ASSESSMENT OF INTERIM DRINKING WATER NEEDS AND COSTS IN CENTRAL COAST AREAS AFFECTED BY AGRICULTURAL NITRATE GROUNDWATER CONTAMINATION

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

CENTRAL COAST REGION

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Water Boards
STATE WATER RESOURCES CONTROL BOARD
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Definitions

Central Coast Water Board: Central Coast Regional Water Quality Control Board.

Contaminant: any physical, chemical, biological, or radiological substance or matter in water. (Health & Saf. Code, section 116275, subd. (a).)

Decentralized Treatment: water treatment units that remove contaminants from the water served to only one home or building and are not used to treat irrigation water. Decentralized treatment can be point of entry (POE) and point of use (POU) technologies.

Disadvantaged Community (DAC): the entire service area of a community water system, or a community therein, in which the median household income is less than 80% of the statewide annual median household income level. (Health & Saf. Code, section 116275, subd. (aa).)

Domestic Well: a groundwater well used to supply water for the domestic needs of an individual residence or a water system that is not a Public Water System and has no more than four service connections. (Health & Saf. Code, section 116681, subd. (i).)

Failing: the inability of a public water system to provide an adequate and reliable supply of drinking water which is at all times pure, wholesome, and potable. (Health & Saf. Code, section 116555.)

Human Right to Water (HR2W): the recognition that “every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking and sanitary purposes,” as defined in Assembly Bill 685 (AB 685). (California Water Code section 106.3, subd. (a).)

Interim Replacement Water or Interim Alternative Water Supplies: includes, but is not limited to: bottled water, vended water, and point-of-use or point-of-entry treatment units. (Health & Saf. Code, section 116767, subd. (q).)

Maximum Contaminant Level (MCL): the highest permissible amount of a contaminant statutorily allowed in water. (Health & Saf. Code, section 116275, subd. (f).)

Median Household Income (MHI): the financial level that represents the middle value of revenue for an entire community averaging the total money received per each home and its occupants.

Operations and Maintenance (O&M): collective term for the materials, functions, duties, and labor associated with the daily operations, normal repairs, replacement of parts and structural components, and other activities needed to preserve a water system’s capital assets so that it can continue to provide safe drinking water.

Point of Use (POU): a treatment device located where the end user accesses the drinking water.

Point of Entry (POE): a treatment device located at the inlet to an entire building or facility.

Public Water System: a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. A PWS includes any collection, pre-treatment, treatment, storage, and distribution facilities under control of the operator of the system that are used primarily in connection with the system; any collection or pretreatment storage facilities not under the control of the operator that are used primarily in connection with the system; and any water system that treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption. (Health & Saf. Code, section 116275, subd. (h).)

Severely Disadvantaged Community (SDAC): the categorization of an entire water-system service area where the Median Household Income is less than 60% of the statewide MHI. (See Water Code section 13476, subd. (j).)

State Small Water System (SSWS): a system for the provision of piped water to the public for human consumption that serves at least five, but not more than 14, service connections and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year. (Health & Saf. Code, section 116275, subd. (n).)

State Water Board: the California State Water Resources Control Board.

Executive Summary

This assessment includes a preliminary estimate of (1) the need (expressed in terms of the number of public water systems, state small water systems, and domestic wells), and (2) cost of providing interim[1] alternative water supplies for residents and communities whose drinking water exceeds the maximum contaminant level (MCL) for nitrate as a result of agricultural discharges to groundwater. This assessment used State Water Resources Control Board's (State Water Board) 2024 California Drinking Water Needs Assessment[2] data and methodology and tailored it to be specific to the direction provided by the State Water Resources Control Board (State Water Board) in Order WQ 2023-0081[3] (Remand Order). In the Remand Order, the State Water Board directs the Central Coast Regional Water Quality Control Board (Central Coast Water Board) to establish an alternative water supply program *"...for residents relying on groundwater in areas where the Maximum Contaminant Level (MCL) for nitrate is exceeded as a result of agricultural operations."*

The goal of this Assessment of Interim Drinking Water Needs and Costs is to provide insights into: 1) the scope of the impacts from nitrate on drinking water in the Central Coast region as a result of agricultural operations, 2) the populations affected, and 3) the potential costs of interim alternative water supplies to mitigate the impacts from nitrate for the residents on the Central Coast. These interim alternative water supply cost estimates will allow for the development of an early implementation program to address immediate alternative water supply needs while planning and prioritization for long-term solutions can be completed.

This assessment does not evaluate options and costs for implementing long-term solutions, which requires substantial additional work including data compilation of cost estimates from case studies, modeling of possible solutions and associated costs, model validation, and peer review to develop accurate cost estimates. Long-term solutions and associated costs will be developed as part of a companion document, separate from this assessment. However, the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs does include cost estimates for planning and prioritizing long-term solutions.

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[1] Interim Alternative Water Supplies**:** includes, but is not limited to, bottled water, vended water, and point-of-use or point-of-entry treatment units.

[2] 2024 Drinking Water Needs Assessment: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024-needs-assessment.pdf

[3] Order WQ 2023-0081: https://www.waterboards.ca.gov/public_notices/petitions/water_quality/docs/2023/wqo2023-0081.pdf

Commitment to the Human Right to Water

This assessment is also an important step toward fulfilling the Central Coast Water Board's commitment to ensuring that every resident has access to safe, clean, affordable, and accessible drinking water, in alignment with the Human Right to Water law (California Water Code section 106.3)[4] and the Central Coast Water Board's Human Right to Water Resolution.[5] Moving forward, a collaborative and well-coordinated effort among regulatory agencies, agricultural stakeholders, and impacted communities is essential to achieving both short-term relief and long-term water security for the Central Coast region.

1. Findings

1.1. Impacted Residents

- **Extent of Impact**: Based on water quality data and water quality risk modeling, it is estimated that there are 17 public water systems, 117 state small water systems, and 3,005 domestic wells within the Central Coast Water Board's geographic boundaries exceeding the MCL for nitrate as a result of agricultural activity. These water systems and domestic wells serve an estimated 14,039 individuals, with the majority relying on domestic wells. Notably, 16% of the affected population are located in disadvantaged or severely disadvantaged communities (DAC/SDAC).

  Wells modeled as being impacted by agricultural discharges, and used to estimate the need and cost in this analysis, are identified based on the spatial footprint of irrigated agriculture, plus a 0.5 mile impact extent to account for migration of nitrogen in groundwater. The agricultural spatial footprint is based on the Department of Water Resources' 2022 Statewide Crop Map. Using this data, there are currently an estimated 475,000 irrigated areas in the Central Coast region that are subject to the Central Coast Water Board's Irrigated Land Program and apply nitrogen fertilizer.

- **Geographic Concentration**: Monterey and Santa Clara counties are the most impacted, with Monterey County alone having an estimated 5,400 people that may be relying on groundwater where nitrate exceeds the MCL as a result of agricultural activities. However, impacts aren't limited to the northern portion of the region - the Santa Maria groundwater basin, which overlies portions of both San

[4] California Water Code, section 103.6: https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=WAT&sectionNum=106.3

[5] Central Coast Water Board Resolution R3-2017-0004: https://www.waterboards.ca.gov/centralcoast/board_decisions/adopted_orders/2017/2017-0004_hrtw_fnl.pdf

Luis Obispo and Santa Barbara counties, contains an estimated 365 domestic wells, 10 state small water systems, and 3 public water systems (serving approximately 2,100 people) that are impacted by agricultural discharges to groundwater. Note that only the portions of Santa Clara County within the Central Coast Water Board regional boundaries are evaluated as part of this assessment.

Need and Cost Summary for Central Coast Water Supply Systems Exceeding the Nitrate MCL due to Agricultural Activities

- Impacted supply wells: 17 public water systems, 117 state small water systems, and 3,005 domestic wells are estimated to exceed the MCL for nitrate as a result of agricultural activities.
- Approximately 14,039 individuals impacted, including 2,178 in disadvantaged or severely disadvantaged communities.
- Annual costs for interim alternate water supplies projected at approximately $6.4–$7.2 million.

1.2. Proposed Interim Supplies and Associated Costs

This Assessment of Interim Drinking Water Needs and Costs evaluates options for providing interim alternative water supplies that address nitrate impacts and estimates the cost of these options.

- Costs were estimated for scenarios that varied the duration of interim supply provision from 3-10 years and varied the types of interim supplies offered. Scenarios included the following:
    - 1) preliminary bottled water (modeled for 3–5 years for domestic wells and state small water systems only),
    - 2) bottled water only (modeled for up to 10-years for domestic wells, state small water systems, and public water systems),
    - 3) bottled water or point-of-use (POU) (modeled for up to 10 years where POU is selected if it is viable based on water quality; if POU is not viable, bottled water is selected), and
    - 4) bottled water only, point-of-use (POU) only, bottled water and point-of-entry (POE), or POU and POE (modeled for up to 10 years and where POU is selected if it is viable based on water quality, POE is selected if constituents are present that pose an inhalation or skin exposure risk, and bottled water is selected if POU is not viable).

  Cost estimates for POU and POE include the cost of Operations and Maintenance (O&M) necessary to provide safe drinking water. The type of interim supply

selected for scenarios 3 and 4 above was based on the modeled water quality relative to the modeled ability of a treatment technology (i.e., POU or POE) to address a particular constituent.

- Interim alternative water supplies are estimated to cost approximately $1,300–$1,500 per water system service connection or domestic well per year over a 10-year period, depending on the type of alternative supply provided. This amounts to an average annual cost of $6.4–7.2 million.
- Scenario 3 (bottled water or POU) is the least expensive over a 10-year period, followed by Scenario 2 (bottled water only). Scenario 4 is the most expensive (options include bottled water only, POU only, POU and POE, or bottled water and POE).
- The average annual cost for all scenarios decreased as the duration of the program increased. This is because the first-year cost to provide bottled water or POU and/or POE is higher than the ongoing cost to continue to provide bottled water or the O&M required for POU and POE.
- First year costs for scenarios that include POE or POU are higher than first year costs associated with bottled water only scenarios because of the high capital costs associated with POU and POE. The financial resources to support a program that includes POU or POE will need to be higher at the program outset compared to a bottled water only scenario. However, because the O&M required for POU is lower than the ongoing cost of providing bottled water, the overall cost is lower for programs that include POU compared to bottled water only, over 10 years.

1.3. Limitations of this Assessment

This Assessment of Interim Drinking Water Needs and Costs does not modify any existing law, regulation, or policy. It does not create supplemental jurisdiction for the Division of Drinking Water over domestic wells. Instead, it is a factual document prepared by Central Coast Water Board staff highlighting the costs of providing, and need to provide, clean, safe drinking water in the region due to ongoing nitrate loading to groundwater that causes and/or contributes to exceedances of the nitrate MCL.

1.4. Conclusion and Recommendations

The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs highlights the urgent need for immediate and sustained action to address nitrate contamination and ensure access to safe drinking water for all affected residents. With an estimated 14,039 individuals impacted, including 2,178 in disadvantaged or severely disadvantaged communities, and annual costs projected at approximately $6.4–$7.2 million, swift implementation of interim alternative water supplies is imperative. The cost

of addressing these problems is substantial but necessary given the scale of the public health risk.

Drinking Water Needs Assessment

1. Background and Introduction

This assessment includes estimates for the number of domestic wells and drinking water systems in California's Central Coast region that have exceeded the MCL for nitrate due to discharges from agricultural operations. This assessment also includes an evaluation of possible interim alternative water supplies that could be provided to impacted domestic wells and water systems and estimates the costs associated with the various options. Additionally, this assessment estimates the cost of prioritization and planning of long-term solutions.

This assessment does not include an evaluation of long-term solutions for domestic wells and water systems. Estimating the range of possible long-term solutions and estimating the associated costs is inherently more uncertain and complicated compared to options for interim supplies. An assessment of long-term solutions and associated costs will be included as part of a separate companion assessment, released at a later date.

Data and the methodology utilized as part of this assessment were originally developed by the State Water Resources Control Board's (State Water Board) Safe and Affordable Funding for Equity and Resilience (SAFER) program in its 2024 Drinking Water Needs Assessment[6] (Statewide Needs Assessment) to identify and address drinking water challenges. The data and methodology from the Statewide Needs Assessment were adapted to be specific to the needs of the Central Coast Regional Water Quality Control Board's (Central Coast Water Board) assessment of interim drinking water needs and costs (Assessment of Interim Drinking Water Needs and Costs) and consistent with the directive given by the State Water Board to develop an alternative water supply program, as described below.

The Central Coast Water Board developed this Assessment of Interim Drinking Water Needs and Costs to inform the development of an interim alternative water supply program for the Central Coast region. State Water Board Order WQ 2023-0081[7] remanded portions of the Central Coast Water Board's Order R3-2021-0040 *General Waste Discharge Requirements for Discharges from Irrigated Lands* (Ag Order).[8] One of

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[6] The 2024 Drinking Water Needs Assessment can be accessed via the Internet at the following link: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024-needs-assessment.pdf

[7] Order WQ 2023-0081: https://www.waterboards.ca.gov/public_notices/petitions/water_quality/docs/2023/wqo2023-0081.pdf

[8] Order R3-2021-0040: https://www.waterboards.ca.gov/centralcoast/water_issues/programs/ilp/docs/ag_order4/2021/ao4_order.pdf

the remands in the State Water Board Order was that the Central Coast Water Board must develop an alternative water supply program in which:

> "…dischargers or their third-party representatives provide short-term and long-term alternative water supplies for residents relying on groundwater in areas where the maximum contaminant level (MCL) for nitrate is exceeded as a result of agricultural operations."

While short-term solutions are undefined in State Water Board Order WQ 2023-0081, they are referred to as "interim" measures herein to align with the terminology used in the Statewide Needs Assessment. Interim treatment options are described in Table 2 of this assessment.

The findings included in this Assessment of Interim Drinking Water Needs and Costs will be used to estimate the funding needed to provide interim alternative water supplies to address nitrate pollution from agricultural discharges in the Central Coast region. These estimates will guide the development of fees that will be paid by dischargers and inform the gap in funding between financial resources needed to provide alternative water supplies and the funds that can be raised through fees.

This Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs includes information on impacted public water systems, state small water systems, and domestic wells, which are defined in the California Health and Safety Code as shown in Table 1. Only water systems that use groundwater were included in this analysis.

