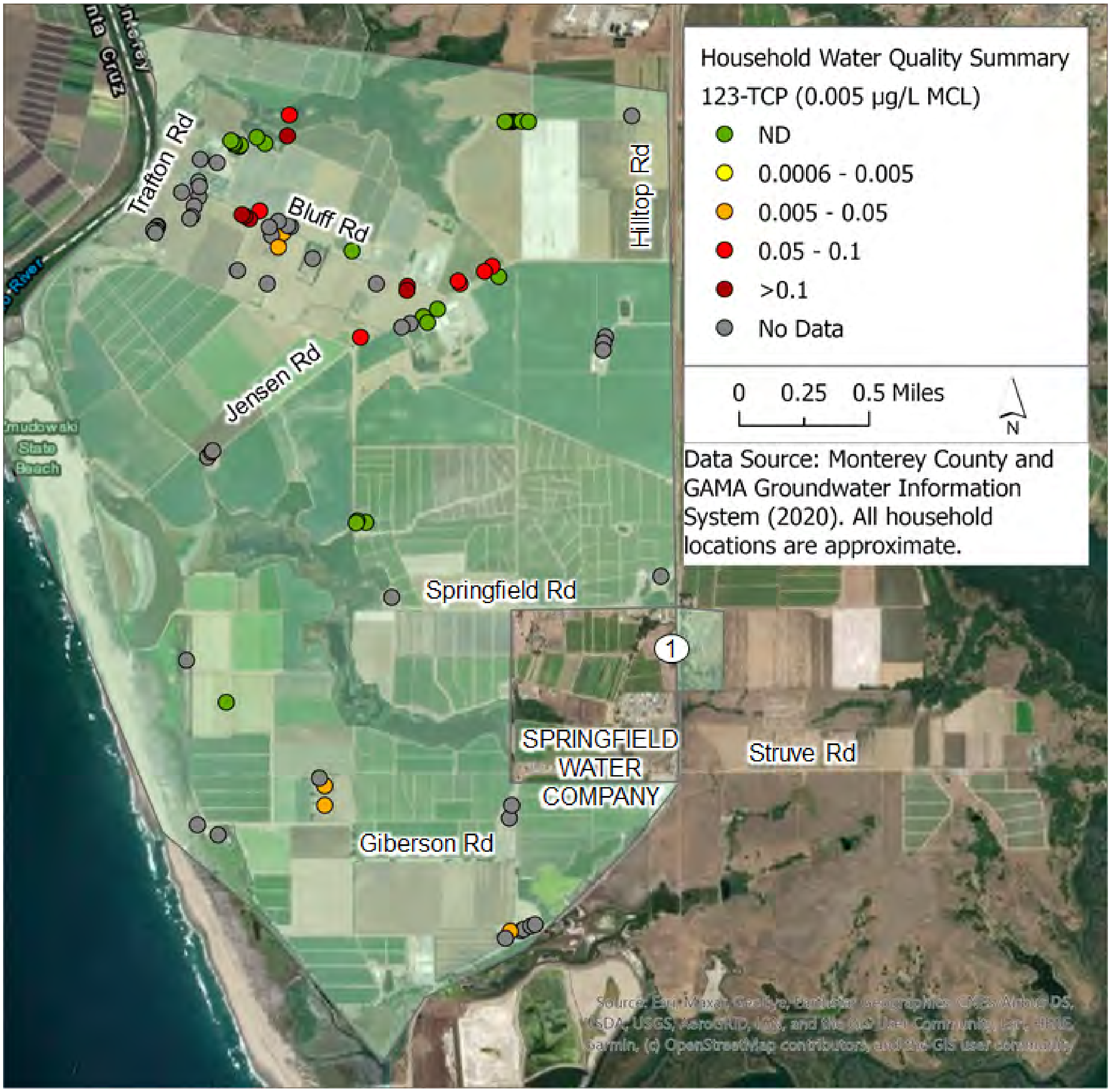


Figure A-4. Map of highest historical TDS results. (Sample collection dates range from 3/13/2014 to 11/13/2020 for the available water quality data for all of the wells). Number of wells tested = 18.

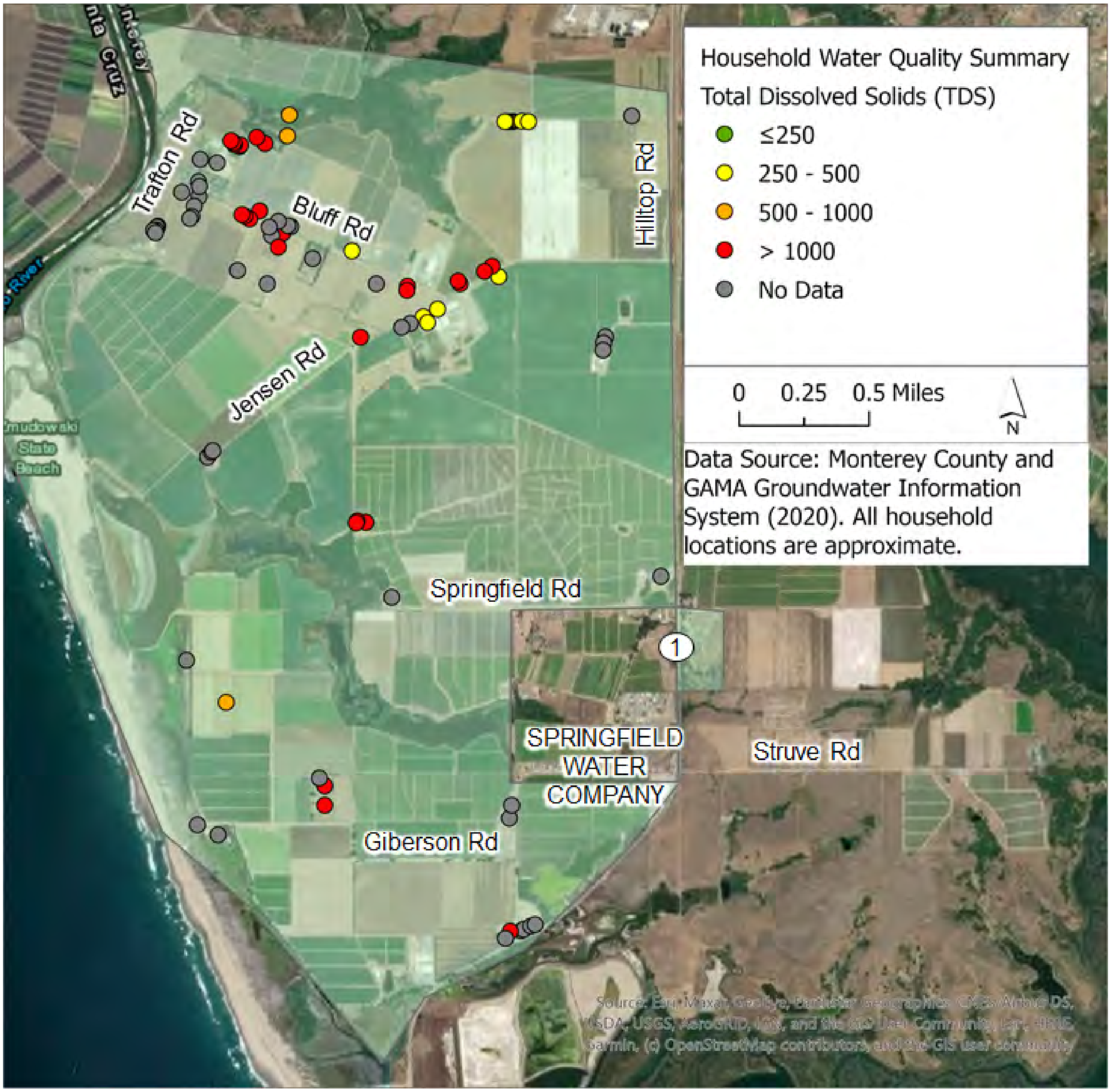
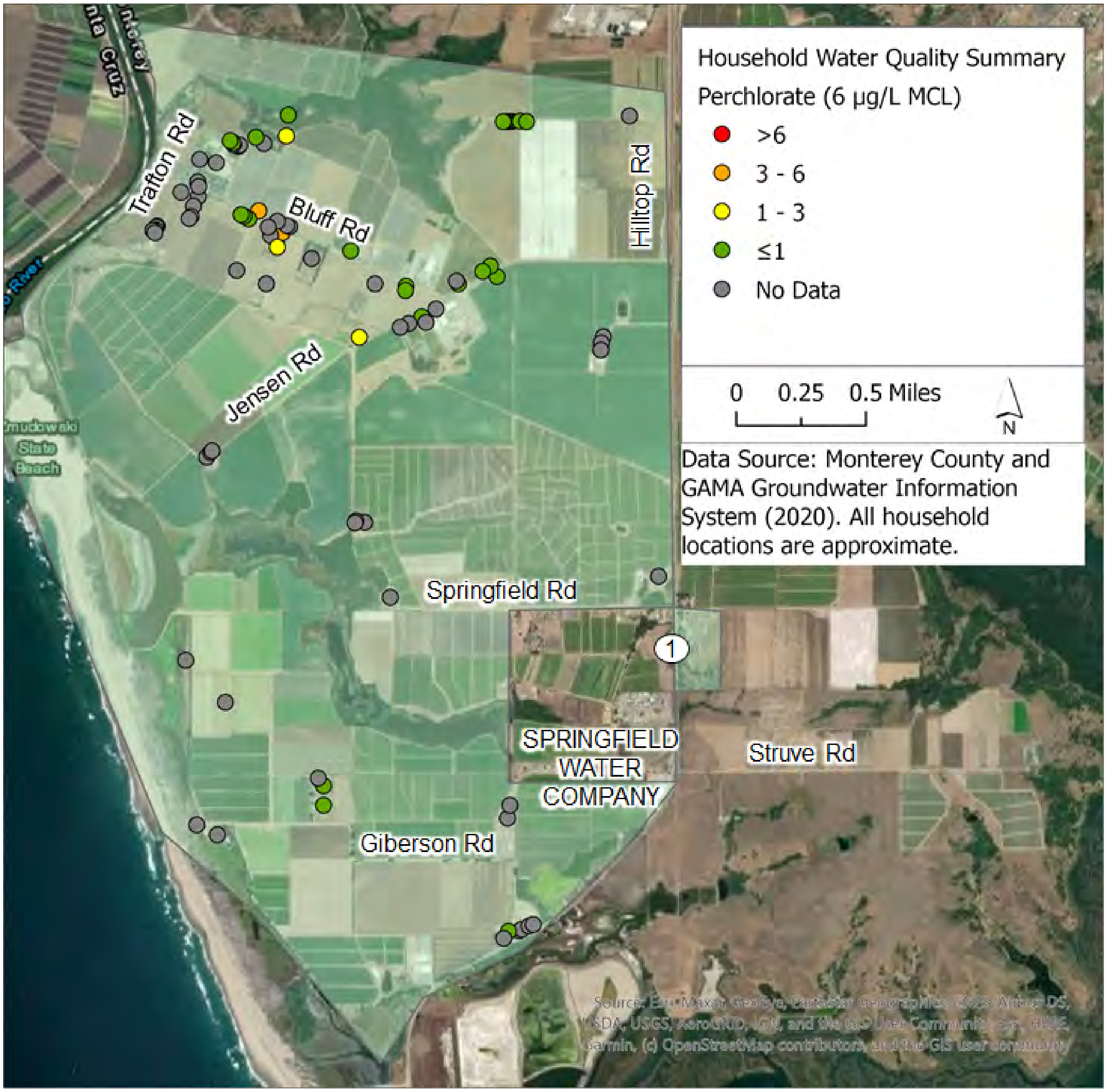


Figure A-5. Map of highest historical perchlorate results. (Sample collection dates range from 3/13/2014 to 11/13/2020 for the available water quality data for all of the wells). Number of wells tested = 18.



Appendix B - Summary of Well Conditions in the Point of Entry Pilot

Table B-1. Existing well and infrastructure condition assessment from site evaluations from CWC's 123-TCP POE Treatment Pilot Project.

Well Information			**Condition assessment**						
Well	**Capacity (gpm)***	**# of conn.**	**Wellhead**	**Pumps/ Motors**	**Piping**	**Space available for treatment?**	**Electrical**	**Treatment at Wellhead or POE**	**Tanks**
A	>60	2	Agricultural well converted for domestic use, poor condition	Submersible pump, non- functional pressure gauge	3/4 to 2" galvanized steel; 3/4" copper; 3/4 to 1" sched. 40 PVC	Yes, concrete pad needed	Sub-electrical panel and control box.	None	None
B	10.3- 11.5	3	Domestic well, good condition	Submersible pump pressurizes to 35 and 55 psi.	1" galvanized steel; 3/4" copper; 3/4" sched. 40 PVC	Yes, concrete pad needed	Electrical panel and control box	Water softening	None
C	11.1- 12.5	1	Domestic well, covered well in good condition	Submersible pump pressurizes between 40 and 60 psi.	2" galvanized steel, 2" stainless steel , 1.5" schedule 40 PVC pipe, ½" copper	Yes, concrete pad available, possible in well shed	Electrical panel and control box	In-line filter	None
D	8.6- 9.4	2	Agricultural and domestic well, poor condition	Surface mounted turbine pump and a booster pump after water tank	2"and 3"galvanized steel, 1.25 "flex metal pipe,1" and 3" schedule 40 PVC , and ¾" copper	Yes, location with concrete pad may be available	Electrical breaker and control box, sub-panel	In-line filter	10,000 gal domestic tank.
E	10.7- 11.5	1	Domestic well, good condition	Submersible pump pressurizes at 40 and 60 psi	1" and 1.25" schedule 40 PVC	Yes, location with concrete pad may be available	Electrical panel and control box	Future RO system	Several storage tanks
F	3.3- 3.5	1	Domestic and irrigation well in moderate condition	Submersible pump, non-functional pressure gauge	1" galvanized steel, 1" schedule 40 PVC pipe	Yes, possible well house.	Electrical panel and control box	In-line filter	None
G	3.75- 4.25	2	Domestic well in moderate condition	Submersible pump pressurizes between 40 and 60 psi.	1 ¼ " galvanized steel, ¾ & 1 ¼ " schedule 40 PVC , 1" schedule 80 PVC, and 1" copper	Yes, location with concrete pad may be available	Electrical panel and control box	None	None

*Approximate capacities were measured with a field "bucket test" from the closest tap near the well. Actual well pump capacity may be greater if flow was limited by the size of the tap used for the bucket test

Appendix C - Hydrogeology Analysis from KYLE Groundwater, Inc.

C.1. Hydrogeology

C.1.1 General Geologic Setting

The project area is located within the southern portion of the Pajaro Valley Groundwater Subbasin (hereafter referred to as the PVGB), one of two subbasins of the Corralitos Groundwater Basin (see Figure C-1; all figures are located at the end of this appendix). The PVGB encompasses approximately 117 square miles of Santa Cruz, Monterey, and San Benito Counties and is bounded to the west by Monterey Bay and to the east by the San Andreas Fault, pre-Quaternary Formations, and the Santa Cruz Mountains. The southern boundary is formed by surface water and groundwater divides separating the PVGB from the 180/400 Foot Aquifer and Langley Area Subbasins of the Salinas Valley Groundwater Basin. The northern boundary largely consists of the jurisdictional boundary of the Pajaro Valley Water Management Agency (PVWMA), and partly by the drainage divide between Aptos Creek and Pajaro River (PVWMA, 2016).

The primary geologic units that comprise the PVGB include the Mio-Pliocene Purisima Formation, the Pleistocene Aromas Red Sands Formation, Pleistocene Terrace deposits, and Holocene alluvium and dune deposits (PVWMA, 2014). These alluvial materials overlie Cretaceous granitic basement rock and low-permeability consolidated sedimentary rock and volcanics occurring at depths ranging from 2,000 to 4,000 feet below ground surface (bgs; Balance Hydrologics, 2018). The northwest-trending San Andreas and Zayante-Vergales faults act as barriers to groundwater flow along the eastern boundary of the PVGB, as do the impermeable clays of Elkhorn Slough in the southern portion of the PVGB (DWR, 2006).

Natural recharge to the PVGB occurs from direct percolation of rainfall upon the basin floor, surface water within the Pajaro River and associated tributaries, and percolation of water applied for irrigation (DWR, 2006). Recharge to the deeper aquifer systems primarily occurs in the northern and eastern portions of the PVGB where groundwater percolation is less impeded by low-permeability sediments (i.e., silt and clay), allowing for a more direct hydraulic connection between the ground surface and deeper aquifers. Confining sediments generally characterized by the presence of low-permeability sediments that impede vertical groundwater flow and limit percolation of surface water into the groundwater system are thickest in the central portion of the PVGB and roughly parallel the course of the Pajaro River (PVWMA, 2014).

Managed aquifer recharge was implemented at Harkins Slough in 2002 in an effort to supplement natural recharge to the PVGB and consists of diverting excess surface water from the slough to spreading basins where it is recharged to shallow aquifers. Expansion of this facility and implementation of additional recharge projects, such as the Watsonville Slough System Managed Aquifer Recharge and Recovery Project have also been proposed (PVWMA, 2020).

C.1.2 Groundwater

C.1.2.1 Groundwater Occurrence

The primary aquifers within the PVGB include water-bearing portions of the deeper Purisima Formation, the Aromas Red Sands Formation, and the uppermost terrace, alluvium, and dune deposits. The Purisima Formation is a thick sequence of variable sediments ranging from marine shale at the base to continental deposits in the upper portion (DWR, 2006). The Purisima occurs at considerable depth throughout much of the PVGB, particularly within the central portion of the valley, and as such, very few wells have penetrated this formation. The Aromas Red Sands Formation is composed of well-sorted brown to red sands that are weakly cemented with iron oxide ranging in thickness from 100 feet near the foothill areas to 900 feet below sea level near the mouth of the Pajaro River (DWR, 2006). The Aromas Red Sands Formation contributes to the majority of groundwater extractions within the PVGB and is considered the principal producing aquifer within the subbasin. It has generally divided into upper and lower Aromas units separated by a fine-grained confining layer (Hanson, 2014). The uppermost alluvium and terrace deposits consist of highly variable mixtures of gravel, sand, and silt that are used as a source of groundwater where aquifer thicknesses allow. The alluvium is comprised of Pleistocene terrace deposits overlain by Holocene alluvium and dune sands ranging in thickness from 50 to 300 feet (DWR, 2006). These deposits consist of gravel, sand, silt, and clay in varying proportions that have varying degrees of hydraulic continuity with the underlying Aromas Red Sands Formation (DWR, 2006).

Groundwater movement within the PVGB generally flows from areas of recharge and topographic highs toward the interior of the subbasin and aquifers extending offshore beneath Monterey Bay. Fall 2019 groundwater elevation contour maps for the Aromas Red Sands aquifer were published by PVWMA as part of their Water Year 2019 Annual Report (PVWMA, 2020; see Figure C-2). These contours show increased elevations in the northern portions of the basin corresponding with areas of increasing topographic gradient. Another area of increased groundwater elevations occurs in the eastern portion of the basin where surface water from the Pajaro River is recharging and mounding within aquifers in the vicinity of Murphy Crossing. Groundwater levels are depressed within the central and southern portions of the PVGB due to over-pumping, and primarily occur at elevations below sea level (PVWMA, 2020). Specifically, groundwater elevations in the project area in Fall 2019 were shown to be slightly below sea level due to over-pumping, resulting in a shallow groundwater gradient from the coast toward the inland areas, a condition that has led to seawater intrusion into freshwater aquifers.

C.1.2.2 Aquifer Yield

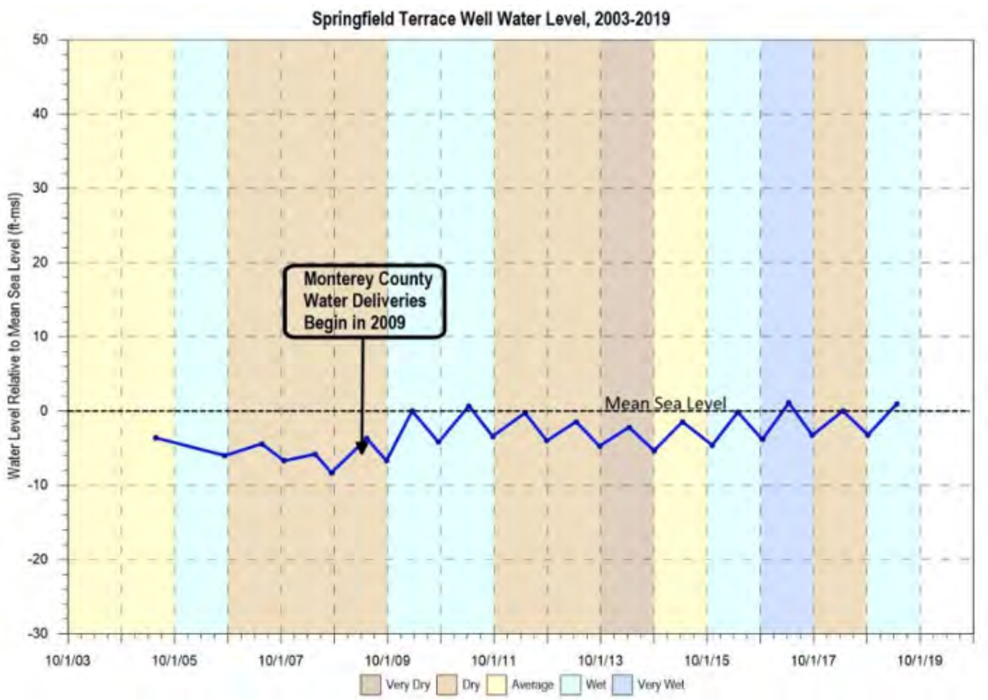
Aquifer transmissivity is defined as the rate of water flow through a vertical section of aquifer one foot in width under a hydraulic gradient of 1 and is typically expressed in units of gallons per day per foot (gpd/foot). This parameter is a measure of the capability of an aquifer to transmit water and can be best estimated from data collected during controlled pumping tests (Cooper and Jacob, 1946). When pumping test data is not available, transmissivity can be estimated from measurements of specific capacity (Ferris, 1963), or the amount of drawdown measured within a well pumping at a known rate. It should be noted that there are many variables affecting transmissivity values as determined from well data, including but not limited to, well depth, aquifers screened, effectiveness of well development, well age, well interference, and the quality of the data collected. However, when taken as a whole, these data do allow for an effective assessment of aquifer production potential.

