CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

MEETING OF NOVEMBER 12-13, 2014
BARSTOW, CALIFORNIA

ITEM:	**5**	
SUBJECT:	**OVERVIEW OF THE ANTELOPE VALLEY SALT AND NUTRIENT MANAGEMENT PLAN, ANTELOPE VALLEY INTEGRATED REGIONAL WATER MANAGEMENT GROUP**	
CHRONOLOGY:	October 12, 2011	Scope of Work to prepare Salt and Nutrient Management Plan (SNMP) accepted by Water Board
	July 17, 2013	Preliminary Draft SNMP submitted to Water Board staff for review
	September 6, 2013	Water Board staff provided input and recommendations on plan development
	May 14, 2014	Draft SNMP submitted to Water Board staff for review
	July 18, 2014	Water Board staff determined that the SNMP met the requirements of State Water Resources Control Board Resolution Number 2009-0011 (Recycled Water Policy) and that implementation of the SNMP would not require an amendment to the *Water Quality Control Plan for the Lahontan Region* (Basin Plan)
	August 21, 2014	Final copy of SNMP submitted to Water Board staff
ISSUE:	Representatives from Antelope Valley Integrated Regional Water Management (IRWM) Group will present an overview of the SNMP prepared for the Antelope Valley groundwater basin. The Water Board will have an opportunity to provide input on the findings of the SNMP and to discuss how the plan may be used to protect water quality in the Antelope Valley.	

DISCUSSION:

The SNMP was prepared primarily by staff from the Los Angeles County Waterworks District No. 40 and the Los Angeles County Sanitation Districts Nos. 14 and 20 with cooperation from the stakeholders of the Antelope Valley IRWM Group (collectively referred to herein as “the Group”). Staff commends the Group for taking the lead role in the development of the SNMP and their ongoing collaborative groundwater management efforts.

The SNMP establishes background water quality data for 9 of the 12 sub-basins in the Antelope Valley groundwater basin with respect to arsenic, boron, chloride, fluoride, nitrate as nitrogen, total chromium, and total dissolved solids (TDS). Water quality management goals were then selected for each of these constituents and represent the standard necessary to protect either Municipal and Domestic Supply (MUN) or Agricultural Supply (AGR) beneficial uses. With the exception of the constituent arsenic, the AGR water quality management goals are more restrictive than the MUN water quality management goals.

Assimilative capacity was calculated as the difference between the water quality management goal and the baseline water quality concentration for a given constituent. The SNMP documents that there are several sub-basins where baseline water quality already exceeds the water quality management goal and there is no assimilative capacity at this time for that constituent; however these exceedances are localized and attributed to naturally occurring conditions.

The model developed for the SNMP is a completely mixed model of the principal aquifer and is too coarse to drill down to the sub-basin level with the data currently available. The model does, however, provide broad conclusions regarding the effects of salt and nutrient loading on the overall quality of groundwater as averaged across the greater Antelope Valley basin. The model predicts that the average TDS concentrations in the greater Antelope Valley basin will not exceed the AGR water quality management goal of 450 milligrams per liter for at least 110 years. Therefore, it appears that there is ample time to plan for salt management measures before a critical situation arises. Arsenic, on the other hand, could potentially exceed the MUN water quality management goal of 10 micrograms per liter in as early as 47 years, but not within the 25-year planning period of the SNMP.

Arsenic and TDS were identified by the model as having a potential to significantly impact the basin and beneficial uses and are the only SNMP constituents expected to exceed a concentration greater than the background concentration plus 20% of the assimilative capacity during the 25-year planning period. Of the source waters evaluated, imported water (State Water Project water) has the highest contributing concentration of arsenic, and recycled water has the highest contributing concentration of TDS.

Because groundwater in the greater Antelope Valley Basin is generally of good quality and assimilative capacity is expected to generally be maintained for all constituents throughout the 25-year planning period, no changes to water quality objectives are proposed at this time. Therefore, a Basin Plan amendment is not warranted.

Water Board staff has solicited comments from the Group and interested parties regarding this agenda item.

RECOMMENDATION: The Water Board will be asked to accept the Antelope Valley SNMP with no amendment to the Basin Plan, and to direct the Executive Officer to send a letter accepting the plan to the IRWM Group. The Water Board may provide input on the findings of the SNMP as well as provide direction to staff and the public on how the plan may be used to protect water quality in the Antelope Valley basin.

ENCLOSURES

ENCLOSURE	ITEM	BATE NUMBER
1	Final Antelope Valley SNMP, electronic copy, including appendices, available online at http://www.ladpw.org/wwd/avirwmp/docs/saltplan/Salt%20and%20Nutrient%20Management%20Plan%20for%20Antelope%20Valley_May%202014.pdf	5-7
2	Staff Report titled "Salt and Nutrient Management Plan for the Antelope Valley Groundwater Basin and Update on the Status of Salt/Nutrient Planning in the Lahontan Region"	5-201

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ENCLOSURE 1

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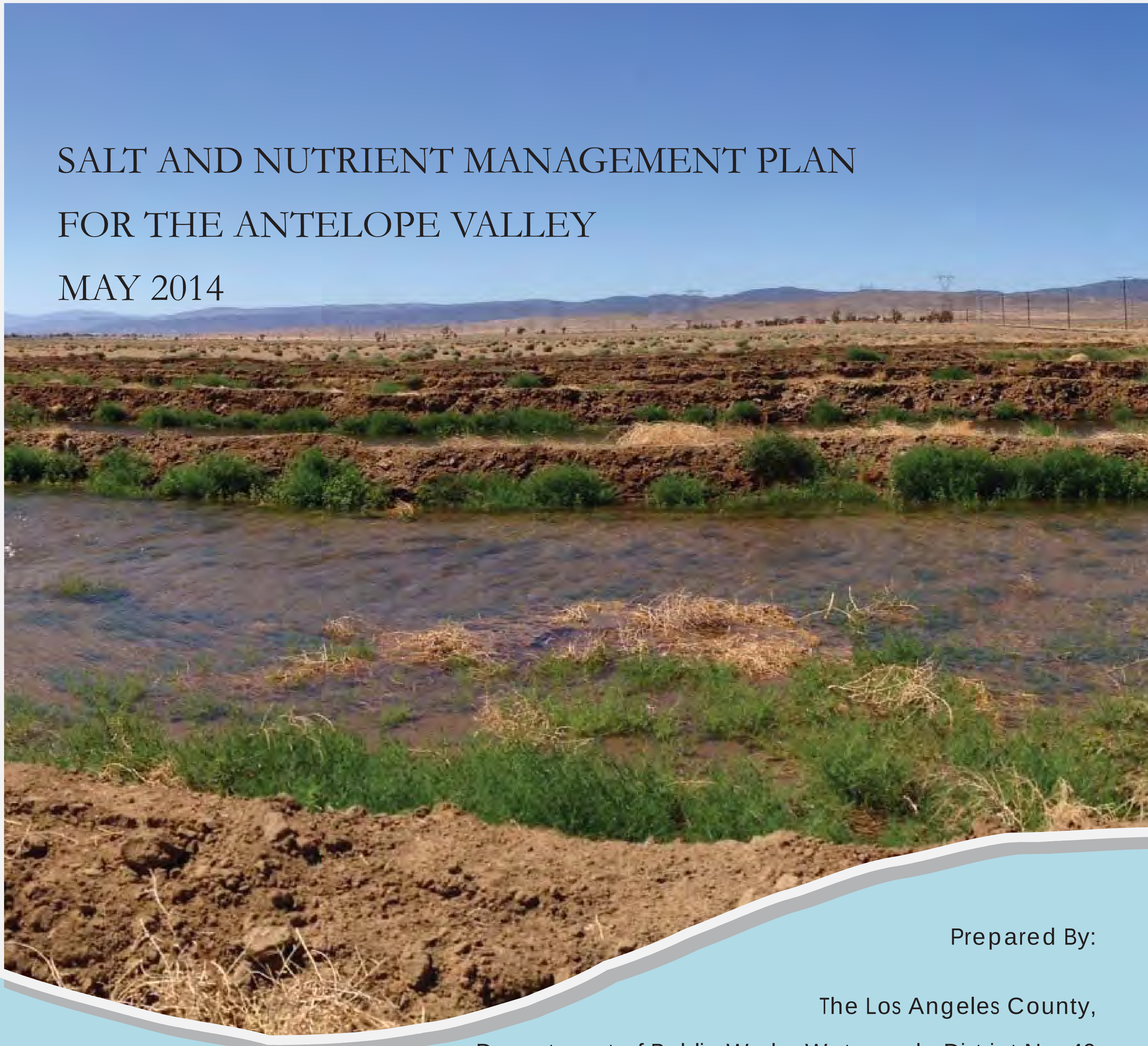
SALT AND NUTRIENT MANAGEMENT PLAN

FOR THE ANTELOPE VALLEY

MAY 2014



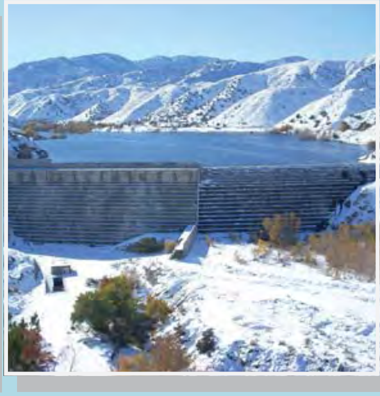
Prepared By:

The Los Angeles County,

Department of Public Works Waterworks District No. 40

The Los Angeles County, Sanitation Districts Nos. 14 and 20

Antelope Valley Salt and Nutrient Management Planning Stakeholders Group



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Executive Summary

Salt and Nutrient Management Plan Overview

In February 2009, the State Water Resources Control Board (State Board) established a statewide Recycled Water Policy to encourage and provide guidance for the use of recycled water in California. The Recycled Water Policy requires local water and wastewater entities, together with local salt and nutrient contributing stakeholders to develop a Salt and Nutrient Management Plan (SNMP) for each groundwater basin in California. Development of the SNMP is required to get recycled water projects approved and permitted by the Lahontan Regional Water Quality Control Board (Regional Board).

This SNMP was developed for the Antelope Valley (AV) Groundwater Basin through a collaborative effort to manage salts and nutrients (as well as other constituents) from all sources to ensure water quality objectives are met and sustained, and beneficial uses of the groundwater basin are protected.

Existing Groundwater Quality

The SNMP stakeholders, with the Lahontan Regional Board, selected total dissolved solids (TDS), chloride, nitrate, arsenic, boron, fluoride, and total chromium to characterize the water quality in the Antelope Valley Groundwater Basin. These constituents are either associated with recycled water use or detected at elevated levels in parts of the region. The average basin groundwater concentrations of these constituents, measured in samples collected between 2001 and 2010, were used to establish the baseline water quality for the groundwater basin.

Table ES-1 provides the baseline water quality and current assimilative capacity for each constituent in the groundwater basin. The water quality management goals for the Antelope Valley SNMP are based on protecting the Regional Board designated beneficial uses of the Antelope Valley groundwater basin, specifically Agricultural Supply (AGR) and Municipal and Domestic Supply (MUN). Assimilative capacity is the difference between the water quality management goal and the baseline water quality and refers to the capacity of the groundwater basin to receive salts and nutrients without exceeding beneficial use standards. Arsenic and TDS have 0.34 µg/L (3.4% of management goal) and 100 mg/L (22% of management goal), respectively, of assimilative capacity remaining. The other constituents have an assimilative capacity ranging from 56% to 89% of the water quality management goal.

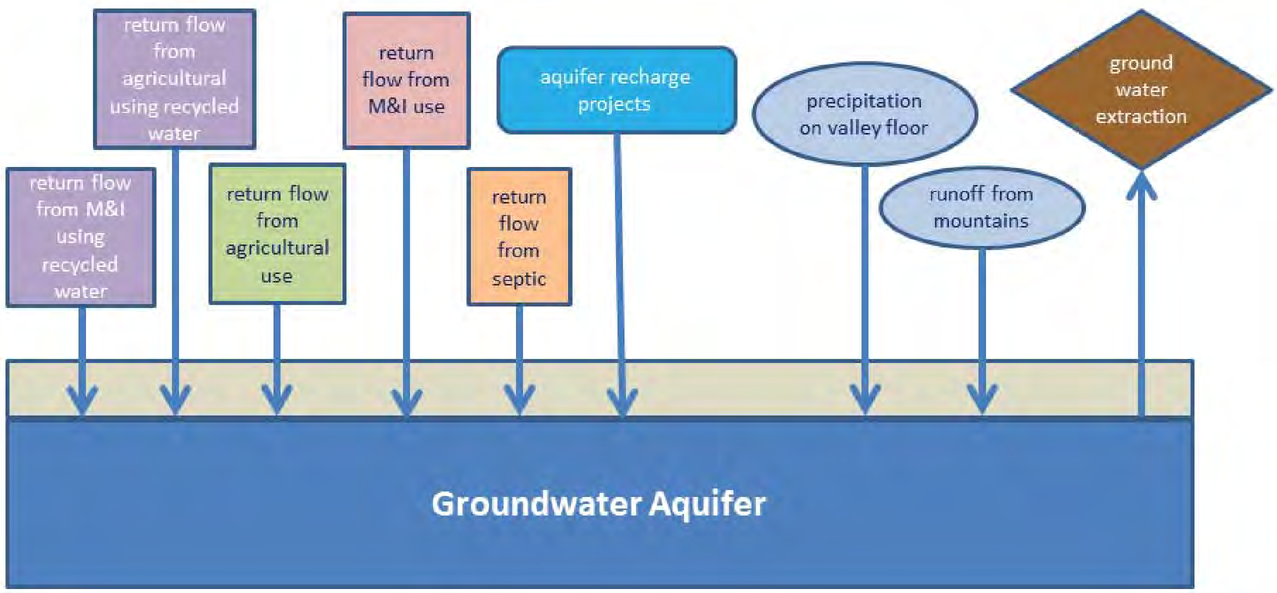
Table ES-1: Water Quality for Antelope Valley Groundwater Basin

	Arsenic (µg/L)	Boron (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate as N (mg/L)	Total Chromium (µg/L)	TDS (mg/L)
Goal	10	0.7	238	1	10	50	450
Baseline Water Quality	9.66	0.17	38.4	0.44	1.97	5.5	350
Assimilative Capacity	0.34	0.53	199.6	0.56	8.03	44.5	100

Future Groundwater Quality

Salt and nutrient loading from surface activities to the Antelope Valley Groundwater Basin are due to various sources, including agricultural irrigation, outdoor municipal and industrial water use, and on-site waste disposal systems. Natural recharge from precipitation and mountain runoff are also sources of salt and nutrient loading. The Antelope Valley is a closed basin and the only major groundwater outflow is groundwater pumping. Figure ES-1 depicts the direct loading and unloading of water, salts, and nutrients in and out of the groundwater basin.

Figure ES-1: Salt and Nutrient Balance



To better understand the significance of the various loading factors, a spreadsheet-based mixing model was developed. TDS and arsenic water qualities were incorporated into the model because of their potential to exceed SNMP water quality management goals. The mixing model calculated impacts of the identified projects that may contribute TDS and arsenic to the groundwater over the 25-year planning period (2011-2035) of the SNMP (see Table ES-2 and Figure ES-2). The model was used to predict future water quality and water quality trends.

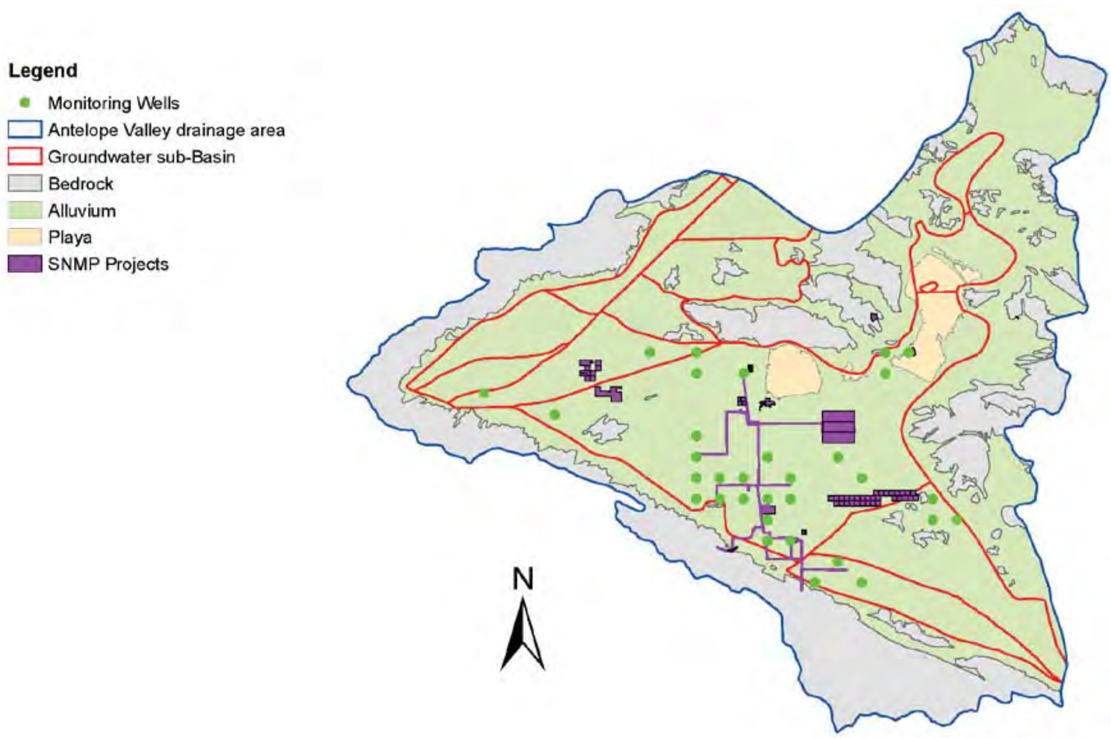
Six future scenarios were simulated:

- Scenario 1 (Base Case): Assumes no SNMP projects will be implemented.
- Scenario 2: Assumes all SNMP projects will be implemented.
- Scenario 3: Assumes only recycled water projects and none of the groundwater recharge projects will be implemented.
- Scenarios 4: Assumes all recycled water and half of the artificial groundwater recharge projects will be implemented.
- Scenario 5: Assumes all recycled water and a quarter of the artificial groundwater recharge projects will be implemented.
- Scenario 6 (Extreme Drought): Assumes no groundwater recharge projects will be implemented and annual natural recharge is decreased by 25% for planning period.

Table ES-2: Concentration Projections

Scenario	Concentration in 2035		Concentration by 2110		Years to Reach SNMP Water Quality Management Goal	
	TDS	arsenic	TDS	arsenic	TDS	arsenic
	mg/L	µg/L	mg/L	µg/L	450 / 500 mg/L	10 µg/L
1	364	9.78	404	10.13	184 / 276	72
2	371	9.79	438	10.19	113 / 170	64
3	366	9.78	416	10.14	151 / 227	70
4	369	9.79	427	10.17	129 / 194	66
5	368	9.79	422	10.15	139 / 209	69
6	368	9.84	422	10.38	139 / 208	47

Figure ES-2: SNMP Projects and Monitoring Locations



In scenario 2, the projected TDS increase is 21 mg/L by 2035 and will take 113 years to reach the TDS water quality management goals of 450 mg/L. In scenario 6, the projected arsenic increase is 0.18 µg/L and will take 47 years to reach the arsenic water quality management goal of 10 µg/L.

Considering the baseline groundwater quality and assimilative capacity, arsenic has the potential to exceed the water quality management goal before the other constituents. The arsenic load to the groundwater is largely naturally occurring. Arsenic levels are not expected to increase due to anthropogenic activities because municipal water supply wells, recycled water, treated State Water Project (SWP) water, and stormwater are not significant contributors of arsenic. Recycled water, treated SWP water, and stormwater have arsenic concentrations below detectable levels (less than 2 µg/L). The mixing model projects an increase in arsenic concentration, but actual loadings from these sources may be lower considering that overly conservative assumptions were used in the model.

Monitoring Plan

A monitoring plan is proposed to track the water quality in the basin. Results will be used to determine whether the concentrations of salt and nutrients over time are consistent with the SNMP predictions and the applicable SNMP water quality management goals. The monitoring program includes 32 municipal water supply wells that are currently monitored by the California Department of Public Health. The results from these existing monitoring programs will be downloaded from the State Board's Geotracker Groundwater Ambient Monitoring and Assessment (GAMA) database and included in the monitoring report prepared by the SNMP stakeholders or the appointed Antelope Valley Groundwater Basin Watermaster, if applicable. Imported, recycled, and treated potable water supply to the region will also be monitored and results included in the report. Updates to the SNMP model and relevant project list will be made to reevaluate water quality projections. The monitoring report will be prepared and submitted to the Lahontan Regional Board every three years. The monitoring locations are depicted in Figure ES-2.

Results of the monitoring will be used to determine whether future mitigation, or implementation measures, are necessary to maintain the SNMP water quality management goals. Monitoring report results that indicate the ambient groundwater quality exceeding 50% of the baseline assimilative capacity or significant increases may require additional modeling and/or evaluation to determine what mitigation action, if any, is necessary and appropriate.

Conclusion

The findings from the SNMP indicate that overall groundwater quality in the basin is stable and below the water quality management goals. On a sub-basin level, there are cases of water quality management goal exceedances, but the constituents are naturally occurring (i.e., arsenic, boron, fluoride, and TDS) and there are no current or projected projects identified in these areas. Analysis of future water quality (through 2035), with implementation of various recycled water and groundwater recharge projects, indicates good water quality and stable trends and that the basin groundwater will continue to be able to support the designated beneficial uses.

Section 1: Introduction

The Salt and Nutrient Management Plan (SNMP) for the Antelope Valley (AV) has been prepared in cooperation with the water and wastewater agencies, the cities of Lancaster and Palmdale, Edwards Air Force Base, private home owners, and other stakeholders in the Antelope Valley. It fulfills the State Water Resources Control Board (State Board) requirements of the Recycled Water Policy (SWRCB 2009) and its amendment (SWRCB 2013), which encourages every region in California to develop an SNMP to address long-term groundwater basin sustainability.

1.1 The Salt and Nutrient Management Plan

In February 2009, the State Board adopted the Recycled Water Policy to provide direction to the Regional Water Quality Control Boards, proponents of water use and recycled water projects, and the public regarding the appropriate criteria to be used by the State and Regional Boards in issuing permits for recycled water projects. The Recycled Water Policy includes State Board goals for statewide increases in the use of recycled water, which is considered a drought-proof, reliable, and sustainable water resource. The State Board addresses the concern for protecting the beneficial uses of groundwater basins by its intention for every groundwater basin in California to have a SNMP. The Recycled Water Policy expects salt and nutrient loading in groundwater basins/sub-basins to be addressed through the development of a management plan by the collaborative stakeholder process rather than imposing requirements on individual recycled water projects by the regional regulating agency.

In response to the adoption of the Recycled Water Policy, Los Angeles County Waterworks Districts and Sanitation Districts of Los Angeles County, with support of the Lahontan Regional Water Quality Control Board (Regional Board) staff, initiated efforts to organize a stakeholder group to develop a regional SNMP for the Antelope Valley. Stakeholders include, but are not limited to, water importers, purveyors, stormwater management agencies, wastewater agencies, the Regional Board, and other significant salt/nutrient contributors, in addition to the recycled water stakeholders. Stakeholder participation is described in Section 1.3. This SNMP is a result of stakeholder collaborations and meets the intentions of the Recycled Water Policy.

1.2 Purpose and Goals of the Salt and Nutrient Management Plan

The purpose of developing a regional SNMP for the Antelope Valley is to address the management of salts and nutrients (and possibly other constituents of concern) from various sources within the basin to maintain water quality objectives and support beneficial uses of the region’s groundwater. The intention is to involve all users of water in the Antelope Valley basin to participate in efforts to minimize the anthropogenic accumulation of salt and nutrients that would degrade the quality of water supplies in the Antelope Valley to the extent that it may limit their use.

Additionally, the SNMP is developed to satisfy the Recycled Water Policy, and thus allow for a streamlined process in getting recycled water projects approved and permitted by the Regional Board. The Antelope Valley is an arid region that requires careful management of its water supplies to meet the needs of its residents. Increasing recycled water use will allow for increased available potable water supplies for the people of the Antelope Valley.

One goal of the SNMP is to address salt and nutrient loading to the Antelope Valley groundwater basin region through the development of a management plan by the collaborative stakeholder process rather than the regional regulating agency imposing requirements on individual water projects. The AV SNMP has been prepared to be included as an appendix to the updated 2013 Antelope Valley Integrated Regional Water Management Plan[1] (AVIRWMP) and for acceptance by the Regional Board. The involvement of local agencies in developing an SNMP may lead to more cost-effective means of protecting and enhancing groundwater quality, quantity, and availability.

Another goal is to assess impacts with potential long-term basin-wide effects on groundwater quality that result from activities such as projects involving surface water, groundwater, imported water, and/or recycled water, as well as other salt/nutrient contributing activities, through regional groundwater monitoring. The design and implementation of a regional groundwater monitoring program shall involve the stakeholders.

The completion and implementation of the SNMP may lead to the potential for enhanced partnering opportunities and potential project funding between water and wastewater agencies, or other stakeholders, for developing and protecting water supplies.

1.3 Stakeholder Participation

The collaborative stakeholder process is an essential method to ensure that this SNMP reflects the needs of the Antelope Valley region, promotes the formation of partnerships, and encourages coordination with agencies. One of the benefits of this process is that it brings together a broad array of groups into a forum to discuss and better understand shared needs and opportunities.

Over twenty stakeholder meetings were held periodically, since August 2009, to raise awareness and engage stakeholders and other interested parties on salt and nutrient issues and management plan development efforts in the Antelope Valley region. The meetings were open to the public and were geared toward water, groundwater, and wastewater agency representatives, regulators, and community stakeholders. Neither a financial contribution nor agency status are required to be part of the collaborative SNMP development process. Copies of the meeting agendas, minutes, and presentations are available online and accessible via the AVIRWMP website[2].

The Antelope Valley SNMP development efforts were led by the Los Angeles County Waterworks District No. 40 (Waterworks) and the County Sanitation Districts Nos. 14 and 20 of Los Angeles County (Sanitation Districts). Both agencies are interested in increasing recycled water use in the region. For the most part, staff from these two agencies led the stakeholder meetings and prepared the meeting agendas, minutes, and presentations.

The stakeholders assisted in the development of the SNMP in addition to helping with data collection. Data compilation and analysis was conducted by staff from Waterworks and the Sanitation Districts and presented to stakeholders at the SNMP meetings. Stakeholders provided feedback, upon which revisions were made by the Waterworks and the Sanitation Districts staff. This SNMP document was prepared by Waterworks and Sanitation Districts staff. An initial draft was prepared in early 2013 and made available on the AVIRWMP website in July 2013. Stakeholder and Regional Board comments on the July 2013 draft SNMP are incorporated, as appropriate and applicable, into this Final SNMP.

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[1] The Antelope Valley IRWMP was updated in December 2013, prior to completion of the SNMP. A draft version of this plan is included in Appendix G of the 2013 IRWMP update.

[2] http://www.avwaterplan.org/

The following is a list of roles and responsibilities in developing the SNMP:

<u>Stakeholders:</u>

- Attend SNMP stakeholder meetings
- Review meeting materials and other documentation
- Provide comments and feedback
- If applicable, provide data or other information related to the SNMP

<u>Lead Agencies Staff (Waterworks and Sanitation Districts):</u>

- Lead SNMP stakeholder meetings
- Ensure that meetings were announced to a broad distribution list via e-mail and related meeting materials were made available on the AVIRMP website
- Prepare meeting agendas, minutes, and presentations
- Prepare Scope of Work for presentation to Regional Board
- Compile and analyze data
- Prepare SNMP document
- Address comments from stakeholders and Regional Board staff

<u>Regional Board Staff:</u>

- Attend SNMP stakeholder meetings
- Provide guidance on regulatory issues
- Ensure that regulatory compliance standards and goals are adequately addressed
- Review meeting materials and other documentation
- Provide comments and feedback
- Consider SNMP for acceptance

Members of the stakeholder group have included:

Association of Rural Town Councils (ARTC)
Antelope Acres Town Council
Antelope Valley Building Industry Association (BIA)
Antelope Valley Board of Trade
Antelope Valley Resource Conservation District
Antelope Valley United Water Purveyors/White Fence Farms Mutual Water Co.
Antelope Valley-East Kern Water Agency (AVEK)
Boron Community Services District
Bureau of Reclamation
California Department of Water Resources (DWR)
California Department of Public Health (CDPH)
California Water Services Company
City of California City
City of Lancaster
City of Palmdale
Edwards Air Force Base (EAFB)
GEI Consultants (on behalf of Rosamond Community Services District)
General public and residents of the Antelope Valley
Kennedy Jenks
Kern County Farm Bureau
Los Angeles County Farm Bureau
Los Angeles County Waterworks District No. 40 (Waterworks)
County Sanitation Districts Nos. 14 and 20 of Los Angeles County (Sanitation Districts)
California Regional Water Quality Control Board, Lahontan Region (Regional Board)

Lake Los Angeles Park Association
Lakes Town Council
Leona Valley Town Council
Littlerock Creek Irrigation District
National Water Research Institute (NWRI)
Palmdale Water District
Quartz Hill Water District
Rosamond Community Services District (RCSD)
RMC Water and Environment
Sundale Mutual Water Company
US Bureau of Reclamation (USBR)

1.4 Scope of Work

AV SNMP stakeholders and Regional Board staff developed a Scope of Work detailing tasks to be completed in developing a SNMP for the Antelope Valley (see Appendix A). The Scope of Work was developed using elements described in the State Board's "SNMP Suggested Elements"[3] and Recycled Water Policy.

The Regional Board distributed the draft Scope of Work for public comment on August 29, 2011 and no comments were received. Regional Board staff and stakeholder representatives updated Members of the Regional Board on the Antelope Valley SNMP development efforts at the October 2011 Regional Board meeting. Regional Board Members provided positive feedback on the proposed Scope of Work, finding it acceptable, and praised the SNMP development process. As a result, the Regional Board issued an acceptance letter (see Appendix B) for the Scope of Work, which the stakeholders then finalized in the January 24, 2012 stakeholder meeting.

1.5 SNMP Definitions

The following definitions were accepted by the AV SNMP stakeholder group.

Salts: The dissolved ions in water. Salts are observed by measuring total dissolved solids (TDS).

Nutrients: Constituents in the environment that an organism needs to live and grow. While nutrients may include a variety of substances, nitrate specifically was considered in the SNMP because it may be detected at significant levels in groundwater. Substances such as potassium, phosphorous or ammonia are not found at concerning levels, or often times are not even detected, in the Antelope Valley groundwater. This plan expresses nitrate concentration in units of milligrams per liter as nitrogen (mg/L as N).

Constituents of Emerging Concern (CECs): A class of unregulated substances, such as pharmaceuticals and personal care products (PPCPs) and perfluorinated compounds (PFCs), that previously had not been detected or are being detected at levels that may be significantly different than expected. A "blue ribbon" science advisory panel, convened by the State Board, prepared a report titled, "Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water", which presented recommendations for monitoring CECs in municipal recycled water used for groundwater recharge. Future monitoring of CECs will be incorporated, as applicable, under the direction of the State Board.

[3] http://www.swrcb.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/SNMP_Elements.pdf

SNMP Water Quality Management Goal: Goal(s) set at a level for a particular constituent in groundwater for the purposes of this plan. The water quality management goal take into consideration the water quality objectives established by the Regional Board for the reasonable protection of the area's beneficial use(s) of water.

Baseline Conditions: Average concentration of a particular constituent measured in the water (e.g., surface or groundwater) from 2001 to 2010. This is also referred to as the historical condition.

Current Ambient Conditions: Average concentration of a particular constituent measured in the water (e.g., surface or groundwater) for the most recent 5-year averaging period.

Assimilative Capacity: Difference between the SNMP water quality management goal and the ambient condition of a particular constituent is the amount of assimilative capacity available for a particular basin, sub-basin, or sub-area. If the ambient water quality is the same or poorer than the water quality goal, then assimilative capacity does not exist. If the ambient condition is better than the water quality goal, then assimilative capacity exists.

The assimilative capacity is a moving figure, as water quality may change over time. The baseline assimilative capacity (see Section 4) is the difference between the SNMP water quality management goal and an established baseline condition, whereas the current assimilative capacity is based on the current condition.

Assimilative Capacity = (SNMP Water Quality Management Goal) – (current or baseline ambient condition)

Antidegradation: Defined by the State Board's Antidegradation Policy (SWRCB 1968), which is aimed at maintaining high quality waters to the maximum extent possible. The Antidegradation Policy requires the quality of California's waters be maintained until it has been demonstrated to the State that any change will be consistent with the maximum benefit to the people of the State, will not unreasonably affect present and potential beneficial uses and will not result in water quality lower than applicable standards.

Future Planning Period: A 25-year planning period (2011-2035) was used to simulate current and future basin activities and their impacts to the Antelope Valley Basin. The planning period is consistent with the future planning period in the AVIRWMP. The Recycled Water Policy requires at least a ten year planning period be used.

Per Regional Board suggestion, the following definitions are included:

Pollution: Defined in the California Water Code, section 13050(l) to mean that beneficial uses of water are unreasonably affected.

Degradation: Condition in which the natural water quality is adversely altered, but still satisfies water quality objectives to support beneficial uses.

1.6 List of Acronyms:

AF	Acre-Feet
AFY	Acre-Feet per Year
AV	Antelope Valley
AVEK	Antelope Valley East Kern Water Agency
AVIRWMP	Antelope Valley Integrated Regional Water Management Plan
CDPH	California Department of Public Health
CECs	Constituents of Emerging Concern
DPR	Department of Pesticide Regulation
DWR	Department of Water Resources
EAFB	Edwards Air Force Base
EIR	Environmental Impact Report
GAMA	Groundwater Ambient Monitoring & Assessment
LACSD	Los Angeles County Sanitation Districts
LACWD	Los Angeles County Waterworks Districts
LADWP	Los Angeles Department of Water and Power
LCID	Littlerock Creek Irrigation District
LLNL	Lawrence Livermore National Laboratory
MCL	Maximum Contaminant Level
µg/L	Micrograms per Liter
mg/L	Milligrams per Liter
mg/L as N	Milligrams per Liter as Nitrogen
MG	Million Gallons
MGD	Million Gallons per Day
M&I	Municipal and Industrial
MWC	Mutual Water Company
ND	Non-Detect
NL	Notification Level
NWIS	National Water Information System
PRID	Palm Ranch Irrigation District
PWD	Palmdale Water District
QHWD	Quartz Hill Water District
RCSD	Rosamond Community Services District
SMCL	Secondary Maximum Contaminant Level
SNMP	Salt and Nutrient Management Plan
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WRP	Water Reclamation Plant
WVCWD	West Valley County Water District

Section 2: Characterization of the Basin

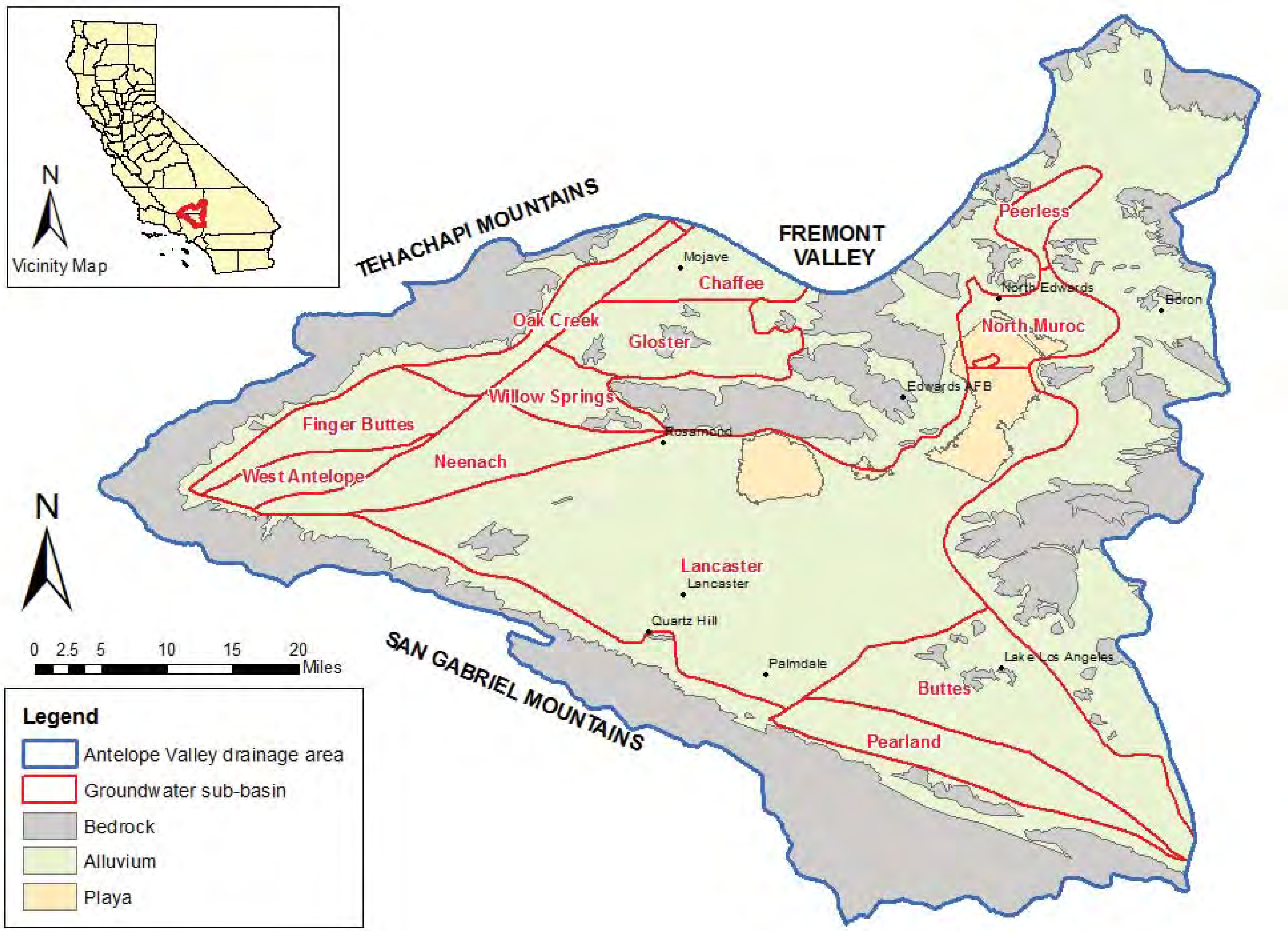
2.1 Antelope Valley Groundwater Basin

The Antelope Valley Region is located in the southwestern part of the Mojave Desert in Southern California and is approximately 40 miles north of the center of the City of Los Angeles. The Antelope Valley Groundwater Basin is bordered on the southwest by the San Gabriel Mountains, on the northwest by the Tehachapi Mountains, and on the east by a series of hills and buttes that generally follow the Los Angeles/San Bernardino County line. The basin boundaries are based on reports by the United States Geological Survey (USGS 1987) and the California Department of Water Resources (DWR 2004).

The groundwater basin is divided into twelve subbasins: Finger Buttes, West Antelope, Neenach, Willow Springs, Gloster, Chaffee, Oak Creek, Pearland, Buttes, Lancaster, North Muroc and Peerless (see Figure 2-1). Subbasin boundaries are based on faults, consolidated rocks, groundwater divides, and, in some cases, arbitrary boundaries (USGS 1998). General descriptions of the sub-basins are as follows (USGS 1987):

- *Finger Buttes:* A large part of the subbasin is range or forest land. Water use is mainly agricultural. Recharge comes from the surrounding Tehachapi Mountains. Groundwater moves generally from the northwest to the southeast into the Neenach subbasin. Depth to water varies, but is commonly more than 300 feet.
- *West Antelope:* Water use in this area is for agricultural purposes. Groundwater flows southeasterly into the Neenach subbasin. Depth to water ranges from 250 to 300 feet.
- *Neenach:* Water use is for agricultural purposes. Groundwater flows mainly eastward into the Lancaster subbasin. Depth to water ranges from 150 to 350 feet.
- *Willow Springs:* Water use is made up of agricultural and urban land uses. Recharge comes from intermittent streams of the surrounding mountain areas. Groundwater flows southeast and ultimately enters the Lancaster subbasin, although this flow is considered negligible (USGS 2003). Depth to water ranges from 100 to 300 feet.
- *Gloster:* Water use is confined to urban and mining (quarry pits) activity. Groundwater flows mainly to the southeast and east into the Chaffee subbasin. Depth to water for the southeast area of the subbasin ranges from 50 to 100 feet; other water level data is sparse.
- *Chaffee:* Water use in this area is mainly for the town of Mojave. Groundwater moves into the Chaffee subbasin from Cache Creek, adjacent alluvial fans to the west and, in lesser amounts, from the Gloster subbasin. Groundwater moves eastward in the western part and northward in the southern part of the subbasin, generally toward the town of Mojave. Any outflow would move north to the Koehn Lake area. Depth to water ranges from 50 to 300 feet.
- *Oak Creek:* Water use in the area is nominal except for the mining activity in the central part of the subbasin. Recharge comes from the Tehachapi Mountains. Groundwater flow is generally southeastward, with some outflow moving northeasterly to the Koehn Lake area. Water depth data is not available.

Figure 2-1: Groundwater Sub-Basin Boundary Map



5-23

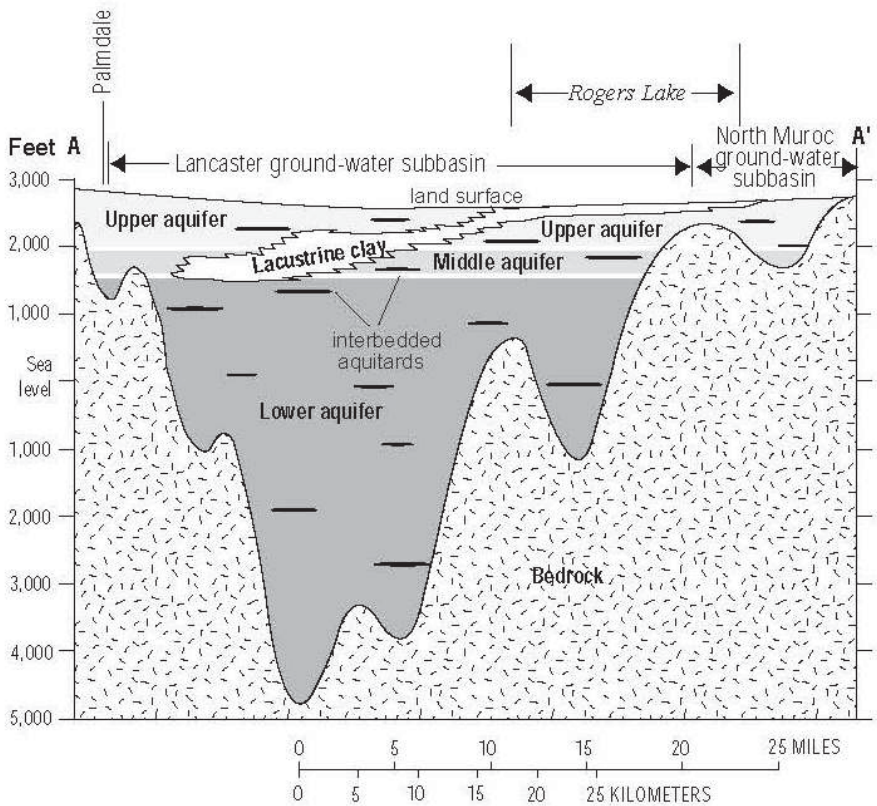
- *Pearland:* Water use is attributed to urban and irrigation activity. Substantial recharge occurs to the Pearland and Buttes subbasins from Little Rock and Big Rock Creeks. Groundwater generally flows from the southeast to the northwest, with outflows to the Lancaster subbasin. Depth to water ranges from 100 to 250 feet.
- *Buttes:* Water use includes urban and agricultural. Imported California State Water Project water became available for irrigation to the subbasin in 1972. Groundwater generally flows from the southeast to the northwest into the Lancaster subbasin. Depth to water ranges from 50 to 250 feet.
- *Lancaster:* This subbasin is the largest in both water use and size, and the most economically significant in terms of population and agriculture. Water is used for agricultural, urban and industrial applications. Groundwater flows to several pumping depressions and partially towards Rosamond and Rogers dry lakes. Due to agricultural, urban and industrial water use, depth to water varies widely, but in general is greatest in the south and west. The area includes Lancaster, Palmdale, Quartz Hill, Rosamond, Antelope Acres and other smaller communities.
- *North Muroc:* Water use is for urban and military purposes. Sewage disposal ponds are within and near this subbasin. These disposal ponds are of much less concern than similar ponds in the Antelope Valley because the soil structure allows for little percolation. The suggested monitoring networks were designed for this consideration. Groundwater flows north and west to a pumping depression located near North Edwards. North of this depression, the direction of flow is generally north into the Fremont Groundwater Basin and possibly into the Peerless subbasin.
- *Peerless:* Water is used for agricultural and municipal purposes. The general movement of groundwater is toward a pumping depression in the center of the subbasin. Little information is available on this subbasin.

The Antelope Valley Basin is comprised of three primary aquifers: (1) the upper, (2) the middle and (3) the lower aquifer. The upper aquifer varies from unconfined, in the south part of the Lancaster sub-basin from Palmdale to Littlerock Wash, to confined, north of Littlerock Wash, depending on the presence and vertical position of the thick lacustrine deposits. The upper aquifer yields most of the current groundwater supplies, and therefore is the primary focus of this SNMP. Due to the overlying lacustrine deposits and interbedded aquitards, the middle aquifer is assumed to be confined. The deep aquifer is generally considered to be confined by the overlying lacustrine deposits and discontinuous interbedded aquitards (USGS 2003). A schematic geologic cross-section of the Antelope Valley is depicted in Figure 2-2.

In general, groundwater in the Antelope Valley Basin flows northeasterly from the mountain ranges to the dry lakes. The basin is principally recharged by infiltration of precipitation and runoff from the surrounding mountains and hills in ephemeral stream channels. However, precipitation over the valley floor is generally less than 10 inches per year and evapotranspiration rates, along with soil moisture requirements, are high; therefore, recharge from direct infiltration of precipitation below the root zone is deemed negligible (Snyder 1955; Durbin 1978; USGS 2003). Other sources of recharge to the basin include artificial recharge and return flows from agricultural and urban irrigation. Depending on the thickness and characteristics of the unsaturated zone of the aquifer below a particular site, these sources may or may not contribute to recharge of the groundwater.

Figure 2-2: General Geologic Cross-Section of the Antelope Valley Basin

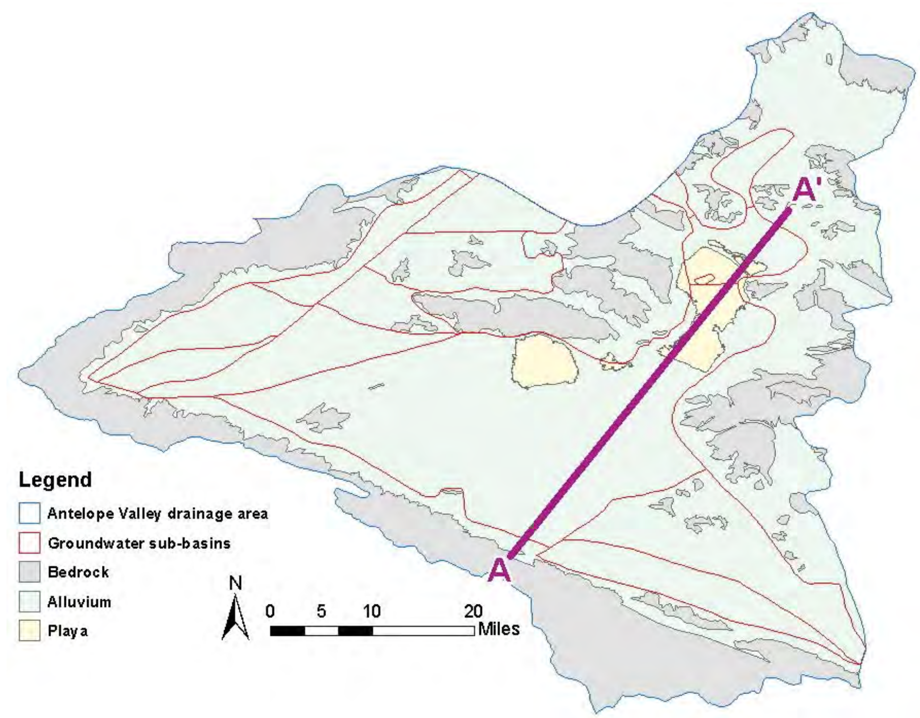
(a) Cross Section



Legend

- Bedrock
- Lacustrine clay deposits
- Continental deposits
- Older alluvium
- Younger alluvium

(b) Line of Cross-Section



Groundwater has been, and continues to be, an important resource within the Antelope Valley Region. Prior to 1972, groundwater provided more than 90 percent of the total water supply in the region; since 1972, it has provided between 50 and 90 percent (USGS 2003). Groundwater pumping in the region peaked in the 1950s and decreased in the 1960s and 1970s when agricultural pumping declined due to increased pumping costs from greater pumping lifts and higher electric power costs (USGS 2000a). The rapid increase in urban growth in the 1980s resulted in an increase in the demand for water for municipal and industrial (M&I) uses and an increase in groundwater use. Projected urban growth and limits on the available local and imported water supply are likely to continue to increase the reliance on groundwater.

The basin has historically shown large fluctuations in groundwater levels. Data from 1975 to 1998 show that groundwater level changes over this period ranged from an increase of 84 feet to a decrease of 66 feet (Carlson and Phillips 1998 as cited in DWR 2004). In general, data collected by the USGS (2003) indicate that groundwater levels appear to be falling in the southern and eastern areas and rising in the rural western and far northeastern areas of the region. This pattern of falling and rising groundwater levels correlates directly to changes in land use over the past 40 to 50 years. Falling groundwater levels are generally associated with areas that are developed and rising groundwater levels are generally associated with areas that were historically farmed but have been largely fallowed during the last 40 years. However, recent increases in agricultural production, primarily carrots, in the northeastern and western portions of the region may have reduced rising groundwater trends in these areas (LACSD 2005).

According to the USGS (2003), groundwater extractions have exceeded the estimated natural recharge of the basin since the 1920s. This overdraft has caused water levels to decline by more than 200 feet in some areas and by at least 100 feet in most of the region (USGS 2003). Extractions in excess of the groundwater recharge can cause groundwater levels to drop and associated environmental damage (e.g., land subsidence).

Annual groundwater extractions are reported to have increased from about 29,000 AF in 1919 to about 400,000 AF in the 1950's, when groundwater use in the Antelope Valley Region was at its highest (USGS 1995). Use of California State Water Project (SWP) water, which is imported from Northern California, has since stabilized groundwater levels in some areas of the Antelope Valley Region. In recent years, groundwater pumping has resulted in subsidence and earth fissures in the Lancaster and Edwards AFB areas, which has permanently reduced storage by 50,000 AF (DWR 2004).

Although the groundwater basin is not currently adjudicated, the adjudication process is underway. There are no existing restrictions on groundwater pumping. However, pumping may be altered or reduced as part of the adjudication process. The adjudication aims to provide clarity for the groundwater users regarding management of groundwater resources.

2.2 SNMP Area Boundaries

Figure 2-1 depicts the groundwater basin and sub-basin boundaries for the SNMP. The planning area of the SNMP is the same as that of the AVIRWMP, which was defined as the drainage area because of its use in several studies and inclusion of key agencies dealing with similar water management issues. Each sub-basin in the Antelope Valley Basin has been addressed in some manner with information and data provided in this SNMP. . Further detail and analyses for any of the sub-basins may be provided in the future, contingent on the availability of sufficient data for analysis and the presence of projects that have the potential to impact salt/nutrient concentrations in the basin.

2.3 Surface Water

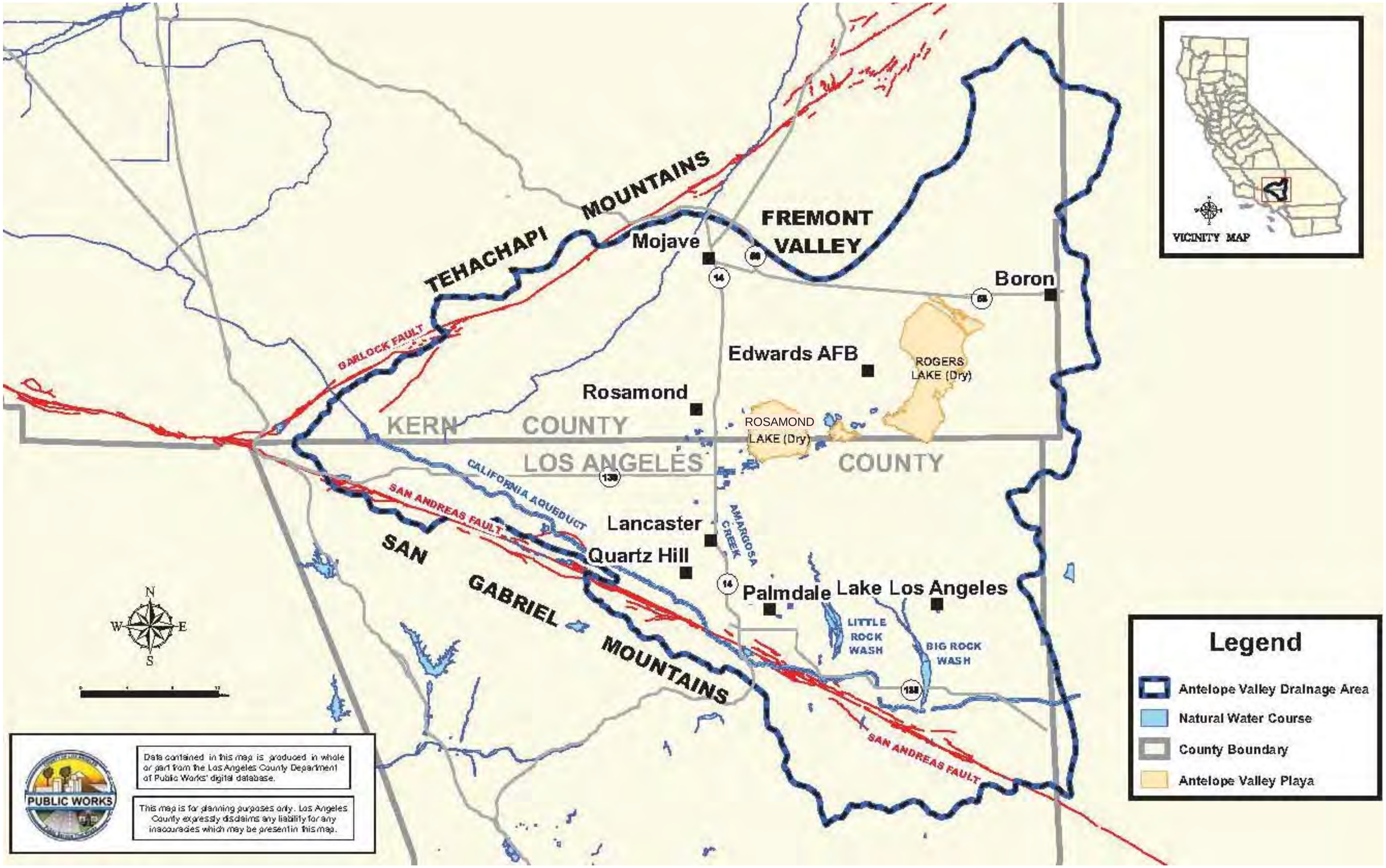
Comprising the southwestern portion of the Mojave Desert, the Antelope Valley ranges in surface elevation from approximately 2,300 feet to 3,500 feet above sea level. The Antelope Valley is a closed basin with no outlet to the ocean. Water that enters the Valley either infiltrates into the groundwater basin, evaporates, or flows toward the three dry lakes on Edwards Air Force Base—Rosamond Lake, Buckhorn Lake, and Rogers Lake. In general, water flows northeasterly from the mountain ranges to the dry lakes.

Surface water from the surrounding hills and from the Antelope Valley floor flows primarily toward the three dry lakes. Except during the largest rainfall events of a season, surface water flows toward the Antelope Valley from the surrounding mountains, quickly percolates into the stream beds, and recharges the groundwater basin. Due to the relatively impervious nature of the dry lake soil and high evaporation rates, water that collects on the dry lakes eventually evaporates rather than infiltrating into the groundwater (LACSD 2005). It appears that little percolation occurs in the Antelope Valley other than near the base of the surrounding mountains due to low permeability soils overlying the groundwater basin.

Surface water flows are carried by ephemeral streams. The most hydrologically significant streams begin in the San Gabriel Mountains on the southwestern edge of the Antelope Valley and include Big Rock Creek, Littlerock Creek and Amargosa Creek. Oak Creek begins in the Tehachapi Mountains. The hydrologic features are shown on Figure 2-3.

Littlerock Creek is the only developed surface water supply in the Antelope Valley. The Littlerock Reservoir collects runoff from the San Gabriel Mountains and is jointly owned by Palmdale Water District (PWD) and Littlerock Creek Irrigation District (LCID). Historically, water stored in the Littlerock Reservoir has been used directly for agricultural uses within LCID's service area and for M&I uses within PWD's service area following treatment at PWD's water purification plant.

Figure 2-3: Antelope Valley Hydrologic Features



Source: 2007 Antelope Valley Integrated Regional Water Management Plan

2.4 Water Resources

Two major sources contributing to the Antelope Valley Region water supply are imported water via the SWP (or California Aqueduct) and natural recharge (precipitation). These sources may eventually become another water source for the region, such as infiltrated groundwater (including return flows from water use activities), recycled water from wastewater treatment, and surface water flow from precipitation, run-off, and subsurface flow.

Potable water supply in the Antelope Valley comes from three primary sources. Historically, the main water source in the region has been groundwater from well extraction (i.e., pumping). However, the groundwater in the Antelope Valley is not currently managed and is susceptible to overdraft, which could cause land subsidence and thereby decrease the region's groundwater storage capacity. Most Antelope Valley residents are familiar with the SWP, a surface water source beginning in Northern California at Oroville Reservoir with water flowing into the Sacramento River Delta and pumped south to serve, amongst others, the urban and agricultural centers in Southern California. Water from the SWP may be used directly for agricultural use or treated at one of the region's water treatment plants for potable supply. The availability of SWP supply is known to be variable and fluctuates from year to year depending on precipitation, regulatory and legislative restrictions, and operational conditions, and is particularly unreliable during dry years. The third source of potable water is surface water supplied by Littlerock Reservoir, which is fed by natural run-off from snow packs in the local San Gabriel Mountains and from precipitation. Further stress to the Antelope Valley's water supply management is due to recent lower than average precipitation levels and mountain snowpack.

Recycled water is a supplemental source of water used for non-potable applications such as landscape and agricultural irrigation, construction activities, and commercial and industrial processes. Recycled water can also be used for indirect potable uses through groundwater replenishment. Recycled water is assumed to be 100 percent reliable and practically drought-resistant since it is derived from consistent water use. Maximizing recycled water use helps increase the region's water reliability by augmenting local supplies and reducing dependence on imported surface water, which has varying and recently decreasing reliability. By 2035, the Los Angeles County Sanitation District's (LACSD) Lancaster and Palmdale Water Reclamation Plants are projected to produce 36,000 acre-feet per year of tertiary treated water. The regional goal is to fully utilize the recycled water for beneficial uses.

Development demands on water supply, coupled with the potential curtailments of SWP deliveries due to environmental constraints and prolonged drought periods, have intensified the competition for available water resources. Consequently, the Antelope Valley Integrated Regional Water Management Plan (AVIRWMP) was developed by stakeholders as a strategy to sustainably manage water resources and address the needs of the M&I purveyors to reliably provide the quantity and quality of water necessary to serve the expanding Antelope Valley Region, while concurrently addressing the need of agricultural users and small pumpers to have adequate supplies of reasonably-priced water.

2.5 Geology and Soils

The Antelope Valley represents a large topographic and groundwater basin in the western part of the Mojave Desert in southern California. It is a prime example of a single, undrained, closed basin. The Antelope Valley Region occupies part of a structural depression that has been downfaulted between the Garlock, Cottonwood-Rosamond, and San Andreas Fault Zones. The Antelope Valley Region is bounded on the southwest by the San Andreas Fault and San Gabriel Mountains, the Garlock Fault and Tehachapi Mountains to the northwest, and San Bernardino County to the east. Consolidated rocks that yield virtually no water underlie the basin and crop out in the highlands that surround the basin. They consist of igneous and metamorphic rocks of pre-Tertiary age that are overlain by indurated continental rocks of Tertiary age interbedded with lava flows (USGS 1995).

Alluvium and interbedded lacustrine deposits of Quaternary age are the important aquifers within the closed basin and have accumulated to a thickness of as much as 1,600 feet. The alluvium is unconsolidated to moderately consolidated, poorly sorted gravel, sand, silt, and clay. Older units of the alluvium are somewhat coarser grained, and are more compact and consolidated, weathered, and poorly sorted than the younger units. The rate at which water moves through the alluvium, also known as the hydraulic conductivity of the alluvium, decreases with increasing depth. Groundwater sub-basins are often divided by faulted bedrock that influences groundwater flow between the basins.

During the depositional history of the Antelope Valley, a large intermittent lake occupied the central part of the basin and was the site of accumulation of fine-grained material. The rates of deposition varied with the rates of precipitation. During periods of relatively heavy precipitation, massive beds of blue clay formed in a deep perennial lake. During periods of light precipitation, thin beds of clay and evaporative salt deposits formed in playas or in shallow intermittent lakes. Individual beds of the massive blue clay can be as much as 100 feet thick and are interbedded with lenses of coarser material as much as 20 feet thick. The clay yields virtually no water to wells, but the interbedded, coarser material can yield considerable volumes of water.

Soils within the area are derived from downslope migration of loess and alluvial materials, mainly from granitic rock sources originating along the eastern slopes of the Tehachapi and San Gabriel Mountains. Figure 2-4 depicts a soil map of the Antelope Valley Region.

2.6 Land Use

Figure 2-5 depicts the major existing land use categories within the Antelope Valley Region that are characterized and grouped together according to broad water use sectors. The map was created with City of Lancaster, City of Palmdale, Los Angeles County, and Kern County Geographic Information System (GIS) parcel level data. Table 2-1 depicts the colors used to indicate each land use category. Each major land use category is identified below, including the types of "like water uses" assigned to each category. Additional descriptions for the land use categories provided by the agencies are detailed in Appendix C.

- *Residential:* Residential uses include a mix of housing developed at varying densities and types. Residential uses in the Antelope Valley Region include single-family, multiple-family, condominium, mobile home, low density "ranchettes," and senior housing.
- *Commercial/Office:* This category includes commercial uses that offer goods for sale to the public (retail) and service and professional businesses housed in offices (doctors, accountants, architects, etc.). Retail and commercial businesses include those that serve local needs, such as restaurants, neighborhood markets and dry cleaners, and those that serve community or regional needs, such as entertainment complexes, auto dealers, and furniture stores. Also included in this category are government offices that have similar water duty requirements as a typical commercial/office use.

- *Industrial:* The industrial category includes heavy manufacturing and light industrial uses found in business, research, and development parks. Light industrial activities include some types of assembly work, utility infrastructure and work yards, wholesaling, and warehousing.
- *Public and Semi-Public Facilities:* Libraries, schools, and other public institutions are found in this category. Uses in this category support the civic, cultural, and educational needs of residents.
- *Resources:* This category encompasses land used for private and public recreational open spaces, and local and regional parks. Recreational use areas also include golf courses, cemeteries, water bodies and water storage. Also included in this category are mineral extraction sites.
- *Agriculture:* Agricultural lands are those in current crop, orchard or greenhouse production, as well as any fallow lands that continue to be maintained in agricultural designations or participating in tax incentive agricultural programs.
- *Vacant:* Vacant lands are undeveloped lands that are not preserved in perpetuity as open space or for other public purposes.