	**Public Water System** – a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. A Public Water System includes any collection, pre-treatment, treatment, storage, and distribution facilities under control of the operator of the system that are used primarily in connection with the system; any collection or pretreatment storage facilities not under the control of the operator that are used primarily in connection with the system; and any water system that treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption. (Health & Safety Code, section 116275, subdivision (h).)
	**State Small Water System** – a system for the provision of piped water to the public for human consumption that serves at least five, but not more than 14, service connections and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year. (Health & Safety Code, section 116275, subdivision (n).)
	**Domestic Well -** a groundwater well used to supply water for the domestic needs of an individual residence or a water system that is not a Public Water System and has no more than four service connections. (Health & Safety Code, section 116681, subdivision (g).)

Table 1. Definitions of public water systems, state small water systems, and domestic wells from the California Health and Safety Code.

2. Scope Exclusions

The cost estimates provided in this assessment are not intended to serve as a basis for decision-making regarding the implementation of specific interim solutions. Rather, these estimates are intended to assess the funding need for providing potable drinking water in areas where agricultural discharges have polluted the groundwater supply. These estimates will be able to inform fee development for the AWS Program, which will be addressed separately from this assessment. The options for interim supplies presented in this assessment are meant to illustrate plausible options and associated costs based on the methodology developed by the State Water Board. Actual alternative supplies delivered should be tailored and specific to each well or water system on a case-by-case

basis, separate from those presented in this assessment.

Similarly, this assessment is not intended to definitively identify domestic wells or water systems that have been polluted by nitrate from agricultural discharges. Rather, this assessment uses water quality data and water quality modeling to identify public or state small water systems or domestic wells that have likely been impacted by agricultural discharges to groundwater. Estimating the number of impacted water systems and domestic wells is needed to model the cost of providing interim alternative water supplies. However, definitive determination of the specific domestic wells or water systems that have been polluted by nitrate from agricultural discharges and are therefore eligible to receive benefit from the alternative water supply program is beyond the scope of this assessment.

3. Summary of the Water Quality Problem

The need for alternative water supplies is a result of the widespread nitrate pollution in Central Coast groundwater. The ubiquity of groundwater pollution is particularly concerning when considering that the Central Coast region is the most groundwater dependent region in California.[9] The relative lack of surface water resources compared to elsewhere in the state means there is limited ability to replace polluted groundwater with an alternative source. According to the California Department of Water Resources, groundwater provides 86% of all water used in the region (see Figure 1, Panel A) and 65% of the water used for urban purposes, including drinking water, in the region (Figure 1).

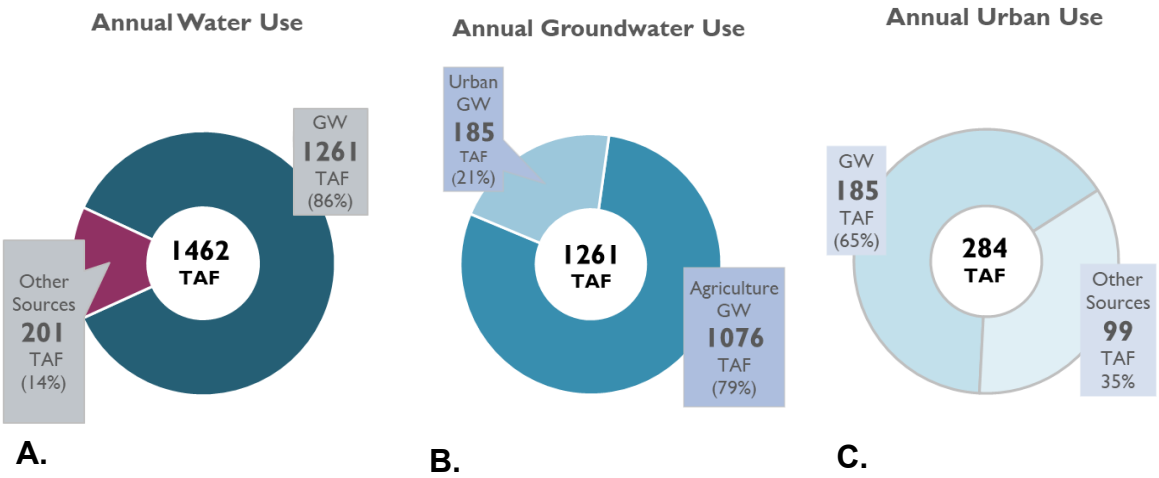

Figure 1. Water use in the Central Coast region in thousand acre-feet (TAF). Panel A shows that groundwater (GW) comprises 86% of all the water used in the Central Coast region. Panel B shows the proportion of groundwater allocated to

[9] California Department of Water Resources' California's Groundwater Update 2020 (Bulletin 118): https://data.cnra.ca.gov/dataset/calgw_update2020

urban uses, including drinking water, and agricultural uses. Panel C shows the total amount of water used for urban purposes and the proportion of urban uses from groundwater and other sources. Data from DWR's publication *California Groundwater Update 2020*.

Analysis included in a May 2018 staff report on groundwater quality impacts from agricultural discharges in California's Central Coast region, and updated for the 2021 Ag Order,[10] describes the impact of agricultural discharges on groundwater. The findings from the analyses included in the Ag Order indicate that region-wide, 28% of over 2,600 on-farm domestic wells sampled between 2012 and 2019 had mean nitrate concentrations exceeding the MCL of 10 milligrams per liter (mg/L). These evaluations are based on the data from 2012 through 2019 and do not include the many wells that have already been decommissioned due to significant impacts in the past.

In specific groundwater subbasins, nitrate concentrations are much higher than the regional average. For example, the Salinas Valley Forebay subbasin had 64% of sampled domestic wells exceeding the MCL and other Salinas Valley subbasins such as the East Side and Upper Valley showed significant exceedances of 59% and 42% respectively (see footnote 10, finding 9 a,b,c). However, nitrate pollution from agricultural discharges is not limited to the Salinas Valley; subbasins in Gilroy-Hollister Valley had exceedance rates ranging from 25-34% and in the Santa Maria basin 55% of domestic wells exceeded the MCL (see footnote 10, finding 9 e,f,h). These statistics highlight the severity of groundwater pollution in the Central Coast region (Figure 2).

[10] Findings 8 and 9 from Attachment A of Order No. R3-2021-0041 describe the nitrate impacts in groundwater in the Central Coast Region.

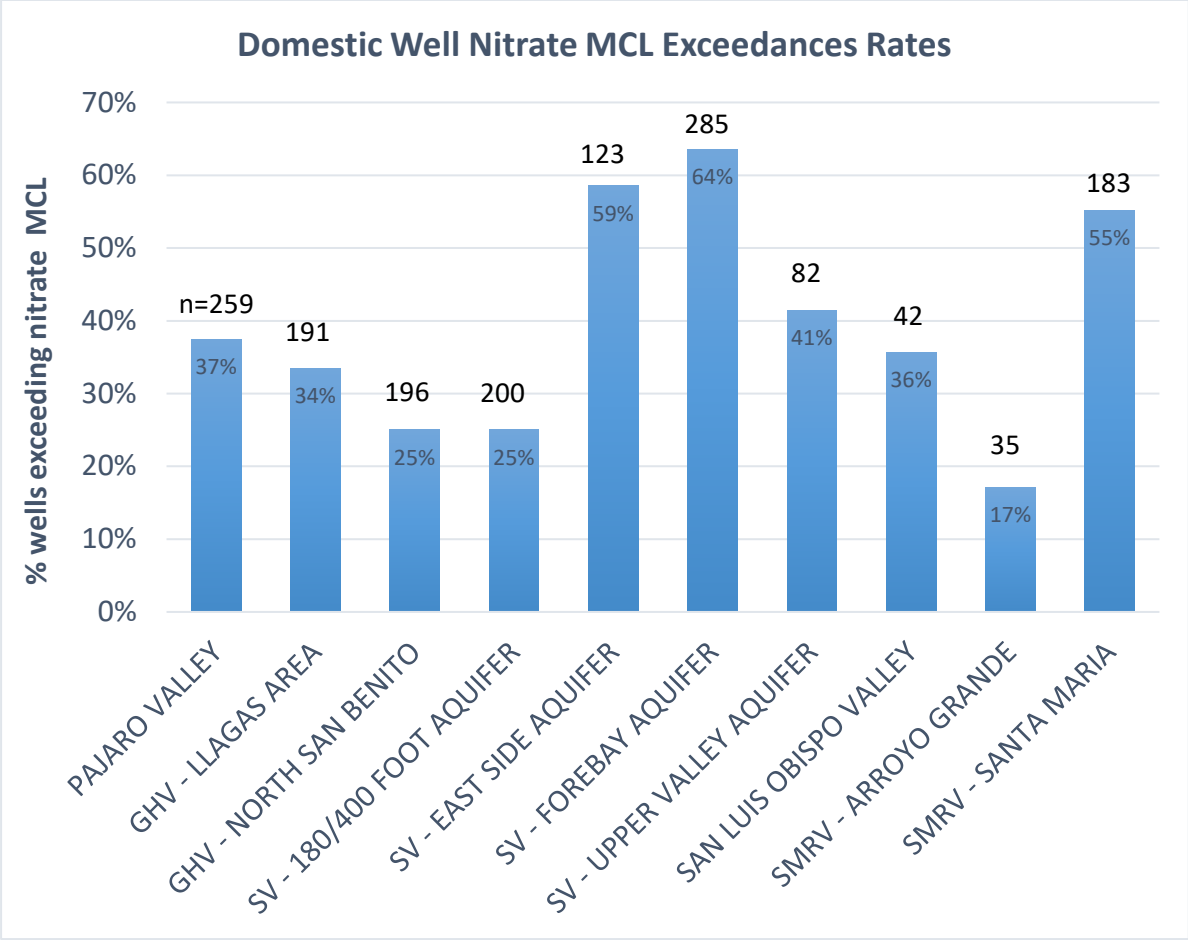

Figure 2. The percentage of domestic wells in select groundwater subbasins sampled between 2012 and 2019 that exceeded the MCL for nitrate is shown. The number of wells included in the statistics are shown above the bar in the chart. GHV denotes Gilroy-Hollister Valley, SV denotes Salinas Valley, SMRV denotes Santa Maria River Valley.

4. Summary of the Statewide Needs Assessment

The Statewide Needs Assessment was developed in part to help implement the State Water Board's Human Right to Water resolution[11] (Resolution 2016-0010). This resolution affirms that every person has the right to secure safe, clean, affordable, and accessible water for drinking, cooking, and sanitary purposes. The Statewide Needs Assessment is a comprehensive tool designed to evaluate the drinking water needs of failing or at-risk public water systems and at-risk state small water systems and domestic wells. The Statewide Needs Assessment plays a critical role in supporting state efforts to

[11] Resolution 2016-0010 Adopting the Human Right to Water as a Core Value and Directing Its Implementation in Water Board Program and Activities: https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2016/rs2016_0010.pdf

address water quality challenges, water quantity shortages, and in ensuring that every Californian has access to safe drinking water. The components of the Statewide Needs Assessment relevant to the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs include an assessment of: 1) public water systems that are failing due to nitrate impairment, 2) state small water systems and domestic wells at-risk of nitrate impairment, and 3) modeled potential solutions and costs. An overview of the methodology for this assessment is as follows:

1. **Need -** estimates the number and location of public water systems that are failing or state small water systems and domestic wells at risk of failing due to nitrate impairment from agricultural discharges;
2. **Solutions -** models interim alternative water supplies based on the specific risks to the water systems (e.g., constituents present or modeled to be present that exceed the MCL); and
3. **Cost -** estimates how much it may cost to implement the modeled interim alternative water supply.

The Statewide Needs Assessment includes an extensive library of appendices that explain in detail how the risk, solutions, and costs were modeled. Hyperlinks to the appendices can be found at the last page of the Statewide Needs Assessment.[12]

4.1. Summary of Central Coast Water Board's Needs Assessment

The Statewide Needs Assessment was broader in scope in terms of the needs addressed and solutions considered. As an example, the Statewide Needs Assessment considered impacts from a wide suite of water quality constituents, beyond nitrate, and included issues beyond water quality such as water shortage and water affordability. Because the range of impacts addressed in the Statewide Needs Assessment was broad, so too was the breadth of possible solutions. For the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs, the scope of need was limited to identifying wells impacted by nitrate pollution from agricultural activities and identifying potential alternative water supplies that would address this pollution.

However, there are a couple of areas where the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs scope is broader compared to the Statewide Needs Assessment. First, the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs does not limit interim supplies to only Disadvantaged or Severely Disadvantaged Communities (DACs or SDACs) but rather estimates interim solutions for all residents whose groundwater source exceeds the MCL

[12] Statewide Needs Assessment: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024-needs-assessment.pdf

for nitrate as a result of agricultural activities. The Central Coast Water Board Assessment of Interim Drinking Water Needs and Costs is more inclusive than the Statewide Needs Assessment in accordance with the State Water Board Order WQ 2023-0081:

> "…we hereby direct the Central Coast Water Board to incorporate a requirement or reach an agreement in which dischargers or their third-party representatives provide short-term and long-term alternative water supplies for residents relying on groundwater in areas where the maximum contaminant level (MCL) for nitrate is exceeded as a result of agricultural operations." [emphasis added]

Limiting the scope of interim solutions to only DACs would be in violation of the requirements of the State Water Board Order.

Second, under the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs, cost estimates are modeled for 3, 5, and 10 years of alternative supplies, instead of two years (domestic wells) or five years (all other water systems) as done in the Statewide Needs Assessment. Therefore, even though the Statewide Needs Assessment's data and modeling results provided a foundational framework, some of the methods and results were tailored to better inform the development of the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs and alternative water supply program.

5. Drinking Water Risk Assessment for the Central Coast Region

5.1. Public Water Systems

The Central Coast Water Board's risk assessment for public water systems identifies failing systems with known exceedances of the nitrate MCL. A system is deemed failing by the State Water Board based on a variety of criteria that includes exceedances of an MCL. Water quality data from these public water systems was acquired from the State Water Board Division of Drinking Water's Safe Drinking Water Information System (SDWIS). The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs focused on public water systems that exceeded the nitrate MCL based on either average concentrations measured during the previous year or by a maximum value exceeding the MCL in the previous year. For public water systems with multiple wells or sources, the average concentration of all sources was used as the metric for evaluating MCL exceedances.