Specific capacity and pumping test data were compiled by USGS for water supply wells within Central and Soquel Creek Water Districts (Hanson, 2014) and utilized to provide an indication of the potential yield of the aquifer system, in addition to indirect estimates of transmissivity from groundwater model calibration. The transmissivity of the Upper Aromas layer was estimated to range from approximately 49,000 to 97,000 gpd/foot while the transmissivity of the Lower Aromas layer was estimated to be approximately 58,000 gpd/foot (Hanson, 2014). An estimated transmissivity of approximately 124,000 gpd/foot was obtained from an aquifer pumping test conducted on a well screened within both the Upper and Lower Aromas (Hanson, 2014). Aquifer testing conducted at Test Well No. 2, located within the Springfield Project area and screened within the Lower Aromas, resulted in an estimated aquifer transmissivity of approximately 24,000 gpd/foot (Balance Hydrologics, 2018). Instantaneous pumping rate for municipal and irrigation wells across the PVGB range from 100 to 2,000 gpm and average 500 gpm (DWR, 2006). Test Well No. 2 was pumped at a rate of 400 gpm during aquifer testing in February 2018 (Balance Hydrologics, 2018). Generally, these aquifer transmissivity and pumping rate data indicate the presence of fairly productive aquifers within the Aromas Red Sands Formation.

The area of influence surrounding a pumping well is a function of aquifer properties (transmissivity, and storage coefficient), pumping rate, and duration of pumping. The results of pumping Test Well No. 2 were used to estimate the area of influence around the well over a range of pumping durations at an assumed pumping rate of 43 gpm (Balance Hydrologics, 2018). The area of influence was estimated to range from a radius of 464 feet after 10 years of pumping to as much as 2,077 feet after 200 years of pumping. The report concludes that this area of influence is small and that groundwater of similar water quality may be pumped from the well for many years, thus implying some level of sustainability. However, there are many unknown factors to consider, particularly when making calculations decades and centuries into the future, and as such, and particularly if higher pumping rates are used, any assertions regarding long-term sustainability should not be relied upon.

C.1.2.3 Historical Groundwater Elevations

The Pajaro Valley Water Management Plan (PVWMA, 2014) provides a detailed discussion of historical groundwater elevations trends within the PVGB. Like many basins in the coastal regions of California, historical groundwater elevations in the PVGB exhibited a significant period of decline from during the 1940s due to excessive groundwater extraction for agricultural purposes. By the 1970s, groundwater levels west of Watsonville were reportedly below sea level for a good portion of each year, creating conditions which ultimately led to extensive seawater intrusion within the upper Aromas Red Sands and the alluvial aquifers of the PVGB (Balance Hydrologics, 2018). However, efforts to reverse seawater intrusion through reduced pumping have shown some success by slowing or stopping the advancement of seawater as exhibited in groundwater elevations within the Springfield Terrace area (see inset below).



Source: PVWMA, 2020.

C.1.2.4 Groundwater Quality

Groundwater within the PVGB has been generally categorized into the following five groups based on the relative concentrations of dissolved ions (DWR, 2006 and Hanson, 2001). Pajaro River water and local runoff has also been characterized into separate groups by USGS (2018).

1) Recent Seawater: groundwater within the Upper and Lower Aromas sands characterized by high concentrations of chloride, sodium, potassium, and sulfate from recent seawater intrusion at the coast due to over-pumping within the basin.

2) Young Groundwater: groundwater with high concentrations of calcium, magnesium, sulfate, chloride, and boron. These waters occur within the alluvium and upper Aromas sands aquifers in the eastern portion of the PVGB, within close proximity to areas of recharge to the basin.

3) Older Groundwater: groundwater with high concentrations of carbonate, bicarbonate, calcium and magnesium and low concentrations of TDS. This is reportedly the best quality water in the PVGB as it is beyond the influence of seawater intrusion and the Pajaro River and is protected from nitrate loading by laterally continuous low-permeability clays.

4) Older Seawater: groundwater with high concentrations of calcium, magnesium, sulfate, and chloride but much lower concentrations of sodium than recent seawater. These waters are found within the Purisima Formation within the western portion of the PVGB, are remnants of seawater left behind by fluctuations in sea level and are not related to over-pumping within the basin.

5) Very Old Groundwater: groundwater with relatively equal concentrations of sodium, potassium, calcium, and magnesium, and concentrations of sulfate and chloride that are higher than carbonate and bicarbonate. These waters occur within the Purisima Formation in the eastern portion of the PVGB and are the oldest waters in the basin.

Wells used for domestic purposes within the project area would ideally produce groundwater from the older groundwater group although the presence of recent seawater and older seawater groups are also acknowledged.

Primary non-point source constituents of concern within the project area of the PVGB include total dissolved solids (TDS), chloride, nitrate, arsenic, perchlorate, 123-TCP, and hexavalent chromium. The presence of elevated concentrations of TDS, nitrate, perchlorate, and 123-TCP can be attributed to widespread agricultural activity within the PVGB while elevated concentrations of chloride and TDS can be attributed to seawater intrusion along the coast. Arsenic and hexavalent chromium are naturally-occurring contaminants within the PVGB and can be released into groundwater through a variety of mechanisms (e.g., changes in pH and dissolved oxygen content of the groundwater). As such, contamination from both anthropogenic and naturally-occurring constituents present risk to potable groundwater within the project area. Due to the constraints of individual data sets and the need to correlate well screen depths to water quality information, project area water quality data discussed within the following subsections were attributable to specific wells and are not necessarily relatable to water system quality data presented elsewhere in this report.

C.1.2.4.1 Total Dissolved Solids

TDS is a measure of the dissolved mineral content of water and is commonly used as a metric for the general quality of groundwater. The primary pathways for elevated TDS within groundwater of the PVGB include seawater intrusion, surface water infiltration, and streamflow infiltration (PVWMA, 2016). Elevated TDS concentrations can affect the potability of water and can negatively affect agricultural activities due to salt accumulation within topsoil. TDS concentrations from groundwater samples collected by PVWMA and the City of Watsonville during the period from 2002 to 2011 ranged from 45 to over 27,000 mg/L (PVWMA, 2016). These data were used to create a map showing the regional spatial distribution of average TDS values across the PVGB (see Figure C-3) which demonstrates very high TDS concentrations along the western boundary of the PVGB (near the project area) from seawater intrusion, and in the eastern portion of the PVGB from infiltration of high-TDS water at Murphy Crossing (PVWMA, 2016). Average TDS concentrations within the western half of the project area are elevated (i.e., greater than 1,000mg/L) due to seawater intrusion. It should be noted that the map on Figure C-3 was created using data from a wide variety of well depths, aquifers screened, and over a relatively large temporal period, and as such, represent a general depiction of average aquifer conditions within the PVGB.

Project Area Total Dissolved Solids

Available water quality data for wells within the project area reported TDS concentrations ranging from 314 mg/L to 2,170 mg/L, and averaging approximately 777 mg/L, exceeding the DDW upper secondary MCL of 1,000 mg/L in four of the twelve wells for which data is available, and exceeding the DDW short-term limit of 1,500 mg/L for two of those three wells (see Figure C-3). Although the data set is too small to make a statistical correlation, lower TDS concentrations occur to the east and north of the project area and very high TDS concentrations are observed to be associated and shallow well screen and annular seal depths (see Figure C-3). Specifically, the three greatest TDS concentrations for wells with construction details (i.e., Springfield Well No. 1, DWR No. 81242, and Jensen Road [4]) have the shallowest well screen intervals and/or shallowest annular seals (see Table C-1).

C.1.2.4.2 Nitrate

Nitrate is regulated under the DDW primary MCL of 10 mg/L and is a well-known contaminant derived from percolation of nitrogen-based fertilizers applied to crops, high-density animal operations, wastewater treatment, and from leaking septic tanks. Nitrate concentrations from groundwater samples collected by PVWMA and the City of Watsonville during the period from 2002 to 2011 ranged from 0.5 to a maximum of 1,830 mg/L (PVWMA, 2016). The extremely high maximum reported value was suspected to have been sampled downstream of a fertigation injection line and is likely an outlier. These data were used to create a map showing the regional spatial distribution of average nitrate values across the PVGB (see Figure C-4) which demonstrates that nitrate concentrations are very high in agricultural areas overlying permeable soils, in the eastern portion of the PVGB, and south of Corralitos (PVWMA, 2016). Average nitrate concentrations within much of the project area are shown as greater than the secondary MCL of 10 mg/L, and are particularly high (greater than 100 mg/L) in the northwestern portion of the project area. It should be noted that the map shown on Figure C-4 was created using data from a wide variety of well depths, aquifers screened, and over a relatively large temporal period, and as such, represent a general depiction of average aquifer conditions within the PVGB.

Project Area Nitrate
Available water quality data for wells within the project area with well logs reported nitrate concentrations ranging from below laboratory detection limits (i.e., non-detect) to 76.5 mg/L, and averaging approximately 18.9 mg/L, exceeding the DDW MCL of 10 mg/L in six of 19 wells for which data were available (see Figure C-4). Although the data set is too small to make a statistical correlation, lower nitrate concentrations occur to the east of the project area (see Figure C-4) and high nitrate concentrations are observed to be associated and shallow well screen and annular seal depths (with the exception of DWR No. 384611). Specifically, four of the five greatest nitrate concentrations for wells with construction details have relatively shallow well screen intervals and annular seals (see Table 1). This is consistent with contaminants associated with anthropogenic activities at the ground surface (i.e., agricultural operations).

C.1.2.4.3 Chloride

Chloride is an anion of sodium chloride, the most abundant salt component of seawater. Since elevated TDS can be the result of salts added from either seawater and/or agricultural activity, chloride can be considered a more effective indicator of groundwater impacted by seawater intrusion and is a means of distinguishing between the primary sources of salts. The PVWMA has been tracking the progression of seawater intrusion into the PVGB since the 1950s as shown in Figure C-5 which depicts areas of the PVGB impacted by chloride in excess of 100 mg/L (PVWMA, 2016). At its greatest extent in 1951, seawater had intruded as much as ¾-mile inland in the vicinity of Moss Landing, increasing to approximately 2.8 miles and encompassing the entire project area by 2017 (PVWMA, 2018).

Chloride concentrations from groundwater samples collected by PVWMA and the City of Watsonville during the period from 2002 to 2011 ranged from 3 to a maximum of 13,705 mg/L (PVWMA, 2016). These data were used to create a map showing the regional spatial distribution of average chloride values across the PVGB (see Figure C-6) which demonstrates that high chloride concentrations are coincident with areas of seawater intrusion and within the eastern portion of the PVGB near Murphy's Crossing (PVWMA, 2016). As with TDS, average chloride concentrations within the western half of the project area are elevated (i.e., greater than 100 mg/L) due to seawater intrusion. It should be noted that the map shown on Figure C-6 was created using data from a wide variety of well depths, aquifers screened, and over a relatively large temporal period, and as such, represent a general depiction of average aquifer conditions within the PVGB. Further, it should be acknowledged that the area of seawater intrusion is extremely complex and that there are areas of the intruded zone that provide good quality groundwater to wells with chloride concentrations below 100 mg/L (PVWMA, 2016).

Project Area Chloride

Available water quality data for wells within the project area with well logs reported chloride concentrations ranging from 11.6 mg/L to 639 mg/L, and averaging approximately 141 mg/L, exceeding the DDW recommended lower limit of 250 mg/L in three of the 14 wells for which data is available, and the DDW short-term limit of 600 mg/L for one of those three wells (see Figure C-6). As with TDS, the data set is too small to make any statistical correlation between elevated chloride concentrations and well construction details, although chloride concentrations are generally lower in the eastern portion of the project area (see Figure C-6). It should be noted that the well with the greatest chloride concentration (Springfield Well No. 1) is associated with one of the shallowest well screen intervals and the minimum annular seal depth of 50 feet bgs (see Table C-1).

C.1.2.4.4 Arsenic

Arsenic in drinking water is regulated under the DDW primary MCL of 10 µg/L. Arsenic within the PVGB is a naturally-occurring contaminant and has no anthropogenic source.

Available water quality data for wells within the project area with well logs reported arsenic at concentrations ranging from below laboratory detection limits (i.e., non-detect) to 8 µg/L, below the DDW primary MCL in all cases (see Figure C-7). It should be noted that the available data is limited and should not be considered wholly representative of arsenic conditions throughout the project area.

C.1.2.4.5 Perchlorate

Perchlorate is a naturally-occurring and anthropogenic compound commonly used in solid rocket propellants, munitions, fireworks, airbag initiators for vehicles, matches, signal flares, and in some electroplating operations. Perchlorate occurs as a natural impurity in nitrate fertilizers from Chile that have been applied for agricultural purposes in the United States. As such, perchlorate is often a contaminant associated with areas of agricultural activity involving fertilizer application. Perchlorate is regulated under the DDW primary MCL of 6 mg/L.

Available perchlorate data for wells within the project area with well logs were extremely limited and ranged from below laboratory detection limits to 2 µg/L, below the DDW primary MCL. Data presented within the main body of this report also indicates the presence of perchlorate in excess of the MCL within the project area. It should be noted that the available data is limited to two data points and should not be considered representative of conditions throughout the project area.

C.1.2.4.6 123-TCP

1,2,3,-Trichloropropane (123-TCP) is a highly stable chlorinated hydrocarbon utilized in industry as a cleaning agent and degreasing solvent. It has also been found as an impurity in soil fumigants used for agricultural pest control and, as such, is a contaminant often associated with areas of agricultural activity involving pesticide application. It is recognized by the State of California as a human carcinogen and is regulated under the DDW primary MCL of 0.005 mg/L.

Available 123-TCP data for wells within the project area with well logs were limited to the five data points at Springfield Well No. 1, Springfield Well No. 2, Bluff Road (6), Bluff Road (3), and Salinas Rd WS#14. Springfield Well No. 1 and Bluff Road (3) and (6) are in excess of the DDW primary MCL and Salinas Rd WS#14 and Springfield Well No. 2 are below detection. Data presented within the main body of this report also indicates the presence of 123-TCP within the project area. This is consistent with contaminants associated with anthropogenic activities. That said, there are also five (5) wells within the project area that have tested non-detect for 1,2,3-TCP but for which there are no construction details. Nevertheless, water quality sampling results suggest it could be feasible to construct wells in the project area that are not impacted by this contaminant.

C.2. New Well Feasibility

C.2.1 Alternatives

Based on the available well and hydrogeological data, it is considered feasible that one or more wells could be constructed within the project area and designed in such a way as to provide groundwater with concentrations of TDS, nitrate, chloride, and arsenic that are below the regulatory limits. There is limited available data concerning the source and distribution of 123-TCP within project area wells although the data that is available indicates at least 12 wells in the project area with values in excess of MCL (See Table C-2). However, it should be noted that two of the five wells for which well completion reports were matched with well testing results for 123-TCP (i.e., Springfield Well No. 1 and Bluff Road [6]) are both wells that exhibit contamination from contaminants related to surface activities (i.e., TDS, chloride, and nitrate were above their respective (S)MCLs), presumably due to shallow well screens and/or annular seals. In contrast, 123-TCP was non-detect in Salinas Rd WS#14, which also contained TDS and nitrate at much lower levels of 350 mg/L and 0.03 mg-N/L, respectively. Likewise, Springfield Well No. 2 also was non-detect for 123-TCP and contained TDS and nitrate at lower levels of 410 mg/L and 0.1 mg/L, respectively. Bluff Road (3) was found to contain 123-TCP above the MCL, but with lower levels of TDS and nitrate of 460 mg/L and 3 mg/L, respectively, which does not suggest surface contamination. The source of 123-TCP in Bluff Road (3) is uncertain and there are many potential reasons it has elevated 123-TCP (e.g., improper well design, improper well construction, pre-existing contamination). Additionally, as mentioned previously, there are also five (5) wells within the project area that have tested non-detect for 123-TCP but for which there are no construction details, suggesting the feasibility of constructing wells in the project area that are not impacted by this contaminant. These five (5) wells also reported concentrations of arsenic, nitrate, and TDS below their respective MCLs.

Generally speaking, the overall groundwater quality is better in the eastern and northeastern portions of the project area as shown on Figures C-3 through C-7, and as generally delineated on Figure C-8. The feasibility of any particular site would need assessment on a case by case basis and may require test borehole drilling and testing. Potential alternatives include a second well along the eastern boundary of the Springfield Project, and one or more wells along the northern and/or eastern boundaries of the project area. Each of these alternatives is discussed in greater detail in the following sections.

C.2.1.1 Additional Wells at Springfield Project Area

Springfield Well No. 2 was drilled and constructed in 2017 in the northeastern corner of the Springfield Project area. The well was completed within the lower Aromas sands aquifer and screened from 490 to 590 feet bgs. A deep annular cement seal was installed from ground surface to 470 feet bgs, adjacent to low-permeability clay materials observed at depth intervals of 295 to 360 feet bgs and 450 to 470 feet bgs. The resultant groundwater quality from this well was good compared to other wells within the area, most notably Springfield Well No. 1 located approximately 3,500 feet to the southwest, which has one of the worst water quality profiles within the project area. The deep annular seal has presumably protected the producing aquifers screened by the well from elevated concentrations of TDS, chloride, and nitrate associated with shallow aquifers known to be impacted by seawater intrusion and contamination from agricultural activities.

Despite the good quality groundwater observed at Springfield Well No. 2, the lower Aromas sands aquifer within which it is screened is known to be intruded by seawater to some extent, and as such, the sustainability of pumping in this area while maintaining good quality cannot be known with any degree of certainty. Continued pumping of a well in this area may eventually induce movement of poor quality water horizontally toward the well from farther afield within the Aromas sands aquifer, or vertically through less permeable layers and/or through improperly abandoned wells screened across multiple aquifer systems. Additionally, a greater pumping rate or volume of extraction will induce a larger radius of water level influence surrounding a pumping well, increasing the risk of inducing water quality degradation over time. There are many wells located throughout the project area that have produced good quality water for extended periods (e.g., Bluff Road WS#3 Well 2 that was constructed in 1984 and has presumably been operating since then), suggesting some degree of sustainable water quality is possible. Ultimately however, the long-term viability of wells within this area is uncertain.

Installing additional groundwater production wells within the Springfield Project area could result in water level interference between wells, increasing pumping costs, and possibly affecting sustainable use of the producing aquifers. The magnitude of water level interference can be estimated using the Theis equation for non-steady radial flow to pumping wells (Theis, 1935).

For purposes of this calculation, it is assumed that the pumping rate of a new well would be 250 gpm and that the well could be continuously operational for a period of one (1) day at an assumed well efficiency of 70%. An estimated aquifer transmissivity of approximately 24,000 gpd/foot and an aquifer storativity of 0.0015 were used based on aquifer test results from Springfield Well No. 2 (Theis, 1963) although an average transmissivity of 58,000 gpd/foot has been reported for the lower Aromas sands aquifer by others (Hanson, 2014).

Utilizing these assumptions, the predicted additional drawdown from water level interference was estimated to be approximately 2 feet and 0.4 feet at a distance of 1,000 feet and one-half mile from the pumping well, respectively. Actual water level interference may vary depending upon pumping schedules, well construction details, actual aquifer parameters, nearby recharge operations, and other factors. However, it is considered reasonable to utilize these values as a metric for determining the relative magnitude of water level interference and the feasibility of placing additional wells within the vicinity of the Springfield Project area. Based on these results, it is considered feasible that additional wells can be installed in the vicinity of the Springfield Project area should they be properly sited, designed, and constructed. However, as noted above, the long-term water quality from such a well may be uncertain in the long-term given the significant water quality concerns within the project area.

C.2.1.2 Well in Northeastern Portion of Project Area

The available data suggest that the best groundwater quality occurs in the northeastern portion of the project area as shown on Figures C-3 through C-7, at least in part due to these areas being the greatest distance from areas of the basin most heavily intruded by seawater. Conditions in this portion of the project area are likely similar to those encountered at the Springfield Project area albeit with less hydrogeological certainty as provided by drilling and testing of Springfield Well No. 2. A new well installed in this area will likely target the lower Aromas sands aquifer and, as such, must be carefully designed based on test hole drilling and groundwater quality estimated from geophysical borehole logs. As with the Springfield Project area, the long-term viability of new wells within this area is uncertain.

C.3. Engineer’s Estimate of Construction Costs

Engineer’s estimates for drilling, construction, and development of a new 8-inch diameter PVC domestic water supply well to a depth of approximately 600 feet bgs are included in Table C-2. These estimates were based on similar projects in California and design elements similar to Springfield Well No. 2. The estimated cost as detailed for a domestic well is shown in Table C-2, is approximately $135,000 including a 10% contingency. These costs exclude soft costs, and any costs associated with well equipping and pipeline.