Figure 2-4: Antelope Valley Soils

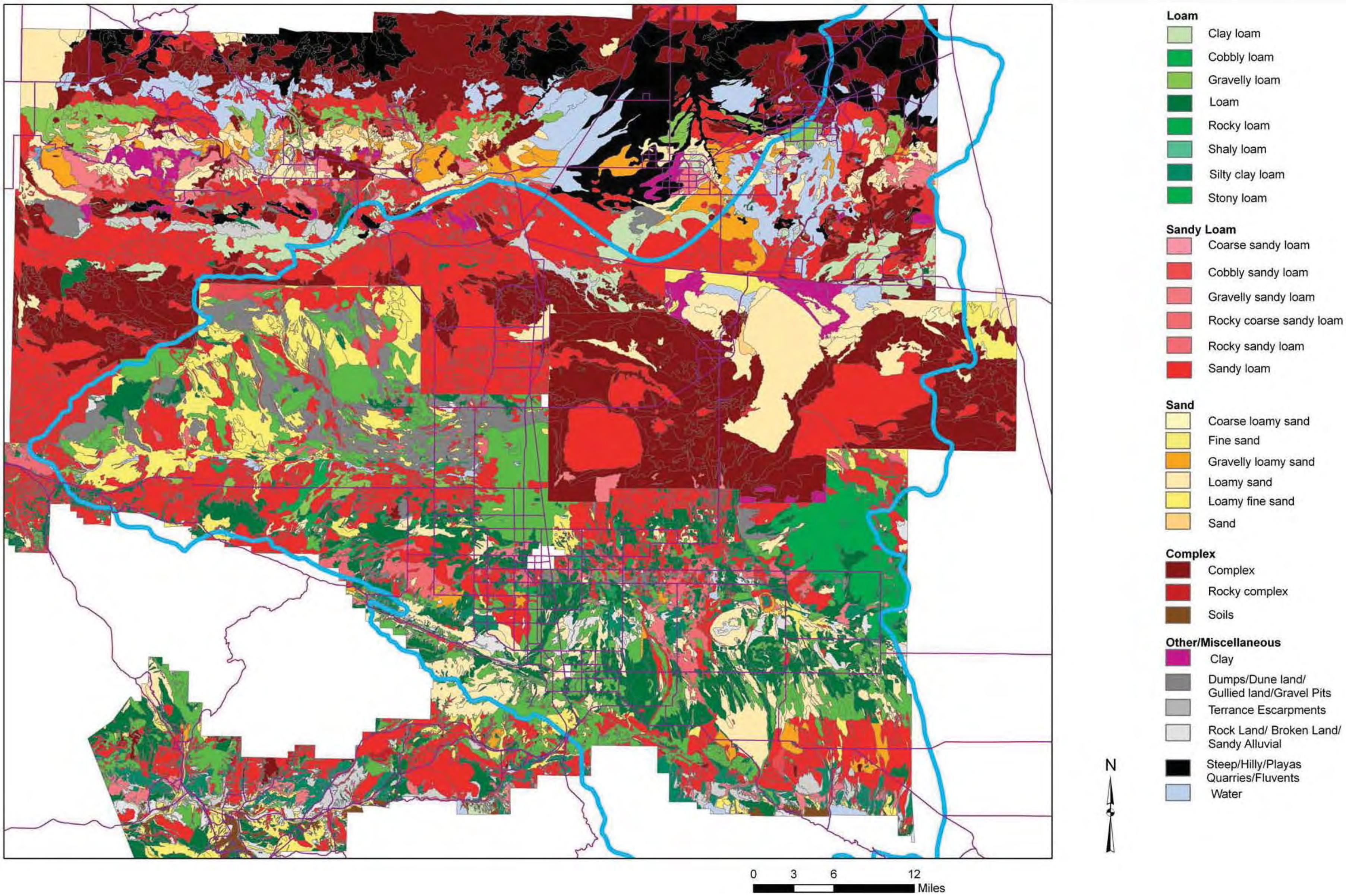
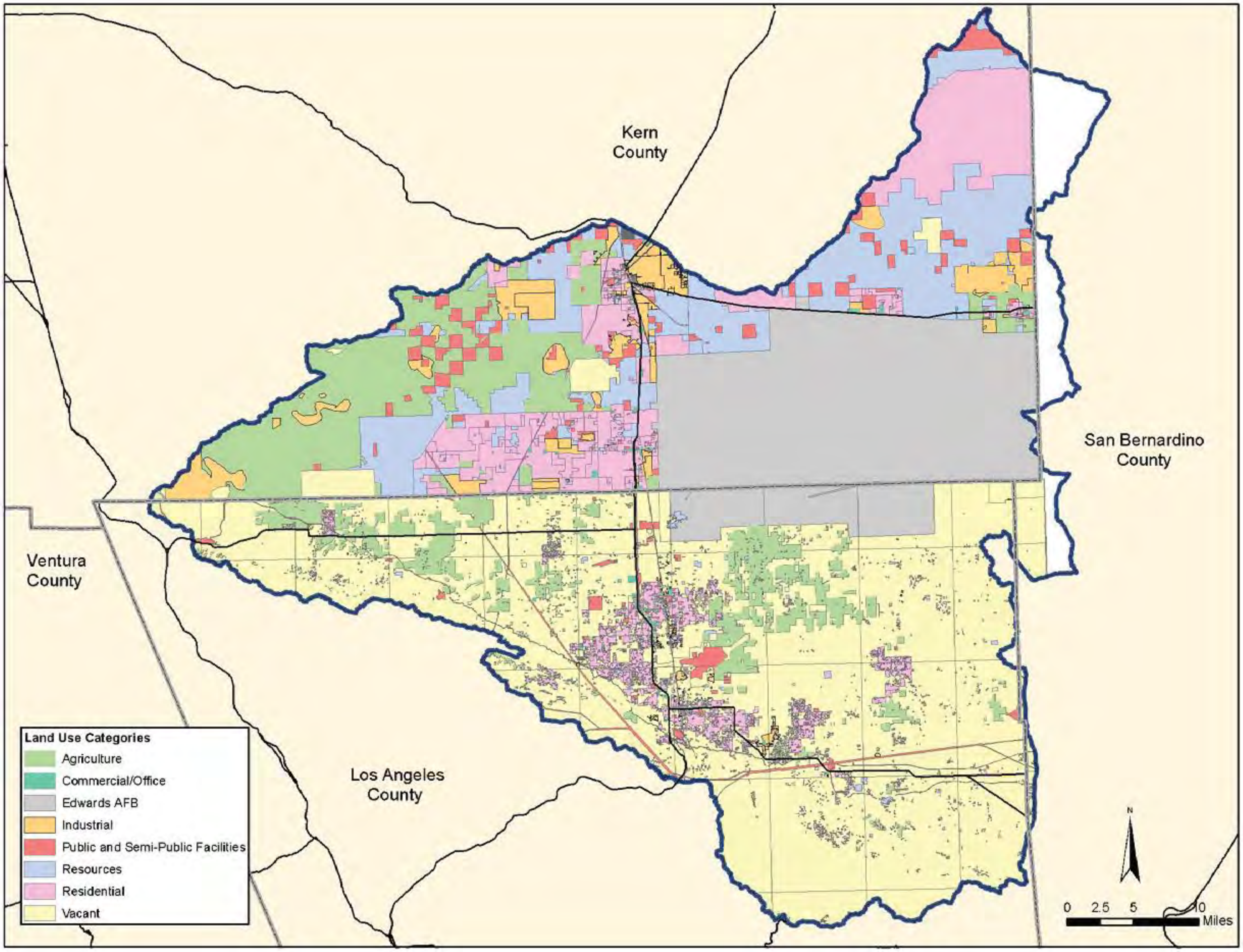


Figure 2-5: Antelope Valley Land Uses



2.7 Groundwater Quality

Groundwater quality is excellent within the upper or "principal" aquifer but degrades toward the northern portion of the dry lake areas. Considered to be generally suitable for domestic, agricultural, and industrial uses, the water in the principal aquifer has a total dissolved solids (TDS) concentration ranging from 200 to 800 milligrams per liter (mg/L). The deeper aquifers typically have higher TDS levels. Hardness levels range from 50 to 200 mg/L and high fluoride, boron, and nitrate concentrations have been measured in some areas of the basin. Arsenic is a concern in parts of the region and has been observed in some water supply wells. Research conducted by Waterworks and USGS has shown the problem to reside primarily in the deep aquifer. It is not anticipated that the existing arsenic concentrations will lead to future loss of groundwater as a water supply resource for the region. Portions of the basin have experienced nitrate levels above the maximum contaminant level (MCL) of 10 mg/L as N.

Most, if not all, water supply wells in the Antelope Valley draw groundwater from the principal aquifer. The SNMP and future monitoring plan will focus on the groundwater quality in the principal aquifer. The basin's groundwater quality is discussed further in Section 3 and 4.

2.8 Water Quality Control

The primary responsibility for ensuring the highest reasonable quality for waters of the State has been assigned by the California legislature to the State Water Resources Control Board (State Board) and the nine Regional Water Quality Control Boards. The mission of the Regional Boards is to develop and enforce water quality objectives and implementation plans that will best protect the beneficial uses of the State's waters, recognizing local differences in climate, topography, geology and hydrology.

The Antelope Valley Region falls within the jurisdiction of the Lahontan Regional Water Quality Control Board (Regional Board), the regulatory agency whose primary responsibility is to protect water quality within the Lahontan Region. The Regional Board adopted and implemented the "*Water Quality Control Plan for the Lahontan Region*" (Basin Plan; Regional Board 1995), which, among other functions, sets forth water quality standards for the surface and groundwater within the Regional Board's jurisdiction. The Basin Plan includes the designated uses of water and the narrative and numerical objectives which must be maintained or attained to protect those uses. The Regional Board has not established water quality objectives specific to the Antelope Valley Region. However, water quality objectives have been established that apply to all groundwaters in the Lahontan Region. These objectives are aimed to be protective of the beneficial uses assigned to the groundwater basins. Further discussion on the water quality objectives examined in this SNMP is included in Section 4.

2.9 Antelope Valley Regulatory Groundwater Cleanup Sites

The State Board's Site Cleanup Program regulates and oversees the investigation and cleanup of non-federally owned sites where recent or historical unauthorized releases of pollutants to the environment, including soil, groundwater, surface water, and sediment, have occurred. Sites in the program include, but are not limited to, pesticide and fertilizer facilities, rail yards, ports, equipment supply facilities, metals facilities, industrial manufacturing and maintenance sites, dry cleaners, bulk transfer facilities, and refineries. The types of pollutants encountered at the sites are numerous and diverse and may include substance such as solvents, pesticides, heavy metals, and fuel constituents.

GeoTracker is the State Board's data management system for managing sites that impact groundwater, especially those that require groundwater cleanup as well as permitted facilities such as land disposal sites. Information relating to the groundwater cleanup sites is available on the GeoTracker website [1].

At the request of the Regional Board, a discussion of the Antelope Valley cleanup sites is included in the SNMP. The list of cleanup sites was obtained with Regional Board assistance. The list can be downloaded using the following steps and search parameters:

1. Website: http://geotracker.waterboards.ca.gov/
2. Use the "advanced search" link.
3. County: Los Angeles, Kern (separate runs are needed for both)
4. Site/Facility Type: Uncheck the "Leaking Underground Storage Tank (LUST) Cleanup Sites"
5. Regional Board: Lahontan
6. Use latitude and longitude coordinates to determine which sites are within the basin

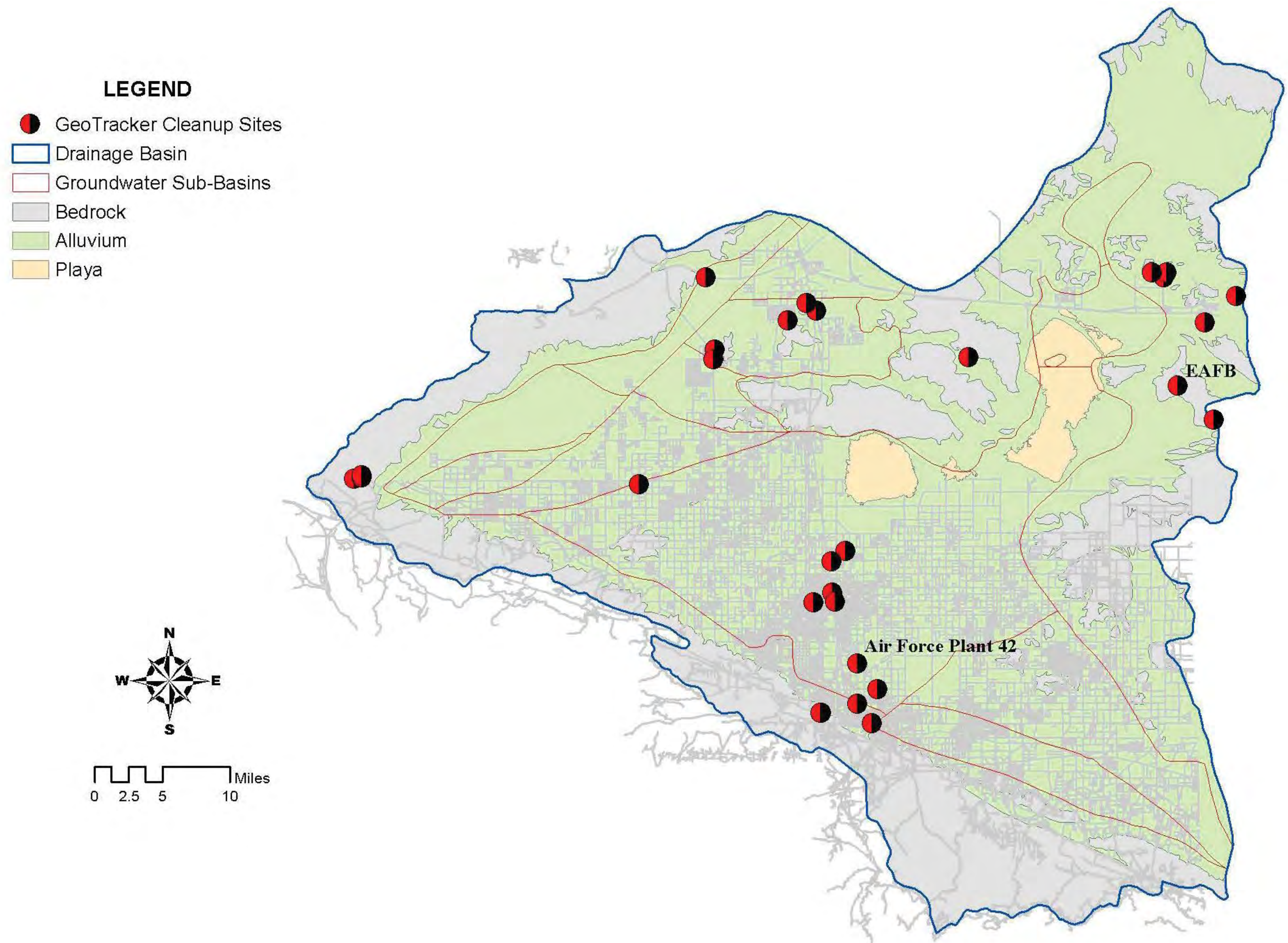
According to GeoTracker, there are currently 548 cleanup sites on Edwards Air Force Base, 36 cleanup sites on Air Force Plant 42 and 30 non-military cleanup sites in the Antelope Valley. All but 29 of the Edwards Air Force Base and Air Force Plant 42 sites are open cases. 22 of the 30 non-military sites are open cases. Of the 614 total cases, 9 are cleanup program sites, 21 are land disposal sites and 584 are military cleanup sites. The cleanup sites are listed in Appendix D and depicted in Figure 2-6.

For the sites that have a listed potential contaminant(s) of concern, the majority of the contaminants are gasoline and diesel from gas stations. Only one site, the eSolar Sierra SunTower Power Plant, has listed potential contaminants in GeoTracker that are relevant to the SNMP. The potential contaminants are listed as "Nitrate, other inorganic / salt, arsenic, chromium, other metal." This site is listed as a land disposal site; however, it is a power generating location using solar power. The cleanup case is also listed as inactive, meaning that it is a site that has ceased accepting waste but has not been formally closed or is still within the post closure monitoring period, and the site is not considered a significant threat to water quality.

This SNMP includes a monitoring plan, as discussed later in Section 5. If in the future, the SNMP monitoring network detects a high concentration of a monitored constituent, the stakeholders may use this map or updated information from GeoTracker to see if there are any known cleanup sites in the vicinity of the well that may be contributing to the high concentration.

[1] http://geotracker.waterboards.ca.gov/

Figure 2-6: GeoTracker Groundwater Cleanup Sites



Section 3: Salt & Nutrient Characterization

3.1 Salts and Nutrients – What are they and where do they come from?

The purpose of the SNMP is to address the management of salts and nutrients from various sources within the basin. This section explains how the appropriate constituents were selected to be addressed in this SNMP. Identification of existing and future sources of salts and nutrients is necessary for assessing constituent loads and analyzing impacts on basin groundwater quality.

The stakeholders developed a list of relevant salts, nutrients, and other constituents. The list includes total dissolved solids, chloride, and nitrate as they are typically associated with recycled water use. Arsenic, boron, and fluoride were included because these constituents have been detected at elevated concentrations in parts of the region. Chromium was added to the list at the request of Regional Board staff because both trivalent and hexavalent forms of chromium are known to naturally exist in the groundwater of the Antelope Valley Basin, as well as other groundwater basins in the Lahontan region. Phosphorous, nitrogen, and potassium were considered since agriculture is important in the Antelope Valley and these nutrients are associated with fertilizers and livestock waste. However, only nitrogen, in the form of nitrate, is found in the local groundwater. Each constituent is discussed below.

3.1.1 Total Dissolved Solids

Salinity in groundwater is typically characterized by measuring the water's electrical conductivity or the total dissolved solids (TDS) level. TDS represents the overall mineral content and is considered the more accurate indicator of salinity in water. Most TDS sources are anthropogenic in nature and include, but are not limited to, agricultural runoff, point source water pollution, and industrial and sewage discharge. Inorganic sources include minerals commonly found in nature through the weathering and dissolution of rocks and organic material from decaying organisms, plants, and animals.

There are no known health effects associated with the ingestion of TDS in drinking water. In California, TDS has secondary maximum contaminant levels (SMCL) and are regulated under Title 22 of the California Code of Regulations, particularly Secondary Drinking Water Standards, which are intended to control the aesthetic qualities (taste, odor and color) of drinking water. The TDS SMCL is made up of a range of consumer acceptance levels and includes a 500 mg/L "recommended" level, a 1,000 mg/L "upper" level, and a 1,500 mg/L "short term" level. High TDS concentrations can negatively impact sensitive crops. Based on guidelines from the Food and Agriculture Organization of the United Nations (FAO), TDS concentrations below 450 mg/L should not restrict a water's use for irrigation (i.e. crop selection or the irrigation management program should not have to be altered to accommodate the salinity level), levels between 450 and below 2000 mg/L can be slightly to moderately restrictive on crop selection and/or irrigation practices, and levels greater than 2000 mg/L may severely restrict effective irrigation use to only high salinity tolerant crops.

Based on available data between 2001 and 2010, average TDS concentrations in the Antelope Valley groundwater basin ranges from 122 mg/L to 1380 mg/L. Of the 58 wells analyzed in the Lancaster sub-basin, seven exceeded the recommended SMCL and only one well exceeded the upper SMCL. SMCLs are not enforceable standards and, as previously stated, are not health-threatening and are only set to protect the aesthetics of water.

3.1.2 Chloride

Chloride is widely distributed in nature as salts of sodium ($NaCl$), potassium (KCl), and calcium ($CaCl_2$). Chloride is essential for metabolism (the process of turning food into energy) and help keep the body's acid-base balance.

Chloride in groundwater is naturally occurring from weathering of rocks, atmospheric deposition, and human uses and resulting wastes. As with TDS, many sources of chloride are anthropogenic. Sources of chloride from human use include food condiment and preservative, potash fertilizers, animal feed additive, production of industrial chemicals, dissolution of deicing salts, and treatment of drinking water and wastewater. Release of brines from industrial processes, leaching from landfills and fertilized soils, discharge of treated water from wastewater treatment facilities, infiltration from septic tank systems and irrigation activities, and other consumptive uses affect chloride in groundwater.

One commonly discussed source of chloride to the environment is from self-generating water softeners that use rock salt or potassium chloride pellets to treat hard water. These types of water softeners discharge a brine consisting of concentrated chloride levels. This briny waste may be discharged into the sewer system and then treated by a process that does not remove the chloride. Therefore, the salty waste may be released into the treatment plant's discharge location. Although the imported water to the Antelope Valley is considered only moderately hard (between 60 and 120 mg/L as CaO_3), it is possible that the use of self-generating water softeners exists in the region. Between 2009 and 2013, average chloride levels in imported water and the Lancaster Water Reclamation Plant (WRP) was 74 and 97 mg/L, respectively. The 23 mg/L increase in chloride concentration is within the 20 to 50 mg/L range expected for typical domestic water use. Based on these results, it is presumed that chloride-releasing water softeners are not widely used in the Antelope Valley at present.

As with TDS, there are no known health effects associated with the ingestion of chloride in drinking water. However, chloride concentrations in excess of 250 mg/L can affect taste. Chloride is regulated under the Secondary Drinking Water Standards and has SMCLs consisting of a 250 mg/L "recommended" level, a 500 mg/L "upper" level, and a 600 mg/L "short term" level. Elevated chloride concentrations can negatively impact sensitive crops. According to FAO guidelines, the most chloride sensitive crops are avocado, strawberries, and Indian Summer raspberries, which are not commercially grown in the Antelope Valley. The most chloride sensitive crops that are grown in the Antelope Valley are a variety of grapes, stone fruits, and citrus crops. These crops have a chloride tolerance up to 238 mg/L.

Based on available data, average chloride concentrations in the groundwater basin ranges from 3.17 mg/L to 180 mg/L. No wells exceeded the recommended SMCL standard.

3.1.3 Nitrate

Nitrate is a naturally occurring form of nitrogen. Nitrogen is essential to all life, including many crop plants which require large quantities to sustain high yields. Nitrate is found in groundwater and is a principal by-product of fertilizers. Other sources of nitrate include land use activities such as irrigation farming of crops, high density animal operations, wastewater treatment, food processing facilities and septic tank systems.

Nitrate is regulated under the Primary Drinking Water Standards and has a maximum contaminant level (MCL) of 10 mg/L as nitrogen (N). Nitrate in drinking water at levels above the MCL is a health risk for infants of less than six months of age. Such nitrate levels can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin (methemoglobin or "blue baby syndrome"). High nitrate levels may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with certain specific enzyme deficiencies.

Based on available data, average nitrate concentrations in the groundwater basin ranges from non-detect (ND) to 3.69 mg/L as N. ND levels for nitrate are concentrations below the nitrate DLR (Detection Limit for purposes of Reporting) of 0.4 mg/L as N. About half of the wells analyzed had nitrate concentrations below the DLR. No wells exceeded the MCL standard.

3.1.4 Arsenic

Arsenic is an odorless and tasteless semi-metal element. It enters drinking water supplies from natural deposits in the earth or from agricultural and industrial practices. Higher levels of arsenic tend to be found more in groundwater sources than in surface water sources (i.e., lakes and rivers) of drinking water. The demand on ground water from municipal systems and private drinking water wells may cause water levels to drop and release arsenic from rock formations.

Arsenic has an MCL of 10 μg/L and is known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems. The arsenic drinking water standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. Arsenic has the potential to reduce agricultural productivity. The FAO guidelines recommend a maximum concentration of 100 μg/L in irrigation water.

Based on available data, average arsenic concentrations in the groundwater basin ranges from ND (less than 2 μg/L) to 78 μg/L. Nineteen of the 55 wells within the Lancaster sub-basin exceed the arsenic MCL. Twelve of these high arsenic wells, including the 78 μg/L arsenic concentration, are located outside the more populated urbanized areas in the Antelope Valley.

Elevated arsenic levels are localized and are not a widespread problem in the region. Most drinking water wells with arsenic concentrations above 10 μg/L have been shut down and/or abandoned. Other options for high arsenic wells also include wellhead treatment for removing arsenic and implementing blending plans with lower arsenic concentration sources to decrease the arsenic level to below eighty percent of the MCL or 8 μg/L.

3.1.5 Chromium

Chromium is an odorless and tasteless metallic element. Chromium is found naturally in rocks, plants, soil and volcanic dust, and animals. The most common forms of chromium that occur in natural waters in the environment are trivalent chromium (chromium-3) and hexavalent chromium (chromium-6).

Chromium-3 is an essential human dietary element and is found in many vegetables, fruits, meats, grains and yeast. Chromium-6 occurs naturally in the environment from the erosion of natural chromium deposits, and it can also be produced by industrial processes (e.g., electroplating and metal finishing operations). There are demonstrated instances of chromium being released to the environment by leakage, poor storage or inadequate industrial waste disposal practices.

Chromium-6 has been known to cause cancer when inhaled and has also been linked to cancer when ingested. Chromium-6 is regulated under the State Primary Drinking Water Standard for total chromium, which has a State MCL of 50 µg/L. The State standard is more health protective than the National standard of 100 µg/L. The State total chromium MCL was established in 1977 to address the non-cancer toxic effects of chromium-6, and also includes the chromium-3 form. On July 1, 2014, the California Department of Public Health (CDPH) adopted a specific chromium-6 drinking water standard of 10 µg/L. . The chromium-6 MCL is one-fifth the level of the current total chromium MCL and is expected to reduce the theoretical cancer risk statewide from exposure to chromium-6.

Based on available data, average total chromium concentrations in the groundwater basin ranges from ND (less than 10 µg/L) to 13 µg/L. No wells exceeded the MCL standard for total chromium.

3.1.6 Fluoride

Fluoride compounds are salts that form when the element, fluorine, combines with minerals in soil or rocks. Some fluoride compounds, such as sodium fluoride and fluorosilicates, dissolve easily into groundwater as it moves through gaps and pore spaces between rocks. Most water supplies contain some naturally occurring fluoride. Fluoride also enters drinking water in discharge from fertilizer or aluminum factories. Also, many communities add fluoride to their drinking water to promote dental health.

Exposure to excessive consumption of fluoride over a lifetime may lead to increased likelihood of bone fractures in adults, and may result in effects on bone leading to pain and tenderness. Children aged 8 years and younger exposed to excessive amounts of fluoride have an increased chance of developing pits in the tooth enamel, along with a range of cosmetic effects to teeth.

Based on available data, average fluoride concentrations in the groundwater basin ranges from 0.13 mg/L to 5.5 mg/L. Two wells exceeded the fluoride MCL of 2 mg/L.

The agricultural water goal for fluoride was established by the FAO and National Academy of Sciences to protect livestock from tooth mottling and bone problems. The upper limit guideline for fluoride is 2.0 mg/L. Low fluoride levels below 1 mg/L are beneficial to both animals and humans.

3.1.7 Boron

Boron is a naturally-occurring element found in rocks, soil, and water. Human causes of boron contamination include releases to air from power plants, chemical plants, and manufacturing facilities. Fertilizers, herbicides and industrial wastes are among the sources of soil contamination. Contamination of water can come directly from industrial wastewater and municipal sewage, as well as indirectly from air deposition and soil runoff. Boron compounds are used in the manufacture of glass, soaps and detergents and as flame retardants.

The general population obtains the greatest amount of boron through food intake, as it is naturally found in many edible plants. Boron is taken as health supplements to build strong bones, treat osteoarthritis, use as an aid for building muscles and increasing testosterone levels, and improve thinking skills and muscle coordination.

Boron has a State Notification Level (NL) of 1 mg/L. CDPH established these health-based advisory levels to provide information to public water systems and others about certain non-regulated chemicals in drinking water that lack MCLs. Based on available data, average boron concentrations in the groundwater basin ranges from ND (less than 0.1 mg/L) to 1.52 mg/L. Only one well exceeded the NL.

Boron can accumulate in a sensitive crop to concentrations high enough to cause crop damage and reduce yields. Damage results when boron is absorbed in significant amounts with the water taken up by the roots. Based on FAO guidelines, boron concentrations below 0.7 mg/L should not restrict a water's use for irrigation, slight to moderate restrictions may occur for levels below 3.0 mg/L, and severe restrictions may occur for levels above 3.0 mg/L.

3.2 Historical Salt and Nutrient Characterization of the Groundwater Basin

The salt and nutrient characterization is based on the historical water quality or baseline conditions of the Antelope Valley groundwater basin. The baseline condition is the average concentration of each constituent in groundwater during the ten year period between 2001 and 2010. At the recommendation of the Regional Board, the State Board's GeoTracker Groundwater Ambient Monitoring and Assessment[1] (GAMA) and the USGS National Water Information System[2] (NWIS) online databases were used to download the historical monitoring results to establish the baseline conditions. GAMA was used to obtain municipal water supply well data. NWIS was used to obtain USGS monitoring well data. Refer to Sections 3.2.1 and 3.2.2 for additional information about GAMA and NWIS.

Many private well owners were reluctant to share their groundwater well information. Many well owners have serious concerns regarding privacy issues, although assurances could be made that the well information would remain anonymous and used solely for the purpose of baseline water quality determinations. The stakeholder group determined that it would be more practical to use water quality information from the publicly available GAMA and NWIS databases.

The first draft of this SNMP, sent to stakeholders in June 2013, included two separate analyses for the baseline groundwater conditions. The first analyzed USGS monitoring well results from the NWIS database and the second, utilizing results from the GAMA database, considered both municipal water supply and USGS monitoring wells. During the draft SNMP review process, it was discovered that the GAMA database was missing some USGS monitoring data from the northerly (Gloster) and westerly (West Antelope) areas of the groundwater basin. This inconsistency was found to be due to a discrepancy between the Federal (USGS 1987) and State (DWR 2004) groundwater basin boundaries. The data from the two database sources was subsequently combined and the results are included in this report.

Table 3-1 provides a well count summary organized by constituent, sub-basin, and data source. This includes wells in areas of the region that are not considered part of the USGS established sub-basins. Much of these areas are located over bedrock and do not have separate sub-basin analysis. These areas, however, are within the SNMP study area and are included in the overall basin analysis. Seven of the sub-basins have less than three wells for some or all of the constituents. A significant portion of the region is sparsely or not populated and, therefore, has limited well data available on GAMA and NWIS. Per the Regional Board, three wells per sub-basin are preferred for statistical significance. The last two rows of the table are the number of GAMA and NWIS sourced wells for each constituent. For both sources, the well count differs for each constituent because each well was monitored for a different set of constituents.

As mentioned earlier, the constituents investigated in the SNMP include TDS, nitrate, chloride, arsenic, chromium, fluoride and boron. The average concentrations, or baseline conditions, of

[1] http://geotracker.waterboards.ca.gov/gama/
[2] http://waterdata.usgs.gov/nwis

each constituent were determined for each sub-basin and for the groundwater basin as a whole, see Table 3-2. No data from the 2001-2010 timeframe was available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.

There are distinct water quality differences presented between sub-basins. Water quality for wells can also vary by depth. A discussion regarding vertical partitioning of water quality was requested by the Lahontan Regional Board. However, the data available from the GeoTracker GAMA or USGS NWIS databases is insufficient for water quality analysis by vertical partitioning.

Most of the water quality data for the investigated constituents were measured at levels that were well below the DLR, a parameter set by CDPH for most regulated analytes. The DLR parameters are not laboratory specific and are independent of the analytical methods used. Most State certified laboratories are capable of achieving a detection limit that is lower than or equal to the DLR. Chloride and TDS do not have a DLR.

Figures 3-1 through 3-14 illustrate the mean concentration of each constituent by well and by sub-basin. The well locations were mapped using approximate latitude and longitude coordinates downloaded from the GAMA and NWIS databases. Many coordinate locations represent a cluster of wells (multiple wells using the same coordinates).

The groundwater basin has generally good water quality. The overall basin concentration of each constituent meets the SNMP water quality management goals. Compared to the other sub-basins, North Muroc and Peerless generally have higher concentrations of TDS, chloride, chromium, fluoride, and boron. This is not a concern, however, as the concentrations for these constituents meet all drinking water regulations. As discussed in the previous section, these constituents are naturally occurring.

Arsenic is a concern in the Antelope Valley. The elevated arsenic concentrations in the Gloster, Neenach, North Muroc, Peerless, and Willow Springs sub-basins exceed the regulatory drinking water and SNMP water quality management goals. High arsenic in groundwater is naturally occurring, resulting from dissolution of rocks and minerals. Arsenic concentrations above the MCL of 10 µg/L are not used for potable applications. Wells with concentrations above the MCL are typically treated to remove arsenic, blended to dilute arsenic concentration, or shut down.

Table 3-1: Total Number of Wells Organized by Constituent, Sub-Basin, and Data Source

	Arsenic	Boron	Chloride	Fluoride	Nitrate as N	Total Chromium	TDS
Buttes	10	10	10	10	10	9	10
Chaffee	-	-	-	-	-	-	-
Gloster	2	2	2	2	-	-	2
Finger Buttes	-	-	-	-	-	-	-
Lancaster	223	178	218	220	184	171	220
Neenach	5	1	4	4	7	6	4
North Muroc	5	5	5	5	8	7	6
Oak Creek	-	-	-	-	-	-	-
Pearland	24	23	25	24	25	22	22
Peerless	2	2	2	2	2	2	2
West Antelope	1	1	1	1	1	-	1
Willow Springs	5	4	5	5	6	4	5
No Sub-Basin (a)	62	36	53	52	57	50	46
AV Groundwater Basin	339	262	325	325	300	271	318
GAMA (b)	262	195	255	256	283	253	249
NWIS (c)	77	67	70	69	17	18	69

(a) These wells are located in areas that are not considered part of the established sub-basins.
(b) GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) database
(c) USGS National Water Information System (NWIS) database

Table 3-2: Baseline Water Quality Concentrations in the Antelope Valley Groundwater Basin (2001 - 2010)

Sub-Basin	Arsenic (µg/L)	Boron (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate as N (mg/L)	Total Chromium (µg/L)	TDS (mg/L)
MCL	10	1 (a)	500 (b)	2	10	50	1000 (c)
DLR	2	0.1	N/A	0.1	0.4	10	N/A
Buttes	1.32	0.07	19.1	0.38	1.42	8.77	301
Chaffee	-	-	-	-	-	-	-
Gloster	50.65	0.20	12.2	0.51	-	-	404
Finger Buttes	-	-	-	-	-	-	-
Lancaster	8.88	0.14	35.2	0.43	1.53	6.10	325
Neenach	13.24	0.20	51.9	0.46	1.84	7.64	446
North Muroc	55.15	0.87	201.9	0.68	2.18	10.17	858
Oak Creek	-	-	-	-	-	-	-
Pearland	0.76	0.07	17.5	0.19	4.06	1.91	256
Peerless	27.46	0.87	68.8	1.48	2.72	4.17	547
West Antelope	8.93	0.77	19.7	0.35	3.69	-	403
Willow Springs	12.43	0.04	22.1	0.21	1.81	4.00	301
AV Groundwater Basin	**9.66**	**0.17**	**38.4**	**0.44**	**1.97**	**5.53**	**350**

(a) Boron NL is 1 mg/L. There is no drinking water standard (MCL) for Boron
(b) Chloride SMCL: Consists of a 250 mg/L recommended level, a 500 mg/L upper level, and a 600 mg/L short-term level.
(c) TDS SMCL: Consists of a 500 mg/L recommended level, a 1,000 mg/L upper level, and a 1,500 mg/L short-term level.

Figure 3-1: TDS Concentration Range by Well

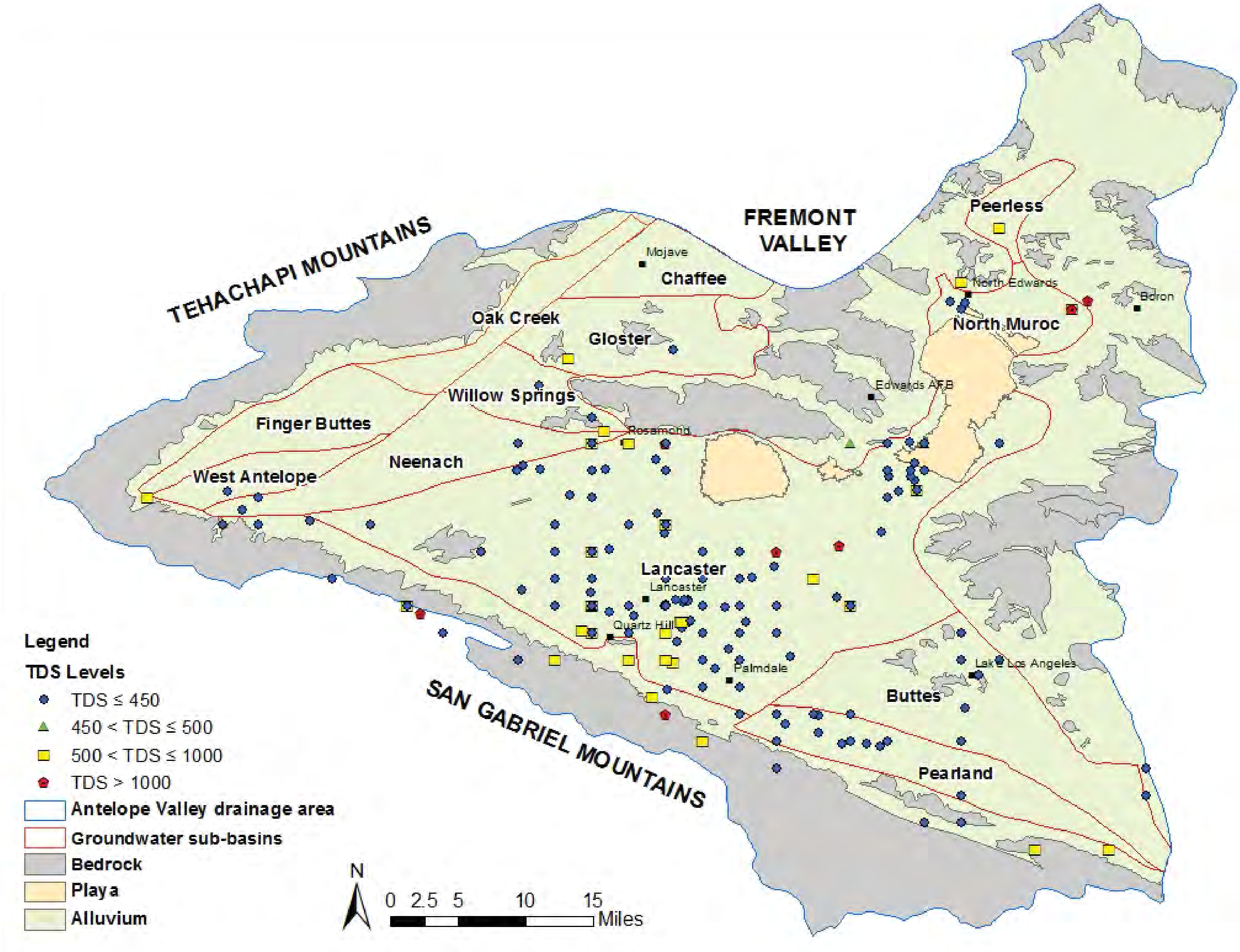
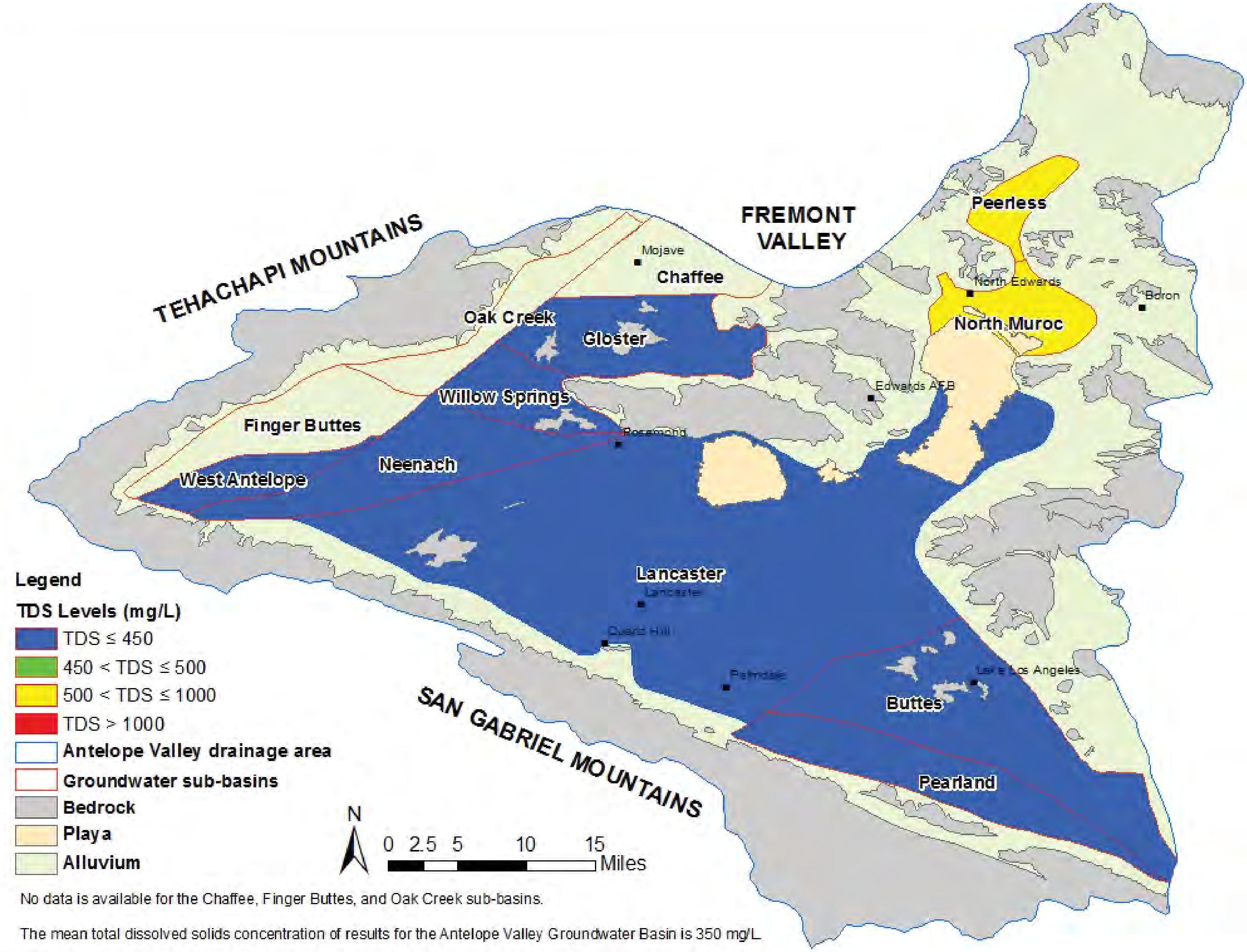


Figure 3-2: TDS Concentration Range by Sub-Basin



No data is available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.

The mean total dissolved solids concentration of results for the Antelope Valley Groundwater Basin is 350 mg/L.

Figure 3-3: Chloride Concentration Range by Well

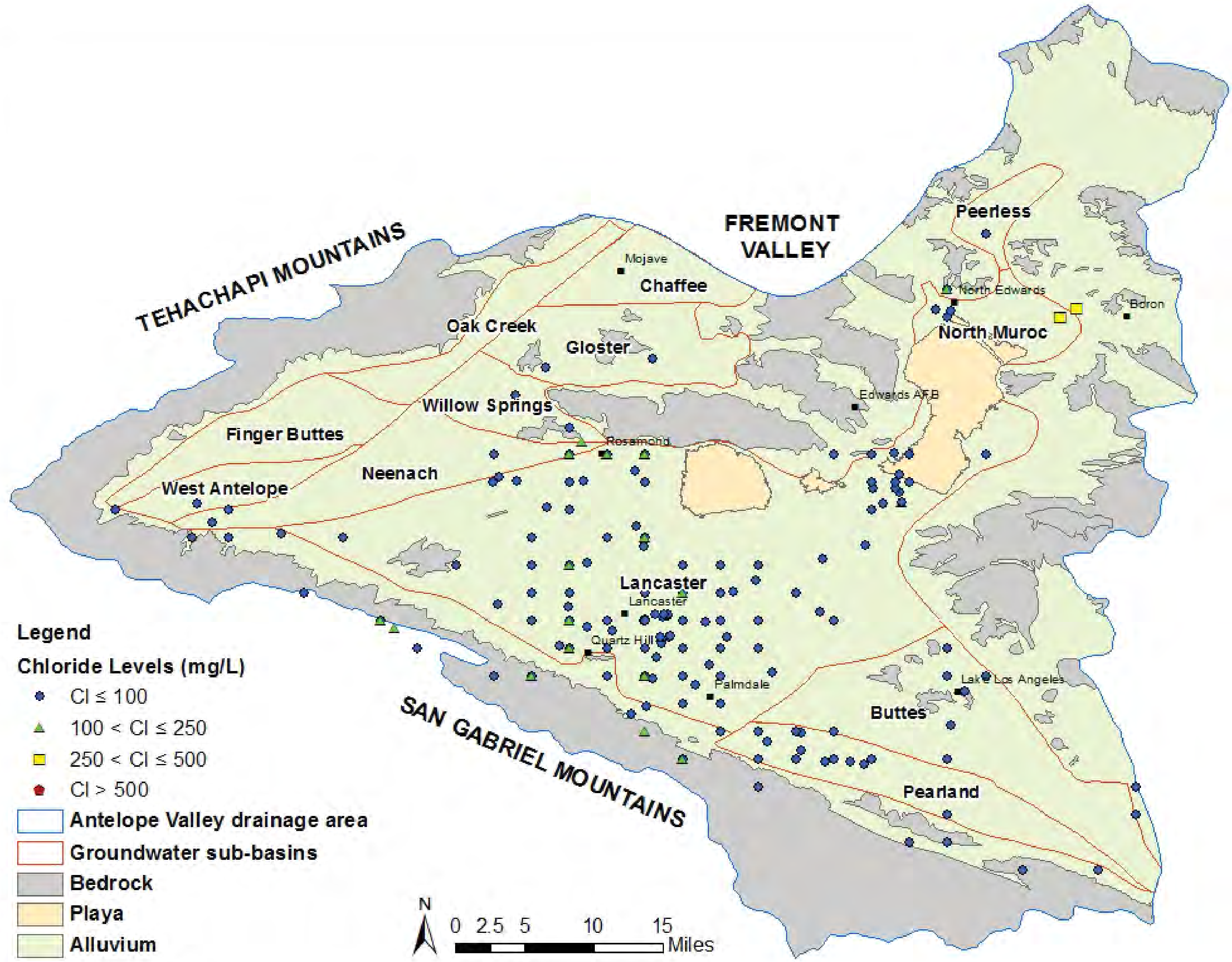
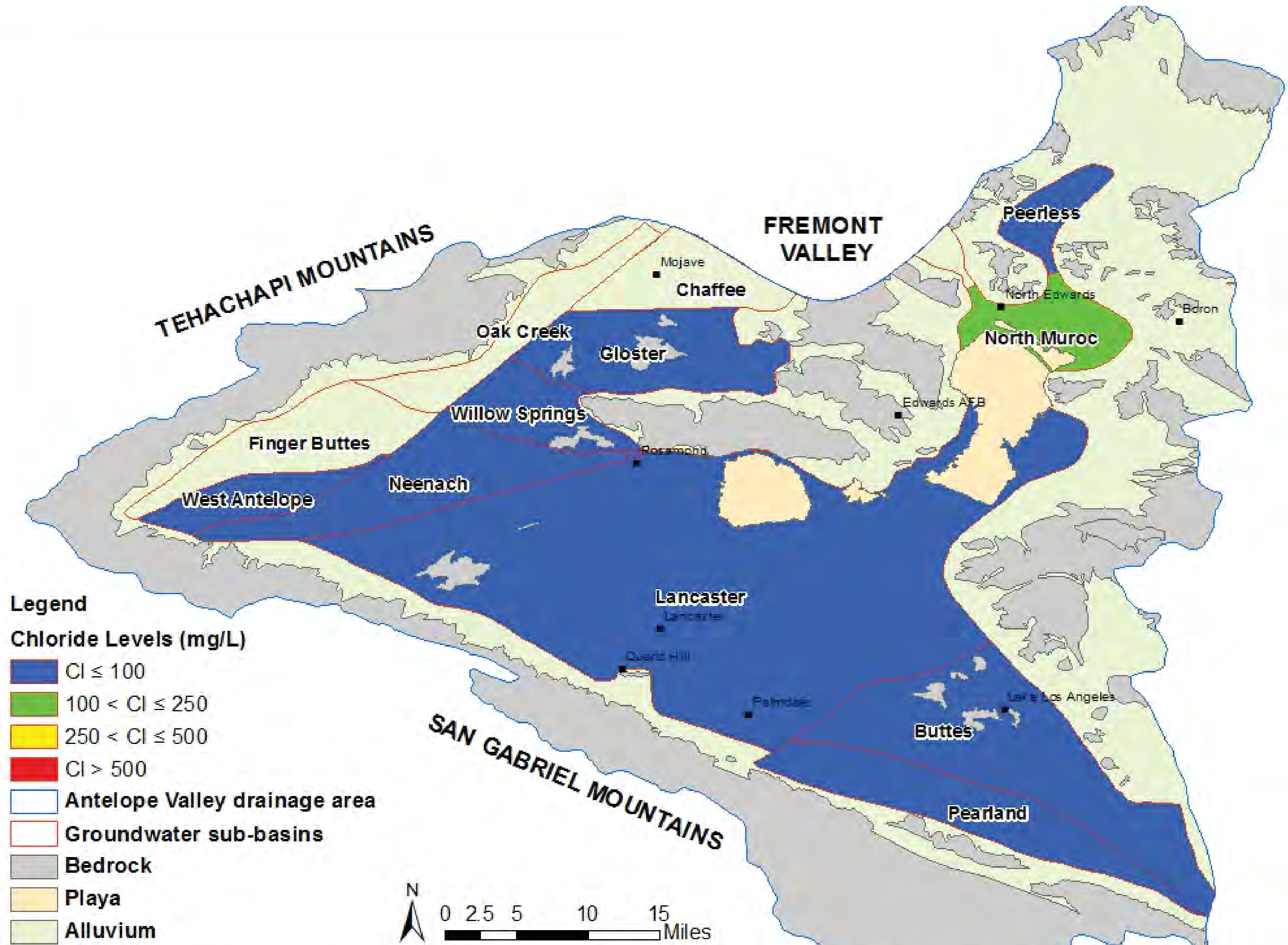
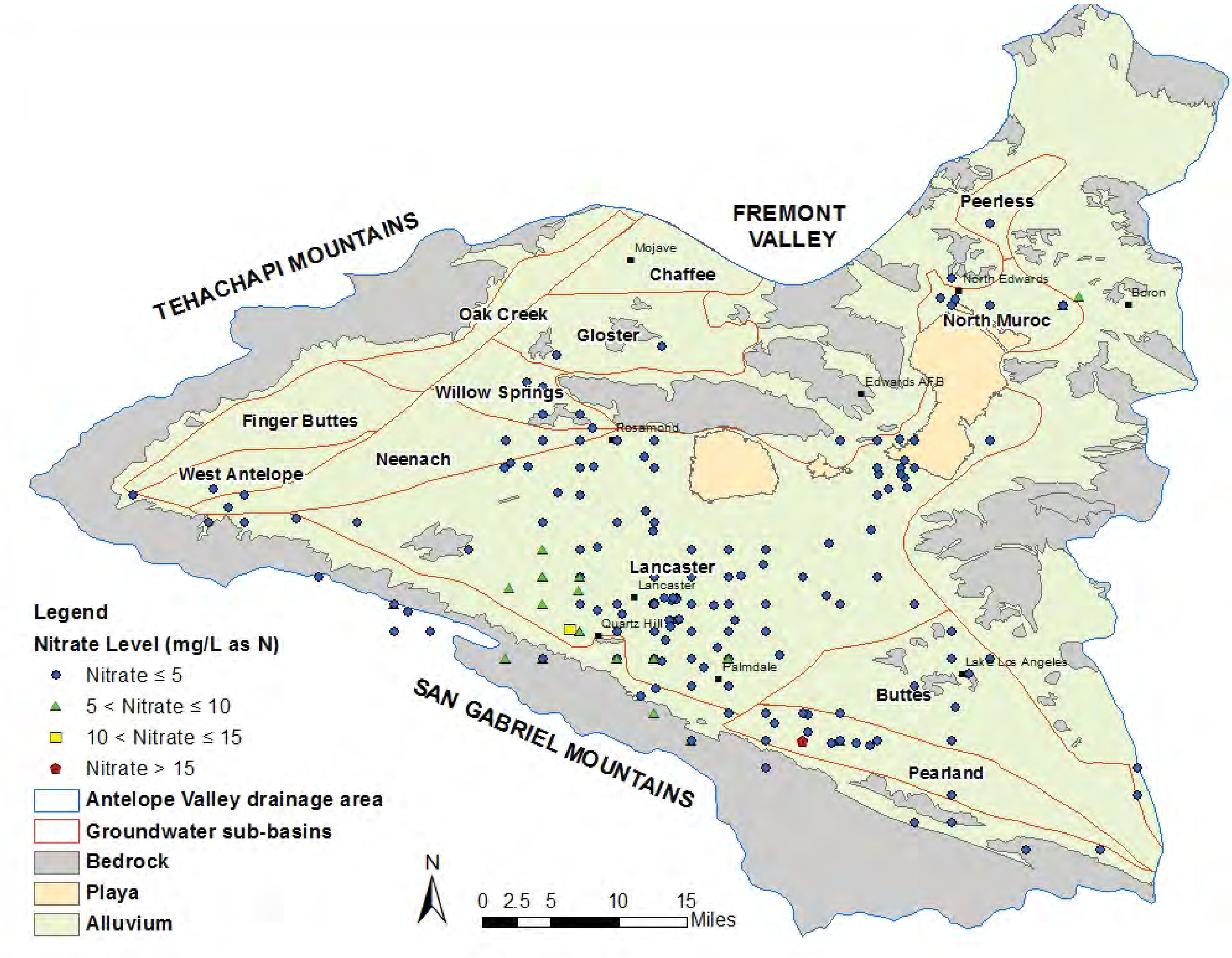


Figure 3-4: Chloride Concentration Range by Sub-Basin



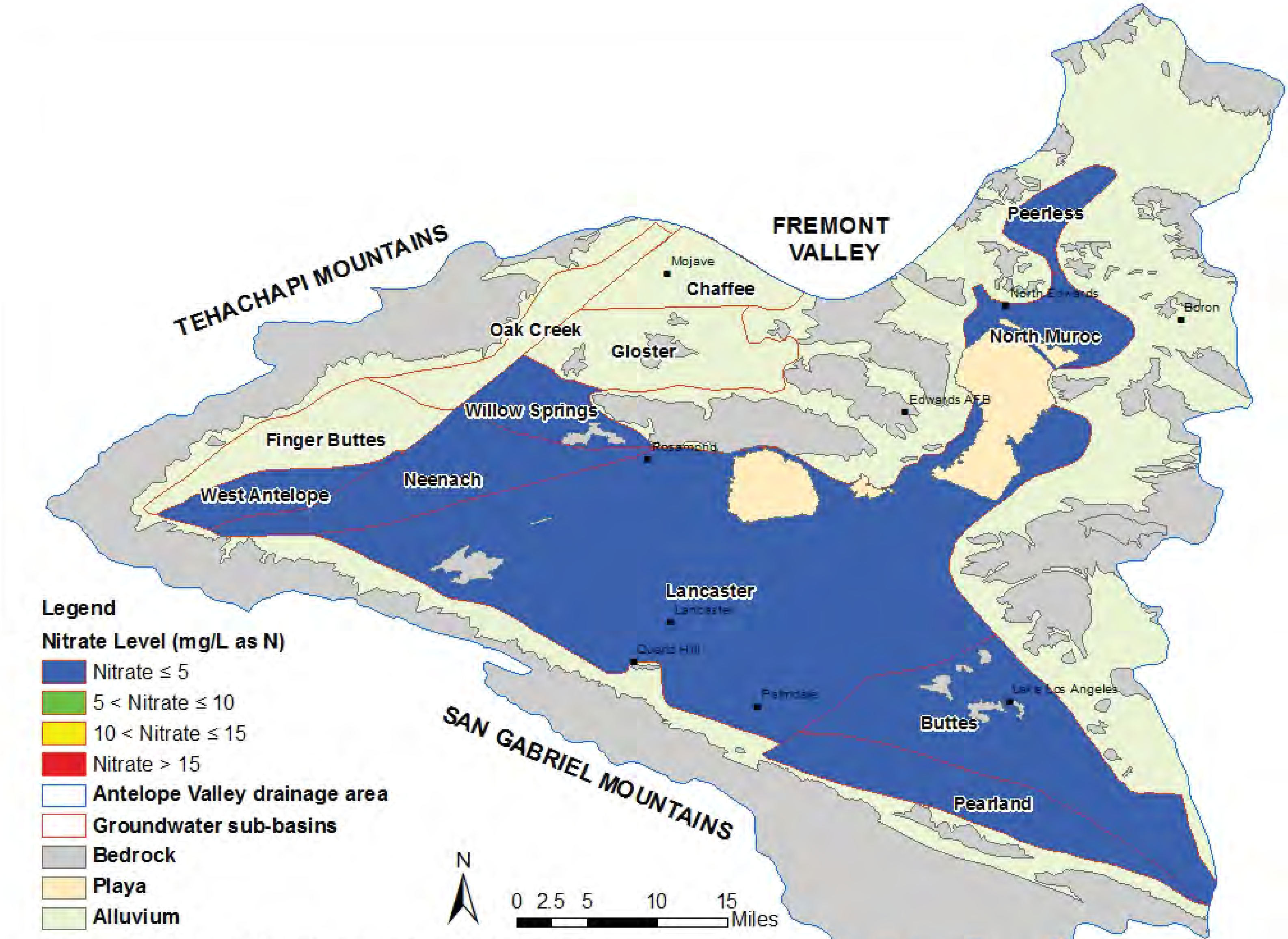
No data is available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.
The mean chloride concentration of results for the Antelope Valley Groundwater Basin is 38 mg/L.

Figure 3-5: Nitrate Concentration Range by Well



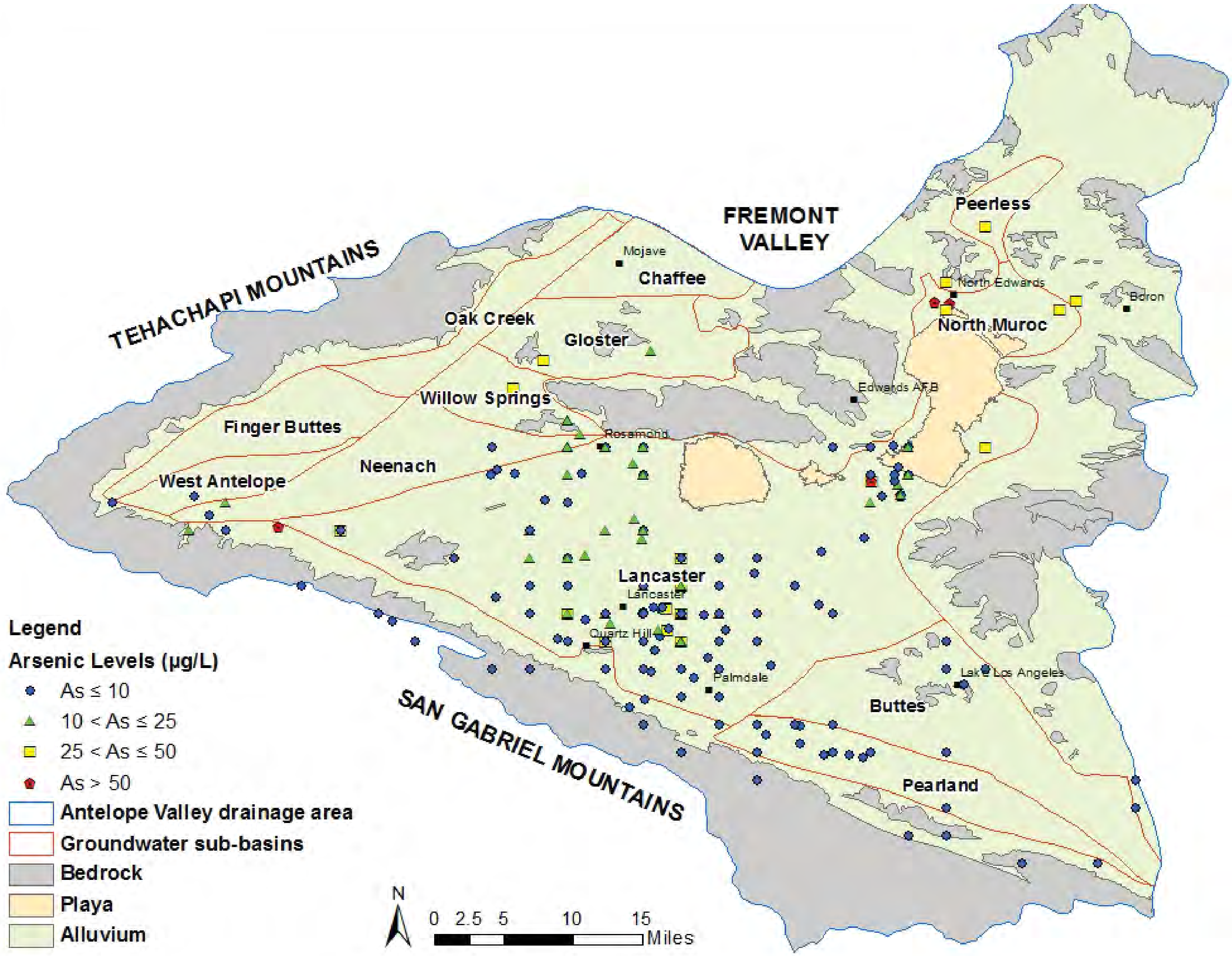
5-49

Figure 3-6: Nitrate Concentration Range by Sub-Basin



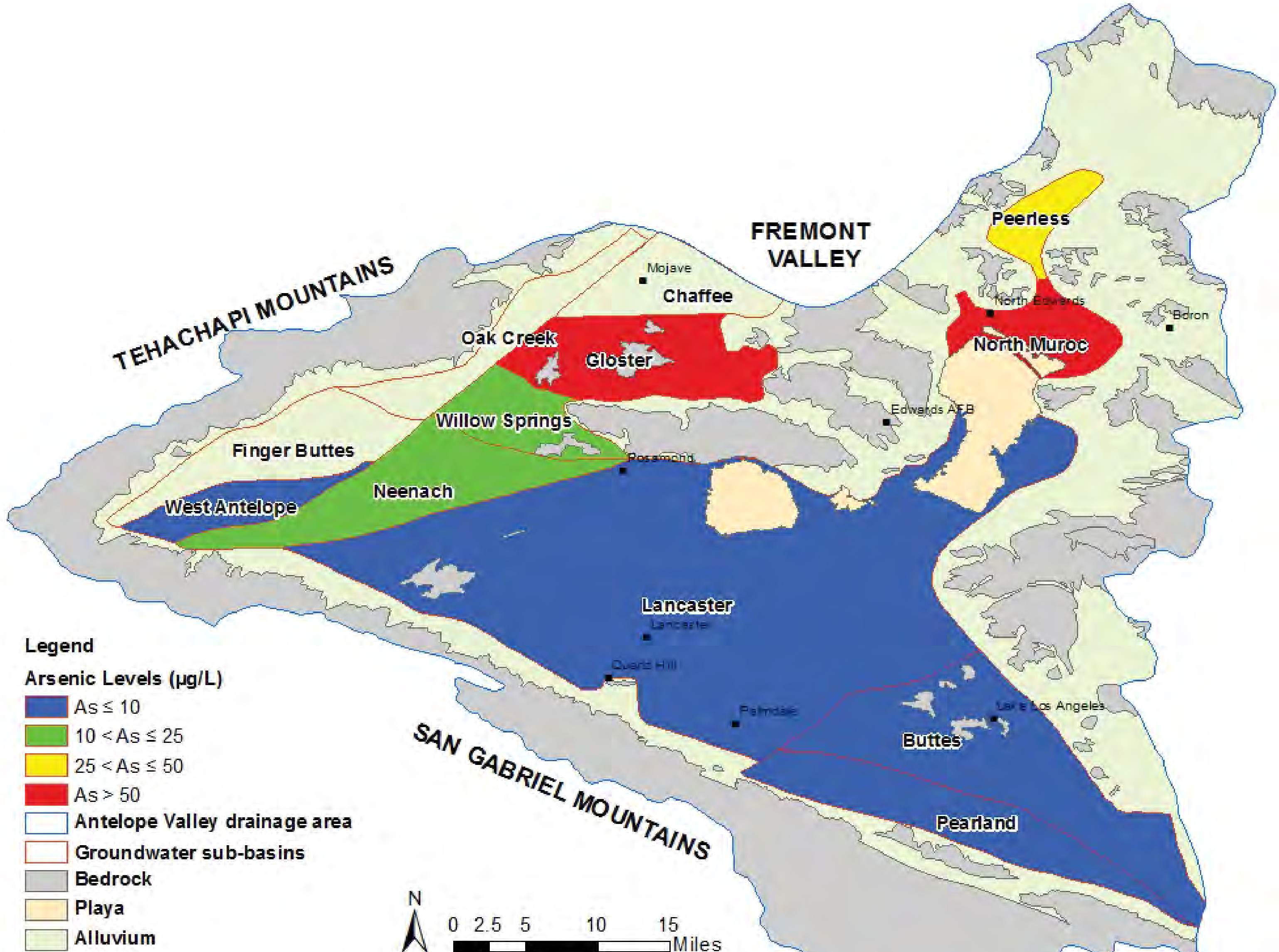
No data is available for the Chaffee, Gloster, Finger Buttes, and Oak Creek sub-basins.
The mean nitrate + nitrite concentration of results for the Antelope Valley Groundwater Basin is 1.97 mg/L as nitrogen.

Figure 3-7: Arsenic Concentration Range by Well



5-51

Figure 3-8: Arsenic Concentration Range by Sub-Basin



No data is available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.
The mean arsenic concentration of results for the Antelope Valley Groundwater Basin is 9.66 µg/L.