5.2. State Small Water Systems and Domestic Wells

Actual water quality in state small water systems and domestic wells is largely unknown because there are inconsistent, infrequent, or non-existent requirements for water quality sampling and reporting for these types of wells and water systems. To estimate water quality risk for domestic wells and state small water systems, the Statewide Needs

Assessment used the Statewide Aquifer Risk Map.[13] The Aquifer Risk Map estimates water quality in state small water systems and domestic wells based on known water quality data from nearby wells screened at similar depths. The existence of many domestic supply wells can be determined based on the well completion reports that are required to be submitted by well drillers after completion of a new well, in accordance with California Water Code section 13751. These well completion reports have been catalogued by the Department of Water Resources and stored in the Online System for Well Completion Reports (OSWCR).[14] Many older well completion reports do not have precise location information; OSCWR approximates the location of domestic wells to the center of a 1 mile x 1 mile Public Land Survey System (PLSS) section. The Aquifer Risk Map assigns the same water quality risk to all domestic wells and state small water systems that are of similar depth intervals and located in the same PLSS section. The locations of state small water systems are precisely known based on reporting mandated by California Senate Bill 200 (SB-200).

For state small water systems or domestic wells, systems were identified as high risk and included in the needs assessment if either the 20-year average or highest recent (5-year) nitrate concentration exceeded the MCL, based on the water quality predictions from the Aquifer Risk Map. Water shortage and socioeconomic risks are parameters modeled by the Aquifer Risk Map but were not included as part of the Central Coast Water Board risk assessment because they are unrelated to agricultural discharges.

6. Identifying Water Systems and Domestic Wells Impacted by Agricultural Discharges

For this assessment, any water system or well (as described in Section 5) located within the spatial footprint of agricultural lands was assumed to be impacted by agricultural discharge and included in the analysis. Spatial data on the location of various irrigated agricultural lands was acquired from Department of Water Resources' (DWR) Statewide Crop Mapping for 2022.[15]

Only crops regulated by the Central Coast Water Board's Irrigated Lands Program (ILP) were included in the analysis. This includes *truck crops* (e.g., berries, leafy greens, broccoli), *citrus, deciduous* (e.g., avocados, apples, tree nuts), *field crops* (e.g., corn,

[13] 2024 Aquifer Risk Map: https://gispublic.waterboards.ca.gov/portal/apps/experiencebuilder/experience/?id=18c7d253f0a44fd2a5c7bcfb42cc158d

[14] Department of Water Resources and stored in the Online System for Well Completion Reports (OSWCR): https://water.ca.gov/Programs/Groundwater-Management/Wells/Well-Completion-Reports

[15] Department of Water Resources Statewide Crop Mapping Map Service: https://data.cnra.ca.gov/dataset/statewide-crop-mapping

beans, sunflowers), *young perennial crops* (e.g., young vineyards), *grain and hay crops* (e.g., hay, wheat, barley), turf farms under DWR's *pasture* classification, and *vineyards*. Nurseries were excluded as they are not captured in DWR's data. The irrigated acreage footprint using the DWR data totals 475,000 acres—greater than the 401,166 acres enrolled in the Ag Order as of April 2025—likely due to the inclusion of unregulated crops (e.g., cannabis, classified as a truck crop) and some grain and hay fields used on-site and therefore not subject to regulation by the ILP.

Uncertainty in the acreage estimate stems from the difficulty of aligning DWR crop categories with ILP regulatory criteria. This assessment excludes DWR's *pasture* (except turf farms), *idle, fallow, unclassified*, and *rice* (not grown in the region) categories. *Pasture* was excluded because many of the crop types in this category (e.g., alfalfa; clover; mixed and native pasture; Bermuda, rye, and native grasses) are likely used on-site (and not subject to ILP regulation) or are nitrogen-fixing crops requiring little or no fertilizer and not expected to significantly contribute to groundwater nitrate. Including *pasture* would raise the estimated acreage to 491,000, the upper bound of plausible irrigated area. Excluding *grain and hay* and *pasture* crops would reduce the estimate to 427,000 acres, representing the lower end of the range of plausible irrigated area.

Wells located outside the estimated agricultural footprint may still be impacted by agricultural discharges due to transport of nitrate through the subsurface over time. To account for these wells and for the purposes of estimating how many wells may need alternative water supply, a 0.5 mile area of impact is added to the agricultural footprint for the purposes of this assessment. A smaller impact extent distance (i.e., less than 0.5 miles) results in too few wells with likely agricultural impacts captured as part of the analysis while a larger impact extent captures too many wells with low likelihood for agricultural impacts. The 0.5 mile distance finds an appropriate middle ground. Additional justification for the use of the 0.5 mile impact extent is included in the appendix of this assessment.[16]

The estimated groundwater impact extent developed herein is for the purpose of estimating the need and cost of interim alternative water supplies. **Determination of the true groundwater impact for all agricultural lands in the region and by extension, identifying wells that are definitively impacted by nitrate from agricultural discharges, is beyond the scope of this assessment.**

The location of public water systems was determined using a geospatial dataset of water service area boundaries maintained by the State Water Board, known as the Service

[16] It is important to note that once the 0.5 mile impact extent is used solely for the purpose of estimating need and cost. Once the AWS program is being implemented, an approach will be developed for determining which wells and water systems exceeding the nitrate MCL are eligible for AWS program benefits.

Area Boundary Layer (SABL). For the purposes of the Statewide Needs Assessment, SABL was modified to SABL+ to include estimated boundaries for systems without digital geospatial boundaries in SABL [17]. The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs utilized SABL+ to estimate the location of public water systems relative to the estimated agricultural footprint and 0.5 mile area surrounding the agricultural footprint. Public water system that exceeded the MCL for nitrate and whose boundaries intersected the agricultural footprint and 0.5 mile impact extent were included in the analysis.

The location of state small water systems is precisely known due to reporting requirements under California Senate Bill 200. State small water systems located within the estimated agricultural footprint and 0.5 mile impact extent that met the risk thresholds identified in section 5 were included in the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs.

Domestic wells are known to be located within 1 mile x 1 mile PLSS sections based on the results of the Aquifer Risk Map analysis. Domestic wells were included in the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs if the modeled water quality in these wells exceeded the water quality risk threshold and the PLSS section where these wells were located intersects the estimated agricultural footprint and 0.5 mile impact extent.

7. Methodology for Modeling Interim Supplies and Costs

The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs estimates the cost of providing interim alternative water supplies by matching the various alternative supply options to the water systems or domestic wells, after considering the quality of water present and the suitability of the alternative supply. Costs are estimated for a variety of scenarios that incorporate different time horizons and combinations of alternative supplies.

Interim supplies considered include bottled water and decentralized treatment using POU and POE devices. This assessment assumes that POE devices are not capable of adequately treating nitrate. However, some model scenarios include POE in cost estimates because the known or modeled water quality indicates that there are constituents present in addition to nitrate that exceed applicable MCLs and can only be treated by POE. POE is included in this assessment to estimate the cost of providing water that complies with all MCLs in wells impacted by agricultural nitrate. Table 2

[17] A description of SABL+ can be found in the Statewide Needs Assessment Supplemental Appendix: Physical Consolidation Cost Assessment Methodology: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-physical-consolidation.pdf

summarizes the interim alternative water supplies considered. Details of the approach for modeling alternative water supplies and costs are described in the sections that follow.

Table 2. Summary of Interim Treatment Options Modeled in the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs

Interim Decentralized Treatment - POU	POU treatment devices are included as interim options for all public water systems, state small water systems, and domestic wells where water quality complies with model assumptions. Reverse osmosis is the POU treatment technology assigned by the model. Modeled costs include operations and maintenance costs (O&M).
Interim Decentralized Treatment - POE	POE treatment technologies are added if co-contaminants are present that have an inhalation or skin absorption exposure pathway and where water quality complies with model assumptions. Granular activated carbon is the POE treatment technology assigned by the model. Modeled costs include O&M.
Interim Bottled Water	Bottled water is modeled as an interim option for all public water systems, state small water systems, and domestic wells that aren't eligible for interim decentralized treatment.

The cost of interim supplies available differs substantially. The cost assumptions used in various modeling scenarios are summarized in Table 3 and described in detail in the sections below on decentralized treatment and bottled water. Importantly, there are substantial differences in the initial costs and ongoing costs of decentralized treatment versus bottled water that are summarized here.

Table 3. Summary of expenses used in modeling the cost of interim alternative water supplies.

Expense Category	Cost
Administrative cost	$400,000 per year
Outreach	$170,000 per year
Initial cost	Varies, see discussion below regarding decentralized treatment and bottled water costs
Ongoing cost	Varies, see discussion below regarding decentralized treatment and bottled water ongoing costs.
Public Water Systems Technical Assistance	$142,250 per public water system

Expense Category	Cost
Domestic Well and State Small Water System Technical Assistance	$525,000
Water Quality Sampling	$550 per well or water system for nitrate $1,100 per well or water system for additional constituents. Additional constituent sampling required for POU and POE. See discussion in section 7.5 on water quality sampling for details.

Bottled water has a low first-year cost compared to decentralized treatment systems, which both have relatively high capital costs. These capital costs are related to the need for installation and testing of the treatment device and the need to educate users about the treatment technology. However, the ongoing cost of providing bottled water is high compared to the operations and maintenance (O&M) needed to maintain decentralized treatment systems. Because of the relative difference in the ongoing costs for bottled water versus decentralized treatment, decentralized treatment becomes increasingly economical compared to bottled water as the timeframe for interim supply provision increases. For example, Central Coast Water Board analysis shows that the cost of POU treatment becomes comparable to bottled water after seven or eight years of service and after that, POU treatment is less expensive compared to bottled water (Figure 3).

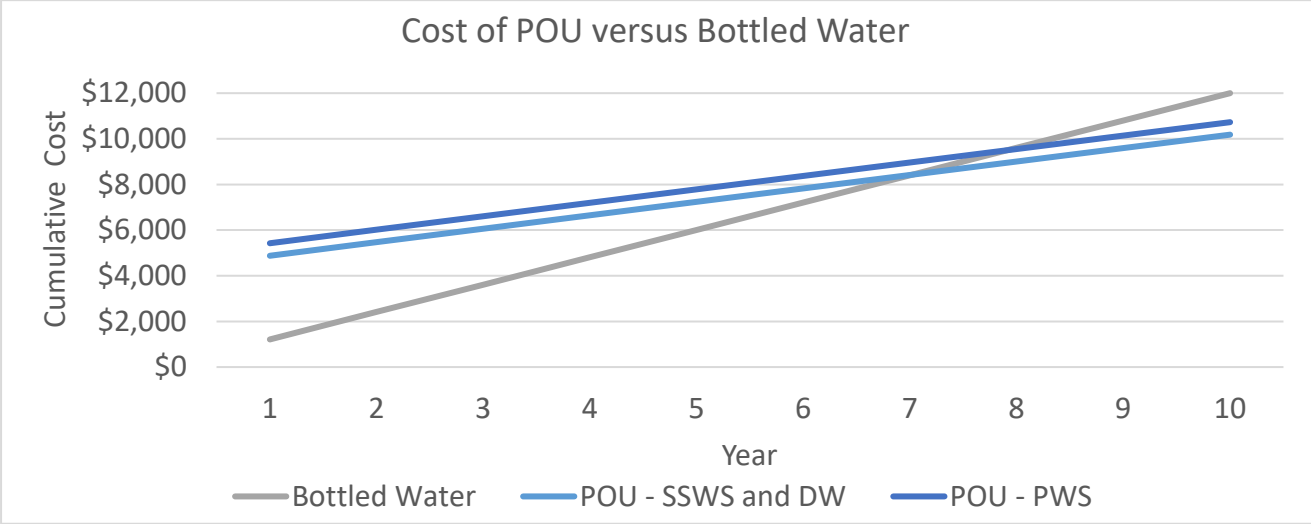

Figure 3. The modeled cost through time of bottled water versus POU using reverse osmosis is shown. PWS denotes public water systems, SSWS denotes state small water systems, and DW denotes domestic wells. The slight difference in cost between water system types reflects different modeled outreach costs.

7.1. Interim Decentralized Treatment

Decentralized treatment is modeled as the interim alternative water supply in some of the cost assessment scenarios if the composition and/or concentration of the contaminant(s) present is consistent with model assumptions. The model assumes that aluminum, thallium, iron, manganese, or bromate are not compatible with decentralized treatment (POU or POE). Additionally, the model assumes that POU is only reliable when nitrate-N concentrations are less than 25 mg/L. Public water systems conduct water quality sampling for *E. coli*; if it was present, decentralized treatment was deemed not viable and bottled water was assigned as the alternative supply. The aquifer risk model does not simulate *E. coli* so it was not considered in assessing decentralized treatment viability for state small water systems or domestic wells. However, state small water systems do perform routine sampling for E. coli in accordance with California Code of Regulations section 64212[18] and this information should be utilized once interim supplies are being implemented. Details regarding the constituents and concentrations used by the model to determine decentralized treatment viability are included in the Statewide Needs Assessment's *Supplemental Appendix: Interim Solutions Cost Assessment Methodology.* [19]

For POU, the modeled treatment approach is reverse osmosis (RO) and a list of contaminants that that the cost model assumes can be treated by POU is shown in Table 4. The modeled POE treatment technology is granular activated carbon (GAC) and a list of contaminants that the cost model assumes can be treated by GAC is shown in Table 5. POE is included herein to estimate the cost of treating for: 1) contaminants that can't be addressed by POU but are present along with nitrate and/or 2) contaminants that pose an inhalation or skin absorption exposure pathway.

Details regarding the selection of treatment technology used by the model for POU and POE systems is included in the Statewide Needs Assessment's *Supplemental Appendix: Decentralized Treatment Cost Assessment Methodology.* [20]

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[18] California Code of Regulations, title 22, section 64212: https://govt.westlaw.com/calregs/Document/I765DB2185B6111EC9451000D3A7C4BC3?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

[19] *Supplemental Appendix: Interim Solutions Cost Assessment Methodology:* https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-Interim-solutions.pdf

[20] *Supplemental Appendix: Decentralized Treatment Cost Assessment Methodology:* https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-decentralized-treatment.pdf

Table 4. Contaminants treated by POU in the cost assessment model

Contaminant	Contaminant
Antimony	Lead
Arsenic	Mercury
Barium	Nickel
Beryllium	Nitrate
Chromium	Nitrite
Copper	Perchlorate
Cyanide	Radium 228, Radium 226
Fluoride	Selenium
Gross Alpha particle activity	Uranium
Gross Beta particle activity	

Interim decentralized treatment costs include capital costs and ancillary factors such as regional cost multipliers, inflation, installation, community or household outreach and communication cost, and operations and maintenance (O&M). These ancillary costs are integral to estimating the total cost of short-term alternative water supplies, ensuring that any implemented project is comprehensive and sustainable over time. Details of the cost associated with decentralized treatment can be found in the Statewide Needs Assessment can be found in the *Appendix: Cost Assessment Methodology*[21].