Engineer's estimates for drilling, construction, and development of a 12-inch diameter copper-bearing steel community water supply well to a depth of approximately 600 feet bgs are included in Table C-3. These estimates were based on similar projects in southern California and design elements similar to Springfield Well No. 2. The estimated cost as detailed for a community well is shown in Table C-3, is approximately $640,000 including a 20% contingency. These costs exclude soft costs, and any costs associated with well equipping and pipeline.

C.4. References

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Appendix C Tables

Table C-1. Summary of available well information and groundwater quality in the Project Area

DWR No.	State Well No.	APN	Well Name	Water System ID	Latitude	Longitude	Year Drilled	Well Use	Well Depth [feet bgs]	Screen Intervals [feet bgs]	Seal Depth [feet bgs]	Flow Rate [gpm]	Deep Seal?	WQ?	SOURCE	TDS [mg/L]	Chloride [mg/L]	Nitrate [mg/L]	Arsenic [µg/L]	Perchlorate [mg/L]	1,2,3-TCP [µg/L]
1086080	13S/02E-06	117-043-009	Bluff Road (1)	-	36.852499	-121.794293	2007	Domestic	502	380-440; 460-500	350	200	Y	Y	CWS/GAMA	437	42.0	0.2	-	-	-
22762	12S/02E-31	412-032-005	Jensen Road (1)	-	36.850935	-121.792221	1977	Irrigation	305	200-300	200	936	Y	Y	GAMA	-	116.7	4.4	-	-	-
280027	12S/02E-31	-	Bluff Road (2)				1989	Domestic	490	350-490	220	80	Y	-	CWS						
e0097896	12S/02E-30	117-031-003	Bluff Road (3)	-	-	-	2009	Irrigation	500	360-500	330	-	Y	-	CWS	460	41.0	3.0	ND	ND	0.042
198250	13S/02E-06A	413-012-008	Springfield Road (1)	-	36.838122	-121.78002	1965	Irrigation	420	150-400	50	1,200	N	-	CWS	-	-	-	-	-	-
003654	12S/02E-30	117-032-001	D00348	-	36.85227691	-121.7857257	2017	Irrigation	-	400-440, 460-380	360	-	Y	-	CWS	-	-	-	-	-	-
e0080956	12S/02E-30	117-041-011	Bluff Road (4)	-	-	-	2007	Irrigation	1,520	1,380-1,520	1,335	-	Y	-	CWS	-	-	-	-	-	-
22777	12S/02E-30	117-032-004	Jensen Road (2)	-	-	-	1977	Irrigation	305	270-280, 290-300	50	30	N	-	CWS	-	-	-	-	-	-
490442	12S/01E-25	117-041-004	Bluff Road (5)	-	-	-	1982	Irrigation	600	520-600	408	800	Y	-	CWS	-	-	-	ND	-	-
716415	12S/02E-31	117-031-013	102941	-	-	-	2001	Irrigation	440	280-420	260	350	Y	-	CWS	-	-	-	-	-	-
076746	13S/02E-00		Springfield Well 1	-	36.832015	-121.778012	1982	Domestic	172	122-172	50	40	N	Y	BH/GAMA	**2,170**	**639.0**	**56.0**	4.9	2.0	**0.043**
e0119536	13S/02E-05	413-014-001	Springfield Well 2	-	36.838058	-121.768521	2017	Test / Domestic	600	400-590	470	400	Y	Y	BH	410	55.0	0.1	ND	ND	ND
788689	12S/02E-32	147-022-001	21213-1	-	36.850974	-121.774244	2003	Irrigation	600	310-410, 430-490	290	-	Y	N	DWR	-	-	-	-	-	-
81210	12S/02E-32		Jensen Road (3)	-	36.848684	-121.775276	1973	Irrigation	602	200-602	20	-	N	Y	DWR/GAMA	394	41.3	1.7	-	-	
410388	12S/02E-00	117-011-013	505583	-	36.844692	-121.768317	1995	-	680	-	-	2,800	-	Y	DWR/GAMA	-	64.6	1.0	-	-	-
02895	12S/02E-32	-	-	-	36.845425	-121.766031	1964	Irrigation	603	253-289, 315-603	0	-	N	N	DWR	-	-	-	-	-	-
403047	12S/02E-32	413-014-003	20871-1	-	36.832453	-121.767095	1993	Irrigation	530	330-360; 370-410	290	2,800	Y	Y	DWR/GAMA	446	49.0	0.2	-	-	-
e0086003	13S/02E-05	413-013-001	Struve Road (1)	-	36.828352	-121.773123	2009	Irrigation	710	660-700	270	1,174	Y	Y	DWR/GAMA	463	65.0	0.4	-	-	-
384611	13S/02E-06	413-012-007	Struve Road (2)	-	36.826917	-121.780262	1991	Irrigation	460	290-460	260	-	Y	Y	DWR/GAMA	-	-	**60.5**	-	-	-
725009	12S/02E-00	117-032-001	-	-	36.853935	-121.776780	2000	Domestic	600	360-390, 470-600	330	-	Y	Y	DWR/GAMA	366	28.3	2.3	-	-	-
115544	13S/02E-06	413-012-008	Giberson Road	-	36.830443	-121.790681	1974	Test Well	425	-	-	-	N	N	DWR	-	-	-	-	-	-
81242	13S/02E-05		Springfield Road (2)		36.837233	-121.776548	1974	Domestic/Irrigation	408	168-384	50		N	Y	DWR/GAMA	**1,046**	92.4	**24.5**			
-	-	-	Rocha	-	36.838176	-121.763491	-	-	-	-	-	-	-	Y	HB/GAMA	-	46.5	0.6	-	-	-
			Hawkins		36.838384	-121.770081									HB						
-	-	-	School	-	36.83601	-121.76853	-	-	-	-	-	-	-	-	HB	-	-	-	-	-	-
191332	-	-	Bluff Road WS #2	Bluff Road WS #2	36.855474	-121.793451	1987	Domestic	178	120-160	120	-	Y	Y	CWS/COUNTY	-	-	**14.8**	5.0	-	-
237361	-	117-043-012	Well 2	Bluff Road WS #3	36.856879	-121.798414	1984	Domestic	570	500-560	460	-	Y	Y	CWS/COUNTY	314	11.6	ND	1.0	-	-
-	12S/02E-30N1	-	Bluff Road (6)	Bluff Road WS #4	36.855507	-121.794743	1946	Domestic/Irrigation	180	140-180	-	-	N	Y	CWS/COUNTY	**1,390**	-	**89.8**	8.0	ND	**0.189**
-	-	-	Lower Well	Jensen Road WS #1	36.849959	-121.783065	1978	Domestic	320	260-300	50	-	N	Y	CWS/COUNTY	-	-	ND	1.0	-	-
-	12S/02E-31	412-032-005	Jensen Road (4)	Jensen Road WS #2	36.847546	-121.801037	-	Domestic	-	-	-	-	-	Y	CWS/COUNTY	**1,568**	**393.0**	**76.3**	8.0	-	-
-	12S/02E-29E2	-	Hilltop Road	Salinas Road WS #14	36.859861	-121.779384	1977	Domestic/Irrigation	400	250-400	250	15	Y	Y	CWS/COUNTY	350	-	0.03	1.03	0.83	ND
409607	-	117-041-017	Tralton Road	Tralton Road WS #7	36.85948	-121.797141	1997	Domestic	600	460-600	400	50	Y	Y	CWS/COUNTY	-	**412.0**	ND	ND	-	-

Notes:

Well name designated by address where unknown.

Water quality, where provided, is from most recent available data.

Shaded cells with bold text indicate concentrations in excess of regulatory limits.

Data Source: Monterey County and GAMA Groundwater Information System (2020). All household locations are approximate.

California Division of Drinking Water Regulatory Limits:

TDS regulated under secondary MCL (recommended limit of 500 mg/L, upper limit of 1,000 mg/L, and short-term limit of 1,500 mg/L).

Chloride regulated under secondary MCL (recommended limit of 250 mg/L, upper limit of 500 mg/L, and short-term limit of 600 mg/L).

Nitrate as nitrogen regulated under primary MCL of 10 mg/L.

Arsenic regulated under primary MCL of 10 µg/L.

Perchlorate regulated under primary MCL of 6 µg/L.

1,2,3-TCP regulated under primary MCL of 0.005 µg/L.

Table C-2. Estimate of construction cost for a domestic well

Item No.	Description	Qty	Units	Unit Price	Total Item Price
1	Mobilization	1	LS	$2,500	$2,500
2	Contain Water and Drill Cuttings	1	LS	$5,000	$5,000
3	Install Surface Sanitary Seal (0- 50 feet)	1	LS	$11,800	$11,800
4	Drill 16-inch Borehole (50 - 620 feet)	570	FT	$50	$28,500
5	Provide Geophysical Borehole Logs	1	LS	$2,500	$2,500
6	Install 8-inch PVC Blank Well Casing (0 - 490 and 590 to 600 feet)	500	FT	$14	$7,000
7	Install 8-inch PVC Blank Screen (490 - 590 feet)	100	FT	$16	$1,600
8	Furnish and Install Gravel Envelope (470 - 620 ft)	150	FT	$25	$3,750
9	Furnish and Install Annular Cement Seal (0 - 470 ft)	470	FT	$25	$11,750
10	Provide Initial Well Development	24	HR	$450	$10,800
11	Provide, install, and Remove Development Test Pump	1	LS	$5,000	$5,000
12	Provide Final Development by Pumping and Surging	24	HR	$450	$10,800
13	Provide Aquifer Pumping Tests	32	HR	$450	$14,400
14	Provide Title 22 Laboratory Analyses	1	LS	$5,000	$5,000
15	Provide Well Disinfection	1	LS	$2,000	$2,000
	SUBTOTAL:				$122,400
	CONTINGENCY (10%):				$12,240
	TOTAL:				$134,640

Table C-3. Estimate of construction cost for a community well

Item No.	Description	Qty	Units	Unit Price	Total Item Price
101	Mobilization, site preparation, demobilization, site cleanup, and restoration.	1	LS	$100,000.00	$100,000.00
102	Comply with Discharge Requirements, Including Discharge Pipeline, Monitoring, and Reporting (assumes discharge to ground)	1	LS	$10,000.00	$10,000.00
103	Testing and Disposal of Drill Cuttings	1	LS	$5,000.00	$5,000.00
104	Drill 32-inch Borehole, Furnish and Install 24-inch OD x 3/8-inch Wall ASTM A139 Mild Steel Conductor Casing, Cement in Place	50.5	FT	$400.00	$20,200.00
105	Drill 17.5-inch Pilot Borehole from 50 to 620 feet	570	FT	$65.00	$37,050.00
106	Provide Geophysical Borehole Logs	1	LS	$5,000.00	$5,000.00
107	Install Isolated Aquifer Zone Tool, Seals, and Gravel Envelope, and Provide for Initial Development by Airlifting	3	EA	$12,500.00	$37,500.00
108	Pump Isolated Aquifer Zones (estimate 8 hours per zone)	24	HR	$400.00	$9,600.00
109	Provide Isolated Aquifer Zone Test Laboratory Analyses	3	LS	$3,500.00	$10,500.00
110	Ream Pilot Borehole to 22-inch from 50 to 620 feet	650	FT	$75.00	$48,750.00
111	Provide Caliper Survey of Reamed Borehole	1	LS	$2,000.00	$2,000.00
112	Furnish and Install 12-inch x 5/16-inch Wall ASTM A 139 Grade B Copper-Bearing Steel Blank Well Casing (+1 to 490 feet and 590 to 600 feet)	501	FT	$112.00	$56,112.00
113	Furnish and Install 12-inch x 5/16-inch Wall ASTM A 139 Grade B Copper-Bearing Steel Ful Flo Louvered Well Screen with 0.080-inch Slots (490 to 590 feet)	100	FT	$168.00	$16,800.00
114	Furnish and Install 2-inch SCH. 40 Mild Steel Sounding Tube and 2-foot Connection Box (+1 to 488 feet)	489	FT	$10.00	$4,890.00
115	Furnish and Install 3-inch SCH. 40 Mild Steel Gravel Feed Pipe (+1 to 480 feet)	481	FT	$15.00	$7,215.00
116	Furnish and Install Engineered Gravel Envelope (470 to 620 feet)	150	FT	$75.00	$11,250.00
117	Furnish and Install 10.3-sack Sand-Cement Slurry Annular Seal (ground surface to 470 feet)	470	FT	$85.00	$39,950.00
118	Provide Initial Development by Swabbing and Airlifting	96	HR	$400.00	$38,400.00
119	Provide, Install, and Remove Development Test Pump	1	LS	$15,000.00	$15,000.00
120	Provide Final Development by Pumping and Surging	60	HR	$400.00	$24,000.00
121	Provide Aquifer Pumping Tests (8-hour step drawdown, 24-hour constant rate drawdown, and 4-hour recovery tests)	36	HR	$400.00	$14,400.00
122	Provide Title 22 Laboratory Analyses	1	LS	$5,000.00	$5,000.00
123	Provide Downhole Video Survey	1	LS	$2,000.00	$2,000.00
124	Provide Plumbness and Alignment Surveys	1	LS	$3,000.00	$3,000.00

Item No.	Description	Qty	Units	Unit Price	Total Item Price
125	Provide Well Disinfection	1	LS	$5,000.00	$5,000.00
126	Complete and Cap Well Head and Ancillary Tubing, as Specified	1	LS	$2,000.00	$2,000.00
			SUBTOTAL:		$530,617.00
			CONTINGENCY (20%):		$106,123.40
			TOTAL:		$636,740.40