Figure 3-9: Total Chromium Concentration Range by Well

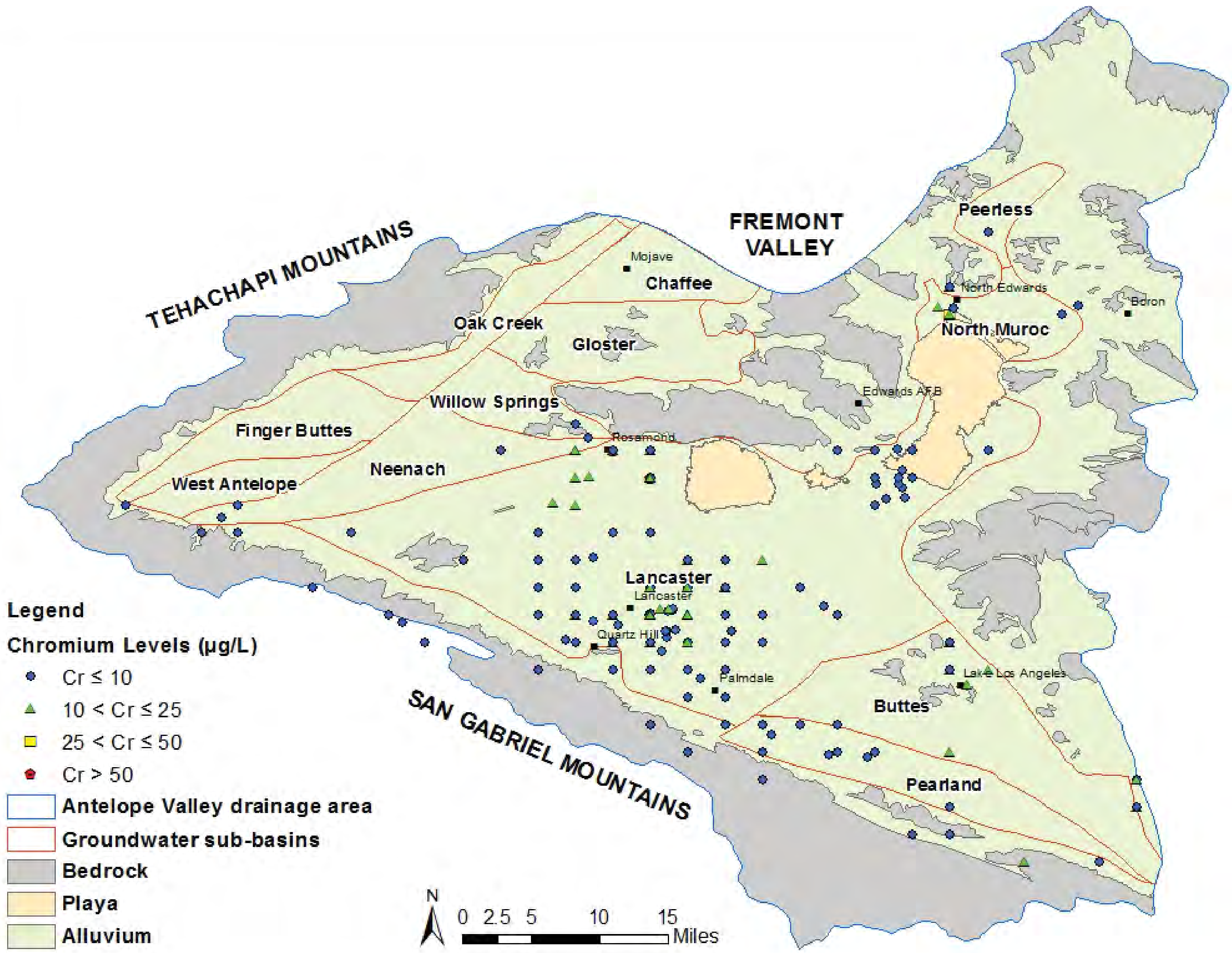
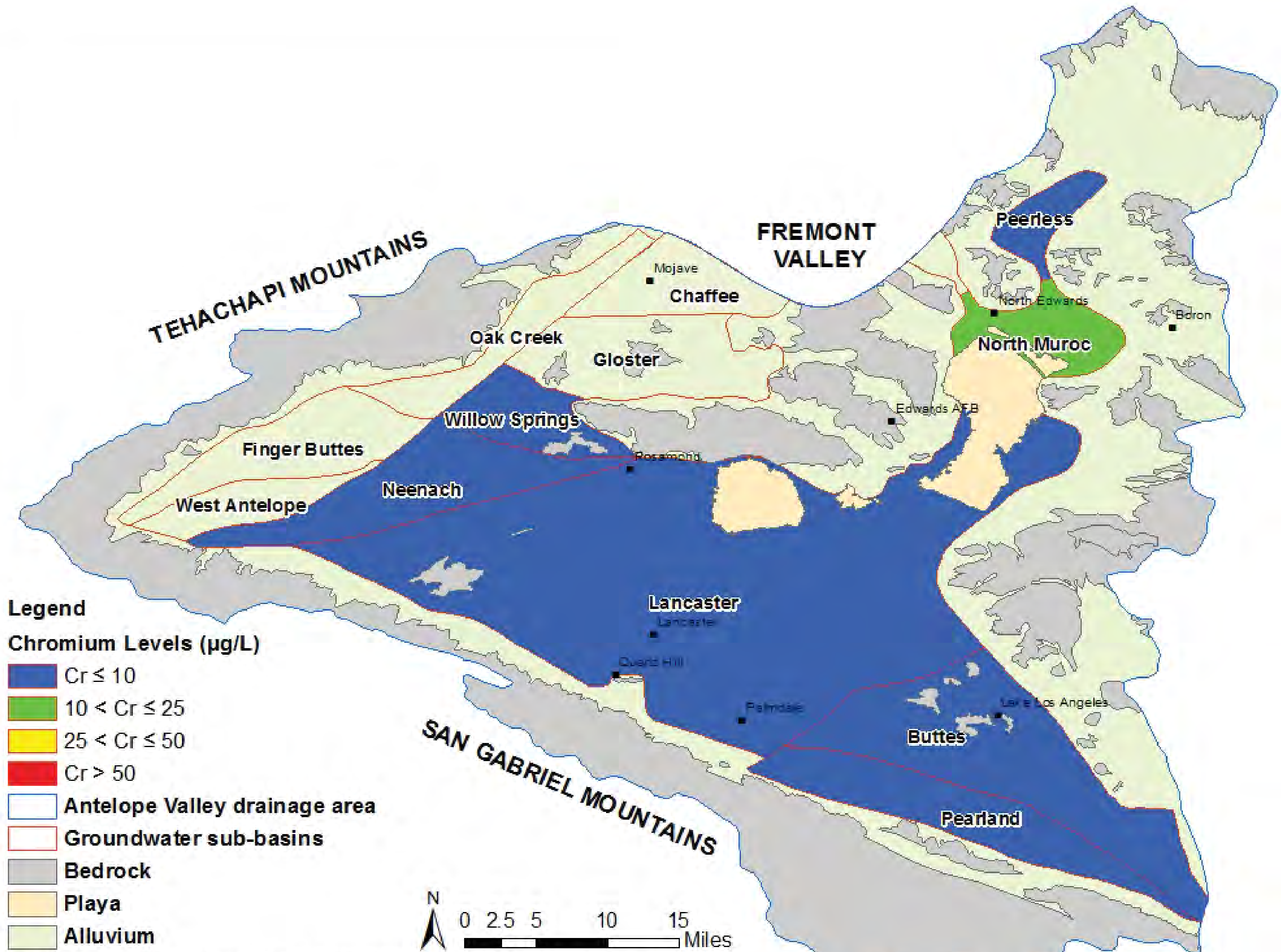
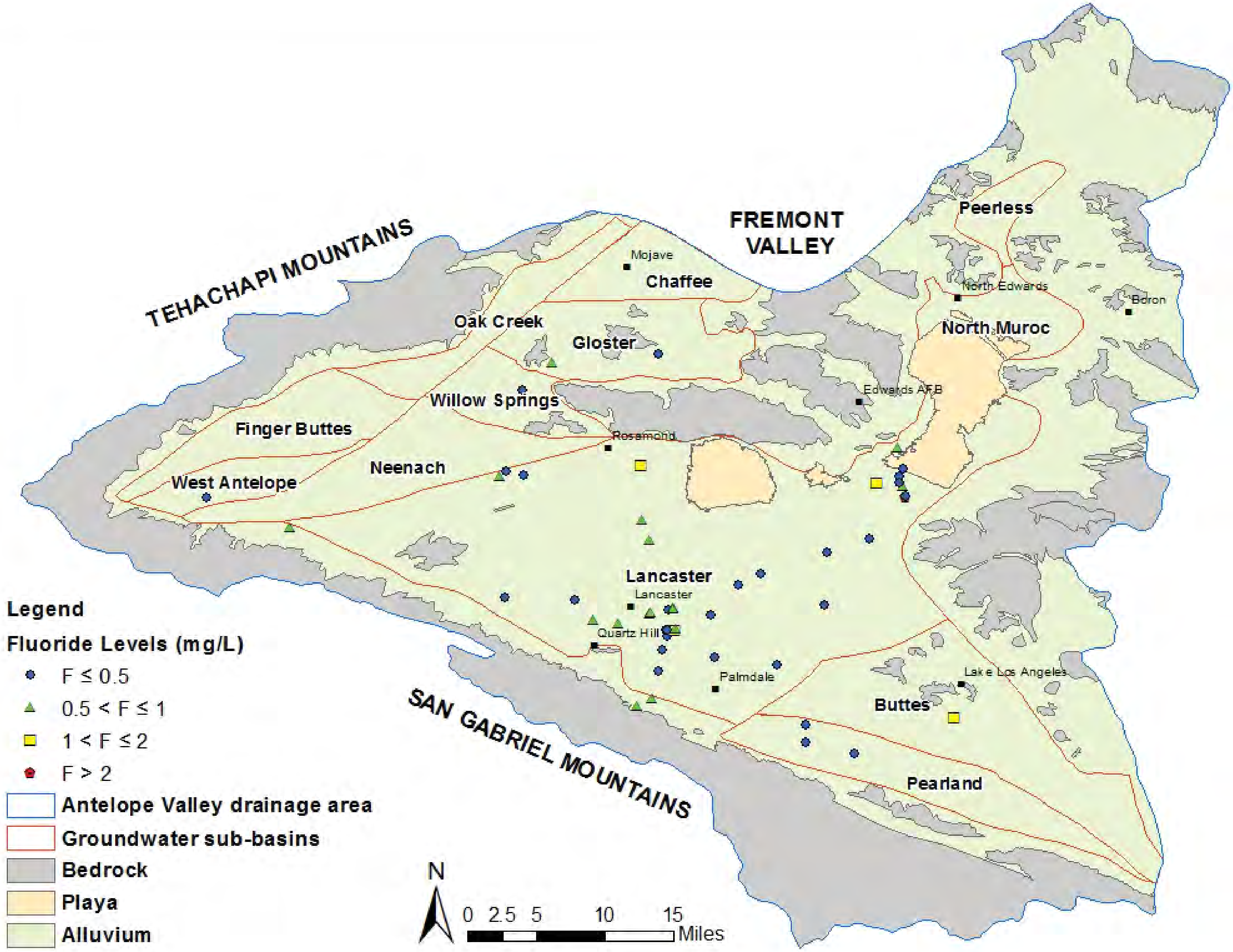


Figure 3-10: Total Chromium Concentration Range by Sub-Basin



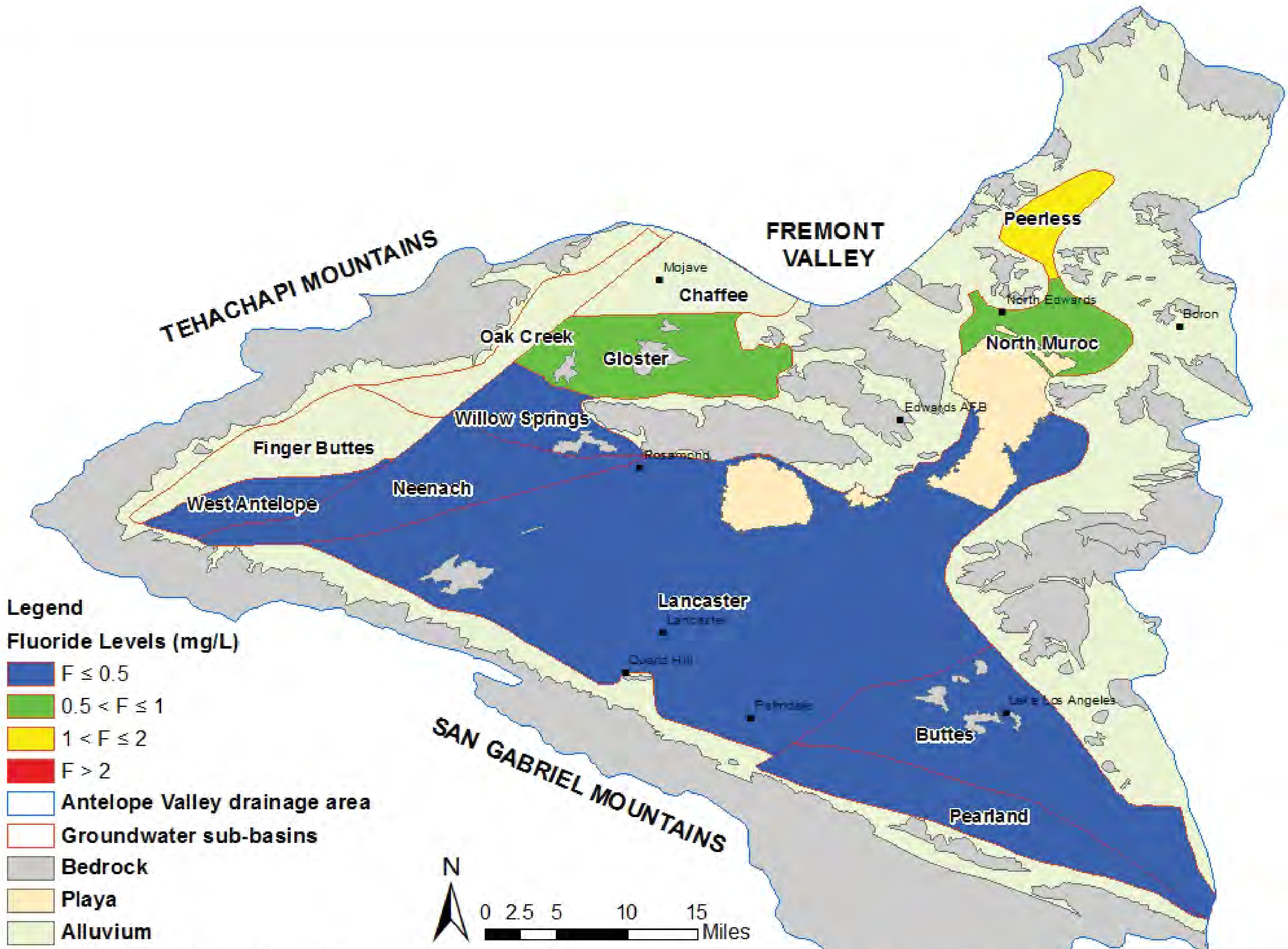
No data is available for the Chaffee, Gloster, Finger Buttes, West Antelope and Oak Creek sub-basins.
The mean chromium concentration of results for the Antelope Valley Groundwater Basin is 5.5 µg/L.

Figure 3-11: Fluoride Concentration Range by Well



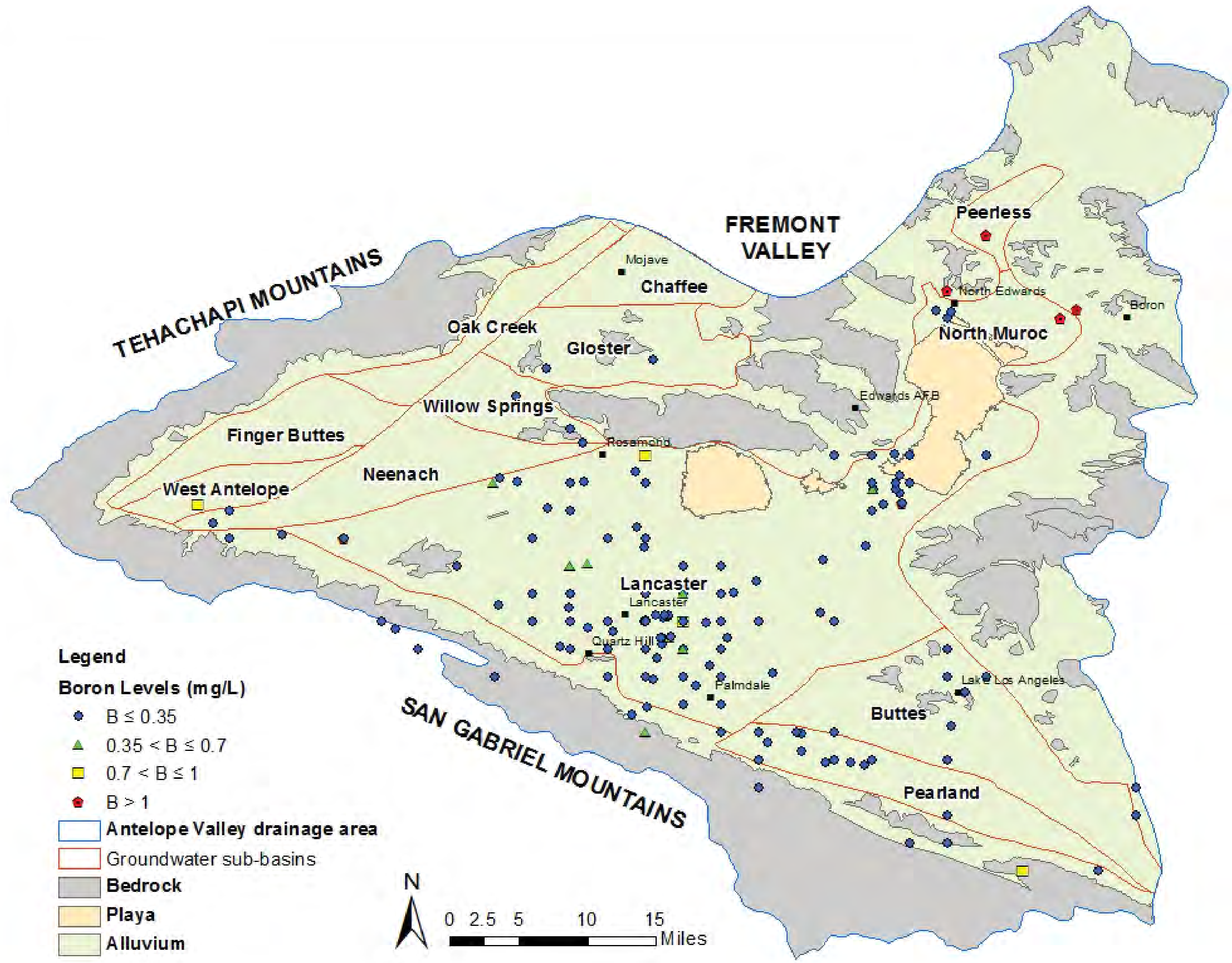
5-55

Figure 3-12: Fluoride Concentration Range by Sub-Basin



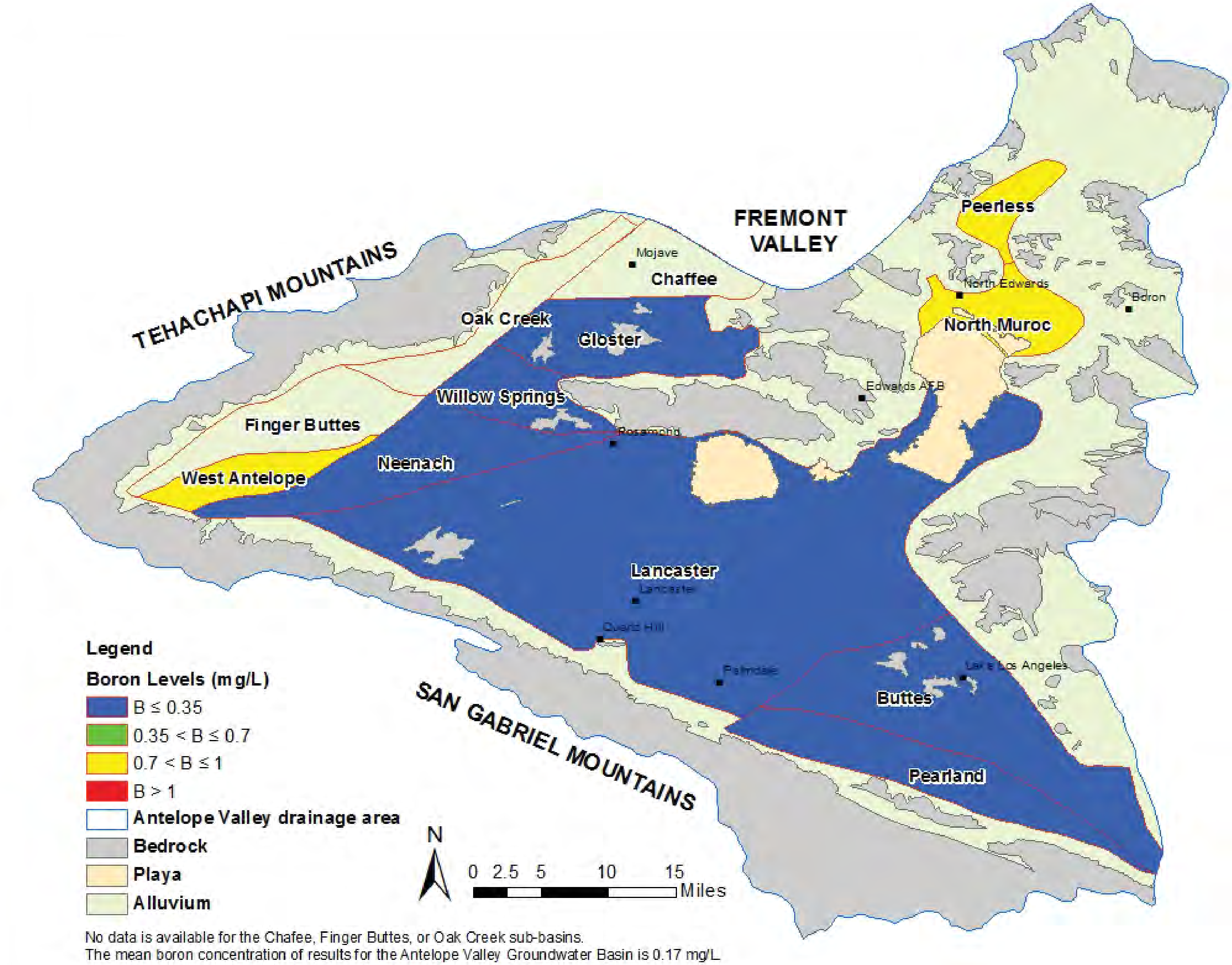
No data is available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.
The mean fluoride concentration of results for the Antelope Valley Groundwater Basin is 0.44 mg/L.

Figure 3-13: Boron Concentration Range by Well



5-57

Figure 3-14: Boron Concentration Range by Sub-Basin



3.2.1 GeoTracker Groundwater Ambient Monitoring and Assessment Database

The State Board's GeoTracker GAMA database integrates data from State and Regional Boards, CDPH, Department of Pesticide Regulation (DPR), Department of Water Resources (DWR), USGS, and Lawrence Livermore National Laboratory (LLNL). The GAMA database was used to download historical water quality data for municipal water supply wells in the Antelope Valley.

The search parameters were selected based on the following criteria:

1. Datasets: Supply Wells – CDPH
2. GIS Layer: Groundwater Basins
3. Groundwater Basin: Antelope Valley (6-44)
4. Well Type: Wells With Results
5. Constituents: Arsenic (MCL=10 µg/L), Boron (NL=1 mg/L), Chloride (SMCL=500 mg/L), Chromium (MCL=50 µg/L), Fluoride (MCL=2 mg/L), Nitrate as NO_3 (MCL=45 mg/L) and Total Dissolved Solids (SMCL = 1000 mg/L)
6. Timeline: All Years

A data file for each constituent was exported separately. The data included the following fields: well ID, well name, approximate latitude, approximate longitude, chemical, qualifier, result, units, date, dataset category, dataset source, county, regional board, groundwater basin name, assembly district and senate district.

The approximate latitude and longitude coordinates of the CDPH supply wells are within one mile of the actual locations. Each set of well coordinates is a cluster of wells. The wells depicted in Figures 3-1 through 3-14 may represent multiple water supply wells. The location of each well in terms of sub-basin was determined by mapping the coordinates with ArcGIS software.

The downloaded data was then verified and filtered. The units for each sample entry were verified to ensure that they were consistent for the same chemical. Only samples tested within the 10-year baseline period of 2001-2010 were selected. Samples tested before and after the 10-year window were excluded. Future GAMA data should be reviewed to correct any errors in reported values due to incorrect units or values.

Nitrate as NO_3 data is available from GAMA. This data was converted to nitrate as nitrogen (N) by dividing each number by the molecular weight ratio of NO_3 to N (approximately 4.4).

3.2.2 USGS National Water Information System Database

As part of the USGS program for disseminating water data within USGS, to USGS cooperators, and to the general public, the USGS maintains a distributed network of computers and fileservers for the acquisition, processing, review, and long-term storage of water data. This distributed network of computers is called the NWIS. Many types of data are stored in NWIS, including comprehensive information for site characteristics, well-construction details, time-series data for gage height, streamflow, groundwater level, precipitation, and physical and chemical properties of water. Additionally, peak flows, chemical analyses for discrete samples of water, sediment, and biological media are accessible within NWIS.

USGS data is obtained on the basis of category, such as surface water, groundwater, or water quality, and by geographic area. Further refinement is possible by choosing specific site-selection criteria and by defining the output desired. The data originates from all 50 states, plus border and territorial sites, and include data from as early as 1899 to present. Of the over 1.5 million sites with NWIS data, the vast majority are for wells; however, there are thousands of sites with streamflow data, many sites with atmospheric data such as precipitation, and about 10,900 of the sites provide current condition data. The groundwater observations used in this plan were obtained for the Antelope-Fremont Valleys hydrologic unit, designated by the code 18090206 by USGS.

Individual well location coordinates were determined using the USGS site number for each well. The USGS well site-numbering system is based on the grid system of latitude and longitude and provides the geographic location of the well and a unique number for each site. The number consists of 15 digits: the first 6 digits denote the degrees, minutes, and seconds of latitude; the next 7 digits denote degrees, minutes, and seconds of longitude; and the last 2 digits are a sequential number for wells within a 1-second grid. In the event that the latitude-longitude coordinates for a well are the same, a sequential number such as “01,” “02,” and so forth, would be assigned as one would for wells.

The location of each well in terms of sub-basin was determined by using the well coordinates given by the site numbers and identifying the sub-basin location in a map created using ArcGIS software. Only data from the 2001 to 2010 baseline period were considered in the analysis.

3.3 Current Salt and Nutrient Characterization of the Groundwater Basin

For the initial analysis of this plan, the current water quality of the groundwater basin is assumed to be equivalent to the average water quality during the baseline period between 2001 and 2010 (see Table 3-2). In future analyses as part of the monitoring plan (see Section 5 regarding the SNMP monitoring plan), the current water quality will be determined by calculating the average water quality concentrations for the most recent 5-year period.

3.4 Salt and Nutrient Characterization of the Source Water

Imported and surface water used for potable supply may undergo treatment at one of the region’s four water treatment plants. Recycled water may originate from five different wastewater treatment plants in the Antelope Valley. Table 3-3 provides source water quality information for the constituents identified in Section 3.1. Along with water quantity projections, this information was used in determining the basin’s salt/nutrient loadings for the 25-year projection period.

The water imported to the Antelope Valley is of high quality and the average concentrations calculated for each of the SNMP constituents meet drinking water standards. Stormwater is considered a high quality water, because it contains low concentrations of most constituents, including salts and nutrients. Because of its high quality, it is desirable to maximize the use of stormwater for groundwater recharge to lower constituent concentrations in the basin. Thus, the Antelope Valley IRWMP stakeholders have identified projects that utilize stormwater to augment groundwater recharge. For the most part, the recycled water available in the Antelope Valley is also high quality and meets most drinking water standards. Recycled water produced by the Edwards Air Force Base tend to be higher in salt and nutrient concentration (e.g., TDS, nitrate, and chloride) which is probably due to source water coming from higher concentration supplies. The groundwater used in that area is typically pumped from the lower aquifer, which has a much higher mineral content than the middle and upper aquifers of the southern regions. Rosamond Community Services District treats wastewater to secondary standards and is undergoing treatment plant upgrades and expansion to produce tertiary treated recycled water. The first phase of the upgrades has been completed, but the reuse expansion is still underway.

Table 3-3: Source Water Quality

	Average Concentration (mg/L unless otherwise noted)										
Constituent	State Water Project (California Aqueduct)					WRP/WWTP (Recycled Water)					Stormwater
	Raw (a)	Treatment Plant (potable)									
		Acton (a)	Eastside (a)	Quartz Hill (a)	Rosamond (b)	Palmdale (c)	Lancaster (d)	Air Force Research Lab (e)	Main Base (f)	RCSD (g)	Littlerock Reservoir (h)
TDS	300	274	284	293	290	489	444	430	815	-	152
Chloride	85	83	83	86	84	158	128	50	330	-	3.7
Nitrate as N	0.90	0.90	0.97	0.91	0.92	3.07	6.31	3.3	16	6	0.08
Arsenic (µg/L)	3.8	1.4	1.2	1.2	1.2	ND	ND	7.2	2.3	-	ND
Chromium (µg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
Fluoride	0.1	0.1	0.1	0.1	0.1	-	-	-	0.36	-	0.3
Boron	0.162	0.240	0.180	0.170	0.160	-	-	0.25	0.67	-	ND

Table Notes

(a) Antelope Valley-East Kern Water Agency Annual Water Quality Report (2001-2010) - Los Angeles County System. Boron was only tested in 2009.
(b) Antelope Valley-East Kern Water Agency Annual Water Quality Report (2001-2010) - Kern County System. Boron was only tested in 2009.
(c) Average 2013 water quality for tertiary treated effluent at LACSD 20 Palmdale WRP. The detection limit for arsenic is 1 µg/L.
(d) Average 2013 water quality for tertiary treated effluent at LACSD 14 Lancaster WRP.
(e) 2011 Annual Monitoring Report for EAFB Air Force Research Laboratory (AFRL) Treatment Plant.
(f) 2012 Annual Report for EAFB Main Base WWTP.
(g) Water quality in May 2013 for RCSD WWTP. Additional water quality testing after RCSD obtains permit from the Lahontan Regional Board.
(h) Water quality (2001-2010) provided by Palmdale Water District. Used as stormwater water quality.

3.5 Fate and Transport

Historically, groundwater in the basin generally flows north from the San Gabriel Mountains and south and east from the Tehachapi Mountains toward the Rosamond, Buckhorn, and Rogers dry lakes (DWR 2004). The general direction of groundwater flow is illustrated with groundwater level contours in Figure 3-15. In the Neenach sub-basin, groundwater flows to the northeast. In the Pearland sub-basin, groundwater generally moves from the southeast to northwest. In the Lancaster sub-basin, groundwater flows from areas of natural recharge to the low water altitude areas in the south-central part of the sub-basin.

Fate and transport refers to the way constituents move through the environment, from the source to how they arrive at their ultimate destinations.

The fate and transport of TDS and chloride in groundwater is influenced by groundwater flow which is governed by hydraulic gradients. Average TDS concentrations in the Antelope Valley Groundwater Basin are below the recommended SMCL. Chloride is soluble in water and moves freely with water through soil and rock. Chloride is not readily consumed by microorganisms, so it is more persistent than nitrate and likely to leach into groundwater (USGS 2004). Average chloride levels in the Antelope Valley Groundwater Basin are well below the recommended SMCL.

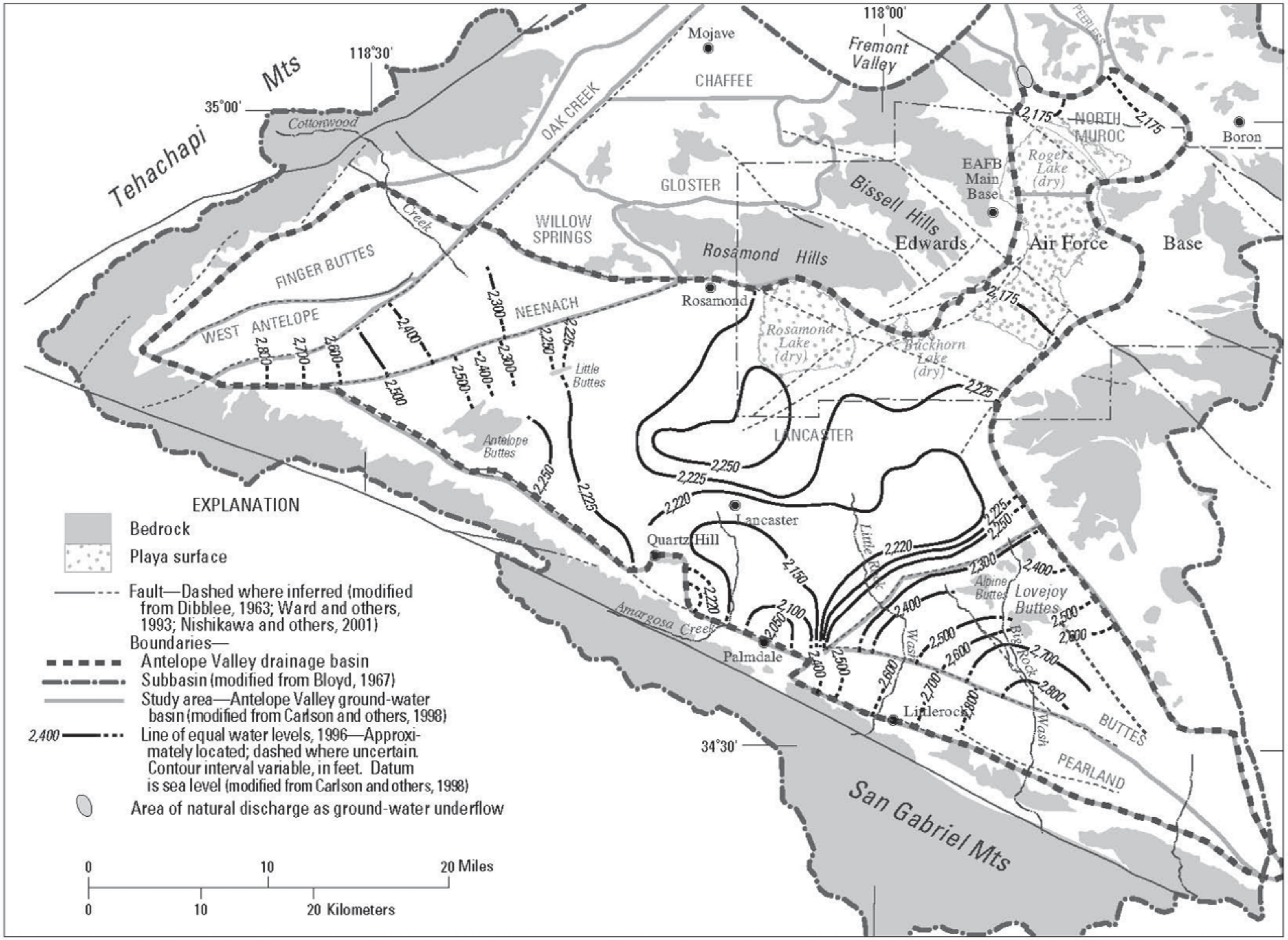
Elevated concentrations of nitrate are commonly found at shallow water-table depths. However, studies show that water and nitrate transport from the root zone to the water table follow preferential flow paths with potential to reach deeper portions of the soil vadose zone and the water table, with limited denitrification. Geologic and hydraulic parameters vary substantially causing high spatial variability of nitrate transport. But in general, nitrate is soluble and mobile at the concentrations typically found in soil and may leach into groundwater. Ammonium (NH_4^+) is strongly adsorbed by most soils and thus is not a concern.

Although movement of nitrate with percolating water through the unsaturated zone may take many years to reach groundwater, long-term increases are possible where aquifers are recharged by nitrate-rich water such as recycled water. In the saturated zone, groundwater movement is generally slow and there is little mixing. For that reason, nitrate contamination is generally localized and can possibly continue for decades after nitrate contaminant sources are eliminated because of the slow rate of movement and lack of dilution.

Fortunately, nitrate levels in the groundwater basin are well below the MCL.

Arsenic, boron, fluoride, and chromium in the region’s groundwater mainly originate from natural sources, such as rock and soil, as water moves through the ground and dissolves minerals and salts from the rock formations.

Figure 3-15: Antelope Valley Groundwater Levels (USGS 2004)



3.6 Current and Future Projects

To assess salt and nutrient impacts in the Antelope Valley, current and future projects having the potential to significantly contribute to salt and/or nutrient impacts to the Antelope Valley Groundwater Basin were identified. Details of these projects are described below. Initially, projects having the potential to impact the salt and nutrient content of Antelope Valley Groundwater Basin were identified from the projects listed in the 2007 AVIRWMP. The SNMP stakeholder group added and deleted projects to and from the project list, as necessary and as a result of meeting discussions. A project was deleted from the list if it was deemed irrelevant to this SNMP due to the project's implementation date occurring after the SNMP future planning period (2011-2035) or the project was not expected to impact the basin salt and/or nutrient levels. At the time of development of this SNMP, some projects were in the early stages of development, such as the concept phase, and were not included due to insufficient information to assess impacts. Inclusion of additional projects in future updates to the SNMP necessitates evaluation of project details for relevance, such as those listed in the SNMP "Project Identification Form". The blank and completed project identification forms are included in Appendix E.

Figure 3-16 is a map showing the locations of the identified SNMP projects within the Antelope Valley groundwater basin. Figure 3-17 shows the SNMP project locations within the Lancaster sub-basin.

3.6.1 Project Summary Descriptions

1. *Amargosa Creek Recharge Project*
   Proposed by the City of Palmdale, this project consists of multiple proposed improvements (overall project is the Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project), one of which includes expanding the size and capacity of spreading grounds to increase the natural recharge of the underlying aquifer. The recharge component includes eight basins to recharge groundwater using raw State Water Project water and stormwater runoff from the Amargosa Creek Watershed. Recharge volumes are dependent on available supply and annual precipitation, anticipated averages are listed below in Table 3-4.

2. *Antelope Valley Water Bank*
   The project is owned by the Valley Mutual Water Company, which operates the bank within the structure of the Semitropic-Rosamond Water Bank Authority (SRWBA). At full build-out, the water banking project will provide up to 500,000 acre-feet of storage and the ability to recharge and recover up to 100,000 AFY of water for later use when needed. The project recharges water from the State Water Project into storage using recharge basins and will use new and existing wells and regional conveyances to recover water for delivery. The project is being constructed in phases and currently has 320 acres of operational percolation pond capacity.

3. *Eastside Banking and Blending Project*
   Operational water recharge and recovery site providing a supplemental potable source of water for the AVEK Eastside Water Treatment Plant. The project will involve State Water Project water spread over local recharge basins, storing water for future recovery during dry or drought years. This alternative potable water supply will be used for periodic substitution or supplementation to the Eastside plant.

4. *Edwards Air Force Base Air Force Research Laboratory Treatment Plant*
   The Edwards Air Force Base (EAFB) Air Force Research Laboratory (AFRL) Treatment Plant produces secondary effluent. The effluent is discharged to onsite evaporation ponds.

5. *EAFB Main Base Wastewater Treatment Plant*
   The EAFB Main Base Wastewater Treatment Plant (WWTP) discharges treated domestic wastewater. The facility collects, treats and disposes of a design 24-hour daily average flow of 2.5 million gallons per day (MGD) and a design peak daily flow of 4.0 MGD from the housing, main base, north base and south base areas. The facility is designed to produce tertiary treated effluent and has the capacity to hold up to 3,000 gallons per day of seepage. For three months of the year during winter, the effluent is discharged to onsite evaporation ponds. The effluent is used to irrigate the golf course for the remainder of the year.

6. *EAFB Evaporation Ponds*
   The evaporation ponds receive effluent from the EAFB AFRL Treatment Plant and the EAFB Main Base WWTP.

7. *EAFB Golf Course Irrigation*
   The golf course is the largest user of recycled water at the EAFB. It receives the tertiary effluent from the EAFB Main Base WWTP as irrigation water during the warmer months of the year.

8. *Lancaster WRP Upgrade and Expansion*
   The upgrade and expansion project was completed in 2012. The major components were upgraded wastewater treatment facilities, recycled water management facilities, and municipal reuse. Wastewater treatment processes were upgraded to meet tertiary recycled water requirements prescribed in CDPH's Title 22.

9. *Lancaster WRP Eastern Agricultural Site*
   Existing agricultural site using recycled water produced by the Lancaster WRP. Per Regional Board requirements, recycled water is applied to the crops at agronomic rates, based on the needs of the crop plant, with respect to water and nitrogen, to minimize deep percolation from the root zone to the groundwater table of the applied recycled water.

10. *Lancaster WRP Environmental Maintenance Reuse*
    Disinfected tertiary recycled water produced by the Lancaster Water Reclamation Plant (WRP) is used for environmental maintenance at Apollo Community Regional Park (Apollo Park) and Piute Ponds. Since 1972, Apollo Park has been using recycled water to fill a series of lakes that are used for recreational fishing and boating. Piute Ponds are located on Edwards Air Force Base Property and uses recycled water to maintain marsh-type habitat. Flows below do not include water from Apollo Park lakes that is used for landscape irrigation within the park.

11. *Multi-use/Wildlife Habitat Restoration Project*
    Duck Hunting Club (Wagas Land Company) in both Kern and Los Angeles County, started in 1925. The Antelope Valley region is a flyaway zone for many migratory birds flying south and the Club has been preserving habitat. The Club is coordinating with Waterworks to replace their groundwater use with recycled water. The Club would also allow Waterworks to use a portion of the property for banking.

12. *North Los Angeles/Kern County Regional Recycled Water Project*
The recycled water project is the backbone for a regional recycled water distribution system in the Antelope Valley. The proposed system is sized to distribute recycled water for irrigation and other approved uses throughout the service area and also deliver recycled water for recharge areas. Construction is phased over time and portions are already complete. The first phase was implemented in 2009. The flow projection below is based on project components being complete and excludes flows to the Palmdale Hybrid Power Plant (3,400 AFY) and groundwater recharge.

13. *Palmdale Hybrid Power Plant Project*
Construction of a 570 Mega-Watt electricity generating facility. The power plant will be a hybrid design, utilizing natural gas combined cycle technology and solar thermal technology. The plant is projected to use approximately 3,400 AFY of recycled water and will employ "zero liquid discharge" design.

14. *Palmdale Recycled Water Authority Recycled Water Project*
The recycled water project is the recycled water distribution system for the Palmdale Recycled Water Authority (PRWA). Construction is phased over time and the first portion to serve McAdam Park was completed and implemented in 2012.

15. *Palmdale WRP Upgrade and Expansion*
The upgrade and expansion project was completed in 2011. The major components were upgraded wastewater treatment facilities, recycled water management facilities, and municipal reuse. Wastewater treatment processes were upgraded to meet tertiary recycled water requirements prescribed in CDPH's Title 22.

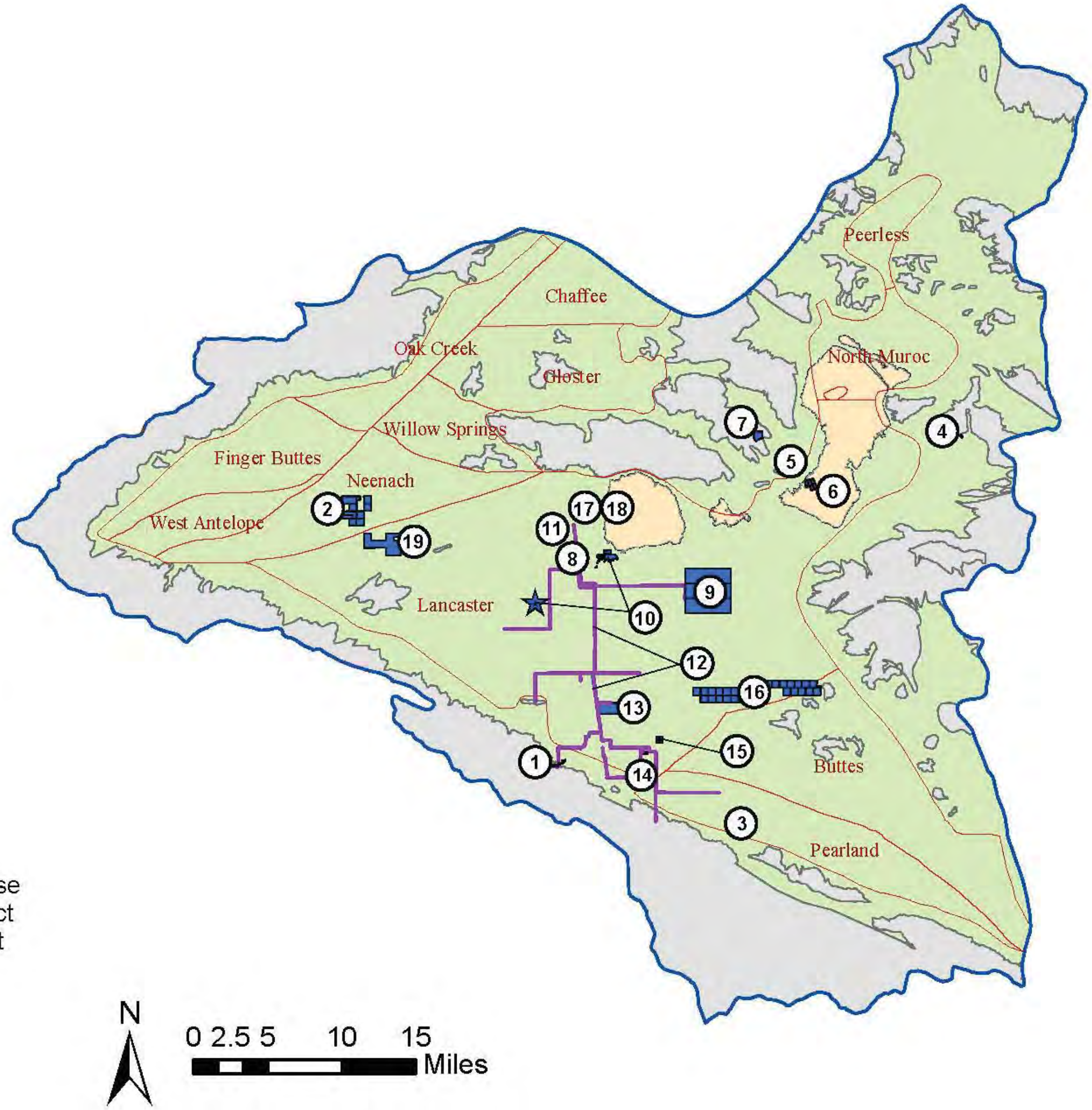
16. *Palmdale WRP Agricultural Site*
Existing agricultural site using recycled water produced by the Palmdale WRP. Per Regional Board requirements, recycled water is applied to the crops at agronomic rates, based on the needs of the crop plant, with respect to water and nitrogen, to minimize deep percolation of the applied recycled water from the root zone to the groundwater table. Additional land was acquired for future agricultural operations. Infrastructure is in place, but not is currently used.

17. *Rosamond Community Services District (RCSD) WWTP*
The plant, owned and operated by RCSD, produces both secondary and tertiary treated recycled water. The capacity of the secondary treatment is 1.3 MGD, while the tertiary capacity is 0.5 MGD. The design to upgrade the tertiary treatment capacity to 1.0 MGD is complete. However, the construction is on hold indefinitely due to lack of funding.

18. *RCSD WWTP Evaporation Ponds*
The evaporation ponds receive effluent from the RSCD WWTP.

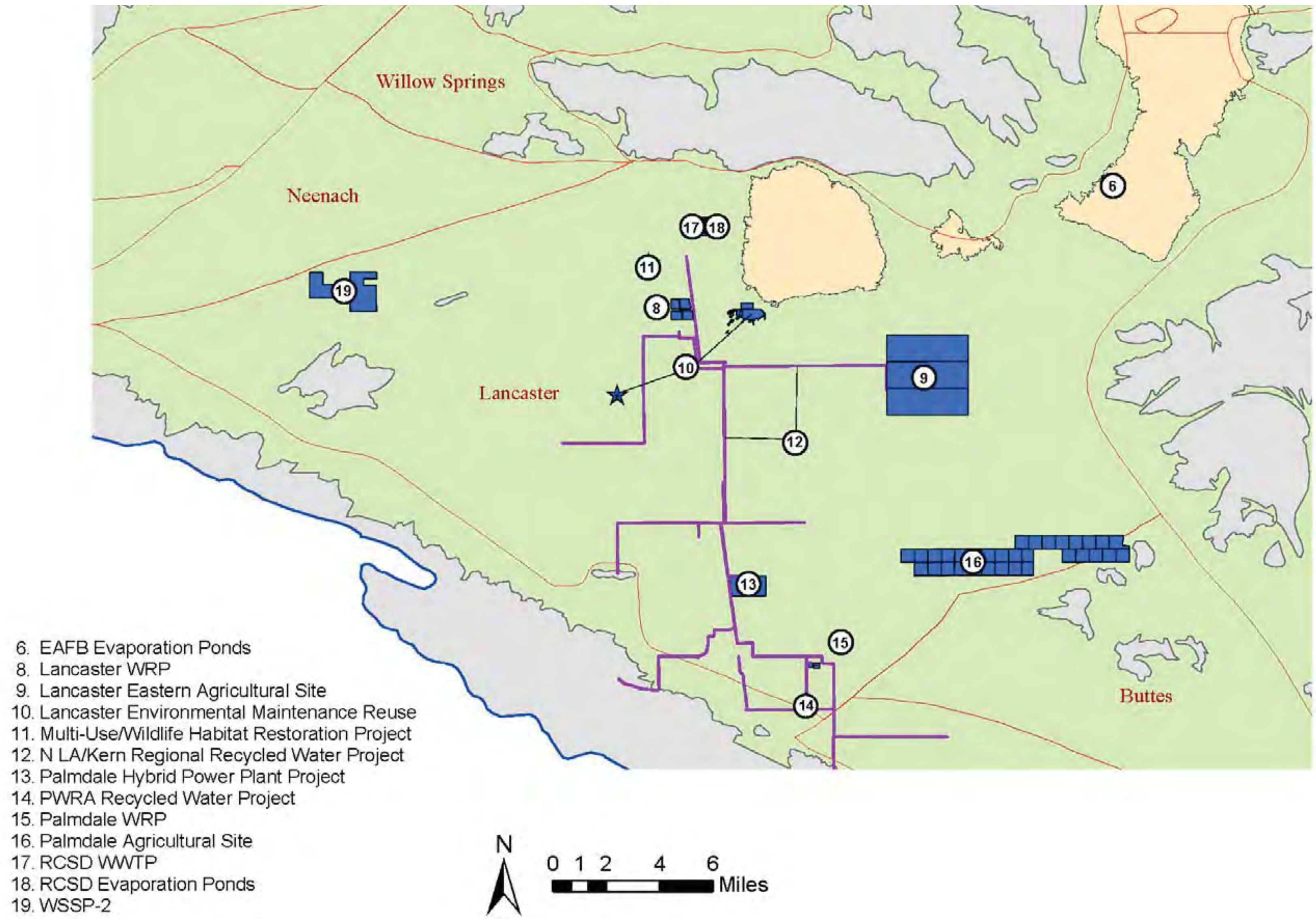
19. *Water Supply Stabilization Project (WSSP-2)*
Imported water stabilization program that utilizes State Water Project (SWP) water delivered to the Antelope Valley Region's west side for groundwater recharge during wet years for supplemental supply during dry years and to meet peak summer demand. This project includes facilities necessary for the delivery of untreated water for indirect recharge (percolation basins) and wells and pipelines for raw water and treated water extraction and conveyance.

Figure 3-16: SNMP Projects in the Antelope Valley Basin



1. Amargosa Creek Recharge Project
2. Antelope Valley Water Bank
3. Eastside Banking and Blending Project
4. EAFB AFRL Treatment Plant
5. EAFB Main Base WWTP
6. EAFB Evaporation Ponds
7. EAFB Golf Course
8. Lancaster WRP
9. Lancaster Eastern Agricultural Site
10. Lancaster Environmental Maintenance Reuse
11. Multi-Use/Wildlife Habitat Restoration Project
12. N LA/Kern Regional Recycled Water Project
13. Palmdale Hybrid Power Plant Project
14. PWRA Recycled Water Project
15. Palmdale WRP
16. Palmdale Agricultural Site
17. RCSD WWTP
18. RCSD Evaporation Ponds
19. WSSP-2

Figure 3-17: SNMP Projects in the Lancaster Sub-Basin



Additional projects were considered, but had implementation dates after the 2035 SNMP planning horizon or had insufficient project details. The projects include:

- *Amargosa Water Banking and Stormwater Retention Project*
  This project would recharge a blend of recycled water from the Lancaster WRP with stormwater and/or treated imported water at a 100-acre stormwater basin in the City of Lancaster. The pilot project would allow extraction of 2,500 AFY. Ultimately, this recharge project would recharge 50,000 AFY of blend water, consisting of 40,000 AFY of imported water and 10,000 AFY of recycled water. The project would extract an average of 48,000 AFY of recharged water via a new well field and deliver the water to wholesaler/retailer distribution system(s) and private agricultural users.

- *Barrel Springs Detention Basin and Wetlands*
  Proposed by the City of Palmdale, this project will provide flood control for the City of Palmdale and provide for wetland enhancement and habitat protection. The project includes the construction of an 878 AF detention basin in the Barrel Springs area.

- *Hunt Canyon Groundwater Recharge & Flood Control Basin*
  Proposed by the Palmdale Water District, this project entails construction of a new 3,000 AF detention/recharge basin. The basin would be used to store raw aqueduct water to allow recharge into the aquifer and would act as a detention basin during severe storms.

- *Littlerock Creek Groundwater Recharge and Recovery Project*
  This project would involve groundwater recharge using a blend of recycled water, from the Palmdale Water Reclamation Plant, imported water and local stormwater. Completion of a feasibility study is expected in 2015.

3.6.2 Project Water Volume Projections

Table 3-4 shows the water volume projections, associated with current and future projects, for the 25-year planning period (2011-2035). This planning period parallels the planning horizon for the Antelope Valley IRWMP, 2013 Update, and the 2010 Integrated Regional Urban Water Management Plan for the Antelope Valley (LACWD, June 2011). These projections will allow the stakeholder group to analyze the salt and nutrient impacts the projects may have on the basin.

Table 3-4: Water Volume Projections for Current and Future Projects

Project Name	Source	Implementation Date	Water Quantity Projection (AFY)					
			2010	2015	2020	2025	2030	2035
Treatment Plants								
EAFB Air Force Research Laboratory Treatment Plant	Recylced	Implemented	46	46	46	46	46	46
EAFB Main Base WWTP	Recylced	Implemented	511	511	511	511	511	511
Lancaster WRP Expansion	Recylced	2012	-	17,000	18,500	20,000	21,500	23,000
Palmdale WRP Expansion	Recylced	2011	-	11,000	12,000	12,000	13,000	13,000
RCSD WWTP	Recylced	Implemented	560	560	560	560	560	560
Reuse								
EAFB Golf Course Irrigation	Recylced	Implemented	383	383	383	383	383	383
Lancaster WRP Eastern Agricultural Site	Recylced	Implemented	1,000	10,500	11,500	11,200	11,700	10,900
Landcaster WRP Environmental Maintenance Reuse	Recylced	Implemented	-	5,700	5,700	5,700	5,700	5,700
Multi-Use Wildlife Habitat Restoration Project	Recylced	2016	-	-	2,000	2,000	2,000	2,000
North LA/Kern County Regional Recycled Water Project	Recylced	2009	3	700	1,800	3,600	4,700	7,100
PRWA Recycled Water Project	Recylced	2012	-	80	1,000	1,000	2,300	3,500
Palmdale WRP Agricultural Site	Recylced	Implemented	7,600	10,200	6,400	7,400	4,100	800
Evaporation/Export								
EAFB Evaporation Ponds (Main Base & AFRL)	Recylced	Implemented	174	174	174	174	174	174
Palmdale Hybrid Power Plant Project	Recylced	2016	-	-	3,400	3,400	3,400	3,400
RCSD WWTP Evaporation Ponds	Recylced	Implemented	560	560	560	560	560	560
Groundwater Recharge/Banking								
Amargosa Creek Recharge Project	Imported	2015	-	24,300	24,300	24,300	24,300	24,300
	Stormwater		-	400	400	400	400	400
Antelope Valley Water Bank	Imported	2010	1,300	22,000	22,000	22,000	22,000	22,000
Eastside Banking and Blending Project	Imported	2015	-	5,000	10,000	10,000	10,000	10,000
Water Supply Stabilization Project (WSSP-2 Project)	Imported	Implemented	10,000	25,000	25,000	25,000	25,000	25,000

Section 4: Basin and Antidegradation Analysis

4.1 Antidegradation Policy

In 1968, the State Board adopted Resolution No. 68-16, "*Statement of Policy with Respect to Maintaining High Quality of Waters in California*," establishing an Antidegradation Policy for the protection of water quality in California. The Resolution states that whenever the existing quality of a water is better than the applicable established water quality objectives, such existing quality shall be maintained until it has been demonstrated to the State that any change will be consistent with the maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use(s) of such water and will not result in water quality less than that prescribed by the respective Regional Board.

In order to determine whether the projects, identified in Section 3, if implemented, will satisfy the Antidegradation Policy, the following were performed:

1. Identified the Beneficial Uses of the Antelope Valley Groundwater Basin
2. Identified the water quality objectives established by the Regional Board and other criteria to protect the beneficial uses of the Antelope Valley Groundwater Basin
3. Projected whether the identified projects, if implemented, will significantly change the water quality of the Antelope Valley Groundwater Basin
4. Determined whether any projected changes to the groundwater would exceed water quality objectives or unreasonably affect beneficial uses of the groundwater
5. Demonstrated whether any projected change would be consistent with the maximum benefit to the people.

The State Board determined that the use of recycled water, in accordance with the Recycled Water Policy, which supports the sustainable use of groundwater and/or surface water, which is sufficiently treated so as not to adversely impact public health or the environment and which ideally substitutes for use of potable water, is presumed to have a beneficial impact. The Recycled Water Policy also discusses State mandates to increase recycled water use while protecting water quality. Increased use in the region is especially critical given the basin's limited supply, potential climate change impacts, and threatened imported water supply. Recycled water produced and used in the Antelope Valley is regulated by the Regional Board and must meet environmental and health standards established for its intended use. As discussed in the AV IRWMP and Water Plans of the Antelope Valley Region's water and municipal agencies, there are plans to increase recycled water use in the Antelope Valley in order to decrease the demand for potable supplies while potentially increasing their availability and reliability.

To satisfy the Antidegradation and Recycled Water Policies, the basin background groundwater quality and the potential water quality impacts of the projects, identified in Section 3, on the Antelope Valley Groundwater Basin were examined. In order to assess the groundwater and the impacts of these projects, the basin's water quality goals, with respect to the SNMP constituents of concern, were selected based on protecting the groundwater's beneficial uses, as discussed later in this Section. To assess the magnitude of the basin's need for water quality protection, the baseline "assimilative capacity" for each SNMP constituent of concern was determined by subtracting the baseline concentrations established in Section 3 from the SNMP water quality management goals. Constituent balances for those constituents with a significant potential to exceed water quality management goals (i.e., TDS and arsenic) were created and projections were calculated using an instantaneous mixing model for the groundwater basin. Included in the model are calculated impacts of the identified projects in various scenarios, including simulated drought conditions, over the 25-year planning period (2011-2035). The results from the 25-year scenarios were used to predict results over longer periods. Then, the groundwater quality projections that were calculated using the model were compared to the assimilative capacities for each SNMP constituent of concern to determine whether significant degradation of the water would occur if the SNMP projects are to be implemented as planned. In addition, future salt and nutrient concentrations will be monitored (as described in Section 5) to evaluate actual water quality and predictions as compared to the SNMP water quality management goals to ensure consistency with the Antidegradation Policy.

4.2 Beneficial Uses

As a regulatory agency, the Lahontan Regional Board's primary responsibility is to protect water quality within its jurisdiction, under which the Antelope Valley falls. The Regional Board adopted and implemented the "*Water Quality Control Plan for the Lahontan Region*" (Basin Plan; Regional Board 1995), which, among other functions, sets forth water quality standards for the surface and groundwater within the Regional Board's jurisdiction. The Basin Plan includes the designated uses of water within the Lahontan Region and the narrative and numerical objectives which must be maintained or attained as a means to protect those uses.

The Regional Board has designated the following beneficial uses to the Antelope Valley Groundwater Basin (Basin Unit 6-44):

- *Agricultural Supply (AGR):* Beneficial uses of waters used for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, and support of vegetation for range grazing.
- *Freshwater Replenishment (FRSH):* Beneficial uses of waters used for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).
- *Industrial Service Supply (IND):* Beneficial uses of waters used for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, geothermal energy production, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.
- *Municipal and Domestic Supply (MUN):* Beneficial uses of waters used for community, military, or individual water supply systems including, but not limited to, drinking water supply.

The beneficial uses for groundwater listed in the Basin Plan are for each groundwater basin or sub-basin as an entirety. The Regional Board recognizes that, in some areas, useable groundwater occurs above or below an aquifer of highly mineralized groundwater, which can contain concentrations of dissolved solids and metals, such as arsenic, unsuitable for drinking water. Therefore, a beneficial use designation in the Basin Plan does not indicate that all of the groundwaters in that particular location are suitable (without treatment) for a designated beneficial use. However, all waters in the Lahontan Region are designated as MUN unless they have been specifically exempted by the Regional Board through adoption of a Basin Plan amendment after consideration of substantial evidence to exempt such water. A MUN exemption has not been adopted for the Antelope Valley Groundwater Basin or any of its sub-basins.

4.3 Water Quality Objectives and Other Criteria

Water quality objectives are the allowable limits or levels of water quality constituents established for the beneficial uses of water or the prevention of nuisance within a specified area. Therefore, the Regional Board established water quality objectives for the waters within the Lahontan Region that it considers protective of the designated beneficial uses. The general methodology used in establishing water quality objectives involves, first, designating beneficial water uses, and second, selecting and quantifying the water quality parameters necessary to protect the most vulnerable (sensitive) beneficial uses. As additional information is obtained on the quality of the Lahontan Region's waters and the beneficial uses of those waters, certain water quality objectives may be updated to reflect the levels necessary to protect those beneficial uses. Revised water quality objectives would then be adopted as part of the Basin Plan by amendment.

The Regional Board has not established water quality objectives specific to the Antelope Valley Region. However, water quality objectives have been established that apply to all groundwaters in the Lahontan Region. These objectives are aimed to be protective of the beneficial uses assigned to the groundwater basins.

The water quality objectives that apply to groundwater designated as MUN are based on drinking water standards specified in Title 22 of the California Code of Regulations (CCR). Table 4-1 lists the water quality objectives associated with salts and nutrients that are applicable to the MUN designated groundwaters. The MUN water quality objectives for arsenic, chromium, fluoride, and nitrate are based on the Title 22 CCR drinking water primary Maximum Contaminant Levels (MCLs), which are health-based. While there are primary MCLs for nitrite and nitrate plus nitrite, only nitrate is examined in this SNMP because nitrite is not typically observed above detection levels in samples from the Antelope Valley groundwater. The MUN water quality objectives for total dissolved solids (TDS) and chloride are based on the Title 22 CCR Secondary Maximum Contaminant Levels (SMCLs) determined for "Consumer Acceptance," although no fixed consumer acceptance contaminant level has been established. According to Title 22 CCR, constituent concentrations lower than the "Recommended" contaminant levels are desirable for a higher degree of consumer acceptance. Constituent concentrations ranging up to the "Upper" contaminant levels are acceptable if it is neither reasonable nor feasible to provide more suitable waters. Constituent concentrations ranging to the "Short Term" contaminant level are acceptable for community water systems on a temporary basis pending construction of treatment facilities or development of acceptable new water sources or on a case-by-case basis.

Table 4-1: Lahontan Basin Plan MUN Water Quality Objectives

Constituent	Units	MUN Water Quality Objective
Arsenic	µg/L	10
Chromium, total	µg/L	50
Fluoride	mg/L	2
Nitrate	mg/L as N	10
Total dissolved solids	mg/L	500 (recommended)/1000 (upper)/1500 (short term)
Chloride	mg/L	250 (recommended)/500 (upper)/600 (short term)

In California, boron is not regulated in drinking water and therefore, there is no established drinking water MCL for boron. However, the California Department of Public Health (CDPH) has established a health-based advisory level, or “notification level,” for boron at 1000 µg/L. An exceedance of the notification level does not pose a significant health risk but may, in certain cases, warrant notification to the local governing bodies pursuant to the California Health & Safety Code. Notification levels are non-regulatory and are established by CDPH as precautionary measures for constituents that may be considered candidates for establishment of MCLs, but have not yet undergone or completed the regulatory standard-setting process prescribed for MCL development and are not drinking water standards.

To examine the appropriate water quality to protect AGR uses, Regional Board staff suggested using the State Board’s online searchable database of water quality based numeric thresholds.[1] These thresholds may be used to assess whether beneficial uses of surface water or groundwater are likely to be impaired or threatened. The thresholds listed under “Agricultural Water Quality Goals” in the database are based on the paper, “*Water Quality for Agriculture*,” published by the Food and Agriculture Organization of the United Nations in 1985, and containing guidelines on water quality protective of various agricultural uses of water, including irrigation of various types of crops and stock watering. Information on each of SNMP constituents was retrieved from the database and the thresholds listed under “Agricultural Water Quality Goals” were compiled. The listed thresholds for each constituent are listed in Table 4-2.

Crop information for the Antelope Valley Region was found in Los Angeles County Annual Crop Reports and Kern County Annual Pesticide Use Reports (Beeby et al. 2010). According to the reports, the following crops are grown in the region:

- Alfalfa, hay & other grains
- Apples
- Carrots
- Cherries
- Grapes
- Miscellaneous nursery
- Nectarines
- Onions
- Peaches
- Pears
- Plums
- Potatoes
- Pumpkins
- Squash
- Watermelons

“*Water Quality for Agriculture*” suggests that a maximum chloride concentration of 106 mg/L will not restrict the use of water as agricultural supply, especially if the water used is for irrigation of avocadoes, strawberries, or Indian Summer raspberries, which are sensitive to high concentrations of chloride. These crops are not commercially grown in the Antelope Valley and are not expected to be grown in the future. The next most chloride sensitive crops listed in “Water Quality for Agriculture” and that are grown in the Antelope Valley region are a variety of grapes, stone fruits, and citrus crops, which have a chloride tolerance maximum of 238 mg/L. The chloride threshold level of 238 mg/L is comparable to the recommended drinking water standard of 250 mg/L.

“*Water Quality for Agriculture*” indicates that the guideline provided for fluoride reflects the then-current information available and is supported by only limited, long-term field experience. The value is conservative, meaning that if the suggested limit is exceeded, toxicity to the plant may not occur.

The IND beneficial use by definition does not depend primarily on water quality, so water quality objectives do not apply. The FRSH beneficial use option for the groundwater is currently not being

[1] Accessible at http://www.waterboards.ca.gov/water_issues/programs/water_quality_goals/.

utilized and there are presently no related established water quality objectives for this use in the Antelope Valley.