Table 5. Contaminants treated by POE in the cost assessment model

Contaminant
Synthetic Organic Chemicals, *some examples include:* • 1,2,3-TCP • Dibromochloropropane • Ethylene Dibromide

[21] Appendix: Cost Assessment Methodology: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-methodology.pdf

Contaminant
Volatile Organic Compounds, *some examples include:* • 1,1-Dichloroethylene (1,1-DCE) • Trichloroethylene (TCE) Disinfection byproducts, *some examples include:* • Total Trihalomethanes (TTHM) • Haloacetic Acids (five) (HAA5)

The initial cost associated with POU and POE systems, including capital and ancillary costs and associated cost multipliers, are as follows:

- Capital Costs:
  - POU - $3,251
  - POE - $4,049
- Outreach Costs (included in Capital Costs):
  - public water systems- $631
  - state small water systems and domestic wells - $840
- Annual Inflation Rate: 3.1%
- Regional Multiplier: 30-32%[22]
- Planning and Construction: 3%
- Engineering Services: 15%
- Permitting and Environmental: 3%

The O&M costs associated with POU and POE systems and associated cost multipliers are as follows:

- O&M[23]:
  - POU – $536/year
  - POE - $786/year
- Regional Multiplier: 30-32%
- Annual Inflation Rate: 3.1%

[22] The concept of a regional multiplier is described in the Statewide Needs Assessment's Appendix: Cost Assessment Methodology. Ventura, Santa Clara, and San Mateo are considered Urban and have a 32% cost multiplier; the remaining counties in the Central Coast Region are considered Suburban and have a 30% cost multiplier. More information can be found at the following link: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-methodology.pdf

[23] O&M is calculated at net present value (NPV). NPV = Total Annual O&M x [(1+ i) ^ n-1] / [i x (1+ i) ^n]; where i = 4% interest rate and n = years of O&M

Details of the costs associated with POU and POE systems can be found in the Statewide Needs Assessment's *Supplemental Appendix: Decentralized Treatment Cost Estimate Methodology.*[24]

7.2. Interim Bottled Water

Bottled water is considered a less sustainable option compared to decentralized treatment because of the environmental impacts (carbon footprint, plastic waste, etc.), reliability concerns (particularly for residents in remote areas), and high long-term costs associated with frequently needing to provide new supplies. Additionally, bottled water may not be as equitable compared to decentralized treatment if there are age- or disability-related challenges associated with lifting heavy bottles of water or cases of small bottles of water. Storing large volumes of bottled water can present challenges as well.

However, bottled water is also a simpler option compared to POU and POE because the decentralized treatment systems must consider the composition and concentration of contaminants present whereas bottled water does not. For POU or POE treatment systems to be viable, the source water must be sampled for a wider suite of constituents to determine if the treatment system is suitable and which treatment systems is needed (POU or POE); in some cases, co-contaminants other than nitrate may be present that preclude the use of a treatment approach. By contrast, bottled water meets all drinking water quality standards, regardless of the quality of the source water and as such, the presence of co-contaminants in the source water doesn't affect the drinking water quality of bottled water.

Because of the relative simplicity of bottled water, a bottled water only alternative water supply program may be faster to implement than a program that incorporates POU and/or POE. As such, some of the scenarios modeled are bottled water only. For the other scenarios that include POU and/or POE along with bottled water, bottled water is only selected if the treatment options are not viable due to water quality constraints.

The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs adopted the same cost assumptions as outlined in the Statewide Needs Assessment for bottled water:

- Bottled Water Cost: $1.25 per gallon, with an average monthly usage of 60 gallons per household
- Monthly Delivery Fee: $22
- Hand Pump (one-time fee): $11

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[24] Supplemental Appendix: Decentralized Treatment Cost Estimate Methodology: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-decentralized-treatment.pdf

- Annual inflation rate: 3.1%.

Details of the costs can be found in the Statewide Needs Assessment's *Supplemental Appendix: Interim Solutions Cost Assessment Methodology.*[25]

7.3. Duration

The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs models the cost of interim solutions for 3, 5, and 10 years. The shorter duration scenarios (e.g., 3 years) were modeled to estimate the cost of providing rapidly implementable and simple interim supplies such as a preliminary bottled water program. The benefit of a rapid and simple program is that it could quickly address the immediate need for drinking water. However, it is envisioned that this type of program would be short-lived because it would need to be replaced with an interim program that was planning for long-term solutions and incorporated more sustainable alternative supplies such as POU and/or POE.

Longer duration interim scenarios (e.g., 10 years) were modeled because, unless there are shovel-ready projects already developed, the Central Coast Water Board anticipates it will take several years to develop a program for long-term solutions and secure adequate co-funding that will allow implementation of long-term solutions for all systems. A 10-year time horizon ensures that interim supplies will be provided during the time that long-term solutions are being developed and prioritized.

7.4. Funding to Plan and Prioritize Long-Term Solutions

The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs also includes cost estimates for planning and prioritizing long-term solutions. This funding is intended to help ensure that plans for long-term solutions are developed during the time when interim alternative supplies are being provided.

7.4.1. Funding for Public Water System Long-Term Solution Planning

The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs includes estimates of the cost of providing project-specific long-term solution technical assistance for public water systems in its cost assessment scenarios. This technical assistance is intended to provide public water systems with a clear and specific plan for developing sustainable long-term solutions. The cost of project-specific long-term solution technical assistance was estimated based on guidance (personal correspondence) from staff in the State Water Board's Division of Financial Assistance,

[25] *Supplemental Appendix: Interim Solutions Cost Assessment Methodology:* https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024costassessment-Interim-solutions.pdf

which is responsible for providing statewide funding for drinking water and wastewater system technical assistance and project implementation.

The cost of project-specific long-term solution technical assistance is estimated to be $142,250 per system. This includes the development of a workplan ($12,250), feasibility study ($70,000), community outreach ($30,000), and project management ($30,000). The workplan includes kickoff meetings and the establishment of scope, deliverables, schedule, and budget. The feasibility study evaluates potential approaches for long-term solutions. Community outreach aims to educate communities on nitrate contamination, outline possible solutions, gather feedback, and offer translation services. Project management ensures oversight, meeting coordination, deliverable quality, and communication with all stakeholders, including updating relevant databases.

7.4.2. Funding for State Small Water System and Domestic Well Long-Term Solution Planning

The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs also includes modeled costs for high-level planning and prioritization of long-term solutions for domestic wells and state small water systems. This planning and prioritization would identify initial focus areas that require attention, conduct feasibility analyses to assess potential long-term solutions, and plan for outreach to ensure that affected communities are engaged in the process. The methodology employed may be conceptually similar to the *Long-Term Drinking Water Solutions Program* developed as part of the Modesto Management Zone Implementation Plan[26] for the Central Valley's Salinity Alternatives for Long-Term Sustainability (CV-SALTS) Program.

The cost to develop this type of planning and prioritization for the entire region is speculative at this time and is based in part on the costs estimated by the Central Valley Regional Water Quality Control Board (Central Valley Water Board) and Community Water Center to develop similar types of planning documents. The Central Valley Water Board estimates in its 2018 Basin Plan amendment for the Sacramento River and San Joaquin River basin and Tulare Lake basin[27] that a Prioritization and Optimization strategy for salt control as part of CV-SALTS would cost between $357,000 and $696,000. This may be a reasonable estimate for the cost of prioritization and

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[26] Modesto Management Zone Implementation Plan: https://cvsalinity-my.sharepoint.com/:b:/g/personal/cv-salts_cvsalinity_org/EWsKxCpB6J9Ki1ElO5NPCMgBJieUzE9MnFHUpC51V8I3Hg?e=RdPL1b

[27] Resolution R5-2018-0034 Amendments to the Water Quality Control Plans for the Sacramento River and San Joaquin River Basins and the Tulare Lake Basin to Incorporate a Central Valley-Wide Salt and Nitrate Control Program: https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/resolutions/r5-2018-0034_res.pdf

optimization study for long-term solutions for domestic wells and state small water systems.

Additional estimates of the cost of this type of planning come from Community Water Center (CWC). CWC is a non-governmental organization that advocates for water solutions in California. CWC has developed many regional-scale drinking water prioritization and/or planning documents and estimates that the cost of a planning and prioritization study for domestic wells and state small water systems in the Central Coast Water Board jurisdictional boundary is approximately $500,000. The estimates were shared in personal communications between Central Coast Water Board staff and CWC.

Based on the costs estimated by the Central Valley Water Board and CWC, the cost to develop planning and prioritization documents for domestic wells and state small water system as part of the AWS is estimated to be approximately $525,000. This estimated cost reflects the midpoint in the range of estimates from the Central Valley Water Board and is similar to the estimate from CWC.

7.5. Water Quality Sampling

Sampling to identify wells impacted by nitrate from agricultural discharges was not included as part of the Statewide Needs Assessment but is included as part of the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs. Because actual water quality in state small water systems and domestic wells is largely unknown (with the exception of on-farm domestic wells sampled to comply with the Central Coast Ag Order or domestic wells sampled by other programs), this water quality sampling is needed to identify state small water systems and domestic wells that exceed the MCL for nitrate and are in need of interim supplies and long-term solutions. Public water systems will not need additional sampling because they are already required to sample for nitrate and other constituents as part of statewide drinking water regulations.

Water quality sampling of wells suspected of agricultural discharge impacts is consistent with the approach taken by Central Valley coalitions operating under the Central Valley Regional Water Quality Control Board's CV-SALTS.[28] The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs estimates the cost of collecting the sample, performing the laboratory analysis to measure nitrate concentration, and reporting the results to be $550 per well. This estimate is based on the experience of the Central Coast Water Board Domestic Well Sampling Program.[29] The cost of water quality sampling is included with the estimates for interim solutions because this sampling will need to occur to determine which systems need solutions.

[28] CV-Salts: https://www.cvsalinity.org/

[29] Central Coast Drinking Water Well Testing Program: https://sites.google.com/view/ccgroundwater

If decentralized treatment is offered as an interim alternative water supply, sampling for co-contaminants will need to be conducted to ensure that the composition and/or concentration of contaminants is compatible with decentralized treatment technologies. Under CV-SALTS, funding for co-contaminant sampling is achieved by a grant through SAFER and that could be an approach implemented by the Central Coast Water Board's AWS Program. Co-contaminant sampling will only be needed for state small water systems and domestic wells since public water systems are already required to conduct sampling for a wide range of constituents. California Code of Regulations (CCR) section 64213[30] requires that state small water systems perform one-time sampling for the 19 constituents outlined in CCR 64431,[31] including nitrate. The Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs assumes that this sampling would be sufficient for identifying co-contaminants in state small water systems and domestic wells. The cost of water quality sampling for co-contaminants is based on the experience of the Central Coast Water Board Domestic Well sampling program and is estimated to be $1,100, which includes collection of the sample at the wellhead, analytical costs, and upload of results to the water quality database.

7.6. Administrative and Outreach Costs

The AWS Program will need to have an administrator that helps to facilitate provision of interim alternative water supplies. It is unclear at this time who the administrator would be but regardless of the entity that fills the role, the following duties will likely need to be performed by the administrator:

- collect and/or coordinate the collection of discharger financial contributions;
- solicit, approve, and manage contracts needed to implement the AWS program;
- perform financial forecasting and inform funding needs;
- provide regular reports to the Central Coast Water Board summarizing fee collection and distribution into contracts; and
- engage with the advisory committee, if applicable.

Additional administrative responsibilities that will need to be fulfilled, either by the program administrator or a contractor, include the following:

- apply for and manage grants, loans, and other forms of co-funding;
- track participation and financial contributions from dischargers;
- conduct and/or contract outreach efforts;

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[30] California Code of Regulations section 64213: https://govt.westlaw.com/calregs/Document/I76626D075B6111EC9451000D3A7C4BC3?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

[31] California Code of Regulations section 64431: https://govt.westlaw.com/calregs/Document/I6881336253F711EF8510F0EDAB703C6A?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

- develop plans for the implementation of long-term solutions;
- develop and implement short- and long-term solutions;
- prioritize communities for assistance;
- manage the water quality sampling (well testing) program to determine eligibility;
- determine if a well or water system is eligible for benefits (i.e., drinking water exceeds the MCL for nitrate as a result of agricultural activities);
- create and maintain a database of water quality sampling results and program outcomes;

The Central Coast Water Board estimates that it will cost approximately $400,000 per year to perform all of the duties above. Contracting some of the required elements of the program may result in a slight increase in cost relative to these estimates.

While it is anticipated that the administrator will perform some amount of outreach to engage potential program benefactors, community-based organizations should also be involved in outreach efforts to identify and inform eligible residents. The organizations can potentially provide increased efficiency and effectiveness in conducting outreach because they have established relationships and experience engaging with communities that are in need of drinking water solutions.

Based on the cost of outreach in contracts awarded by SAFER to Community Water Center for a bottled water provision program in the northern part of the Central Coast region, Central Coast Water Board staff estimates that it will cost $170,000 per year to fund community-based organizations capable of performing outreach covering the entire region. We estimate that at least two community-based organizations are needed to effectively reach the residents of the Central Coast region: one in the northern part of the region and one in the southern part of the region.

7.7. Cost Scenarios

Costs were evaluated for a variety of scenarios that included different time horizons, and different types of alternative supplies offered. These different types of alternative water supply combinations evaluated in scenarios are 1) preliminary bottled water; 2) bottled water only; 3) bottled water and POU; and 4) bottled water, POU, and POE. These scenarios are summarized in Table 6 and are described below.

Scenario 1, Preliminary Bottled Water: This scenario estimates the cost of a preliminary bottled water program that allows for rapid implementation of simple alternative water supplies. Speed of implementation, simplicity in the supplies offered, and low cost are the primary benefits. In essence, this scenario simulates the provision of emergency alternative supplies to immediately address the needs of residents not served by regulated (i.e., public) water systems.