Appendix C Figures

Figure C-1. General project location

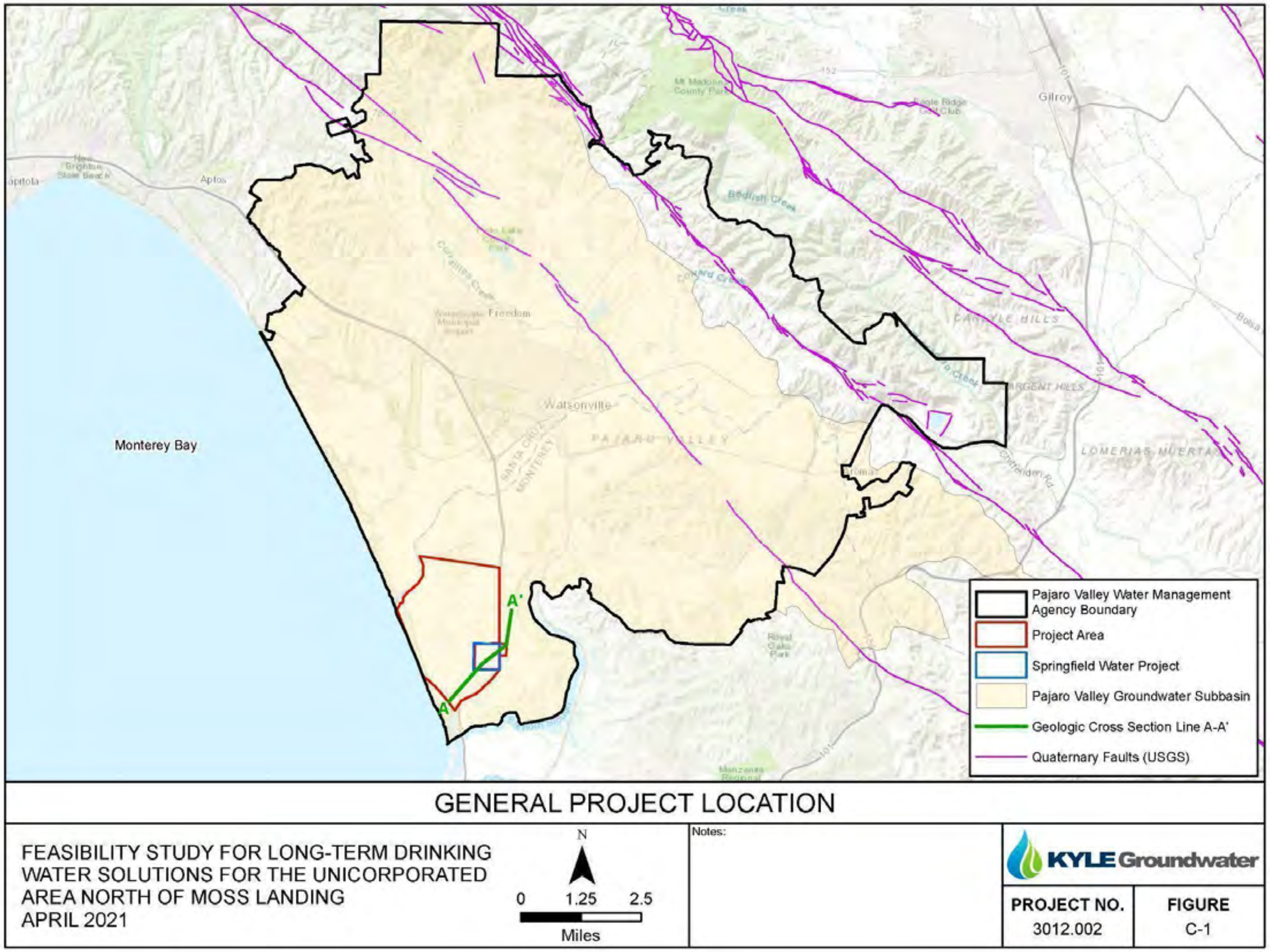


Figure C-2. Groundwater contours within the Pajaro Valley

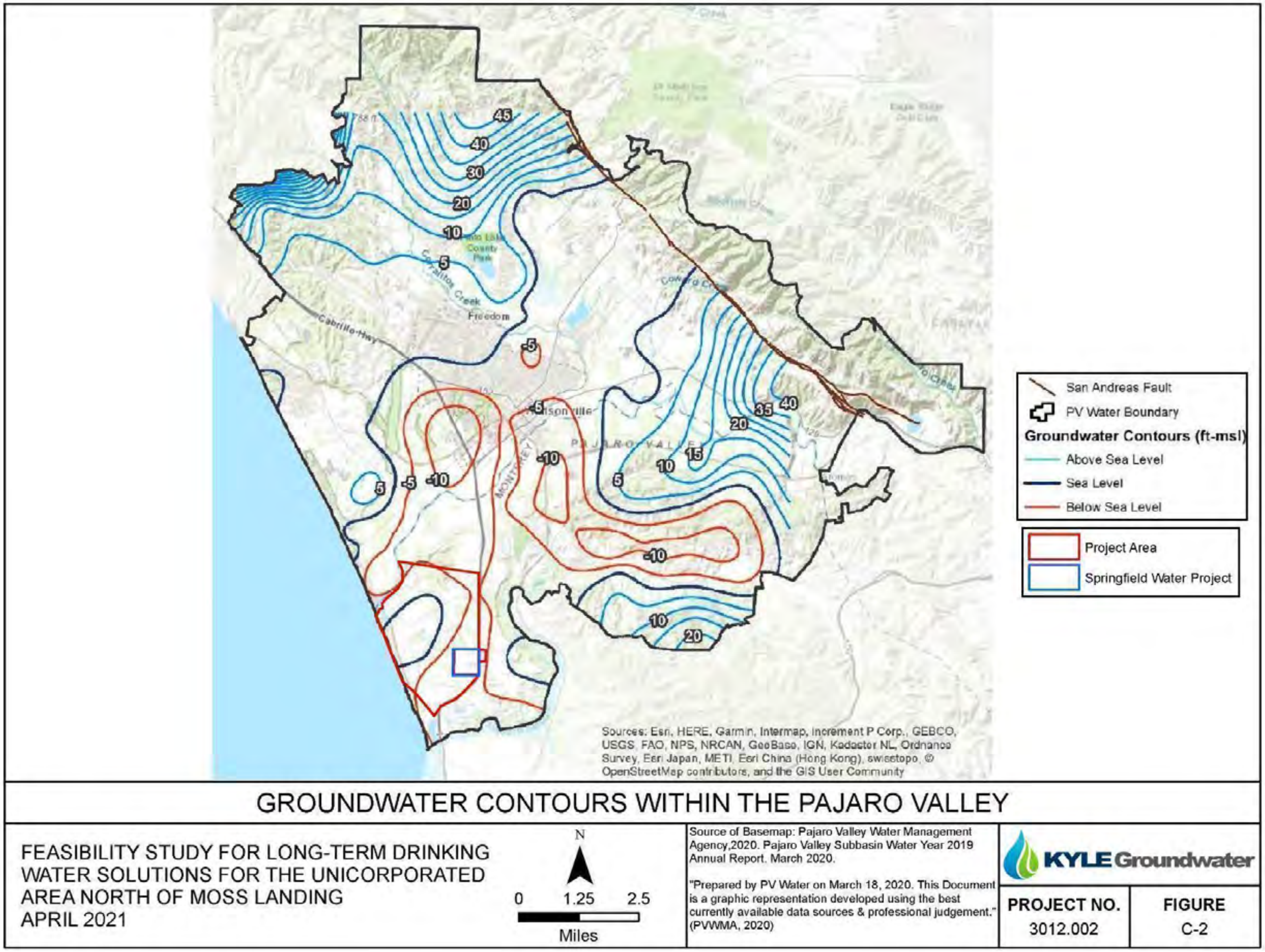


Figure C-3. Occurrence of TDS in groundwater of the PVGB

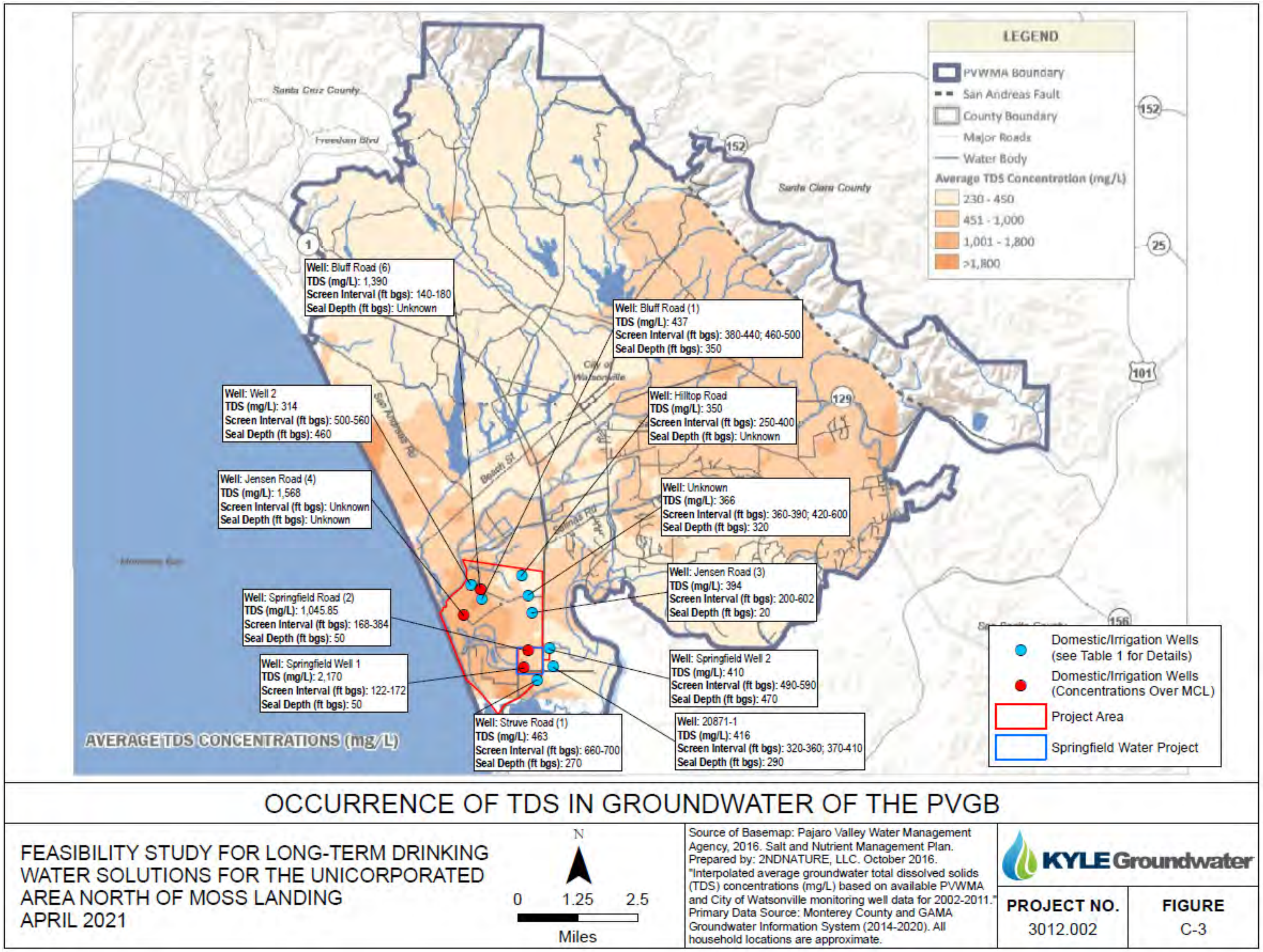
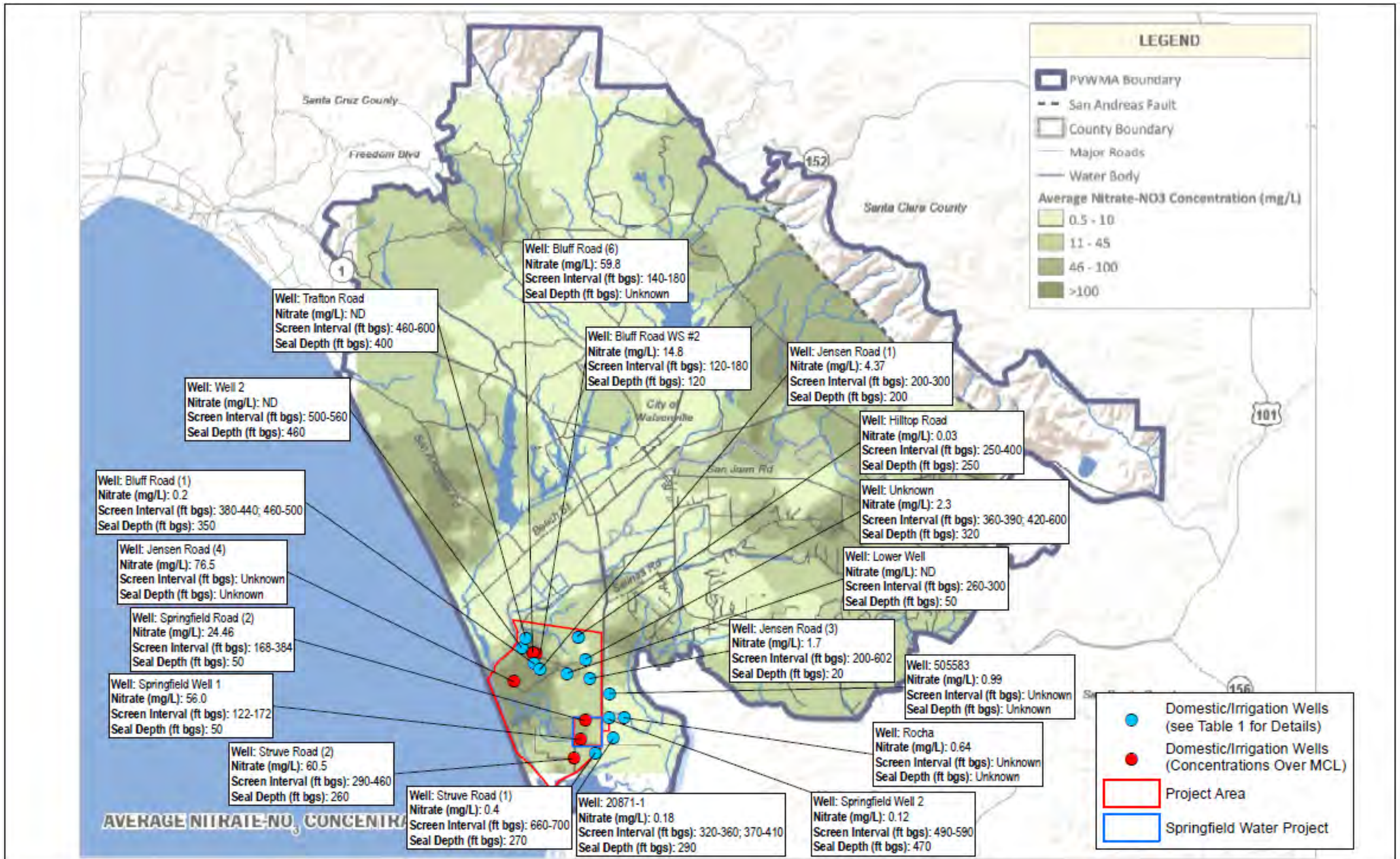


Figure C-4. Occurrence of nitrate in groundwater of the PVGB



OCCURRENCE OF NITRATE IN GROUNDWATER OF THE PVGB

FEASIBILITY STUDY FOR LONG-TERM DRINKING WATER SOLUTIONS FOR THE UNICORPORATED AREA NORTH OF MOSS LANDING
APRIL 2021

Source of Basemap: Pajaro Valley Water Management Agency, 2016. Salt and Nutrient Management Plan. Prepared by: 2NDNATURE, LLC. October 2016. "Interpolated average groundwater nitrate-NO3 concentrations (mg/L) based on available PVWMA and City of Watsonville monitoring well data for 2002-2011." Primary Data Source: Monterey County and GAMA Groundwater Information System (2014-2020). All household locations are approximate.

KYLE Groundwater

PROJECT NO.	FIGURE
3012.002	C-4

Figure C-5. Seawater intrusion within the Pajaro Valley

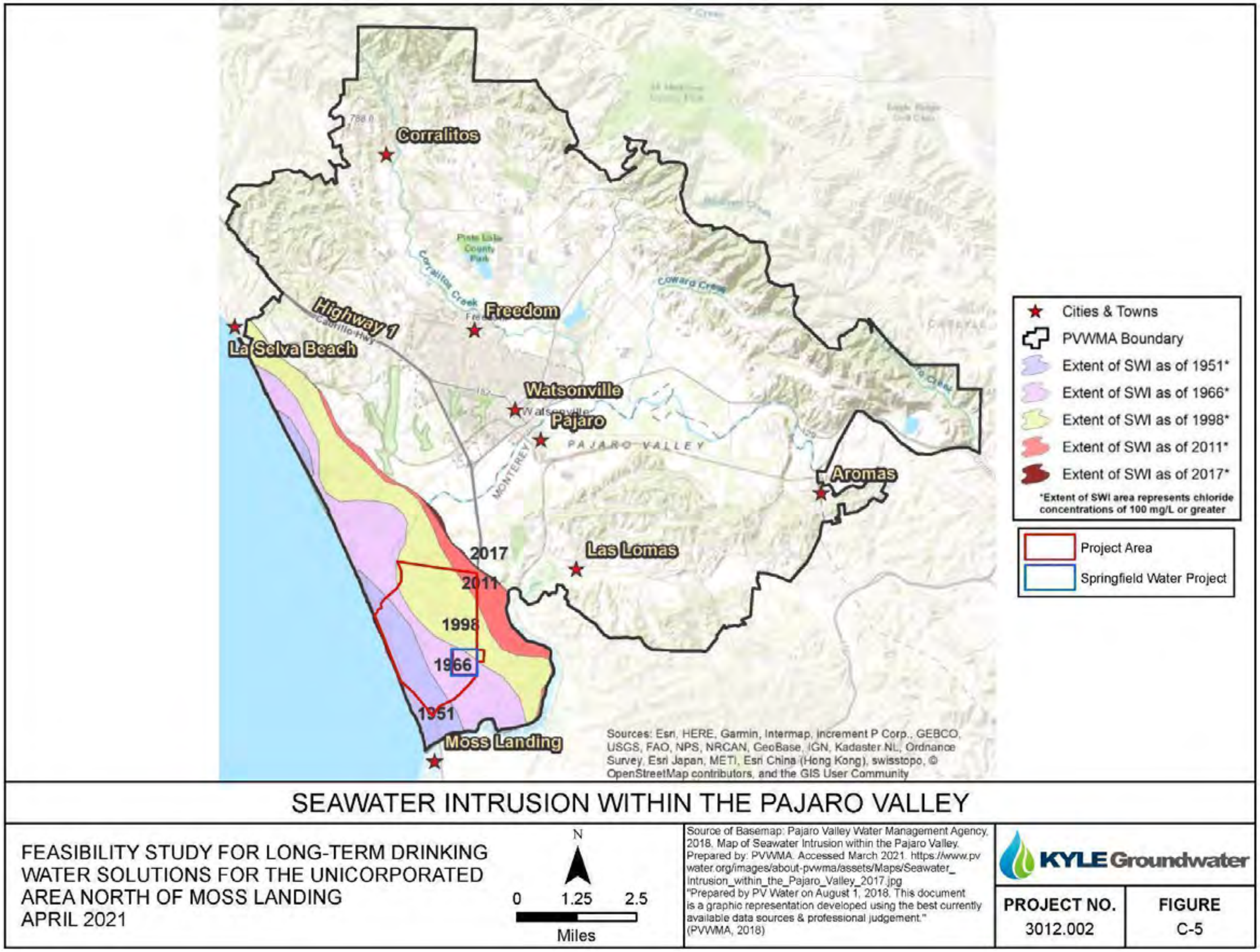


Figure C-6. Occurrence of chloride in groundwater of the PVGB

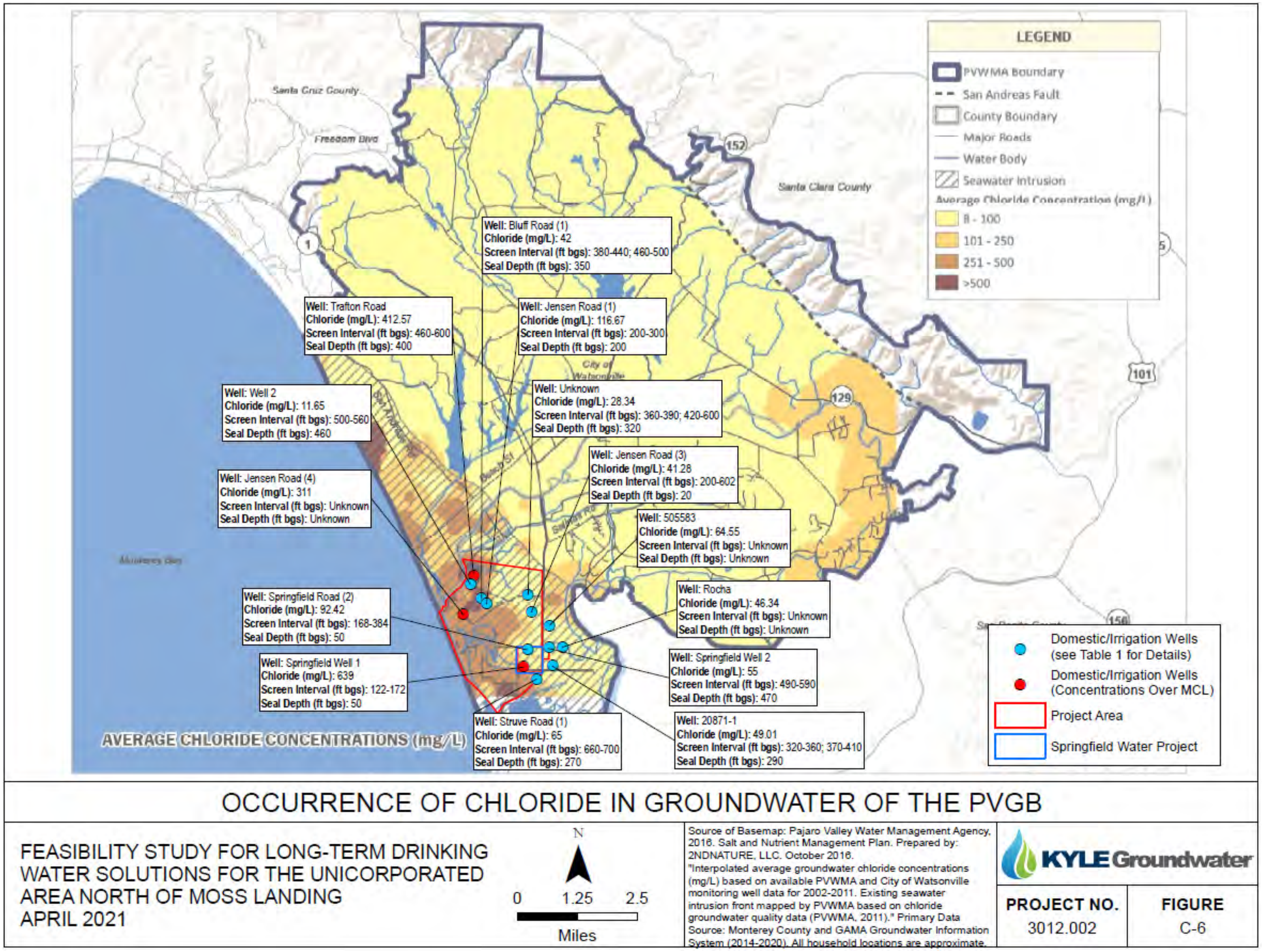


Figure C-7. Occurrence of arsenic in groundwater of the PVGB

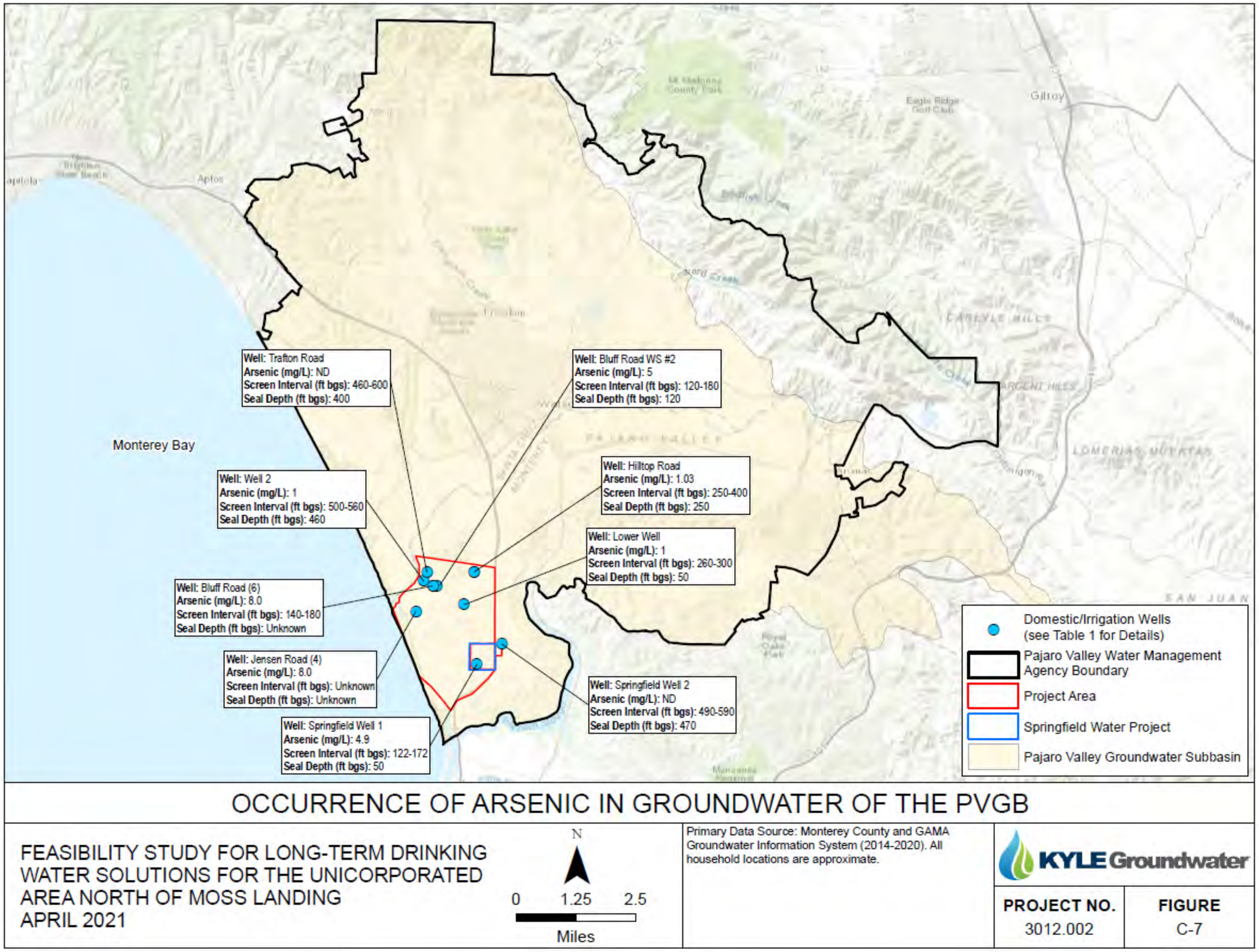
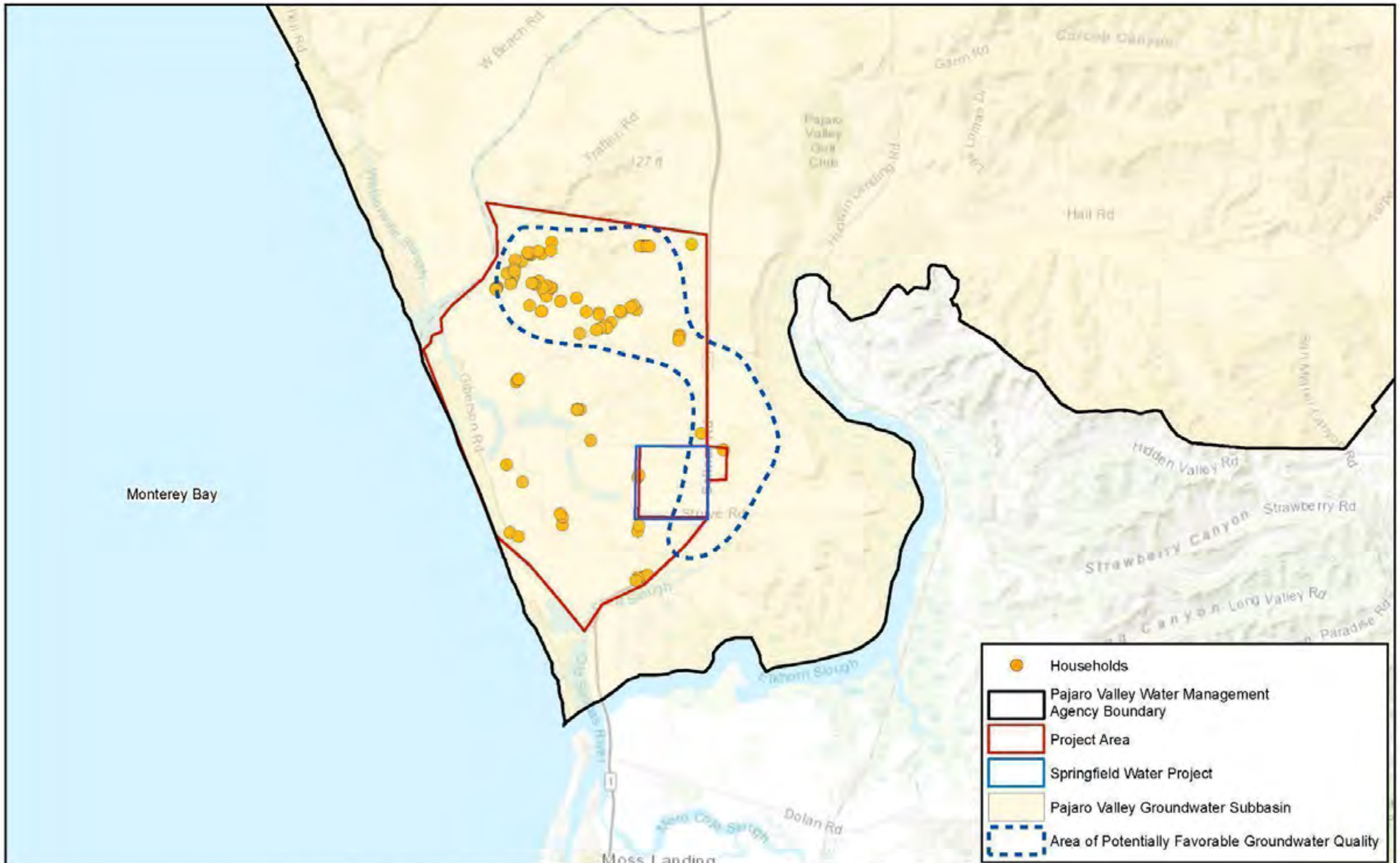


Figure C-8. Area of potentially favorable groundwater quality.