Table 4-2: Recommended AGR Water Quality Thresholds

Constituent	Units	Recommended AGR Water Quality Thresholds
Arsenic	µg/L	100
Chromium, total	µg/L	none
Fluoride	mg/L	1
Nitrate	mg/L as N	none
Total dissolved solids	mg/L	450
Chloride	mg/L	238
Boron	µg/L	700

4.4 SNMP Water Quality Management Goals

As mentioned earlier, the purpose of developing the AV SNMP is to address the management of salts and nutrients to maintain water quality objectives and support beneficial uses. Considering the regulations and recommendations discussed and the purpose of this SNMP, certain water quality objectives and other levels were assigned as the SNMP water quality management goals. These levels are listed in Table 4-3 below. The SNMP water quality management goals are meant to serve as a management and planning tool for groundwater quality and not to serve as a basis for regulatory or discharge limits.

The SNMP water quality management goals for arsenic, chromium, and nitrate are based on the primary drinking water MCLs. The goal for boron is based on the AGR beneficial use threshold and the CDPH notification level. The goal for fluoride is based on the AGR beneficial use threshold and the MCL.

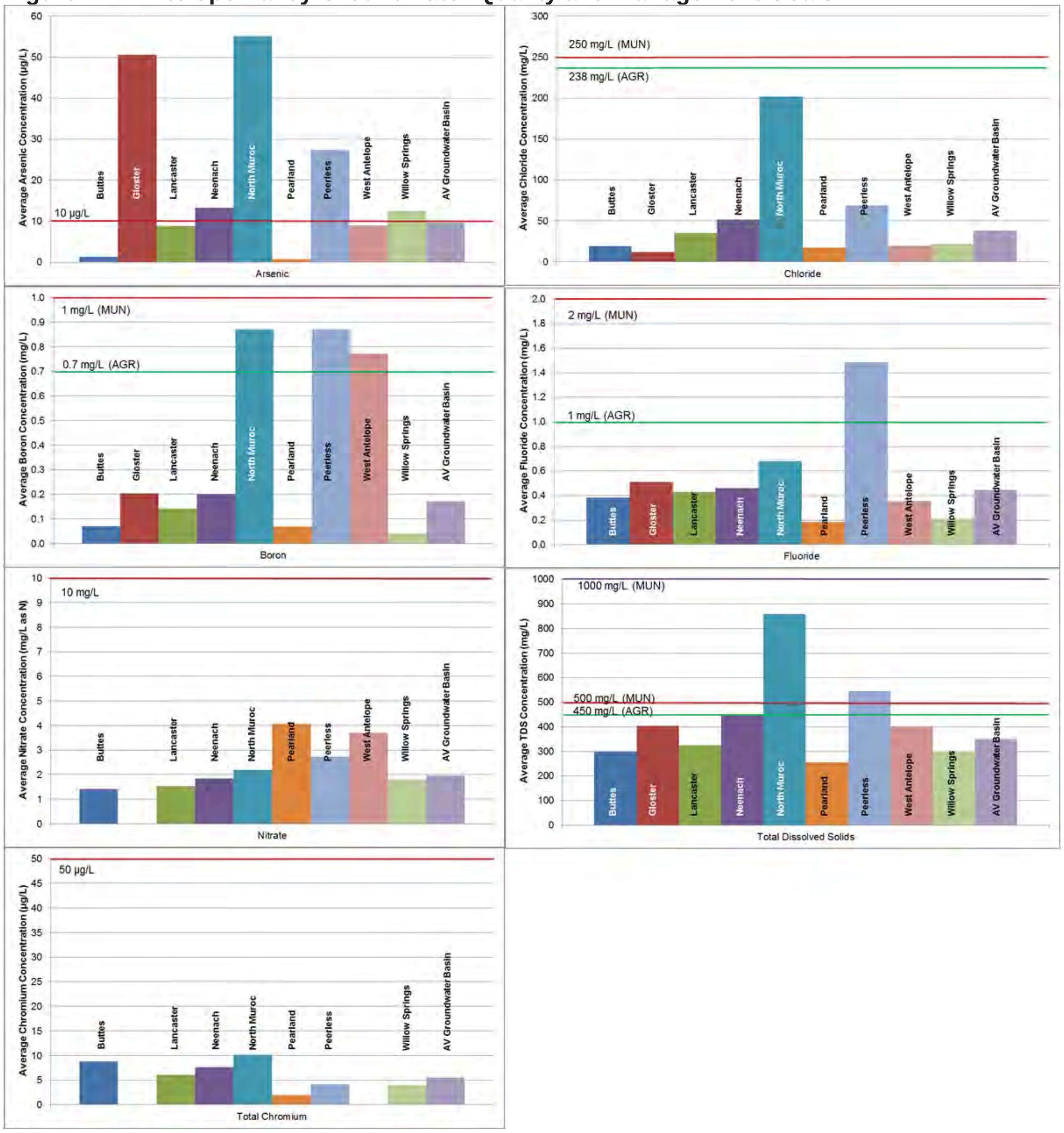
Per direction from the Regional Board, the goals for chloride and TDS are based on the baseline basin or sub-basin groundwater quality. If the basin's baseline groundwater quality is below the TDS or chloride constituent's respective AGR water quality threshold, the AGR threshold is assigned as the SNMP water quality management goal for that particular constituent in the basin. If the basin's baseline groundwater quality exceeds the AGR threshold, the recommended SMCL, or the upper SCML in the case that the recommended SCML is exceeded, is assigned as the SNMP water quality management goal for that particular constituent in the basin. The same strategy is used for assigning SNMP management goals to the sub-basins. Comparisons of the SNMP water quality management goals with the sub-basin average water quality are depicted in Figure 4-1. All of the SNMP water quality management goals are consistent with the Basin Plan.

Table 4-3: SNMP Water Quality Management Goals

Constituent	Units	MUN	AGR	SNMP Water Quality Management Goals
Arsenic	µg/L	10	100	10
Chromium, total	µg/L	50	none	50
Fluoride	mg/L	2	1	1-2 [b]
Nitrate	mg/L as N	10	none	10
Total dissolved solids	mg/L	500-1000-1500	450	450-500-1000[b]
Chloride	mg/L	250-500-600	238	238-250-500[b]
Boron	mg/L	1[a]	0.7	0.7-1[b]

a. California Notification Level
b. Basin and sub-basin goals are based on baseline groundwater quality

Figure 4-1: Antelope Valley Groundwater Quality and Management Goals



4.5 Assimilative Capacity

The Recycled Water Policy defines assimilative capacity for a constituent as the difference between a water quality objective and the mean concentration of the basin or sub-basin. Because specific numerical water quality objectives are not established for the Antelope Valley Groundwater Basin, the baseline assimilative capacity in this SNMP is calculated as the difference between the SNMP water quality management goal for a particular constituent and the mean baseline concentration of the basin or sub-basin. The SNMP constituents' baseline concentrations, as discussed in Section 3, are based on the water quality data from GAMA and NWIS for the period from 2001 through 2010. Baseline water quality was presented in Table 3-1 and baseline assimilative capacities for the Antelope Valley basin and sub-basins are shown in Table 4-4. A negative calculated value for assimilative capacity indicates that the baseline water quality already exceeds the SNMP water quality management goal and there is no assimilative capacity at this time for that particular constituent.

The magnitude of assimilative capacity for the sub-basins can be visualized in Figure 4-1 as the amount between the bar graph value and the SNMP water quality management goal. For the four sub-basins with planned projects (Lancaster, Neenach, Buttes, and Pearland), the only absence of assimilative capacity is with arsenic in the Neenach sub-basin. A small amount of arsenic assimilative capacity is available for the Antelope Valley Groundwater Basin and the Lancaster sub-basin and a small amount of TDS assimilative capacity is available for the Neenach sub-basin.

In regards to the remainder sub-basins, while some of the sub-basins lack assimilative capacity for certain constituents, it is important to note that none of the projects identified in Section 3 are expected to affect these groundwaters due to proximity and because these sub-basins' groundwaters are upstream of the projects. Also, much of the groundwater quality exceedances are due to natural causes, such as with arsenic and boron, and meeting water quality goals would most likely require treatment.

Gloster, North Muroc, Peerless, and Willow Springs sub-basins have groundwater quality exceeding the arsenic SNMP water quality management goal, and therefore, have no assimilative capacity with regards to arsenic. The high arsenic values have been known in the area to be naturally occurring, due to the movement of water through the basin rocks and soils.

North Muroc, Peerless, and West Antelope sub-basin average concentration of boron exceeded the level that "*Water Quality for Agriculture*" (Ayers & Westcot 1985) suggested for non-restricted agricultural use. Thus, these sub-basin areas may not be suitable or preferable for some boron-sensitive crops. However, all the sub-basins have assimilative capacity with respect the CDPH notification level for boron.

All the sub-basins have assimilative capacity with regards to chloride. However, the North Muroc sub-basin has an average groundwater quality of approximately 200 mg/L chloride and an assimilative capacity with respect to chloride of only approximately 36 mg/L. The remaining sub-basins have over 165 mg/L of chloride assimilative capacity, which is much greater than the ambient concentrations and thus considered ample.

All the sub-basins have assimilative capacity with regards to nitrate. The Pearland sub-basin has the highest average nitrate groundwater quality, calculated as over 4 mg/L as nitrogen. The assimilative capacity is slightly greater than this concentration, calculated at approximately 6 mg/L as nitrogen, and thus considered ample. Very localized exceedances of the nitrate SNMP water quality management goal have been known to occur within the Antelope Valley and these situations are mitigated by individual clean-up and remediation programs overseen by the Regional Board. Average conditions of the sub-basins do not exceed these goals.

Only the Peerless sub-basin has an average fluoride concentration that exceeds the level listed in the State Board's online searchable database of water quality based numeric thresholds for non-restricted agricultural use. So, this sub-basin area may not be suitable or preferable for some fluoride-sensitive crops. However, all the sub-basins have assimilative capacity with respect to fluoride and the drinking water MCL.

With respect to TDS, the North Muroc and Peerless sub-basins have average concentrations that do not meet the TDS-sensitive agricultural use level of 450 mg/L or the drinking water recommended SMCL of 500 mg/L, but have assimilative capacity with respect to the upper SMCL of 1000 mg/L. The rest of the sub-basins have assimilative capacity with respect to the 450 mg/L level.

Table 4-4: Antelope Valley Basin Baseline Assimilative Capacities

	Arsenic (µg/L)	Boron (mg/L)		Chloride (mg/L)		Fluoride (mg/L)		Nitrate (mg/L)	Total Chromium (µg/L)	Total Dissolved Solids (mg/L)		
SNMP water quality mgmt. goal	10	0.7	1	238	250	1	2	10	50	450	500	1000
Buttes	8.7	0.63	0.93	219	231	0.6	1.6	8.6	41	149.5	200	700
Gloster	-40.7	0.50	0.80	226	238	0.5	1.5	(no results)	(no results)	45.8	96	596
Lancaster	1.1	0.56	0.86	203	215	0.6	1.6	8.5	44	124.7	175	675
Neenach	-3.2	0.50	0.80	186	198	0.5	1.5	8.2	42	3.6	54	554
North Muroc	-45.1	-0.17	0.13	36	48	0.3	1.3	7.8	40	-408.2	-358	142
Pearland	9.2	0.63	0.93	221	233	0.8	1.8	5.9	48	194.5	244	744
Peerless	-17.5	-0.17	0.13	169	181	-0.5	0.5	7.3	46	-96.7	-47	453
West Antelope	1.1	-0.07	0.23	218	230	0.6	1.6	6.3	(no results)	47.5	98	598
Willow Springs	-2.4	0.66	0.96	216	228	0.8	1.8	8.2	46	148.9	199	699
AV Groundwater Basin	0.3	0.53	0.83	200	212	0.6	1.6	8.0	44	99.8	150	650

4.6 Salt and Nutrient Balance

To assess the salt and nutrient impacts of current and future projects and water uses within the Antelope Valley, projected constituent loadings and unloadings, with respect to the SNMP constituents of concern were determined. Further extensive calculations were performed for predicting TDS and arsenic impacts. Other constituents were not further examined because the assimilative capacities of the basin with respect to those constituents are large proportions of their respective SNMP water quality management goals and impacts from water use are not expected to significantly increase the basin concentrations. Further discussion on the selection process is presented later in this section.

Conceptual mass balance and concentration models were developed for the constituents of concern by taking into consideration the use of water within the Antelope Valley Groundwater Basin and by making reasonable assumptions of the constituent concentrations and loadings.

Figure 4-2 depicts the direct loading and unloading of water, salts, and nutrients in and out of the groundwater aquifer. Return flows from agricultural irrigation, outdoor municipal and industrial (M&I) water use, and on-site waste disposal systems (such as septic tanks and leach fields), along with natural recharge from precipitation and mountain runoff are considered sources of direct loading to the groundwater. Aquifer recharge projects may also directly load salts and nutrients to the groundwater aquifer. Since the Antelope Valley is a closed basin, the only major outflow is groundwater pumping. Subsurface inflow from other basins and subsurface outflow of the aquifer are considered insignificant.

Figure 4-2: Aquifer Loading/Unloading

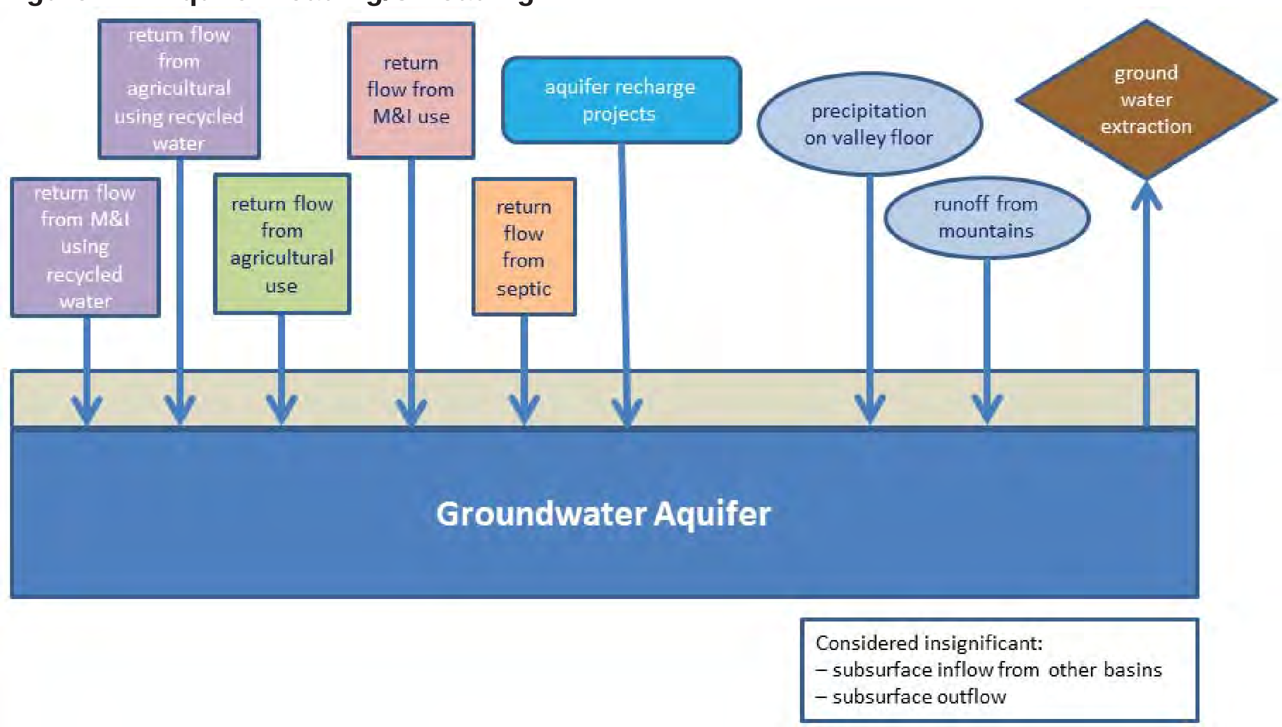
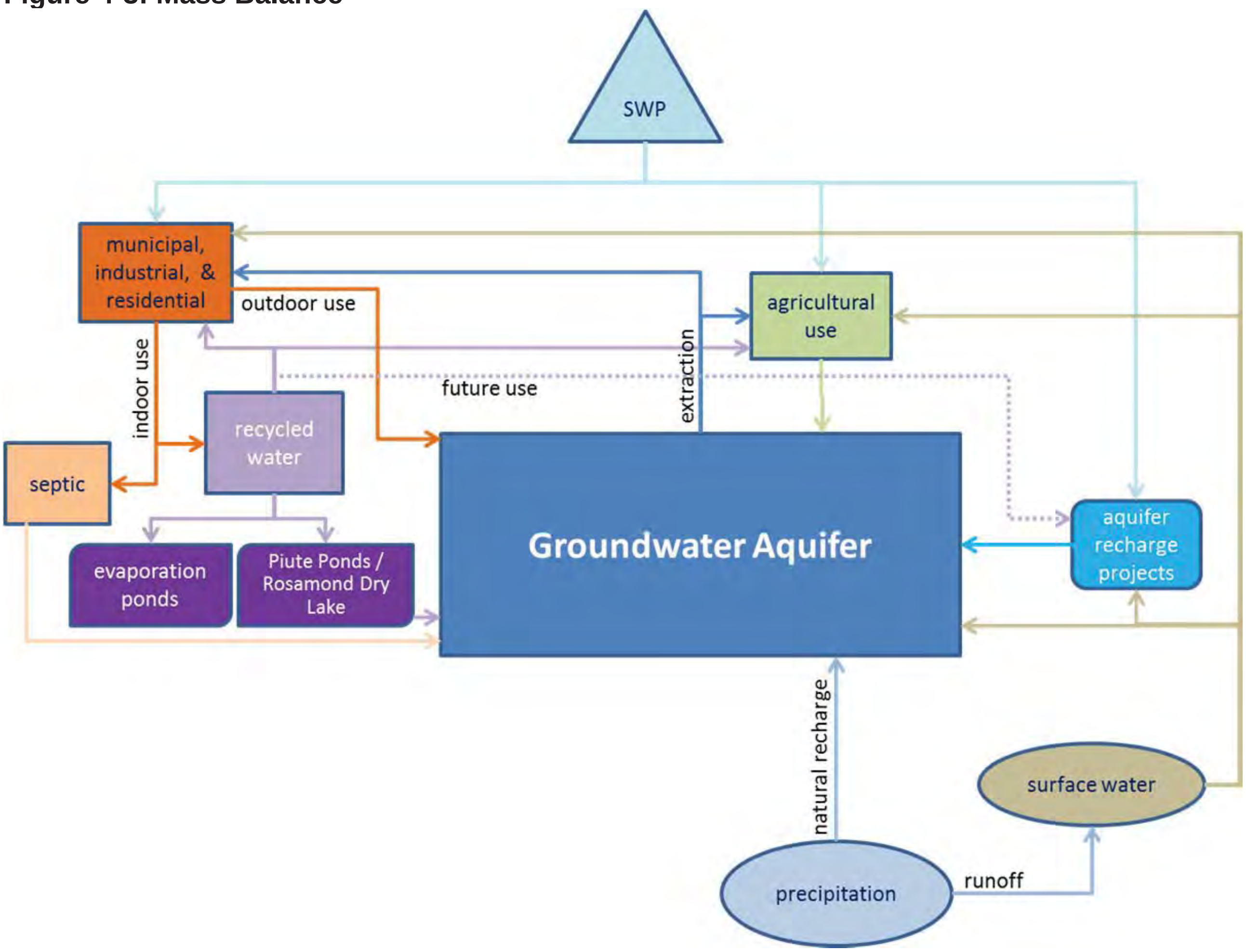


Figure 4-3 depicts the conceptual model of the constituent balance, which takes into consideration the water balance of the various types of water entering and exiting the groundwater basin. The two major outside sources of water to the basin include imported water via the California State

Water Project (SWP) and precipitation, which is represented in the model by natural recharge. The other major sources of water that are used within the Antelope Valley region include groundwater from extraction (i.e., pumped groundwater), recycled water from wastewater treatment, and surface water flow. The major uses of water are M&I and agricultural uses, which contribute to return flows to the groundwater basin. M&I is further broken down into indoor and outdoor use. Outdoor use includes activities, such as landscape irrigation, that contribute to return flows to the groundwater aquifer. After water is used indoors, it typically either goes to the local sewers or to an on-site waste disposal system (i.e., septic tanks with leach fields). On-site waste disposal systems also contribute to percolating flows to the groundwater aquifer. Wastewater collected from the sewers are processed by wastewater treatment plants and the resulting effluent may be used as recycled water for M&I uses (indoor and outdoor), agricultural irrigation, or for aquifer recharge projects in the future. Artificial aquifer recharge projects may use imported, recycled, or stormwater to augment water in the aquifer.

Figure 4-3: Mass Balance



Taking the conceptual models into consideration, a completely mixed model of the principal aquifer was developed to evaluate and predict the effects of salt and nutrient loading on overall groundwater quality of the Antelope Valley groundwater aquifer for the planning period (through 2035). The spreadsheet model was created to predict the impact of current and future water use in the Antelope Valley on the groundwater basin's salt and nutrient load. The model allows for improvements and addition of more details as additional data is collected for validation and verification. As such, the model presented here should be viewed as a tool that will be refined and improved over time. A short description of the methods used is provided below and summarized in Table 4-5.

A general water budget was developed that incorporated findings from the Antelope Valley Groundwater Adjudication Case Summary Expert Report for Phase 3 – Basin Yield and Overdraft (Summary Expert Report; Beeby et al. 2010). Specifically, the model uses the same flow assumptions as the subject report and arrives at the same sustainable yield, which is based on pumping of locally derived (“native”) waters and supplemental pumping of return flow from imported water use. It is important to note that the model is intended for planning purposes only and nothing in this model shall be interpreted to interfere in any way with the ongoing adjudication actions, settlement process, or rulings of the Court. The Summary Expert Report describes the basin’s sustainable yield as the rate of pumping that will produce return flows in combination with other recharge that will result in no long-term depletion of groundwater storage and no purposeful increase in storage. In general, imported water and pumped groundwater are used to meet agricultural and M&I water demands, each demand producing differing amounts of return flows and recharge to the aquifer via deep percolation. These flows combine with natural recharge for a total quantity of water that may be pumped on a sustainable basis with no long term-depletion of groundwater storage. Through a series of calculations, the Summary Expert Report concludes that the average sustainable yield of the basin is 110,500 acre-feet per year (AFY). The SNMP model assumes that the average annual pumped groundwater supply is equal to the basin’s sustainable yield (110,500 AFY) and that the groundwater volume is 55 million acre-feet (AF; DWR 1980). These assumed flows could be refined as additional information is obtained in the future to improve the model.

In order to estimate sustainable yield, return flows and recharge of water to the groundwater from natural recharge and water use were determined. Water demands and sources were identified. Land uses in the basin include agricultural and several municipal-type uses (also termed “municipal and industrial” or “M&I”). The Summary Expert Report describes two independent analyses as a basis for using 60,000 AFY as an estimate of average long-term natural recharge. Return flows were then estimated, taking into consideration agricultural and M&I uses, as well as return flow from recycled water usage, as 50,500 AFY.

Based on historical average rates, the Summary Expert Report assumes 25% for the average agricultural return flow rate. Of the water utilized for M&I uses, about 44% is consumptively used, 11% becomes return flow through outside irrigation, and the remaining 45% is used indoors and goes either to a sewer or to an on-site waste disposal system. It is assumed that all of the water going to an on-site waste disposal system is returned to the groundwater. Of the water that is applied outdoors, the model assumes that 20% flows to the groundwater.

The Summary Expert Report estimates that approximately 70% of the urban areas in the Antelope Valley are sewered and the remaining areas are served by on-site waste disposal systems (e.g., septic tanks). The Summary Expert Report also estimates that the mutual and small water companies’ customers make up about 4.4% of the Antelope Valley’s M&I demand and the customers all use on-site waste disposal systems. Rural residential areas make up about 7.1% of the M&I demand and all of these areas utilize on-site waste disposal systems. As a result, approximately 28% of the Antelope Valley’s M&I water utilized is conveyed to one of the water reclamation plants (WRPs) and approximately 17% is of the M&I flow is conveyed to on-site waste disposal systems and ultimately reaches the groundwater. The Summary Expert Report also estimated that approximately 500 AFY of the water conveyed to the WRPs becomes return flow during treatment (i.e. through percolation ponds).

The SNMP model uses the estimates of sustainable yield calculated in the Summary Expert Report that use imported water deliveries and land use present in 2005. Land use was divided into approximately 51.5% agricultural and 48.5% M&I. Imported deliveries were comprised of 9,300 AFY for agricultural use and 64,200 AFY for M&I uses. These land use and imported delivery levels were assumed the same throughout the planning period, but may be adjusted if additional data becomes available.

As with the Summary Expert Report, average annual flow conditions were assumed in the baseline model throughout the planning period. As such, inflow to and outflow from the aquifer are assumed equal so there is no change in storage. The model, however, allows for volume changes, which were applied to some of the scenarios tested. Also, for conservative planning purposes, the model assumes an instantaneous mixing of waters and constituents added on a yearly basis, rather than assuming it typically may take months to years for the applied water to travel through soil and reach the aquifer.

Table 4-5: Antelope Valley SNMP Groundwater Model Flow Assumptions

Flows	Assumed Quantities
Imported Water	73,500 AFY total Agriculture: 9,300 AFY M&I: 64,200 AFY (2005 levels, assumed same throughout planning period)
M&I Use	Of the total flow to M&I: 44% is consumptively used, 11% becomes return flow from outdoor use, and 45% is subsequently conveyed to WRPs (sewered; 28% of total M&I) or on-site waste disposal systems (unsewered; 17% of total M&I) from indoor use Of the urban areas: 70% sewered, 30% unsewered Mutual and small water companies deliver about 4.4% of M&I demand and customers all use on-site waste disposal systems Rural residential makes up about 7.1% of M&I demand and customers all use on-site waste disposal systems
Natural recharge	60,000 AFY: Infiltration of stormwater (precipitation and mountain runoff), no inflow from adjacent aquifers
Return Flow	Of the amount applied to each use, the percentage returned: M&I outdoor = 20%, Agr. = 25%, recycled water for M&I outdoor use = 20%, on-site waste disposal systems = 100% WRP return flow = 500 AF (from percolation ponds) Calculated total inflow to groundwater = 110,500 AFY
Total Groundwater pumped	110,000 AFY at steady conditions, but may vary Agriculture = 45,000 AFY; M&I = 65,000 AFY
Aquifer volume	55,000,000 AF
Land Use	Agriculture = 51.5 %, M&I = 48.5% (2005 levels, assumed same throughout planning period); used for determining “native” sustainable yield

Note: Assumptions and numbers found herein are selected strictly for long-term planning purposes (e.g., develop the constituent model) and are not intended to answer the questions being addressed within the adjudication process.

Before further development of the model, the SNMP constituents to incorporate into the model were selected. To determine which constituents have a potential to significantly impact the basin and beneficial uses, a simplified and highly conservative set of calculations were performed. The calculations assume that the entire volume of State Water Project imported water contracted to the

Antelope Valley (165,000 AFY) and the entire average sustainable yield (110,500 AFY) are converted to recycled water. Assuming that the entire mass of salts and nutrients calculated for this flow instantaneously enters and mixes with the aquifer (55 million AF) on a yearly basis for 25 years, TDS and arsenic are the only SNMP constituents expected to exceed a concentration greater than the baseline plus 20% of the assimilative capacity (the Recycled Water Policy discusses an allowance of multiple projects using 20% of the basin's assimilative capacity over the course of a decade). The remaining constituents were calculated to not have a significant potential to impact the basin's beneficial uses. Note that this is an overly conservative calculation that assumes only the mass of constituents and not the accompanying water enters the basin. In other words, the calculations assume no consumption of the constituents (e.g., uptake by plants, attenuation, or chemical transformation) and 100% evapotranspiration. Evapotranspiration is water that is lost to the atmosphere via evaporation and plant transpiration, and it has a large impact on water availability. According to USGS, half of annual rainfall is consumed by evapotranspiration. The calculations also ignore changes in the basin volume and naturally occurring processes (such as attenuation to the substrate during infiltration through unsaturated zone or dissolution from rocks and soil, as is the case with arsenic), as well as other processes that would reduce the mass of salts entering the basin. To be conservative, recycled water concentrations were assumed because constituents were measured highest in that source water (see Table 3-3). Even though chromium in recycled water was either not detected or measured at concentrations below the reporting limit, the detection limit concentration was used in the calculations. Nitrate loadings may be higher than calculated due to nitrification or lower due to denitrification and plant uptake. However, the available nitrate baseline assimilative capacity is a wide margin since it is more than half of the total SNMP management goal of 10 mg/L as N. Table 4-6 includes the calculation results. Real world applications of water are expected to yield lower impacts to the basin than these conservative calculations assume.

Table 4-6: Simplified SNMP Constituent Impacts

Constituent	Recycled Water Concentration[1] (mg/L)	Total Mass to Basin Over 25 Years[2] (tons)	Baseline Average Antelope Valley Basin Concentration (mg/L)	Baseline Basin Mass[3] (tons)	Resulting Basin Concentration After 25 Years[4] (mg/L)	Baseline Assimilative Capacity (mg/L)	Percent Assimilative Capacity Used[5]
Arsenic	0.0055	52	0.0097	720	0.0103	0.00034	>100
Boron	0.6	5,600	0.17	13,000	0.25	0.5	14
Chloride	167	1,600,000	38.4	2,900,000	59	200	10
Fluoride	0.36	3,400	0.44	33,000	0.5	0.6	8
Nitrate as N	7	66,000	1.97	150,000	2.8	8	11
Chromium	0.01[6]	94	0.0055	410	0.006	0.044	3
TDS	545	5,100,000	350	26,000,000	418	100	68

[1] Recycled water concentration is the calculated average of the recycled water concentrations provided in Table 3-3.
[2] Assume mass from entire volume of contracted imported (165,000 AFY) and sustainable yield (110,500 AFY). Values displayed have been rounded to two significant figures.
[3] Assume volume of the aquifer is 55 million acre feet. Values displayed have been rounded to two significant figures.
[4] Calculated by adding the total mass load over 25 years and the baseline mass of the basin and dividing by the aquifer volume of 55 million acre feet.
[5] Calculated by dividing the increase in constituent concentration (the resulting concentration minus the baseline concentration) by the baseline assimilative capacity available.
[6] Although chromium in recycled water was either not detected or measured at concentrations below the reporting limit; the detection limit concentration is used.

The analysis above demonstrates that TDS and arsenic necessitate further detailed evaluation due to their significant potential to impact the basin's beneficial uses, so these constituents were incorporated into the model. The model assumes that the entire mass of each of these constituents in the applied water will enter the groundwater with the respective return flow, and will instantaneously mix with the groundwater in the aquifer. This is a conservative assumption and could be lowered for well managed/regulated projects. In reality, there may be some uptake by the irrigated vegetation, retention within the soil, or some other method of consumption. Recycled water projects are regulated so that water must be applied at agronomic rates so that deep percolation of the applied water, and accompanying constituents, is minimized. If more information becomes available, the model allows for refinement of each use's constituent mass contribution to the groundwater basin. Similar enhancements can be made to the model if certain practices are put in place to manage the constituent contribution of water use activities (e.g., irrigating at agronomic rates with respect to the constituent). Note that both arsenic and TDS are naturally occurring within the basin soil and rock, but these impacts are difficult to determine and, therefore, are not incorporated into the model. It is unlikely that the SNMP water quality management goal for arsenic will be achievable in the groundwater given the high natural occurrence of the compound in the Antelope Valley, and a more likely scenario is management applied to the drinking water prior to supply (e.g., supply well head treatment). Nevertheless, arsenic was incorporated into the model to understand the potential effects of the SNMP projects.

This is a conservative assumption and could be lowered for well managed/regulated projects. The following source water concentrations were used in the SNMP model. Based on observations at Littlerock Reservoir, which is fed by natural run-off from snow packs in the local mountains and from rainfall, water entering the groundwater by means of natural recharge was assumed to contain 150 mg/L of TDS and no detectable arsenic (see Table 3-3). For a conservative projection, one half of the detection level (2 µg/L) was used in the model. The initial groundwater concentrations were based on the calculations performed in Section 3 and are 350 mg/L TDS and 9.66 µg/L arsenic. The imported water concentrations were provided in Section 3 and are 300 mg/L TDS and 3.8 µg/L arsenic. Recycled water values were calculated as the weighted average, based on the projected contribution of each recycled water facility to the overall recycled water volume and their respective constituent concentrations provided in Section 3, and rounded up – 500 mg/L TDS and 1 µg/L arsenic.

Typical TDS increases from domestic water use range from 150-380 mg/L (Metcalf & Eddy 2003) and the model assumes an increase of 175 mg/L, which is consistent with actual values measured in the Lancaster and Palmdale WRPs influent (LACSD 2013a and 2013b) as compared to the water treatment plant effluent (see Table 3-3). Arsenic is not typically increased due to domestic water use, which is consistent with actual values measured in the Lancaster and Palmdale WRPs influent as compared to the water treatment plant effluent. However, to be conservative, the model assumes one half of the detection level (1 µg/L) increase in arsenic due to domestic use. A summary of the constituent concentrations is listed in Table 4.7.

Table 4.7: Constituent Concentrations Used in Salt Balance Model

Parameter	TDS (mg/L)	Arsenic (µg/L)
Natural Recharge	150	1
Imported Water	300	3.8
Recycled Water	500	1
Aquifer Baseline	350	9.66
Increase from Domestic Indoor Use	175	0.5

Several scenarios were tested with the model, the first being no project or base case, where groundwater extraction is consistent with the sustainable yield, so that there is no change in groundwater storage, and no new projects are implemented. The second scenario incorporates the projects listed in Section 3 to the base case. The third scenario incorporates just recycled water usage without the artificial aquifer recharge projects (i.e., water banking projects). Note that the model assumes that 90% of the return flows from recycled water use and the banking/recharge projects becomes pumped water supply. The fourth and fifth scenarios consider recycled water usage and a fraction of the flows for the artificial recharge projects. A sixth scenario considers an increased incidence of dry years for the region and no groundwater recharge during those years.

Population growth is accounted for in the recycled water availability projections, which are derived using population growth forecasts. In contrast, potable water supplies are not expected to change significantly, even with increased population growth.

Linear regressions were performed using the 25-year planning period results to predict: 1) in which year water quality could potentially reach or exceed the SNMP management goals, and 2) the water quality levels in 2110 (after 100 years).

Scenario 1: Base Case

As mentioned earlier, the base case condition (Scenario 1) assumes that the 25-year planning period will remain status quo with groundwater extraction rates consistent with the sustainable yield and that no new projects identified in Section 3 will be implemented. This scenario results in no change in aquifer storage, because inflow is assumed to be equal to outflow. According to the model and considering Scenario 1, the average TDS concentration in the groundwater basin will increase by 14 mg/L by 2035 or by 54 mg/L in one hundred years, and will reach 450 mg/L in approximately 184 years. The model's Scenario 1 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.12 µg/L by 2035, will be 10.1 µg/L in 2110, and will reach 10 µg/L in 72 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5. The top charts in Figures 4-4 and 4-5 are set to encompass constituent concentrations starting at zero units (mg/L or µg/L, as appropriate). Since it is difficult to discern the individual concentration increases for each scenario, the bottom charts are set at a narrower concentration range to provide better detail.

Scenario 2: Incorporation of All Future Projects

The second scenario is one in which all the projects identified in Section 3 are assumed be implemented by the projected dates within the 25-year planning period. This scenario considers the water inputs and return flows resulting from the new projects in addition to the conditions presented in Scenario 1. It is assumed that 90% of the return flows from recycled water use and the banking/recharge projects becomes pumped water supply, and 10% of the flows remain in the basin. For projecting further in the future than the planning period, the linear regressions assume no additional projects other than the ones included in the 25-year planning period. According to the model for Scenario 2, the average TDS concentration in the groundwater basin will increase by 21 mg/L by 2035 or by 88 mg/L in a hundred years, and will reach 450 mg/L in 113 years. The model's Scenario 2 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.13 µg/L by 2035, will be 10.1 µg/L in 2110, and will reach 10 µg/L in 64 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

Scenario 3: Recycled Water Projects Only

To assess the potential effects of the recycled water projects alone without the potential dilution from the recharge projects, the third scenario tested is one in which only the recycled projects and none of the recharge projects identified in Section 3.5 are assumed to be implemented by the projected dates within the 25-year planning period. For projecting further in the future than the planning period, the linear regressions assume no additional projects other than the recycled water projects included in the 25-year planning period. According to the model and considering Scenario

3, the average TDS concentration in the groundwater basin will increase by 16 mg/L by 2035 or by 66 mg/L in a hundred years, and will reach 450 mg/L in 151 years. The model's Scenario 3 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.12 µg/L by 2035, will be 10.1 µg/L in 2110, and will reach 10 µg/L in 70 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

Scenario 4 and 5: Recycled Water and Partial Groundwater Recharge Projects

Because it can take a considerable amount of time to get recharge projects implemented, it is possible that the projections presented in Section 3 of this report may not be met. Therefore, the fourth and fifth scenarios include all of the recycled projects and some fraction of the recharge projects identified that are assumed to be implemented by the projected dates within the 25-year planning period. To avoid assigning a likelihood of one project being implemented over another, a fraction of the total flows for all the recharge projects were assumed to be implemented. Scenario 4 assumes half of the projected inflow for the recharge projects will be implemented, whereas Scenario 5 assumes a quarter (25%) of inflow of the recharge projects will be implemented. To project further in the future than the planning period, the linear regressions assume no additional projects will be implemented after the 25-year planning period.

According to the model and considering Scenario 4, the average TDS concentration in the groundwater basin will increase by 19 mg/L by 2035 or by 77 mg/L in a hundred years, and will reach 4500 mg/L in 129 years. The model's Scenario 4 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.13 µg/L by 2035, will be 10.2 µg/L in 2110, and will reach 10 µg/L in 66 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

According to the model and considering Scenario 5, the average TDS concentration in the groundwater basin will increase by 18 mg/L by 2035 or by 72 mg/L in a hundred years, and will reach 450 mg/L in 139 years. The model's Scenario 5 calculations also indicate that the groundwater basin arsenic concentration will increase by 0.12 µg/L by 2035, will be 10.2 µg/L in 2110, and will reach 10 µg/L in 69 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

Scenario 6: Extreme Drought

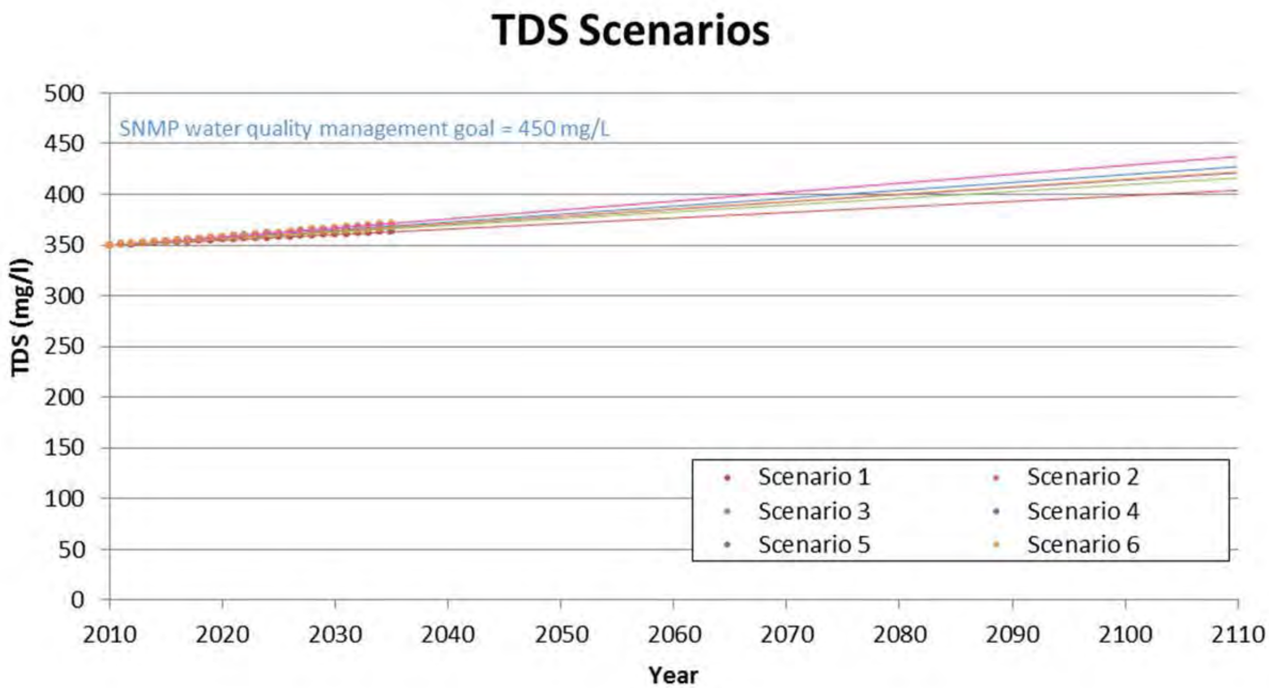
The scenarios mentioned above take into consideration average conditions, where periodic dry and wet years are averaged over the planning period to generate an average annual condition. Because the Antelope Valley is susceptible to drought conditions and decreases to imported water availability, an extreme drought scenario was examined where the annual natural recharge was decreased by 25% during the entire 25-year planning period. It is expected that any drought will not be this persistent, but this scenario can be viewed as an extreme case that provides a lower bound for natural recharge. In addition, the imported water rate was left unchanged, but no recharge projects were included. The groundwater extraction was not reduced, which resulted in the aquifer losing storage over the 25-year planning period. Due to limitations of the model, total sustainable yield findings of Summary Expert Report were ignored and the flow adjustments were made to the overall planning period rather than each individual year. This was accomplished by reducing the natural recharge by 25% for the entire planning period, while keeping imported water constant and including recycled water. These assumptions resulted in an increase after 25 years of only 1.5 mg/L TDS when compared with a similar scenario without drought conditions (Scenario 3). Moreover, the Scenario 6 TDS results are similar to the Scenario 5 (recycled water and 25% of recharge projects implemented) results. The model's Scenario 6 calculations indicate a steeper increase in arsenic concentrations than with the other scenarios tested. According to the model, the groundwater basin arsenic concentration will increase by 0.18 µg/L by 2035, will be 10.4 µg/L in 2110, and will reach 10 µg/L in 47 years. Results are summarized in Table 4-8 and depicted in Figures 4-4 and 4-5.

Table 4.8: Concentration Projections

Scenario	Concentration in 2035		Concentration by 2110		Years to Reach SNMP Water Quality Management Goal	
	TDS	Arsenic	TDS	Arsenic	TDS	Arsenic
	mg/L	µg/L	mg/L	µg/L	450 / 500 mg/L	10 µg/L
1	364	9.78	404	10.13	184 / 276	72
2	371	9.79	438	10.19	113 / 170	64
3	366	9.78	416	10.14	151 / 227	70
4	369	9.79	427	10.17	129 / 194	66
5	368	9.79	422	10.15	139 / 209	69
6	368	9.84	422	10.38	139 / 208	47

Note: The baseline Antelope Valley Groundwater Basin concentrations are 350 mg/L of TDS and 9.66 µg/L of arsenic.

Figure 4-4: TDS Model Predictions



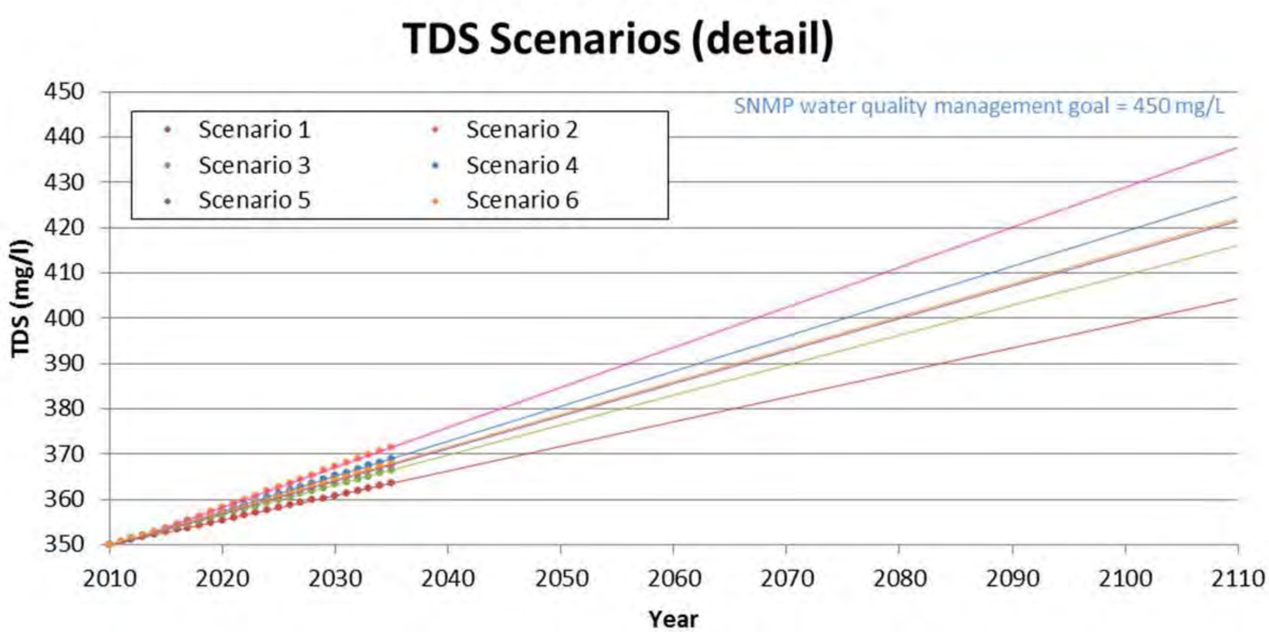
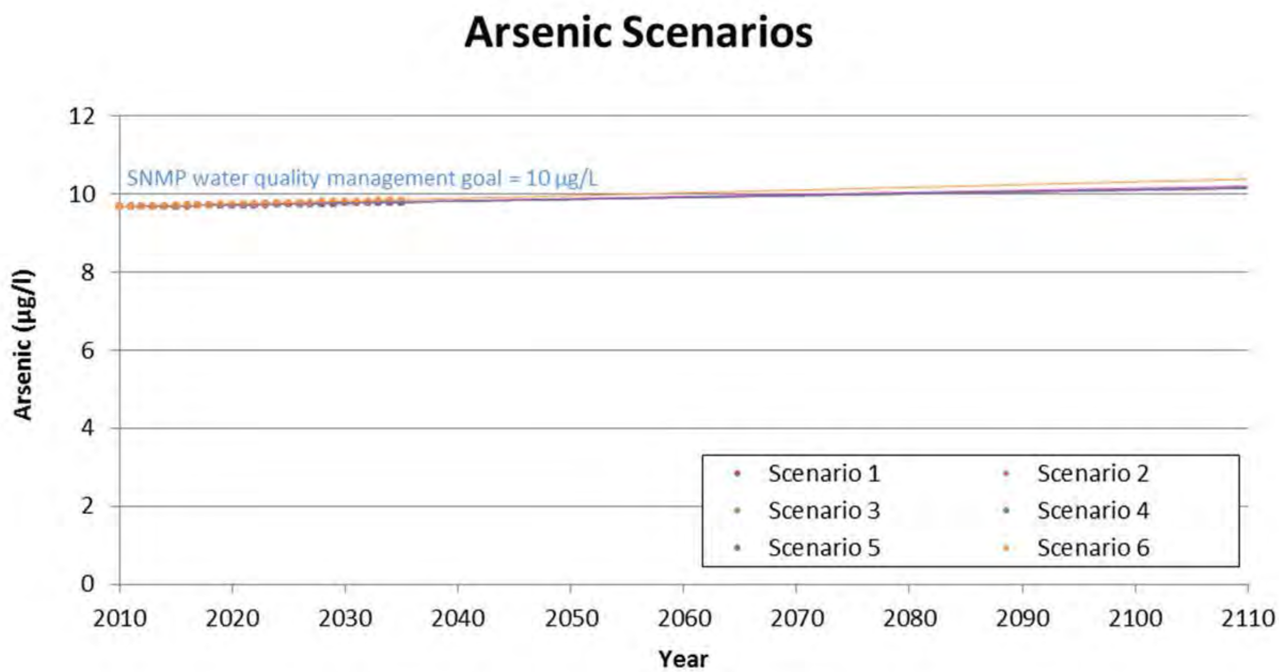
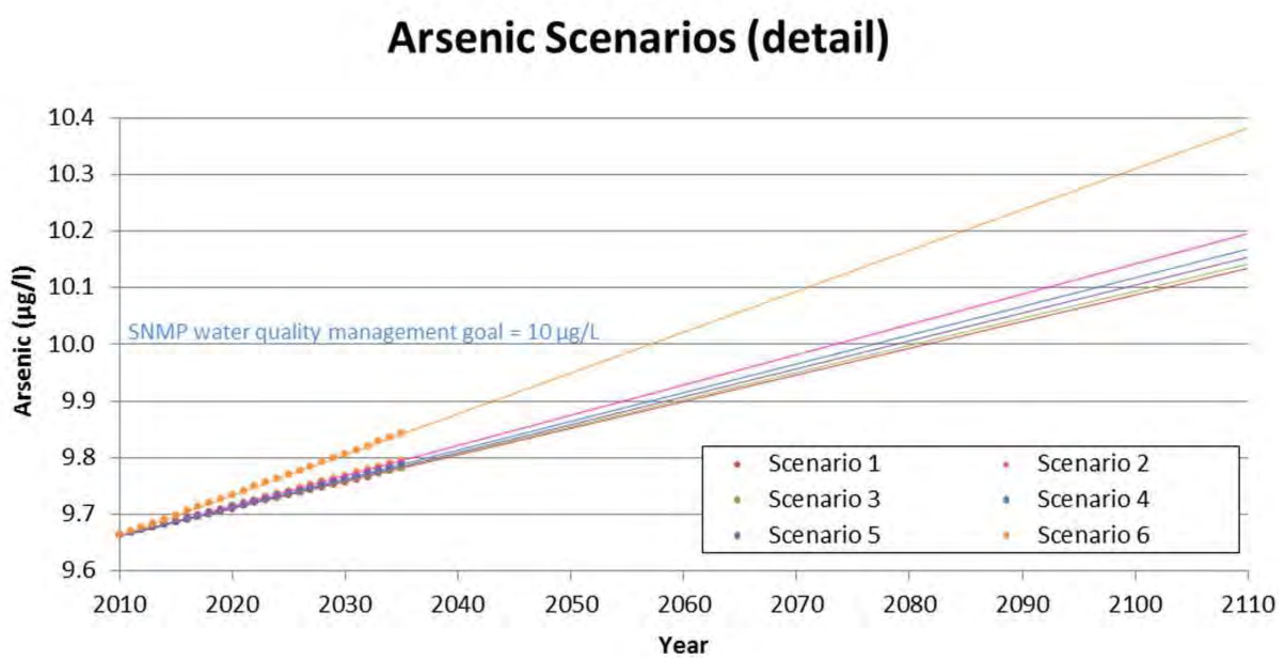


Figure 4-5: Arsenic Model Predictions





The model predicts that for each Scenario, the average Antelope Valley Basin groundwater condition with respect to TDS will not exceed the management parameters until at least 110 years. This is ample time to plan for salt management measures before a critical situation arises, although that does not appear to be necessary within the 25-year planning period. Arsenic, on the other hand, could potentially exceed the SNMP water quality management goal in as early as 47 years, but not within the 25-year planning period. It should be mentioned that there has been sub-basin average and localized exceedances of the management parameter, but these have been attributed to naturally occurring arsenic in the basin. It is understood in the region that arsenic concentrations may continue to be a concern and efforts are underway, such as well head treatment or natural attenuation projects, to ensure that the drinking water supplied to the public meets drinking water quality standards.

The Recycled Water Policy discusses an allowance of using 20% of the basin's assimilative capacity for multiple projects, over the course of a decade (10 years), to streamline the permitting process where no SNMP has been developed. A summary of basin assimilative capacity usage with respect to TDS and arsenic, calculated using the SNMP model, is included in Table 4-9. According to the model, the projects in the SNMP would be able to meet this criterion, except in the case where there are extreme drought conditions, in which the arsenic concentration increase would use 21% of the assimilative capacity. As discussed in the next sub-section, it is reasonable to assume that recycled water use despite the potential increase in arsenic concentration, which would be slight and still remain under the 10 µg/L SNMP water quality management goal, would be preferable to not having that recycled water available to meet demands during drought conditions. Also, it is important to keep in mind that many of the assumptions in the model are conservative, including the assumption that natural recharge water and domestic use of water adds arsenic equal to half the detection level. If a lower value is assumed, say one quarter of the detection level, Scenario 6 would meet the 20% criterion for 10 years.

The model predicts that after 25 years for each scenario, the water quality will not be degraded past 21% of the assimilative capacity for TDS. However, arsenic concentrations have the potential to use up much more assimilative capacity, but would not reach a 10 µg/L average basin concentration. However, given that in-lieu recycled water use in the regional would allow for potable supplies to be available for use, the increases would be offset by the benefit of having an increase in reliability of the potable supply for the residents of the water supply strapped region.

Table 4.9: Assimilative Capacity Usage

Scenario	Concentration increase in 10, 25 Years				Assimilative capacity used			
	TDS (mg/L)		Arsenic (µg/L)		TDS		Arsenic	
	10 years	25 years	10 years	25 years	10 years	25 years	10 years	25 years
1	5	14	0.05	0.12	5%	14%	14%	35%
2	8	21	0.05	0.13	8%	21%	15%	39%
3	7	16	0.05	0.12	7%	16%	14%	35%
4	8	19	0.05	0.13	8%	19%	15%	37%
5	7	18	0.05	0.12	7%	18%	14%	36%
6	7	18	0.07	0.18	7%	18%	21%	53%

Model sensitivities to the constituent concentrations used for the source waters (see Table 4-7) were examined by increasing the TDS and arsenic concentrations by 25%. Increasing these concentrations had the greatest effect on Scenario 2, which has the greatest loading to the groundwater. Table 4-10 lists the increased concentration results over the original Scenario 2 25-year projection (see Table 4-8). 50% increases were also tested and were at most double that of the 25% increase results. Increasing the imported water concentration had the greatest impact on the projections. Increasing the TDS content of the waters, except the imported water, by 50% in the model still resulted in over a century before the groundwater basin would be expected to exceed the SNMP water quality management goal. The imported water TDS 50% increase resulted in an 80-year period before the groundwater basin would be expected to exceed the SNMP water quality management goal. Because arsenic concentrations in the source waters are low or below detection levels, increasing the arsenic content yielded similar results as originally projected.

Table 4-10: SNMP Model Result Variations for Source Water Concentrations 25% Increase

Parameter	Concentration Increase to Initial Scenario 2 Projections	
	TDS (mg/l)	Arsenic (µg/L)
Natural Recharge	2	0.01
Imported Water	5	0.06
Recycled Water	1	0.01
Increase from Domestic Indoor Use	1	0.01

Agricultural land use has seen a decreasing trend in the Antelope Valley. Changing the land use assumptions and imported flows to either all agricultural or all municipal did not have much effect on the initial model projections. If the assumptions were changed to all municipal, an extreme case, the greatest effects were 1 mg/l TDS and 0.04 µg/L arsenic decreases over the initial 25-year projections results in Table 4-8. If the assumptions were changed to all agricultural water use, which is an unlikely case, the greatest effects were 1 mg/l TDS and 0.06 µg/L arsenic increases over the initial 25-year projections results in Table 4-8.

Model sensitivities to the imported water deliveries assumptions were examined. Changes in deliveries were applied to annual average of the whole 25-year period (no single year differences) and the average sustainable yield was altered due to limitations on the model. An increase in deliveries by 25% resulted in at most 3 mg/L TDS and 0.03 µg/L arsenic increases over the initial 25-year projections results in Table 4-8, while decreasing deliveries by 25% resulted in the same concentration decreases over the initial 25-year projections results. These results are consistent with the expectation that additional imported water to the basin will result in an increased load.

4.7 Antidegradation Analysis

The SNMP antidegradation analysis relies on the assessment of observed and future simulated groundwater concentrations compared to the baseline groundwater concentrations and SNMP water quality management goals, in consideration of projects that have the potential to affect the groundwater salt and nutrient concentrations. Groundwater monitoring will be used to confirm model and other predictions. Model improvements may be made based on new information, such as monitoring results.

The SNMP antidegradation analysis found that, in most cases, there will be no significant degradation of groundwater quality associated with the implementation of the SNMP projects as described in the initial constituent impact calculations (Table 4-6) and the SNMP model scenarios. The exception is with arsenic, but this is a naturally occurring constituent in the basin and it is typically not detected in stormwater and is measured at low levels in the imported and recycled water. To be protective, the projections are an overestimation of arsenic loading to the basin because of the conservative assumptions used in the model. One such assumption is that all of the applied arsenic associated with each use will reach the groundwater, whereas in reality natural attenuation typically occurs, thereby reducing the amount of arsenic that reaches the groundwater. It may be that return flows from water use in the basin cause dilutive effect to the groundwater with respect to arsenic.

It is not anticipated that future concentrations of the SNMP constituents of concern will be significantly increased with implementation of the recycled water and recharge projects. The average concentrations of the SNMP constituents in the Antelope Valley groundwater basin do not currently exceed SNMP water quality management goals and are not predicted to exceed these goals in the 25-year planning period. All of the SNMP water quality management goals are consistent with the Basin Plan. It is proposed that any change in groundwater quality associated with the projects with respect to the SNMP constituents of concern is consistent with the Antidegradation Policy for the following reasons:

The water quality changes will not result in water quality less than prescribed in the Basin Plan.

According to the initial constituent impact calculations and the SNMP model, current observed average SNMP salt and nutrient constituent concentrations in the Antelope Valley groundwater basin and simulated future concentrations through 2035 do not and will not exceed SNMP water quality management goals if the identified projects are implemented. All of the SNMP water quality management goals are consistent with the water quality prescribed in the Basin Plan. In the case of some Antelope Valley sub-basins, average baseline water quality may already exceed the SNMP water quality management goals. However, none of the projects identified are located within those sub-basins or considered to have an impact on them since the projects are located hydrologically downgradient.

The water quality changes will not unreasonably affect present and anticipated beneficial uses.

Recycled water use and aquifer recharge projects are not expected to affect present or anticipated beneficial uses. While TDS concentrations in the recycled water are higher than in background groundwater, the average concentration in the Antelope Valley groundwater basin is projected to remain below the SNMP water management goal in the future. Because TDS concentrations in the groundwater are projected to remain below 450 mg/L, local groundwater can be used for municipal use and all other beneficial uses defined in the Basin Plan (i.e. agricultural supply, industrial service supply, and freshwater replenishment) with no restrictions. Future water use is expected to increase TDS concentrations in the groundwater above existing background levels in the 25-year planning period, but not significantly, and the basin average will remain within an acceptable range that will not unreasonably affect present and anticipated beneficial uses. In the case of some sub-basins (e.g., North Muroc and Peerless) average baseline water quality already exceeds 450 and 500 mg/L, but the concentrations are all under the upper SMCL of 1000 mg/L, and thus meet MUN objectives. Furthermore, none of the projects identified are located within those sub-basins or considered to have an impact on them.

Arsenic concentrations in the recycled, imported, and natural recharge water are lower than in background groundwater and the average concentration in the Antelope Valley groundwater basin is projected to remain below the SNMP water management goals in the 25-year planning period. Because arsenic concentrations in the groundwater are projected to remain below 10 µ/L, local groundwater can be used for municipal use and all other beneficial uses defined in the Basin Plan with no restrictions. Under conservative assumptions, future water use is projected to increase arsenic concentrations in the groundwater above existing background levels in the 25-year planning period, but the basin average will remain within an acceptable range to protect present and anticipated beneficial uses. However, this is a conservative projection and it may be that return flows from use of waters with very low arsenic concentrations would cause dilutive effects to the groundwater with respect to arsenic. There are localized exceedances of arsenic in the groundwater, but they are attributed to dissolution of arsenic in basin rocks and soils and, thus, are naturally occurring. Public supply wells with arsenic concentrations above the MCL are typically shut down and/or abandoned. Other options include arsenic removal treatment at the wellhead and blending with lower arsenic concentration sources to decrease the arsenic level to below the MCL.

The remaining SNMP constituents have been projected to remain below their respective SNMP water quality management goals within the 25-year planning period if the identified projects are implemented. The constituent levels are not projected to change significantly and, thus, these water quality changes will not unreasonably affect present and anticipated beneficial uses. In the case of some sub-basins, average baseline water quality already exceeds the SNMP water quality management goal to protect the AGR beneficial use with respect to boron and fluoride, but the constituent concentrations are all under the SNMP water quality management goal to protect the MUN beneficial use. So, there may be some restrictions on the cultivation of boron or fluoride sensitive crops in these areas, which most likely has been the case historically since these constituents are naturally occurring in these areas. In any case, none of the projects identified are located within those sub-basins or considered to have an impact on them.

The water quality changes are consistent with the maximum benefit to the people of the state.

Recycled water is considered a valuable resource and is suitable for various beneficial uses. Implementation of the recycled water projects identified will increase the water supply available to the Antelope Valley Region and therefore reduce the Regional gap between supply and demand. The recycled water available to the Region is equal to the supply for over 20,000 average single-family households in the Antelope Valley. As identified in the AV IRWMP, recycled water is a much needed sustainable and reliable water supply option for the region. The recycled water projects have the potential to increase availability of supplies during SWP disruption and decrease the long-term costs of water. Recycled water use also supports adaptation to climate change impacts that increase overall demands and/or reduce supplies, as well as mitigates against climate change by reducing greenhouse gas emissions associated with the energy to import water. By using locally produced recycled water, and therefore reducing the demand for imported water from other parts of the State, the amount of recycled water that could be used in the 25-year planning period has the potential to annually save the equivalent of over 35,000 to 52,000 barrels of oil and reduce greenhouse gas emissions and other air pollutants by 48,000 to 71,000 tons annually.

Aquifer recharge projects allows for the capture of otherwise unused imported water and stormwater, as well as recycled water and increases the amount of overall supplies. Like recycled water, aquifer recharge reduces the regional gap between supply and demand and supports adaptation to climate change impacts that increase overall demands and/or reduces supplies.

Despite the potential to increase the arsenic concentration of the basin's groundwater, which nevertheless would remain under the 10 µg/L SNMP water quality management goal unless increased by naturally occurring causes, implementation of the identified projects is preferable to not having the increased supply reliability available, especially during drought conditions. Increased use of recycled water and artificial recharge projects are benefits to the people of the Antelope Valley and contribute to the goals prescribed by the Recycled Water Policy for California.

The projects are consistent with the use of best practicable treatment or control to avoid pollution or nuisance and maintain the highest water quality consistent with maximum benefit to the people of the state.

Pollution is defined in the California Water Code, section 13050(l), to mean that beneficial uses of water are unreasonably affected. As demonstrated above, implementation of the projects identified in this SNMP will not cause an exceedance of the SNMP water quality management goals and therefore will not unreasonably affect the basin's beneficial uses. This SNMP includes an implementation measures roadmap that incorporates, as needed, the best practicable treatment or control to avoid pollution or nuisance and maintain the highest water quality consistent with maximum benefit to the people of the state. The SNMP monitoring plan results will be used to compare future groundwater quality to applicable SNMP water quality management goals and determine whether additional measures to manage constituent load to the basin are needed for implementation.

Section 5: Monitoring

5.1 Monitoring Plan Development

The AV SNMP monitoring plan is designed to determine water quality in the basin and focus on the water quality in water supply wells and areas proximate to large water projects, as discussed in the Recycled Water Policy. Results will be used to determine whether the concentrations of salt and nutrients over time are consistent with the SNMP predictions discussed in Section 4 and the applicable SNMP water quality management goals. The monitoring program will be used to determine whether implemented measures to manage the SNMP constituents in the groundwater basin are beneficial and/or cost-effective and if additional measures are needed.

5.2 Monitoring Locations

Per the Recycled Water Policy, the preferred approach to selecting groundwater monitoring locations is to target existing wells, as feasible and appropriate, as was done in developing the SNMP monitoring program. The groundwater wells included in the SNMP monitoring program are water supply wells that were selected based on their proximity to the projects listed in Section 3. Well selection was limited to those available on the State Board's Groundwater Ambient Monitoring and Assessment (GAMA) database, which is based on subsets of other well databases and does not encompass all the State regulated wells. Most of the Antelope Valley Basin wells with data available in GAMA are located in the Lancaster sub-basin. The remaining Antelope Valley sub-basins are largely undeveloped and several do not have any well monitoring data available in GAMA. Since monitoring results for these wells can be found in GAMA, it is likely that future monitoring results will also be available in the GAMA database. Additional discussion on the GAMA database can be found in Section 3.

If needed, additional groundwater monitoring results that are not available from the GAMA program may be examined. Also, the United States Geological Survey (USGS) database may be accessed to compile additional groundwater data and information for the monitoring report. If new projects are added to the SNMP list of projects having the potential to significantly contribute to salt and/or nutrient impacts to the Antelope Valley Groundwater Basin, the agency responsible for the project shall designate a groundwater well (existing or new), as appropriate, for inclusion in the SNMP monitoring program. Other water sources, such as imported and recycled waters, are typically monitored at the applicable treatment plant.