Under this scenario, only bottled water is provided and only for state small water systems and domestic wells. Water quality sampling for nitrate is also included. Planning and

prioritization for long-term solutions is not included. Under this scenario, it is assumed that subsequent phases of an interim alternative water supply program would be implemented where the range of alternative supplies would be broadened to include POU and/or POE, that public water systems would also be incorporated, and planning and prioritization of long-term solutions would begin. This preliminary scenario is simulated for only 3 or 5 years because it would need to be replaced by more comprehensive interim and long-term programs, consistent with the requirements of the Remand Order.

Scenario 2, Bottled Water Only: Under this scenario, only bottled water is provided but public water systems are also eligible, in addition to domestic wells and state small water systems. The cost of planning and prioritizing long-term solutions is also included as is water quality sampling for nitrate. The cost of this scenario is estimated for 3, 5, or 10 years.

Scenario 3, Bottled Water or POU: Under this scenario, a water system or domestic well could be assigned either POU treatment or bottled water. POU is selected if it is viable based on water quality. If POU is not viable, bottled water is selected. The cost of planning and prioritizing long-term solutions is also included. Water quality sampling includes nitrate and co-contaminants. This scenario is simulated for 3, 5, or 10 years.

POU was assigned as the interim alternative supply unless any of the following conditions occurred:

- Nitrate concentrations exceeded 25 mg/L as N; or
- aluminum, thallium, iron, manganese, or bromate were present; or
- contaminants in Table 5 were present; or
- public water systems had *E. coli* (occurrence of *E.coli* is unknown for state small water systems and domestic wells).

If any of the above conditions were present, bottled water was assigned as the solution.

Scenario 4, Bottled Water, POU, POE: Under this scenario, a water system or domestic well could be assigned bottled water only, POU only, POU and POE, or bottled water and POE. The cost of planning and prioritizing long-term solutions is also included. Water quality sampling includes nitrate and co-contaminates. This scenario is simulated for 3, 5, or 10 years.

The alternative water supply selected by the model used the following decision criteria:

- If nitrate was less than 25 mg/L as N, POU was selected and POE was added if constituents in Table 5 were present;
- If nitrate was greater than 25 mg/l as N, bottled water was selected and POE was added if constituents in Table 5 were present;

- If aluminum, thallium, iron, manganese, or bromate were present, or public water systems had *E. coli*., POU and POE were deemed not viable and bottled water was selected as the only alternative supply.

Table 6. Comparison of the different cost scenarios.

Scenario Variable	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Alternative Supplies Considered	BW[1]	BW	BW, POU	BW, POU, POE
Water Systems Included	SSWS, DW	SSWS, DW ,PWS	SSWS, DW, PWS	SSWS, DW, PWS
Water Quality Sampling	nitrate	nitrate	nitrate plus others[2]	nitrate plus others[2]
Long-Term Planning	No	Yes	Yes	Yes
Duration (years)	3 or 5	3, 5, or 10	3, 5, or 10	3, 5, or 10

[1]BW denotes bottled water, SSWS denotes state small water systems, DW denotes domestic wells, and PWS denotes public water systems.

[2]Nitrate plus others includes the co-contaminants described in section 7.5 on water quality sampling.

8. Results

8.1. Impacted Systems and Demographics

Nitrate contamination from agricultural discharges impacts water systems, domestic wells, and populations across the Central Coast region. In total, 3,005 domestic wells, 117 state small water systems (SSWS), and 17 public water systems (PWS) are estimated to be impacted by nitrate from agricultural discharges. The number of impacted public water system service connections ranged from 1-163 and the population served by these public water systems ranged from 30-538 people. A map showing the location of water systems with known or estimated nitrate MCL exceedances located within the estimated irrigated agricultural footprint and associated 0.5 mile impact extent is shown in Figure 4.

The population served by public water systems is approximately known based on reporting required by the State Water Board's Division of Drinking Water (DDW). The populations served by domestic wells and state small water systems was estimated by assuming that each domestic well and each state small water system service connection served 2.86 people, which is the median number of people per household in the Central Coast Region according to United State Census Bureau estimates from 2019-2023.[32]

[32] United States Census Bureau Quick Facts California:

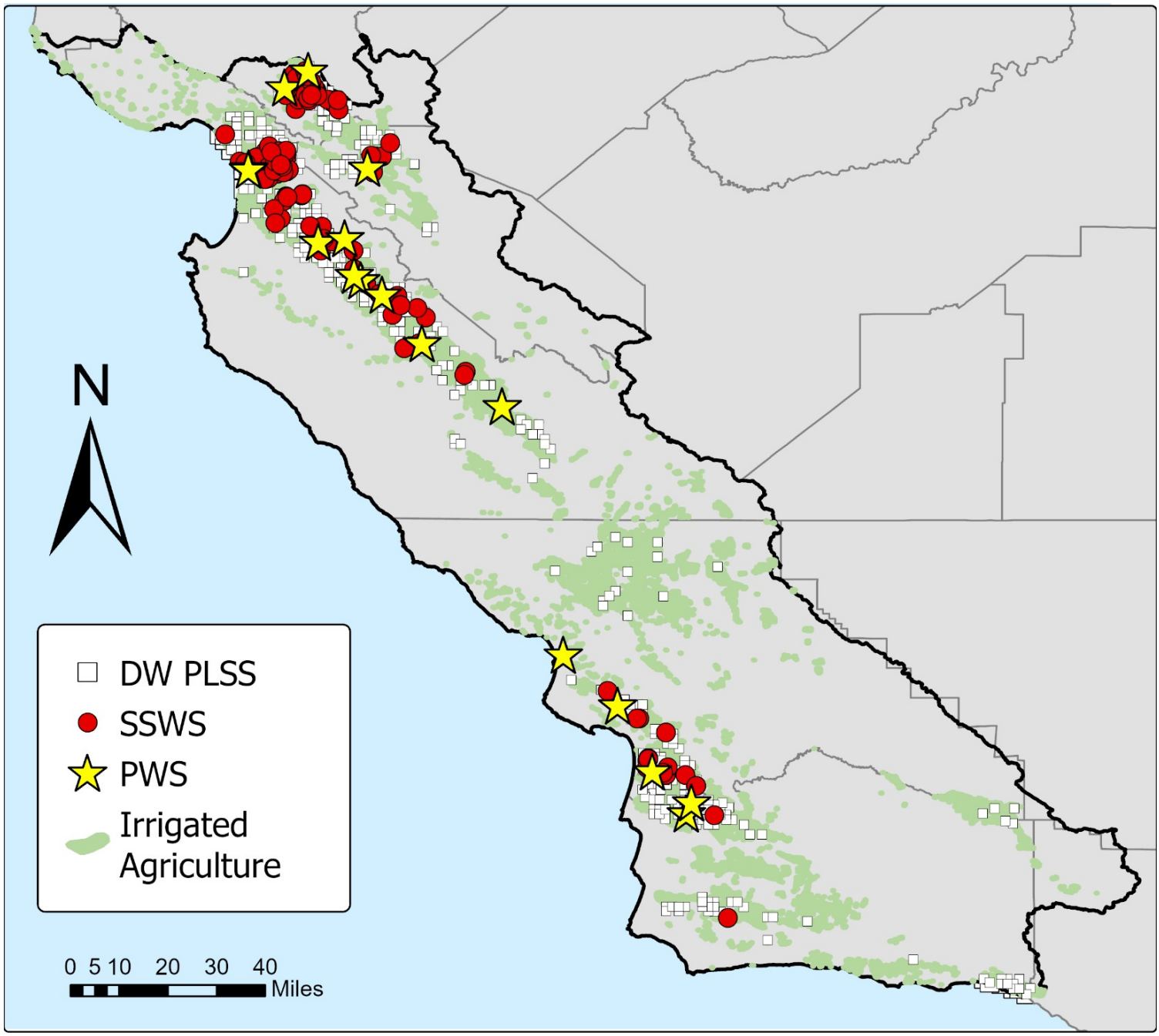

Figure 4. Map of water systems and domestic wells with possible nitrate impacts from irrigated agriculture. Public Land Survey System (PLSS) sections that were identified as high risk by the Aquifer Risk Map are displayed to identify areas where nitrate-impacted domestic wells (DW) may be located. Public water systems (PWS) and state small water systems (SSWS) are also shown. Agricultural lands are from DWR's 2022 Crop Mapping Database and include a 0.5 mile agricultural discharge impact extent.

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https://www.census.gov/quickfacts/fact/table/CA/PST045223

Collectively, impacted domestic wells, state small water systems, and public water systems are estimated to serve 14,039 people, with domestic wells accounting for the largest portion of affected populations at 8,594 individuals (Figure 5). Table 7 provides a summary of the number of known or estimated impacted systems, service connections, and population.

Table 7. The total number of water systems, service connections, or population estimated to be impacted by nitrate from agricultural discharges to groundwater.

Count	Domestic Wells	State Small Water Systems	Public Water Systems	Total
# Systems	3,005	117	17	3,139
Total # Service Connections	3,005	945	854	4,804
Estimated population	8,594	2,703	2,742	14,039
Estimated DAC/SDAC Population	638	326	1,214	2,178

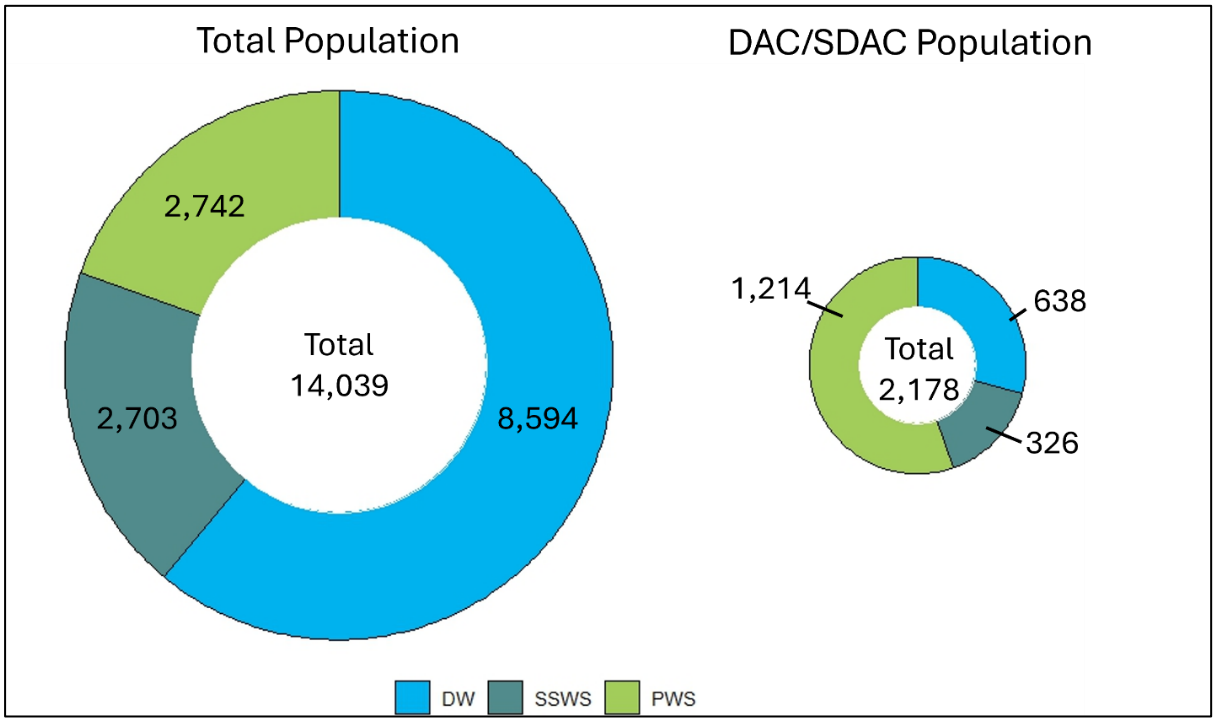

Figure 5. The estimated total population served by public water systems (PWS), state small water systems (SSWS), and domestic wells (DW) polluted by nitrate from agricultural activities is shown on the left. The estimated portion of the total population classified as a disadvantaged community (DAC) or severely disadvantaged community (SDAC) is shown on the right.

Socioeconomic data indicate that approximately 16% of the impacted population is classified as DAC or SDAC (Figure 5). The majority (55%) of the impacted DAC and

SDAC populations are served by public water systems, which differs from the impacted population as a whole of whom only 20% is served by public water systems. Based on these estimates, much smaller proportions of DAC and SDAC populations rely on impacted state small water systems and domestic wells compared to the total population. This information suggests that solutions focused on public water systems may have the greatest benefit to DACs and SDACs.

A county-level analysis reveals that Monterey and Santa Clara counties are the most severely affected (Figure 6 and Table 8). Monterey has 878 impacted domestic wells and 75 impacted state small water systems, while the portion of Santa Clara County within the Central Coast Water Board boundary has 982 impacted domestic wells and 21 impacted state small water systems. The Santa Maria groundwater basin, which straddles San Luis Obispo and Santa Barbara counties, contains an estimated 365 domestic wells, 10 state small water systems, and 3 public water systems (serving approximately 2,100 people) that are impacted by agricultural discharges to groundwater. Other counties, such as San Benito, also face notable challenges, with hundreds of residents potentially exposed to nitrate pollution in groundwater. It's important to note that only small portions of Ventura, Kern, and San Mateo Counties intersect the Central Coast Water Board regional boundaries, which likely contributes to the minimal or nonexistent impacts identified in those counties as part of this analysis.

Table 8. Counts of impacted domestic wells or water systems for the various counties in the Central Coast region. Numbers reflect the systems within the Central Coast region only.