AREA OF POTENTIALLY FAVORABLE GROUNDWATER QUALITY

FEASIBILITY STUDY FOR LONG-TERM DRINKING WATER SOLUTIONS FOR THE UNICORPORATED AREA NORTH OF MOSS LANDING
APRIL 2021

Data Source: Monterey County and GAMA Groundwater Information System (2020). All household locations are approximate.

KYLE Groundwater

PROJECT NO.	FIGURE
3012.002	C-8

Appendix D - Wellhead Treatment Technology Descriptions

D.1. Strong base anion exchange

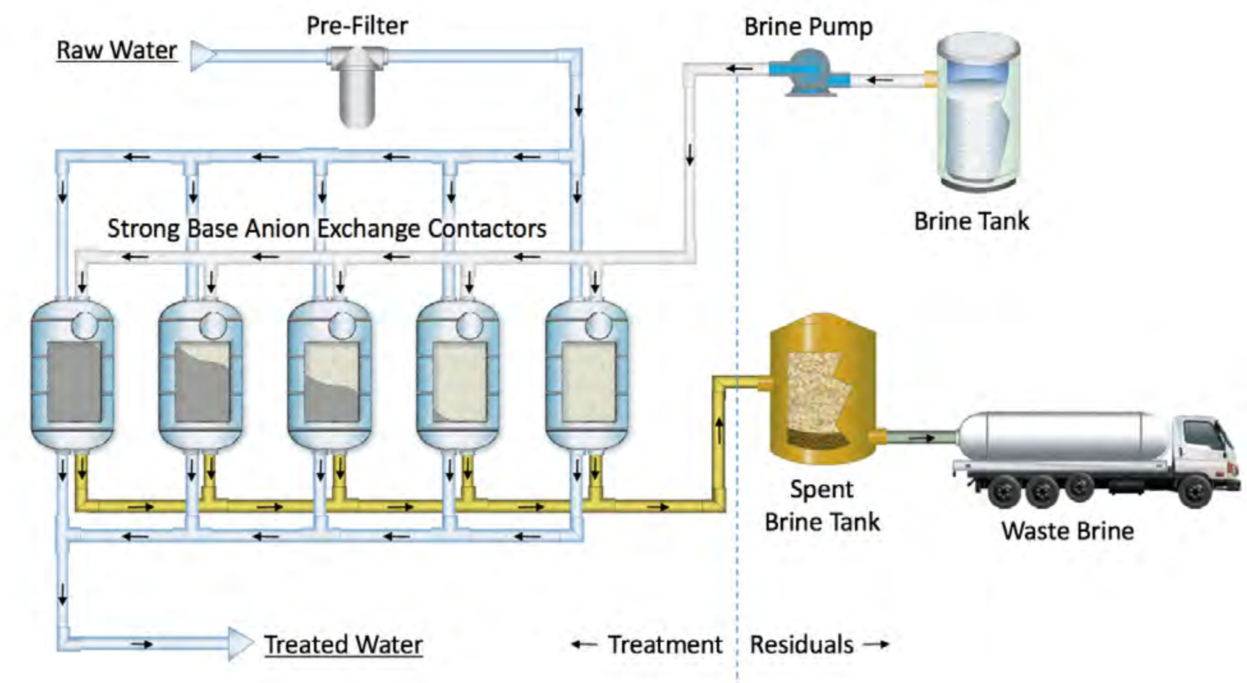
Strong base anion exchange (SBA-IX) can be operated with either a regenerable or single-use resin. For regenerable resins, a brine solution, typically sodium chloride (NaCl), is used to restore the exchange capacity. For single use resins, the spent resin is removed, disposed, and replaced with new resin. The feasibility and cost effectiveness of regenerable versus single-use SBA-IX depends on the target contaminant, other water quality characteristics, corresponding treatment efficiency, waste disposal, and site-specific constraints. For contaminants such as arsenic and nitrate, regenerable systems are more effective, whereas non-regenerable systems tend to be more effective for contaminants like perchlorate. Hexavalent chromium can be removed by either regenerable or non-regenerable SBA-IX and the selection is based on which is more economical to operate in a given water. Nitrate is generally treated with regenerable SBA-IX because it is not held as strongly by the resin, and for a typically sized treatment unit, nitrate is at concentrations of concern in a few days. After that time the resin must be regenerated, or the resin would need to be replaced. It is usually more cost effective to install a regenerable SBA-IX treatment unit for nitrate removal. A description of each approach is included below. This technology can be implemented at the community wellhead scale or the household scale.

D.1.1 Regenerable SBA-IX

Figure D-1 presents a typical regenerable SBA-IX treatment system consisting of a pre-filter, pressure vessels or contactors, and regeneration equipment including a brine tank and pumps. Typical regenerable SBA-IX treatment systems utilize multiple contactors operated in a staggered sequence. As depicted in Figure D-1, each contactor is progressively loaded with the contaminant of concern. Operating in a staggered sequence allows the system to more efficiently achieve target water quality conditions through blending of the finished water effluent.

Sodium chloride (NaCl), typically greater than 10% solution strength, is used to regenerate the spent resin. The regeneration process produces a high-strength liquid waste brine containing the removed contaminants. Depending on co-contaminants in the raw water and the treatment efficiency, the brine could be hazardous and should be properly characterized prior to disposal. Since the contaminants are known to be arsenic, hexavalent chromium, and nitrate, managing the hazardous waste should not be an issue. Moss Landing lacks a brine line or local sewer discharge, so the brine will require off-site disposal, which entails trucking the liquid waste. Since offsite disposal is required, brine management will likely be the largest ongoing cost for SBA-IX.

Figure D-1. Regenerable SBA-IX treatment schematic.



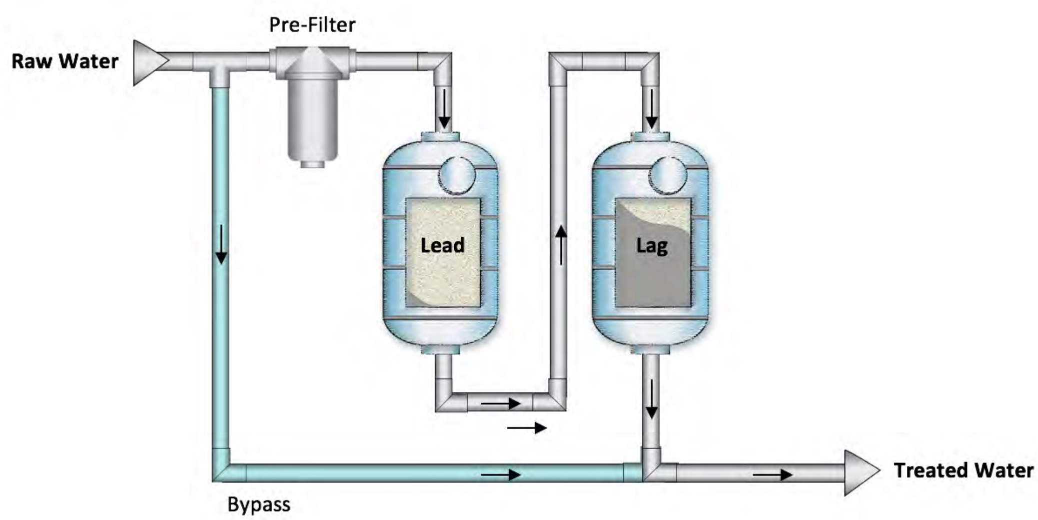
Nitrate and sulfate levels in the project area wells that have been tested ranged from 0.02 to 76.5 mg/L and 172 mg/L to 970 mg/L, respectively. These high concentrations make SBA-IX treatment for nitrate economically and technically infeasible. This technology will not be moved into the costing phase of the project.

D.1.2 Single-use SBA-IX

SBA-IX can be operated with single use resin where exhausted resin is removed from the pressure vessels and replaced with new resin. This option could be considered for hexavalent chromium and perchlorate treatment. Spent single-use resin is characterized and then sent to an appropriate waste receiving facility. This approach is cost effective for contaminants such as uranium, perchlorate, and hexavalent chromium due to their high affinity for SBA-IX resins.

Figure D-2 presents a typical single-use SBA-IX treatment system consisting of a pre-filter, lead-lag pressure vessels or contactors, and an optional bypass. The non-regenerable SBA-IX process is simplified by avoiding the need for regeneration equipment and chemicals, leading to lower capital costs and smaller required footprint for treatment. As depicted in Figure D-2, single-use SBA-IX would typically be operated in a lead-lag configuration where the lead vessel would be operated to exhaustion and the lag vessel serves as a polishing vessel.

Figure D-2. Non-regenerable SBA-IX lead-lag treatment schematic with optional bypass.



Non-regenerable SBA-IX will not be moved into the costing phase of the project because it is not capable of removing co-contaminants, such as nitrate.

D.2. GAC Adsorption

GAC is listed in Title 22[76] as the best available technology (BAT) for the control of 55 of the 60 regulated organic contaminants, including 123-TCP. The Division of Drinking Water provided three reasons for why GAC has been proposed as the BAT. First, GAC is already in use in locations that have co-occurring organic contaminant removal and demonstrates 123-TCP removal in those locations. Second, GAC can reliably remove 123-TCP to non-detect concentrations and is relatively insensitive to fluctuations in the influent 123-TCP concentration. And third, GAC is readily commercially available so there is no market acclimation time. GAC is also operationally simple, and treatment performance is insensitive to on/off cycles for 123-TCP treatment. However, adsorption requires periodic replacement of the GAC media. GAC replacement or reactivation typically accounts for the bulk of the operational costs.

GAC is effective for organic contaminant removal and has a high capacity for total organic carbon (TOC). The TOC competes with other contaminants for sites on the GAC, and cause more frequent replacement of the GAC media. The efficiency of GAC to remove TOC may influence the best carbon type as carbon made from different sources removes TOC to different extents.

Co-occurring inorganics (e.g. nitrate, arsenic, hexavalent chromium) may be subject to peaking after GAC installation and following on/off cycles. GAC will adsorb inorganic compounds for a short time while the media is fresh. As GAC adsorption capacity is exhausted, the weaker adsorbing inorganic compounds start being displaced by more strongly adsorbing organics and can appear in the treated water at concentrations higher than in the raw water. This is concerning at Moss Landing sites because the concentrations of TDS are high, and there are many co-occurring inorganic compounds such as nitrate, arsenic, and hexavalent chromium. Higher concentrations of inorganic compounds being released from

[76]https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dw_regulations_2019_04_16.pdf

the GAC is a concern and should be evaluated any time the raw water inorganic compound concentrations are greater than half of their respective MCL. GAC treatment under these conditions requires additional operational considerations.

GAC bedlife and corresponding operational costs depend on the contaminant of interest, treatment objective, GAC type, and source water quality conditions. For purposes of this project, generalized GAC bedlife estimates will be developed using referenced sources (e.g. DDW Initial Statement of Reasons, published literature[77]) and real-world examples from installed and operating systems within California.

This treatment technology will be moved into the costing phase of the project because it is the best available treatment technology for 123-TCP removal.

D.3. Adsorption

The adsorption process for arsenic removal relies on adsorptive media that has an affinity for the constituent of concern. The media is housed in pressure vessels typically oriented in a lead-lag configuration. Activated alumina is commonly used for fluoride treatment while there are a variety of media available for arsenic removal. Chlorine is typically added prior to the pressure vessels to ensure that all of the arsenic is in the adsorbable arsenate form. The process is pH sensitive, meaning greater arsenic removal can be achieved at lower pH conditions. Silica can foul the adsorption media resulting in reduced arsenic removal capacity.

In the lead-lag mode of operation, two vessels are operated in series, so the effluent of the lead vessel becomes the influent to the lag vessel. When the media in the lead vessel is exhausted with respect to arsenic removal, the media is replaced, and the lag vessel is placed in lead position. Operating adsorption in this mode maximizes the resin’s capacity and reduces operating expenses.

In addition to lead-lag, the adsorption treatment process can operate with a partial stream bypass. In this mode of operation, either a fixed or a variable portion of flow is bypassed around the treatment unit and blended with the treated water. Treatment bypass can also decrease the frequency of media replacement, further reducing operational costs.

This treatment technology will not be moved into the costing phase of the project because it is only suitable for the removal of arsenic and the location with high arsenic also has TDS levels that require treatment.

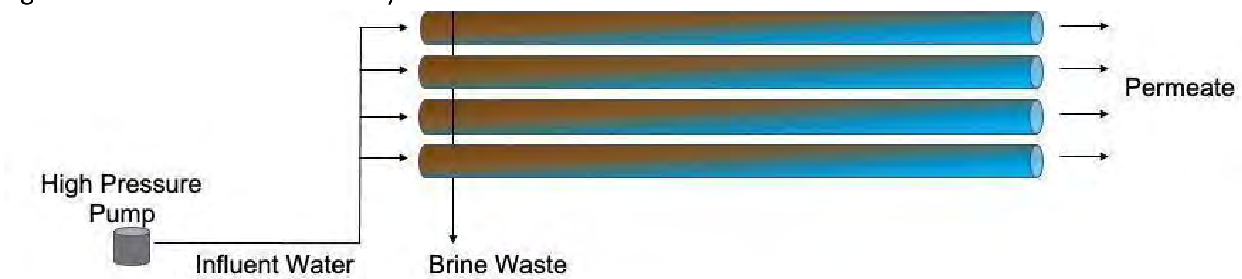
D.4. Reverse Osmosis

Reverse Osmosis (RO) uses high-pressure pumps to force water through a membrane. RO is not a filtration process, but a purification process. Water diffuses through the semipermeable membrane, leaving impurities behind, and resulting in an extremely purified permeate. A concentrated waste brine is created in the process that requires disposal. The volume of permeate produced per volume of raw water treated is often referred to as the water recovery. Water recoveries between 50 to 75% are often achieved depending on the system and water quality, though recoveries that fall below and above this

[77] Corwin, C. J., and Summers, R. S. (2012). "Controlling Trace Organic Contaminants with Granular Activated Carbon Adsorption," Journal AWWA, 104(1) E36-E47.

range are not uncommon. For instance, more advanced RO systems that achieve recoveries that exceed 90% are entering the market. High recoveries also means that less reject water called “brine” is produced, which can substantially reduce operations and maintenance costs because brine disposal is often a major cost driver for the operations and maintenance of this technology. The treated water often needs to have minerals added back in to prevent corrosion of the pipes. A schematic diagram is given in Figure D-3.

Figure D-3. Schematic of an RO system.



This technology will be moved into the costing phase of the project because it is capable of removing multiple contaminants. Disposal of the brine waste is the biggest challenge.

Appendix E - Detailed Wellhead Treatment Costs

Table E-1. Detailed wellhead treatment costs for local small water systems.

	Indoor + Outdoor Use		Indoor Use Only	
	Vendor A	Vendor B		
Capital costs				
Construction costs				
RO system ($)[1]	21,500	229,500	Same costs as Indoor + Outdoor Use	
Brine storage[2]	35,400	35,400		
Water Storage[2]	11,900	11,900		
GAC treatment ($)[3]	20,600	20,600		
Anitscalant system ($)[1]	700	Included in RO system		
Calcite contactor ($)[3]	300	300		
Total equipment costs ($)	90,400	297,700		
Construction multiplier[4]	2.7	2.7		
Total constructed costs ($)	243,600	802,300		
Planning, Engineering, Legal, & Admin costs (PEL&A)				
PGE upgrade ($)[5]	20,000	20,000		
Well repair ($)[6]	10,000	10,000		
New pump and motor ($)[5]	20,000	20,000		
Engineering Design ($)[6]	100,000	100,000		
Coastal commission ($)[5]	50,000	50,000		
County permitting and O&M plan ($)[6]	20,000	20,000		
CEQA ($)[6]	20,000	20,000		
Installed costs per system (Total constructed + PEL&A costs) ($/system)	483,600	1,042,300		
Installed cost per household ($/household)	142,200	306,600		
O&M				
Membrane element ($/yr)[1]	4,000	800	2,000	400
Chemicals (antiscalant) ($/yr)[1]	300	500	100	300
Prefilter, postfilter changeout ($/yr)[1]	70	Included w/ antiscalant	70	Included w/ antiscalant
Electricity use ($/yr)[7]	800	300	300	100
Waste hauling ($/yr)[5]	115,500	26,100	42,300	9,600
Operator labor & county reporting ($/yr)[6]	10,400	10,400	10,400	10,400
Analytical ($/yr)[8]	2,800	2,800	2,800	2,800
Calcite ($/yr)[3]	60	60	20	20
GAC media replacement ($/yr)[3]	700	700	700	700
Well operation ($/yr)[6]	500	500	500	500
Total O&M ($/yr)	135,100	42,200	59,200	24,800
Total O&M ($/yr/household)	39,700	12,400	17,400	7,300
20 Year O&M ($/household)	494,700	154,500	216,800	91,000
Combination of Capital and O&M costs				
NPW 20 year ($)	636,900	461,100	359,000	397,600

Information sources: [1]Vendor A or B, [2]Vendor C, [3]Vendor A, [4]Table E-3, [5]Local service provider to provide 240 V outlet, [6]Professional judgement, [7]PG&E, [8]Local analytical laboratory

Table E-2. Detailed wellhead treatment costs for state small water systems.

	Indoor + Outdoor Use		Indoor Use Only	
	Vendor A	Vendor B		
Capital costs				
Construction costs				
RO system ($)[1]	21,500	230,000		
Brine storage[2]	35,400	35,400		
Water Storage[2]	22,750	22,750		
GAC treatment ($)[3]	20,600	20,600		
Anitscalant system ($)[1]	700	Included in RO system		
Calcite contactor ($)[3]	300	300		
Total equipment costs ($)	101,250	309,050		
Construction multiplier[4]	2.7	2.7		
Total constructed costs ($)	272,900	832,900		
Planning, Engineering, Legal, & Admin costs (PEL&A)			Same costs as Indoor + Outdoor Use	
PGE upgrade ($)[5]	20,000	20,000		
Well repair ($)[6]	10,000	10,000		
New pump and motor ($)[5]	20,000	20,000		
Engineering Design ($)[6]	100,000	100,000		
Coastal commission ($)[5]	50,000	50,000		
County permitting and O&M plan ($)[6]	20,000	20,000		
CEQA ($)[6]	20,000	20,000		
PEL&A costs) ($/system)	512,900	1,072,900		
Installed cost per household ($/household)	78,900	165,100		
O&M				
Membrane element ($/yr)[1]	4,000	800	2,000	400
Chemicals (antiscalant) ($/yr)[1]	700	500	200	300
Prefilter, postfilter changeout ($/yr)[1]	73	Included w/ antiscalant	73	Included w/ antiscalant
Electricity use ($/yr)[7]	1,500	600	600	200
Waste hauling ($/yr)[5]	220,700	49,800	80,900	18,300
Operator labor & county reporting ($/yr)[6]	10,400	10,400	10,400	10,400
Analytical ($/yr)[8]	2,800	2,800	2,800	2,800
Calcite ($/yr)[3]	60	60	20	20
GAC media replacement ($/yr)[3]	700	700	700	700
Well operation ($/yr)[6]	500	500	500	500
Total O&M ($/yr)	241,400	66,200	98,200	33,600
Total O&M ($/yr/household)	37,100	10,185	15,100	5,200
20 Year O&M ($/household)	462,300	126,900	188,200	64,800
Combination of Capital and O&M costs				
NPW 20 year ($)	541,200	292,000	267,100	229,900

Information sources: [1]Vendor A or B, [2]Vendor C, [3]Vendor A, [4]Table E-3, [5]Local service provider to provide 240 V outlet, [6]Professional judgement, [7]PG&E, [8]Local analytical laboratory

Table E-3. Construction multiplier estimate

Category	Denotation	Percentage	Formula	Multiplier	% of Total
Treatment Capital	A			1.00	37%
Installation	B	30%	A x 0.30	0.30	11%
Electrical and I&C	C	25%	A x 0.25	0.25	9%
General Site Civil	D	20%	A x 0.20	0.20	7%
Subtotal	**E**		**A + B + C + D**	**1.75**	**65%**
Overhead and Profit	F	15%	E x 0.15	0.26	10%
Contingency	G	25%	E x 0.25	0.44	16%
Total Construction Capital Costs	**H**		**E + F + G**	**2.45**	**91%**
Construction Administration	I	10%	H x 0.10	0.25	9%
Total			**H + I**	**2.70**	**100%**

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Appendix F - Community Meeting and 1-on-1 Feedback Summary

Feasibility Study for Long-Term Drinking Water Solutions for the Unincorporated Area North of Moss Landing
Community Meeting Feedback Summary

We at Community Water Center (CWC) held two virtual public meetings to share more details about the project and obtain community feedback. The table below captures the questions that were asked and the answers that were given. CWC tried to represent the questions as they were asked. The answers, however **, have been edited for clarity and are not transcribed verbatim.**

Public Meeting #1: Scope of Project - February 19th, 2021 at 4:30 pm

Question	Answer
For the point-of-entry and also personal wellhead treatment – who pays for ongoing maintenance of the filters and who pays for the installation of the systems?	**Corona Environmental Consulting (Corona)** – The State of California is often open to assisting with capital installation of treatment equipment, but it remains to be seen if there will be assistance for operations. This will require more discussion with the State. Additionally, they will likely restrict assistance to individuals who are economically disadvantaged.
	Community Water Center (CWC) – This is a part of what we are going to learn in the study. This study will come up with what the costs are, and then we will work with the state to figure out what the funding availability will be.
Question	**Answer**
I'm currently considering making improvements to the reverse osmosis water treatment system that I have. When the study is complete and a solution is selected, will it be mandatory for everyone to join whatever solution is decided upon, or can we decide to continue to use the same wells and any treatment systems that we have?	**CWC** – Everyone's participation is totally voluntary. At the end of this study, we will also know approximately how long it will take to get the solutions to your property and what your options are. If you are going to make a big investment into your water system you may want to wait for the results of this study to help inform your decision.
Question	**Answer**
If treatment is just done at the point-of-entry system/point-of-use, horses and other animals that drink the water from the well would potentially be impacted by untreated water if all of the water going to the animals is not treated.	**Corona** – The point-of-entry treatment systems being considered have similar capacity to what would be installed for wellhead treatment to treat all of the water coming from the well, because the wells are pretty small in most cases. On a case-by-case basis you could consider whether it makes more sense to treat the water at the well or at the entrance to the home. The difference would be that treating all of the water from the well would result in higher maintenance costs.
Question	**Answer**
Will I qualify for the project given that I live on Jensen Road and the water I use is from the adjoining property where it is also used for agricultural irrigation?	**Heather Lukacs, CWC** – All households that are in the area will be eligible to be included in the project. The project is focused on water for domestic uses and bringing enough safe water for use in the household. Water for agricultural use is not included in the project.