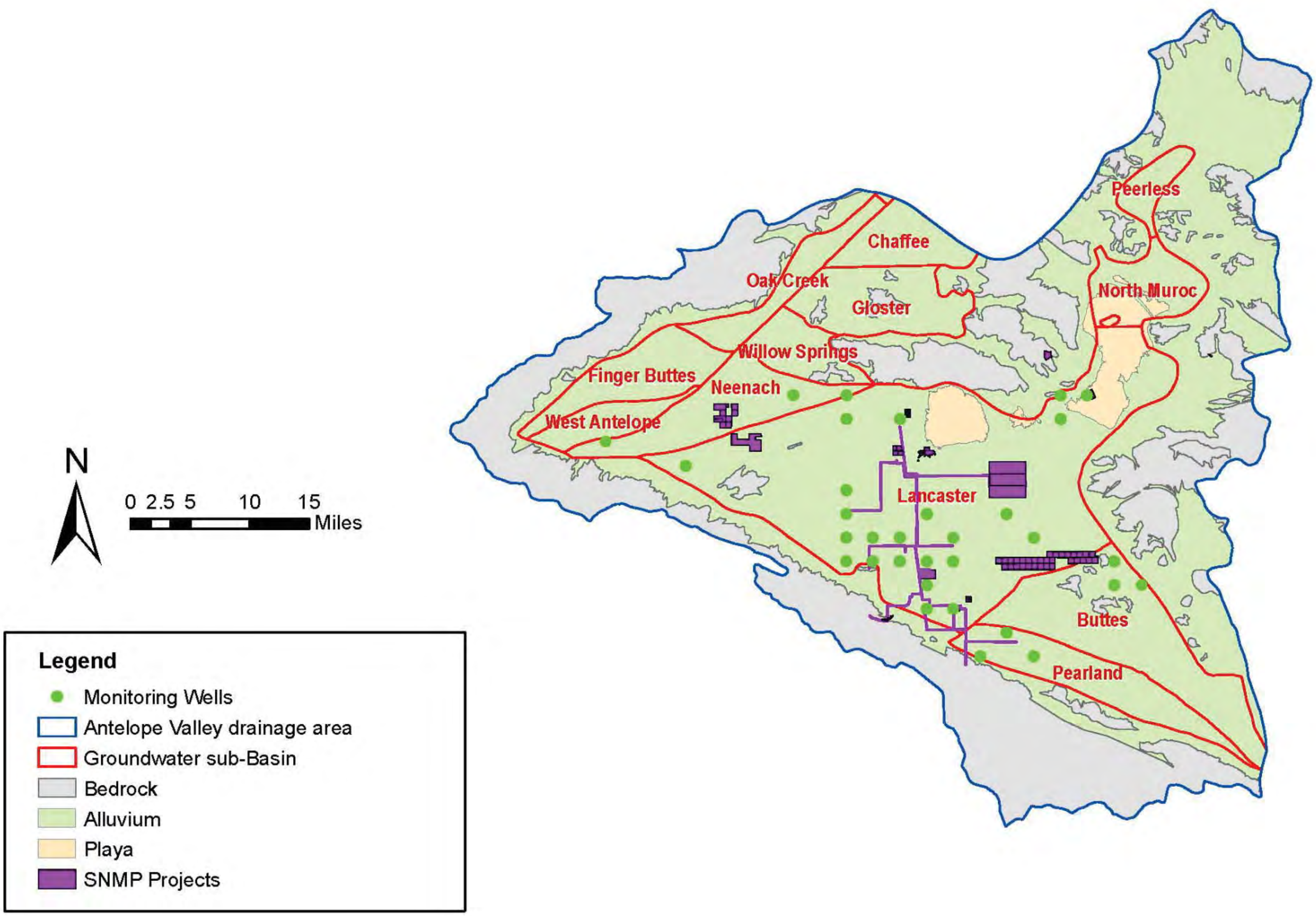
The SNMP groundwater wells to be included in the SNMP monitoring plan are listed in Table 5-1 and the locations are depicted in Figure 5-1. The Lancaster sub-basin is suitably represented with 23 monitoring locations. Buttes, Pearland, and Neenach sub-basins have three locations each. A minimum of three wells per sub-basin is preferred to be considered statistical valid for monitoring. Of the 32 potential wells, 24 are owned and operated by established water utilities or US Air Force. The remaining wells belong to mutual water companies, industrial companies and some smaller entities (hospital, elementary school, casino). Two wells used by Rosamond CSD and Land Project Mutual Water Company were discussed at a stakeholder meeting and found to be abandoned/inactive and no longer in use. These wells are not included in the SNMP monitoring plan.

Table 5-1 includes well identification numbers and location information. The depth of each well, the screen interval(s), and land surface elevation are not available from the GAMA database. However, future reporting efforts may include tracking this information.

Table 5-1: Groundwater Wells Included in the SNMP Monitoring Plan

State Well ID	GAMA Well ID	Sub-Basin	Well Owner
1910005-008	W0601910005	Buttes	LACWD
1910027-002	W0601910027	Buttes	LACWD
1910005-003	W0601910005	Buttes	LACWD
1503360-001	W0601503360	Lancaster	Diamond Jim Casino
1510018-009	W0601510018	Lancaster	RCSD
1510701-008	W0601510701	Lancaster	EAFB
1510701-011	W0601510701	Lancaster	EAFB
1510701-013	W0601510701	Lancaster	EAFB
1900751-001	W0601900751	Lancaster	Eastside Elementary
1900929-001	W0601900929	Lancaster	High Desert Hospital
1910067-211	W0601910067	Lancaster	LADWP
1910070-011	W0601910070	Lancaster	LACWD
1910070-026	W0601910070	Lancaster	LACWD
1910070-034	W0601910070	Lancaster	LACWD
1910070-036	W0601910070	Lancaster	LACWD
1910070-049	W0601910070	Lancaster	LACWD
1910070-070	W0601910070	Lancaster	LACWD
1910070-091	W0601910070	Lancaster	LACWD
1910097-004	W0601910097	Lancaster	Northrop Grumman
1910102-009	W0601910102	Lancaster	PWD
1910102-015	W0601910102	Lancaster	PWD
1910103-001	W0601910103	Lancaster	PRID
1910103-007	W0601910103	Lancaster	PRID
1910130-006	W0601910130	Lancaster	QHWD
1910130-009	W0601910130	Lancaster	QHWD
1910137-007	W0601910137	Lancaster	Boeing Company
1500421-001	W0601500421	Neenach	Longview Mobile Estates
1502569-001	W0601502569	Neenach	First Mutual Water System
1909006-001	W0601909006	Neenach	WVCWD
1910102-021	W0601910102	Pearland	PWD
1910102-027	W0601910102	Pearland	PWD
1910203-005	W0601910203	Pearland	LACWD

Figure 5-1: Locations of the Groundwater Wells Included in the SNMP Monitoring Plan



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5.3 Monitoring Frequency

Supply (e.g., raw imported and treated potable) and recycled waters are monitored annually. In general, public supply wells are monitored every year per California Department of Public Health (CDPH) requirements, but the monitoring frequency may vary depending on the specific constituent and the concentration of the constituent in the water extracted from the groundwater well (e.g., additional monitoring may be necessary if results indicated than an MCL is exceeded). The appropriate agency or well owner is responsible for monitoring water quality. For example, AVEK monitors raw imported water and the Sanitation Districts monitor the recycled water that they produce.

5.4 Constituents to be Monitored

As appropriate and necessary, the program will include monitoring of: total dissolved solids (TDS), nitrate, chloride, arsenic, total chromium, fluoride, and boron. Constituents of emerging concern (CECs; e.g., endocrine disrupters, personal care products or pharmaceuticals) and other constituents may be added to the monitoring program in consideration of actions taken by the State Board. In January 2013, the State Board adopted an amendment to the Recycled Water Policy and presented recommendations for monitoring CECs in recycled water. The Recycled water policy does not designate CEC monitoring requirements for recycled water used for landscape irrigation due to the low risk for ingestion of the water. However, the CEC monitoring requirements prescribed in the Recycled Water Policy pertain to the production and use of recycled water for groundwater recharge by surface and subsurface application methods. Only one of the listed projects in Section 3, the Littlerock Creek Groundwater Recharge and Recovery Project, proposes to use recycled water for groundwater recharge. Prior to the implementation of this project, or any other proposed groundwater recharge project using recycled water, the appropriate agency (or agencies) will monitor the water for CECs as prescribed in the Recycled Water Policy, as applicable, unless an alternative monitoring plan is approved by the Regional Board. The Recycled Water Policy does not prescribe CEC monitoring requirements for other uses of recycled water, but may in the future, at which time stakeholders may revisit and revise the SNMP monitoring plan as applicable and appropriate.

5.5 Data Evaluation and Reporting

All public supply wells are monitored and the results reported to the State's Drinking Water Program, administered by the State Board. The State's GAMA Program compiles a portion of these monitoring results (depending on the GAMA data needs) into a publicly-accessible internet database, GeoTracker GAMA[1]. GeoTracker GAMA integrates data from the State and Regional Boards, CDPH, Department of Pesticide Regulation, Department of Water Resources, USGS, and Lawrence Livermore National Laboratory.

Water quality analyses for the Drinking Water Program are required to be conducted by certified laboratories. These laboratories are required to be in compliance with the Environmental

[1] Accessible at http://www.waterboards.ca.gov/gama/geotracker_gama.shtml.

Laboratory Accreditation Program[2] (ELAP). ELAP is administered by the State Board and provides evaluation and accreditation of environmental testing laboratories to ensure the quality of analytical data used for regulatory purposes to meet the requirements of the State. In addition, ELAP requires laboratories to have an updated quality assurance manual that includes the following elements:

- Laboratory organization and personnel responsibilities
- Quality assurance objectives for measurement of data
- Sampling procedures (when the laboratory performs the sampling)
- Custody, holding, and disposal of samples
- Calibration, procedures and frequency
- Analytical procedures
- Acquisition, reduction, validation and reporting of data
- Internal quality control checks
- Performance and system audits
- Preventive maintenance
- Assessment of precision and accuracy
- Corrective action
- Quality assurance reports

Water samples will be collected by ELAP-certified laboratory technicians in accordance with the pre-approved quality assurance manuals. The ELAP-accredited laboratories have demonstrated capability to analyze water samples using approved methods. A sample chain-of-custody form, from the USEPA report titled "Manual for the Certification of Laboratories Analyzing Drinking Water Criteria and Procedures Quality Assurance", is provided in Figure 5-2.

The Antelope Valley SNMP Monitoring Report (Report) prepared for submittal to the Lahontan Regional Water Board may include, but is not limited to, the following:

1. The relevant monitoring data, as described above, including TDS, nitrate, chloride, arsenic, total chromium, fluoride, and boron.
2. Determination of current ambient conditions. As stated in the definition in Section 1, the "current ambient condition" is the average concentration of a particular constituent measured in the water collected at the monitoring locations for the most recent 5-year period.
3. Comparisons of current ambient conditions to baseline conditions and to the values determined in the SNMP antidegradation analysis. Comparisons may include statistical and other analyses to test for significant differences, trends, and graphical representations (e.g., time versus concentration plots).
4. Comparisons of current water quality to applicable SNMP water quality management goals.
5. An update of the model and relevant calculations. This step may involve averaging the groundwater data from the basin to detect trends in constituent concentrations over time, which can be compared with model predictions to calibrate and improve the model.
6. An update of relevant projects and implementation information, such as discussed in Section 3.
7. Other relevant updates, such as land uses and cleanup site information from the State Board's GeoTracker database.
8. Discussion on adequacy of the SNMP monitoring plan (e.g., whether to incorporate additional wells into the SNMP monitoring program).

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[2] http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx

9. Discussion on adequacy of SNMP components (e.g., implementation strategies) based on analysis results and discussion of the SNMP monitoring program.

One goal of the SNMP monitoring and reporting is to evaluate whether basin water quality has changed over time and if it is consistent with the model predictions. This evaluation will help to assess whether the SNMP constituents are effectively managed to meet the SNMP water quality management goals or if changes to the SNMP are necessary to meet goals. The current intent is to submit the Report to the Lahontan Regional Board every three years.

The AVIRWMP group may take on the reporting responsibilities. It has also been discussed at an AV SNMP stakeholder meeting that reporting responsibilities could potentially be a duty of the eventual Antelope Valley Groundwater Watermaster.

Figure 5-2: Sample Chain-of-Custody Form

Survey	**Samplers:** Signature

Station Number	Station Location	Date	Time	Sample Type			Seq. No.	No. Of Containers	Analysis Required
				Water		Air			
				Comp.	Grab.				

Relinquished by: Signature	**Received by:** Signature	**Date/Time**
Relinquished by: Signature	**Received by:** Signature	**Date/Time**
Relinquished by: Signature	**Received by:** Signature	**Date/Time**
Relinquished by: Signature	**Received by Mobile Laboratory for Field analysis:** Signature	**Date/Time**

Dispatched by:	**Date/Time**	**Received for Laboratory by:** Signature	**Date/Time**
Method of Shipment:			

Distribution: Orig. --Accompany Shipment, 1 Copy--Survey Coordinator Field Files

Section 6: Implementation Measures

6.1 Managing Salt and Nutrient Loadings on a Sustainable Basis

The baseline water quality analyses for the Antelope Valley Groundwater Basin indicates that overall groundwater quality with respect to the SNMP constituents of concern is below the SNMP water quality management goals. These goals are consistent with the Regional Board's Basin Plan to protect the beneficial uses of the water. The analysis of future water quality (through 2035) indicates slowly increasing trends and that, with implementation of the projects identified to have a potential effect on the salt and nutrient load to the groundwater basin, the overall basin groundwater salt and nutrient quality will remain below the SNMP water quality management goals. Under conservative assumptions, future water use is projected to increase arsenic concentrations in the groundwater above existing background levels in the 25-year planning period. However, the basin average will remain within an acceptable range over the long term to protect present and anticipated beneficial uses and any increases will be most likely due to naturally occurring causes. Therefore, no new implementation measures as part of the SNMP process are recommended at this time. Nevertheless, existing measures or practices are already in place to manage water quality, and frequent monitoring should also be implemented to assess trends in water quality.

In the case of some Antelope Valley sub-basins, average baseline water quality may already exceed the SNMP water quality management goals. However, none of the projects identified are located within those sub-basins or considered to have an impact on them since the projects are located hydrologically downgradient.

6.2 Existing Implementation Measures

As mentioned, the projected future groundwater quality concentrations are not expected to exceed the SNMP water quality management goals and implementation of the identified projects will not unreasonably affect the basin's designated beneficial uses. Therefore, no new implementation measures are recommended to manage salts and nutrients within the basin. Several programs are already underway in the basin, which help manage groundwater supplies and quality. These programs fall under five categories, as follows:

- Municipal Wastewater Management
- Recycled Water Irrigation
- Groundwater Management
- Onsite Wastewater Treatment System Management
- Agricultural

Implementation measures that are underway in the basin within these broad categories are described below.

6.2.1 Municipal Wastewater Management

Most of the municipal wastewater treatment agencies in the Antelope Valley have implemented source control programs including industrial waste management measures (i.e., pre-treatment program, educational outreach, coordination with customers) to control salinity and nutrients in influent waters, which ultimately improves the quality of recycled water.

The Palmdale and Lancaster Wastewater Reclamation Plants (WRPs) owned and operated by the Los Angeles County Sanitation Districts have undergone upgrades from secondary to tertiary treatment that include nitrification-denitrification treatment processes. This has led to a reduction in nitrate and overall nitrogen content in the recycled water produced at these plants. With the new tertiary treatment, the plants' effluents have also experienced reductions in TDS. The Rosamond Community Services District (RCSD) Wastewater Treatment Plant has undergone upgrades to treat a portion of its flow to tertiary standards, but has not yet expanded its recycled water use program.

6.2.2 Recycled Water Irrigation

The implementation of recycled water is regulated by the Title 22 California Code of Regulations (Title 22). Numerous BMPs and operating procedures must be followed when using recycled water for irrigation to ensure safety. The following BMPs, amongst others, are implemented in recycled water operations, per permitting by the Regional Board:

- Water quality monitoring at the treatment plant to ensure regulatory compliance with Title 22 and meet monitoring requirements as part of the Recycled Water Policy.
- Irrigation at agronomic rates – irrigation water is applied at a rate that does not exceed the demand of the plants, with respect to water and nutrients (typically monitored as nitrogen), and does not exceed the field capacity of the soil.
- Site Supervisor – a site supervisor who is responsible for the recycled water system and for providing surveillance to ensure compliance at all times with regulations and Permit requirements is designated for each site. The Site Supervisor is trained to understand recycled water, and supervision duties. In addition to monitoring the recycled water system, the Site Supervisor must also conduct an annual self-inspection of the system.
- Minimize runoff of recycled water from irrigation – Irrigation is not allowed to occur at any time when unauthorized runoff may occur, such as during times of rainfall or very low evapotranspiration, and any excessive overspray must be controlled.

6.2.3 Groundwater Management

Measures and practices to protect the basin include the following:

- The Antelope Valley Integrated Regional Water Management Plan (IWRMP) development process provided a mechanism for: 1) coordinating, refining and integrating existing planning efforts within a comprehensive, regional context; 2) identifying specific regional and watershed-based priorities for implementation projects; and 3) providing funding support for the plans, programs, projects and priorities of existing agencies and stakeholders. The process also includes public outreach and groundwater management strategies and objectives for the Region (including this SNMP), as well as a list of implemented and proposed projects to meet the management objectives.
- Basin-wide groundwater level monitoring.
- Groundwater quality monitoring, such as the State's GAMA program and other local efforts. Also includes groundwater quality analyses, such SNMP efforts to track water quality and improve the SNMP prediction model
- Groundwater banking and recharge studies and pilot-projects.
- Stormwater has low to no concentrations of salt and nutrients. Proposed projects for the region incorporates stormwater management and groundwater recharge.
- Arsenic treatment study and projects.
- Water recycling projects to offset groundwater pumping.
- Groundwater cleanup site programs.

- A water purveyor's Urban Water Management Plan (UWMP) provides a summary of an agency's water supplies, demands, and plans to ensure future reliability, such as potential water transfers and exchanges, desalination, and recycled water opportunities.
- The Antelope Valley Groundwater Basin is currently undergoing a groundwater rights adjudication process.

6.2.4 Onsite Wastewater Treatment System Management

A large percentage of the groundwater basin is overlain by rural areas that manage waste through individual onsite wastewater treatment system (OWTS), also known as septic systems. Individual property owners are responsible for managing their own system and employ a variety of BMPs such as monitoring and frequent pumping to manage the operation of the system. In 2012, the State Water Resources Control Board adopted the Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems. The intent of the Policy is "to allow the continued use of OWTS, while protecting water quality and public health". BMPs required in the Policy include site evaluations, setbacks, and percolation tests for new systems.

6.2.5 Agriculture

Agricultural areas include various ongoing BMPs that may include:

- Drip irrigation – water application is minimized by focusing the amount and area applied.
- Soil and plant testing – it is common practice for agricultural site managers to conduct annual soil testing to understand soil characteristics for crop production efficiencies and refine crop nutrient needs. Soil testing includes review of TDS and nitrate and other salts.
- Focused application of fertilizer and soil amendments

6.3 Additional Implementation Measures

As mentioned earlier, the projected future groundwater quality concentrations are not expected to exceed the SNMP water quality management goals and implementation of the identified projects will not unreasonably affect the basin's designated beneficial uses. It is the intention of the SNMP monitoring plan to obtain water quality results that will be used to compare future groundwater quality to applicable SNMP water quality management goals and determine whether additional measures are necessary to manage constituent load to the basin. After confirmation of results indicating that either the current average water quality of the basin exceeds the available baseline assimilative capacity use by 50% or that significant increases in the groundwater quality are projected within the next 10 years that would affect the designated beneficial uses, the implementation measures identified below will be evaluated and the most appropriate measures will be recommended for implementation.

Implementation measures to reduce salt and/or nutrient concentrations in groundwater that may be considered include, but are not limited to, the following:

- Reducing the amount of salts/nutrients imported into the basin by implementing imported water treatment processes that remove salts and/or nutrients (e.g. reverse osmosis).
- Reducing the amount of salts added to groundwater via source water - wastewater treatments, modified processes such as increased retention time, or blending prior to use for irrigation or basin recharge.
- Reducing the amount of salts and nutrients added to water via anthropogenic sources – BMPs, public outreach, and land management guidelines.
- Natural treatment such as a wetland system.
- Ultrafiltration treatment (i.e., reverse osmosis) of source or recycled water. This treatment

is typically very costly and results in a waste stream that must be managed, which can itself be challenging and costly. Options for briny waste include: transporting and exporting salts to a landfill or other site, disposing of salts via brine lines (not cost effective or practical), or deep well injection.

- An ordinance or ban on water softeners that uses salts may result in reduced chloride and slightly reduced TDS concentrations in the wastewater and ultimately reduced concentrations in the recycled water produced.
- Evaluating industry (e.g. commercial, industrial, agricultural, etc.) processes.
- Replacing chlorination disinfection processes with ultraviolet light (UV) disinfection to reduce chloride concentrations.
- Developing BMPs such as limiting excess fertilizing (set realistic goals for maximum crop yield) and eliminating over-irrigation to curtail the leaching transport process.
- Developing nutrient management programs and crop-specific nutrient application rates to improve crop fertilizer efficiency (decrease the total residual mass of nitrogen in the soil by using nitrification inhibitors or delayed release forms of nitrogen).
- Encouraging Low Impact Development (LID), to increase stormwater recharge and limit salt and nutrient loading to runoff.

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Appendix A

October 3, 2011

SCOPE OF WORK
Salt/Nutrient Management Plan for the Antelope Valley

PURPOSE

To develop a regional Salt/Nutrient Management Plan (SMP) for the Antelope Valley (AV) to manage salts and nutrients (and possibly other constituents of concern) from all sources within the basin to maintain water quality objectives and support beneficial uses. The intention is to involve all surface water and groundwater users and wastewater dischargers in the Antelope Valley basin to participate in efforts to protect these waters from accumulating concentrations of salt and nutrients that would degrade the quality of water supplies in the Antelope Valley to the extent that it may limit their use.

BACKGROUND

On February 3, 2009, the State Water Resources Control Board (State Board) adopted a Recycled Water Policy (Policy) that addresses the concern for protecting the quality of California's groundwater basins. In response to this Policy, Los Angeles County Waterworks Districts and Sanitation Districts of Los Angeles County have, with support of the Lahontan Regional Water Quality Control Board (Lahontan Water Board) staff, initiated efforts to organize a group to develop a regional SMP for the Antelope Valley.

Activities, such as irrigation using imported water, groundwater or recycled water can potentially add salts, typically measured as total dissolved solids (TDS), and nutrients to groundwater basins. Other sources of salts/nutrients can include natural soil conditions, atmospheric deposition, discharges of waste, soil amendments and water supply augmentation using surface water or recycled water.

The SMP shall be completed and proposed to the Lahontan Water Board by May 14, 2014; an extension of up to two years may be allowed if the Lahontan Water Board finds that the stakeholders are making substantial progress toward completion of the plan. In no case shall the period for the completion of the plan exceed seven years.

GOALS

One goal is to address salt/nutrient loading in the Antelope Valley basin region through the development of a management plan by the collaborative stakeholder process rather than the regional regulating agency imposing requirements on individual water projects. The process shall involve participation by Lahontan Water Board staff and be in compliance with California Environmental Quality Act (CEQA) regulations. The involvement of local agencies in a SMP may lead to more cost-effective means of protecting and enhancing groundwater quality, quantity, and availability.

Another goal is to assess impacts resulting from all activities with potential long-term basin-wide effects on groundwater quality, such as surface water, groundwater, imported water, and recycled water irrigation projects and groundwater recharge projects, as well as other salt/nutrient contributing activities through regional groundwater monitoring.

The design and implementation of a regional groundwater monitoring program must involve all stakeholders, including, but not limited to, water importers, purveyors, stormwater management agencies, wastewater agencies, Lahontan Water Board, and other significant salinity/nutrient contributors, in addition to the recycled water stakeholders.

The completion of the SMP may lead to the potential for enhanced partnering opportunities and potential project funding between water and wastewater agencies, or other stakeholders, for developing and protecting water supplies.

PLAN REQUIREMENTS

Data Collection and Assessment

1. Stakeholder Participation
   a. Outreach to the Lahontan Water Board staff and the stakeholders.
   b. Convene stakeholder meetings.
   c. Receive and review stakeholder input.

2. Determine SMP Area Boundaries
   a. The AV Integrated Regional Water Management (IRWM) Plan efforts cover the Antelope Valley groundwater basin. SMP stakeholders have determined that, while the scope of the AV SMP will include the groundwater sub-basins within the AV IRWM geographic boundaries, the Lancaster, Buttes, Neenach, and Pearland sub-basins, for which data has been provided to the AV SMP effort and relevant projects overlay, will be specifically addressed in detail. Additional sub-basins may be further addressed in the AV SMP depending on the willingness of users, purveyors, wastewater agencies, regulators, significant salt/nutrient contributors, and other stakeholders to participate and provide data. Surface water resources are defined using a watershed approach and are categorized based on a hierarchy of hydrologic systems including basins, units, areas, and subareas, which may or may not coincide with groundwater basin nomenclature defined by the CA Department of Water Resources (DWR). The surface waters within the Antelope Valley IRWM geographic boundary fall within the Antelope Hydrologic Unit of the South Lahontan Hydrologic Basin. There are a total of eight hydrologic areas within the Antelope Hydrologic Unit. For clarity and consistency, surface water hydrologic areas and hydrologic subareas will be identified and correlated, to the extent practical, with the groundwater basins as identified by DWR nomenclature within SMP area.
   b. Within the determined scope, identify land uses, surface water resources, groundwater basins and sub-basins, well locations, and hydrogeologic conditions including confined and unconfined aquifer systems, and current water quality.

3. Understand Current and Future Basin Uses
    a. Collect data from counties and participating cities regarding past/historic, current and potential future land uses contributing, or that could contribute, to potential salt/nutrient impacts.
    b. Identify existing surface/groundwater data collection efforts throughout the region.
    c. Create a map(s) with land uses and sites related to salts and nutrients, such as: irrigation (agricultural, commercial, residential); wastewater treatment and disposal (including septic and water softening systems); water recycling; groundwater augmentation and recharge, water treatment, applicable alternative energy; imported water; land application of solids; animal wastes (dairy, confined animal, and ranching) and other potential sources of salinity/nutrient contributions to the groundwater supply.

4. Create Groundwater Quality Database for Sub-basin
    a. Determine groundwater characteristics, recharge areas, and background water quality.
    b. Compile data and determine existing water quality, defined as the average concentration of salts/nutrients and other constituents of concern measured at each well.

5. Data Analysis
    a. Conduct a regional analysis of available groundwater quality databases to determine whether sufficient data and ongoing monitoring are available for the sub-basin.
    b. Collect data regarding other factors (such as atmospheric deposition, mixing of imported water with native basin water, natural sources) contributing, or that could contribute, to potential salt/nutrient impacts.
    c. If necessary, chose an appropriate model for data analysis and run the model. Provide rationale for selection of the specific model, if used. Calibrate the model used to analyze the data (including de-bugging of the chosen model) and verify the input data. Compare various model runs to observed values for each basin, as applicable.

<u>Characterization of Basin</u>

6. Salt and Nutrient Characterization
    a. Identify the current and projected sources and loadings of salts/nutrients. Include water balance/budget (volumetric analysis) and consider atmospheric nitrogen as a source.
    b. Determine the basin’s assimilative capacity of salts/nutrients. Identify and include rationale for the assimilative capacity determination (e.g., selection of maximum TDS limit, etc.). Assimilative capacity will not be necessarily assumed based on Maximum Contaminant Levels, but rather based on a reasonably achievable objective derived from site-specific characteristics and source water quality.
    c. Determine the fate and transport of salt/nutrients.

d. Include other constituents of concern as necessary and appropriate (include naturally occurring constituents such as fluoride, boron, arsenic, chromium as well as constituents from anthropogenic sources, such as those concerned with cleanup sites).
e. Identify potential salt sinks.
f. Develop future planning scenarios for future users/uses that would include expected requests for projected recycled water production, reuse, discharges to Antelope Valley basins, and expected quality for each wastewater treatment facility (existing and projected). Planning scenarios could include appropriate planning spans, including, for example, a 5-year plan, 10-year plan, 25-year plan and a 50-year projected plan, or some combination as determined by the stakeholders.
g. Prepare a draft report to the stakeholders to present the data collected during basin characterization and the results for assimilative capacity (by sub-basin). Include rationale for selection of sub-basins (e.g., current uses, at risk basins, water quality, hydrogeology).
h. Consider the effects of importation of water and transferring recycled water sources between sub-basins. For example, consider the effects of source water derived from the Lancaster sub-basin that is recycled and subsequently transferred to the Buttes sub-basin (Buttes Hydrologic Area) for reuse as irrigation.

<u>Monitoring</u>

7. Develop a Monitoring Plan
    a. Define the scale of the monitoring plan component, dependent on site-specific conditions.
    b. Monitor for salts, nutrients, and other constituents of concern that potentially could adversely affect the water quality of the basin.
    c. Determine appropriate monitoring by targeting basin water quality at existing water supply and monitoring wells and areas proximate to large water recycling projects, and groundwater recharge projects.
    d. The monitoring plan should be designed to evaluate and track the long-term impacts to groundwater quality resulting from past, current, future, and transitioning land uses.
    e. Identify stakeholders responsible for conducting, compiling, and reporting the monitoring data.

8. Monitoring Implementation and Data Management
    a. Monitor each location at a determined frequency to assess impacts and take into account changes in all significant sources.
    b. Establish criteria for concentrations above ambient conditions based on statistical evaluation of data to trigger additional investigations.
    c. Conduct monitoring of constituents of concern (CECs), as recommended by the “blue-ribbon” Advisory Panel and approved by the State Board. CEC monitoring will be conducted in a manner consistent with the Policy.

   d. Data submitted to the State Board for GAMA (Groundwater Ambient Monitoring & Assessment Program) shall follow the guidelines for "electronic submittal of information" outlined on the website: http://www.waterboards.ca.gov/ust/electronic_submittal/index.shtml
   e. Report data to the Lahontan Water Board staff every 3 years.

<u>Implementation Measures</u>

9. Manage Salt/Nutrient Loadings on a Sustainable Basis
   a. Identify potential methods and best management practices to reduce and/or maintain salt and nutrient loadings—such as disposal and/or reducing methods.
   b. Recommend most appropriate methods and best management practices for reducing and/or maintaining salt and nutrient loadings.
   c. Include cost estimates for implementation and other economic information as required by state water law.
   d. Identify goals and objectives for water recycling and stormwater use/recharge and recommend management measures and ways to make the best use of these water resources.

<u>Antidegradation Analysis</u>

10. Demonstrate that the projects included in the SMP will satisfy the requirements of the State Antidegradation Policy (Resolution No. 68-16).

<u>Preparation of the SMP, Adoption by the members of the Antelope Valley Regional Water Management Group and Submittal to Lahontan Regional Water Board</u>

11. Draft the Salt and Nutrient Management Plan. At a minimum, plan will include the required elements as described in the State Board's Recycled Water Policy and as detailed in this Scope of Work.

12. Obtain approval/adoption/acceptance of the SMP by the members of the Antelope Valley Regional Water Management Group.

13. California Environmental Quality Analysis (CEQA)
    a. Draft appropriate CEQA documents related to the SMP.
    b. Adopt or file CEQA document.

14. Adoption of SMP by Lahontan Regional Board
    a. Collaborate as necessary with the Lahontan Regional Water Board staff to prepare the SMP for adoption into the Lahontan Region's Basin Plan (could include public hearing process, additional CEQA, presentation of SMP to the Lahontan Regional Water Board).
    b. Submit final SMP along with final CEQA document(s) to the Lahontan Regional Water Board for adoption.

Proposed Schedule

Task	Description	Estimated Completion Date
1a	Outreach to RWQCB and Stakeholders	July 2009
1b	Convene Initial S/N Management Plan Meeting	August 2009
2	Determine SMP Area Boundaries	January 2010
3	Current and Future Basin Uses	January 2011
4	Create Groundwater Quality Database	July 2010
5	Data Analysis	December 2011
6	Characterization of Basin	January 2012
7	Develop Monitoring Plan	March 2012
8	Monitoring Implementation	Every three years
9	Identify Implementation Measures	July 2012
10	Antidegradation Analysis	July 2012
11	Draft S/N Management Plan	January 2013
12	Adoption of SMP by members of AV RWM Group	May 2013
13	Completion of CEQA Documents	August 2013
14	Submit Final SMP to RWQCB	October 2013

Appendix B

California Regional Water Quality Control Board
Lahontan Region

Matthew Rodriquez
Secretary for Environmental Protection

2501 Lake Tahoe Boulevard, South Lake Tahoe, California 96150
(530) 542-5400 • Fax (530) 544-2271
www.waterboards.ca.gov/lahontan

Edmund G. Brown Jr.
Governor

April 18, 2012

Antelope Valley Integrated Regional Water Management (IRWM) Stakeholder Group
Antelope Valley State Water Contractors Association
Palmdale Water District
2029 East Ave. Q
Palmdale, CA 93550

Attention: Matt Knudson

ACCEPTANCE OF SCOPE OF WORK FOR SALT AND NUTRIENT MANAGEMENT PLAN FOR ANTELOPE VALLEY IRWM REGION

Please send my thanks to Ms. Jessica Bunker and Ms. Erika de Hollan of the Antelope Valley IRWM Region Stakeholder Group for their effective presentation to the Lahontan Water Board on the Scope of Work (SOW) for the Antelope Valley IRWM proposed Salt and Nutrient Management Plan (SMP). As you know, a key element of the State Water Board's Recycled Water Policy (Resolution No. 2009-0011) is the development of a SMP for every groundwater basin in California by 2014.

Ms. Bunker and Ms. De Hollan explained to the Water Board the process that the Antelope Valley IRWM Stakeholder Group will use to develop its SMP, and that the development of the SMP will be controlled and funded by local stakeholders with participation from Water Board staff. As shown in the enclosed summary (October 12, 2011 Minutes from Regular Meeting of the Lahontan Water Board), the Water Board members were pleased with the initiative and collaboration demonstrated by the Antelope Valley IRWM Stakeholder Group in starting to develop its SMP. The Water Board did not express any concerns with the SOW or the process being used by the Antelope Valley IRWM Stakeholder Group.

Water Board staff appreciate the efforts of the Antelope Valley IRWM Stakeholder Group in its development of the SMP and look forward to continued participation in the process. Please contact me at (530) 542-5408 or Jan Zimmerman at (760) 241-7376 if you have questions or need more information.

Cindy Wise

Cindy Wise
Staff Environmental Scientist

Enclosure (1)

CC: Waterworks and Sanitation Districts

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Erika de Hollan
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California Regional Water Quality Control Board
Lahontan Region

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Matthew Rodriquez
Secretary for Environmental Protection

Edmund G. Brown Jr.
Governor

MINUTES
October 12, 2011

Regular Meeting

Mojave Desert Air Quality Management District
14306 Park Avenue
Victorville, CA 92392

Chairman Clarke called the meeting to order at 1:00 p.m. on October 12, 2011.

Board Members Present
Jack Clarke, Apple Valley
Mike Dispenza, Palmdale
Keith Dyas, Rosamond
Amy Horne, Ph.D., Truckee
Peter C. Pumphrey, Bishop
Don Jardine, Markleeville
Eric Sandel, Truckee

Board Member Absent
None

Legal Counsel

Kimberly Niemeyer, Office of Chief Counsel, State Water Resources Control Board
Laura Drabandt, Office of Chief Counsel, State Water Resources Control Board

Staff Present

Harold Singer, Executive Officer
Lauri Kemper, Assistant Executive Officer
Scott Ferguson, Senior WRCE
Patrice Copeland, Senior Eng. Geologist
Keith Elliott, Senior WRCE
Cindy Wise, Staff Environmental Scientist
Cindi Mitton, Senior WRCE
Jan Zimmerman, Engineering Geologist
John Morales, Water Resources Control Eng
Mike Coony, Water Resources Control Eng
Eric Taxer, Water Resources Control Eng
Rebecca Phillips, Office Technician
Vanessa Ramirez, Student Assistant
Christopher White, Student Assistant

Addressing the Board

Dr. James Hart, Adelanto City Manager; Betsy Elzufon, Larry Walker and Assoc.; John Fogerty, Executive Office, San Bernardino Sheriff's Department; Mark Hagan, USAF; Raymond Tremblay, LA Co. Sanitation District; Stafford Lehr, CA Dept. of Fish and Game; Jessica Bunker, LA Co. Water Works District No. 40; Erika de Hollan, LA Co. Sanitation Districts

INTRODUCTIONS

Chairman Clarke introduced the Board members. Mr. Singer introduced the Water Board staff and Kimberly Niemeyer legal counsel.

1. **PUBLIC FORUM** – Item moved to Page 6, following No. 9 continuation of Executive Officer's Report

2. **MINUTES**

   Minutes of the Regular Meeting of September 14 – 15, 2011 in Kings Beach (Amber Wike)

   - **Motion**: Moved by Mike Dispenza seconded by Dr. Horne and **unanimously carried** to adopt the September 14 – 15, 2011 minutes as written.

3. **ADOPTION OF UNCONTESTED CALENDAR**

   Note: Items denoted by (*) appears next to items adopted by the Board on the uncontested calendar.

   RESCISSION OF WASTE DISCHARGE REQUIREMENTS

*4. Rescission of Waste Discharge Requirements for Desert Terrace Apartments, San Bernardino County

   - **Motion**: Moved by Dr. Horne, seconded by Peter Pumphrey and **unanimously carried** to adopt the Rescission Order as proposed.

STATUS REPORTS

5. Adelanto Public Utility Authority Cease and Desist Order Status Report, San Bernardino County

   Mr. Singer made introductory comments on this item. He informed the Board that this is just an information item and workshop. Mr. Singer also informed the Board that the City and Water Board prosecution team submitted additional information which was added in their packets.

   Dr. James Hart, Adelanto City Manager, gave a general update on this item. He informed the Board that Larry Walker and Associates have been retained to help with reporting on the Water Board Orders. The three year extension has been finalized with VVWRA for diversion. Testing on Ponds 3, 4, 5 and 9 have been completed. Pond 5 construction is complete and is receiving discharge. Also Pond 9 construction is complete. Pond 4 will be completed by October 15.

   Betsy Elzufon, with Larry Walker and Associates made a presentation to the Water Board to assist with answering comments from Water Board staff regarding the report that was submitted last week. The Water Board and Mr. Singer asked questions after Ms. Elzufon's presentation.

   Eric Taxer, commented on the presentation made by Dr. Hart and said that the City of Adelanto has worked very hard to address the Regional Board's concerns. He also stated that there are still a few outstanding issues that have not been complied with which were provided to the Board in a table. Chairman Clarke and Dr. Horne had questions for Mr. Taxer.

   Laura Drabandt, State Water Board, Staff Counsel, reported to the Water Board on the enforcement options. Due to the separation of functions, she informed the Board that she could not be more specific. She also informed the Board that the City of Adelanto is not yet in compliance.

   Chairman Clarke had concerns with the amount of beds at the prisons in the presentation. He said the numbers were not adding up. Mr. Singer suggested that the City and Prosecution team should review the information and provide more clarity to the Board at a future meeting.

6. County Sanitation District No. 14 of Los Angeles County, Lancaster Water Reclamation Plant, Los Angeles County Cease and Desist Order Status Report

   Mike Coony, Water Resources Control Engineer with the Victorville office gave the staff presentation. Mr. Coony answered questions from the Board.

RENEWAL OF NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT

7. California Department of Fish and Game; Fish Springs Fish Hatchery, Inyo County
   Note: This item has been postponed to a future Board Meeting.

   Mr. Singer informed the Water Board that this item has been removed from the agenda.

8. California Department of Fish and Game; Mojave River Fish Hatchery, San Bernardino County

   Keith Elliott, Senior Engineer gave the staff presentation. Dr. Horne suggested additional changes regarding the rain event in the Order.

   Board discussion

   Dr. Horne commented on the professionalism that the Fish and Game is showing and thanked them. Mr. Elliott answered questions from the Water Board.

   - **Motion**: Moved by Eric Sandel, seconded by Keith Dyas and **unanimously carried** to adopt the Order with the late revisions and correction, and additional changes as proposed.

OTHER BUSINESS

9. **Executive Officer's Report**

   Mr. Singer discussed items from the April 1, 2011 - June 31, 2011 Executive Officer's Report and answered questions from the Board.

   Mr. Singer informed the Board that the Hinkley residents have requested that the Board have a Public Forum regarding PG&E. Mr. Singer suggested they do this at 7:00 p.m. this evening. He will discuss the PG&E Executive Officer's Report before the Public Forum. A Cleanup and Abatement Order (CAO) was issued on October 11, 2011 and Mr. Singer will give the Board a briefing on the CAO which was placed in the Board's folders. Ms. Kemper will give the Board a briefing on the status of other Water Board activities associated with PG&E's groundwater cleanup.

   Mr. Singer went over the Draft Board Meeting schedule for 2012.

   Note: Executive Officer's Report to be continued at 7:00 p.m.

10. **Reports by Water Board Chair and Board Members**

Dr. Horne commented on the Water Quality Coordinating Committee meeting that she attended. At the meeting, they discussed having the Water Boards working together as one Board. She also informed the Board about an art exhibit that she attended in Reno regarding altered landscapes that are in the Lahontan and Colorado Region. Dr. Horne handed out the brochure from this exhibit.

Mr. Pumphrey commented on the Water Quality Coordinating Committee meeting that he attended. He was very impressed by the talents and skills of the agency and made him more aware of the work and efforts of the Water Board staff.

Chairman Clarke gave a report regarding the Chair's conference call. He informed the Board that the discussion of the Water Board working together as one Board has been brought up before several times during the Chair's conference calls.

11. **CLOSED SESSION***

The Board met in closed session from 4:30 p.m. to 4:41 p.m. to consider Item k. Discussion of Personnel Matters. Authority: Government Code section 11126. The Board reconvened in open session at 4:45 p.m.

The Board recessed for dinner at 4:45 p.m.

Regular Meeting continued
7:00 p.m., October 12, 2011

Chairman Clarke called the meeting to order at 7:00 p.m.

Board Members Present	Board Member Absent
Jack Clarke, Apple Valley	None
Mike Dispenza, Palmdale	
Keith Dyas, Rosamond	
Amy Horne, Ph.D., Truckee	
Don Jardine, Markleeville	
Peter C. Pumphrey, Bishop	
Eric Sandel, Truckee	

INTRODUCTIONS

Chairman Clarke introduced the Board members.
Mr. Singer introduced the Water Board staff.

9. Executive Officer's Report (continued)

Mr. Singer discussed the CAO that was issued yesterday, October 11, 2011 to PG&E on replacement of water. The Water Board delegated Mr. Singer to issue the CAO. Mr. Singer gave a summary of the CAO and asked if the Board had questions.

Ms. Kemper discussed the 2008 CAO that required PG&E to develop a comprehensive strategy to clean up the ground water in the Hinkley Valley which included the submittal of a feasibility study to the Board last September.

Ms. Kemper informed the Board and Public that staff will have a public meeting later this year at the Hinkley School. They will be discussing the responses from the Peer Review on the background study, the status of the EIR, and current status of the plume investigation and the ground water cleanup.

1. **PUBLIC FORUM** *(continued)*

Carmela Spasojevich, Hinkley resident, expressed her relief that a CAO has been issued to PG&E, and also expressed her dismay at the length of time that PG&E is being given to comply with this CAO.
Robert Conaway, Helphinkley.org, voiced concern that Hinkley / Barstow area need representation on the Water Board.
James Dodd, PG&E Advisory Board Committee: He commends the Water Board for getting something done but not moving fast enough. He believes PG&E needs to help the people who want to move out of the area.
Karen Dodd, Hinkley resident: Where is the legal Administrative Civil Liability for PG&E?
Elaine Kearney, Hinkley resident: Built their retirement home in Hinkley and was not aware of the water problems. She is concerned that her property and home is poisoned and worthless.
Daron Banks, Hinkley resident: Private wells need to be added to the total and complete plume map. Suggest Water Board staff test their water not PG&E personnel.
Patti Dickman, Hinkley resident: Thanks the Water Board for issuing the CAO to PG&E, but disappointed in staff for the length of time that it took and the 10 months that the CAO gives PG&E to comply.
Jackie Conaway, Hinkley resident: Ms. Conaway thanks Mr. Singer for all he has done. Ms. Conaway asked if the Water Board knows the source of the Culligan Water being provided to the residences by PG&E and if it has been tested?

Dr. Horne thanked all the residents from Hinkley for coming to the Water Board meeting and making their presentations.

PLANS AND POLICIES

12. **Discussion of Proposed Scope of Work and Development of a Salt and Nutrient Management Plan (SMP) for the Antelope Valley, Antelope Valley Regional Water Management Group, Los Angeles and Kern Counties**

Jan Zimmerman, from the Victorville office and Cindy Wise from the South Lake Tahoe office each made a presentation to the Board. Also Jessica Bunker and Erika de Hollan, representing the Antelope Valley Group, described the efforts of the Antelope Valley Group.

Ms. Zimmerman, Ms. Wise, Ms. De Hollan and Ms. Bunker answered questions from the Board.

Mr. Sandel commented on the great insight that the presenters gave the Board. The presentation was very organized and well thought through.

Mr. Dispenza congratulated the Antelope Valley Group and is very proud of them.

Mr. Pumphrey is very impressed by the collaborated effort and it is great how they have involved all the stakeholders. The Group should really be commended.

Dr. Horne commented on how excited she is about this project.

Chairman Clarke agrees with all the Board Member's comments. Projects which are the result of collaboration of multiple agencies are great and can work.

Board members did not express any concerns with the workplan or the process being followed by the Antelope Valley Group.

ADJOURNMENT

With no further business to come before the Board, the meeting adjourned at 9:22 p.m. on October 12, 2011.

Prepared by: Rebecca Phillips
Rebecca Phillips, Office Technician

Adopted: **December 6, 2011**

Rp/h/BOInfo/Minutes/Final _MINUTES_OCT12-2011rp

Appendix C

Antelope Valley Land Use Designations

Data Sources

City of Lancaster

Files from City of Lancaster Planning Department staff, January 2010.

Land Use Codes:
http://www.cityoflancasterca.org/Modules/ShowDocument.aspx?documentid=9333
http://www.cityoflancasterca.org/Modules/ShowDocument.aspx?documentid=9323
GENERAL PLAN 2030 web page: http://www.cityoflancasterca.org/index.aspx?page=427

City of Palmdale

Files from City of Palmdale Traffic Division/GIS Section staff, May 2010.

Land Use Codes: http://www.cityofpalmdale.org/departments/planning/general_plan/03-LandUse.pdf

Los Angeles County

Files from Los Angeles County Waterworks staff, April 2012.

Land Use Codes: 2012 Draft General Plan 2035
http://planning.lacounty.gov/assets/upl/project/gp_2035_Appendices_C_2012.pdf
http://planning.lacounty.gov/assets/upl/project/gp_2035_Part2_Chapter3_2012.pdf

Kern County

General Plan Map (updated 1-13-2012): http://www.co.kern.ca.us/gis/Files/GeneralPlan.zip
General Plan document: http://pcd.kerndsa.com/planning/planning-documents/general-plans

Floor Area Ratio (FAR) is the ratio of the total covered area on all floors of all buildings to the area of the project site. As a formula, FAR = (total covered area on all floors of all buildings)/ (area of the project site).

du/ac = dwelling unit(s) per acre

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Population Density (Persons/Acre)	Purpose
CM	Major Commercial	Residential or Mixed Use: 30-150 du/net ac Maximum FAR 3.0		Large and intense commercial uses, such as regional and destination shopping malls and centers, tourist and recreation related commercial services, hotels, and amusement activities; multifamily residences; and residential and commercial mixed uses.
CR	Rural Commercial	Maximum FAR 0.5		Limited commercial uses that are compatible with rural, agricultural, and low-intensity visitor-serving recreational activities, including: retail, personal, and professional services; restaurants; general stores; and professional offices.
CR-MU	Rural Commercial / Mixed Use	0-5 du/net ac Maximum FAR 0.5	13	Limited commercial uses that are compatible with rural, agricultural, and low-intensity visitor-serving recreational activities, including: retail; personal, and professional services; restaurants; general stores; and professional offices; and residential and commercial mixed uses.
H2	Large Lot Residential	0–2 du/net ac	6	Low-density, single family residences
H5	Suburban Residential	0–5 du/net ac	15	Low-density, single family residences
H9	Suburban High Density Residential	0–9 du/net ac	26	Single family residences.
H18	Medium Density Residential	0–18 du/net ac	52	Transitional single family and small-scale multifamily residences, including duplexes, triplexes, fourplexes, rowhouses, small lot subdivisions, and townhomes
H30	Urban Residential	0–30 du/net ac	61	Medium-scale, multifamily residences, and single family residences.
IH	Heavy Industrial	Maximum FAR 1.0		Heavy industrial uses, including heavy manufacturing, refineries, and other labor and capital intensive industrial activities.
IL	Light Industrial	Maximum FAR 1.0		Light industrial uses, such as industrial park activities, warehouses, distribution, assembly, disassembly, fabricating, finishing, manufacturing, packaging, and repairing or processing of materials, printing, commercial laundry, photographic film processing, vehicle repair garages, building maintenance shops, metal work, millwork, and cabinetry work.
ML	Military Land			Military installations and land controlled by U.S. Department of Defense.
OS-BLM	Bureau of Land Management			Areas managed by the Federal Bureau of Land Management.

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Population Density (Persons/Acre)	Purpose
OS-C	Conservation			For the preservation of open space areas and scenic resource preservation in perpetuity. Applies only to land that is legally dedicated for open space and conservation efforts.
OS-NF	National Forest			Areas within the national forest and managed by the National Forest Service.
OS-PR	Parks and Recreation			Open space recreational uses, such as regional and local parks, trails, athletic fields, community gardens, and golf courses.
OS-W	Water			Bodies of water, such as lakes, reservoirs, natural waterways, and man-made infrastructure, such as drainage channels, floodways, and spillways. Includes active trail networks within or along drainage channels.
P	Public and Semi-Public	Maximum FAR 3.0		Public and semi-public facilities and community-serving uses, including: public buildings and campuses, schools, hospitals, cemeteries, government buildings, and fairgrounds. Airports and other major transportation facilities. Major facilities, including landfills, solid and liquid waste disposal sites, multiple use stormwater treatment facilities, and major utilities.
RL1	Rural Land 1	Maximum 1 du/1 gross ac Maximum FAR 0.5	4	Single family residences; equestrian and limited animal uses; and limited agricultural and related activities.
RL2	Rural Land 2	Maximum 1 du/2 gross ac Maximum FAR 0.5	2	Single family residences; equestrian and limited animal uses; and limited agricultural and related activities.
RL5	Rural Land 5	Maximum 1 du/5 gross ac Maximum FAR 0.5	1	Single family residences; equestrian and limited animal uses; and limited agricultural and related activities.
RL10	Rural Land 10	Maximum 1 du/10 gross ac Maximum FAR 0.5	0.4	Single family residences; equestrian and animal uses; and agricultural and related activities.
RL20	Rural Land 20	Maximum 1 du/20 gross ac Maximum FAR 0.5	0.2	Single family residences; equestrian and animal uses; and agricultural and related activities.
RL40	Rural Land 40	Maximum 1 du/40 gross ac Maximum FAR 0.5	0.1	Single family residences; equestrian and animal uses; and agricultural and related activities.
TC	Transportation Corridor			

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Purpose
Aqueduct	California Aqueduct		Open space
AR	Airport and Related Uses		Intended for public and private airfields and support facilities, aerospace-related industries, transportation-related industries, and commercial facilities necessary to support military and commercial air traffic. Primarily applies to U.S. Air Force Plant 42 and the Palmdale Regional Airport site. While industrial development related to the aerospace industry has occurred at Air Force Plant 42, the airport property is largely vacant, supporting minor agricultural uses and sewage treatment facilities.
BP	Business Park		Intended for a variety of office, research and development, light assembly and fabrication, and supportive commercial uses within an environment characterized by master-planned complexes maintaining a high quality of design and construction. Development in this designation is expected to provide enhanced landscaping and outdoor amenities to create a campus setting. Operations and storage activities are to be confined to enclosed buildings.
CC	Community Commercial	Maximum FAR of 1.0.	Intended for retail and service uses, such as restaurants, apparel stores, hardware stores, grocery markets, banks, offices, and similar uses.
CM	Commercial Manufacturing		Intended for mixed use development of lighter industrial uses and the more intensive service, retail and wholesale commercial uses. Uses include research and development, distribution, manufacturing and wholesale or retail sale of industrial supplies, transportation equipment, building equipment and materials, and similar uses. Supportive commercial uses such as restaurants or convenience markets, which serve consumers within the industrial/commercial area, may be allowed. However, this designation is not intended for general commercial uses, either of a retail or service nature, which will attract non-industrial users. Areas shall have or plan to have adequate sewer, water, transportation, drainage, utilities and public services available. The designation may be used as a transitional use between more intensive industrial uses and less intensive commercial uses.
DC	Downtown Commercial		Intended for the City's traditional retail/service core area, located in proximity to Palmdale Boulevard. Representative uses are designed to produce high levels of social or commercial activity in the downtown area and include entertainment uses, institutional uses, pedestrian oriented retail and service uses, and support community commercial uses.
ER	Equestrian Residential	maximum gross density of 0.40 du/ac (1 unit per 2½ acres)	Intended for single family residential uses where equestrian and related animal keeping activities are permitted. Areas are rural in nature with parcel sizes of 2½ acres or larger. Full urban services such as community water and sewer may not be available to these areas. Estimated population: 800 persons/mi^2.
IND	Industrial		Includes a variety of industrial uses, including the manufacturing and assembly of products and goods, warehousing, and distribution. May include some limited commercial uses which are incidental to and supportive of the primary industrial uses. Areas shall have or plan to have adequate sewer, water, transportation, drainage, utilities and public services.
LDR	Low Density	maximum gross	This designation is appropriate to hillside areas and as a transition between rural and suburban areas. It is

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Purpose
	Residential	density of 1 du/ac	generally expected that urban services such as community sewer and water will be provided to new development proposed within this designation. Minimum lot sizes will generally be one acre or larger, although clustering may be permitted to encourage preservation of natural resources and steep slopes. Estimated population: 1,600 persons/mi^2.
MFR	Multifamily Residential	10.1-16 du/ac	Housing types may include a variety of attached and detached dwelling unit types. Estimated population: 26,000 persons/mi^2.
MR	Medium Residential	maximum gross densities of 6.1 to 10 du/ac	Housing types may include single family detached, single family attached, townhouses, condominiums, duplexes, triplexes, apartments, or manufactured housing developments. Minimum lot size is 7,000 ft^2 for single family residential uses. Equestrian and large animal uses are not intended within these areas. Estimated population: 16,200 persons/mi^2.
MRE	Mineral Resource Extraction		Intended for extraction and processing of mineral resources, including sand, gravel and decomposed granite. Activities include mining, crushing and sales of mineral products; asphalt and concrete batching.
NC	Neighborhood Commercial	Maximum FAR is 0.50	Intended for convenience type retail and service activities designed to serve the daily and short-term needs of the immediate neighborhood.
OC	Office Commercial	Maximum FAR is 1.0	Intended for a variety of professional office uses, including medical, personal, business, legal, insurance, real estate, financial, and other similar uses. May include limited retail, service, child care and eating establishments to support the primary office users within this designation. May include vocational, technical and trade schools, private or public college or universities, and supportive commercial uses. This designation is appropriate between more intensive commercial uses and residential designations, or within commercial areas serving the administrative and professional service needs of businesses and the general public.
OS	Open Space		Intended to identify and reserve land for both natural and active open space uses, including City parks. The designation identifies existing and acquired but not yet built park sites within the community, as well as lands dedicated for open space purposes. This designation is appropriate to protect sites with physical limitations such as flood plains, very steep terrain (slopes steeper than 50 percent), or significant natural resources. Typical uses include recreational uses, horticulture, agriculture, animal grazing or similar uses.
PF	Public Facility	Maximum FAR is 1.0.	Intended for various types of public facilities, including but not limited to schools, parks, libraries, hospitals, public safety and governmental facilities, sewer and water treatment plants, and landfills. Within the PF designation, uses are specifically identified by use type: PF-B Public Facility-Basin PF-C Public Facility-Cemetery PF-Landfill Public Facility-Landfill PF-P&R Public Facility-Park and Ride PF-S Public Facility-School PF-TP Public Facility-Treatment Plant PF-W Public Facility-Water Treatment

City of Palmdale Land Uses

Code	General Plan Land Use	Permitted Density	Purpose
RC	Regional Commercial	Maximum FAR is 1.0.	Intended for retail and service uses attracting consumers from a regional market area. Goods and services provided are typically long-term in nature, rather than convenience goods. Uses include department stores, regional shopping malls, automobile dealerships, hotel/motels, and large retail outlets. Supportive commercial uses serving a community commercial function, such as financial institutions, retail and food services, may also be included, provided that such uses are not primarily oriented to the convenience market.
SD	Special Development		Intended for areas which, due to lack of infrastructure and public services, topography, environmental sensitivity, and development constraints, require comprehensive planning beyond that normally associated with the General Plan. This planning could be accomplished through the Specific Plan process. Development is primarily intended to be residential in nature, with a gross density of 0-2 dwelling units per acre. However, supportive commercial uses are anticipated within this designation. Higher residential density and the location and intensity of supportive commercial uses may be established based upon environmental, topographic, and infrastructural capacity of the land.
SFR-1	Single Family Residential 1	0-2 du/ac	Intended for single family residential uses with net lot sizes generally one half acre or larger, creating a semi-rural environment with horse/animal keeping possible. Full urban services are expected in these areas, although larger lot subdivisions may be developed. Estimated population of 3,600 persons/mi^2.
SFR-2	Single Family Residential 2	0-3 du/ac	Intended for single family residential uses with net lot sizes generally 10,000 ft^2 or larger, although clustering may be permitted to preserve steeper terrain or significant physical features. Full urban services will be required in new development areas. Estimated population of 5,600 persons/mi^2.
SFR-3	Single Family Residential 3	3.1-6 du/ac	Intended for single family residential uses with subdivisions containing a 7,000 ft^2 minimum lot size. Estimated population of 9,700 persons/mi^2.

City of Palmdale Specific Plans

General Plan Land Use
Antelope Valley Auto Center Specific Plan (SP-16)
Antelope Valley Business Park Specific Plan
City Ranch Specific Plan (SP-2)
Foothill Ranch Specific Plan (SP-17)
Hillside Residential Specific Plan (SP-7)
Joshua Hills Specific Plan (SP-4)
Lockheed Specific Plan (SP-11)

General Plan Land Use
Palmdale Trade and Commerce Specific Plan (SP-13)
Palmdale Transit Village Specific Plan (SP-??)
Quarry and Reclamation Specific Plan (SP-14)
Quarry and Reclamation Specific Plan
Rancho Vista Specific Plan (SP-5)
Ritter Ranch Specific Plan (SP-3)

City of Lancaster Land Uses

Code	General Plan Land Use	Permitted Density	Description	SNMP Designation
NU	Non-urban Residential	0.4 - 2.0 dwellings per acre (DU/AC)	Density ranges from one dwelling unit per 2.5 acres to two dwelling units per acre.	
UR	Urban Residential	2.1 - 6.5 DU/AC		
MR1	Multiple Family Residential – Medium Density	6.6 - 15.0 DU/AC		
MR2	Multiple Family Residential – High Density	15.1 - 30.0 DU/AC		
C	Commercial	Floor area ratios (FARs) ranging from 0.5 to 1.0.	Includes a broad spectrum of uses, including regional, community, neighborhood, and highway-oriented uses.	
OP	Office/Professional	Maximum FAR of 0.75.	Includes office and professional uses and supporting commercial uses.	
LI	Light Industry	Maximum FAR of 0.5.	Clean, non-polluting industrial and office uses with support commercial.	
HI	Heavy Industry	Maximum FAR of 0.5.	Includes a range of industrial uses in a less restrictive setting.	
H	Public and Quasi- Public Facilities – Health Care		Includes public and private hospitals, health care facilities, and related independent or assisted-living residential facilities.	
P	Public	Maximum FAR of 1.0.	Uses and lands in public ownership, including governmental administration and service facilities. Includes public schools and educational institutions.	
O	Open Space		Includes publicly owned parks and recreation facilities. Existing parks are specifically delineated; future parks may be represented symbolically. Includes cemeteries, funeral homes, mausoleums, crematoriums, and columbariums.	
SP	Specific Plan		Specific Plans and planned developments.	
MU	Mixed Use	Average density: 21 dwelling units/acre Average FAR: 1.0 Unit density and floor area rations may vary depending on the purpose and design.	This category combines retail, service and office uses with higher density residential uses in the same building or on the same site with residential potentially located above commercial activities. Development typically functions as the center of activity for the surrounding area and emphasizes integrated design with strong pedestrian/transit connections. Areas considered for mixed-use development will typically require development under the guidance of a specific plan.	

Kern County Land Uses

General Plan Land Use	Description
State and Federal Land	Applied to all property under the ownership and control of the various State and federal agencies operating in Kern County (military, U.S. Forest Service, Bureau of Land Management, Department of Energy, etc.).
Incorporated Cities	Cities responsible for the preparation and maintenance of their own General Plans.
Solid Waste Disposal Facility	Public, semi-public, or private municipal solid waste facilities, organic waste disposal facilities, and segregated waste stream disposal facilities.
Accepted County Plan Areas	A designation of areas for which specific land use plans have already been prepared and approved.
Interim Rural Community Plan	Settlements in the County that have individual character which, in past plans, have been broadly merged with the surrounding countryside. These settlements are recognized as unique communities; each with its own character, special advantages, and problems which should more appropriately be addressed at a specific plan level of detail.
Specific Plan Required	Areas wherein large-scale projects have been previously proposed by the project landowner(s). The project proponent bears the burden of demonstrating the suitability of the property for the conceptual uses and densities. The Maximum Allowed Land Use Density tables (Appendix C) showing acreages and densities are conceptual and shall be used as guidelines should a specific plan be developed. Actual land uses and densities shall be based on consistency with the General Plan goals, policies and environmental review and may require reduction or elimination.
Maximum 4 Units/Net Acre	This category is designed to accommodate urban single-family development on lots with a minimum average size of 1/4 net acre (10,890 Sq. Ft. Site Area/Unit).
Maximum 1 Unit/Net Acre	Single-family designation with rural service needs in the valley and desert regions, while in the mountain region, residential uses of this density will require urban service provision (43,560 Sq. Ft. Site Area/Unit).
Minimum 2.5 Gross Acres/Unit	Single family designation with rural service needs in the valley and desert regions, while in the mountain region residential uses of this density will require urban service provision.
Minimum 5 Gross Acres/Unit	Designated in the outlying, less densely settled areas, often characterized with physical constraints and not requiring connections to public water and sewer infrastructure.
Minimum 20 Gross Acres/Unit	Designated in the outlying, less densely settled areas, often characterized by physical constraints and not requiring connections to public water and sewer infrastructure.
Highway Commercial	Uses which provide services, amenities, and accommodations at key locations along major roadways to visitors and through traffic. Uses include, but are not limited to: Hotels, motels, restaurants, garages, service stations, recreational vehicle parks, fast-food restaurants, truck stops, and truck washes.
Light Industrial	Unobtrusive industrial activities that can be located in close proximity to residential and commercial uses with a minimum of environmental conflicts. Industries are characterized as labor-intensive and nonpolluting and do not produce fumes, odors, noise, or vibrations detrimental to nearby properties. Uses may include: wholesale businesses, storage buildings and yards, warehouses, manufacturing, and assembling.
Service Industrial	Commercial or industrial activities which involve outdoor storage or use of heavy equipment. Such uses produce significant air or noise pollution and are visually obtrusive. Uses include, but are not limited to: Automobile and truck parking, storage and repair shops, freighting or trucking yards, bottling plants, breweries, welding shops, cleaning plants, and other manufacturing and processing activities.

Kern County Land Uses

General Plan Land Use	Description
Heavy Industrial	Large-scale industrial activities that are incompatible with other land uses because of potential severe environmental impacts and/or high employee densities. Uses include, but are not limited to: Manufacturing, assembling and processing activities, transportation facilities, material and equipment storage, sawmills, foundries, refineries, and petroleum product storage.
Intensive Agriculture (Min. 20-Acre Parcel Size)	Areas devoted to the production of irrigated crops or having a potential for such use. Other agricultural uses, while not directly dependent on irrigation for production, may also be included. Uses may include: Irrigated cropland; orchards; vineyards; horse ranches; raising of nursery stock ornamental flowers and Christmas trees; fish farms’ bee keeping’ ranch and farm facilities and related uses; one single-family dwelling unit; cattle feed yards; dairies; dry land farming; livestock grazing; water storage; groundwater recharge acres; mineral; aggregate; and petroleum exploration and extraction; hunting clubs; wildlife preserves; farm labor housing; public utility uses; and land within development areas subject to significant physical constraints.
Resource Reserve (Min. 20- Or 80- Acre Parcel Size)	Areas of mixed natural resource characteristics, such as rangeland, woodland, and wildlife habitat which occur within an established County water district. Uses may include: Livestock grazing; dry land farming; ranching facilities; wildlife and botanical preserves; and timber harvesting; one single-family dwelling unit; irrigated croplands; water storage or groundwater recharge areas; mineral; aggregate; and petroleum exploration and extraction; recreational activities, such as gun clubs and guest ranches; and land within development areas subject to significant physical constraints.
Extensive Agriculture (Min. 20- Or 80-Acre Parcel Size)	Agricultural uses involving large amounts of land with relatively low value-per-acre yields, such as livestock grazing, dry land farming, and woodlands. Uses may include: Livestock grazing; dry land farming; ranching facilities; wildlife and botanical preserves; and timber harvesting; one single-family dwelling unit; irrigated croplands; water storage or groundwater recharge areas; mineral; aggregate; and petroleum exploration and extraction; and recreational activities, such as gun clubs and guest ranches; and land within development areas subject to significant physical constraints.
Mineral And Petroleum (Min. 5-Acre Parcel Size)	Areas which contain producing or potentially productive petroleum fields, natural gas, and geothermal resources, and mineral deposits of regional and Statewide significance. Uses are limited to activities directly associated with the resource extraction. Uses may include: Mineral and petroleum exploration and extraction, including aggregate extraction; extensive and intensive agriculture; mineral and petroleum processing (excluding petroleum refining); natural gas and geothermal resources; pipelines; power transmission facilities; communication facilities; equipment storage yards; and borrow pits.
Resource Management (Min. 20- Or 80-Acre Parcel Size)	Primarily open space lands containing important resource values, such as wildlife habitat, scenic values, or watershed recharge areas. Other lands may include undeveloped, non-urban areas that do not warrant additional planning within the foreseeable future because of current population (or anticipated increase), marginal physical development, or no subdivision activity. Uses may include: Recreational activities; livestock grazing; dry land farming; ranching facilities; wildlife and botanical preserves; and timber harvesting; one single-family dwelling unit; irrigated croplands; water storage or groundwater recharge areas; mineral; aggregate; petroleum exploration and extraction; open space and recreational uses; one single-family dwelling; land within development areas subject to significant physical constraints; State and federal lands which have been converted to private ownership.

