# SALT AND NUTRIENT MANAGEMENT PLAN FOR THE ANTELOPE VALLEY



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

Antelope Valley Salt and Nutrient Management Planning Stakeholders Group









## **Table of Contents**

Execu	utive Summary	ES-1
Secti	on 1: Introduction	
1.1	The Salt and Nutrient Management Plan	1-1
1.2	Purpose and Goals of the Salt and Nutrient Management Plan	1-1
1.3	Stakeholder Participation	1-2
1.4	Scope of Work	1-4
1.5	SNMP Definitions	1-4
1.6	List of Acronyms:	1-6
Secti	on 2: Characterization of the Basin	
2.1	Antelope Valley Groundwater Basin	2-1
2.2	SNMP Area Boundaries	2-5
2.3	Surface Water	2-6
2.4	Water Resources	2-8
2.5	Geology and Soils	2-8
2.6	Land Use	2-9
2.7	Groundwater Quality	2-13
2.8	Water Quality Control	2-13
2.9	Antelope Valley Regulatory Groundwater Cleanup Sites	2-13
Secti	on 3: Salt & Nutrient Characterization	
3.1	Salts and Nutrients – What are they and where do they come from?	3-1
3.2	Historical Salt and Nutrient Characterization of the Groundwater Basin	3-4
3.3	Current Salt and Nutrient Characterization of the Groundwater Basin	3-24
3.4	Salt and Nutrient Characterization of the Source Water	3-24
3.5	Fate and Transport	3-26
3.6	Current and Future Projects	3-28

### **Section 4: Basin and Antidegradation Analysis**

4.1	Antidegradation Policy	4-1
4.2	Beneficial Uses	4-2
4.3	Water Quality Objectives and Other Criteria	4-3
4.4	SNMP Water Quality Management Goals	4-5
4.5	Assimilative Capacity	4-8
4.6	Salt and Nutrient Balance	4-11
4.7	Antidegradation Analysis	4-23
Sect	tion 5: Monitoring	
5.1	Monitoring Plan Development	5-1
5.2	Monitoring Locations	5-1
5.3	Monitoring Frequency	5-4
5.4	Constituents to be Monitored	5-4
5.5	Data Evaluation and Reporting	5-4
Sect	tion 6: Implementation Measures	
6.1	Managing Salt and Nutrient Loadings on a Sustainable Basis	6-1
6.2	Existing Implementation Measures	6-1
6.3	Additional Implementation Measures	6-3
Section 7: References		7-1

### **List of Figures**

Figure ES-1: Salt and Nutrient Balance	ES-2
Figure ES-2: SNMP Projects and Monitoring Locations	ES-3
Figure 2-1: Groundwater Sub-Basin Boundary Map	2-2
Figure 2-2: General Geologic Cross-Section of the Antelope Valley Basin	2-4
Figure 2-3: Antelope Valley Hydrologic Features	2-7
Figure 2-4: Antelope Valley Soils	2-11
Figure 2-5: Antelope Valley Land Uses	2-12
Figure 2-6: GeoTracker Groundwater Cleanup Sites	2-15
Figure 3-1: TDS Concentration Range by Well	3-9
Figure 3-2: TDS Concentration Range by Sub-Basin	3-10
Figure 3-3: Chloride Concentration Range by Well	3-11
Figure 3-4: Chloride Concentration Range by Sub-Basin	3-12
Figure 3-5: Nitrate Concentration Range by Well	3-13
Figure 3-6: Nitrate Concentration Range by Sub-Basin	3-14
Figure 3-7: Arsenic Concentration Range by Well	3-15
Figure 3-8: Arsenic Concentration Range by Sub-Basin	3-16
Figure 3-9: Total Chromium Concentration Range by Well	3-17
Figure 3-10: Total Chromium Concentration Range by Sub-Basin	3-18
Figure 3-11: Fluoride Concentration Range by Well	3-19
Figure 3-12: Fluoride Concentration Range by Sub-Basin	3-20
Figure 3-13: Boron Concentration Range by Well	3-21
Figure 3-14: Boron Concentration Range by Sub-Basin	3-22
Figure 3-15: Antelope Valley Groundwater Levels (USGS 2004)	3-27
Figure 3-16: SNMP Projects in the Antelope Valley Basin	3-31
Figure 3-17: SNMP Projects in the Lancaster Sub-Basin	3-32
Figure 4-1: Antelope Valley Groundwater Quality and Management Goals	4-7
Figure 4-2: Aquifer Loading/Unloading	4-11
Figure 4-3: Mass Balance	4-12
Figure 4-4: TDS Model Predictions	4-20
Figure 4-5: Arsenic Model Predictions	4-21
Figure 5-1: Locations of the Groundwater Wells Included in the SNMP Monitoring Plan	5-3
Figure 5-2: Sample Chain-of-Custody Form	5-6

#### **List of Tables**

Table ES-1: Water Quality for Antelope Valley Groundwater Basin	ES-1
Table ES-2: Concentration Projections	ES-3
Table 3-1: Total Number of Wells Organized by Constituent, Sub-Basin, and Data Source	3-7
Table 3-2: Baseline Water Quality Concentrations in the AV Groundwater Basin	3-8
Table 3-3: Source Water Quality	3-25
Table 3-4: Water Volume Projections for Current and Future Projects	3-34
Table 4-1: Lahontan Basin Plan MUN Water Quality Objectives	4-3
Table 4-2: Recommended AGR Water Quality Thresholds	4-5
Table 4-3: SNMP Water Quality Management Goals	4-6
Table 4-4: Antelope Valley Basin Baseline Assimilative Capacities	4-10
Table 4-5: Antelope Valley SNMP Groundwater Model Flow Assumptions	4-14
Table 4-6: Simplified SNMP Constituent Impacts	4-15
Table 4-7: Constituent Concentrations Used in Salt Balance Model	4-16
Table 4-8: Concentration Projections	4-19
Table 4-9: Assimilative Capacity Usage	4-22
Table 4-10: SNMP Model Result Variations for Source Water Concentrations 25% Increase	4-23
Table 5-1: Groundwater Wells Included in the SNMP Monitoring Plan	5-2
Appendices	
Appendix A – Antelope Valley Salt and Nutrient Management Plan Scope of Work	

- Appendix B Lahontan Regional Water Board Acceptance Letter for the Antelope Valley Salt and Nutrient Management Plan Scope of Work
- Appendix C Antelope Valley Land Use Designations
- Appendix D Antelope Valley Regulatory Groundwater Cleanup Sites
- Appendix E Project Identification Form
- Appendix F Comments for June 2013 Draft Antelope Valley Salt and Nutrient Management Plan