Public Meeting #2: Overview of Alternatives - June 3rd, 2021 at 4:30 pm	
Question	**Answer**
Who would pay for treatment and what are the income qualifications?	We are still working to determine what funding would be available from the State Water Board for this alternative. However, we expect that state funding for installation would likely only be available for households whose income (or financial capacity determined by other measures) falls below a certain level. We also expect that operation and maintenance funding may be limited for this alternative and also only available to those who are financially eligible.
Question	**Answer**
What are the parameters for income qualification?	**Corona -** The MHI for California is approximately $75,000. 80% of that is $60,188, which is an income level the state typically uses. **CWC -** We are working with the State Water Board to better understand what the income qualification requirements would be for work done on private property. The State Water Board currently is proposing a method that collects different financial information from homeowners and uses that to evaluate their ability to pay for the work themselves. In the past, they have also used 80% of the statewide Median Household Income (MHI) as a threshold to qualify for funding. In 2020, the MHI was $71,228 and 80% of that was $56,982.
Question	**Answer**
Can you put in layman's terms how much monthly bills would be if we are consolidated with an existing system?	**CWC -** Pajaro Sunny Mesa Community Services District has the same water rates across the 9 systems that they own and operate, and if they extend the services here, then the rates would be the same as those. In order to move forward with this project and move forward with the state, it will take everyone involved, all types of property owners and residents. It needs to be a community-supported project.
Question	**Answer**
How will the final decision be made and by whom?	**CWC -** We are in the information gathering phase of this project and to determine what this will cost and what funding will be available for each alternative. The state has policies, like the Intended Use Plan and Fund Expenditure Plan, that describe how funding decisions are made. If project costs are higher than allowable in these policies, some decisions may need to go before the State Water Board. In order to secure funding, all interested community members will need to join together and seek state funding for that solution.

Question	Answer
If we are consolidated with another system will we be able to continue to use our wells for outdoor watering/agriculture?	**CWC -** Yes. Backflow preventers would be required if you choose to keep the well on your property, and it would need to be monitored annually. This backflow preventer is important for everyone to keep contaminated water out of the water system. **Corona -** If the consolidation option is selected, PSM CSD would decide whether private wells could be kept. It is our understanding that PSM CSD would allow property owners to keep their wells, but only if they install and maintain backflow preventers. in the Springfield system they are allowing homeowners to keep their wells for non-domestic use like irrigation. We are working now on costing out both backflow preventers and well destruction so you can see the estimated cost difference.
Question	**Answer**
If we decide to keep are well, it seems like we will need to install a backflow preventer at the expense of the homeowner and inspected every year or 6 months at the expense of the homeowner, is that still the case?	**CWC-** Yes, backflow preventers would be required if you choose to keep the well on your property, and it would need to be monitored annually. This backflow preventer is important for everyone to keep contaminated water out of the water system.
Question	**Answer**
When comparing between consolidation with Pajaro Sunny Mesa CSD and a new community water system, at some point will you be able to provide a comparison of the monthly water costs between Pajaro Sunny Mesa CSD and the [other] organization that could potentially be providing the water?	**Corona -** We do have monthly cost estimates for PSM CSD's rates and at this point it is assumed that Pajaro Sunny Mesa CSD would be the owner and operator for either the consolidation or new community water system option. Because this area is in Pajaro Sunny Mesa's service area, they get the first option to provide water service unless they decline it. **CWC -** on the water rates, PSM CSD has the same water rates across the 9 systems that they own and operate, and if they extend the services here, then it would be the same as those. In order to move forward with this project and move forward with the state, it will take everyone involved, all types of property owners and residents. It needs to be a community-supported project.

Question	Answer
Will the farmers in our area benefit from this project? In my opinion, it seems like they would. Will they be contributing to the expenses, or will only the residential homeowners be left to pay for it?	**Corona -** This water will be quite a bit more expensive than water that farmers have available on their property through their own well. They generally are not as concerned with the quality of water they are using so have more flexibility and options for what water they use. At this point, this is a residential project. If we go with the Springfield consolidation or new community water system options the intention would be for the project to be funded by a state grant. **CWC -** We are having preliminary discussions with landowners and everyone in the area, and we did have someone ask if they can get additional water, and if they would be able to pay for that on top of the grant. We have checked in with the grant managers, and that has been done before. So if there is a company that wants water, and there is enough water available, they could pay additionally for that.
Question	**Answer**
Will farmers who have single or multiple residential homes on their fields where they are doing agricultural work be asked to contribute because the people who are living in their different homes would benefit from the healthy water?	**Tarrah Henrie, Corona -** Ownership vs who is living there can be complicated sometimes, but yes, these households would have a chance to participate in the project and would need to contribute to work done in private property if they don't meet state funding requirements.
Question	**Answer**
For the consolidation option, pipes would run on public roads and then pipes would run lateral on private property and at that point people would have to pay if they didn't qualify, and it would be part of it if they do qualify.	**Corona-** Yes, that description of qualifications for work on private property is correct.
Question	**Answer**
Is it possible that PSM CSD would be bringing water out to the community within the next year.	**Corona -** It will definitely not be within the next year because of the time required to get grant funding and also because PSM CSD cannot start this project until they start the Springfield project. **CWC -** 3-5 years would be optimistic. Coming out of this project, it will be important to select a solution and for everyone to advocate for it.

Public Meeting #4: Draft Report - September 24th, 2021 at 4:30 pm	
Question	**Answer**
What is the deadline for us to decide whether or not we want to join the project?	**CWC -** CWC is requesting that all interested residents and property owners sign a petition that will (1) request state grant funding for the preferred solution and (2) state their interest in connecting to the new water system if grant funding is secured. CWC is working with State Water Board staff and Pajaro Sunny Mesa CSD to understand the level of commitment required during different steps of the process. As detailed in the second paragraph of Section 3.2.2 of the Final Report, a property owner opts out of connecting initially but wants to connect to connect at a later date after the project is complete, they may be able to do so if Pajaro Sunny Mesa CSD verifies there is sufficient water supply, but the property owner would have to pay (i) for the installation of a water meter and the Pajaro Sunny Mesa CSD-owned portion of the service line (i.e., the lateral between the water main and the property line), the cost of which varies depending on the household, but is typically around $12,500, and (ii) a connection fee of approximately $5,400.
Question	**Answer**
I am the last house on a shared private road. What would happen if the houses in front of me don't want to join? Would I still be able to join?	**CWC -** You could still be connected to the project as long as you have the right or are able to attain the right to install and maintain a private service lateral along the shared road. In some cases, Pajaro Sunny Mesa CSD may also be able to install and maintain water mains on private shared roads, but CSD staff have said that the CSD is unlikely to do this to serve just one household (See the end of Section 2.1.1).
Question	**Answer**
If I sign an agreement to connect to Pajaro Sunny Mesa CSD, but then my situation changes and I am unable to connect or not interested in connecting, would that cause any problems? Will I need to sign a legally binding document to connect to the project?	**CWC -** The petition that CWC is currently requesting that all property owners and residents sign is only intended to determine how many properties are interested in the project, so that CWC, Pajaro Sunny Mesa CSD and the State Water Board can plan around that. CWC is working with State Water Board staff to understand when in the process a commitment to join the project might be required, to what extent that commitment would be binding, and whether the commitment would be contingent on certain factors such as receiving state funding for all work on private property.

Feasibility Study for Long-Term Drinking Water Solutions for the Unincorporated Area North of Moss Landing
Community Member Survey Feedback Summary

Community Water Center (CWC) conducted surveys to share more details about the project with community residents and property owners and obtain their feedback on the alternatives that are being considered. The table below captures community member questions and feedback collected during the surveys. In many cases, direct quotes were not captured verbatim and the responses are paraphrased. In some cases, additional wording has been added by CWC in brackets for clarity.

(Results shown here are from 52 surveys conducted from 6/17/21 - 10/8/21)

1-on-1 Survey Feedback Summary

Survey Question 1	**Item No.**	**Community Member Responses**
When considering different drinking water solutions for your area, what is most important ?	1.1	The cost to the household, what portion will be covered by available funding (grants), and that the solution is long term. Avoid filters for solutions because they are too expensive and you have to make sure you maintain them.
	1.2	I would like a solution that applies not only to my house, but to everyone. Because it's not only my house that is impacted, it's the whole area. Because of the Ag industry. Something that isn't just temporary either, bottled water is only temporary.
	1.3	People's health.
	1.4	I want to keep things the way they are.
	1.5	Clean and safe water and not have water from a well.
	1.6	The water needs to be safe and clean so that it doesn't have contamination and so we are able to use it for our everyday uses without worries. Also the cost, it has to be affordable.
	1.7	For it to be reliable and affordable.

	1.8	That it is reliable, good water quality, and isn't a major responsibility on the owner.
	1.9	The least amount of contaminants.
	1.10	I hear everyone is concerned about the cost and how the project will be done. That concerns me too. Making changes to wells is going to be costly. I am on a tight budget and do not have the money to do any big changes.
	1.11	I really want to ensure that the water quality is good and that there is sufficient water. I have a 10-year-old so water quality is super important. I was really frustrated not having water due to power issues.
	1.12	The water quality is important. I have concerns around getting sick and having skin health effects due to showering with the water from the well.
	1.13	That the solution is reliable.
	1.14	I'm most concerned about cost. We use a lot of water because we have animals. We are under the impression that our bill would be expensive if we connected to a system because of the water use. Right now between our house payments, property tax, and insurance we have monthly expenses over $4,200 and are concerned about any solution that would be costly monthly. Water quality is also really important to us. The water dries out our hair, and we are aware the quality is very poor.
	1.15	To have reliable water, we currently get trucked water that costs $450 every time they come. We get trucked water because the property owners say that it's cheaper than fixing the well. They said that fixing the well would cost $10,000-15,000. So it would be great not to get trucked water.
	1.16	Access to clean drinking water. Without the bottled water that is being provided, it would be very hard to obtain clean drinking water given that I have small children and I am disabled. It's challenging to get a single bottle from a water kiosk, so I’m very grateful to have the bottled water resource.
	1.17	Cost, quality of water, and reliability.
	1.18	That the water quality is good for everyone.
	1.19	Well, according to the well testing that you did, we have good water quality, but I support the work that you are doing to help others in the community.
	1.20	Being able to have safe drinking water.
	1.21	Having good affordable water.
	1.22	Having safe water to drink and shower in as soon as possible.
	1.23	I want to make sure that the water is good for my grandkids and the future generations.
	1.24	To have safe water for my kids and my wife.
	1.25	Drinking water quality.

Survey Question 2	Item No.	Community Questions, Concerns, and Comments	CWC/Corona Responses to Questions Asked
Do you have any questions, comments or concerns about cost information that I just shared? (Asked after sharing information regarding what costs are being considered in the project and which are expected to be eligible for state grant funding based on preliminary discussions with the State Water Board.)	2.1	As a tenant, what costs would I have to cover? Would it just be the monthly water bill? Or would I have to pay for something else?	Any initial capital costs that are not paid for by a grant would be the responsibility of the property owner. The monthly water bill if connected to a community water system could be paid by you or your landlord, depending on what agreement you have with your landlord. Your landlord would likely be responsible for maintenance of household-level solutions such as treatment systems.
	2.2	Would I, as a tenant, have to pay any of the costs associated with this project?	
	2.3	The physical consolidation option makes the most sense because the initial costs would be lower than forming a new water system, and ongoing costs are up to you. If you don’t like your water bill, that is up to you and your water usage.	
	2.4	A lot of people’s concern is how far they are from the pipe and how the water will get to their homes. My house is 500-600 feet from the road. Would the state cover the cost of the pipe all the way to my house?	If the pipe from the public road to your house only supplies water to your home, it would most likely be a private service line owned by you, with a water meter located at the edge of the public road. You could be eligible for state grant funding for this pipe, but funding eligibility may depend on your ability to pay for improvements on your private property (see Sect. 4.1.1.1 for more details). If there are several houses near you that are far from the road, it is possible that a community water main could be installed and owned and maintained by the water system to serve all of those houses. In this case, the pipe costs would be eligible for state grant funding regardless of property owner ability-to-pay. Information on this topic was added to the end of Sect. 2.1.1.
	2.5	I care about the funding availability, but don't think the landlord cares. I think ongoing costs are important, but it depends on how high or low the actual costs will be. I am also concerned about my rent going up if a project is implemented.	

	2.6	What are the costs to each household?	The per-household costs for each alternative and potential eligibility for grant funding are shown in the Executive Summary (tables ES-2, ES-3 and ES-4) and Sect. 3. These costs will also be presented at Community Meeting #4 in September.
	2.7	Costs are really important to us. We are "tapped" and prefer a solution that is lower cost.	
	2.8	The property owners are retired, so hopefully they can qualify for state funding. We [the tenants] would be open to covering costs if necessary, as long as the solution is really reliable in the long-term.	
	2.9	We go through a lot of water filters currently and the costs are very high. My landlord was going to install a new well but that's been pushed back. I would like to keep my private well, but that's probably not possible due to the bad water quality. So I'm very interested in this project and this option.	
	2.10	We are very concerned about costs. We are low-income, and we have 8 people in our household. The cost will be a major factor in all this.	
	2.11	When will you have more information on whether or not the costs on private property will be covered?	Current SWRCB policy states that for funding of consolidation projects that involve privately-owned water systems serving small or expanded small disadvantaged or extremely disadvantaged communities (DACs/SDACs), "the system owner's ability to pay will be considered for any work occurring on the private property."[1] DFA staff initially advised CWC that this guidance would apply to work on private property for households involved in this project. However, via email correspondence on 10/14/2021, the DFA Assistant Deputy Director said that the SWRCB is updating their funding policy for work on private property. In the updated funding policy, funding eligibility for work on private property may be determined on a community basis, meaning that most households in this project would be eligible since the area is classified

[1] SWRCB, "State of California Drinking Water State Revolving Fund Intended Use Plan", 6/15/21, pg. 20. https://www.waterboards.ca.gov/water_issues/programs/grants_loans/docs/dwsrf_iup_sfy2021_22_final.pdf

			as a DAC. The DFA Assistant Deputy Director said there may be some exceptions, such as very costly work on private property or in cases where block group income data is not representative of individual households in the project area. In these cases, funding eligibility would be based on the property owner's ability to pay. DFA is working to formalize this guidance into a written policy and CWC is seeking confirmation whether this policy applies to all costs on private property (lateral, well destruction and backflow preventer), and what criteria may be used to identify exceptions where ability-to-pay information is required. This update has been added to a footnote in Sect. 4.1.1.1 of the report.
	2.12	The lower the monthly cost the better. People are moving out of California because of the high costs.	
Survey Question 3	**Item No.**	**Community Questions, Concerns, and Comments**	**CWC/Coronal Responses to Questions Asked**
Do you have any questions, comments or concerns about Option 1: Connecting to the Springfield Water System?	3.1	I would need to think about whether each household would be served by a separate meter or one main meter for the multiple households on my property. Can I install the lateral connection on my private property myself? If a right-of-way is required on my parcel, what impact would that have if I want to sell or build on my property? (This question was asked regarding a property that includes more than one household owned by the same owner.)	Yes, property owners can install the lateral connection from the meter to the household themselves. The property owner would be required to obtain a simple construction permit from Monterey County, which costs approximately $240. A right-of-way would only be required on your parcel if pipes will pass through your parcel to serve a property behind you that does not have access to the public road. In this case, the pipes would likely be installed along a private road where a right of way has already been granted. We recommend you discuss with a real estate professional whether these right of ways could have any impact on future sale or use of the property. Information on this topic was added to the end of Sect. 2.1.1.

	3.2	I like this option because it seems more realistic and possible. I think drilling a new well is too expensive and we are really far from the city. I am willing to pay a water bill for safe water.	
	3.3	I wonder whether it could also be feasible to consolidate with the Las Lomas or Pajaro water systems.	Based on this and other stakeholder feedback, we added Physical Consolidation Scenario B: Connection with the Pajaro Water System to the Draft Public Report (see the Executive Summary and Sect. 2.1.1). As discussed in Sect. 2.1.1, the majority of the project area is in Pajaro Sunny Mesa CSD's (PSMCSD) designated service area, as established by the Local Area Formation Commission (LAFCO) of Monterey County. Therefore, PSMCSD has the right to serve the project area and they have expressed willingness to do so. A connection to the Las Lomas water system, owned and operated by California Water Service, could be considered only if PSMCSD declined to provide service to this area.
	3.4	The water system option makes most sense with Sunny Mesa because the initial costs would be lower than forming another water system, and ongoing costs are up to you, if you don't like your water bill price, that's on you and your water usage. This option is the most reliable and makes the most sense for cost reasons, so this is the best option. Would state funding be available or are other funding options being looked into? If renters are low-income, would that apply for funding eligibility, or is it based on the property owner's income?	As detailed in the Executive Summary (Table ES-3) and Sect. 4.1.1, state grant funding will likely be available for the community infrastructure for the consolidation alternatives due to the overall income of residents in this geographic area. State funding eligibility for work on private property that is permanent (e.g. pipes in the ground) may depend on the property owner's ability to pay (see Sections 4.1.1.1 and 4.1.1.2 for more details). Other funding options may be available to supplement state funding if needed, but these options have not yet been explored in detail.
	3.5	I think this is the best option.	

	3.6	I lived somewhere else in the past and paid $200 for water and didn’t understand why it was so expensive. I don’t like water companies, don’t trust any agencies, and am not fond of the government. I’m not against consolidation, just against agencies and how they work. If consolidation does happen, I would want to have the option of keeping my well.	If the project moves forward with the physical consolidation alternative, property owners would have the option of keeping their well for outdoor water use as long as they install and maintain a backflow preventer to prevent water from their well from entering the public system (see Executive Summary and Sect. 3.2.2). Property owners would also have the option to not join the project and continue to use their existing well for all purposes.
	3.7	This seems to be the best option, that way you don't waste time and money looking for additional sources of water for a new water system. If I get piped water, what will happen to the pipes in my home? Will they be cleaned or flushed? I imagine there could be contaminated water residue in the pipes.	If your home is connected to a safe water supply, your pipes could be flushed to flush out the old water before you begin to use the water. The contaminants of concern in this area, such as nitrate and 123-TCP, do not accumulate in or stick to the pipes in significant quantities, so the contaminants will go away once the old water is flushed out of your pipes.
	3.8	At first I wasn’t interested in this option, I was only interested in treatment options because that is something I have tried before, and also because my neighbor has tried it as well. My neighbor was able to figure out a system, however they stopped taking care of changing the filters and now it doesn't work. I’m mentioning this because I have animals, so our water use would be significant, and therefore the bills would be significant. However, after learning about the option of keeping one's well if we were to install a backflow preventer, we are more interested in this option. This would work for us, if we are able to install that, because our indoor use is minimal, and it would allow us to use our well for outdoor usage. We are aware of Pajaro Sunny Mesa CSD, and were initially concerned because we heard about the costs with them.	
	3.9	It seems like a good option, much better than getting water trucked in.	