Appendix D

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
T10000002727	Air Force Plant 42 - Air Force Plant #42, Palmdale - Site 2 T2-1, T2-2, & T2-3 Bldg 214	Military Cleanup Site	Open - Inactive	Palmdale	93550	34.6427	-118.0906	
DOD100004000	Air Force Plant 42 - AOC 2 - Former Firing Range at Bldg 728	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Palmdale	93550-2196	34.6214	-118.0969	
T10000002610	Air Force Plant 42 - RCRA Facility Assessment at SWMU 95	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Palmdale	93550-2196	34.6388	-118.0994	
T0603700347	Air Force Plant 42 - SITE 1 UST T1-1 & T1-2 (BLDG 147)	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6355	-118.0984	Aviation
T0603700374	Air Force Plant 42 - SITE 1 UST T1-10 BLDG 127	Military UST Site	Completed - Case Closed	Palmdale	93550	34.638	-118.097	Aviation
T10000002785	Air Force Plant 42 - Site 1 UST T1-11	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6379	-118.0966	Aviation
T10000002741	Air Force Plant 42 - Site 1 UST T1-13	Military UST Site	Completed - Case Closed	Palmdale	93550	33.8809	-118.3787	Aviation, Gasoline, Heating Oil / Fuel Oil
T10000002739	Air Force Plant 42 - Site 1 UST T1-3	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6354	-118.0994	Gasoline
T0603700369	Air Force Plant 42 - SITE 1 UST T1-4 BLDG 145	Military UST Site	Completed - Case Closed	Palmdale	93550	34.636	-118.0991	Gasoline
T0603700370	Air Force Plant 42 - SITE 1 UST T1-5 BLDG 145	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6362	-118.0995	Heating Oil / Fuel Oil
T0603700371	Air Force Plant 42 - SITE 1 UST T1-6 BLDG 198	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6378	-118.0994	Aviation
T10000002740	Air Force Plant 42 - Site 1 UST T1-7	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6411	-118.0975	
T0603700373	Air Force Plant 42 - SITE 1 UST T1-8 BLDG 143	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6379	-118.0953	Heating Oil / Fuel Oil
T10000002732	Air Force Plant 42 - Site 1 UST T1-9 & T1-12, Bldg 145	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6369	-118.0983	
T0603700232	Air Force Plant 42 - SITE 2	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6371	-118.0892	
T10000002774	Air Force Plant 42 - Site 2 Clarifier C2-12	Military Cleanup Site	Completed - Case Closed	Palmdale	93550	34.6374	-118.0884	
T10000002728	Air Force Plant 42 - Site 2 T2-1, T2-2, & T2-3 (Bldg 214)	Military Cleanup Site	Completed - Case Closed	Palmdale	93550	34.6367	-118.0854	Benzene, Toluene, Trichloroethylene (TCE), Xylene, Gasoline
T10000002745	Air Force Plant 42 - Site 2 UST T2-11	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6375	-118.09	Gasoline, Other Petroleum
T0603700350	Air Force Plant 42 - SITE 2 UST T2-4 & T2-5 (BLDG 210)	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6382	-118.0892	Diesel
T0603700226	Air Force Plant 42 - SITE 2 UST T2-6 (BLDG 210)	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6376	-118.0905	Gasoline
T0603700372	Air Force Plant 42 - SITE 2 UST T2-7, T2-8, T2-9, T2-10 (Bldg 210)	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6381	-118.0886	Diesel
DOD100000500	Air Force Plant 42 - Site 27, Waste Piles	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Palmdale	93550-2196	34.6284	-118.0968	Lead, Zinc, Polynuclear aromatic hydrocarbons (PAHs)

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100000900	Air Force Plant 42 - Site 28, Dust Control Area	Military Cleanup Site	Open - Site Assessment	Palmdale	93550-2196	34.6391	-118.0871	Polychlorinated biphenyls (PCBs), Polynuclear aromatic hydrocarbons (PAHs)
T10000002776	Air Force Plant 42 - Site 3 Clarifier C3-16	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6389	-118.08	
T10000002752	Air Force Plant 42 - Site 3 Clarifier C3-19 & C3-20 and Sump S3-21 & S3-22	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6401	-118.0823	
T10000002754	Air Force Plant 42 - Site 3 Clarifier C3-28	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6383	-118.0802	Other Petroleum
T10000002734	Air Force Plant 42 - Site 3 T3-2 & T3-3	Military UST Site	Open - Eligible for Closure	Palmdale	93550	34.6374	-118.082	
T10000002736	Air Force Plant 42 - Site 3 T3-4, T3-5, T3-6, T3-7, T3-8, T3-14, T3-15, & S3-27	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6384	-118.0809	
T10000002775	Air Force Plant 42 - Site 3 UST T3-1	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6416	-118.0826	
T10000002746	Air Force Plant 42 - Site 3 UST T3-17	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6368	-118.0815	Aviation
T10000002747	Air Force Plant 42 - Site 3 UST T3-18 & T3-24	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6425	-118.0771	
T10000002749	Air Force Plant 42 - Site 3 UST T3-26	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6424	-118.0769	Diesel, Gasoline, Heating Oil / Fuel Oil
T10000002737	Air Force Plant 42 - Site 3 UST T3-9, T3-10, T3-11, T3-12, and T3-13	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6383	-118.0775	Heating Oil / Fuel Oil
T0603700399	Air Force Plant 42 - SITE 4 NORTHROP GRUMMAN	Military UST Site	Completed - Case Closed	Palmdale	93350	34.6408	-118.0666	Gasoline
T0603799267	Air Force Plant 42 - Site 4 Surface Release UST T4-201 (Bldg 460)	Military UST Site	Completed - Case Closed	Palmdale	93350	34.6406	-118.0665	Gasoline
T0603700237	Air Force Plant 42 - Site 4 UST T4-601 & T4-603 (Bldg 431) Pipeline Release	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6395	-118.0684	Aviation
T0603700275	Air Force Plant 42 - SITE 5 FUEL FARM, UST T5-12, T5-13, T5-14, T5-15, and T5-16	Military UST Site	Open - Eligible for Closure	Palmdale	93550	34.6129	-118.1069	Aviation
T10000002738	Air Force Plant 42 - Site 5 T5-21, T5-22, & T5-23	Military UST Site	Open - Eligible for Closure	Palmdale	93550	34.6216	-118.0766	
T0603700398	Air Force Plant 42 - SITE 5 UST T5-1 & T5-2	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6099	-118.0896	Gasoline
T10000002766	Air Force Plant 42 - Site 5 UST T5-17	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6218	-118.0756	Other Petroleum
T10000002905	Air Force Plant 42 - Site 5 UST T5-20	Military UST Site	Open - Site Assessment	Palmdale	92395	34.6201	-118.0782	
T10000002907	Air Force Plant 42 - Site 5 UST T5-24 (Bldg 531)	Military UST Site	Open - Site Assessment	Palmdale	93551	34.6201	-118.0812	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
T10000002756	Air Force Plant 42 - Site 5 UST T5-3 & T5-5	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6292	-118.0815	Diesel, Gasoline, Other Petroleum
T10000002757	Air Force Plant 42 - Site 5 UST T5-4	Military UST Site	Completed - Case Closed	Palmdale	93550	34.628	-118.0826	Aviation, Diesel, Gasoline, Other Petroleum
T10000002759	Air Force Plant 42 - Site 5 UST T5-6, T5-7, T5-8, T5-9, T5-10, T5-11, T5-18, T5-19	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6278	-118.0814	Other Petroleum
T0603700227	Air Force Plant 42 - SITE 7 BLDG 727	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6181	-118.0988	Stoddard solvent / Mineral Spriits / Distillates
T0603700346	Air Force Plant 42 - SITE 7 TANK 7-1 BLDG 752	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6239	-118.0924	Aviation
T0603700365	Air Force Plant 42 - SITE 7 TANK 7-2 BLDG 757	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6211	-118.0914	Aviation
T0603700345	Air Force Plant 42 - SITE 7 TANK 7-3 BLDG 740	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6199	-118.0958	Diesel
T0603700366	Air Force Plant 42 - SITE 7 TANK 7-4 BLDG 730	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6187	-118.0958	Aviation
T0603700367	Air Force Plant 42 - SITE 7 TANK 7-5/C7-10/C7-14 BLDG 722	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6191	-118.0968	Diesel
T10000002909	Air Force Plant 42 - Site 7 UST 7-12 (Bldg 723)	Military UST Site	Completed - Case Closed	Palmdale	93551	34.6197	-118.0962	Toluene, Xylene, Copper, Lead, Other Metal
T10000002910	Air Force Plant 42 - Site 7 UST 7-13 (Bldg 779)	Military UST Site	Open - Site Assessment	Palmdale	93551	34.6204	-118.0962	
T10000002908	Air Force Plant 42 - Site 7 UST T7-11 (Bldg 723)	Military UST Site	Completed - Case Closed	Palmdale	93551	34.6196	-118.0963	
T10000002769	Air Force Plant 42 - Site 7 UST T7-15	Military UST Site	Completed - Case Closed	Palmdale	93550	34.618	-118.0987	Diesel, Other Petroleum
T10000002770	Air Force Plant 42 - Site 7 UST T7-16	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6165	-118.0991	
T0603700228	Air Force Plant 42 - SITE 7, BLDG 722, UST T7-6, T7-7, T7-8	Military UST Site	Completed - Case Closed	Palmdale	93550	34.619	-118.0973	Diesel
T10000002771	Air Force Plant 42 - Site 8 UST T8-1 & T8-3	Military UST Site	Completed - Case Closed	Palmdale	93550	34.6219	-118.1092	Diesel, Gasoline
T10000002911	Air Force Plant 42 - Site 8 UST T8-2 (Bldg 870)	Military UST Site	Completed - Case Closed	Palmdale	93551	34.6225	-118.1111	
DOD100002000	Air Force Plant 42 - SS007 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6378	-118.0863	
DOD100003800	Air Force Plant 42 - SS008 - Fuel Transfer Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6212	-118.1142	
DOD100000800	Air Force Plant 42 - SS012 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6367	-118.0952	
DOD100001000	Air Force Plant 42 - SS014 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6364	-118.0896	
DOD100001900	Air Force Plant 42 - SS015 - Triethyl Borane (TEB) Disposal Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6364	-118.0882	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100001200	Air Force Plant 42 - SS019 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6424	-118.0837	
DOD100000100	Air Force Plant 42 - SS020 - Noise Level Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6364	-118.0854	
DOD100003200	Air Force Plant 42 - SS022 - Engine Run-Up Area	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6145	-118.0891	
DOD100003700	Air Force Plant 42 - ST004 - Vehicle Washrack and Leaking UST	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6207	-118.0814	
DOD100003600	Air Force Plant 42 - ST026 - Battery Shop UST	Military Cleanup Site	Open - Verification Monitoring	Palmdale	93550-2196	34.6202	-118.0812	
DOD100074300	Edwards Air Force Base - 1 - AOC 344	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100074400	Edwards Air Force Base - 1 - AOC 365	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.908	-117.9115	
DOD100074500	Edwards Air Force Base - 1 - AOC 367	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9191	-117.9023	
DOD100074600	Edwards Air Force Base - 1 - AOC 377	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9062	-117.9117	
DOD100075900	Edwards Air Force Base - 1 - AOC 397	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9226	-117.8859	
DOD100076000	Edwards Air Force Base - 1 - Site 10	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9316	-117.8869	
DOD100076100	Edwards Air Force Base - 1 - Site 11	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.927	-117.8821	
DOD100076200	Edwards Air Force Base - 1 - Site 16	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9365	-117.8888	
DOD100077500	Edwards Air Force Base - 1 - Site 17	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9208	-117.8879	
DOD100077600	Edwards Air Force Base - 1 - Site 18	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9415	-117.8899	
DOD100077700	Edwards Air Force Base - 1 - Site 19	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9324	-117.8789	
DOD100077800	Edwards Air Force Base - 1 - Site 20	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.942	-117.8903	
DOD100090400	Edwards Air Force Base - 1 - Site 21	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9313	-117.891	
DOD100090500	Edwards Air Force Base - 1 - Site 23	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9374	-117.893	
DOD100090600	Edwards Air Force Base - 1 - Site 24	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9386	-117.8933	
DOD100090700	Edwards Air Force Base - 1 - Site 33	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9169	-117.8963	
DOD100082300	Edwards Air Force Base - 1 - Site 342	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9079	-117.9122	
DOD100082400	Edwards Air Force Base - 1 - Site 343	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9151	-117.8991	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100082500	Edwards Air Force Base - 1 - Site 345	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9242	-117.8967	
DOD100082600	Edwards Air Force Base - 1 - Site 346	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9237	-117.8981	
DOD100087100	Edwards Air Force Base - 1 - Site 366	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9166	-117.905	Soil
DOD100087200	Edwards Air Force Base - 1 - Site 41	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9141	-117.8982	
DOD100087300	Edwards Air Force Base - 1 - Site 42	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9074	-117.9129	
DOD100087400	Edwards Air Force Base - 1 - Site 43	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9138	-117.9005	
DOD100079100	Edwards Air Force Base - 1 - Site 44	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9158	-117.8996	
DOD100079200	Edwards Air Force Base - 1 - Site 45	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9172	-117.8969	
DOD100079300	Edwards Air Force Base - 1 - Site 46	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.919	-117.8953	
DOD100079400	Edwards Air Force Base - 1 - Site 47	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9189	-117.8914	
DOD100083900	Edwards Air Force Base - 1 - Site 48	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9235	-117.8859	
DOD100084000	Edwards Air Force Base - 1 - Site 49	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9218	-117.8847	
DOD100084100	Edwards Air Force Base - 1 - Site 50	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9245	-117.8873	
DOD100084200	Edwards Air Force Base - 1 - Site 51	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9243	-117.8823	
DOD100088800	Edwards Air Force Base - 1 - Site 52	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9227	-117.8823	
DOD100088900	Edwards Air Force Base - 1 - Site 53	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9272	-117.8883	
DOD100089000	Edwards Air Force Base - 1 - Site 54	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9308	-117.8872	
DOD100089100	Edwards Air Force Base - 1 - Site 55	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9285	-117.8824	
DOD100080700	Edwards Air Force Base - 1 - Site 56	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9396	-117.8918	
DOD100080800	Edwards Air Force Base - 1 - Site 57	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9391	-117.8849	
DOD100080900	Edwards Air Force Base - 1 - Site 58	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9418	-117.885	
DOD100081000	Edwards Air Force Base - 1 - Site 59	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.924	-117.8954	
DOD100085500	Edwards Air Force Base - 1 - Site 60	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9266	-117.8918	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100085600	Edwards Air Force Base - 1 - Site 62	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9459	-117.8877	
DOD100085700	Edwards Air Force Base - 1 - Site 64	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9248	-117.8782	
DOD100085800	Edwards Air Force Base - 1 - Site 65	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9339	-117.8902	
DOD100118400	Edwards Air Force Base - 1 - Site 66	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9369	-117.8851	
DOD100118500	Edwards Air Force Base - 1 - Site 67	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9202	-117.8938	
DOD100118600	Edwards Air Force Base - 1 - Site 68	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9277	-117.8895	
DOD100118700	Edwards Air Force Base - 1 - Site 8	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9293	-117.8765	
DOD100120000	Edwards Air Force Base - 10 - 1C	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9963	-117.8272	
DOD100120100	Edwards Air Force Base - 10 - 1D	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9958	-117.8277	
DOD100120200	Edwards Air Force Base - 10 - AOC 254	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9836	-117.8722	
DOD100120300	Edwards Air Force Base - 10 - AOC 418	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9789	-117.8701	
DOD100121600	Edwards Air Force Base - 10 - AOC 462	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9954	-117.8432	
DOD100121700	Edwards Air Force Base - 10 - AOC 463	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.998	-117.8473	
DOD100121800	Edwards Air Force Base - 10 - AOC 464	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9959	-117.8626	
DOD100121900	Edwards Air Force Base - 10 - AOC 465	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9952	-117.8495	
DOD100098000	Edwards Air Force Base - 10 - AOC 466	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.996	-117.8547	
DOD100098100	Edwards Air Force Base - 10 - AOC 467	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9801	-117.8117	
DOD100098200	Edwards Air Force Base - 10 - AOC 468	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9909	-117.8111	
DOD100098300	Edwards Air Force Base - 10 - Site 1A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.999	-117.844	
DOD100099600	Edwards Air Force Base - 10 - Site 1B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9959	-117.8267	
DOD100099700	Edwards Air Force Base - 10 - Site 1E	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9983	-117.8431	
DOD100099800	Edwards Air Force Base - 10 - Site 234	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9677	-117.8802	
DOD100099900	Edwards Air Force Base - 10 - Site 273	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9789	-117.8711	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100101200	Edwards Air Force Base - 10 - Site 274	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9964	-117.8356	
DOD100101300	Edwards Air Force Base - 10 - Site 275	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9925	-117.8279	
DOD100101400	Edwards Air Force Base - 10 - Site 276	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9765	-117.8906	
DOD100101500	Edwards Air Force Base - 10 - Site 277	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9979	-117.8446	
DOD100102800	Edwards Air Force Base - 10 - Site 278	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9988	-117.8532	
DOD100102900	Edwards Air Force Base - 10 - Site 279	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9978	-117.8819	
DOD100145300	Edwards Air Force Base - 15	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100145400	Edwards Air Force Base - 167	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100103000	Edwards Air Force Base - 2 - AOC 218	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.893	-117.8994	
DOD100103100	Edwards Air Force Base - 2 - AOC 219	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9116	-117.8683	
DOD100104400	Edwards Air Force Base - 2 - AOC 220	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8776	-117.8817	
DOD100104500	Edwards Air Force Base - 2 - AOC 222	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8777	-117.8737	
DOD100104600	Edwards Air Force Base - 2 - AOC 290	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.812	-117.9168	
DOD100104700	Edwards Air Force Base - 2 - AOC 291	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8188	-117.8757	
DOD100106000	Edwards Air Force Base - 2 - AOC 364	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8847	-117.8847	
DOD100106100	Edwards Air Force Base - 2 - AOC 408	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8167	-117.8924	
DOD100106200	Edwards Air Force Base - 2 - AOC 417	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8164	-117.8913	
DOD100106300	Edwards Air Force Base - 2 - AOC 458	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8737	-117.8744	
DOD100107600	Edwards Air Force Base - 2 - AOC 459	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9188	-117.8655	
DOD100107700	Edwards Air Force Base - 2 - AOC 460	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8979	-117.8791	
DOD100107800	Edwards Air Force Base - 2 - S223	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100107900	Edwards Air Force Base - 2 - Site 100	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8974	-117.8624	
DOD100109200	Edwards Air Force Base - 2 - Site 101	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8964	-117.8617	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100109300	Edwards Air Force Base - 2 - Site 102	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8876	-117.8667	
DOD100109400	Edwards Air Force Base - 2 - Site 103	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8861	-117.866	
DOD100109500	Edwards Air Force Base - 2 - Site 104	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8773	-117.8988	
DOD100110800	Edwards Air Force Base - 2 - Site 105	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8733	-117.913	
DOD100110900	Edwards Air Force Base - 2 - Site 106	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8719	-117.9125	
DOD100111000	Edwards Air Force Base - 2 - Site 107	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8768	-117.8971	
DOD100111100	Edwards Air Force Base - 2 - Site 108	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8766	-117.9118	
DOD100112400	Edwards Air Force Base - 2 - Site 109	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8735	-117.9153	
DOD100112500	Edwards Air Force Base - 2 - Site 110	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8598	-117.8681	
DOD100112600	Edwards Air Force Base - 2 - Site 111	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8697	-117.8825	
DOD100112700	Edwards Air Force Base - 2 - Site 112	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8607	-117.8848	
DOD100114000	Edwards Air Force Base - 2 - Site 14 South Base Fire Fighting Training Facility	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8943	-117.8654	
DOD100114100	Edwards Air Force Base - 2 - Site 15A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8986	-117.8783	
DOD100114200	Edwards Air Force Base - 2 - Site 15B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8984	-117.8771	
DOD100114300	Edwards Air Force Base - 2 - Site 22	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9003	-117.8693	
DOD100115600	Edwards Air Force Base - 2 - Site 221	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8852	-117.8746	
DOD100115700	Edwards Air Force Base - 2 - Site 223	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.913	-117.8647	
DOD100115800	Edwards Air Force Base - 2 - Site 29 South Base Abandoned Sanitary Landfill	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8695	-117.881	
DOD100115900	Edwards Air Force Base - 2 - Site 341	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8728	-117.9109	
DOD100117200	Edwards Air Force Base - 2 - Site 5 Former South Base Waste POL Storage Area	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9003	-117.8814	
DOD100117300	Edwards Air Force Base - 2 - Site 69	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.908	-117.8863	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100117400	Edwards Air Force Base - 2 - Site 70	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9094	-117.8835	
DOD100117500	Edwards Air Force Base - 2 - Site 71	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9048	-117.8803	
DOD100118800	Edwards Air Force Base - 2 - Site 72	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9085	-117.8798	
DOD100118900	Edwards Air Force Base - 2 - Site 73	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9077	-117.8777	
DOD100119000	Edwards Air Force Base - 2 - Site 74	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9049	-117.8762	
DOD100119100	Edwards Air Force Base - 2 - Site 75	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9008	-117.8924	
DOD100120400	Edwards Air Force Base - 2 - Site 76 Old South Base Assorted Facilities	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9041	-117.8683	
DOD100120500	Edwards Air Force Base - 2 - Site 77	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9097	-117.8733	
DOD100120600	Edwards Air Force Base - 2 - Site 78	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9073	-117.8685	
DOD100120700	Edwards Air Force Base - 2 - Site 79	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9068	-117.8634	
DOD100122000	Edwards Air Force Base - 2 - Site 80	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9108	-117.8583	
DOD100122100	Edwards Air Force Base - 2 - Site 81	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9044	-117.859	
DOD100122200	Edwards Air Force Base - 2 - Site 82	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9055	-117.8622	
DOD100122300	Edwards Air Force Base - 2 - Site 83	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.902	-117.8634	
DOD100098400	Edwards Air Force Base - 2 - Site 84A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9014	-117.8613	
DOD100098500	Edwards Air Force Base - 2 - Site 84B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9018	-117.8593	
DOD100098600	Edwards Air Force Base - 2 - Site 85	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8984	-117.8727	
DOD100098700	Edwards Air Force Base - 2 - Site 86 Building 300 Engine Test Cell	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9038	-117.8615	
DOD100100000	Edwards Air Force Base - 2 - Site 87	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9024	-117.8592	
DOD100100100	Edwards Air Force Base - 2 - Site 88	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9075	-117.8728	
DOD100100200	Edwards Air Force Base - 2 - Site 89	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9071	-117.8736	
DOD100100300	Edwards Air Force Base - 2 - Site 90	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9078	-117.8706	
DOD100101600	Edwards Air Force Base - 2 - Site 91	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9049	-117.866	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100101700	Edwards Air Force Base - 2 - Site 92	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.909	-117.8691	
DOD100101800	Edwards Air Force Base - 2 - Site 93	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9086	-117.8623	
DOD100101900	Edwards Air Force Base - 2 - Site 94	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9016	-117.8694	
DOD100103200	Edwards Air Force Base - 2 - Site 95	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8862	-117.8889	
DOD100103300	Edwards Air Force Base - 2 - Site 96	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8894	-117.8909	
DOD100103400	Edwards Air Force Base - 2 - Site 97	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8884	-117.8851	
DOD100103500	Edwards Air Force Base - 2 - Site 98	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8797	
DOD100104800	Edwards Air Force Base - 2 - Site 99	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8895	-117.8844	
DOD100104900	Edwards Air Force Base - 3 - Site 409	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100105000	Edwards Air Force Base - 3 - Site 410	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100105100	Edwards Air Force Base - 3 - Site 411	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100106400	Edwards Air Force Base - 3 - Site 412	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100106500	Edwards Air Force Base - 3 - Site 413	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100106600	Edwards Air Force Base - 3 - Site 414	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100106700	Edwards Air Force Base - 3 - Site 415	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100108000	Edwards Air Force Base - 3 - Site 416	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
T10000001992	Edwards Air Force Base - 4 - Site 120 AFRL Sewage Treatment Plant	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	923524-113	34.9071	-117.7003	
DOD100105500	Edwards Air Force Base - 4 - Site 133 AFRL Civil Engineering Yard Groundwater Plume	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9276	-117.6872	
DOD100118300	Edwards Air Force Base - 4 - Site 37 Building 8595 PCE Plume	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9298	-117.6985	
DOD100108100	Edwards Air Force Base - 4A - AOC 119	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9093	-117.6976	
DOD100108200	Edwards Air Force Base - 4A - AOC 121	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9086	-117.6996	
DOD100108300	Edwards Air Force Base - 4A - AOC 134	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9275	-117.6862	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100109600	Edwards Air Force Base - 4A - AOC 135	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9284	-117.6872	
DOD100109700	Edwards Air Force Base - 4A - AOC 136	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.928	-117.6871	
DOD100109800	Edwards Air Force Base - 4A - AOC 138	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.934	-117.6954	
DOD100109900	Edwards Air Force Base - 4A - AOC 139	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9318	-117.7025	
DOD100111200	Edwards Air Force Base - 4A - AOC 140	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.937	-117.6935	
DOD100111300	Edwards Air Force Base - 4A - AOC 144	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9373	-117.676	
DOD100111400	Edwards Air Force Base - 4A - AOC 147	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9374	-117.6923	
DOD100111500	Edwards Air Force Base - 4A - AOC 148	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9294	-117.6872	
DOD100112800	Edwards Air Force Base - 4A - AOC 149	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9323	-117.6875	
DOD100112900	Edwards Air Force Base - 4A - AOC 151	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9319	-117.6844	
DOD100113000	Edwards Air Force Base - 4A - AOC 152	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9301	-117.6843	
DOD100113100	Edwards Air Force Base - 4A - AOC 154	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9277	-117.6839	
DOD100114400	Edwards Air Force Base - 4A - AOC 155	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9339	-117.7009	
DOD100114500	Edwards Air Force Base - 4A - AOC 156	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9367	-117.7007	
DOD100114600	Edwards Air Force Base - 4A - AOC 157	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9352	-117.701	
DOD100114700	Edwards Air Force Base - 4A - AOC 158A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9347	-117.7026	
DOD100116000	Edwards Air Force Base - 4A - AOC 158B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9341	-117.7019	
DOD100116100	Edwards Air Force Base - 4A - AOC 159	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9325	-117.7032	
DOD100116200	Edwards Air Force Base - 4A - AOC 161	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9366	-117.7052	
DOD100116300	Edwards Air Force Base - 4A - AOC 163	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9363	-117.7045	
DOD100117600	Edwards Air Force Base - 4A - AOC 164	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9485	-117.6834	
DOD100117700	Edwards Air Force Base - 4A - AOC 165	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9479	-117.6797	
DOD100117900	Edwards Air Force Base - 4A - AOC 168	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9398	-117.6952	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100119200	Edwards Air Force Base - 4A - AOC 169	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9441	-117.6863	
DOD100119500	Edwards Air Force Base - 4A - AOC 173	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9303	-117.7005	
DOD100120800	Edwards Air Force Base - 4A - AOC 175	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9301	-117.7009	
DOD100120900	Edwards Air Force Base - 4A - AOC 184	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9277	-117.6938	
DOD100121000	Edwards Air Force Base - 4A - AOC 314	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100121100	Edwards Air Force Base - 4A - AOC 315	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100098800	Edwards Air Force Base - 4A - AOC 316	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100098900	Edwards Air Force Base - 4A - AOC 317	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.943	-117.6886	
DOD100099000	Edwards Air Force Base - 4A - AOC 319	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100099100	Edwards Air Force Base - 4A - AOC 320	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100100400	Edwards Air Force Base - 4A - AOC 326	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9372	-117.6729	
DOD100100500	Edwards Air Force Base - 4A - AOC 327	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9366	-117.669	
DOD100100600	Edwards Air Force Base - 4A - AOC 335	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9356	-117.6891	
DOD100100700	Edwards Air Force Base - 4A - AOC 336	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.939	-117.6976	
DOD100102000	Edwards Air Force Base - 4A - AOC 372	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.929	-117.6845	
DOD100102100	Edwards Air Force Base - 4A - AOC 373	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9305	-117.6843	
DOD100102200	Edwards Air Force Base - 4A - AOC 374	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9352	-117.6866	
DOD100102300	Edwards Air Force Base - 4A - AOC 404	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9344	-117.6967	
DOD100103600	Edwards Air Force Base - 4A - AOC 405	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9297	-117.6858	
DOD100103700	Edwards Air Force Base - 4A - AOC 406	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9313	-117.6997	
DOD100103800	Edwards Air Force Base - 4A - AOC 407	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9382	-117.6965	
DOD100103900	Edwards Air Force Base - 4A - AOC160	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9375	-117.7052	
DOD100105200	Edwards Air Force Base - 4A - AOC174	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9311	-117.6994	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100105300	Edwards Air Force Base - 4A - Site 12	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9483	-117.6813	
DOD100106800	Edwards Air Force Base - 4A - Site 137	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9305	-117.6856	
DOD100106900	Edwards Air Force Base - 4A - Site 143A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9351	-117.6994	
DOD100107000	Edwards Air Force Base - 4A - Site 143B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9344	-117.6998	
DOD100107100	Edwards Air Force Base - 4A - Site 145	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9301	-117.6909	
DOD100108400	Edwards Air Force Base - 4A - Site 146	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9281	-117.6873	
DOD100110200	Edwards Air Force Base - 4A - Site 162	Military Cleanup Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9374	-117.7046	
DOD100111600	Edwards Air Force Base - 4A - Site 177	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9379	-117.6748	
DOD100111700	Edwards Air Force Base - 4A - Site 185	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9327	-117.6879	
DOD100111800	Edwards Air Force Base - 4A - Site 186	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9287	-117.6876	
DOD100113300	Edwards Air Force Base - 4A - Site 313	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100113400	Edwards Air Force Base - 4A - Site 318	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9415	-117.6845	
DOD100113500	Edwards Air Force Base - 4A - Site 32	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9377	-117.6853	
DOD100114800	Edwards Air Force Base - 4A - Site 333A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8849	-117.6354	
DOD100114900	Edwards Air Force Base - 4A - Site 333B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8857	-117.6325	
DOD100115000	Edwards Air Force Base - 4A - Site 35	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100115100	Edwards Air Force Base - 4A - Site 354	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9284	-117.6958	
DOD100116400	Edwards Air Force Base - 4A - Site 355	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9345	-117.6956	
DOD100116500	Edwards Air Force Base - 4A - Site 356	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9285	-117.6868	
DOD100116600	Edwards Air Force Base - 4A - Site 357	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9302	-117.6858	
DOD100116700	Edwards Air Force Base - 4A - Site 358	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9297	-117.6876	
DOD100118000	Edwards Air Force Base - 4A - Site 359	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9313	-117.7078	
DOD100118100	Edwards Air Force Base - 4A - Site 36	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9331	-117.7032	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100118200	Edwards Air Force Base - 4A - Site 361	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9396	-117.6955	
DOD100119700	Edwards Air Force Base - 4A - Site 40	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9283	-117.7059	
DOD100119800	Edwards Air Force Base - 4A - Site 461	Military Cleanup Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9432	-117.6894	
DOD100119900	Edwards Air Force Base - 4A - Site A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100121200	Edwards Air Force Base - 4B - AOC 167	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8898	-117.633	
DOD100145500	Edwards Air Force Base - 5	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100097700	Edwards Air Force Base - 5 - AOC 187	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9934	-117.8739	
DOD100097800	Edwards Air Force Base - 5 - AOC 188	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9934	-117.8726	
DOD100097900	Edwards Air Force Base - 5 - AOC 189	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9932	-117.8728	
DOD100099200	Edwards Air Force Base - 5 - AOC 190	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9933	-117.8736	
DOD100099300	Edwards Air Force Base - 5 - AOC 191	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9945	-117.8733	
DOD100099400	Edwards Air Force Base - 5 - AOC 192	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.994	-117.873	
DOD100099500	Edwards Air Force Base - 5 - AOC 193	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9941	-117.8722	
DOD100100800	Edwards Air Force Base - 5 - AOC 194	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9945	-117.8722	
DOD100100900	Edwards Air Force Base - 5 - AOC 195	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9931	-117.8758	
DOD100101000	Edwards Air Force Base - 5 - AOC 196	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9936	-117.8782	
DOD100101100	Edwards Air Force Base - 5 - AOC 197	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9936	-117.8764	
DOD100102400	Edwards Air Force Base - 5 - AOC 198	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9941	-117.878	
DOD100102500	Edwards Air Force Base - 5 - AOC 199	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9947	-117.8767	
DOD100102600	Edwards Air Force Base - 5 - AOC 200	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9976	-117.8764	
DOD100102700	Edwards Air Force Base - 5 - AOC 201	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9937	-117.8776	
DOD100115200	Edwards Air Force Base - 5 - AOC 202	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9947	-117.8762	
DOD100115300	Edwards Air Force Base - 5 - AOC 203	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9997	-117.877	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100115400	Edwards Air Force Base - 5 - AOC 204	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	35.0008	-117.868	
DOD100115500	Edwards Air Force Base - 5 - AOC 228	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9837	-117.8624	
DOD100107200	Edwards Air Force Base - 5 - AOC 230	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9847	-117.8647	
DOD100107300	Edwards Air Force Base - 5 - AOC 232	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9812	-117.8674	
DOD100107400	Edwards Air Force Base - 5 - AOC 237	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9856	-117.8628	
DOD100107500	Edwards Air Force Base - 5 - AOC 243	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9884	-117.8578	
DOD100112000	Edwards Air Force Base - 5 - AOC 244	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.989	-117.8588	
DOD100112100	Edwards Air Force Base - 5 - AOC 245	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9857	-117.8652	
DOD100112200	Edwards Air Force Base - 5 - AOC 246	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9838	-117.8661	
DOD100112300	Edwards Air Force Base - 5 - AOC 247	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9838	-117.8641	
DOD100116800	Edwards Air Force Base - 5 - AOC 248	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9861	-117.8624	
DOD100116900	Edwards Air Force Base - 5 - AOC 249	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9855	-117.8648	
DOD100117000	Edwards Air Force Base - 5 - AOC 251	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9868	-117.8642	
DOD100117100	Edwards Air Force Base - 5 - AOC 251	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9868	-117.8644	
DOD100104000	Edwards Air Force Base - 5 - AOC 252	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9868	-117.865	
DOD100104100	Edwards Air Force Base - 5 - AOC 253	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9868	-117.8637	
DOD100104200	Edwards Air Force Base - 5 - AOC 255	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9846	-117.865	
DOD100104300	Edwards Air Force Base - 5 - AOC 256	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9862	-117.8602	
DOD100108800	Edwards Air Force Base - 5 - AOC 281	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9922	-117.873	
DOD100108900	Edwards Air Force Base - 5 - AOC 283	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9934	-117.8743	
DOD100109000	Edwards Air Force Base - 5 - AOC 284	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9942	-117.8766	
DOD100109100	Edwards Air Force Base - 5 - AOC 286	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9942	-117.8759	
DOD100113600	Edwards Air Force Base - 5 - AOC 287	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.994	-117.8628	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100113700	Edwards Air Force Base - 5 - AOC 288	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9952	-117.8715	
DOD100113800	Edwards Air Force Base - 5 - AOC 289	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9908	-117.8792	
DOD100113900	Edwards Air Force Base - 5 - AOC 350	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9911	-117.8776	
DOD100105600	Edwards Air Force Base - 5 - AOC 369	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9942	-117.8731	
DOD100105700	Edwards Air Force Base - 5 - AOC 370	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9872	-117.8592	
DOD100105800	Edwards Air Force Base - 5 - AOC 401	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9942	-117.8656	
DOD100105900	Edwards Air Force Base - 5 - AOC 402	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9866	-117.8598	
DOD100110400	Edwards Air Force Base - 5 - AOC 403	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9852	-117.8643	
DOD100110500	Edwards Air Force Base - 5 - AOC 420	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.994	-117.8742	
DOD100110600	Edwards Air Force Base - 5 - AOC 421	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9957	-117.8733	
DOD100110700	Edwards Air Force Base - 5 - AOC 423	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9971	-117.8767	
DOD100142400	Edwards Air Force Base - 5 - AOC 424	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9969	-117.8735	
DOD100142500	Edwards Air Force Base - 5 - Site 229	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9843	-117.8635	
DOD100142600	Edwards Air Force Base - 5 - Site 231	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9843	-117.8655	
DOD100142700	Edwards Air Force Base - 5 - Site 233	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9823	-117.8679	
DOD100144000	Edwards Air Force Base - 5 - Site 235	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9852	-117.8635	
DOD100144100	Edwards Air Force Base - 5 - Site 236	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9845	-117.864	
DOD100144200	Edwards Air Force Base - 5 - Site 238	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9854	-117.8632	
DOD100144300	Edwards Air Force Base - 5 - Site 239	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9857	-117.8638	
DOD100145600	Edwards Air Force Base - 5 - Site 240	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9877	-117.8596	
DOD100145700	Edwards Air Force Base - 5 - Site 241	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9889	-117.8606	
DOD100145800	Edwards Air Force Base - 5 - Site 242	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9888	-117.8605	
DOD100145900	Edwards Air Force Base - 5 - Site 282	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9945	-117.8724	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100147200	Edwards Air Force Base - 5 - Site 285	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9967	-117.8766	
DOD100147300	Edwards Air Force Base - 5 - Site 348	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9928	-117.8738	
DOD100147400	Edwards Air Force Base - 5 - Site 349	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.994	-117.8736	
DOD100147500	Edwards Air Force Base - 5 - Site 422	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9911	-117.8782	
DOD100123600	Edwards Air Force Base - 6 - AOC 205	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123700	Edwards Air Force Base - 6 - AOC 206	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123900	Edwards Air Force Base - 6 - AOC 208	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125200	Edwards Air Force Base - 6 - AOC 209 N14	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9625	-117.8853	
DOD100125300	Edwards Air Force Base - 6 - AOC 210	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125400	Edwards Air Force Base - 6 - AOC 211	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125500	Edwards Air Force Base - 6 - AOC 212	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126900	Edwards Air Force Base - 6 - AOC 214	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127000	Edwards Air Force Base - 6 - AOC 215	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127100	Edwards Air Force Base - 6 - AOC 216	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128400	Edwards Air Force Base - 6 - AOC 217	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128500	Edwards Air Force Base - 6 - AOC 307	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130000	Edwards Air Force Base - 6 - AOC 310	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130100	Edwards Air Force Base - 6 - AOC 311	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128600	Edwards Air Force Base - 6 - Site 205 N1	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9528	-117.8832	
DOD100130200	Edwards Air Force Base - 6 - Site 206 N2	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.95	-117.8861	
DOD100123800	Edwards Air Force Base - 6 - Site 207 N3	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9493	-117.8892	
DOD100128700	Edwards Air Force Base - 6 - Site 208 N4	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9477	-117.885	
DOD100126800	Edwards Air Force Base - 6 - Site 211 N7	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9468	-117.8878	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100130300	Edwards Air Force Base - 6 - Site 351	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100146800	Edwards Air Force Base - 7	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100131600	Edwards Air Force Base - 7 - AOC 260	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9112	-117.9497	
DOD100131700	Edwards Air Force Base - 7 - AOC 261	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9444	-117.9439	
DOD100131800	Edwards Air Force Base - 7 - AOC 268	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9215	-117.7727	
DOD100131900	Edwards Air Force Base - 7 - AOC 368	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9698	-117.9307	
DOD100133200	Edwards Air Force Base - 7 - AOC 371	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9901	-117.7005	
DOD100133300	Edwards Air Force Base - 7 - AOC 378	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133400	Edwards Air Force Base - 7 - AOC 379	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133500	Edwards Air Force Base - 7 - AOC 380	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100134800	Edwards Air Force Base - 7 - AOC 381	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100134900	Edwards Air Force Base - 7 - AOC 382	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100135000	Edwards Air Force Base - 7 - AOC 383	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8319	-117.7681	
DOD100135100	Edwards Air Force Base - 7 - AOC 384	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.7932	-117.7128	
DOD100136400	Edwards Air Force Base - 7 - AOC 385	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8073	-117.7487	
DOD100136500	Edwards Air Force Base - 7 - AOC 386	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8229	-117.7587	
DOD100136600	Edwards Air Force Base - 7 - AOC 387	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100136700	Edwards Air Force Base - 7 - AOC 388	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100138000	Edwards Air Force Base - 7 - AOC 389	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100138100	Edwards Air Force Base - 7 - AOC 390	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100138200	Edwards Air Force Base - 7 - AOC 391	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100138300	Edwards Air Force Base - 7 - AOC 392	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139600	Edwards Air Force Base - 7 - AOC 393	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100139700	Edwards Air Force Base - 7 - AOC 394	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139800	Edwards Air Force Base - 7 - AOC 395	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139900	Edwards Air Force Base - 7 - AOC 398	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9429	-117.9449	
DOD100141200	Edwards Air Force Base - 7 - AOC 399	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9287	-117.9437	
DOD100141300	Edwards Air Force Base - 7 - AOC 400	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9287	-117.9408	
DOD100141400	Edwards Air Force Base - 7 - AOC 450	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9369	-117.9444	
DOD100141500	Edwards Air Force Base - 7 - AOC 451	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100142800	Edwards Air Force Base - 7 - AOC 452	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100142900	Edwards Air Force Base - 7 - AOC 453	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100143000	Edwards Air Force Base - 7 - AOC 454	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100143100	Edwards Air Force Base - 7 - AOC 455	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100144400	Edwards Air Force Base - 7 - AOC 456	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100144500	Edwards Air Force Base - 7 - AOC 469	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9653	-117.5668	
DOD100144600	Edwards Air Force Base - 7 - AOC 470	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9903	-117.9182	
DOD100144700	Edwards Air Force Base - 7 - AOC CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100146000	Edwards Air Force Base - 7 - AOC CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100146100	Edwards Air Force Base - 7 - Site 258	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9242	-117.9435	
DOD100146200	Edwards Air Force Base - 7 - Site 259	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9235	-117.9381	
DOD100146300	Edwards Air Force Base - 7 - Site 262	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9265	-117.7555	
DOD100147600	Edwards Air Force Base - 7 - Site 263	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9278	-117.7558	
DOD100147700	Edwards Air Force Base - 7 - Site 264	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9689	-117.755	
DOD100147800	Edwards Air Force Base - 7 - Site 265	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9862	-117.7096	
DOD100147900	Edwards Air Force Base - 7 - Site 266	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8928	-117.6855	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100122400	Edwards Air Force Base - 7 - Site 267	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9227	-117.765	
DOD100122500	Edwards Air Force Base - 7 - Site 269	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9423	-117.7834	
DOD100122600	Edwards Air Force Base - 7 - Site 270	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8216	-117.8006	
DOD100122700	Edwards Air Force Base - 7 - Site 271	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9002	-117.7066	
DOD100143200	Edwards Air Force Base - 7 - Site 272	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9548	-117.7801	
DOD100143300	Edwards Air Force Base - 7 - Site 28	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9148	-117.9658	
DOD100143400	Edwards Air Force Base - 7 - Site 280	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8714	-118.1399	
DOD100143500	Edwards Air Force Base - 7 - Site 292	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8626	-117.9247	
DOD100144800	Edwards Air Force Base - 7 - Site 293A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8337	-117.9237	
DOD100144900	Edwards Air Force Base - 7 - Site 293B	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8284	-117.9262	
DOD100145000	Edwards Air Force Base - 7 - Site 294	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8453	-117.9105	
DOD100145100	Edwards Air Force Base - 7 - Site 295	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.7932	-118.1175	
DOD100146400	Edwards Air Force Base - 7 - Site 296	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8828	-117.9473	
DOD100146600	Edwards Air Force Base - 7 - Site 302	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9435	-117.9308	
DOD100146700	Edwards Air Force Base - 7 - Site 339	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.7842	-118.1169	
DOD100122800	Edwards Air Force Base - 7 - Site 34	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8225	-118.1408	
DOD100122900	Edwards Air Force Base - 7 - Site 340	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.7961	-118.0351	
DOD100123000	Edwards Air Force Base - 7 - Site 353	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9127	-117.95	
DOD100123100	Edwards Air Force Base - 7 - Site 4	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9532	-117.9583	
DOD100124000	Edwards Air Force Base - 7 - Site 419	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9253	-117.9164	
T10000001939	Edwards Air Force Base - 7 - Site 426	Military Cleanup Site	Completed - Case Closed	EDWARDS AFB	93524-1130	34.9228	-117.9008	Other Groundwater (uses other than drinking water), Soil
T10000001942	Edwards Air Force Base - 7 - Site 442 - Area 1	Military Cleanup Site	Open - Remediation	EDWARDS AFB	93524-1130	34.8918	-117.7438	Soil, Under Investigation
T10000001943	Edwards Air Force Base - 7 - Site 442 - Area 2	Military Cleanup Site	Open - Remediation	EDWARDS AFB	93524-1130	34.8935	-117.7489	Soil, Under Investigation

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
T10000001944	Edwards Air Force Base - 7 - Site 442 - Area 3	Military Cleanup Site	Open - Remediation	EDWARDS AFB	93524-1130	34.8435	-117.5987	Soil, Under Investigation
DOD100132300	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125900	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127400	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125700	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100124100	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133600	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132100	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130400	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128900	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129100	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128800	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125800	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132200	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100124300	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125600	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132000	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130700	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127500	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100130600	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127200	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100127300	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129000	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100130500	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100124200	Edwards Air Force Base - 7 - Site CWM-A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133700	Edwards Air Force Base - 7 - Site CWM-A-AREA 1	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100133800	Edwards Air Force Base - 7 - Site CWM-B	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133900	Edwards Air Force Base - 7 - Site CWM-B	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100135200	Edwards Air Force Base - 7 - Site CWM-B-AREA 2	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100135300	Edwards Air Force Base - 7 - Site CWM-C-AREA 3	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100135400	Edwards Air Force Base - 7 - Site CWM-D-AREA 4	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100135500	Edwards Air Force Base - 8 - AOC 303	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9413	-117.9033	
DOD100136800	Edwards Air Force Base - 8 - AOC 304	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9463	-117.8919	
DOD100136900	Edwards Air Force Base - 8 - AOC 306	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9456	-117.9133	
DOD100137000	Edwards Air Force Base - 8 - Site 2	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9342	-117.9106	
DOD100137100	Edwards Air Force Base - 8 - Site 224	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9305	-117.8995	
DOD100138400	Edwards Air Force Base - 8 - Site 225	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9286	-117.8989	
DOD100138500	Edwards Air Force Base - 8 - Site 226	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9304	-117.8962	
DOD100138600	Edwards Air Force Base - 8 - Site 227	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9275	-117.8939	
DOD100138700	Edwards Air Force Base - 8 - Site 25	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Edwards AFB	93524-1130	34.9588	-117.9053	
DOD100140000	Edwards Air Force Base - 8 - Site 257	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9636	-117.9145	
DOD100140200	Edwards Air Force Base - 8 - Site 298	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.927	-117.8997	
DOD100140300	Edwards Air Force Base - 8 - Site 299	Military Cleanup Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9267	-117.9058	
DOD100141600	Edwards Air Force Base - 8 - Site 300 A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9361	-117.8993	
DOD100141700	Edwards Air Force Base - 8 - Site 300 B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9351	-117.8994	
DOD100141800	Edwards Air Force Base - 8 - Site 301	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9325	-117.9002	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100141900	Edwards Air Force Base - 8 - Site 31	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.942	-117.9122	
DOD100124400	Edwards Air Force Base - 8 - Site 347	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9326	-117.8993	
DOD100124500	Edwards Air Force Base - 8 - Site 352	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9399	-117.8972	
DOD100124600	Edwards Air Force Base - 8 - Site 61	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9421	-117.8965	
DOD100126000	Edwards Air Force Base - 8 - Site 9	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9446	-117.9038	
DOD100126100	Edwards Air Force Base - 9 - AOC 114	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9526	-117.646	
DOD100126200	Edwards Air Force Base - 9 - AOC 117	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9315	-117.6382	
DOD100127600	Edwards Air Force Base - 9 - AOC 122	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9102	-117.6569	
DOD100127700	Edwards Air Force Base - 9 - AOC 123	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9085	-117.6553	
DOD100127800	Edwards Air Force Base - 9 - AOC 124	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.893	-117.6486	
DOD100127900	Edwards Air Force Base - 9 - AOC 126	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8895	-117.6505	
DOD100130900	Edwards Air Force Base - 9 - AOC 142	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9475	-117.6646	
DOD100131000	Edwards Air Force Base - 9 - AOC 176	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9018	-117.6648	
DOD100131100	Edwards Air Force Base - 9 - AOC 179	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9326	-117.6512	
DOD100132600	Edwards Air Force Base - 9 - AOC 183	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9472	-117.6661	
DOD100132700	Edwards Air Force Base - 9 - AOC 322	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8995	-117.6608	
DOD100134000	Edwards Air Force Base - 9 - AOC 323	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8996	-117.6605	
DOD100134100	Edwards Air Force Base - 9 - AOC 324	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9088	-117.6549	
DOD100134200	Edwards Air Force Base - 9 - AOC 328A	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9414	-117.6586	
DOD100134300	Edwards Air Force Base - 9 - AOC 328B	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9339	-117.6508	
DOD100135600	Edwards Air Force Base - 9 - AOC 330	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9285	-117.6431	
DOD100135700	Edwards Air Force Base - 9 - AOC 331	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9248	-117.6454	
DOD100137200	Edwards Air Force Base - 9 - AOC 337	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9526	-117.6445	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100137300	Edwards Air Force Base - 9 - AOC 375	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9395	-117.6623	
DOD100137500	Edwards Air Force Base - 9 - Site 115	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9544	-117.6471	
DOD100138800	Edwards Air Force Base - 9 - Site 116	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9339	-117.6432	
DOD100138900	Edwards Air Force Base - 9 - Site 125	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8932	-117.6478	
DOD100139100	Edwards Air Force Base - 9 - Site 178A	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9336	-117.6528	
DOD100140400	Edwards Air Force Base - 9 - Site 178B	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9401	-117.6449	
DOD100140700	Edwards Air Force Base - 9 - Site 305	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9543	-117.6459	
DOD100142000	Edwards Air Force Base - 9 - Site 321	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9006	-117.6619	
T10000001993	Edwards Air Force Base - 9 - Site 321 Liquid Propellant Storage Complex Catch Tanks	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9008	-117.6622	Aquifer used for drinking water supply, Soil
DOD100142100	Edwards Air Force Base - 9 - Site 325	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9478	-117.6651	
DOD100142200	Edwards Air Force Base - 9 - Site 338	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9524	-117.643	
DOD100142300	Edwards Air Force Base - 9 - Site 360	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9037	-117.666	
DOD100143600	Edwards Air Force Base - 9 - Site 362	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9554	-117.6449	
DOD100143700	Edwards Air Force Base - 9 - Site 376	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.9544	-117.6462	
DOD100143800	Edwards Air Force Base - 9 - Site 38	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.8994	-117.6606	
DOD100143900	Edwards Air Force Base - 9 - Site 39	Military Cleanup Site	Open - Inactive	Edwards AFB	93524-1130	34.956	-117.6442	
DOD100146900	Edwards Air Force Base - B8595	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
T0602985237	Edwards Air Force Base - Edwards Air Force Base	Military Cleanup Site	Open - Assessment & Interim Remedial Action	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100146500	Edwards Air Force Base - Operable Unit 7 - Site 3	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.9443	-117.9453	Other Groundwater (uses other than drinking water), Soil Vapor
DOD100105400	Edwards Air Force Base - OU 4 - Site 13 AFRL Closed Landfill	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.9225	-117.6853	
DOD100113200	Edwards Air Force Base - OU 4 - Site 312 Test Area 1-14 Polychlorinated Biphenyl (PCB) Sill Area	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.9348	-117.6996	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100119300	Edwards Air Force Base - OU 4&9 - AOC 170 Building 8595 Indoor Vapor Degreaser Pit and Indoor Sump	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.931	-117.7	
DOD100119400	Edwards Air Force Base - OU 4&9 - AOC 171 Building 8595 Indoor Vapor Degreaser Pit and Indoor Sump	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9299	-117.6993	
T10000001961	Edwards Air Force Base - OU 4&9 - Site 115 Test Area 1-100 Missile Silos 1 and 2	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9529	-117.6463	
DOD100108500	Edwards Air Force Base - OU 4&9 - Site 150A Building 8451 Former Waste Evaporation Ponds	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9324	-117.6872	
DOD100108600	Edwards Air Force Base - OU 4&9 - Site 150B Building 8451 Former Waste Evaporation Ponds	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9311	-117.6869	
DOD100108700	Edwards Air Force Base - OU 4&9 - Site 153A Dry Wells Associated with Buildings 8419, 8421, 8423, 8425, and 8431	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9314	-117.6858	
DOD100110000	Edwards Air Force Base - OU 4&9 - Site 153B Dry Wells Associated with Buildings 8419, 8421, 8423, 8425, and 8431	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9298	-117.6867	
DOD100110100	Edwards Air Force Base - OU 4&9 - Site 153C Dry Wells Associated with Buildings 8419, 8421, 8423, 8425, and 8431	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.93	-117.6855	
DOD100117800	Edwards Air Force Base - OU 4&9 - Site 166 Building 8240 Former Waste Discharge Area and Removed Waste Oil UST	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9276	-117.6935	
T10000001958	Edwards Air Force Base - OU 4&9 - Site 167 Test Area 1-46 Beryllium Firing Range	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.8867	-117.6367	
DOD100110300	Edwards Air Force Base - OU 4&9 - Site 172 Building 8595 Outdoor Sump	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9306	-117.7003	
DOD100111900	Edwards Air Force Base - OU 4&9 - Site 26 Former Fire Training Area	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9291	-117.6829	
T10000001960	Edwards Air Force Base - OU 4&9 - Site 318 Test Area 1-120 Catch Basin and Evaporation Pond	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9408	-117.6846	
DOD100121300	Edwards Air Force Base - OU 4&9 - Site 329A Test Area 1-46 Former Wash Rack and Oxidation Pond	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8828	-117.6388	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100121400	Edwards Air Force Base - OU 4&9 - Site 329B Test Area 1-46 Former Wash Rack and Oxidation Pond	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8829	-117.6372	
DOD100121500	Edwards Air Force Base - OU 4&9 - Site 329C Test Area 1-46 Former Wash Rack and Oxidation Pond	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8833	-117.6378	
DOD100119600	Edwards Air Force Base - OU 4&9 - Site 396 Dry Wells Associated with Buildings 8419, 8421, 8423, 8425, and 8431	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.9284	-117.6837	
DOD100097600	Edwards Air Force Base - OU 4&9 - Site 7 Test Area 1-46 Beryllium-Contaminated Earth Piles	Military Cleanup Site	Completed - Case Closed	Edwards AFB	93524-1130	34.8883	-117.6387	
T10000001957	Edwards Air Force Base - OU 4&9 Site 36 Test Area 1-21 Former Wastewater Evaporation Tank	Military Cleanup Site	Open - Remediation	Edwards AFB	93524-1130	34.9323	-117.7027	
DOD100147000	Edwards Air Force Base - PRL1	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100147100	Edwards Air Force Base - PRL10	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123200	Edwards Air Force Base - PRL11	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123300	Edwards Air Force Base - PRL12	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123400	Edwards Air Force Base - PRL13	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100123500	Edwards Air Force Base - PRL14	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100124800	Edwards Air Force Base - PRL15	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100124900	Edwards Air Force Base - PRL16	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125000	Edwards Air Force Base - PRL17	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100125100	Edwards Air Force Base - PRL18	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126400	Edwards Air Force Base - PRL19	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126500	Edwards Air Force Base - PRL20	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126600	Edwards Air Force Base - PRL21	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100126700	Edwards Air Force Base - PRL22	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128000	Edwards Air Force Base - PRL23	Military Cleanup Site	Open - Site Assessment	Edwards AFB	93524-1130	34.8886	-117.8464	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100128100	Edwards Air Force Base - PRL24	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128200	Edwards Air Force Base - PRL25	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100128300	Edwards Air Force Base - PRL26	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100140800	Edwards Air Force Base - PRL27	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100140900	Edwards Air Force Base - PRL28	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100141000	Edwards Air Force Base - PRL29	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100141100	Edwards Air Force Base - PRL30	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132800	Edwards Air Force Base - PRL31	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100132900	Edwards Air Force Base - PRL32	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133000	Edwards Air Force Base - PRL4	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100133100	Edwards Air Force Base - PRL5	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100137600	Edwards Air Force Base - PRL6	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100137700	Edwards Air Force Base - PRL7	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100137800	Edwards Air Force Base - PRL8	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100137900	Edwards Air Force Base - PRL9	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129600	Edwards Air Force Base - S133	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129700	Edwards Air Force Base - S172	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129800	Edwards Air Force Base - S426	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100129900	Edwards Air Force Base - SIT14	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100134400	Edwards Air Force Base - SIT16	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100134500	Edwards Air Force Base - SIT18	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100134600	Edwards Air Force Base - SIT29	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100134700	Edwards Air Force Base - SIT45	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
DOD100139200	Edwards Air Force Base - SRAM	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139300	Edwards Air Force Base - STE18	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.8886	-117.8464	
DOD100139400	Edwards Air Force Base - STE25	Military Cleanup Site	Open - Verification Monitoring	Edwards AFB	93524-1130	34.9096	-117.9346	
DOD100140100	Edwards Air Force Base - 8 - Site 297	Military UST Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9201	-117.9173	
DOD100124700	Edwards Air Force Base - 8 - Site 63	Military UST Site	Open - Site Assessment	Edwards AFB	93524-1130	34.9429	-117.9069	Soil
T0602900810	Edwards Air Force Base - BLDG 0723	Military UST Site	Completed - Case Closed	EDWARDS AFB	93524	34.9208	-117.9031	Soil
T0602900967	Edwards Air Force Base - BLDG 0736	Military UST Site	Completed - Case Closed	EDWARDS AFB	93524	34.9208	-117.9031	Soil
T0602900859	Edwards Air Force Base - BLDG 112	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900857	Edwards Air Force Base - BLDG 148	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900911	Edwards Air Force Base - BLDG 1616/18	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Under Investigation
T0602900890	Edwards Air Force Base - BLDG 173	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900994	Edwards Air Force Base - BLDG 1735 HUSH HOUSE	Military UST Site	Completed - Case Closed	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900960	Edwards Air Force Base - BLDG 1824	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Soil
T0602900870	Edwards Air Force Base - BLDG 1824	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Soil
T0602900977	Edwards Air Force Base - BLDG 1873	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Aquifer used for drinking water supply
T0602900973	Edwards Air Force Base - BLDG 2110 GASOLINE & DIESEL	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Soil
T0602900892	Edwards Air Force Base - BLDG 2580	Military UST Site	Completed - Case Closed	EDWARDS AFB	93523	34.905	-117.8836	Under Investigation
T0602900894	Edwards Air Force Base - BLDG 3800	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Soil
T0602900887	Edwards Air Force Base - BLDG 3807	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Aquifer used for drinking water supply
T0602900904	Edwards Air Force Base - BLDG 4402	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Under Investigation
T0602900808	Edwards Air Force Base - BLDG 8409	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602900921	Edwards Air Force Base - BLDG 940	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Under Investigation
T0602999269	Edwards Air Force Base - HYDRANT FUEL DISTR BLDG 1724	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.905	-117.8836	Soil

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
T0602900819	Edwards Air Force Base - NASA/ADFRF GAS STATION	Military UST Site	Open - Remediation	EDWARDS AFB	93523	34.9204	-117.9156	Aquifer used for drinking water supply
T0602900896	Edwards Air Force Base - PRATT & WHITNEY BLDG 1899	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Aquifer used for drinking water supply
T0602900880	Edwards Air Force Base - PRATT & WHITNEY BUILDING	Military UST Site	Open - Site Assessment	EDWARDS AFB	93523	34.9204	-117.9156	Under Investigation
T0602900813	Edwards Air Force Base - SITE 17 BLDG 1404	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9208	-117.9031	Aquifer used for drinking water supply
T0602900991	Edwards Air Force Base - Site 51 BLDG 1724 HYDRANT 1	Military UST Site	Open - Site Assessment	EDWARDS AFB	93524	34.9243	-117.8823	Other Groundwater (uses other than drinking water)
L10007240290	AIR FORCE PLANT 42 FFTF	Land Disposal Site	Open	PALMDALE	93550	34.6228	-118.102	
L10009605384	ANTELOPE VALLEY RECYCLING # 1	Land Disposal Site	Open	PALMDALE	93550	34.5697	-118.1497	
L10004594296	ANTELOPE VALLEY RECYCLING #2	Land Disposal Site	Open	PALMDALE	93550	34.5699	-118.1498	
L10009721950	BIO-GRO SYSTEMS-LANCASTER	Land Disposal Site	Completed - Case Closed	LANCASTER	93534	34.8155	-118.3879	
L10004638786	BORON CLASS III LANDFILL	Land Disposal Site	Open	BORON	93516	34.9905	-117.6483	
L10001386878	BORON MINE FACILITY	Land Disposal Site	Open	BORON	93516-2000	35.0397	-117.7024	
L10005924923	DEBORD SEPTAGE PONDS	Land Disposal Site	Completed - Case Closed	BORON	93516	35.019	-117.6074	
L10003261293	DRUM STORAGE AREA (Lebec Cement Plant)	Cleanup Program Site	Completed - Case Closed	LEBEC	93243	34.8233	-118.7491	
L10003257539	EDWARDS AIR FORCE BASE- 4 - SITE 13 - RESEARCH LAB CLASS III LF	Land Disposal Site	Completed - Case Closed	EDWARDS AFB	93523	34.923	-117.6844	
L10005585471	GANGUE/OVERBURDEN/REF WASTE	Land Disposal Site	Open	BORON	93516-2000	35.0448	-117.698	
L10009466231	LANCASTER LF & GW TRTMT DSCHRG	Land Disposal Site	Open	LANCASTER	91325	34.7443	-118.1176	
L10006923234	LEBEC CEMENT PLANT	Land Disposal Site	Open - Closed/with Monitoring	LEBEC	93243	34.8196	-118.7589	
L10003043139	MAIN BASE CLASS III LANDFILL	Land Disposal Site	Open	EDWARDS AFB	93523	34.9541	-117.9571	
SL206063824	MAINTENANCE SHOP (LEBEC CEMENT PLANT)	Cleanup Program Site	Open - Remediation	LEBEC	93243	34.8213	-118.7495	
L10002272084	MIDDLE BUTTES PROJECT	Land Disposal Site	Open	MOJAVE	93501	34.9615	-118.2897	
T10000003229	Mission Linen Supply	Cleanup Program Site	Open - Site Assessment	Lancaster	93535	34.6994	-118.1348	Tetrachloroethylene (PCE), Trichloroethylene (TCE)
L10001220608	MOJAVE PLANT NO 55	Land Disposal Site	Open - Inactive	MOJAVE	93501	35.0041	-118.1568	

Global ID	Site/ Facility Name	Site/ Facility Type	Site Status	City	Zip Code	Latitude	Longitude	Potential Contaminants of Concern
L10009509578	MOJAVE PLANT-CALIF PORTLAND	Land Disposal Site	Open	MOJAVE	93501	35.0393	-118.3016	
SL206083826	OLD INDUSTRIAL LANDFILL (LEBEC CEMENT PLANT)	Cleanup Program Site	Open - Remediation	LEBEC	93243	34.8233	-118.7491	Other Chlorinated Hydrocarbons, Tetrachloroethylene (PCE), Trichloroethylene (TCE)
T10000004967	Palmdale Water Reclamation Plant	Cleanup Program Site	Open - Assessment & Interim Remedial Action	Palmdale	93550	34.5957	-118.0748	Nitrate
L10002603256	PHILLIPS LAB INDUSTRIAL PONDS	Land Disposal Site	Open	EDWARDS AFB	93524-6225	34.886	-117.6374	
SL0603710027	QUALITY CLEANERS	Cleanup Program Site	Completed - Case Closed	PALMDALE	93550	34.5584	-118.0837	* Chlorinated Solvents - PCE, * Chlorinated Solvents - TCE, * Volatile Organic Compounds (VOC)
L10003439498	SHUMAKE PROJECT	Land Disposal Site	Open	MOJAVE	93501	34.9509	-118.2907	
T10000002837	Sierra Suntower LLC Sierra Suntower Generating Station	Land Disposal Site	Open - Inactive	Lancaster	93534	34.733	-118.1357	Nitrate, Other inorganic / salt, Arsenic, Chromium, Other Metal
SL206123828	SILVER HANGER DRY CLEANERS	Cleanup Program Site	Completed - Case Closed	Palmdale		34.6886	-118.1597	
L10001287451	SMITH & THOMPSON WTF	Land Disposal Site	Open	LANCASTER		34.6894	-118.1314	
L10001283834	SOLEDAD MOUNTAIN PROJECT	Land Disposal Site	Open	MOJAVE	93502-0820	34.9931	-118.1937	
L10005171449	STANDARD HILL PROJECT	Land Disposal Site	Completed - Case Closed	MOJAVE	93502	35.0121	-118.1691	
SL206073825	US BORAX & CHEMICAL PONDS A THROUGH E	Cleanup Program Site	Open - Remediation	BORON	93516	35.0447	-117.7176	

Appendix E

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: ______________________________

Project Sponsor: ______________________________

Project Contact Person: ______________________________

Project Contact Phone: ______________________________

Project Contact Email: ______________________________

Project Location (include name of sub-basin): ______________________________

____

Project Description: ______________________________

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Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Last revised: 09/17/2013

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Amargosa Creek Recharge Project

Project Sponsor: City of Palmdale

Project Contact Person: Gordon Phair

Project Contact Phone: (661) 267-5310

Project Contact Email: gphair@cityofpalmdale.org

Project Location (include name of sub-basin): 20 acres along Amargosa Creek near Elizabeth Lake Road and 25th St W. Located outside, but upstream of the Lancaster sub-basin.