County	Domestic Wells	State Small Water Systems	Public Water Systems
Monterey	878	75	9
San Benito	180	5	1
San Luis Obispo	460	13	3
Santa Barbara	268	2	2
Santa Clara	982	21	2
Santa Cruz	234	1	0
Ventura	3	0	0

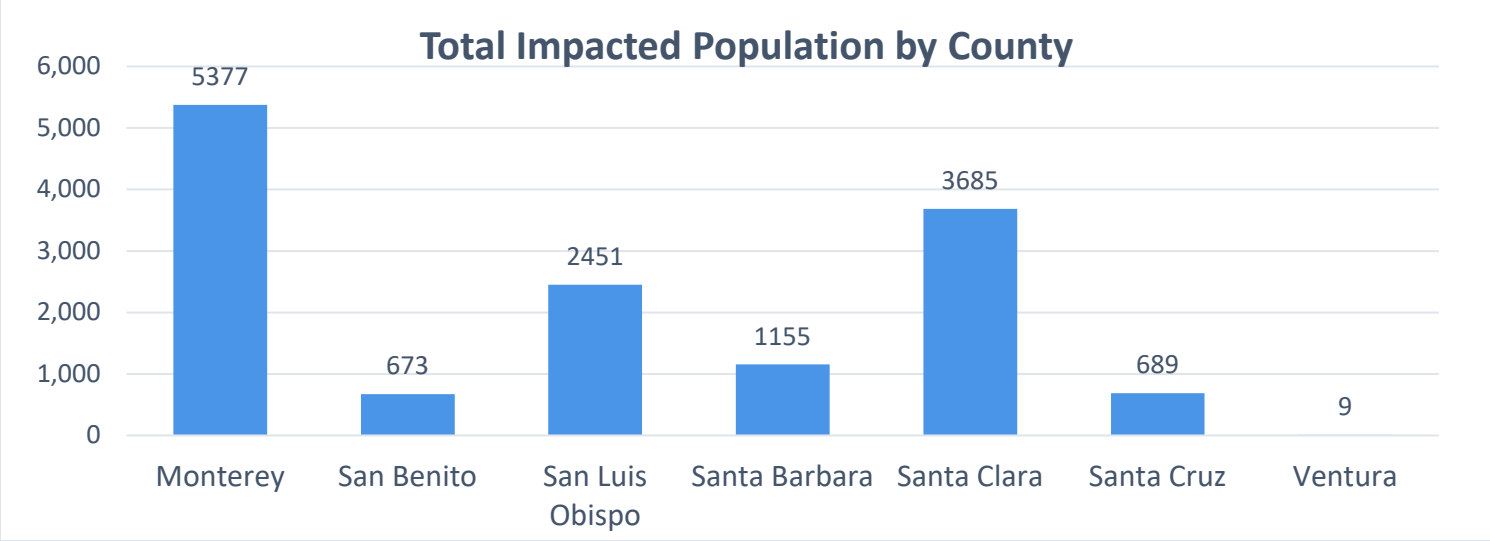

Figure 6. The estimated population served by water systems or domestic wells impacted by nitrate from agricultural discharges is shown for various counties in the central coast region. Numbers reflect systems within the Central Coast region only.

8.2. Modeled Costs and Associated Solutions

8.2.1. Comparison of Cost of Options

Results of the cost modeling scenarios estimate that an interim alternative water supply program will cost between $5.7 and $13.6 million per year, depending on the scenario and time horizon (Figure 7). For all modeling scenarios, the average annual cost decreases as the duration of the scenario increases. Total cost estimates over the duration of a program range between $17.7 million for a three-year program and $72.2 million for a 10-year program. Cost per domestic wells or service connection ranges from $13,300 - $15,000 over a 10-year period, or approximately $1,300 - $1,500 per domestic well or service connection per year.

The preliminary bottled water program scenario is the least expensive over the three- and five-year time horizons. However, given that this scenario excludes public water systems and doesn't include the cost of planning for long-term solutions, it isn't surprising that this is the least expensive option nor is this an equitable comparison to the other three scenarios.

Of the remaining three scenarios, the bottled water only option (scenario 2) is the least expensive over the three- and five-year time horizons. The lower cost of bottled water for shorter duration scenarios is a reflection of the high first-year cost for decentralized treatment compared to bottled water. For example, first year total cost estimate is $18.9 million for bottled water + POU (scenario 3) and $24.4 million for bottled water + POU + POE (scenario 4) compared to just $6.4 million for bottled water only (scenario 2). The high initial cost for decentralized treatment is due to the high capital cost associated with

installing the treatment systems and performing outreach to educate users about the treatment technology.

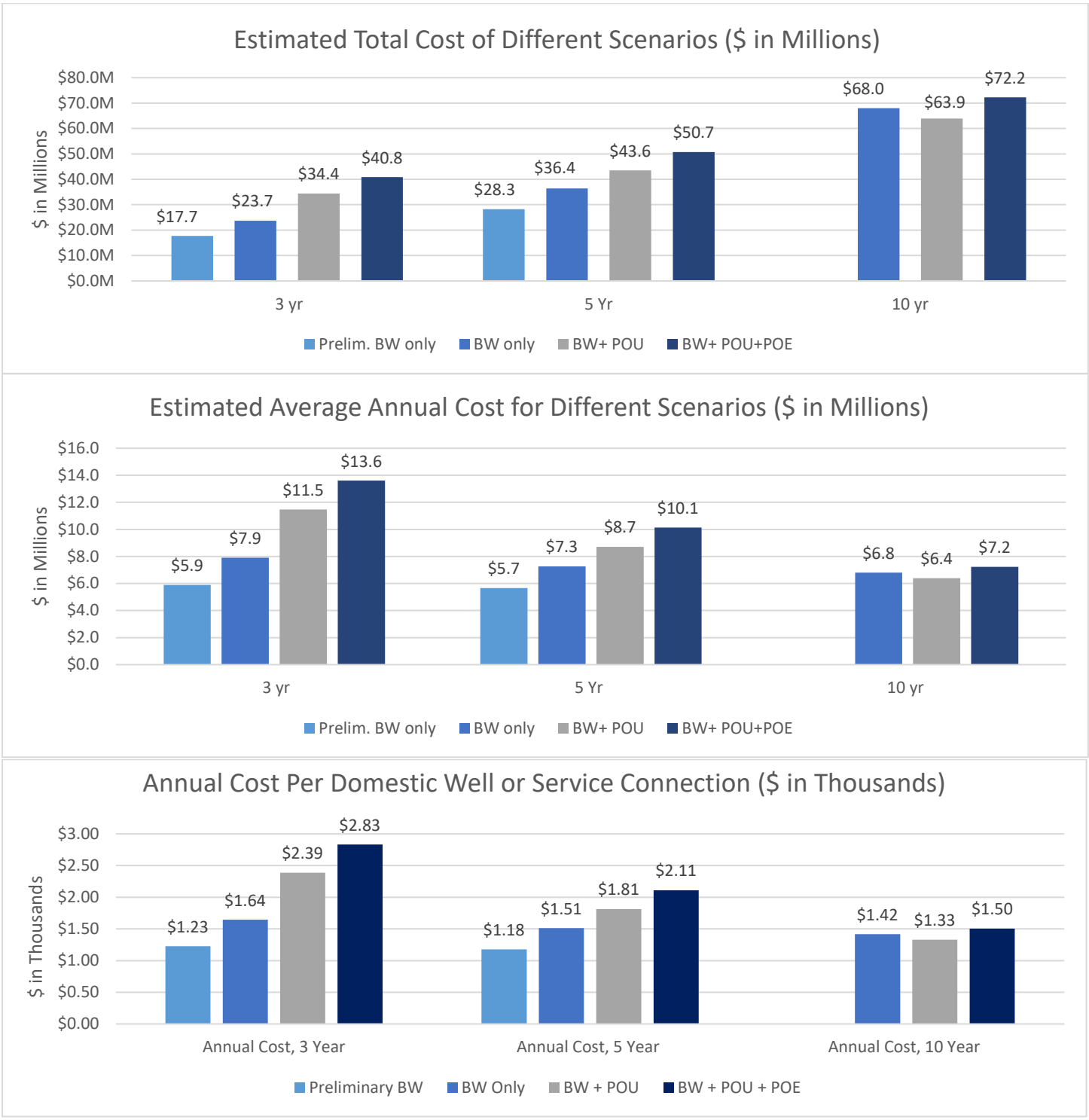

Figure 7. Total cost estimate (top), average annual cost estimate (middle), and average annual cost estimate per service connection or domestic well (bottom) of various interim alternative water supply scenarios.

However, bottled water + POU (scenario 3) is the least expensive scenario over a 10-year time horizon. This is because the high initial costs for decentralized treatment are offset by lower O&M compared to ongoing provision of bottled water. While the bottled water + POU + POE scenario (scenario 4) continues to be the most expensive even over a 10-year time horizon, the difference in cost between this scenario and the bottled water only scenario (scenario 2) for a 10-year time horizon is much smaller than for the shorter duration scenarios. Given that a bottled water + POU + POE scenario provides a more sustainable option compared to bottled water only and addresses contaminants that pose inhalation and/or skin exposure risk, which bottled water doesn't, the additional estimate of $400,000 per year for the bottled water + POU + POE scenario may be worth the expense.

8.2.2. Cost Contributors to Individual Scenarios

Details regarding the proportional contribution of each interim alternative water supply program expense category to the total estimated cost for a particular scenario and duration is shown in Figure 8. For all scenarios and time horizons, domestic wells make up the largest component of the total expense reflecting the fact that there are approximately three times as many domestic wells as there are public water system or state small water system service connections. Public and state small water systems have a similar number of service connections and correspondingly, similar cost. The results of each of the scenarios are described in greater detail below. Appendix A includes tables detailing the cost of each expense category for each scenario.

Preliminary Bottled Water: Under the preliminary bottled water scenario, all domestic wells and state small water systems receive bottled water (3,005 domestic wells and 117 state small water systems with 945 service connections). The preliminary bottled water program is estimated to cost $5.9 and $5.7 million per year for three and five years, respectively. The total estimated cost of the preliminary bottled water program is $17.7 million and $28.3 million for three and five years, respectively (Appendix A, Table A- 1). Cost per service connection or domestic well is approximately $1,200 per year.

Bottled Water Only Scenarios: Under this scenario, all wells and water systems receive bottled water. This amounts to 3,005 domestic wells, 117 state small water systems (945 service connections), and 17 public water systems (854 service connections). The average annual cost of the bottled water only program is approximately $7.9 million, $7.3 million, and $6.8 million for 3, 5, and 10 years, respectively. The total estimated costs range from $23.7-$68.0 million for 3-10 years (Appendix A, Table A- 2). Estimated cost per service connection or domestic well ranges from $1,400-$1,650 per year.

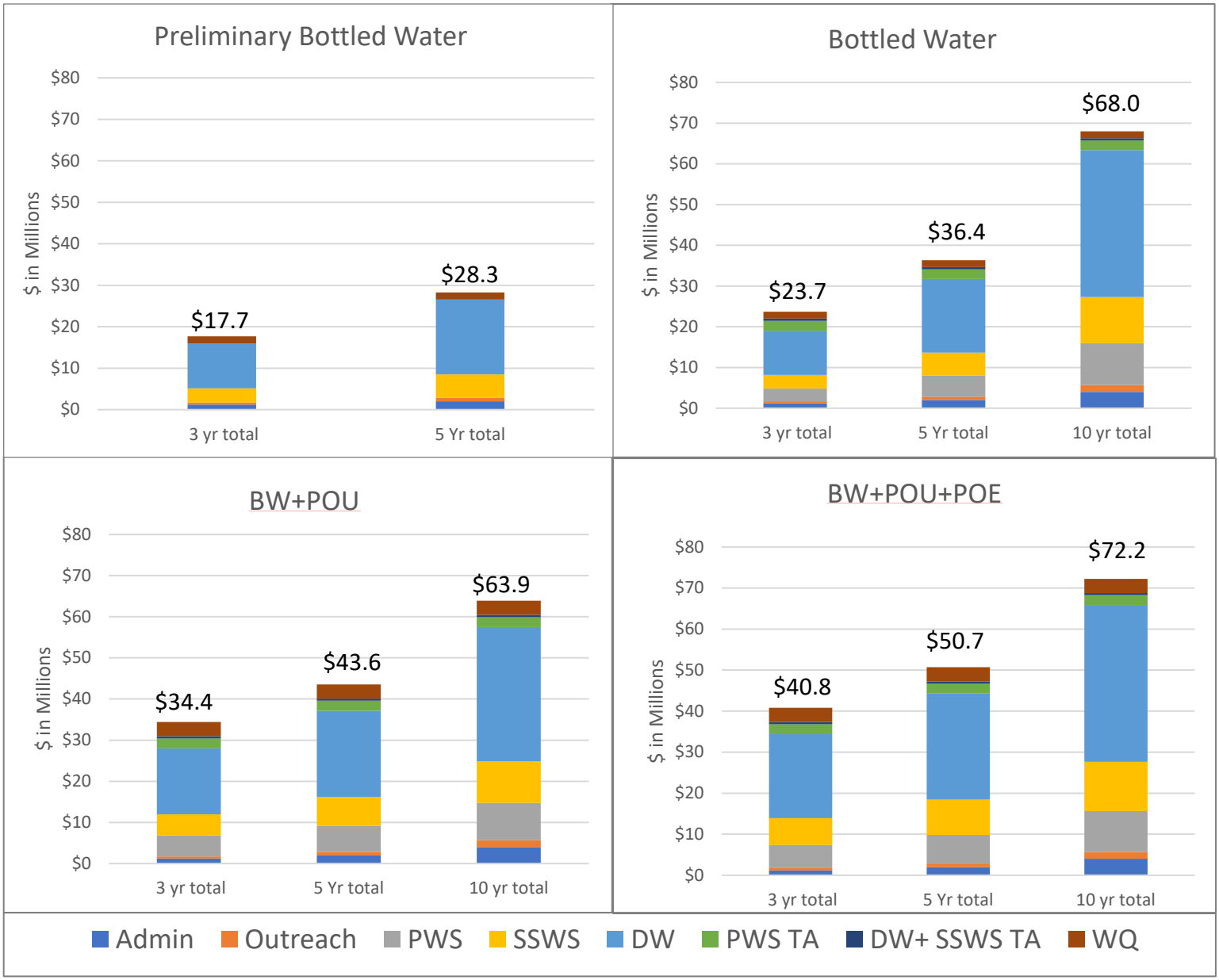

Figure 8. The proportional contribution of each expense category to the total estimated cost for a particular scenario and time horizon is shown.

Bottled water + POU Scenario: This scenario estimates that bottled water will be provided to 1,046 domestic wells, 82 state small water systems (280 service connections), and six public water systems (115 service connections). POU will be provided to the remaining 1,959 domestic wells, 35 state small water systems (665 service connections), and 11 public water systems (739 service connections) (Figure 9 and

Table 9).