	3.10	While, there may be less control, this seems to be the best option, it seems like this might be less stressful. Having the accessibility of having decent monthly water costs is worth it because I am a disabled person and I would prefer to have a professional take care of the water. That would be one less worry for me.	
	3.11	The only thing that comes to mind, is it going to be overcharged, or are the rates going to be reasonable from the water company. Who is going to assure that the water company isn't overcharging us for water? The $88.00 (shown in table ES-4) is really high for a family of 4. We are a family of 8 and so we are concerned that we would not be able to afford water, or would have to ration water all the time for indoor use. We have teenage kids who use the shower for a very long time, and that would probably raise the consumption and therefore the bill. Right now we are fighting PG&E because we were charged $800, and we are concerned about water bills being similar.	The water rates would be set by Pajaro Sunny Mesa CSD (PSMCSD), which charges the same water rates across all of the water systems that it owns and operates. PSMCSD is governed by a board of directors that have monthly meetings that are open to the public. All members of the board are also paying customers of PSMCSD. A water bill is based on the amount of water used; the more water used, the higher the bill will be. The Pajaro Valley Water Management Agency (PV Water) has a local residential water conservation program that can help you reduce water use in your home. You can read more about their programs at: https://www.pvwater.org/residential One part of their program offers free indoor water conservation devices including free low-flow fixtures including showerheads, hose nozzles, 5-minute shower timers, moisture sensors, kitchen faucet aerators and bathroom faucet aerators. These devices are free to homeowners and renters that live within the PV Water boundaries outside of the City of Watsonville and Soquel Creek Water District areas. You can pick up the free devices from the PV Water office.

	3.12	Our water line runs close to the street (a couple hundred feet) and provides water to two households. When we put in an agricultural well, we had a ton of work that needed to be done, which with the size of the pipes, caused damage to the trees on our property. The trees then died, and two of them fell on the house. This was for a pipe sized for an agricultural well, so I assume that this [piping for drinking water supply] would be different. I think that the connection would be fairly simple since our household water system pipes are right close to the street, and we could connect that way. I support this option, it seems very logical. It seems like you have a good team working on it.	Thank you for this comment. As you indicate, to connect the households on your property to a piped drinking water system, a lateral pipe will need to be installed from the water meter on your property line to piping that enters your house. The length and route of this lateral will depend on the layout of your plumbing.
	3.13	We are not very optimistic about this option, not because we don't believe in it, but because we have been here for over 45 years and I know that this gets really political. There is an enormous amount of money that needs to go into a project like this, and I don't see it being funded. I support the work you are doing, and I support this option. It would make more sense to have tanks at each household and having water trucked to the houses since there is going to be a long time delay in getting this going. I would like to know more about costs, how deep the wells in the Springfield project are, and how long those wells will last before they need to look into others.	For more information on costs of the alternatives considered, including Connecting to the Springfield Water System, please refer to Tables ES-2, ES-3 and ES-4 in the Executive Summary. There is currently only one well to supply the Springfield Project that meets water quality standards. Information on that well is shown in Table C-1 in Appendix C of the report as “Springfield Well 2” and is 600 feet deep and screened from 490 to 590 feet deep. Based on existing water quality and hydrogeologic information, the length of time the wells will produce adequate water quality cannot be determined.
	3.14	I love the idea, and support it.	
	3.15	Would the pipes go underground along the road? I am supportive of this option and supportive of your work. I would support any option that you suggest is the best, because I know you support the community. I’ll leave it up to your expertise to understand the details, and I will be ready to take action if needed.	The exact locations of the pipes would be determined during detailed design, but they would most likely be installed underground within the right-of-ways for the roads, either below or alongside the road itself.

	3.16	How much will the monthly water bill be? I think that it might be cheaper if I use my well water for my art studio. Would I be able to maintain my well for outdoor landscaping, would I be able to replumb my well for my art studio only? I understand that the treatment options would not work for my house because of the high levels of contamination that I have, so I'm supportive of this option. I'm curious if my electricity bill would go down since I will not be using the well as much, the well uses a lot of electricity right now, and also maintaining it is expensive as I was thinking about getting a new pressure gauge and tank.	Potential household water bills for different water use scenarios are shown in Table ES-4 of the Executive Summary. As detailed in the Executive Summary and the last paragraph of Section 3.2.2, property owners would be able to keep their wells for outdoor use as long as a backflow preventer is installed and maintained and piping supplied by the well is separated from piping supplied by the community water system. In the case of the art studio, the well water should only be used for non-potable uses. If the well is used to supply the art studio, the art studio plumbing would need to be separated from the plumbing connected to the community water system. If your well is not used for indoor water, the time the well is on and the electricity used will decrease. The extent of the decrease will depend on how much water you continue to use from the well for outdoor purposes.
	3.17	I am supportive of this, but I'm not sure I'm ready to commit to it just yet. I am putting tens of thousands of dollars into my water system in order to build my house to code, and having to change everything in the future after all that I have invested is a big concern. I do think it's a good idea, but I'm thinking a lot about the investments I'm making now, and what I would have to do later. I don't think that I would be able to sell all the investment (i.e. equipment) 10 years from now, or whenever the project is finalized, so I am not sure. I would sign a petition if it is general though to support in the planning process.	
	3.18	This seems like a good option, but since we have good water would we need to connect? Would we have any power in deciding whether to connect or not? Or is it up to the landlord?	No one would be required to connect to the project, and it would be up to the property owner to decide whether or not to connect.

	3.19	How would the pipes come all the way out to my trailer? We have a big fence around the trailers. Would that be an issue when the construction begins?	A lateral pipe would be installed from the water meter on your property line to the trailer or to an existing pipe that is currently supplying the trailer. The property owner would own and maintain the lateral, but state funding for its construction may be available as detailed in Section 4.1.1.1. The lateral would need to be built according to county requirements, and a county construction permit would be required. Any potential issues with installing the lateral under the fence would need to be evaluated based on the details of how the fence is constructed.
	3.20	This seems like a good option, public water seems to be safer than water from the wells.	
	3.21	This seems like a good option, what needs to be done to implement this option?	The steps for implementing this option and a potential schedule are shown in Figure 20 in Section 4.1.4.
	3.22	This seems like a good option, but can I keep my well? If I keep my well, do I still have to pay PV Water every year?	Yes, you can keep your well if you install and maintain a backflow prevention device (see Executive Summary and the last paragraph of Section 3.2.2). Yes, if you keep your well, you will need to continue to pay PV Water each year. If you destroy your well, you will no longer pay PV Water.
	3.23	This seems like a great option, it seems reliable and it would be great not needing to worry about the water quality from the well. It's great that that's left to the professionals.	

	3.24	Would everyone have the same water pressure with this option? For instance, would the person at the beginning of the pipe have the same pressure as the person at the end of the pipe? If doing this project, would it make sense to install additional parallel pipes in the road for future projects? They would prefer to keep their well and not destroy it.	The water system would be designed so that pressure loss in the pipes is minimal during normal conditions and that all households have sufficient pressure even under extreme conditions, such as when large quantities of water are being extracted from a fire hydrant. The California Code of Regulations requires that piped distribution systems be operated to assure a minimum pressure of 20 psi at the service connection and that new distribution system expansions be designed to provide a minimum operating pressure of 40 psi at all times excluding fire flows (22 C.C.R. § 64602). Households at the end of the pipe may have slightly lower pressure, but these differences should not be noticeable. This project would most likely only include funding for pipes sized for the current project. Installing additional piping would increase the cost of the project, and funding is only available to satisfy current needs.
Survey Question 4	**Item No.**	**Community Questions, Concerns, and Comments**	**CWC/Coronal Responses to Questions Asked**
Do you have any questions, comments or concerns about Option 2: Forming a new community water system in the area	4.1	This is a good option too, if it is more expensive and what if we don't have enough grants?	The State Water Board has communicated that if consolidation is found to be a feasible option for the community, it will be the solution the State would most likely fund, and other solutions such as a new community water system may not be eligible for funding (see Section 4.1.1.1).
	4.2	If 50 of 90 people move, and new tenants move in and they are part of a community, then who has the power and know-how to run it? Who would manage it? This solution would probably not work.	Pajaro Sunny Mesa CSD (PSMCSD) has indicated they may be able to manage a new community water system in the area. They currently own and operate nine small public water systems in north Monterey County. If PSMCSD declines to manage a new community water system, and no other existing water providers in the area, such as California Water Service, are willing to operate it, a new water provider would have to be formed to manage and operate the system. This new water provider would be a legal entity with a governance structure and state-certified operator. Households would become customers of this new water system. Similar to other public water systems, when someone moves, the system would stop water service to their

			house and the new resident would open an account in their name. If a board member (responsible for making decisions) moves, a new board member would have to be elected or appointed to the board.
	4.3	Why would we have two systems when you could have just one?	This option is being considered in an effort to include all potentially feasible options, and in case households in the project area may want to own and operate their own water system.
	4.4	A new separate system would probably be better for everyone on their road because you might not have to pipe it from all the way across the road. A neighbor has a pretty deep well that might be a water source option, but I don't think the neighbor would likely be interested.	
	4.5	This seems to be a lot of extra work and it could take longer to complete with drilling the wells and getting the permits. I probably won't be here to see this project through.	
	4.6	How big will the wells be? To get this option it will take a while to implement and it'd be more costly, so I don't think this is the best option.	For preliminary cost estimating, it was assumed in the report that new community wells would be 620 feet deep and have 12-inch diameter well casings (See Table C-3 in Appendix C). The dimensions of the well could change based on additional analysis conducted during design.
	4.7	It seems like it would make more sense to do the first option rather than this one because it would be the same thing, but more costly.	
	4.8	This seems like a good option as well, but I think the first one makes more sense given the costs.	

	4.9	The first option seems better considering the costs and considering that we don't know how much we will need to pay for the work on private property. I would assume that the state would fund the least expensive option.	
Survey Question 5	**Item No.**	**Community Questions, Concerns, and Comments**	**CWC/Coronal Responses to Questions Asked**
Do you have any questions, comments or concerns about Option 3: Replace existing private wells	5.1	My well currently has good water.	
	5.2	With the drought there isn’t enough water. Seawater intrusion could occur, causing more problems.	
	5.3	This option would be too expensive for me.	
	5.4	I don’t see this as a solution on my property, since there's no way to put in a well that would produce good water quality. The only solutions I see are treating my well or connecting to a piped system.	
	5.5	This would be a terrible idea for my location. That's just spending money, and not having success. To drill a $150,000 well for one house makes no sense, especially when you don't have a guarantee of success. It's better to be a part of a system that is going to be successful. Based on my experience living on a system, that seems to be a good option.	

	5.6	When they're drilling, you don't know if you're going to hit good water or not. A well driller will come and drill, and will tell you that they can't guarantee whether they'll find good quality water. The way things are with the drought right now things are just getting worse and worse. My father put in another well that was about 450 feet deep on an adjacent property that we later sold. That well is still there. They were also getting a little bit of nitrate in that well and for that reason they are having water hauled in.	
	5.7	I am interested in this option, but prefer to keep things the way they are.	
	5.8	This option seems the same as what I am doing now.	
	5.9	I'm not sure I'm interested in this option, I'm more interested in treatment options.	
	5.10	It seems like this would require more responsibility from us, which I'm not interested in being responsible for.	
	5.11	It seems like this option would be more appealing to my grandparents (that live on Bluff) because they're more old fashioned and they like to keep things more private. My landlord would probably like this option better as well.	
	5.12	That doesn't seem like a good option because it seems like the water here isn't that good.	
	5.13	The well that we have here is an agricultural well. Could another well be constructed specifically for household use only?	Monterey County permits all new wells and would decide whether it is feasible to construct a drinking water well on your property. They require that any new well be drilled to their standards and be located at least 100 feet from subsurface sewage leaching fields and septic tanks, and at least 150 feet away from seepage pits (See Monterey County Code Chapter 15.08: Water Wells). They also require that the well be set back 10 feet from the

			property line and also meet setback requirements for subsurface sewage leaching fields, septic tanks and seepage pits located on other parcels. The Department of Water Resources also requires a sanitary separation of a new well from animal or fowl enclosure of 100 feet: Section 8. Well Location with Respect to Contaminants and Pollutants.
	5.14	Is there a place to get good water here? It seems like it might be a waste of time and money.	Analysis of the viability of a new community well is provided in Section 2.1.1 under “Scenario A: Consolidation with the Springfield Project and development of a new community well.”
	5.15	If it's not feasible in some areas of the community then it doesn't seem like a good option to me.	
	5.16	This solution seems like it would be awfully costly. A new 700-ft deep well they recently installed cost approximately $160,000. That will likely be even higher in two or three years, maybe $200,000-$300,000.	
Survey Question 6	**Item No.**	**Community Questions, Concerns, and Comments**	**CWC/Coronal Responses to Questions Asked**
Do you have any questions, comments or concerns about Option 4: Installing treatment systems on existing wells.	6.1	I don't like this option because I have multiple contaminants (nitrate, 123-TCP, and bateria) and it is too much responsibility for me to monitor and replace the filters.	
	6.2	I would have to go to a desalination system. You could put one in and the cost would be high, but not as high as drilling a new well. I am not sure that would work either.	
	6.3	Doesn't it make more sense to get the connection to the existing system than wasting time and money on treatment systems?	
	6.4	If you had to go that route (treatment), is the system going to work? Like you mentioned, it may depend on how high the contaminant levels are.	That is correct. A treatment system installed on existing wells would have to be designed to effectively treat the level of all contaminants present in that specific well. If you have very high nitrate, for example, a treatment system would have to be designed to reduce that nitrate to levels that are safe for potable use. The treatment system would also have to be properly monitored

			and maintained in order to be effective after installation.
	6.5	This would not work for me.	
	6.6	I have filters that I buy at Ace Hardware for under my sink. I'm not too sure what they do.	
	6.7	Initially, I was only interested in this option. I have tried this in the past, and I am interested in support for how to do this successfully. However, after reviewing my well results, my water quality [contaminants are] at such high levels they would not be treatable by a certified system.	
	6.8	How often would filters need to be replaced? How much would the filters cost?	Estimated operation and maintenance costs, including membrane and filter changeout, are provided in Table 19 in Section 3.5.1.2 for wellhead treatment and in Tables 23 and 24 in Section 3.5.2 for point-of-entry and point-of-use treatment. For point-of-entry granular activated carbon treatment for 123-TCP, it was estimated that the pre- and post-filter would be changed out every 3 years and that the carbon media in the lead vessels would be changed out every 2 years. For point-of-use reverse osmosis treatment, it was estimated that the pre-filter and membrane would be changed out two times per year. These are only estimates, and actual change-out frequency will vary depending on the source water quality.
	6.9	That's something I’m trying to implement on a small scale. It seems very costly because you would have to have multiple systems on the different areas where you use water. It doesn't make water appealing for drinking. If you don't test it you wouldn't know if the water is clean enough to drink. This sounds like it would lead us back to the drawing board. It would probably have a high failure rate.	
	6.10	How much would it cost to install a system? I am concerned about all costs across all options. The capital and monthly O&M costs of the treatment options are surprising and concerning.	Capital and O&M costs for wellhead treatment are provided in Table 19 in Section 3.5.1.2.

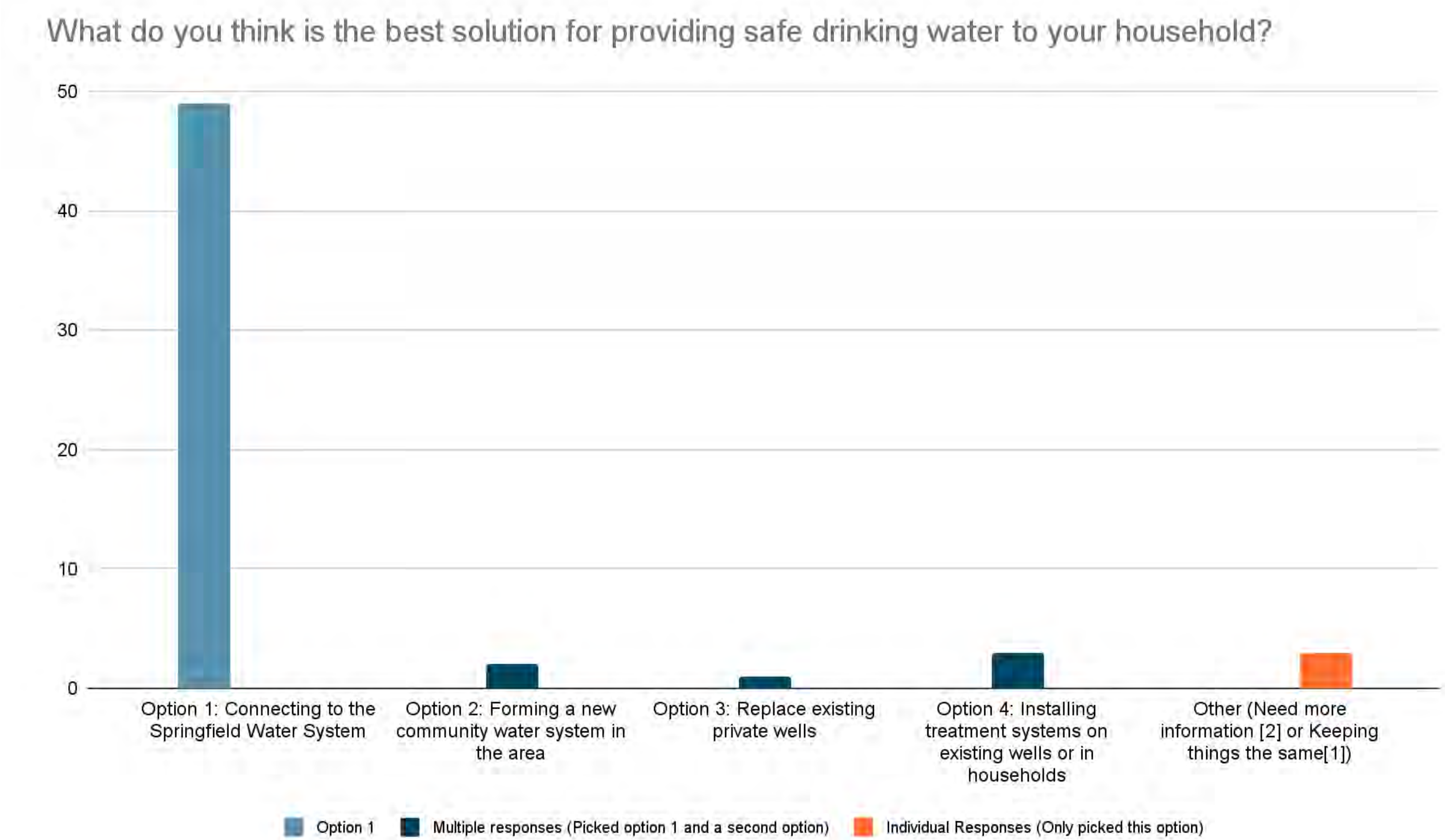
	6.11	That doesn't seem like a good option either because there's a lot of responsibility on us and the owner to make sure that the filters are changed.	
	6.12	I'm interested in learning more about my water quality to see if we could use these treatment systems in the meantime.	
	6.13	This seems like a good option, but not as a long-term solution. I don't think I would trust the water if it was just being treated and I had to be responsible to make sure it's working.	
	6.14	We have tried this before in the past. Our landlord bought us filters but they would get filled up with sediment and it was a hassle to deal with. This isn't a good option.	
	6.15	We've tried this in the past. It's been a struggle. We have really bad water and it eats everything up, we constantly need to replace the shower head.	
Survey Question 7	**Item No.**	**Community Questions, Concerns, and Comments**	**CWC/Coronal Responses to Questions Asked**
Additional thoughts and questions on the project	7.1	Would this project be against me if I wanted to develop additional properties? If there is existing water, could I connect?	Any new development would have to be approved by the County and be consistent with the Monterey County General Plan. If piped water supply from Pajaro Sunny Mesa CSD is installed in the area and a new service connection is requested, Pajaro Sunny Mesa CSD would need to verify that sufficient supply is available before connecting new households. This information has been added to Sect. 3.2.2.
	7.2	With the different options, it's hard to say because it's hard to know what it's going to cost. The state is going to go the cheapest route, which is understandable, but everyone's concern is what's going to happen in the next year or two with their wells.	

	7.3	I am very worried about the contamination and think the best solution is to get the connection to the pipes.	
	7.4	Does the Springfield water system have enough water to provide additional households water (i.e. more than 90)?	Yes, the Pajaro Sunny Mesa CSD has indicated that the well that will supply the Springfield Water Project has sufficient capacity to also supply the additional 88 homes in the project area. However, the Springfield Water Project does not include a backup well that meets water quality standards, so an additional backup well would need to be constructed in the project area or a connection to another water system would need to be made in order to have a backup supply (see Sect. 2.1.1).
	7.5	Good luck. Please support us to ensure we implement a long-term solution.	
	7.6	My property is in the middle of nowhere. Let's say the project moves slower, but I choose physical consolidation. Would there be extensive costs because of my distance from the system or from the road? What about parcels that don't have residents on them? If there are 10 acres on there, and you want to build a house in the area, would you be able to connect in the future? Would there be potential to connect in the future to a system if not done right away?	Regarding distance from the system or the road, see response to Item No. 2.3. Regarding new development, see response to Item No. 7.1.
	7.7	Does the road have to be wider if they extend water service? If there are a bunch of houses out here, will the road be the same? Taxes are going up, but there are no improvements in the road.	We anticipate that the water pipe could be buried along the existing road and that the width of the road would not need to change.