Project Description: Recharge component that is a part of a larger project, "Upper Amargosa Creek Flood Control, Recharge and Habitat Restoration Project." The project includes eight basins to recharge groundwater using raw State Water Project water and stormwater runoff from the Amargosa Creek Watershed. Recharge volumes dependent on available supply and annual precipitation. Anticipated averages provided below.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater	-	400	400	400	400	400
Imported Water, raw	-	24,300	24,300	24,300	24,300	24,300
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2015

Project Status (check status):

____ Concept

X Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Antelope Valley Water Bank

Project Sponsor: Antelope Valley Water Storage

Project Contact Person: Mark Beuhler

Project Contact Phone: (323) 860-4829

Project Contact Email: MBeuhler@avwaterbank.com

Project Location (include name of sub-basin): Property is located west of Rosamond (Neenach sub-basin)

Project Description: The project is owned by the Valley Mutual Water Company, which operates the bank within the structure of the Semitropic-Rosamond Water Bank Authority. At full build-out, the water banking project will provide up to 500,000 acre-feet of storage and the ability to recharge and recover up to 100,000 AFY of water for later use when needed. The project recharges water from the State Water Project into storage using recharge basins and will use new and existing wells to recover water for delivery and regional conveyances. The project is being constructed in phases and currently has 320 acres of operational percolation pond capacity.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater						
Imported Water, raw	1,300	22,000	22,000	22,000	22,000	22,000
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2010

Project Status (check status):

____ Concept

____ Planning

____ Design

X Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Eastside Banking and Blending Project

Project Sponsor: Antelope Valley East Kern Water Agency (AVEK)

Project Contact Person: Dwayne Chisam

Project Contact Phone: (661) 943-3201

Project Contact Email: dchisam@avek.org

Project Location (include name of sub-basin): Lancaster sub-basin

Project Description: Operational water recharge and recovery site providing a supplemental potable source of water for the AVEK Eastside Water Treatment Plant. The project will involve State Water Project water spread over local recharge basins, storing water for future recovery during dry or drought years. This alternative potable water supply will be used for periodic substitution or supplementation to the Eastside plant.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater						
Imported Water, raw	-	5,000	10,000	10,000	10,000	10,000
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2015

Project Status (check status):

____ Concept

____ Planning

____ Design

_X_ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Edwards Air Force Base (EAFB) Air Force Research Laboratory Treatment Plant

Project Sponsor: Edwards Air Force Base

Project Contact Person: Amy Frost

Project Contact Phone: (661) 277-1419

Project Contact Email: amy.frost@edwards.af.mil

Project Location (include name of sub-basin): Edwards Air Force Base

Project Description: Secondary wastewater treatment plant. All the effluent is discharged to the onsite evaporation ponds.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	46	46	46	46	46	46
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year:____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Edwards Air Force Base (EAFB) Main Base Wastewater Treatment Plant

Project Sponsor: Edwards Air Force Base

Project Contact Person: Amy Frost

Project Contact Phone: (661) 277-1419

Project Contact Email: amy.frost@edwards.af.mil

Project Location (include name of sub-basin): Edwards Air Force Base

Project Description: The plant discharges treated domestic wastewater. The facility can collect, treat and dispose of a design 24-hour daily average flow of 2.5 million gallons per day (mgd) and a design peak daily flow of 4.0 mgd from the EAFB areas. The facility is designed to produce tertiary treated effluent and has the capacity to hold up to 3,000 gallons per day of seepage.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	511	511	511	511	511	511
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Edwards Air Force Base (EAFB) Evaporation Ponds

Project Sponsor: Edwards Air Force Base

Project Contact Person: Amy Frost

Project Contact Phone: (661) 277-1419

Project Contact Email: amy.frost@edwards.af.mil

Project Location (include name of sub-basin): Edwards Air Force Base (Lancaster sub-basin)

Project Description: The evaporation ponds receive effluent from the EAFB Air Force Research Laboratory Treatment Plant and EAFB Main Base Wastewater Treatment Plant.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	174	174	174	174	174	174
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Edwards Air Force Base (EAFB) Golf Course Irrigation

Project Sponsor: Edwards Air Force Base

Project Contact Person: Amy Frost

Project Contact Phone: (661) 277-1419

Project Contact Email: amy.frost@edwards.af.mil

Project Location (include name of sub-basin): Edwards Air Force Base. Located above becrock.

Project Description: The golf course is the largest user of recycled water at the EAFB. It receives tertiary effluent from the EAFB Main Base Wastewater Treatment Plant as irrigation water during warmer months of the year. The golf course is located over bedrock and will have limited influence groundwater quality. The inclusion of the site is conservative.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	383	383	383	383	383	383
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Lancaster Water Reclamation Plant Upgrade and Expansion

Project Sponsor: Los Angeles County Sanitation District No. 14

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): City of Lancaster (Lancaster sub-basin)

Project Description: The upgrade and expansion project was completed in 2012. The major components were upgraded wastewater treatment facilities, recycled water management facilities, and municipal reuse. Wastewater treatment processes were upgraded to meet tertiary recycled water requirements prescribed in CDPH's Title 22.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	-	17,000	18,500	20,000	21,500	23,000
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Lancaster Water Reclamation Plant Eastern Agricultural Site

Project Sponsor: Los Angeles County Sanitation District No. 14

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): City of Lancaster (Lancaster sub-basin)

Project Description: Existing agricultural site using recycled water produced by the Lancaster Water Reclamation Plant. Per Regional Board requirements, recycled water is applied to the crops at agronomic rates, based on the needs of the crop plant, with respect to water and nitrogen, to minimize deep percolation from the root zone to the groundwater table of the applied recycled water.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	1,000	10,500	11,500	11,200	11,700	10,900
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Last revised: 09/17/2013

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Lancaster Water Reclamation Plant environmental maintenance reuse

Project Sponsor: Los Angeles County Sanitation District No. 14

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): Lancaster sub-basin

Project Description: Disinfected tertiary recycled water produced by the Lancaster WRP is used for environmental maintenance at Apollo Community Regional Park (Apollo Park) and Piute Ponds. Since 1972, Apollo Park has been using recycled water to fill a series of lakes that are used for recreational fishing and boating. Piute Ponds are located on Edwards Air Force Base Property and uses recycled water to maintain marsh-type habitat. Flows below do not include water from Apollo Park lakes that is used for landscape irrigation within the park.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	(plant upgrades were completed in 2012)	5,700	5,700	5,700	5,700	5,700
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Last revised: 09/17/2013

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Multi-use/Wildlife Habitat Restoration Project

Project Sponsor: Wagas Land Company, LLC.

Project Contact Person: Ed Renwick

Project Contact Phone: (213) 628-7131

Project Contact Email: erenwick@hanmor.com

Project Location (include name of sub-basin): Northern LA County bounded by Avenue A, 35th St W, Avenue A-8 and the Interstate 14 Freeway (Lancaster sub-basin).

Project Description: AV Duck Hunting Club in both Kern/LA County, started in 1925. The AV region is a flyaway zone for many migratory birds flying south and the Wagas Land Company has been preserving habitat. The Club is proposing to replace their potable water use with recycled water. The Club would allow Waterworks to use a portion of the property for banking.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	-	-	2000	2000	2000	2000
Groundwater	1000	1000	-	-	-	-
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2016

Project Status (check status):

X Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: North Los Angeles/Kern County Regional Recycled Water Project

Project Sponsor: LA County Waterworks District No. 40, City of Lancaster, City of Palmdale

Project Contact Person: ____

Project Contact Phone: ____

Project Contact Email: ____

Project Location (include name of sub-basin): Lancaster and Pearland Sub-basins

Project Description: The recycled water project is the backbone for a regional recycled water distribution system in the Antelope Valley. The proposed system is sized to distribute recycled water throughout the service area and also deliver recycled water for recharge areas. Construction is phased over time and portions are already complete. The first phase (1A) was implemented in 2009. The flow projection below is based on project components being complete and excludes flows to the Palmdale Hybrid Power Plant (3,100 AFY) and groundwater recharge.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	3	700	1,800	3,600	4,700	7,100
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2009

Project Status (check status):

____ Concept

____ Planning

X Design

X Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Palmdale Hybrid Power Plant Project

Project Sponsor: City of Palmdale

Project Contact Person: Gordon Phair

Project Contact Phone: (661) 267-5310

Project Contact Email: gphair@cityofpalmdale.org

Project Location (include name of sub-basin): City of Palmdale, Lancaster Sub-basin

Project Description: Construction of 570 Mega-Watt electricity generating facility. The power plant will be a hybrid design, utilizing natural gas combined cycle technology and solar thermal technology. The plant is projected to use approximately 3,400 AFY of recycled water and will employ “zero liquid discharge” design.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	-	-	3,400	3,400	3,400	3,400
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2016

Project Status (check status):

____ Concept

____ Planning

____ Design

X Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Palmdale Recycled Water Authority Recycled Water Project

Project Sponsor: Palmdale Recycled Water Authority

Project Contact Person: __________

Project Contact Phone: __________

Project Contact Email: __________

Project Location (include name of sub-basin): Lancaster, Buttes, and Pearland Sub-basins

Project Description: The recycled water project is the recycled water distribution system for the Palmdale Recycled Water Authority (PRWA). Construction is phased over time and the first portion to serve McAdam Park was completed and implemented in 2012.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	0	80	1000	1000	2300	3500
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: 2012

Project Status (check status):

____ Concept

____ Planning

X Design

X Construction

Last revised: 09/17/2013

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Palmdale Water Reclamation Plant Upgrade and Expansion

Project Sponsor: Los Angeles County Sanitation District No. 20

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): City of Palmdale (Lancaster sub-basin)

Project Description: The upgrade and expansion project was completed in 2011. The major components were upgraded wastewater treatment facilities, recycled water management facilities, and municipal reuse. Wastewater treatment processes were upgraded to meet tertiary recycled water requirements prescribed in CDPH's Title 22.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	-	11,000	12,000	12,000	13,000	13,000
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Palmdale Water Reclamation Plant Agricultural Site

Project Sponsor: Los Angeles County Sanitation District No. 20

Project Contact Person: Erika DeHollan

Project Contact Phone: (562) 908-4288

Project Contact Email: edehollan@lacsd.org

Project Location (include name of sub-basin): City of Palmdale (Lancaster sub-basin)

Project Description: Existing agricultural site using recycled water produced by the Palmdale Water Reclamation Plant. Per Regional Board requirements, recycled water is applied to the crops at agronomic rates, based on the needs of the crop plant, with respect to water and nitrogen, to minimize deep percolation of the applied recycled water from the root zone to the groundwater table. Additional land acquired for future agricultural operations with infrastructure in place, but not currently used.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	7,600	10,200	6,400	7,400	4,100	800
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Rosamond Community Services District Wastewater Treatment Plant

Project Sponsor: Rosamond Community Services District (RCSD)

Project Contact Person: Mike Gilardone

Project Contact Phone: (661) 816-5184

Project Contact Email: mgilardone@rosamondcsd.com

Project Location (include name of sub-basin): Rosamond (Lancaster sub-basin)

Project Description: The plant, owned and operated by RCSD, produces both secondary and tertiary treated recycled water. The capacity of the secondary treatment is 1.3 mgd, while the tertiary capacity is 0.5 mgd. The design to upgrade the tertiary treatment capacity to 1.0 mgd is complete. However, the construction is on hold indefinitely due to lack of funding.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)	560	560	560	560	560	560
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: RCSD Wastewater Treatment Plant Evaporation Ponds

Project Sponsor: Rosamond Community Services District (RCSD)

Project Contact Person: Mike Gilardone

Project Contact Phone: (661) 816-5184

Project Contact Email: mgilardone@rosamondcsd.com

Project Location (include name of sub-basin): Rosamond (Lancaster sub-basin)

Project Description: The evaporation ponds receives effluent from the RSCD Wastewater Treatment Plant.

Water Volume Projections (fill in applicable rows)

	2010	**2015**	**2020**	**2025**	**2030**	**2035**
Recycled Water (acre-feet/year)	560	560	560	560	560	560
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water						

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Antelope Valley Salt and Nutrient Management Plan
Project Identification Form

Project Name: Water Supply Stabilization Project (WSSP-2)

Project Sponsor: Antelope Valley East Kern Water Agency (AVEK)

Project Contact Person: Dwayne Chisam

Project Contact Phone: (661) 943-3201

Project Contact Email: dchisam@avek.org

Project Location (include name of sub-basin): Lancaster sub-basin

Project Description: Imported water stabilization program that utilizes SWP water delivered to the Antelope Valley Region's west side for groundwater recharge during wet years for supplemental supply required during summer peaking demand and anticipated dry years. This project includes facilities necessary for the delivery of untreated water for direct recharge (percolation basins) and includes wells and pipeline for raw water and treated water conveyance.

Water Volume Projections (fill in applicable rows)

	2010	2015	2020	2025	2030	2035
Recycled Water (acre-feet/year)						
Groundwater						
Stormwater						
Imported Water, raw						
Imported Water, treated						
Surface Water	10,000	25,000	25,000	25,000	25,000	25,000

Anticipated Implementation Year: ____________

Project Status (check status):

____ Concept

____ Planning

____ Design

____ Construction

Appendix F

SALT AND NUTRIENT MANAGEMENT PLAN (SNMP)

FOR THE ANTELOPE VALLEY

Draft, June 2013

R. Large Comments

21 Aug 13

Before providing specific comments, I would like to complement the preparation team on the huge amount of specific and relevant information provided by this document. Since my comments tend to address multiple document sentences, I think it will be more efficient for me to use the paragraph/page approach rather than the track change approach.

As I have indicated in our discussions, I am very much in favor of the SNMP being an integral part of the overall AV Integrated Regional Water Management Plan (IRWMP). As such, redundant information that has been developed in the two plans as they were separately drafted needs to be removed. I am referring to information such as the basin and climate descriptions, historical and projected water flows, and project descriptions. I know this is challenging, and that there are times when the SNMP is being presented as a stand-alone document, but the reduction in errors as basic IRWMP-specific information is updated, a potentially sizeable reduction in duplicated efforts, and especially a concern for the ultimate user/reader of the integrated document, make it very worthwhile. My recommendation is care in creating modules (linkable by references), and establishing an active coordination effort between the two teams. My remaining comments pertain to the SNMP document, as drafted.

Pg. 1, Section 1.1: Since the Stakeholders are defined in some detail in Section 1.3 (Pg. 2), the sentence in the second paragraph beginning "Stakeholders include ..." should read, "Stakeholder participation is described in Section 1.3".

Pg. 3, Section 1.3 (cont.): "Lakes Town Council", vice "Lake Town Council" [the Lakes Town council represents the communities of Lake Hughes and Elizabeth Lake].

Pg. 3, Section 1.5: To say that the SNMP stakeholder group "established" the definitions implies that we sat down any made up our own definitions. Don't we really mean to say that we accepted and are using common definitions (as used in this technical field) for the following terms? There is still room in the list to note where we had to uniquely define a term (e.g., possibly the Future Planning Period, which would be an opportunity to note that it was selected to be concurrent with the overall IRWMP planning period—hopefully, that's true.)

Pg. 6, Section 2: This is a section that needs to be common and consistent between the IRWMP and SNMP drafts. I have a problem with both the Sub-Basin Boundary Map (SNMP Pg.8) and the IRWMP Groundwater Basin Subunit map (IRWMP Draft of July '07, Pg. 2-19) [Note: inconsistent terminology]: The sub-basin containing Edwards AFB Main Base and the sub-basin that includes Boron (a significant portion of the whole basin, in terms of surface area) are not named or described. While I recognize that this is probably consistent with the USGS 1987 definitions, it makes the map essentially incomplete. In Section 2.4 (Pg. 21) we discuss regulatory groundwater cleanup sites, several of which are in these unnamed sub-basins. It is inconsistent to have a concern about a listed site (i.e., that it might be polluting groundwater), yet not have a sub-basin name/description of the area presumably being polluted.

Pg. 11, Section 2.1: "Peerless" vice "Pearless"—it's confusing enough to have both "Peerless" and "Pearland" in the same map.

Pg. 14, Section 2.1.2: The Water Supply description, which needs to be a common element of the IRWMP and the SNMP, is incomplete in that it leaves out the interests of individual/small pumpers and landowners who would likely become small pumpers (in order to develop their land) in the future in areas where it is uneconomical to extend water lines from the M&I purveyors.

Pg. 21, Section 2.3: The first sentence in the last paragraph appears to have a typo: should be "objectives" vice "objects".

Pg. 24, Section 3.1.5: In the reference to the chromium-6 study by EPA, the statement implies that the study was not complete as of this report. Is it true that, after five years, there is still no assessment, or is this a case of not checking with EPA for an update?

Pg. 25, Section 3.1.7: The second paragraph, discounting the impact of boron, seems out of place here, since it is addressed on Pg. 27. If the EPA reference is needed, it should be added to the discussion on page 27.

Pg. 26, Section 3.2.1: The second paragraph appears to again erroneously refer to "Pearless".

Pp. 29, 30, 31, 32, 33, 34, and 35: The legends and map symbols for the constituent levels are almost unreadable, particularly with the changing background from map to map. I am not sure what the answer to this dilemma is, but one possibility would be to use slightly larger and distinctly different symbols: e.g.: "o, *, $, +".

Pg. 36, Section 3.2.2.: Several of the North Muroc constituents are so out of line with the other basins, that it seems appropriate to have some discussion in this section regarding them.

Pp. 50-52, Section 3.5.1: There appear to be a number of inconsistencies between the descriptions on these pages, the presumed corresponding numbers on the map (Figure 3-17), and the map legend on page 55. For example, the EAFB Main Base WTP is discussed as item 7, but item 7 in the legend is the e-Solar tower, which appears to be correctly shown in Lancaster on the map. The EAFB/AFRL WTP is discussed and listed in the legend as item 4, but there does not appear to be an item 4 on the map, but that could be the duplicate point labeled "5" in the eastern (unlabeled) sub-basin. The Lancaster WRP Eastern Agricultural site is discussed as item 10, but the legend and map appear to show this as item 9. Item 15, discussed as the Palmdale WRP Ag site, appears in the legend and on the map as Piute Ponds. Similar problems exist with items 17, 18, 19 and 20.

Pg. 52-53, Section 3.5.2: I am uncomfortable reviewing this item and the associated table on page 56, because it introduces yet other plan(s)—the LACWD Integrated Regional Urban Water Management Plan for the AV and the PWD Urban Water Management Plan—which I have not seen and which could have assumptions inconsistent with the IRWMP. Water volume projections are an intense item of debate and it would be far better, in my opinion, if the IRWMP addressed this issue directly and the SNMP referenced the IRWMP discussion as its primary source.

Pg. 58, Section 4.3: I found this one of the most difficult sections to review in the plan. For example, in the first paragraph, it seems like the antidegradation policy should have a time component to it, not just a single figure for assimilative capacity. [By the way, in the last sentence of the first paragraph, it appears that it should be "utilize" vice "utilizes"].

Pg. 59, Section 4.4: The discussion of Fluoride is confusing. How did we get from negative assimilative capacity for the Lancaster sub-basin to plus 20%? It appears that what is being done is using a multiple project argument to allow averaging over multiple sub-basins. But the figure and chart on page 65 seems to indicate that imported water for agriculture is being phased out, and there is no flow connection on the diagram from recycled water projects to agriculture. As long as some of the agriculture water was from imported water, you could make the argument that some dilution of fluoride was occurring because the imported water had less fluoride concentration than the baseline water, but Table 4-5 shows a phasing out of the use of imported water for agriculture. In the absence of other water sources, agricultural water would be pumped from the aquifer, further degraded with chemicals, and a portion would go back into the water table. How is this not an antidegradation concern? What is the rationale for phasing out imported water for agriculture?—I didn't see the discussion.

Pg. 64, Section 4.6: This discussion closely relates to my previous comment. From other sources, I have seen figures of as much as 15 years for water to move from the surface to the water table. I have not seen the studies of how rapidly water moves horizontally or vertically in the aquifer, but how is it considered a "worst case" analysis to assume that salt and nutrient concentrations are "instantly" diluted with the total volume of the aquifer (i.e., 55 million AF). If, in fact, there is slow diffusion, then it would appear that concentrations of undesirable constituents in the upper layers of soil could be significantly more than projected by overall averaging. I think we also need to try to put at least some bounds on the other contributing sources (e.g., fertilizer, manure, etc.) to see if setting them aside impacts our conclusions.

Pg. 59 and 60, Section 4.5.1: Is the term "Fate" being used in a technical sense? If so, it would be helpful if it were defined. Is it the intent for this draft to define the trigger for TDS (last sentence on page 60)—if so, I don't recall the group having done this.

Pg. 63, Figure 4-1: It appears that the label definitions for the sub-basin boundaries and the study area got swapped.

This concludes my comments.

Water Boards

Lahontan Regional Water Quality Control Board

September 6, 2013

File: Antelope Valley Basin Planning

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COMMENTS ON THE DRAFT SALT AND NUTRIENT MANAGEMENT PLAN FOR THE ANTELOPE VALLEY (JUNE 2013), ANTELOPE VALLEY INTEGRATED REGIONAL WATER MANAGEMENT GROUP, LOS ANGELES AND KERN COUNTIES

The California Regional Water Quality Control Board, Lahontan Region (Water Board) staff received a copy of the above-referenced draft Salt and Nutrient Management Plan (SNMP) on July 17, 2013. The draft SNMP was prepared primarily by staff from the Los Angeles County Waterworks Districts and the Sanitation Districts of Los Angeles County with cooperation from the stakeholders of the Antelope Valley Integrated Regional Water Management (IRWM) Group (collectively referred to herein as "the Group"). This draft SNMP was prepared in accordance with the State Water Resources Control Board Resolution Number 2009-0011 (Recycled Water Policy), as amended.

Water Board staff has reviewed the draft SNMP in light of the Scope of Work approved by the Water Board in October 2011, the requirements of the Recycled Water Policy, and with the requirements of the *Water Quality Control Plan for the Lahontan Region* (Basin Plan). We commend the Group in taking the initiative to develop a collaborative plan that evaluates reuses of multiple local water sources and the potential long term effects on water quality. The draft SNMP compliments the IRWM plan and, in conjunction, will benefit and support sustainability of the Antelope Valley. We have determined that the draft SNMP will need to be revised, per our comments below. Listed first are comments on specific components of the plan, followed by comments on plan content.

BACKGROUND WATER QUALITY DATA

A wealth of water quality data has been compiled from the United States Geological Survey (USGS) and the State Water Resources Control Board's Groundwater Ambient Monitoring Assessment Program (GAMA) data sources. For purposes of the SNMP, the Group selected the GAMA dataset for use as the background water quality dataset;

yet, the rationale for selecting only data from GAMA is unclear. For breadth, we recommend combining the USGS and GAMA water quality data into one comprehensive dataset to establish baseline water quality. Care should be taken to avoid duplicating water quality data during the integration.

The USGS data is a subset of GAMA, therefore GAMA should be more inclusive. However, there appears to be data in the USGS dataset (Table 3-1) that is not included in the GAMA dataset (Table 3-2). For example, Table 3-1 lists water quality data for wells located in the Gloster sub-basin, yet in Table 3-2 there is no water quality data available for the Gloster sub-basin from GAMA sources. Such discrepancies may arise from inaccurate or partial well location information as reported by the respective agencies, errors occurring during data downloads, or data entry errors. We recommend the differences between the USGS data and GAMA data be reconciled, to the extent possible, before these two datasets are combined.

For clarity, we request the draft SNMP include a discussion of the existing/background water quality as represented by the combined/comprehensive USGS/GAMA dataset described above. The detailed technical analyses and assumptions that went into developing this background dataset could then be presented in a technical memorandum and appended to the SNMP. The memorandum should include the following: separate discussions for each of the USGS and GAMA data sources; the criteria for selecting viable data from each source (i.e. assumptions, outliers, screened interval, etc.) and the number of wells selected from each data source; the process for siting or mapping well locations; the discrepancies between data obtained from the two sources; the process for combining the two data sets into one comprehensive background water quality dataset; a discussion of the background water quality as represented by the combined USGS/GAMA dataset; and a discussion regarding data gaps.

WATER QUALITY OBJECTIVES

Water quality data illustrate that background water quality in the Antelope Basin varies across the basin, with some sub-basins having higher quality groundwater than others. Water Board staff have determined that one set of water quality objectives (WQOs) applied unilaterally across the entire Antelope Basin (see Table 4-1) is not applicable in this case; rather, the SNMP must establish WQOs for each constituent on a **sub-basin level**. Proper identification of applicable WQOs is critical to calculating assimilative capacity, modeling loading over time, evaluating implementation strategies to manage salts and nutrients, and developing a monitoring program to evaluate the effectiveness of the SNMP. The discussion below provides examples for how the Water Board establishes WQOs.

The general methodology used in establishing WQOs involves, first, designating beneficial water uses, and second, selecting and quantifying the water quality parameters (thresholds) necessary to protect the most vulnerable (sensitive) beneficial uses. Our Basin Plan designates beneficial uses of groundwater in the Antelope Basin as municipal and domestic supply (MUN), agricultural supply (AGR), industrial service supply (IND), and freshwater replenishment (FRSH). The Basin Plan does not identify specific numeric WQOs for groundwater in the Antelope Basin. However the following narrative WQOs are applicable to all groundwaters in the region, including the Antelope Basin: waters shall not contain concentrations of chemical constituents that adversely affect the water for beneficial uses; waters designated as MUN shall not contain concentrations of chemical constituents in excess of the maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL) based upon drinking water standards; waters designated as AGR shall not contain concentrations of chemical constituents in amounts that adversely affect the water for agricultural uses; and waters shall not contain taste or odor producing substances in concentrations that cause nuisance or that adversely affect beneficial uses. Narrative WQOs do not have specific numeric thresholds; therefore, other sources must be referred to in order to determine appropriate thresholds to meet these objectives. Note that WQOs must be protective of the most vulnerable (sensitive) beneficial uses, which may or may not be numeric thresholds established for drinking water standards, as other protected beneficial uses, such as AGR, may be more sensitive.

A Compilation of Water Quality Goals is an online searchable database of water quality-based numeric thresholds for drinking water standards, public health goals, and agricultural water quality goals/thresholds, among others. The database is a compilation from various sources and is maintained by staff of the State Water Resources Control Board, Office of Information Management and Analysis. The database can be accessed online at http://www.waterboards.ca.gov/water_issues/programs/water_quality_goals/. We recommend using this database to aid in identifying the appropriate numeric thresholds for WQOs.

Variability in background water quality indicates that WQOs must be identified for each constituent on a sub-basin level. For example, total dissolved solids (TDS) is a constituent that primarily affects taste and odor and has a three part drinking water standard with a recommended SMCL of 500 milligrams per liter (mg/L), an upper limit of 1,000 mg/L, and a short-term level of 1,500 mg/L. Baseline concentrations of TDS in the Lancaster and Pearland sub-basins is 323 mg/L and 264 mg/L, respectively (see Table 3-2). These baseline concentrations are well below the upper level of 1,000 mg/L as well as the SMCL of 500 mg/L. Baseline TDS concentration in the Neenach sub-basin is 501 mg/L, which exceeds the SMCL of 500 mg/L, but is less than 1,000 mg/L. In this example, it would be appropriate to apply a TDS WQO of 500 mg/L for the Lancaster and Pearland sub-basins. The next higher standard of 1,000 mg/L may be an appropriate TDS WQO for the Neenach sub-basin. This rationale must be applied and justified when identifying WQOs for each constituent.

WQOs must also be protective of the most vulnerable (sensitive) beneficial uses, which may or may not be numeric thresholds established for drinking water standards. Depending on the chemical constituent, AGR beneficial uses may dictate lower WQOs than might otherwise be necessary to protect MUN beneficial uses. For example, chloride has a SMCL of 250 mg/L for drinking water, but has an agricultural water quality threshold of 106 mg/L. Chloride concentrations above 106 mg/L impair the waters AGR beneficial uses. In this example, a WQO for chloride set at 106 mg/L would be the most restrictive and protective of both AGR and MUN beneficial uses.

Now consider baseline chloride concentrations for the Antelope Basin. The data in Table 3-2 show that background water quality for chloride is well below the SMCL of 250 mg/L and below the agricultural threshold of 106 mg/L in all sub-basins (where data is available), with the exception of the North Muroc sub-basin that has a baseline chloride concentration of 155 mg/L. Using the more restrictive agricultural threshold as a numerical objective to protect AGR beneficial uses, the WQO for chloride is 106 mg/L in all sub-basins. Background chloride concentrations in the North Muroc sub-basin presently exceed the 106 mg/L WQO. The SNMP should include a discussion for those sub-basins where background water quality exceeds WQOs.

We recommend amending Table 4-1 to include the numeric thresholds that were used to select the WQO for each constituent within individual sub-basins. The selected WQO must be protective of the most sensitive beneficial uses, which may or may not be numeric thresholds established for drinking water standards.

ASSIMILATIVE CAPACITY

Establishing WQOs is pivotal to calculating assimilative capacity. Because baseline water quality data varies between the sub-basins of the Antelope Basin, the SNMP should identify WQOs for each constituent on a sub-basin level. Consequently, assimilative capacity will also vary depending on the constituent and sub-basin location. Therefore, we recommend that baseline assimilative capacity be calculated for each constituent in each sub-basin where background water quality is available. A discussion should be included in the SNMP for those sub-basins where there is little to no assimilative capacity. Incorporating baseline assimilative capacities for all sub-basins, rather than limiting the focus to only those sub-basins where projects are currently being implemented, would further support the intent of the SNMP, which is to serve as a tool for planning and siting future projects that have the potential to contribute to salt and nutrient loading within the basin.

SOURCE IDENTIFICATION AND LOADING

Source identification and estimating their mass loading of salts and nutrients to the groundwater is fundamental to assessing changes in water quality over time. In addition to the current and future projects identified, various other salt and nutrient contributing sources should be considered in the salt balance calculations. In particular, salt and nutrient loading from agricultural sources (fertilizer, soil amendments, and applied water), residential inputs (septic systems, fertilizer, soil amendments, and applied water), and animal waste (manure land application) should be evaluated and included in Table 4-3. General loading factors and assumptions based on land use categories are available in the literature. The Group is encouraged to review other SNMPs prepared to date where some of this information is summarized and references are cited. All assumptions and references used in the loading and salt/nutrient balance calculations must be identified in the plan, and data gaps should be identified and discussed.

GROUNDWATER MODELING

The simple mixing model should be supplemented with more refined models over time, as there will not be uniform mixing throughout the entire basin as a result of loading. We anticipate that impacts will initially be localized and of much higher magnitude than estimated by the mixing model. Areas of highest concern, particularly the urbanized areas of Palmdale and Lancaster, and in sub-basins where assimilative capacity is threatened, should be targeted for more discrete groundwater modeling in the future.

MONITORING AND REPORTING PROGRAM

We envision that progress toward salt and nutrient management will be assessed through regular evaluation and responses to three pivotal questions over the 25-year planning period: (1) Is water quality changing over time as models predicted? (2) Are salts and nutrients effectively being managed to maintain WQOs for beneficial uses? (3) Can technology and new information improve implementation strategies to reduce salt and nutrient loading? Over the implementation period, these questions will be answered through groundwater monitoring, data evaluation, and adaptive management, and will help the Group define the salt/nutrient management benefit derived from their investment of time and resources.

A groundwater monitoring program is vital to tracking changes in water quality over time, evaluate assimilative capacity, and assess effectiveness of implementation strategies. The Recycled Water Policy states that the monitoring network should "focus on basin water quality near water supply wells and areas proximate to large water recycling projects, particularly groundwater recharge projects. Also, monitoring locations shall, where appropriate, target groundwater and surface waters where groundwater has connectivity with the adjacent surface waters." The preferred approach is to "collect samples from existing wells if feasible as long as the existing wells are located appropriately to determine water quality throughout the most critical areas of the basin."

The monitoring network is the backbone of any monitoring program and requires a sufficient number of strategically located monitoring wells. The proposed SNMP monitoring well locations are shown on Figure 3-16. Please provide a discussion of well selection criteria, and for each well selected, please provide the following: state well number; other well identification numbers; location information (latitude/longitude and corresponding groundwater sub-basin); depth of well; screened interval(s); land surface elevation; frequency of sampling; and sampling program (i.e. USGS, GAMA, California Department of Public Health, etc.). A minimum of three monitoring wells per sub-basin is necessary to be considered statistically valid.

The proposed well locations appear to be located near current and future recycled water projects; however, we recognize that there are other critical areas within the basin with little to no monitoring coverage. We recommend incorporating additional wells in the following locations: the Neenach sub-basin near the Antelope Valley Water Bank Project; the Lancaster and Buttes sub-basins near the Palmdale Water Reclamation Plant Agricultural Site; north of the Lancaster sub-basin near the Edwards Air Force Base Golf Course Landscape Irrigation Project; and near the Amargosa Creek Recharge Project. Several of these projects have active groundwater water monitoring programs, and existing monitoring wells associated with these projects could be incorporated into the SNMP monitoring program.

In order to be a useful tool, the monitoring program must include data analysis and adaptive management components. Increasing and/or decreasing concentration trends need to be tracked and in some cases statistical analyses may need to be performed to evaluate the significance of the changes in water quality. Time versus concentration plots is one way to graphically display data. Adaptive management would provide the process and framework for updating the SNMP to reflect changes over time in land use, project status, source water quality, and groundwater quality, to add or modify implementation strategies, to incorporate new wells as the monitoring program evolves, and to provide a feedback system to the Group. Specific triggers that would lead to further analyses need to be clearly identified.

PLAN APPROVAL PROCESS

We do not envision that the SNMP, in its entirety, will be incorporated in the Basin Plan. Rather, elements of the SNMP, such as revised WQOs and implementation strategies and BMPs, may be incorporated. The final SNMP will be presented to the Water Board at a public hearing for their review and acceptance. We anticipate that at that hearing, further direction will be provided to the Group on how the SNMP or its components will be incorporated into the Basin Plan.

Water Board staff considers submittal of a complete draft SNMP by May 2014 as meeting the deadline requirements outlined in the Recycled Water Policy.

ADDITIONAL COMMENTS

Our comments on plan content are provided below.

1. The draft SNMP contains a wealth of information that is necessary to understanding the existing quality of the groundwater within the Antelope Valley. However, the presentation of the information is fragmented and hard to follow. We recommend that the Group consider adding an Executive Summary and structuring the document in a format where each section builds up the previous one.

2. The stakeholder roles and responsibilities for preparing and implementing the SNMP must be clearly defined, as required by the Recycled Water Policy.

3. Please include water recycling and stormwater recharge/use goals and objectives in the SNMP, as required by the Recycled Water Policy.

4. We suggest adding definitions for "pollution" and "degradation." Pollution, as defined in the California Water Code, section 13050(l), means beneficial uses of water are unreasonably affected. Degradation means natural water quality is adversely altered, but still satisfies water quality objectives to support beneficial uses.

5. Section 2.1.1 states that the SNMP analyses will focus on the Neenach, Lancaster, Buttes, and Pearland sub-basins. However, the Buttes sub-basin is not included in any of the analyses in subsequent sections of the plan.

6. Section 2.4 is a discussion regarding the groundwater cleanup sites included in GeoTracker, and Appendix D is a list of those sites provided by GeoTracker. Please note that Department of Defense sites, such as Air Force Plant 42 and Edwards Air Force Base, have ongoing groundwater cleanup actions, but are absent from the list and discussion.

7. Figures 3-8 through 3-15 are of a noticeable lesser quality than Figures 3-1 through 3-7. The mean concentration of constituent, as represented by Figures 3-8 through 3-15, is a more easily discernible presentation of the data. We request that the quality of Figures 3-8 through 3-15 equal or exceed the quality of Figures 3-1 to 3-7.

8. The water quality data presented distinct differences laterally between sub-basins, but there was little to no discussion regarding vertical partitioning of water quality. Is there sufficient information to discern vertical changes in water quality within some or all of the sub-basins? We request this discussion be included in the SNMP.

9. Not all areas of the Antelope Basin have been subdivided into sub-basins. For example, the western fringe of the basin is not included as a sub-basin, and the area in and around Edwards Air Force Base is also not included as a sub-basin. For those areas where a sub-basin has not been identified, how does the Group intend to assess background water quality? There are several recycled water projects currently implemented in these areas. How will the Group address salt and nutrient management in these areas? These issues need to be addressed in the SNMP.

10. Figure 3-16 and Figure 3-17 show current/future projects in the basin. There are several discrepancies between these figures: different scales; different number of projects shown/listed; and different project number schemes. We recommend using Figure 3-17 as a base for current and future projects. All symbols used on the map must be listed in the legend.

11. TDS, chloride, and nitrate are the chosen indicator parameters for salts and nutrients in the draft SNMP. A discussion as to why these constituents have the potential to degrade water quality and how they were selected as indicator parameters should

be included in the SNMP. The different contributing salt and nutrient sources, both anthropogenic and naturally occurring, should be identified for each.

12. Figure 4-1 is a groundwater contour map of the Antelope Valley based on static water levels in 1996. Groundwater levels have likely changed significantly from 1996 to the present. We recommend that the groundwater contour map be based on more recent water level data.

13. In Section 4.3, there are several references to the "policy." For clarity, we recommend that references to the "Antidegradation Policy" and the "Recycled Water Policy" be referenced as such, with no additional abbreviation.

14. Percolation, in addition to evaporation, is expected from some wastewater ponds in the Antelope Valley (Figure 4-2). We suggest modifying salt balance calculations to include the estimated mass loading from wastewater pond percolation and mass removal of from evaporation.

15. In addition to the "normal year" salt and nutrient mass balance calculations, we recommend that additional calculations be performed for worst-case scenario (no import water) and best-case scenario (full allocation of import water); the results of which should be factored into estimating future groundwater quality.

16. Figures 4-3 through 4-5 illustrate estimated increases in TDS, chloride, and nitrate based on source loading through the planning period. This evaluation seems too simplistic to be a meaningful analysis. From where is the 80% baseline assimilative capacity derived? Our understanding is that the Recycled Water Policy specifies that single recycled water projects should use less than 10% of the available assimilative capacity and, cumulatively, multiple projects are to use less than 20% of available assimilative capacity.

17. The draft SNMP should identify existing measures or practices that are already in place to manage groundwater quality in the basin. For example agricultural BMPs, strategies to manage the quality of municipal wastewater influent, local programs and policies that encourage low impact development, and stormwater recharge, etc., should be identified as appropriate, through the SNMP.

18. Please identify and discuss the triggers that will be used to determine when implementation strategies and BMPs are necessary and how their use will improve/protect water quality.

Thank you for the opportunity to comment. Please share our comments with the rest of the Group. If you have any questions regarding this letter, please contact me at (760) 241-7376 (jzimmerman@waterboards.ca.gov) or Patrice Copeland at (760) 241-7404 (pcopeland@waterboards.ca.gov).

Jan M. Zimmerman, PG
Engineering Geologist

cc: Aracely Jaramillo, County of Los Angeles Dept. of Public Works, Waterworks Districts (via email, ajaramillo@dpw.lacounty.gov)

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ENCLOSURE 2

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STAFF REPORT

SALT AND NUTRIENT MANAGEMENT PLAN
FOR THE ANTELOPE VALLEY GROUNDWATER BASIN AND
UPDATE ON THE STATUS OF SALT/NUTRIENT PLANNING
IN THE LAHONTAN REGION

November 2014

California Regional Water Quality Control Board, Lahontan Region
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STAFF REPORT

SALT AND NUTRIENT MANAGEMENT PLAN FOR THE ANTELOPE VALLEY GROUNDWATER BASIN AND UPDATE ON THE STATUS OF SALT/NUTRIENT PLANNING IN THE LAHONTAN REGION

This report provides a synopsis of the Salt and Nutrient Management Plan (SNMP) prepared for the Antelope Valley groundwater basin and outlines staff recommendations to accept this plan without the need to prepare a Basin Plan amendment. This recommendation is based in part on: (1) groundwater in the greater Antelope Valley groundwater basin is generally of good quality; (2) water quality objectives (WQOs) are expected to be met for all constituents throughout the 25-year planning period; and (3) no changes to WQOs are proposed at this time. This report also provides background information regarding the underlying basis for, and requirements applicable to, the development and implementation of SNMPS including an update on the status of salt/nutrient management planning within the Lahontan Region.

RECYCLED WATER POLICY

In February 2009, the State Water Resources Control Board (State Water Board) adopted the “Recycled Water Policy” under State Water Board Resolution No. 2009-0011(hereinafter referred as the “Policy”). The Policy was later amended under State Water Board Resolution 2013-0003 (January 2013) to include specific monitoring requirements for constituents of emerging concern (CECs). For reference, a copy of the Policy, as amended, is included in Attachment 1.

Through the Policy, the State Water Board recognizes the beneficial uses of recycled water and, when used in a manner consistent with state and federal water quality laws, recognizes recycled water as a drought-proof and reliable water source to help move the state towards a sustainable water future. To that end, the purpose of the Policy is to increase the use of recycled water from municipal wastewater sources, and to provide direction to the Regional Water Quality Control Boards (Regional Water Boards), proponents of recycled water projects, and the public regarding the appropriate criteria to be used by the State Water Board and the Regional Water Boards in issuing permits for recycled water projects. The Policy also establishes statewide goals to increase the volume of recycled water available for reuse, enhance storm water management and increase storm water use, and improve urban and industrial water conservation efforts all in an effort to move towards the sustainable water future end goal.

One concern about increasing the use of recycled water is the potential impact on water quality (i.e. salt and nutrient loading, constituents of emerging concern [CEC], synergistic effects between CECs with other constituents, etc.). Some groundwater basins in the state contain salts and nutrients that already exceed or threaten to exceed WQOs established in the applicable Water Quality Control Plans (Basin Plans), and use of recycled water could exacerbate that problem. Not all Basin Plans include adequate implementation programs for achieving or ensuring compliance with the WQOs for salts and nutrients, and most are often only addressing the issues of salts and nutrients on a permit-by-permit basis, without looking at the basin as a whole or looking ahead at the needs and changes that may be putting additional pressures on groundwater use. One of the key elements of the Policy is the requirement to develop a SNMP for every groundwater basin within the state. Because recycled water may not be the sole source of increasing concentrations of salts and nutrients in groundwater basins, the intent of this requirement is for salts and nutrients from all sources to be managed on a basin-wide or watershed-wide basis in a manner that ensures the attainment of WQOs and protection of beneficial uses. Potential sources of salts and nutrients include naturally occurring salts and minerals in soils and bedrock, discharges of waste from land uses (such as agricultural, industrial, commercial, and/or residential), irrigation return flows (which could originate from surface water, groundwater, and/or recycled water), and water banking projects (source waters include State Water Project water, recycled water, and/or storm water). The Regional Water Boards will then consider incorporation of all or part of the SNMPs into their respective Basin Plans, such as to add or change numeric WQOs, to establish and implement control measures to assure attainment of WQPs, or to include new waste discharge prohibitions.

In summary, the Policy specifies that:

a. Every groundwater basin/sub-basin in the state shall have a consistent SNMP, but that the degree of specificity of each plan will be dependent upon a variety of basin-specific factors;

b. The SNMP shall be tailored to address the water quality concerns specific to that particular basin/sub-basin such as size and complexity of the basin, source water quality, natural recharge, hydrogeology, existing quality of groundwater, land uses, etc.;

c. The SNMP shall be developed and/or funded by local stakeholders pursuant to the provisions of the California Water Code sections 10750 *et seq.* or other appropriate authority and with participation by Regional Water Board staff;

d. A SNMP is not required in areas where a Regional Water Board has approved a functionally equivalent salt/nutrient plan;

e. The SNMP may address constituents other than salts and nutrients that adversely affect groundwater quality;

f. The SNMP shall be completed and proposed to the Regional Water Board by May 2014 or an extension of up to two years may be granted by the Regional Water Board or its Executive Officer with demonstrated progress; and

g. Within one year of the receipt of a proposed SNMP, the Regional Water Board will consider incorporation of all or part of the plan into the respective Basin Plan.

The Policy is clear that development of the SNMP is to be a stakeholder-driven, collaborative process among local water and wastewater entities, local salt/nutrient contributing stakeholders, and all other interested parties/stakeholders. The Regional Water Board's role in that process is to oversee and facilitate, provide regulatory guidance and technical oversight, and to ensure that the final SNMP complies with requirements of the Policy, the Basin Plan, and with other applicable state and federal water quality laws.

OUR STRATEGY FOR SALT/NUTRIENT PLANNING

There are a total of 345 groundwater basins identified within the Lahontan Region. To help focus our salt/nutrient planning efforts, the State Water Board has recommended priority basins in our Region based on its Groundwater Ambient Monitoring and Assessment (GAMA) data. A number of factors were considered in the identification of priority basins, including: those with public supply wells; municipal groundwater pumping; agricultural groundwater withdrawals; high risk of water quality impacts (e.g., leaking underground storage tank sites, high rates of pesticide applications); high potential for water recycling; and those with available groundwater data. Basin size was also considered in order to capture 60% of the land area in the state as priority basins. The ten priority groundwater basins identified in the Lahontan Region are: Antelope Valley (6-44); Lower, Middle, and Upper Mojave River Valley (6-40, 6-41, and 6-42, respectively); Owens Valley (6-12); Tahoe Valley (6-5); Indian Wells Valley (6-54); Honey Lake Valley (6-4); Martis Valley (6-67); and Tehachapi Valley East (6-45). For the purposes of salt/nutrient planning, our strategy is to focus our initial efforts on these ten priority groundwater basins.

At the October 2011 Lahontan Regional Water Quality Control Board (Water Board) meeting, staff outlined our strategy for addressing salt/nutrient planning in the Lahontan Region, which is to work with our seven Integrated Regional Water Management (IRWM) groups to address the priority groundwater basins on a watershed-scale. The IRWM framework provides a watershed-based approach for addressing water supply, water quality, flood control, land use, and environmental resource management. The IRWM groups also have an established and engaged network of stakeholders, a required component of the Policy for the development of a SNMP. Basins not identified as priorities will be grouped and addressed either by IRWM groups or by Water Board staff, as appropriate, and as resources allow.

The Water Board has requested IRWM groups to present their proposed SNMPs. At these meetings, the Water Board members can provide input to the IRWM groups before they finalize their plans. To date, two groups (Antelope Valley and Mojave) have presented to the Water Board the scope and content of their plans.

Another component of our strategy is a team evaluation of draft SNMPs as they are submitted to the Water Board for review. The review is a three-pronged approach that includes administrative (i.e. meets the minimum requirements per the Recycled Water Policy), technical/anti-degradation analysis, and Basin Plan compliance components.

One staff person will be designated per SNMP/IRWM group to coordinate the team of reviewers. Staff is using checklists to help ensure consistency of review.
At the March 2014 Water Board meeting, staff presented our recommendations for accepting the completed SNMPs. For those SNMPs not consistent with the Basin Plan, the Basin Plan amendment process will be followed to consider possible changes to WQOs or to incorporate implementation measures for managing salts/nutrients. Otherwise, for those SNMPs consistent with the Basin Plan, the Board has delegated to the Executive Officer the authority to accept the plan without formal approval from the Water Board, but has advised staff that they want the opportunity to hear the findings of the plan at a future Board meeting.

Extensions to the May 2014 deadline for completion of the SNMPs are necessary for all of the priority groundwater basins. As part of the March 2014 update to the Board on the status of SNMPs in the Region, staff recommended a process for consideration of these time extensions whereby the IRWM/SNMP group requests a time extension from the Executive Officer and provides (1) an explanation of why the extension is needed, (2) a summary of progress to date, (3) a summary of stakeholder involvement, and (4) an estimate of how much additional time is requested. Based on the information provided, the Executive Officer either grants or denies the extension. The Water Board members agreed with the recommended extension process. Staff informed the various IRWM and stakeholder groups of the extension request process in an email letter on May 22, 2014 (Attachment 2).

STATUS UPDATE FOR SALT/NUTRIENT PLANNING IN THE REGION

Our staff has been regularly attending the stakeholder meetings for the different IRWM groups in the region and providing regulatory support and information, as necessary. The status of the IRWM groups in developing SNMPs for the ten priority basins is summarized in Attachment 3. To date, the Antelope Valley and Mojave IRWM groups have presented to the Water Board the scope and content of their SNMPs to get concurrence from the Board before continuing to develop and draft the plans. Other IRWM groups are interested in this same opportunity. Thus, in early 2015, the Water Board may hear presentations on the scope and content of the SNMPs for the Indian Wells Valley, Tehachapi East Valley, Honey Lake Valley, and Tahoe Valley basins. Extension requests to the May 2014 deadline for completion of the SNMPs have been granted for the Antelope Valley, Indian Wells Valley, and Honey Lake Valley basins, and extension requests are underway for the Tahoe Valley and Mojave River Valley basins. The Antelope Valley IRWM group submitted its draft SNMP to Water Board staff for review on May 14, 2014.

THE ANTELOPE VALLEY SALT AND NUTRIENT MANAGEMENT PLAN

The Antelope Valley SNMP was prepared primarily by staff from the Los Angeles County Waterworks Districts and the Sanitation Districts of Los Angeles County with cooperation from the stakeholders of the Antelope Valley IRWM group (Waterworks et al. 2014). The SNMP establishes the existing (baseline) quality of groundwater for 9 of the 12 sub-basins with respect to arsenic, boron, chloride, fluoride, nitrate as nitrogen, total chromium, and total dissolved solids (TDS); water quality data for the three remaining sub-basins (Chaffee, Finger Buttes, and Oak Creek) is not currently available. Data for a 10-year period from 2001 through 2010 was used to establish baseline water quality. For each of these constituents, the SNMP identified water quality management goals that represent the most restrictive standard to protect either Municipal and Domestic Supply (MUN) or Agricultural Supply (AGR) beneficial uses. With the exception of the constituents of arsenic, nitrate, and total chromium, water quality management goals necessary to protect the AGR beneficial uses are more conservative than the objectives necessary to protect MUN beneficial use. Figure 1 is a map showing the Antelope Valley groundwater basin and the individual sub-basin boundaries.

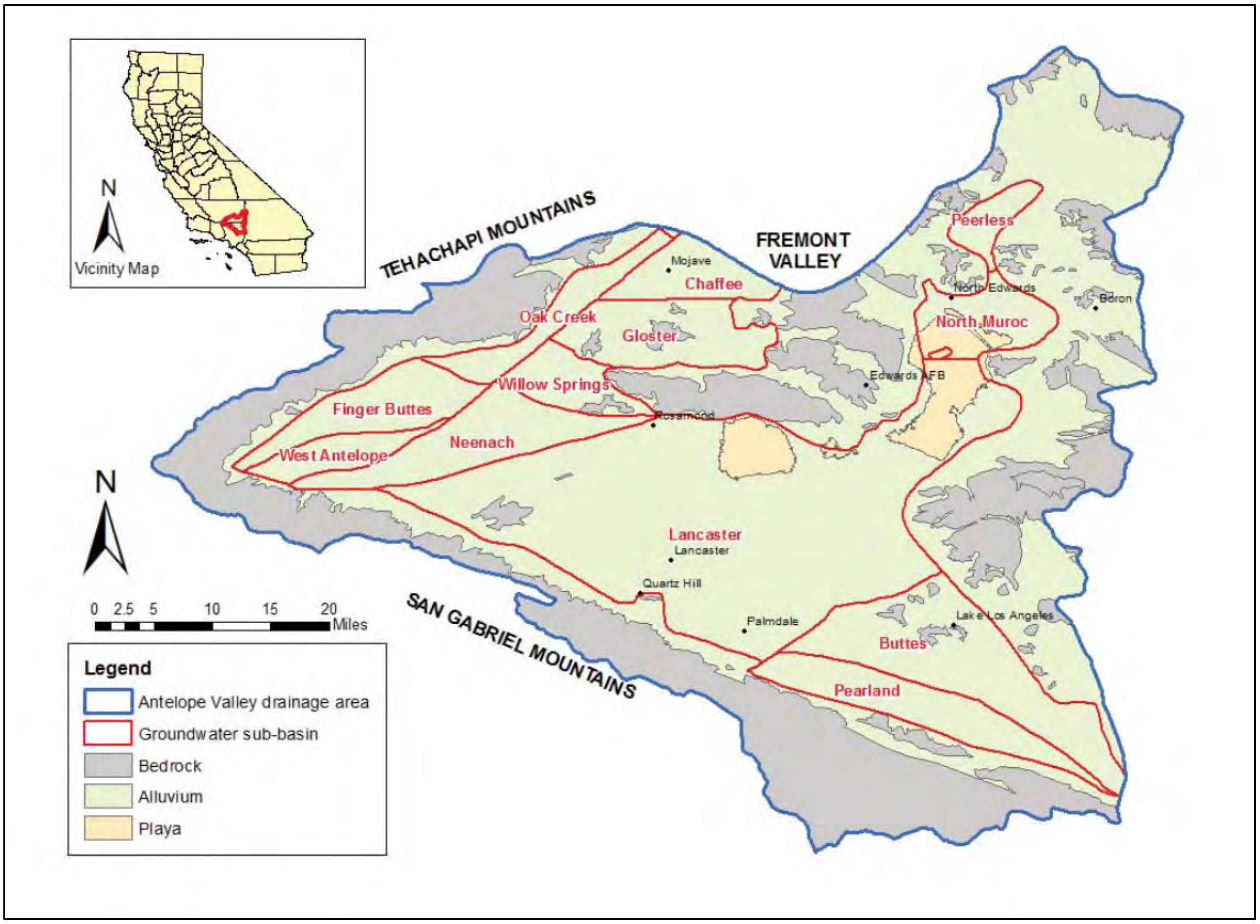

Figure 1. Map of the Antelope Valley groundwater basin and sub-basins; modified from Waterworks et al. 2014.

Assimilative capacity is the natural capacity of a body of water to dilute and absorb pollutants and prevent water quality impairment. For the purposes of the SNMP, assimilative capacity was defined as the difference between the water quality management goal, which is the upper limit needed to protect beneficial uses, and the baseline water quality concentration for a given constituent. The SNMP identifies that there are several sub-basins where baseline water quality for certain constituents already exceeds the water quality management goal and there is no assimilative capacity at this time for that constituent. These current exceedances are localized and attributed to naturally occurring conditions and not anthropogenic sources. Table 1 summarizes the findings of the SNMP regarding presence or absence of assimilative capacity for the six constituents in each of the groundwater sub-basins, depending on whether the beneficial use is MUN or AGR.

TABLE 1 – IS ASSIMILATIVE CAPACITY AVAILABLE?
Yes (✓) or No (X)

Constituent	Arsenic (µg/L)		Boron (mg/L)		Chloride (mg/L)		Fluoride (mg/L)		Nitrate (mg/L)	Total Chromium (µg/L)	TDS (mg/L)		
Water Quality Management Goal	AGR	MUN	AGR	MUN	AGR	MUN	AGR	MUN	MUN	MUN	AGR	MUN	MUN
	100	10	0.7	1	238	250	1	2	10	50	450	500	1000
Buttes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gloster	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lancaster	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Neenach	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
North Muroc	✓	X	X	✓	✓	✓	✓	✓	✓	✓	X	X	✓
Pearland	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Peerless	✓	X	X	✓	✓	✓	X	✓	✓	✓	X	X	✓
W. Antelope	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Willow Spg.	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Average Antelope Valley Basin	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: AGR is agricultural supply. MUN is municipal or domestic supply.
mg/L is milligrams per liter. µg/L is micrograms per liter.

As illustrated in Table 1, arsenic, boron, fluoride, and TDS exceed one or both water quality goals in one or more sub-basins; therefore, there is no assimilative capacity for these constituents in those sub-basins with respect to the specific beneficial use. However, these exceedances do not appear to be associated with a known waste discharge from any of the projects identified in the SNMP. In addition, all of these constituents are naturally occurring in the soil and bedrock within the basin, and their presence in the groundwater is to be expected. The SNMP specifies that no new projects that have the potential to contribute a salt or nutrient load are planned or proposed in those sub-basins where the water quality management goals are currently exceeded.

To further illustrate, Figure 2 summarizes the background concentrations and water quality management goals for arsenic in each of the groundwater sub-basins where data is available. The drinking water standard for arsenic is 10 micrograms per liter (µg/L) and is the selected water quality management goal protective of MUN beneficial uses. The crop-sensitivity standard for arsenic is 100 µg/L and is the water quality management goal protective of AGR beneficial uses. From the graph, you can see that baseline water quality for arsenic exceeds the MUN water quality management goal in the Gloster, Neenach, North Muroc, Peerless, and Willow Springs sub-basins, and, therefore, there is no assimilative capacity for arsenic in regards to the MUN beneficial use in these sub-basins. Conversely, across the entire Antelope Valley groundwater basin, baseline water quality for arsenic is well below the 100 µg/L threshold for the AGR water quality goal; therefore, assimilative capacity for arsenic exists, and additional sources of arsenic can be accommodated without impacting AGR beneficial uses. Arsenic is naturally found in the rocks and soils of the Antelope Valley and these localized, elevated concentrations in the groundwater have been previously documented (Schmitt et. al 2009). The concentration of arsenic averaged across the Antelope Valley groundwater basin is 9.66 µg/L.

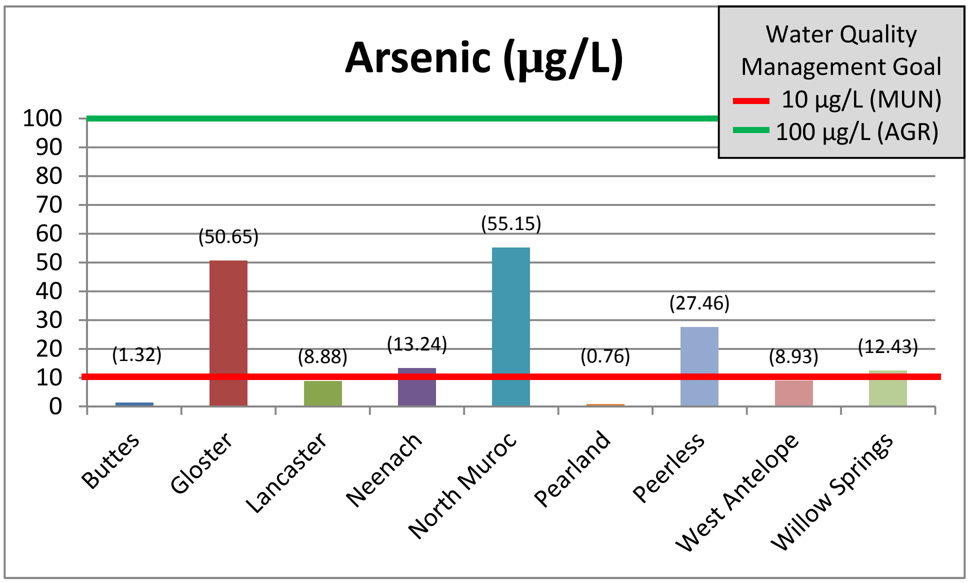

Figure 2. Graph of baseline arsenic concentrations in each groundwater sub-basin; modified from Waterworks et al. 2014.

Arsenic and TDS were identified by the model as having a potential to significantly impact the basin and beneficial uses and are the only SNMP constituents expected to exceed a concentration greater than the background concentration plus 20% of the assimilative capacity during the 25-year planning period. Of the source waters evaluated, imported water (State Water Project water) has the highest contributing concentration of arsenic (3.8 µg/L), and recycled water has the highest contributing concentration of TDS (500 milligrams per liter [mg/L]).

The model developed for the SNMP is a completely mixed model of the principal aquifer and is too coarse to drill down to the sub-basin level with the data currently available. The model does; however, provide broad conclusions regarding the effects of salt and nutrient loading on the overall quality of groundwater as averaged across the greater Antelope Valley basin. Six different scenarios were tested with the model and linear regressions were performed to predict for the constituents of arsenic and TDS (1) in which year water quality could potentially reach or exceed the water quality management goal for both MUN and AGR beneficial uses, and (2) the water quality concentrations of the groundwater in the year 2110. The model predicts that for each scenario, the average TDS concentrations in the greater Antelope Valley basin will not exceed the AGR water quality management goal of 450 mg/L for at least 110 years. Therefore, it appears that there is ample time to plan for salt management measures before a critical situation arises. The average arsenic concentrations, on the other hand, could potentially exceed the MUN water quality management goal of 10 µg/L in the greater Antelope Valley basin in as early as 47 years, but not within the 25-year planning period of the SNMP. It is widely understood that arsenic is naturally occurring within the basin; however, modeling predicts that implementation of recharge projects that utilize State Water Project water are also expected to contribute to arsenic loading in the groundwater. While arsenic concentrations will likely continue to be a concern, water purveyors are currently managing supply through well-head treatment and blending practices, and these practices are expected to continue to ensure that the public supply meets drinking water standards. Though the SNMP model is not currently capable of evaluating salt/nutrient loading on a sub-basin level, it is a tool that will be refined and improved over time as additional data are collected.

An anti-degradation analysis was performed to determine whether the existing and proposed recycled and recharge projects identified in the SNMP, if implemented, will satisfy State Water Board Resolution No. 68-16 (herein referred to as the “Anti-Degradation Policy”). In most cases, the analysis found that there will be no significant degradation of groundwater quality with implementation of the SNMP projects with the exception of arsenic, as discussed above. However, the model is inherently conservative by assuming that all applied arsenic will reach groundwater and does not account for natural attenuation processes or dilution effects with return flows.

The SNMP monitoring program is designed to track changes of salt/nutrient and other constituent concentrations over time and to evaluate if those changes are consistent with the model predictions. The monitoring program will be used to determine whether implemented measures to manage salt/nutrient constituents in groundwater basins are beneficial and/or cost effective and if additional measures are needed. The SNMP monitoring program focuses on monitoring groundwater quality in those sub-basins where known recycled water and recharge projects exist or are planned. Those sub-basins include Buttes, Lancaster, Neenach, and Pearland sub-basins (see Figure 1). The monitoring network initially consists of 32 water supply wells, with a minimum of three wells selected per sub-basin. If/when new projects that have the potential to contribute a salt or nutrient load to the groundwater are proposed, the project proponent shall designate one or more groundwater well (existing or new) for inclusion in the SNMP monitoring program. Imported and recycled source waters are monitored by purveyors or monitored at the applicable treatment plant. The results of that monitoring will also be included in the SNMP monitoring program.

Water quality analyses will be performed for each well annually, and the results of the monitoring will be reported to the Regional Board every three years (tri-annually). The first tri-annual report is expected in 2018. For now, reporting responsibilities will fall on the IRWM group. However, it seems reasonable that a court-appointed watermaster could take on that responsibility in the future once the basin adjudication process has been settled.

Constituents to be monitored include arsenic, boron, chloride, fluoride, nitrate, total chromium, and TDS. CECs (e.g., endocrine disrupters, personal care products, and pharmaceuticals) or other constituents may be added to the monitoring program at a later time, as appropriate. The CEC monitoring requirements prescribed in the Recycled Water Policy pertain to the production and use of recycled water for groundwater recharge by surface and subsurface application methods, and not for recycled water used for landscape irrigation due to the low risk for ingestion of the water. All of the existing and proposed groundwater recharge projects evaluated in the SNMP will not use recycled water and will recharge either storm water or import water sources; therefore, CEC monitoring is not included in the SNMP monitoring program at this time. If/when, in the future, the State Water Board prescribes CEC monitoring requirements for uses of recycled water other than for groundwater recharge, the SNMP will be revised, as appropriate.

One of the goals of the SNMP is to evaluate if the observed changes in groundwater quality over time are consistent with the model predictions. This evaluation is necessary to assess whether salts/nutrients are being effectively managed to meet the water quality management goals or if additional implementation measures are necessary to manage constituent loads. The IRWM group stakeholders currently implement a variety of measures to manage salt and nutrient loading in the basin, which are described in detail in the SNMP (Waterworks et. al 2014). Those implementation measures fall under several broad categories including: (1) municipal and onsite wastewater management; (2) recycled water and responsible irrigation practices; (3) groundwater management; and (4) agricultural practices. For instance, several of the wastewater treatment plants have undergone upgrades from secondary to tertiary treatment processes for all or a portion of the effluent. These upgrades have led to a significant reduction in nitrate and overall reductions in total nitrogen and TDS concentrations in the recycled water produced at these plants. Water purveyors are currently managing arsenic concentrations in supply water through well-head treatment and blending practices; these practices will continue in the future to ensure that the public water supply meets drinking water standards. Agricultural site managers currently perform annual soil testing to refine crop-specific nutrient needs, and drip irrigation systems are used at some sites to manage water quantities.

WHAT ARE THE BENEFITS OF THE ANTELOPE VALLEY SALT AND NUTRIENT MANAGEMENT PLAN?

The SNMP establishes background water quality data for 9 of the 12 sub-basins in the Antelope Valley groundwater basin and documents that there are several sub-basins where there is no assimilative capacity for one or more salt/nutrient constituents due to naturally occurring conditions. While this background data has existed, and currently exists, in various public databases, this is the first time that the data has been assembled to develop a basin-wide set of background water quality data. This background data can be used to support future permitting decisions in the Antelope Valley, as outlined below.

1. It will provide a better understanding of the spatial variability of water quality throughout the greater Antelope Valley basin and its sub-basins.
2. It will help to identify data gaps and areas where future monitoring may be needed.
3. Proponents of new projects proposed in an area or sub-basin where data gaps exist shall be required to establish an adequate set of background water quality data as part of the Report of Waste Discharge (ROWD).
4. It can be used to inform decisions to restrict, prohibit, or require additional treatment for discharges from new projects in sub-basins where little to no assimilative capacity exists if the discharge has the potential to increase the load of the salt/nutrient constituent of concern.
5. Proponents of new projects that have the potential to increase the load of a salt/nutrient constituent should be required to participate in the IRWM group and contribute to the further implementation of the SNMP as part of the ROWD.

