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.

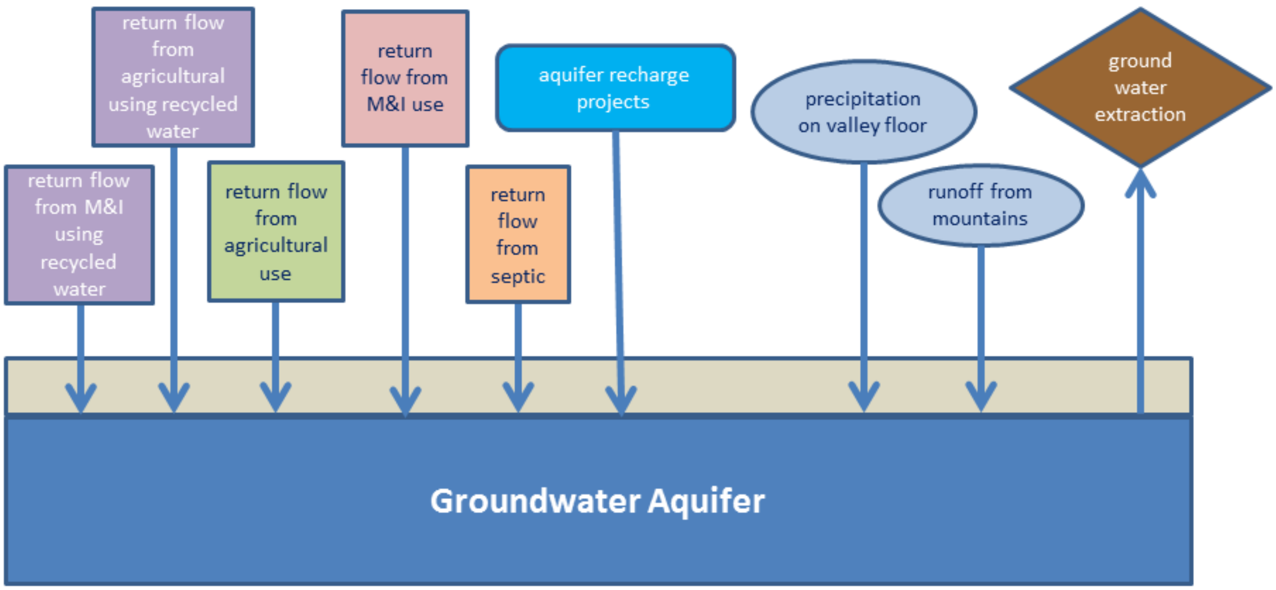
Table ES-1: Water Quality for Antelope Valley Groundwater Basin

	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.

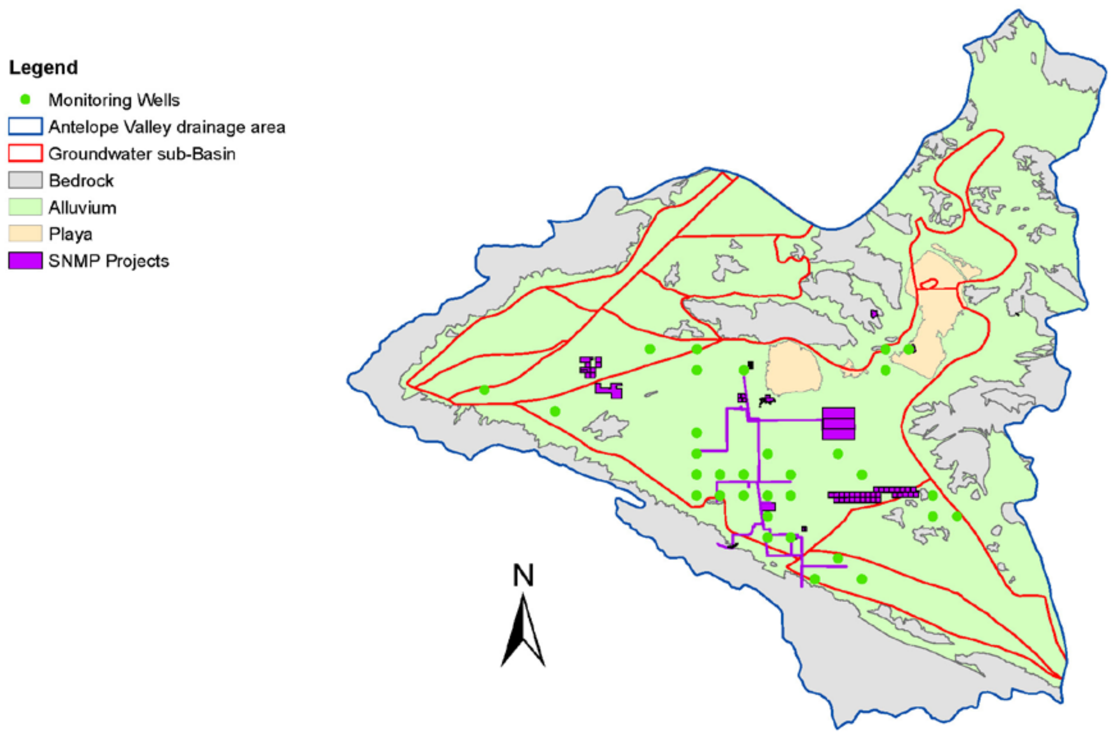
Six future scenarios were simulated:

- 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.