	7.8	Property owners may not be interested in this project because they don't live here and they are not impacted by this issue. So even if I want this solution, but the property owner doesn't, what happens then? Would I as a tenant need to pay for something?	For all alternatives other than point-of-use treatment, the property owner would need to decide to participate. CWC is working to contact property owners and improve their understanding of the importance of this project and safe drinking water.
	7.9	I am against income level funding. I like the bottled water program and would continue to pay for it myself if it ends.	
	7.10	How long does it take to implement or to connect to the existing system?	It is anticipated that connecting to an existing water system (physical consolidation) could take until 2027 or perhaps longer (see Sect. 4.1.4). CWC is working with the State Water Board to expedite this process as much as possible.
	7.11	The community has a lot of distrust with the water. I have never known any of my family or friends that have drank water from the faucet. The older generation doesn't drink a lot of water. Whatever option is chosen, it is hopefully going to help the new generation and promote drinking more water to hydrate. if they could just go to the facet and get water instead of getting sodas.	
	7.12	I don't think the water quality is so bad, but recognize that long-term the water may degrade, and I know we need to do something at some point.	
	7.13	Seawater intrusion is a major concern for us. I have seen so many people dig wells and it never ends up being good. I often joke that a house [in this area] "drilled clear to hell" (a well so deep) that they had to cool the water since it came up so hot. That well eventually went bad too. Salt water intrusion is a big deal. I would discourage digging wells because folks wouldn't be able to pay it off in time before it went bad again. I have seen folks trying to pump water back into the slough. There must have been some fissure under the aquifer that is bringing salt water into the groundwater, and I noticed that the last earthquake has sped that up a lot.	

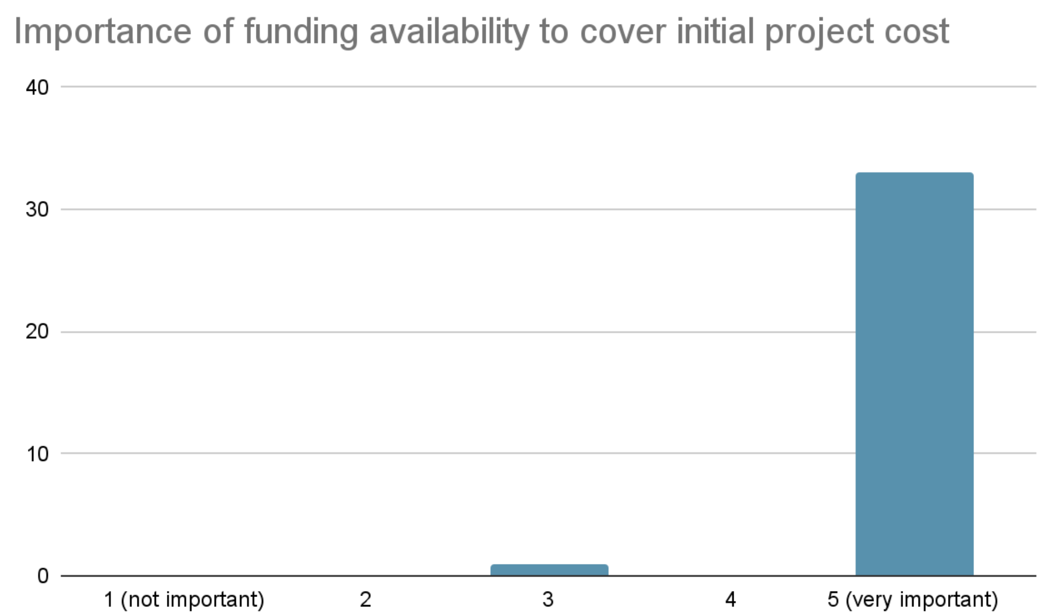
	7.14	I recently recovered from cancer, and maybe it has to do with the water. I've been living here my whole life, so I'm sure I've been exposed to a lot of bad things that can be found in the water.	
	7.15	The water near the hilltop was good back in the day, now a lot of houses have old infrastructure which makes it hard to have safe water. I think it may be a good idea to have a pump station where folks can go and fill up here in the community. We are grateful for the bottled water. I don't think I will see the water project happen in my lifetime. Are the roads good enough to have pipes installed? The reason the community doesn't have gas is due to the roads not being in a good condition, and it would cause harm to potential gas pipes. The crops have changed, labor camps have changed, and in the past there was also an offshore air base nearby in preparation for any foreign attacks. I wonder what contamination may have been brought with that.	If pipes are installed under or along roadways, Pajaro Sunny Mesa CSD requires that they be all-weather roadways that are accessible and covered in pervious or impervious material that will support the weight of traffic all year long.
	7.16	I am concerned about bacteria in particular, I recently had a cut on my leg/foot and went to the hospital. They almost had to amputate the foot because it was infected. I think that the water has to do with it because a neighbor also had a situation happen like this. I am interested in the option of connecting to the Springfield project.	
	7.17	The land has changed a lot due to all the farming that goes on in the area.	
	7.18	I am very grateful for the project, the bottled water has really helped with accessibility. When I lived in Salinas there weren't many issues with water, but then I moved to this area and started to get sicker and sicker, and realized that having clean drinking water is something very valuable that I took for granted.	

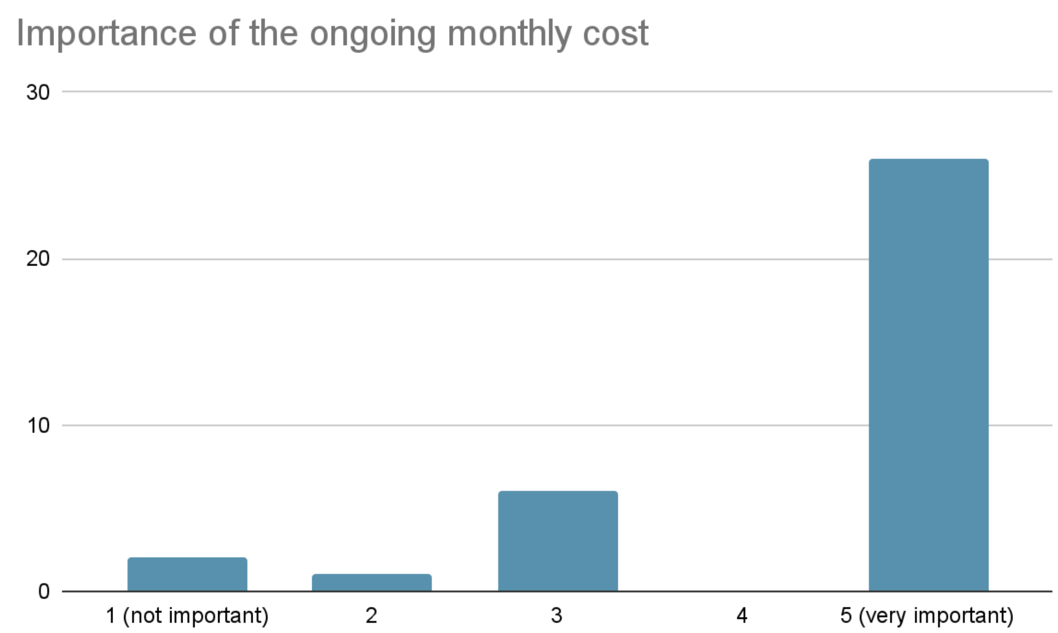
	7.19	Why is it that we have good water, but others around us don't?	Many factors can affect well water quality and cause water quality to differ between two wells even when they are close together. Differences in water quality could be due to: ● Differences in the depths of the wells or how they are constructed because some contaminants may only be present at specific depths and poorly constructed wells can allow for contamination from surface runoff ● One well being closer to a source of contamination ● Differences in the pumping rates of the two wells or of other wells near to them, since stronger pumping could be more likely to draw contaminants toward a well and away from another ● Variations in groundwater quality, which can occur even over short distances
	7.20	How long would it take to start the construction?	Example timelines for implementing the different alternatives considered are provided in Section 4.1.4.
	7.21	Projects like this tend to take a lot of time. They were on a committee about the construction of a frontage road in the community and that project took about 10 years.	

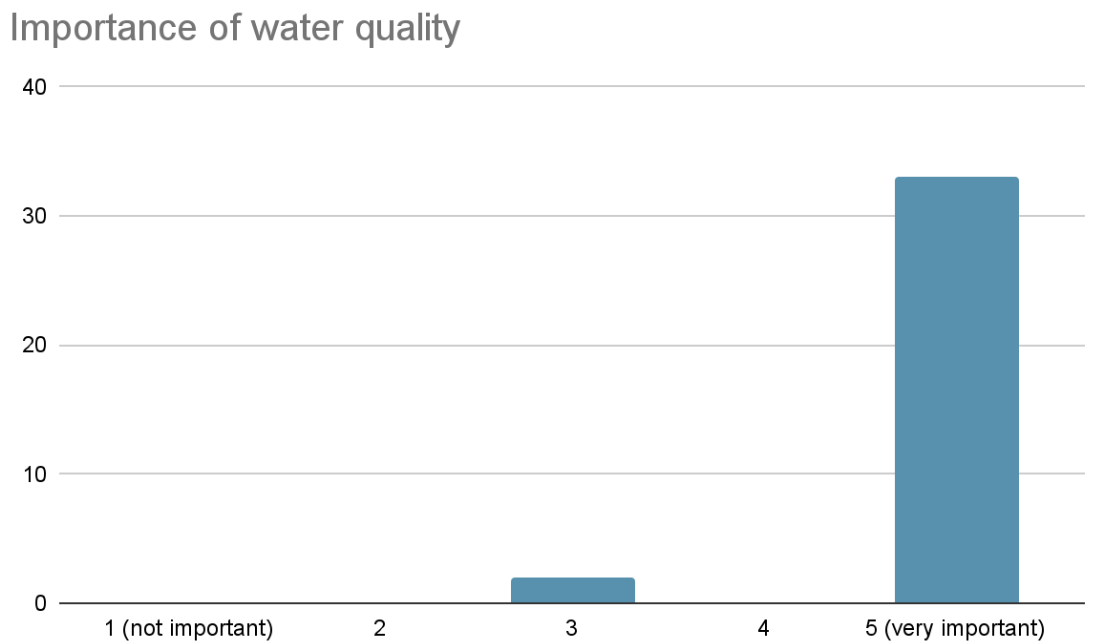


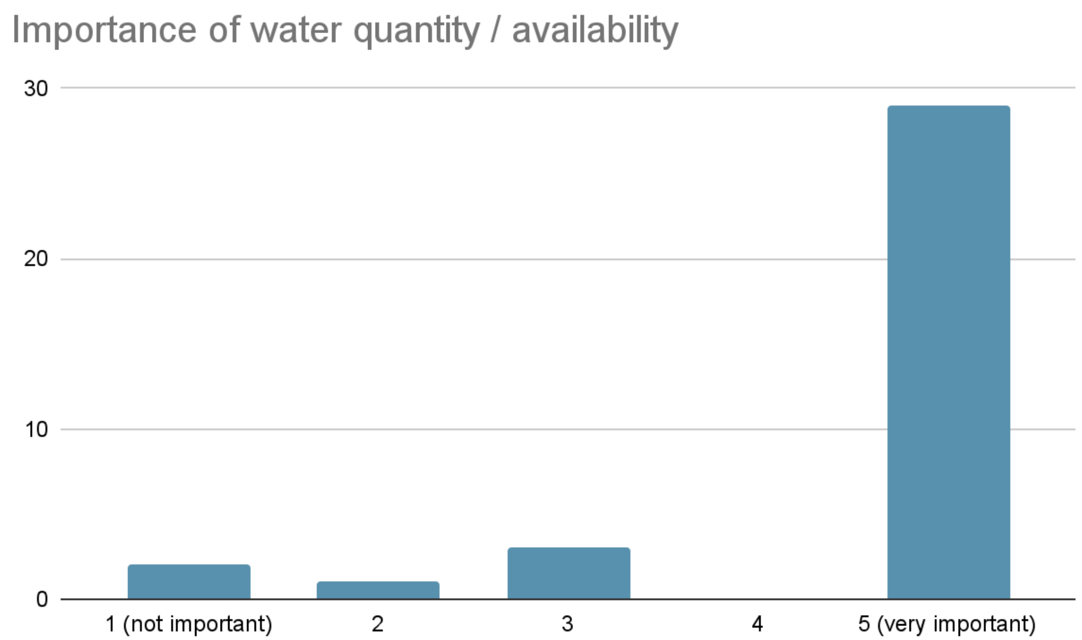
***After 9/24/2021, to reflect the Draft Report recommendation of connecting to the Springfield Project, this question was changed to: "Do you support the recommended alternative of Connecting to the Springfield Project, operated by Pajaro Sunny Mesa Community Services District? If not, what option do you prefer and why?" This modified question was asked to 10 respondents, who all said they supported the recommended alternative and are shown in the "Option 1" bar of this graph.**

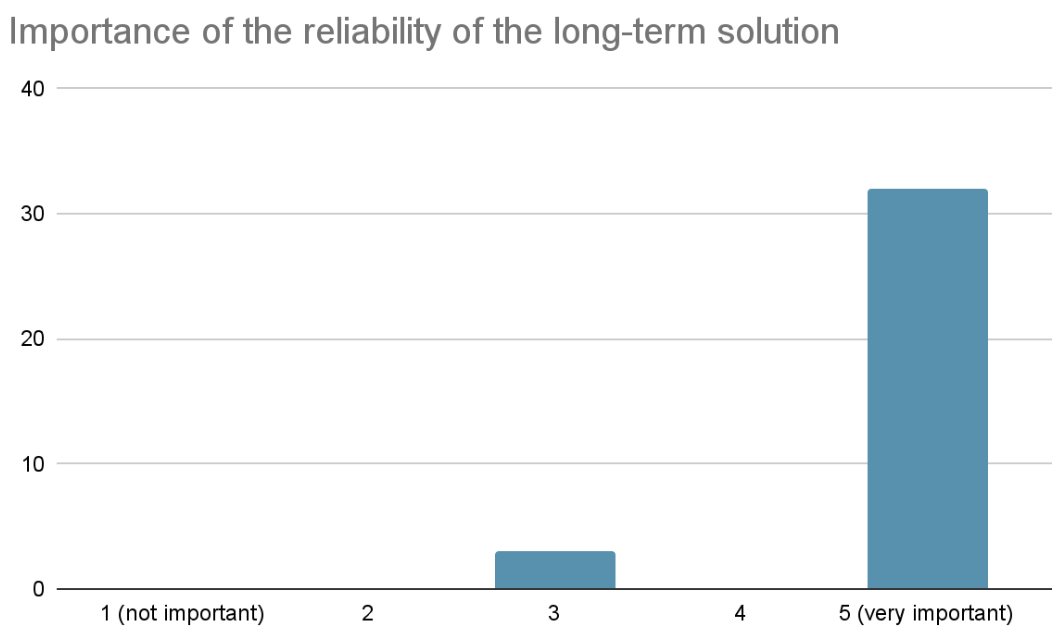
Community members were asked to rate the importance of 8 factors on a scale of 1 (not important) to 5 (very important). The results are shown in the graphs below.

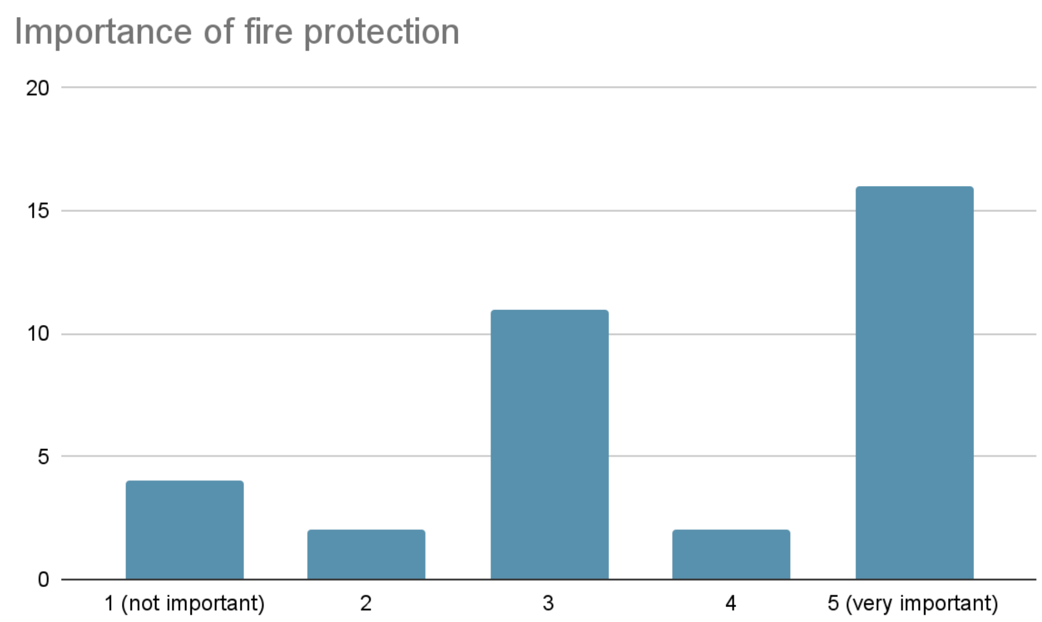


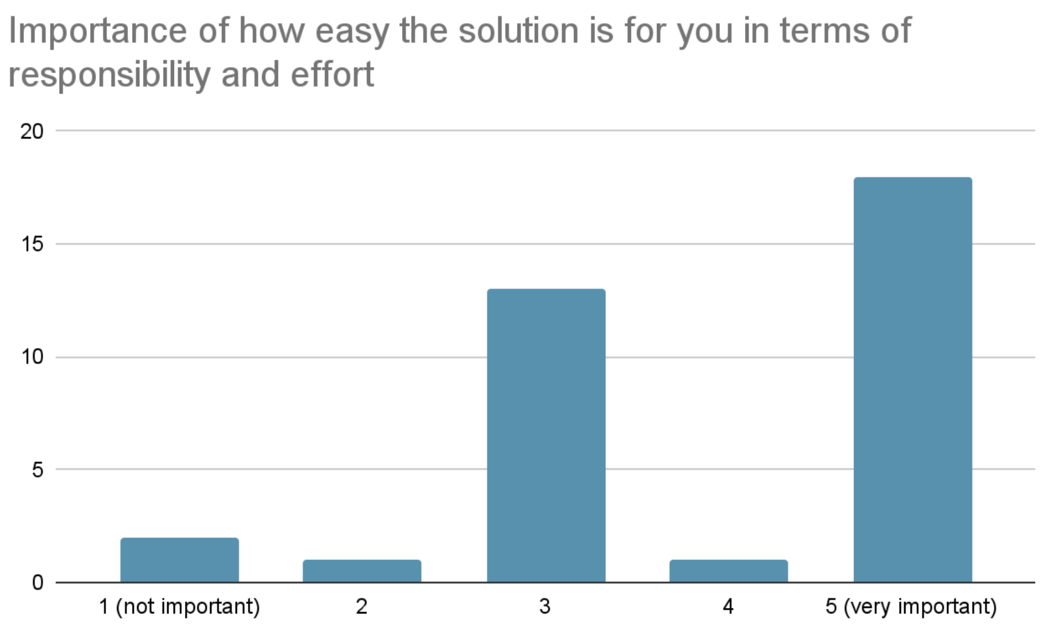


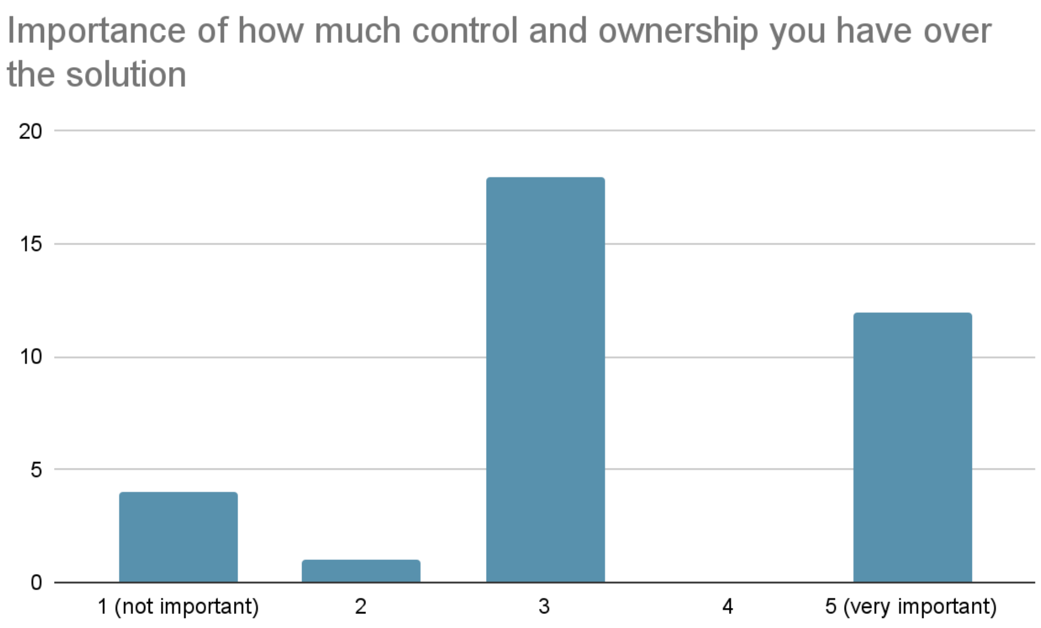

Importance of water quality
40
30
20
10
0
1 (not important)
2
3
4
5 (very important)


Importance of water quantity / availability
30
20
10
0
1 (not important)
2
3
4
5 (very important)


Importance of the reliability of the long-term solution
40
30
20
10
0
1 (not important)
2
3
4
5 (very important)


Importance of fire protection
20
15
10
5
0
1 (not important)
2
3
4
5 (very important)


Importance of how easy the solution is for you in terms of responsibility and effort
20
15
10
5
0
1 (not important)
2
3
4
5 (very important)


Importance of how much control and ownership you have over the solution
20
15
10
5
0
1 (not important)
2
3
4
5 (very important)