Additionally, the SNMP can be used to help inform our understanding of potential water quality impacts associated with existing aquifer recharge projects. While there is no formal Board resolution, the Water Board historically has not regulated projects that recharge State Water Project water. For example, the Antelope Valley Banking Project (Project) is an existing project located in the Neenach sub-basin where there is no assimilative capacity for arsenic. The Project recharges imported State Water Project water and is being constructed in phases. So far, 320 acres of the available 1,500 acres of percolation ponds are constructed and have been in operation for the last 2 to 3 years. At full build out, the Project will be able to recharge and recover up to 100,000 acre-feet per year. Of the source waters evaluated in the SNMP, State Water Project water has highest contributing concentration of arsenic, 3.8 µg/L on average. However, baseline water quality for the Neenach sub-basin is based on pre-Project water quality data collected between 2001 and 2010; therefore, the Project did not discharge during the background data set period. Nonetheless, the Project, as implemented, has the potential to load arsenic into a sub-basin where there is no assimilative capacity. This critical information would not have been known without the background water quality data and analyses provided by the Antelope Valley SNMP.

RECOMMENDATIONS TO THE WATER BOARD

Water Board staff recommends the following to the Water Board.

1. Accept the Antelope Valley SNMP with no amendment to the Basin Plan based on the following rationale:

a. The plan contains the required elements per the Recycled Water Policy and was prepared with stakeholder input;

b. The plan adequately defines baseline water quality for the various sub-basins where data is available;

c. The Anti-Degradation Analysis meets the requirements of the Anti-Degradation Policy;

d. The plan documents that groundwater quality in the greater Antelope Valley basin is generally of good quality;

e. Modelling predicts that assimilative capacity in the greater Antelope Valley Basin will be maintained for all constituents throughout the 25-year planning period;

f. No new projects that have the potential to contribute a salt or nutrient load are planned or proposed in those sub-basins where the water quality management goals are currently exceeded; and

g. No changes to WQOs are proposed at this time.

2. Direct the Executive Officer to send a letter of acceptance of the Antelope Valley SNMP to the IRWM group.

3. Recommend to the Antelope Valley IRWM group that they incorporate robust adaptive management strategies in the SNMP to refine the model and verify model parameters over time, and as additional data is collected, begin to evaluate salt/nutrient loading at the sub-basin level.

4. As additional water quality data is collected and the model is refined over time, Water Board staff may in the future recommend a Basin Plan amendment to incorporate numeric WQOs for individual sub-basins.

5. Direct the Executive Officer to require the proponent of the Antelope Valley Banking Project to perform a Project-specific anti-degradation analysis in accordance with Anti-Degradation Policy. The results of this analysis will then be used by staff to evaluate whether (1) the discharge is adversely impacting water quality and increasing salt/nutrient loading to the Neenach sub-basin over time, (2) the potential water quality degradation of groundwater is in the best interest of the people, and (3) whether or not the discharge (recharge of State Water Project water) should be regulated as a waste in this instance.

6. Reconsider the general approach of not regulating aquifer recharge projects that utilize State Water Project water. Regulating these types of discharges must be evaluated on a project-by-project basis, taking into consideration existing water quality of the groundwater basin and available assimilative capacity relative to the salt/nutrient constituents in the discharge.

REFERENCES

Schmitt, S.J., Milby Dawson, B.J., and Belitz, Kenneth, 2009, Groundwater-quality data in the Antelope Valley study unit, 2008: Results from the California GAMA program: U.S. Geological Survey Data Series 479, 79 p.

Waterworks District No. 40, Los Angeles County Department of Public Works, Los Angeles County Sanitation Districts No. 14 and 20, and Antelope Valley Salt and Nutrient Management Planning Stakeholder Group, 2014, Salt and Nutrient Management Plan for the Antelope Valley, 96 p.

Attachments:
1. Recycled Water Policy and Amendment
2. Extension Process Letter (May 22, 2014)
3. Summary Table of SNMPs, Lahontan Region (updated 10/15/2014)

California
Water Boards
Protecting California's Water

State Water Resources Control Board

Policy for Water Quality Control for Recycled Water (Recycled Water Policy)

Revised January 22, 2013
Effective April 25, 2013

CALIFORNIA
Water Boards

State of California
Edmund G. Brown Jr., Governor

California Environmental Protection Agency
Matthew Rodriquez, Secretary

State Water Resources Control Board
P.O. Box100
Sacramento, CA 95812-0100

STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 2013-0003

ADOPTION OF AN AMENDMENT TO THE POLICY FOR WATER QUALITY CONTROL FOR RECYCLED WATER CONCERNING MONITORING REQUIREMENTS FOR CONSTITUTENTS OF EMERGING CONCERN

WHEREAS:

1. Provisions of the Policy for Water Quality Control for Recycled Water (Recycled Water Policy), adopted under Resolution No. 2009-0011, directed the State Water Resources Control Board (State Water Board) to convene a "blue-ribbon" advisory panel (Panel) to provide guidance on future actions related to monitoring constituents of emerging concern (CECs) in recycled water.

2. In June 2010, the Panel submitted a report titled "Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel" (Report), which presented recommendations for monitoring CECs in municipal recycled water used for groundwater recharge.

3. In December 2010, the State Water Board held a public hearing regarding the Panel's Report and received public comments.

4. In May 2012, staff circulated a draft amendment to the Recycled Water Policy that: (1) proposed, in accordance with the Panel's recommendations, monitoring requirements for CECs and surrogates in recycled water used for groundwater recharge; and (2) proposed a reduction of priority pollutant monitoring of recycled water used for landscape irrigation.

5. In July 2012, a scientific peer review of the draft amendment and the Panel's Report was conducted.

6. Staff reviewed comments received on the draft amendment from the public and peer reviewers and issued a revised draft amendment on September 14, 2012. Written comments were received on this draft prior to an October 9, 2012, due date.

7. The State Water Board held a public hearing on October 16, 2012, to consider adoption of the draft amendment. At the hearing, the adoption was postponed to refine the responses to comments and allow additional time for public review.

8. The Natural Resources Agency has approved the State Water Board's and the Regional Water Quality Control Boards' water quality control planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act requirements for preparing environmental documents. The amendment concerns monitoring requirements for priority pollutants and constituents of emerging concern. It is not a "project" as defined by title 14, California Code of Regulations chapter 3, Guidelines for Implementation of the California Environmental Quality Act. Hence, approval of an environmental document is not required to adopt the amendment.

THEREFORE BE IT RESOLVED THAT:

The State Water Board

1. Adopts the amendment to the Recycled Water Policy.

2. Directs State Water Board Staff to submit the amended Recycled Water Policy to the Office of Administrative Law (OAL) for final approval.

3. Directs the Executive Director or designee to make minor, non-substantive modifications to the language of the amendment, if OAL determines during its approval process that such changes are needed; and directs the Executive Director to inform the State Water Board of any such changes.

CERTIFICATION

The undersigned Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on January 22, 2013.

AYE:	Vice Chair Frances Spivy-Weber Board Member Tam M. Doduc Board Member Steven Moore
NAY:	None
ABSENT:	Chairman Charles R. Hoppin Board Member Felicia Marcus
ABSTAIN:	None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

Recycled Water Policy

Table of Contents

Recycled Water Policy

1. *Preamble*

California is facing an unprecedented water crisis.

The collapse of the Bay-Delta ecosystem, climate change, and continuing population growth have combined with a severe drought on the Colorado River and failing levees in the Delta to create a new reality that challenges California's ability to provide the clean water needed for a healthy environment, a healthy population and a healthy economy, both now and in the future.

These challenges also present an unparalleled opportunity for California to move aggressively towards a sustainable water future. The State Water Resources Control Board (State Water Board) declares that we will achieve our mission to "preserve, enhance and restore the quality of California's water resources to the benefit of present and future generations." To achieve that mission, we support and encourage every region in California to develop a salt/nutrient management plan by 2014 that is sustainable on a long-term basis and that provides California with clean, abundant water. These plans shall be consistent with the Department of Water Resources' Bulletin 160, as appropriate, and shall be locally developed, locally controlled and recognize the variability of California's water supplies and the diversity of its waterways. We strongly encourage local and regional water agencies to move toward clean, abundant, local water for California by emphasizing appropriate water recycling, water conservation, and maintenance of supply infrastructure and the use of stormwater (including dry-weather urban runoff) in these plans; these sources of supply are drought-proof, reliable, and minimize our carbon footprint and can be sustained over the long-term.

We declare our independence from relying on the vagaries of annual precipitation and move towards sustainable management of surface waters and groundwater, together with enhanced water conservation, water reuse and the use of stormwater. To this end, we adopt the following goals for California:

- Increase the use of recycled water over 2002 levels by at least one million acre-feet per year (afy) by 2020 and by at least two million afy by 2030.
- Increase the use of stormwater over use in 2007 by at least 500,000 afy by 2020 and by at least one million afy by 2030.
- Increase the amount of water conserved in urban and industrial uses by comparison to 2007 by at least 20 percent by 2020.
- Included in these goals is the substitution of as much recycled water for potable water as possible by 2030.

The purpose of this Policy is to increase the use of recycled water from municipal wastewater sources that meets the definition in Water Code section 13050(n), in a manner that implements state and federal water quality laws. The State Water Board expects to develop additional policies to encourage the use of stormwater, encourage water conservation, encourage the conjunctive use of surface and groundwater, and improve the use of local water supplies.

When used in compliance with this Policy, Title 22 and all applicable state and federal water quality laws, the State Water Board finds that recycled water is safe for approved uses, and strongly supports recycled water as a safe alternative to potable water for such approved uses.

2. *Purpose of the Policy*

   a. The purpose of this Policy is to provide direction to the Regional Water Quality Control Boards (Regional Water Boards), proponents of recycled water projects, and the public regarding the appropriate criteria to be used by the State Water Board and the Regional Water Boards in issuing permits for recycled water projects.

   b. It is the intent of the State Water Board that all elements of this Policy are to be interpreted in a manner that fully implements state and federal water quality laws and regulations in order to enhance the environment and put the waters of the state to the fullest use of which they are capable.

   c. This Policy describes permitting criteria that are intended to streamline the permitting of the vast majority of recycled water projects. The intent of this streamlined permit process is to expedite the implementation of recycled water projects in a manner that implements state and federal water quality laws while allowing the Regional Water Boards to focus their limited resources on projects that require substantial regulatory review due to unique site-specific conditions.

   d. By prescribing permitting criteria that apply to the vast majority of recycled water projects, it is the State Water Board's intent to maximize consistency in the permitting of recycled water projects in California while also reserving to the Regional Water Boards sufficient authority and flexibility to address site-specific conditions.

   e. The State Water Board will establish additional policies that are intended to assist the State of California in meeting the goals established in the preamble to this Policy for water conservation and the use of stormwater.

f. For purposes of this Policy, the term “permit” means an order adopted by a Regional Water Board or the State Water Board prescribing requirements for a recycled water project, including but not limited to water recycling requirements, master reclamation permits, and waste discharge requirements.

3. *Benefits of Recycled Water*

The State Water Board finds that the use of recycled water in accordance with this Policy, that is, which supports the sustainable use of groundwater and/or surface water, which is sufficiently treated so as not to adversely impact public health or the environment and which ideally substitutes for use of potable water, is presumed to have a beneficial impact. Other public agencies are encouraged to use this presumption in evaluating the impacts of recycled water projects on the environment as required by the California Environmental Quality Act (CEQA).

4. *Mandate for the Use of Recycled Water*

a. The State Water Board and Regional Water Boards will exercise the authority granted to them by the Legislature to the fullest extent possible to encourage the use of recycled water, consistent with state and federal water quality laws.

(1) The State Water Board hereby establishes a mandate to increase the use of recycled water in California by 200,000 afy by 2020 and by an additional 300,000 afy by 2030. These mandates shall be achieved through the cooperation and collaboration of the State Water Board, the Regional Water Boards, the environmental community, water purveyors and the operators of publicly owned treatment works. The State Water Board will evaluate progress toward these mandates biennially and review and revise as necessary the implementation provisions of this Policy in 2012 and 2016.

(2) Agencies producing recycled water that is available for reuse and not being put to beneficial use shall make that recycled water available to water purveyors for reuse on reasonable terms and conditions. Such terms and conditions may include payment by the water purveyor of a fair and reasonable share of the cost of the recycled water supply and facilities.

(3) The State Water Board hereby declares that, pursuant to Water Code sections 13550 *et seq*., it is a waste and unreasonable use of water for water agencies not to use recycled water when recycled water of adequate quality is available and is not being put to beneficial use, subject to the conditions established in sections 13550 *et seq*. The State Water Board shall exercise its authority pursuant to Water Code section 275 to the fullest extent possible to enforce the mandates of this subparagraph.

b. These mandates are contingent on the availability of sufficient capital funding for the construction of recycled water projects from private, local, state, and federal sources and assume that the Regional Water Boards will effectively implement regulatory streamlining in accordance with this Policy.

c. The water industry and the environmental community have agreed jointly to advocate for $1 billion in state and federal funds over the next five years to fund projects needed to meet the goals and mandates for the use of recycled water established in this Policy.

d. The State Water Board requests the California Department of Public Health (CDPH), the California Public Utilities Commission (CPUC), and the California Department of Water Resources (CDWR) to use their respective authorities to the fullest extent practicable to assist the State Water Board and the Regional Water Boards in increasing the use of recycled water in California.

5. *Roles of the State Water Board, Regional Water Boards, CDPH and CDWR*

The State Water Board recognizes that it shares jurisdiction over the use of recycled water with the Regional Water Boards and with CDPH. In addition, the State Water Board recognizes that CDWR and the CPUC have important roles to play in encouraging the use of recycled water. The State Water Board believes that it is important to clarify the respective roles of each of these agencies in connection with recycled water projects, as follows:

a. The State Water Board establishes general policies governing the permitting of recycled water projects consistent with its role of protecting water quality and sustaining water supplies. The State Water Board exercises general oversight over recycled water projects, including review of Regional Water Board permitting practices, and shall lead the effort to meet the recycled water use goals set forth in the Preamble to this Policy. The State Water Board is also charged by statute with developing a general permit for irrigation uses of recycled water.

b. The CDPH is charged with protection of public health and drinking water supplies and with the development of uniform water recycling criteria appropriate to particular uses of water. Regional Water Boards shall appropriately rely on the expertise of CDPH for the establishment of permit conditions needed to protect human health.

c. The Regional Water Boards are charged with protection of surface and groundwater resources and with the issuance of permits that implement CDPH recommendations, this Policy, and applicable law and will, pursuant to paragraph 4 of this Policy, use their authority to the fullest extent possible to encourage the use of recycled water.

d. CDWR is charged with reviewing and, every five years, updating the California Water Plan, including evaluating the quantity of recycled water presently being used and planning for the potential for future uses of recycled water. In undertaking these tasks, CDWR may appropriately rely on urban water management plans and may share the data from those plans with the State Water Board and the Regional Water Boards. CDWR also shares with the State Water Board the authority to allocate and distribute bond funding, which can provide incentives for the use of recycled water.

e. The CPUC is charged with approving rates and terms of service for the use of recycled water by investor-owned utilities.

6. *Salt/Nutrient Management Plans*

a. Introduction.

(1) Some groundwater basins in the state contain salts and nutrients that exceed or threaten to exceed water quality objectives established in the applicable Water Quality Control Plans (Basin Plans), and not all Basin Plans include adequate implementation procedures for achieving or ensuring compliance with the water quality objectives for salt or nutrients. These conditions can be caused by natural soils/conditions, discharges of waste, irrigation using surface water, groundwater or recycled water and water supply augmentation using surface or recycled water. Regulation of recycled water alone will not address these conditions.

(2) It is the intent of this Policy that salts and nutrients from all sources be managed on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses. The State Water Board finds that the appropriate way to address salt and nutrient issues is through the development of regional or subregional salt and nutrient management plans

rather than through imposing requirements solely on individual recycled water projects.

b. Adoption of Salt/ Nutrient Management Plans.

(1) The State Water Board recognizes that, pursuant to the letter dated December 19, 2008 and attached to the Resolution adopting this Policy, the local water and wastewater entities, together with local salt/nutrient contributing stakeholders, will fund locally driven and controlled, collaborative processes open to all stakeholders that will prepare salt and nutrient management plans for each basin/sub-basin in California, including compliance with CEQA and participation by Regional Water Board staff.

(a) It is the intent of this Policy for every groundwater basin/sub-basin in California to have a consistent salt/nutrient management plan. The degree of specificity within these plans and the length of these plans will be dependent on a variety of site-specific factors, including but not limited to size and complexity of a basin, source water quality, stormwater recharge, hydrogeology, and aquifer water quality. It is also the intent of the State Water Board that because stormwater is typically lower in nutrients and salts and can augment local water supplies, inclusion of a significant stormwater use and recharge component within the salt/nutrient management plans is critical to the long-term sustainable use of water in California. Inclusion of stormwater recharge is consistent with State Water Board Resolution No. 2005-0006, which establishes sustainability as a core value for State Water Board programs and also assists in implementing Resolution No. 2008-0030, which requires sustainable water resources management and is consistent with Objective 3.2 of the State Water Board Strategic Plan Update dated September 2, 2008.

(b) Salt and nutrient plans shall be tailored to address the water quality concerns in each basin/sub-basin and may include constituents other than salt and nutrients that impact water quality in the basin/sub-basin. Such plans shall address and implement provisions, as appropriate, for all sources of salt and/or nutrients to groundwater basins, including recycled water irrigation projects and groundwater recharge reuse projects.

(c) Such plans may be developed or funded pursuant to the provisions of Water Code sections 10750 *et seq.* or other appropriate authority.

(d) Salt and nutrient plans shall be completed and proposed to the Regional Water Board within five years from the date of this Policy unless a Regional Water Board finds that the stakeholders are making substantial progress towards completion of a plan. In no case shall the period for the completion of a plan exceed seven years.

(e) The requirements of this paragraph shall not apply to areas that have already completed a Regional Water Board approved salt and nutrient plan for a basin, sub-basin, or other regional planning area that is functionally equivalent to paragraph 6(b)3.

(f) The plans may, depending upon the local situation, address constituents other than salt and nutrients that adversely affect groundwater quality.

(2) Within one year of the receipt of a proposed salt and nutrient management plan, the Regional Water Boards shall consider for adoption revised implementation plans, consistent with Water Code section 13242, for those groundwater basins within their regions where water quality objectives for salts or nutrients are being, or are threatening to be, exceeded. The implementation plans shall be based on the salt and nutrient plans required by this Policy.

(3) Each salt and nutrient management plan shall include the following components:

(a) A basin/sub-basin wide monitoring plan that includes an appropriate network of monitoring locations. The scale of the basin/sub-basin monitoring plan is dependent upon the site-specific conditions and shall be adequate to provide a reasonable, cost-effective means of determining whether the concentrations of salt, nutrients, and other constituents of concern as identified in the salt and nutrient plans are consistent with applicable water quality objectives. Salts, nutrients, and the constituents identified in paragraph 6(b)(1)(f) shall be monitored. The frequency of monitoring shall be determined in the salt/nutrient management plan and approved by the Regional Water Board pursuant to paragraph 6(b)(2).

(i) The monitoring plan must be designed to determine water quality in the basin. The plan must focus on basin water quality near water supply wells and areas proximate to large water recycling projects, particularly groundwater recharge projects. Also, monitoring locations shall, where appropriate, target groundwater and surface waters where groundwater has connectivity with adjacent surface waters.

(ii) The preferred approach to monitoring plan development is to collect samples from existing wells if feasible as long as the existing wells are located appropriately to determine water quality throughout the most critical areas of the basin.

(iii) The monitoring plan shall identify those stakeholders responsible for conducting, compiling, and reporting the monitoring data. The data shall be reported to the Regional Water Board at least every three years.

(b) A provision for annual monitoring of Constituents of Emerging Concern (e.g., endocrine disrupters, personal care products or pharmaceuticals) (CECs) consistent with recommendations by CDPH and consistent with any actions by the State Water Board taken pursuant to paragraph 10(b) of this Policy.

(c) Water recycling and stormwater recharge/use goals and objectives.

(d) Salt and nutrient source identification, basin/sub-basin assimilative capacity and loading estimates, together with fate and transport of salts and nutrients.

(e) Implementation measures to manage salt and nutrient loading in the basin on a sustainable basis.

(f) An antidegradation analysis demonstrating that the projects included within the plan will, collectively, satisfy the requirements of Resolution No. 68-16.

(4) Nothing in this Policy shall prevent stakeholders from developing a plan that is more protective of water quality than applicable standards in the Basin Plan. No Regional Water Board, however, shall seek to modify Basin Plan objectives without full compliance

with the process for such modification as established by existing law.

7. *Landscape Irrigation Projects*[1]

a. *Control of incidental runoff.* Incidental runoff is defined as unintended small amounts (volume) of runoff from recycled water use areas, such as unintended, minimal over-spray from sprinklers that escapes the recycled water use area. Water leaving a recycled water use area is not considered incidental if it is part of the facility design, if it is due to excessive application, if it is due to intentional overflow or application, or if it is due to negligence. Incidental runoff may be regulated by waste discharge requirements or, where necessary, waste discharge requirements that serve as a National Pollutant Discharge Elimination System (NPDES) permit, including municipal separate storm water system permits, but regardless of the regulatory instrument, the project shall include, but is not limited to, the following practices:

(1) Implementation of an operations and management plan that may apply to multiple sites and provides for detection of leaks, (for example, from broken sprinkler heads), and correction either within 72 hours of learning of the runoff, or prior to the release of 1,000 gallons, whichever occurs first,

(2) Proper design and aim of sprinkler heads,

(3) Refraining from application during precipitation events, and

(4) Management of any ponds containing recycled water such that no discharge occurs unless the discharge is a result of a 25-year, 24-hour storm event or greater, and there is notification of the appropriate Regional Water Board Executive Officer of the discharge.

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[1] Specified uses of recycled water considered "landscape irrigation" projects include any of the following:
i. Parks, greenbelts, and playgrounds;
ii. School yards;
iii. Athletic fields;
iv. Golf courses;
v. Cemeteries;
vi. Residential landscaping, common areas;
vii. Commercial landscaping, except eating areas;
viii. Industrial landscaping, except eating areas; and
ix. Freeway, highway, and street landscaping.

As modified by
State Water Board Resolution 2013-0003
(January 22, 2013)

b. *Streamlined Permitting.*

(1) The Regional Water Boards shall, absent unusual circumstances (i.e., unique, site-specific conditions such as where recycled water is proposed to be used for irrigation over high transmissivity soils over a shallow (5’ or less) high quality groundwater aquifer), permit recycled water projects that meet the criteria set forth in this Policy, consistent with the provisions of this paragraph.

(2) If the Regional Water Board determines that unusual circumstances apply, the Regional Water Board shall make a finding of unusual circumstances based on substantial evidence in the record, after public notice and hearing.

(3) Projects meeting the criteria set forth below and eligible for enrollment under requirements established in a general order shall be enrolled by the State or Regional Water Board within 60 days from the date on which an application is deemed complete by the State or Regional Water Board. For projects that are not enrolled in a general order, the Regional Water Board shall consider permit adoption within 120 days from the date on which the application is deemed complete by the Regional Water Board.

(4) Landscape irrigation projects that qualify for streamlined permitting shall not be required to include a project specific receiving water and groundwater monitoring component unless such project specific monitoring is required under the adopted salt/nutrient management plan. During the interim while the salt management plan is under development, a landscape irrigation project proponent can either perform project specific monitoring, or actively participate in the development and implementation of a salt/nutrient management plan, including basin/sub-basin monitoring. Permits or requirements for landscape irrigation projects shall include, in addition to any other appropriate recycled water monitoring requirements, monitoring for priority pollutants in the recycled water at the recycled water production facility once per year, except when the recycled water production facility has a design production flow for the entire water reuse system of one million gallons per day or less. For these smaller facilities, the recycled water shall be monitored for priority pollutants once every five years.

(5) It is the intent of the State Water Board that the general permit for landscape irrigation projects be consistent with the terms of this Policy.

c. *Criteria for streamlined permitting*. Irrigation projects using recycled water that meet the following criteria are eligible for streamlined permitting, and, if otherwise in compliance with applicable laws, shall be approved absent unusual circumstances:

(1) Compliance with the requirements for recycled water established in Title 22 of the California Code of Regulations, including the requirements for treatment and use area restrictions, together with any other recommendations by CDPH pursuant to Water Code section 13523.

(2) Application in amounts and at rates as needed for the landscape (i.e., at agronomic rates and not when the soil is saturated). Each irrigation project shall be subject to an operations and management plan, that may apply to multiple sites, provided to the Regional Water Board that specifies the agronomic rate(s) and describes a set of reasonably practicable measures to ensure compliance with this requirement, which may include the development of water budgets for use areas, site supervisor training, periodic inspections, tiered rate structures, the use of smart controllers, or other appropriate measures.

(3) Compliance with any applicable salt and nutrient management plan.

(4) Appropriate use of fertilizers that takes into account the nutrient levels in the recycled water. Recycled water producers shall monitor and communicate to the users the nutrient levels in their recycled water.

8. *Recycled Water Groundwater Recharge Projects*

a. The State Water Board acknowledges that all recycled water groundwater recharge projects must be reviewed and permitted on a site-specific basis, and so such projects will require project-by-project review.

b. Approved groundwater recharge projects will meet the following criteria:

(1) Compliance with regulations adopted by CDPH for groundwater recharge projects or, in the interim until such regulations are approved, CDPH's recommendations pursuant to Water Code section 13523 for the project (e.g., level of treatment, retention time, setback distance, source control, monitoring program, etc.).

(2) Implementation of a monitoring program for CECs that is consistent with Attachment A and any recommendations from CDPH.

Groundwater recharge projects shall include monitoring of recycled water for priority pollutants twice per year.

c. Nothing in this paragraph shall be construed to limit the authority of a Regional Water Board to protect designated beneficial uses, *provided* that any proposed limitations for the protection of public health may only be imposed following regular consultation by the Regional Water Board with CDPH, consistent with State Water Board Orders WQ 2005-0007 and 2006-0001.

d. Nothing in this Policy shall be construed to prevent a Regional Water Board from imposing additional requirements for a proposed recharge project that has a substantial adverse effect on the fate and transport of a contaminant plume or changes the geochemistry of an aquifer thereby causing the dissolution of constituents, such as arsenic, from the geologic formation into groundwater.

e. Projects that utilize surface spreading to recharge groundwater with recycled water treated by reverse osmosis shall be permitted by a Regional Water Board within one year of receipt of recommendations from CDPH. Furthermore, the Regional Water Board shall give a high priority to review and approval of such projects.

9. *Antidegradation*

a. The State Water Board adopted Resolution No. 68-16 as a policy statement to implement the Legislature's intent that waters of the state shall be regulated to achieve the highest water quality consistent with the maximum benefit to the people of the state.

b. Activities involving the disposal of waste that could impact high quality waters are required to implement best practicable treatment or control of the discharge necessary to ensure that pollution or nuisance will not occur, and the highest water quality consistent with the maximum benefit to the people of the state will be maintained.

c. Groundwater recharge with recycled water for later extraction and use in accordance with this Policy and state and federal water quality law is to the benefit of the people of the state of California. Nonetheless, the State Water Board finds that groundwater recharge projects using recycled water have the potential to lower water quality within a basin. The proponent of a groundwater recharge project must demonstrate compliance with Resolution No. 68-16. Until such time as a salt/nutrient management plan is in effect, such compliance may be demonstrated as follows:

(1) A project that utilizes less than 10 percent of the available assimilative capacity in a basin/sub-basin (or multiple projects utilizing less than 20 percent of the available assimilative capacity in a basin/sub-basin) need only conduct an antidegradation analysis verifying the use of the assimilative capacity. For those basins/sub-basins where the Regional Water Boards have not determined the baseline assimilative capacity, the baseline assimilative capacity shall be calculated by the initial project proponent, with review and approval by the Regional Water Board, until such time as the salt/nutrient plan is approved by the Regional Water Board and is in effect. For compliance with this subparagraph, the available assimilative capacity shall be calculated by comparing the mineral water quality objective with the average concentration of the basin/sub-basin, either over the most recent five years of data available or using a data set approved by the Regional Water Board Executive Officer. In determining whether the available assimilative capacity will be exceeded by the project or projects, the Regional Water Board shall calculate the impacts of the project or projects over at least a ten year time frame.

(2) In the event a project or multiple projects utilize more than the fraction of the assimilative capacity designated in subparagraph (1), then a Regional Water Board-deemed acceptable antidegradation analysis shall be performed to comply with Resolution No. 68-16. The project proponent shall provide sufficient information for the Regional Water Board to make this determination. An example of an approved method is the method used by the State Water Board in connection with Resolution No. 2004-0060 and the Regional Water Board in connection with Resolution No. R8-2004-0001. An integrated approach (using surface water, groundwater, recycled water, stormwater, pollution prevention, water conservation, etc.) to the implementation of Resolution No. 68-16 is encouraged.

d. Landscape irrigation with recycled water in accordance with this Policy is to the benefit of the people of the State of California. Nonetheless, the State Water Board finds that the use of water for irrigation may, regardless of its source, collectively affect groundwater quality over time. The State Water Board intends to address these impacts in part through the development of salt/nutrient management plans described in paragraph 6.

(1) A project that meets the criteria for a streamlined irrigation permit and is within a basin where a salt/nutrient management plan satisfying the provisions of paragraph 6(b) is in place may be

approved without further antidegradation analysis, provided that the project is consistent with that plan.

(2) A project that meets the criteria for a streamlined irrigation permit and is within a basin where a salt/nutrient management plan satisfying the provisions of paragraph 6(b) is being prepared may be approved by the Regional Water Board by demonstrating through a salt/nutrient mass balance or similar analysis that the project uses less than 10 percent of the available assimilative capacity as estimated by the project proponent in a basin/sub-basin (or multiple projects using less than 20 percent of the available assimilative capacity as estimated by the project proponent in a basin/sub-basin).

10. *Constituents of Emerging Concern*

a. General Provisions

(1) Regulatory requirements for recycled water shall be based on the best available peer-reviewed science. In addition, all uses of recycled water must meet conditions set by CDPH.

(2) Knowledge of risks will change over time and recycled water projects must meet legally applicable criteria. However, when standards change, projects should be allowed time to comply through a compliance schedule.

(3) The state of knowledge regarding CECs is incomplete. There needs to be additional research and development of analytical methods and surrogates to determine potential environmental and public health impacts. Agencies should minimize the likelihood of CECs impacting human health and the environment by means of source control and/or pollution prevention programs.

(4) Regulating most CECs will require significant work to develop test methods and more specific determinations as to how and at what level CECs impact public health or our environment.

b. Research Program

(1) The State Water Board, in consultation with CDPH, convened a “blue-ribbon” advisory panel to guide future actions relating to CECs.

(a) The panel was actively managed by the State Water Board and was composed of the following: one human health toxicologist, one environmental toxicologist, one epidemiologist, one biochemist, one civil engineer familiar with the design and construction of recycled water treatment facilities, and one chemist familiar with the design and operation of advanced laboratory methods for the detection of emerging constituents. Each of these panelists had extensive experience as a principal investigator in their respective areas of expertise.

(b) The panel reviewed the scientific literature and submitted a report to the State Water Board and CDPH that described the current state of scientific knowledge regarding the risks of CECs to public health and the environment. In December 2010, the State Water Board, in coordination with CDPH, held a public hearing to hear a presentation on the report and to receive comments from stakeholders.

(c) The State Water Board considered the panel report and the comments received and adopted an amendment to the Policy establishing monitoring requirements for CECs in recycled water. These monitoring requirements are prescribed in Attachment A.

(2) The panel or a similarly constituted panel shall update the report every five years. The next update is due in June 2015.

(a) Each updated report shall recommend actions that the State of California should take to improve our understanding of CECs and, as may be appropriate, to protect public health and the environment.

(b) The updated reports shall answer the following questions: What are the appropriate constituents to be monitored in recycled water, including analytical methods and method detection limits? What is the known toxicological information for the above constituents? Would the above lists change based on level of treatment and use? If so, how? What are possible indicators that represent a suite of CECs? What levels of CEC's should trigger enhanced monitoring of CEC's in recycled water, groundwater and/or surface waters?

(c) Within six months from receipt of an updated report, the State Water Board shall hold a hearing to consider recommendations from staff and shall endorse the recommendations, as appropriate, after making any necessary modifications.

c. Permit Provisions

Permits for recycled water projects shall be consistent with any CDPH recommendations to protect public health and the monitoring requirements prescribed in Attachment A.

11. *Incentives for the Use of Recycled Water*

a. Funding

The State Water Board will request CDWR to provide priority funding for projects that have major recycling components; particularly those that decrease demand on potable water supplies. The State Water Board will also request priority funding for stormwater recharge projects that augment local water supplies. The State Water Board shall promote the use of the State Revolving Fund (SRF) for water purveyor, stormwater agencies, and water recyclers to use for water reuse and stormwater use and recharge projects.

b. Stormwater

The State Water Board strongly encourages all water purveyors to provide financial incentives for water recycling and stormwater recharge and reuse projects. The State Water Board also encourages the Regional Water Boards to require less stringent monitoring and regulatory requirements for stormwater treatment and use projects than for projects involving untreated stormwater discharges.

c. TMDLs

Water recycling reduces mass loadings from municipal wastewater sources to impaired waters. As such, waste load allocations shall be assigned as appropriate by the Regional Water Boards in a manner that provides an incentive for greater water recycling.

ATTACHMENT A

Requirements for Monitoring Constituents of Emerging Concern in Recycled Water

As modified by
State Water Board Resolution 2013-0003
(January 22, 2013)

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ATTACHMENT A

REQUIREMENTS FOR MONITORING CONSTITUENTS OF EMERGING CONCERN FOR RECYCLED WATER

The purpose of this attachment to the Recycled Water Policy (Policy) is to provide direction to the Regional Water Quality Control Boards (Regional Water Boards) on monitoring requirements for constituents of emerging concern[2] (CECs) in recycled municipal wastewater, herein referred to as "recycled water." The monitoring requirements and criteria for evaluating monitoring results in the Policy are based on recommendations from a Science Advisory Panel[3]. The monitoring requirements pertain to the production and use of recycled water for groundwater recharge reuse[4] by surface and subsurface application methods. The monitoring requirements apply to recycled water producers, including entities that further treat or enhance the quality of recycled water supplied by municipal wastewater treatment facilities, and groundwater recharge reuse facilities.

Groundwater recharge by surface application is the controlled application of water to a spreading area for infiltration resulting in the recharge of a groundwater basin. Subsurface application is the controlled application of water to a groundwater basin or aquifer by a means other than surface application, such as direct injection through a well.

The California Department of Public Health (CDPH) shall be consulted for any additional monitoring requirements for recycled water use found necessary by CDPH to protect human health.

[2] For this Policy, CECs are defined to be chemicals in personal care products, pharmaceuticals including antibiotics, antimicrobials; industrial, agricultural, and household chemicals; hormones; food additives; transformation products, inorganic constituents; and nanomaterials.
[3] The Science Advisory Panel was convened in accordance with provision 10.b. of the Policy. The panel's recommendations were presented in the report; *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.
[4] As used in this attachment, use of recycled water for groundwater recharge reuse has the same meaning as indirect potable reuse for groundwater recharge as defined in Water Code section 13561(c), where it is defined as the planned use of recycled water for replenishment of a groundwater basin or an aquifer that has been designated as a source of water supply for a public water system.

1. CECS AND SURROGATES

Within this Policy, CECs of toxicological relevance to human health are referred to as “health-based CECs.”[5] CECs determined not to have human health relevance, but useful for monitoring treatment process effectiveness, are referred to as “performance indicator CECs.” A performance indicator CEC is an individual CEC used for evaluating a family of CECs with similar physicochemical or biodegradable characteristics. The removal of a performance indicator CEC through a treatment process provides an indication of removal of CECs with similar properties. A health-based CEC may also serve as a performance indicator CEC.

A surrogate is a measurable physical or chemical property, such as chlorine residual or electrical conductivity, that can be used to measure the effectiveness of trace organic compound removal by treatment process and/or provide an indication of a treatment process failure. A reverse osmosis (RO) treatment process, for example, is expected to substantially reduce the electrical conductivity of the recycled water being treated. This reduction in the level of the surrogate also provides an indication that inorganic and organic compounds, including CECs, are being removed.

Recycled water monitoring programs used for groundwater recharge reuse shall include monitoring for: (1) human health-based CECs; (2) performance indicator CECs; and (3) surrogates. The purpose of monitoring performance indicator CECs and surrogates is to assess the effectiveness of unit processes to remove CECs. For this policy for groundwater recharge reuse, unit processes that remove CECs include RO, advanced oxidation processes (AOPs), and soil aquifer treatment.[6] AOPs are treatment processes involving the use of oxidizing agents, such as hydrogen peroxide and ozone, combined with ultraviolet light irradiation. Soil aquifer treatment is a natural treatment process that removes CECs as water passes through soil, the vadose zone, and within an aquifer.

This Policy provides CEC monitoring requirements for recycled water which undergoes additional treatment by soil aquifer treatment or by RO followed by AOPs. CEC monitoring requirements for groundwater recharge reuse projects implementing treatment processes that provide control of CECs by processes other than soil aquifer treatment or RO/AOPs shall be established on a case-by-case basis by the State Water Board in consultation with CDPH.

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[5] Heath-based CECs were determined through a screening process that was developed and conducted by the CEC Science Advisory Panel; *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

[6] For evaluating removal of CECs, the treatment zone for soil aquifer treatment is from the surface of the application area through the unsaturated zone to groundwater, including groundwater within a 30-day travel time distance through the aquifer downgradient of the surface application area.

Monitoring of health-based CECs or performance indicator CECs is not required for recycled water used for landscape irrigation due to the low risk for ingestion of the water.[7]

1.1. CECs for Monitoring Programs

This Policy provides requirements for monitoring CECs in recycled water used for groundwater recharge reuse. The Regional Water Boards shall not issue requirements for monitoring of additional CECs in recycled water beyond the requirements provided in this Policy except when recommended by CDPH or requested by the project proponent.

Table 1 provides the health-based CECs and performance indicator CECs to be monitored along with their respective reporting limits. All CECs listed for a recycled water application shall be monitored during an initial assessment monitoring phase, as described in Section 3.1. Based on monitoring results and findings, the list of performance indicator CECs required for monitoring may be refined for subsequent monitoring phases. The health-based CECs listed in Table 1 shall be monitored during the entirety of the initial assessment and baseline monitoring phases (Sections 3.1 and 3.2). Based on the results of the baseline monitoring phase and/or subsequent monitoring, the list of health-based CECs required for monitoring may be revised. The method for evaluation of monitoring results for health-based CECs is provided in Section 4.2.

Quality assurance and quality control measures shall be used for both collection of samples and laboratory analysis work. The project proponent shall develop a quality assurance project plan that includes the appropriate number of field blanks, laboratory blanks, replicate samples, and matrix spikes.

[7] "For monitoring programs to assess CEC threats for urban irrigation reuse, none of the chemicals for which measurement methods and exposure data are available exceeded the threshold for monitoring priority. This is largely attributable to higher Monitoring Trigger Levels (MTLs), because of reduced water ingestion in a landscape irrigation setting compared to drinking water." MTLs are health-based screening level values for CECs for a particular water reuse scenario. MTLs were established in, *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

Table 1 – CECs to be Monitored

Constituent	Constituent Group	Relevance/Indicator Type	Reporting Limit (µg/L)
GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
N-Nitrosodimethylamine (NDMA)	Disinfection byproduct	Health	0.002
Triclosan	Antimicrobial	Health	0.05
Gemfibrozil	Pharmaceutical	Performance	0.01
Iopromide	Pharmaceutical	Performance	0.05
N,N-Diethyl-meta-toluamide (DEET)	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1
GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
NDMA	Disinfection byproduct	Health & Performance	0.002
Triclosan	Antimicrobial	Health	0.05
DEET	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1

µg/L – Micrograms per liter

Analytical methods for laboratory analysis of CECs shall be selected to achieve the reporting limits presented in Table 1. The analytical methods shall be based on methods published by the United States Environmental Protection Agency, methods certified by CDPH, or peer reviewed and published methods that have been reviewed by CDPH, including those published by voluntary consensus standards bodies such as the Standards Methods Committee and the American Society for Testing and Materials International. Any modifications to the published or certified methods shall be reviewed by CDPH and subsequently submitted to the Regional Water Board in an updated quality assurance project plan.

1.2. Surrogates for Monitoring Programs

Table 2 presents a list of surrogates that shall be considered for monitoring treatment of recycled water used for groundwater recharge reuse. Other surrogates not listed in Table 2 may also be considered.

Table 2: Surrogates

GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION
Ammonia
Total Organic Carbon (TOC)
Nitrate
Ultraviolet (UV) Light Absorption
GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION
Electrical Conductivity
TOC

The project proponent shall propose surrogates to monitor on a case-by-case basis appropriate for the treatment process or processes. The Regional Water Board shall review and approve the selected surrogates in consultation with CDPH.

Where applicable, surrogates may be measured using on-line or hand-held instruments provided that instrument calibration procedures are implemented in accordance with the manufacturer's specifications and that calibration is documented.

2. MONITORING LOCATIONS

Monitoring locations for CECs and surrogates are described in this section.

2.1. Health-Based CEC Monitoring Locations

2.1.1. Groundwater Recharge Reuse - Surface Application

For groundwater recharge reuse projects implementing surface application of recycled water, health-based CECs shall be monitored at these locations:

(1) Following tertiary treatment[8] prior to application to the surface spreading area; and

(2) At monitoring well locations designated in consultation with CDPH within the distance groundwater travels downgradient from the application site in 30 days.

Monitoring locations for health-based CECs for the phases of monitoring are presented in Tables 3 through 5.

2.1.2. Groundwater Recharge Reuse - Subsurface Application

For groundwater recharge reuse projects implementing subsurface application of recycled water, health-based CECs shall be monitored at a location following treatment prior to release into an aquifer.

2.2. Performance Indicator CEC and Surrogate Monitoring Locations

To allow evaluation of individual unit processes or a combination of unit processes that provide removal of CECs, performance indicator CECs and surrogates shall be monitored at the locations described below and presented in Tables 3 through 5.

2.2.1. Groundwater Recharge Reuse - Surface Application

For groundwater recharge reuse projects using surface application of recycled water, performance indicator CECs and surrogates shall be monitored at these locations:

(1) Following tertiary treatment prior to application to the surface spreading area; and

(2) At monitoring well locations designated in consultation with CDPH within the distance groundwater travels downgradient from the application site in 30 days.

Monitoring locations for performance indicator CECs and surrogates for the phases of monitoring are presented in Tables 3 through 5.

2.2.2. Groundwater Recharge Reuse - Subsurface Application

For groundwater recharge reuse projects using subsurface application of recycled water, performance indicator CECs shall be monitored in recycled water at these locations:

(1) Prior to treatment by RO; and

[8] Standards for disinfected tertiary recycled water presented in California Code of Regulations, Title 22, section 60301.230 and 60301.320.

(2) Following treatment prior to release to the aquifer.

If the project proponent can demonstrate that the RO unit will not substantially remove a CEC, the Regional Water Board may allow monitoring for that CEC prior to the AOPs, instead of prior to the RO unit.

For groundwater recharge reuse projects using subsurface application of recycled water, surrogates shall be monitored at locations proposed by the project proponent and approved by the Regional Water Board in consultation with CDPH.

3. PHASED MONITORING REQUIREMENTS

The Regional Water Board shall phase the monitoring requirements for CECs and surrogates for groundwater recharge reuse projects. The purpose of phased monitoring is to allow monitoring requirements for health-based CECs, performance indicator CECs and surrogates to be refined based on the monitoring results and findings of the previous phase. An initial assessment monitoring phase, followed by a baseline monitoring phase, shall be conducted to determine the project-specific monitoring requirements for standard operations. The initial assessment and baseline monitoring phases shall be conducted after CDPH approval for groundwater recharge reuse project operation.

3.1. Initial Assessment Monitoring Phase

The purposes of the initial assessment phase are to: (1) identify the occurrence of health-based CECs, performance indicator CECs, and surrogates in recycled water and groundwater;[9] (2) determine treatment effectiveness; (3) define the project-specific performance indicator CECs and surrogates to monitor during the baseline phase; and (4) specify the expected removal percentages for performance indicator CECs and surrogates. The monitoring requirements for the initial assessment monitoring phase shall apply to the start-up of new facilities, piloting of new unit processes at existing facilities, and existing facilities where CECs and surrogates have not been assessed equivalent to the requirements of this Policy. Data from prior assessment need not replicate the exact frequency and duration of the initial assessment phase requirements specified in Table 3, if the overall robustness and size of the data are sufficient to adequately characterize the CECs, surrogates, and treatment performance. The initial assessment monitoring phase shall be conducted for a period of one year.

During the initial assessment monitoring phase for the applicable recycled water application method, each of the health-based CECs and performance indicator CECs

[9] The identification of the occurrence of health-based CECs, performance indicator CECs, and surrogates in groundwater only applies to groundwater recharge reuse by surface application.

listed in Table 1 and appropriate surrogates (see Section 1.2) shall be monitored. Surrogates shall be selected to monitor individual unit processes or combinations of unit processes that remove CECs. Performance indicator CEC and surrogate monitoring results that demonstrate measurable removal for a given unit process shall be candidates for use in the monitoring programs for the baseline and standard operation phases. Monitoring requirements for the initial assessment phase are summarized in Table 3.

For existing groundwater recharge reuse projects, historic monitoring data may be used to assess the occurrence and removal of CECs and surrogates. Existing projects demonstrating prior assessment of CECs and surrogates equivalent to the initial assessment phase requirements of this Policy may skip the initial monitoring phase and initiate the baseline monitoring phase requirements in Section 3.2.
Monitoring results shall be evaluated following each sampling event to allow timely implementation of any response actions. If evaluation of monitoring results indicates a concern, such as finding a concentration of a health-based CEC above the thresholds described in Table 7, more frequent monitoring may be required to further evaluate the effectiveness of the treatment process. Additional actions may also be warranted, which may include, but not be limited to, resampling to confirm a result, additional monitoring, implementation of a source identification program, toxicological studies, engineering removal studies, and/or modification of facility operations. If additional monitoring is required, the Regional Water Board shall consult with CDPH and revise the Monitoring and Reporting Program as appropriate. Evaluation of monitoring results and determination of appropriate response actions based on the monitoring results are presented in Section 4.

Following completion of the initial assessment monitoring phase, monitoring requirements shall be re-evaluated and subsequent requirements for the baseline monitoring phase shall be determined on a project-specific basis.

3.2. Baseline Monitoring Phase

Based on the findings of the initial assessment monitoring phase, project-specific performance indicator CECs and surrogates shall be selected for monitoring during the baseline monitoring phase. The purpose of the baseline monitoring phase is to assess and refine which health-based CECs, performance indicator CECs and surrogates are appropriate to monitor the removal of CECs and treatment system performance for the standard operation of a facility. Performance indicator CECs and surrogates that exhibited reduction by unit processes and/or provided an indication of operational performance shall be selected for monitoring during the baseline monitoring phase. Surrogates not reduced through a unit process are not good indicators of the unit's intended performance. For example, soil aquifer treatment may not effectively lower electrical conductivity. Therefore, electrical conductivity may not be a good surrogate for soil aquifer treatment. The baseline monitoring phase shall be conducted for a period of three years following the initial assessment monitoring phase. Monitoring requirements for the baseline phase are summarized in Table 4. If a performance indicator CEC listed in Table 1 is found not to be a good indicator, the project proponent shall propose an alternative performance indicator CEC representative of the constituent group to monitor. This performance indicator CEC shall be subject to approval by the Regional Water Board in consultation with CDPH.

For existing groundwater recharge reuse projects, historic monitoring data may be used to assess removal of health-based CECs, performance indicator CECs and surrogates. Existing projects that can demonstrate prior assessment of CECs and surrogates equivalent to the initial assessment phase and baseline phase requirements of this Policy may be eligible for the standard operation monitoring requirements.

Monitoring results shall be evaluated following each sampling event to allow timely implementation of any response actions. If evaluation of monitoring results indicates a concern, such as finding a concentration of a health-based CEC above the thresholds described in Table 7, more frequent monitoring may be required to further evaluate the effectiveness of the treatment process. Additional actions may also be warranted, which may include, but not be limited to, resampling to confirm a result, additional monitoring, implementation of a source identification program, toxicological studies, engineering removal studies, and/or modification of facility operation. If additional monitoring is required, the Regional Water Board shall consult with CDPH and revise the Monitoring and Reporting Program as appropriate. Evaluation of monitoring results and determination of appropriate response actions based on the monitoring results are presented in Section 4.

Following the baseline operation monitoring phase, monitoring requirements shall be re-evaluated and subsequent requirements for the standard operation of a project shall be determined on a project-specific basis.

Table 3: Initial Assessment Phase Monitoring Requirements

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge Reuse- Surface Application	Health-Based CECs and Performance Indicator CECs: All listed in Table 1.	Quarterly[1]	- Following tertiary treatment prior to application to surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
	Surrogates: To be selected on a project-specific basis.[5]	1st 3 months: To be determined on a project-specific basis.[3]	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
		3-12 months: To be determined on a project-specific basis.[3]	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
Groundwater Recharge Reuse -Subsurface Application	Health-Based CECs: All listed in Table 1.	Quarterly[1]	Following treatment prior to release to the aquifer.
	Performance Indicator CECs: All listed in Table 1.	Quarterly[1]	- Prior to RO treatment.[4] - Following treatment prior to release to the aquifer.
	Surrogates: To be selected on a project-specific basis.[5]	To be determined on a project-specific basis.	- At locations approved by the Regional Water Board.[6]

1 – This is the initial monitoring frequency for the monitoring and reporting program. The Regional Water Board may require additional monitoring to respond to a concern as stated in Section 3.1.
2 – Groundwater within the distance groundwater travels downgradient from the application site in 30-days.
3 – The monitoring frequency shall be determined by the Regional Water Board in consultation with CDPH. The intent is to have an increased monitoring frequency during the first three months and a decreased monitoring frequency after three months.
4 – If the project proponent can demonstrate that the RO unit will not substantially remove a CEC, the Regional Water Board may allow monitoring for that CEC prior to the AOP, instead of prior to the RO unit.
5 – See Section 1.2 for guidance on selection of surrogates.
6 – See Section 2.2.2 for information on surrogate monitoring locations for subsurface application.

Table 4: Baseline Phase Monitoring Requirements

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge Reuse – Surface Application	Health-Based CECs: All listed in Table 1. Performance Indicator CECs: Selected based on the findings of the initial assessment phase.	Semi-Annually[1]	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
	Surrogates: Selected based on the findings of the initial assessment phase.	Based on findings of the initial assessment phase. .	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
Groundwater Recharge Reuse – Subsurface Application	Health-Based CECs: All listed in Table 1.	Semi-Annually[1]	Following treatment prior to release to the aquifer.
	Performance Indicator CECs: Selected based on the findings of the initial assessment phase.	Semi-Annually[1]	- Prior to RO treatment.[3] - Following treatment prior to release to the aquifer.
	Surrogates: Selected based on the findings of the initial assessment phase.	Based on findings of the initial assessment phase.	- At locations approved by the Regional Water Board.[4]

1 – More frequent monitoring may be required to respond to a concern as stated in Section 3.2.
2 – Groundwater within the distance groundwater travels downgradient from the application site in 30-days.
3 – If the project proponent can demonstrate that the RO unit will not substantially remove a CEC, the Regional Water Board may allow monitoring for that CEC prior to the AOP, instead of prior to the RO unit.
4 – See Section 2.2.2 for information on surrogate monitoring locations for subsurface application.

3.3. Standard Operation Monitoring

Based on the findings of the baseline monitoring phase, monitoring requirements for health-based CECs, performance indicator CECs and surrogates may be refined to establish project-specific requirements for monitoring the standard operating conditions of a groundwater recharge reuse project. Monitoring requirements for the standard operation phase are summarized in Table 5. The list of health-based CECs may be revised to remove a health-based CEC from the list if monitoring results meet the conditions of the minimum threshold level presented in Table 7. Performance indicator CECs and surrogates that exhibited reduction by a unit process and/or provided an indication of operational performance shall be selected for monitoring of standard operations. If a performance indicator CEC is found to be a poor indicator, the project proponent shall propose an alternative performance indicator CEC representative of the constituent group to monitor. This performance indicator CEC shall be subject to approval by the Regional Water Board in consultation with CDPH.

Monitoring locations for the standard operation phase shall be the same as the locations used for the baseline monitoring phase.

Monitoring for health-based CECs and performance indicator CECs shall be conducted on a semi-annual basis, unless the project demonstrates consistency in treatment effectiveness in removal of CECs, treatment operational performance, and appropriate recycled water quality. These projects may be monitored for CECs on an annual basis. Monitoring frequencies for CECs and surrogates for standard operation monitoring are presented in Table 5.

Monitoring results shall be evaluated following each sampling event to allow timely implementation of any response actions. If evaluation of monitoring results indicates a concern, such as finding a health-based CEC above the thresholds described in Table 7 or a decline in removal of a performance indicator CEC from the performance levels established during the initial and baseline monitoring phases, more frequent monitoring may be required to further evaluate the effectiveness of the treatment process. Additional actions may also be warranted, which may include, but not be limited to, resampling to confirm a result, additional monitoring, implementation of a source identification program, toxicological studies, engineering removal studies, and/or modification of facility operation. If additional monitoring is required, the Regional Water Board shall consult with CDPH and revise the Monitoring and Reporting Program as appropriate. Evaluation of monitoring results and determination of appropriate response actions based on the monitoring results are presented in Section 4.

Table 5: Standard Operation Monitoring Requirement

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge Reuse - Surface Application	Health-Based CECs: Selected based on the findings of the baseline phase.	Semi-Annually or Annually[1]	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
	Performance Indicator CECs: Selected based on the findings of the baseline phase.		
	Surrogates: Selected based on the findings of the baseline phase.	Based on findings of the baseline assessment phase.	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
Groundwater Recharge Reuse - Subsurface Application	Health-Based CECs: Selected based on the findings of the baseline phase	Semi-Annually or Annually[1]	-Following ~~RO/AOPs~~ treatment prior to release to the aquifer.
	Performance Indicator CECs: Selected based on the findings of the baseline phase.	Semi-Annually or Annually[1]	- Prior to RO treatment.[3] - Following treatment prior to release to the aquifer.
	Surrogates: Selected based on the findings of the baseline phase,	Based on findings of the baseline assessment phase.	At locations approved by the Regional Water Board.[4]

1 – More frequent monitoring may be required to respond to a concern as stated in Section 3.3.
2 – Groundwater within the distance groundwater travels downgradient from the application site in 30-days.
3 – If the project proponent can demonstrate that the RO unit will not substantially remove a CEC, the Regional Water Board may allow monitoring for that CEC prior to the AOP, instead of prior to the RO unit.
4 – See Section 2.2.2 for information on surrogate monitoring locations for subsurface application.

4. EVALUATION OF CEC AND SURROGATE MONITORING RESULTS

This section presents the approaches for evaluating treatment process performance and health-based CEC monitoring results. Monitoring results for performance indicator CECs and surrogates shall be used to evaluate the operational performance of a treatment process and the effectiveness of a treatment process in removing CECs. For evaluation of health-based CEC monitoring results, a multi-tiered approach of thresholds and corresponding response actions is presented in Section 4.2. The evaluation of monitoring results shall be included in monitoring reports submitted to the Regional Water Board and CDPH.

4.1 Evaluation of Performance Indicator CEC and Surrogate Results

The effectiveness of a treatment process to remove CECs shall be evaluated by determining the removal percentages for performance indicator CECs and surrogates. The removal percentage is the difference in the concentration of a compound in recycled water prior to and after a treatment process (e.g., soil aquifer treatment or RO followed by AOPs), divided by the concentration prior to the treatment process and multiplied by 100.

$$\text{Removal Percentage} = ([X_{in} - X_{out}]/X_{in})\ (100)$$

X_{in} - Concentration in recycled water prior to a treatment process
X_{out} - Concentration in recycled water after a treatment process

During the initial assessment, the recycled water project proponent shall monitor performance to determine removal percentages for performance indicator CECs and surrogates. The removal percentages shall be confirmed during the baseline monitoring phase. One example of removal percentages from Drews et. al. (2008) for each application scenario and their associated processes (i.e. soil aquifer treatment or RO/AOPs) is presented in Table 6. The established removal percentages for each project shall be used to evaluate treatment effectiveness and operational performance.

4.1.1. Groundwater Recharge Reuse – Surface Application

For groundwater recharge reuse by surface application, the removal percentage shall be determined by comparing the quality of the recycled water applied to a surface spreading area to the quality of groundwater at monitoring wells. The distance between the application site and the monitoring wells shall be no more than the distance the groundwater travels in 30 days downgradient from the application site. The location of the monitoring wells shall be designated in consultation with CDPH. The removal percentage shall be adjusted to account for dilution from potable water applied to the application site, storm water applied to the application site, and native groundwater.

The removal percentage shall also be adjusted to account for CECs in these waters. The project proponent shall submit a proposal to the Regional Water Board and CDPH as part of its operation plan on how it will perform this accounting.

4.1.2. Groundwater Recharge Reuse – Subsurface Application

For groundwater recharge reuse using subsurface application, the removal percentage shall be determined by comparing recycled water quality before treatment by RO/AOPs and after treatment prior to release to the aquifer.

Table 6: Monitoring Trigger Levels and Removal Percentages

Constituent/ Parameter	Relevance/Indicator Type/Surrogate	Monitoring Trigger Level (micrograms/liter)[1]	Removal Percentages (%)[2]
GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION[3]			
17β-estradiol	Health	0.0009	--[4]
Caffeine	Health & Performance	0.35	>90
NDMA	Health	0.01	--
Triclosan	Health	0.35	--
Gemfibrozil	Performance	--	>90
Iopromide	Performance	--	>90
DEET	Performance	--	>90
Sucralose	Performance	--	<25[5]
Ammonia	Surrogate	--	>90
TOC	Surrogate	--	>30
Nitrate	Surrogate	--	>30
UV Absorption	Surrogate	--	>30
GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION[6]			
17β-estradiol	Health	0.0009	--
Caffeine	Health & Performance	0.35	>90
NDMA	Health & Performance	0.01	25-50, >80[7]
Triclosan	Health	0.35	--
DEET	Performance	--	>90
Sucralose	Performance	--	>90
Electrical Conductivity	Surrogate	--	>90
TOC	Surrogate	--	>90

1 – Monitoring trigger levels for groundwater recharge reuse and landscape irrigation applications were established in *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.
2 –The removal percentages presented in this table are from work by Drewes et.al. (2008) and provide an example of performance for that specific research. Project specific removal percentages will be developed for each groundwater recharge reuse project during the initial and baseline monitoring phases.
3 – Treatment process: Soil aquifer treatment. The stated removal percentages are examples and need to be finalized during the initial and baseline monitoring phases for a given site.
4 – Not applicable
5 – Sucralose degrades poorly during soil aquifer treatment. It is included here mainly as a tracer.
6 – Treatment process: Reverse osmosis and advanced oxidation process.
7 – For treatment using reverse osmosis, removal percentage is between 25 and 50 percent. For treatment using reverse osmosis and advanced oxidation processes, removal percentage is greater than 80 percent.

4.2. Evaluation of Health-Based CEC Results

The project proponent shall evaluate health-based CEC monitoring results. To determine the appropriate response actions, the project proponent shall compare measured environmental concentrations (MECs) to their respective monitoring trigger levels[10] (MTLs) listed in Table 6 to determine MEC/MTL ratios. The project proponent shall compare the calculated MEC/MTL ratios to the thresholds presented in Table 7 and shall implement the response actions corresponding to the threshold.

For surface application, the results shall be evaluated for groundwater collected from the monitoring wells. For subsurface application projects, results shall be evaluated for the recycled water released to the aquifer.

Table 7: MEC/MTL Thresholds and Response Actions

MC/MTL Threshold	Response Action
If greater than 75 percent of the MEC/MTL ratio results for a CEC are less than or equal to 0.1 during the baseline monitoring phase and/or subsequent monitoring -	A) After completion of the baseline monitoring phase, consider requesting removal of the CEC from the monitoring program.
If MEC/MTL ratio is greater than 0.1 and less than or equal to 1 -	B) Continue to monitor.
If MEC/MTL ratio is greater than 1 and less than or equal to 10 -	C) Check the data. Continue to monitor.
If MEC/MLT ratio is greater than 10 and less than or equal to 100 -	D) Resample immediately and analyze to confirm CEC result. Continue to monitor.
If MEC/MLT ratio is greater than 100 -	E) Resample immediately and analyze to confirm result. Continue to monitor. Contact the Regional Water Board and CDPH to discuss additional actions. (Additional actions may include, but are not limited to, additional monitoring, toxicological studies, engineering removal studies, modification of facility operation, implementation of a source identification program, and monitoring at additional locations.)

[10] Monitoring Trigger Level (MTL): Health-based screening level value for a CEC for a particular water reuse scenario. MTLs were established in, *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

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Time Extension Requests for Completion of Salt Nutrient Management Plan

In February 2009, the State Water Board adopted the Recycled Water Policy that includes the requirement that a Salt and Nutrient Management Plan (SNMP) is developed for every groundwater basin in the State by May 2014. A possible time extension of up to two years may be granted by the Regional Water Boards provided that adequate progress has been made on developing the SNMP. At its March 2014 Board Meeting, the Lahontan Regional Board agreed to grant time extensions to the priority groundwater basin groups that will not have completed their SNMPs by the May 2014 deadline.

To request a time extension, please provide a written request to the Lahontan Regional Board's Executive Officer by May 30, 2014. The request should include the following information:

ITEMS TO INCLUDE IN REQUEST	DESCRIPTION
Name of Priority Groundwater Basin	Name of basin
Name of SNMP Group	IRWM group name
Contact Information for SNMP Group Representative	Name, address, phone and email
Short Summary of Progress to Date	1-3 paragraph summary
Short Summary of Remaining Tasks to Complete the SNMP	1 paragraph
Reason Time Extension is Necessary	1 paragraph
Requested Extension Date	Select one of the following dates: • on or before December 2014 • on or before May 2015 • on or before December 2015 • on or before May 2016

Please mail the written request to:

Patty Zwarts Kouyoumdjian, Executive Officer
Lahontan Regional Water Quality Control Board
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150

If you have any questions, please do not hesitate to contact me by phone or email (530/542-5408 or cwise@waterboards.ca.gov)

Thanks, Cindy

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Salt/Nutrient Management Planning Progress Report

Region 6: Lahontan Regional Water Quality Control Board

Date: October 15, 2014

Stakeholder Group	Antelope Valley IRWM Group (Major)	Mojave IRWM Group (Major)	Tahoe Sierra IRWM Group (Major)	Inyo Mono IRWM Group (Major)	Indian Wells Valley Group (part of Inyo Mono IRWM) (Major)	Lahontan Basins IRWM Group (Major)	Fremont Basin IRWM Group (Major)
Membership	Antelope Valley State Water Contractors Association, Palmdale Water District	Mojave Water Agency (Note: some areas in Region 7 but Region 6 is lead)	South Tahoe Public Utility District	California Trout	Indian Wells Valley Cooperative Groundwater Management Team -- Indian Wells Valley Water District, Naval Air Weapons Station, Searles Valley Minerals, City of Ridgecrest, BLM, Inyokern CSD, Kern Co, Kern Co Water Agency, Eastern Kern Co Airport District	Honey Lake Valley Resource Conservation District	Department of Public Works, California City
Lead Organization	Antelope Valley State Water Contractors Association	Mojave Water Agency	South Tahoe Public Utility District	California Trout	TBD - likely Indian Wells Valley Water District or City of Ridgecrest	Honey Lake Valley Resource Conservation District	Department of Public Works, California City
Lead Group Contact	Matt Knudson (Palmdale Water District) (661) 947-4111x118 mknudson@palmdalewater.org	Kirby Brill (760) 946-7008 kbrill@mojavewater.org	Lynn Nolan (530) 543-6215 lnolan@stpud.dst.ca.us	Mark Drew (760) 924-1008 mdrew@caltrout.org	Don Zbeda/Indian Wells Water Agency (760) 384-5555 don.zdeba@iwvwd.com	Tim Keesey (530) 260-0934 info@honeylakevalleyrcd.us	Michael Bevins (760) 373-7297 pwdir@californiacity.com
Basins Covered DWR 118 Bulletins	6-44 Antelope Valley	6-40 Lower Mojave River Valley 6-41 Middle Mojave River Valley 6-42 Upper Mojave River Valley R7 basins Lucerne Valley, Johnson Valley, and Morongo	6-5 Tahoe Valley 6-5.01 Tahoe Valley South 6-5.02 Tahoe Valley West 6-5.03 Tahoe Valley North 6-67 Martis (Truckee Valley) 6-6 Carson Valley 6-108 Olympic Valley	6-12 Owens Valley	6-54 Indian Wells Valley	6-4 Honey Lake Valley	6-46 Fremont Valley; Tehachapi Valley East 6-45
What Group has Done to Date: (including significant milestones)	Salt/nutrient approach/concept presented to and accepted by Lahontan Regional Water Board. Time extension granted. Regional Board to consider plan acceptance in November 2014.	Salt/nutrient approach/concept presented to and accepted by Lahontan Regional Water Board. Regional Board to consider plan acceptance in early 2015.	Part of IRWM (planning grant funds to update IRWM plan & includes SNMP plan development. SNMP development is underway with possible status presentation to the Regional Board in early 2015.	Part of IRWM; currently seeking funding to begin SNMP development.	The Indian Wells Valley Cooperative Groundwater Management Team decided to develop its own SNMP as a subset of the Inyo Mono IRWM group's effort. Time extension granted. A draft SNMP is under development with a possible status presentation to the Regional Board in early 2015.	• Part of IRWM (planning funds to update IRWM plan include SNMP). Time extension granted. SNMP development is underway with possible status presentation to the Regional Board in early 2015.	• Potential draft plan completed and currently under review by the Regional Board. Possible status presentation to the Regional Board in early 2015.
Date Time Extension for Completion of SNMP Requested	4/16/2014	Was asked to submit a time extension on 5/22/2014	Was asked to submit a time extension on 5/22/2014	Was asked to submit a time extension on 5/22/2014	6/19/2014	5/30/2014	Was asked to submit a time extension on 5/22/2014
Date Time Extension Granted & New Estimated Completion Date	8/19/2014 Estimated Plan Completion Date December 2014				8/19/2014 Estimated Plan Completion Date December 2015	8/19/2014 Estimated Plan Completion Date December 2015	
Approximate Date of Draft Final Plan Presented to the Regional Board	11/1/2014				3/1/2016	3/16/2014	