The average annual cost to provide these alternative supplies is approximately $11.5 million, $8.7 million, and $6.4 million for 3, 5, and 10 years, respectively (Appendix A, Table A- 3). The 3-, 5-, and 10-year total costs are approximately $34.4 million, $43.6 million, and $63.9 million, respectively. Cost per service connection or domestic well

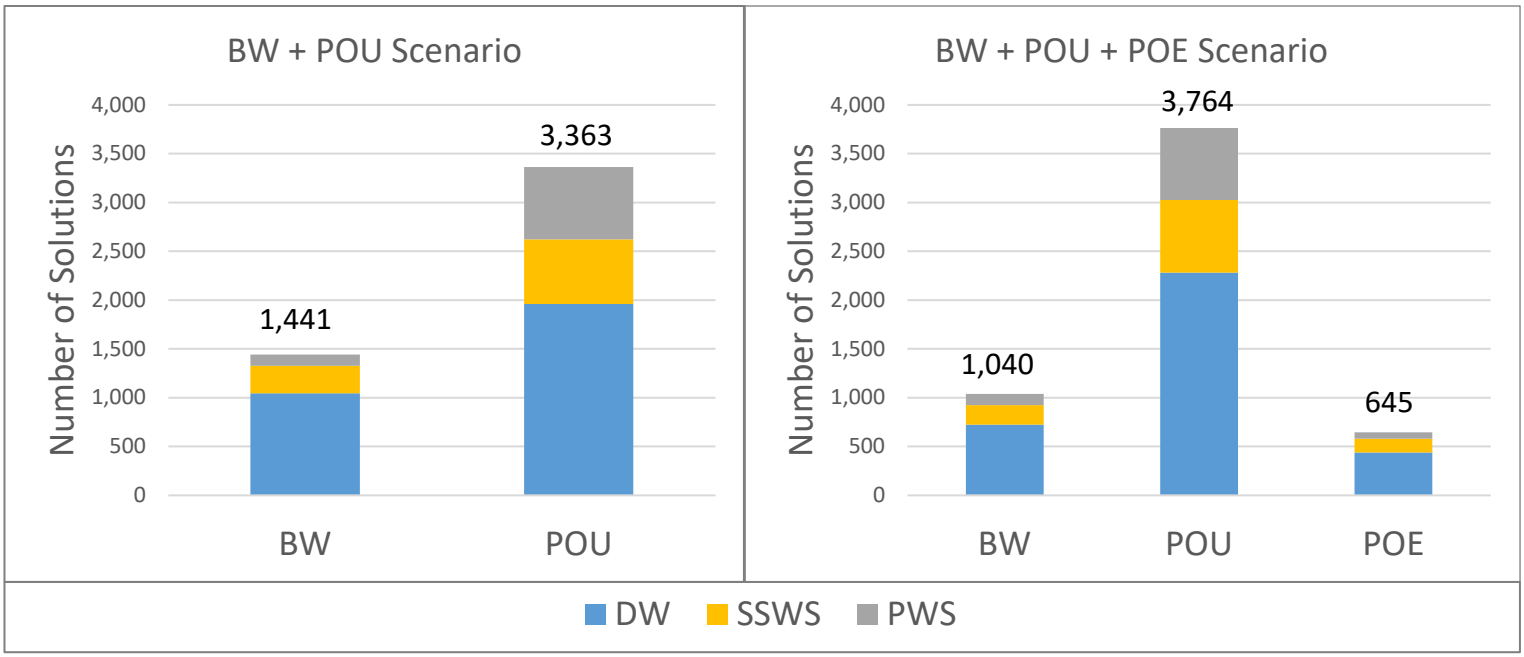

Figure 9.The number of alternative water supplies delivered to domestic wells or water systems is shown for different scenarios.

ranges from approximately $1,300 per year for a 10-year program to $2,400 per year for a three-year program.

Table 9. Summary of the number of alternative water supplies needed as estimated by the bottled water + POU scenario.

Category	Number of BW (% of row total)	Number of POU (% of row total)	Total
Domestic wells	1046 (35%)	1959 (65%)	**3005**
State small water system service connections	280 (30%)	665 (70%)	**945**
Public water system service connections	115 (13%)	739 (87%)	**854**
Total	**1,441**	**3,363**	**4,804**
State small water systems	82 (70%)	35 (30%)	117
Public water systems	6 (35%)	11 (65%)	17

Bottled water + POU + POE scenario: Because this scenario assumes that some

domestic wells or water systems will receive POE in addition to bottled water or POU (i.e., some receive two types of interim supplies), the total number of alternative water supplies is greater than other scenarios and exceeds the total number of domestic wells and water system service connections that need interim solutions. Details regarding the total number of supplies modeled are included in Figure 9 and

Table 10. Details regarding the number of systems receiving two types of interim supplies are shown in

Table 11.

Scenario results indicate that 2,281 domestic wells, 93 state small water systems (744 service connections), and 11 public water systems (739 service connections) receive POU. Of those receiving POU, 270 domestic wells, 11 state small water systems with 79 service connections, and three public water systems with 65 service connections also received POE.

An estimated 724 domestic wells, 24 state small water systems (201 service connections), and six public water systems (115 service connections) receive bottled water. Of those receiving bottled water, 168 domestic wells and nine state small water systems (63 service connections) also received POE.

In total, 645 POE systems were modeled to be provided to 438 domestic wells, 20 state small water systems with 142 service connections, and three public water systems with 65 service connections.

The average estimated annual cost to provide these alternative supplies is $13.6 million, $10.1 million, and $7.2 million for 3, 5, and 10 years, respectively (Appendix A, Table A- 4). The 3-, 5-, and 10-year total costs are approximately $40.8 million, $50.7 million, and $72.2 million, respectively. Estimated cost per service connection or domestic well ranges from $1,500 per year for 10 years to $2,800 per year for three years.

Table 10. Summary of the number of alternative water supplies needed as estimated by the bottled water + POU + POE scenario.

Category	Number of BW (% of row total)	Number of POU (% of row total)	Number of POE (% of row total)	Total
Domestic wells	724 (21%)	2,281 (66%)	438 (13%)	**3,443**
State small water system service connections	201 (18%)	744 (68%)	142 (13%)	**1,087**
Public water system service connections	115 (13%)	739 (80%)	65 (7%)	**919**
Total	**1,040**	**3,764**	**645**	**5,449**

Category	Number of BW (% of row total)	Number of POU (% of row total)	Number of POE (% of row total)	Total
State small water systems	24 (18%)	93 (68%)	20 (15%)	137
Public water systems	6 (30%)	11 (55%)	3 (15%)	20

Table 11. Number of domestic wells and public and state small water systems that received two types of interim alternative water supplies under the bottled water + POU + POE scenario.

Category	Number of BW+POE	Number of POU+POE	Total
Domestic wells	168	270	**438**
State small water system service connections	63	79	**142**
Public water system service connections	0	65	**65**
Total	**231**	**414**	**645**
State small water systems	9	11	20
Public water systems	0	3	3

9. Conclusions

Results of the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs reiterate the impacts to drinking water systems and domestic wells from agricultural discharges and provide a useful framework for understanding options and costs for interim alternative water supplies that can address these impacts in the near term. This assessment quantifies the scope of the water quality problem and uses a structured approach to model options for interim alternative water supplies and to estimate associated costs.

The approach used by the Central Coast Water Board in developing its Assessment of Interim Drinking Water Needs and Costs is based on the methodology employed by the Statewide Needs Assessment. However, the Central Coast Water Board modified the statewide approach to reflect the directive given by the State Water Board in its remand of the Ag Order. The Central Coast Water Board's findings underscore the need for immediate interim supplies tailored to the specific conditions of the impacted water systems or domestic well. Key results demonstrate that nitrate pollution affects people throughout the Central Coast region and impacts populations living in areas classified as disadvantaged communities. An estimated 3,005 domestic wells, 117 state small water systems, and 17 public water systems have been identified as exceeding the nitrate MCL, potentially impacting over 14,000 people. Solutions modeled include preliminary

bottled water, bottled water only, bottled water or POU, and bottled water and/or POU and/or POE.

The total estimated cost of implementing short-term solutions over 10 years ranges between $68-$72 million, or approximately $6.8-$7.2 million per year. Most of the cost is to provide domestic wells with interim alternative supplies. Over 10 years, the least expensive option is a program that provides bottled water or POU, where bottled water is only selected if POU is not viable due to water quality constraints. A program that additionally offers POE (in addition to POU or bottled water) to treat for contaminants that pose inhalation or skin exposure risk is only $400,000 per year more compared to a bottled water only program. Given the relatively low additional cost of providing POE and the many additional benefits in terms of sustainability and human health protection offered by POE relative to the bottled water only scenario, this additional expense may be worthwhile.

However, provision of decentralized treatment has high upfront costs due to the capital costs of installing treatment systems. A program that provided decentralized treatment would need substantial financial resources at the outset of the program to support the capital requirements of decentralized treatment systems. This initial financial need would later be reduced once treatment systems are installed since the O&M is comparatively low.

Geographically, Monterey and Santa Clara counties, as well as residents in the Santa Maria area of Santa Barbara and San Luis Obispo counties, face the highest impacts and costs, emphasizing the regional variability of the issue. The assessment also highlights the importance of including co-contaminants in treatment considerations and the necessity of ensuring that solutions are robust and inclusive of all contaminants present.

In conclusion, the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs provides a foundation for addressing nitrate contamination in the Central Coast region. The findings of this assessment highlight the need for action to address nitrate contamination in drinking water across the Central Coast region. With over 14,000 residents—many in disadvantaged communities—affected by unsafe nitrate levels, immediate steps must be taken to protect public health while simultaneously working toward long-term solutions. Provision of interim supplies and planning and prioritization of long-term solutions is the first step in providing sustainable and equitable long-term solutions for residents whose wells have been polluted by agriculture.

Appendix A
Estimated cost details for each of the interim alternative water supply scenarios.

Table A- 1. Expenses estimated for the preliminary bottled water only scenario.

Expense Category	Year 1 Cost	Average Cost of Each Subsequent Year[1]	3 Year Total	5 Yr total
Admin	$0.4 M	$0.4 M	$1.2 M	$2.0 M
Outreach	$0.2 M	$0.2 M	$0.5 M	$0.9 M
SSWS	$1.1 M	$1.1 M	$3.4 M	$5.7 M
DW	$3.6 M	$3.6 M	$10.8 M	$18.0 M
WQ[2]	-	-	$1.7 M	$1.7 M
Grand Total	**$5.4 M**	**$5.3 M**	**$17.7 M**	**$28.3 M**
Mean Annual cost	**-**	**-**	**$5.9 M**	**$5.7 M**

[1] The rows in the "Average Cost of Each Subsequent Year" column are calculated as the average cost per year, excluding the first year, over the duration of the program. This does not include the cost of water quality sampling or technical assistance.

[2] No water quality cost is included in the "Year 1 Cost" and "Average Cost of Each Subsequent Year" columns because it is assumed that this cost is amortized over the duration of the program (i.e., either 3 or 5 years).

Table A- 2. Expenses estimated for the bottled water only scenario.

Expense Category	Year 1 Cost	Average Cost of Each Subsequent Year[1]	3 Year Total	5 Year total	10 Year Total
Admin	$0.4 M	$0.4 M	$1.2 M	$2.0 M	$4.0 M
Outreach	$0.2 M	$0.2 M	$0.5 M	$0.9 M	$1.7 M
PWS	$1.0 M	$1.0 M	$3.1 M	$5.1 M	$10.2 M
SSWS	$1.1 M	$1.1 M	$3.4 M	$5.7 M	$11.3 M

Expense Category	Year 1 Cost	Average Cost of Each Subsequent Year[1]	3 Year Total	5 Year total	10 Year Total
DW	$3.6 M	$3.6 M	$10.8 M	$18.0 M	$36.1 M
PWS TA[2]	-	-	$2.4 M	$2.4 M	$2.4 M
DW+ SSWS TA[2]	-	-	$0.5 M	$0.5 M	$0.5 M
WQ[2]	-	-	$1.7 M	$1.7 M	$1.7 M
Grand Total	**$6.4 M**	**$6.3 M**	**$23.7 M**	**$36.4 M**	**$68.0 M**
Mean Annual cost	**-**	**-**	**$7.9 M**	**$7.3 M**	**$6.8 M**

[1] The rows in the "Average Cost of Each Subsequent Year" column are calculated as the average cost per year, excluding the first year, over the duration of the program. This does not include the cost of water quality sampling or technical assistance.

[2] No water quality cost is included for this expense category in the "Year 1 Cost" and "Average Cost of Each Subsequent Year" columns because it is assumed that this cost is amortized uniformly over the duration of the program (i.e., either 3, 5, or 10 years).

Table A- 3. Expenses estimated for the bottled water + POU scenario.

Expense Category	Year 1 Cost	Average Cost of Each Subsequent Year[1]	3 Year Total	5 Year total	10 Year Total
Admin	$ 0.4 M	$ 0.4 M	$ 1.2 M	$ 2.0 M	$ 4.0 M
Outreach	$ 0.2 M	$ 0.2 M	$ 0.5 M	$ 0.9 M	$ 1.7 M
PWS	$ 3.8 M	$ 0.6 M	$ 5.1 M	$ 6.3 M	$ 9.0 M
SSWS	$ 3.6 M	$ 0.8 M	$ 5.2 M	$ 7.0 M	$ 10.2 M
DW	$ 10.9 M	$ 2.5 M	$ 16.0 M	$ 21.0 M	$ 32.6 M
PWS TA[2]	-	-	$ 2.4 M	$ 2.4 M	$ 2.4 M
DW+ SSWS TA[2]	-	-	$ 0.5 M	$ 0.5 M	$ 0.5 M
WQ[2,3]	-	-	$ 3.5 M	$ 3.5 M	$ 3.5 M

Expense Category	Year 1 Cost	Average Cost of Each Subsequent Year[1]	3 Year Total	5 Year total	10 Year Total
Grand Total	**$ 18.9 M**	**$ 4.5 M**	**$ 34.4 M**	**$ 43.6 M**	**$ 63.9 M**
Mean Annual Cost	**-**	**-**	**$ 11.5 M**	**$ 8.7 M**	**$ 6.4 M**

[1] The rows in the "Average Cost of Each Subsequent Year" column are calculated as the average cost per year, excluding the first year, over the duration of the program. This does not include the cost of water quality sampling or technical assistance.

[2] No water quality cost is included for this expense category in the "Year 1 Cost" and "Average Cost of Each Subsequent Year" columns because it is assumed that this cost is amortized uniformly over the duration of the program (i.e., either 3, 5, or 10 years).

[3] Water quality testing cost is higher than for the bottled water-only option because additional constituents need to be sampled to determine if POU is viable.

Table A- 4. Expenses estimated for the bottled water + POU + POE scenario.

Expense Category	Year 1 Cost	Average Cost of Each Subsequent Year[1]	3 Year Total	5 Year total	10 Year Total
Admin	$ 0.4 M	$ 0.4 M	$ 1.2 M	$ 2.0 M	$ 4.0 M
Outreach	$ 0.2 M	$ 0.2 M	$ 0.5 M	$ 0.9 M	$ 1.7 M
PWS	$ 4.3 M	$ 0.7 M	$ 5.7 M	$ 7.0 M	$ 9.9 M
SSWS	$ 4.8 M	$ 0.9 M	$ 6.5 M	$ 8.6 M	$ 12.0 M
DW	$ 14.8 M	$ 2.7 M	$ 20.5 M	$ 25.9 M	$ 38.2 M
PWS TA[2]	-	-	$ 2.4 M	$ 2.4 M	$ 2.4 M
DW+ SSWS TA[2]	-	-	$ 0.5 M	$ 0.5 M	$ 0.5 M
WQ[2,3]	-	-	$ 3.5 M	$ 3.5 M	$ 3.5 M
Grand Total	**$ 24.4 M**	**$ 4.9 M**	**$ 40.8 M**	**$ 50.7 M**	**$ 72.2 M**
Mean Annual Cost	**-**	**-**	**$ 13.6 M**	**$ 10.1 M**	**$ 7.2 M**

[1] The rows in the “Average Cost of Each Subsequent Year” column are calculated as the average cost per year, excluding the first year, over the duration of the program. This does not include the cost of water quality sampling or technical assistance.

[2] No cost is included for this expense category in the “Year 1 Cost” and “Subsequent Yr” columns because it is assumed that this cost is amortized over the duration of the program (i.e., either 3, 5, or 10 years).

[3] Water quality testing cost is higher than for the bottled water-only option because additional constituents need to be sampled to determine if POU is viable.

Appendix B
Approach for Determining Agricultural Impacts Outside of the Agricultural Spatial Footprint

To determine which nitrate-impacted wells were likely polluted by nitrate from agricultural discharges, the irrigated agricultural spatial footprint was compared to the location of impacted wells. The footprint of irrigated agricultural lands is from DWR's 2021 Statewide Crop Mapping dataset. If a well was located within the estimated agricultural footprint, there is a reasonable likelihood that the nitrate pollution occurring in the well was a result of agricultural discharges. However, agricultural discharge impacts likely occur outside of the immediate agricultural footprint as estimated for the purposes of this Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs due to downgradient groundwater flow within an aquifer. Continual loading of nitrogen to the land surface as a result of agricultural activities for many consecutive years results in transport of nitrate in groundwater away from the original source, considering that nitrate doesn't readily degrade in groundwater. To include wells in the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs that are impacted by agricultural dischargers but located outside of the immediate estimated agricultural footprint, an impact extent was added to the estimated agricultural footprint. The examples below provide justification for the use and magnitude of the impact extent. It's important to remember that this impact extent is used for the purpose of estimating the cost to provide drinking water solutions to impacted wells. Estimation of the true groundwater impact for all agricultural lands in the region and by extension, identifying wells that are definitively impacted by nitrate from agricultural discharges, is beyond the scope of this assessment.

Figure 10 and Figure 11 below provide visual support for the reasoning used to determine the appropriate impact extent distance. In general, we find that 0.5 miles appears to reasonably approximate the true distance outside of the two-dimensional agricultural footprint at which a majority of wells are impacted by agricultural discharges. With the examples provided below, we demonstrate that in some cases, 0.5 miles underestimates the spatial extent of agricultural discharge impacts in aquifer while in other cases, 0.5 miles overestimates the spatial extent. However, there isn't a systematic bias towards over- or underestimation when using a 0.5 mile impact extent. At this distance, the Central Coast Water Board's Assessment of Interim Drinking Water Needs and Costs provides a reasonable estimate of the number of wells impacted by agricultural discharges.

The first example (Map A of Figure 10 and nitrate concentration time series shown in Figure 11) shows that an impact extent of 0.5 miles underestimates the true spatial extent of agricultural discharges. The map depicts the western portion of the Santa

Maria River Valley from the City of Santa Maria in the east to the Pacific Ocean in the West. The red circle on the map shows the location of a nested monitoring well owned and maintained by the United States Geological Survey (USGS) with a long historical record of nitrate concentrations measured at various depths within the nested well. Land-use immediately adjacent to the nested well is primarily comprised of Dune Sands but hydraulically upgradient and to the east of the monitoring well is the Santa Maria River Valley and extensive irrigated agriculture comprised primarily of truck crops. Nitrate concentrations measured at discrete depths in the nested monitoring well are plotted in Figure 11. The elevated and increasing nitrate concentrations observed in multiple vertical horizons within the monitoring well are likely attributed to agricultural discharges, particularly given the lack of other obvious nitrogen-contributing land use practices in vicinity of the well. Given that this well is located outside of the 0.5 mile impact extent, 0.5 miles underestimates the true spatial extent of the agricultural discharge impact in this example.

In contrast to the first example, the second example (Map B of Figure 10) demonstrates that a 0.5 mile impact extent likely overestimates the true extent of agricultural discharges for this location. The map depicts a portion of the Salinas Valley near King City. In this example, the agricultural impact extent exceeds the boundary of the Salinas Valley groundwater basin boundary and protrudes into the hillsides on the eastern and western edges of the Valley. The 0.5 mile impact extent intersects some PLSS sections with domestic wells that are identified as at-risk for nitrate contamination by the Statewide Aquifer Risk Map and are located on the western edge of the impact extent. These sections with domestic wells are on hillsides elevated above the valley floor and beyond the extent of the groundwater basin boundary. It is unlikely that there is substantial saturated groundwater in these areas that is hydraulically connected and downgradient from the agricultural lands and agricultural discharges in the valley. As such, it is unlikely that nitrate impacts in the wells on the hillsides adjacent to the Salinas Valley would be from agricultural discharges in the valley. In this case, the 0.5 mile impact extent likely overestimates the true spatial extent of the agricultural discharge impact.

These two examples help to demonstrate that the 0.5 mile impact extent does not have a consistent bias towards over- or underestimating the true impact extent. A 0.5 mile impact likely extent provides a reasonable estimate of the true extent of agricultural impacts to groundwater outside the immediate estimated agricultural footprint.

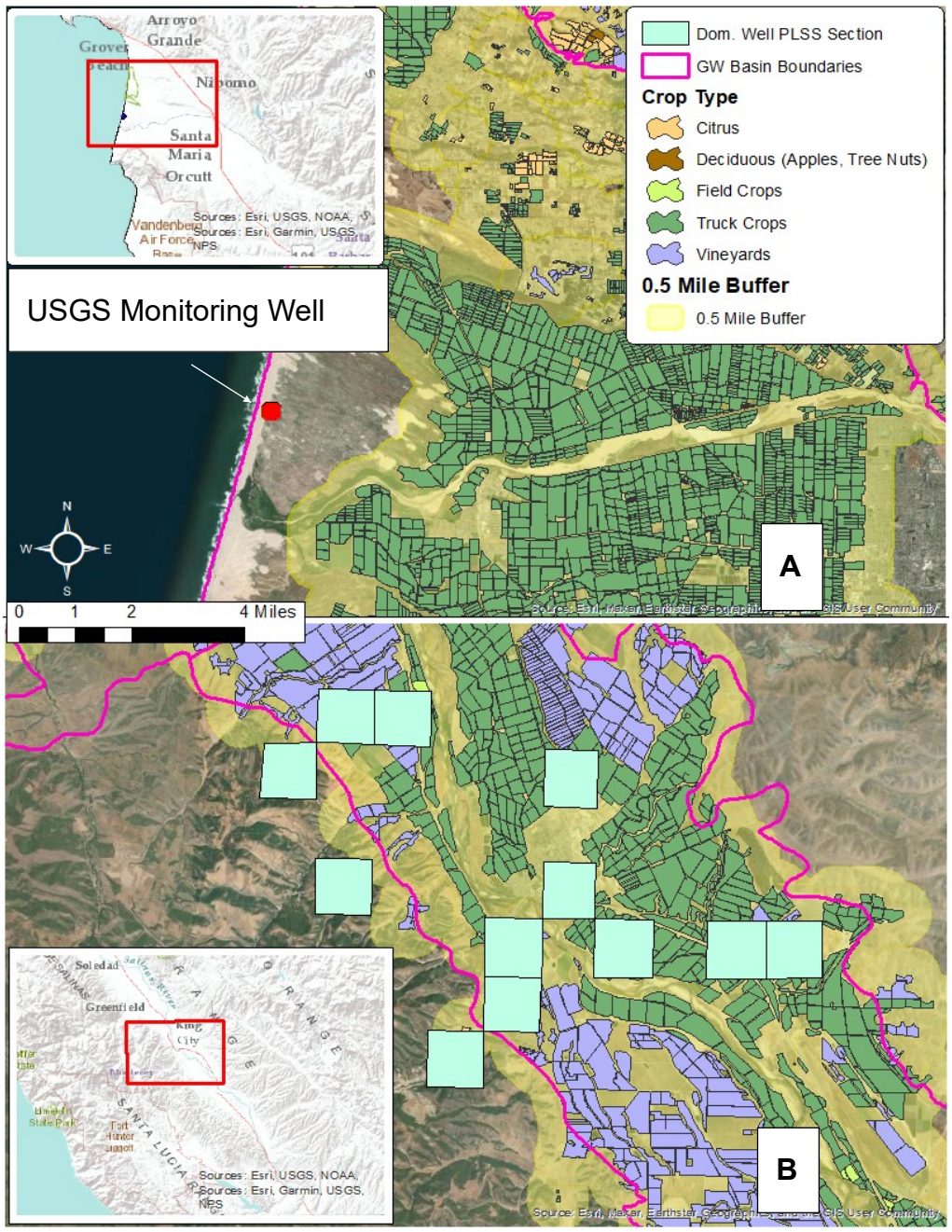

Figure 10. Map of the irrigated agricultural lands in the Santa Maria (map A) and Salinas Valleys (map B). A 0.5 mile impact extent (0.5 Mile Buffer) is appended to the agricultural parcel boundaries, shown by the yellow shading. The Salinas and Santa Maria River Valley groundwater basin boundaries are also shown. The Salinas Valley map also includes PLSS sections that contain domestic wells that are at-risk for nitrate pollution based on the results of the statewide Aquifer Risk Map.

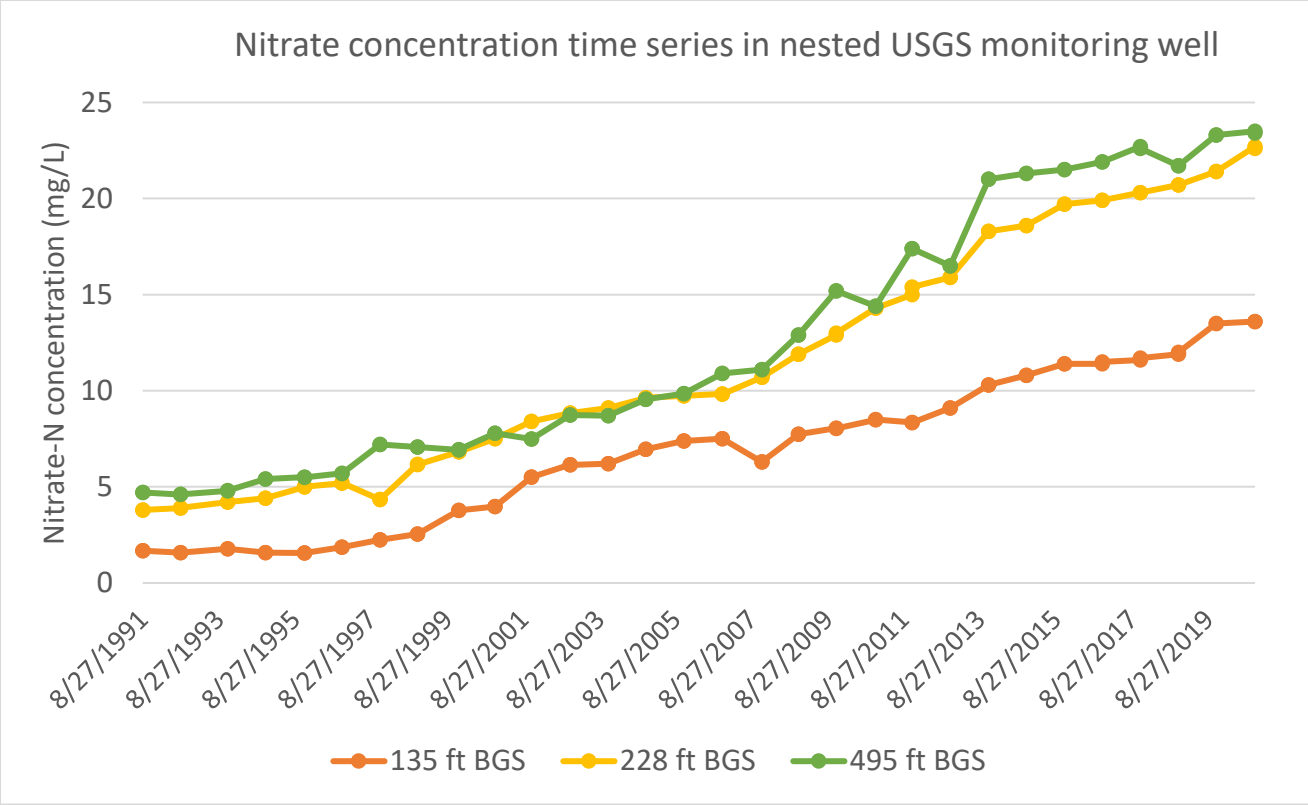

Figure 11. Nitrate concentrations measured at different depths in USGS nested monitoring well *USGS-3459211203816-02, -03,* and *-04*. The well location is shown by the red dot in Figure 10, Map A. Each line represents concentrations measured at a discrete screened intervals in the nested well. Ft denotes *feet* and BGS denotes *below ground surface*.