SANITATION DISTRICTS OF LOS ANGELES COUNTY

Salt & Nutrient Management Plan for the Antelope Valley

Prepared by: Antelope Valley Salt & Nutrient Management Planning Stakeholders Group

Presented by:
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Civil Engineer
Los Angeles County Sanitation Districts

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Antelope Valley Salt & Nutrient Management Plan (AV SNMP)

- Effective water management – recycled water is part of the solution.
- AV SNMP meets the Recycled Water Policy for a stakeholder-developed SNMP for RWQCB approval.
- AV Basin has stable, good groundwater quality, with some naturally occurring issues.
- Current and future (through 2035) water projects satisfy the Antidegradation Policy.
- AV SNMP provides for monitoring and other approaches to demonstrate effective management of salts & nutrients in the basin.

AV SNMP Development

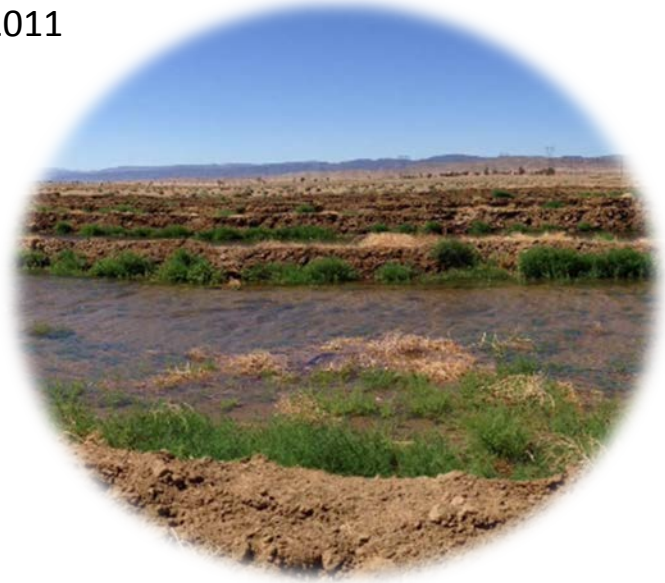
Recycled Water Policy
- May 2009

SNMP Kick-Off Meeting
- August 2009

Scope of Work
- October 2011

Draft SNMP
- July 2013
- May 2014

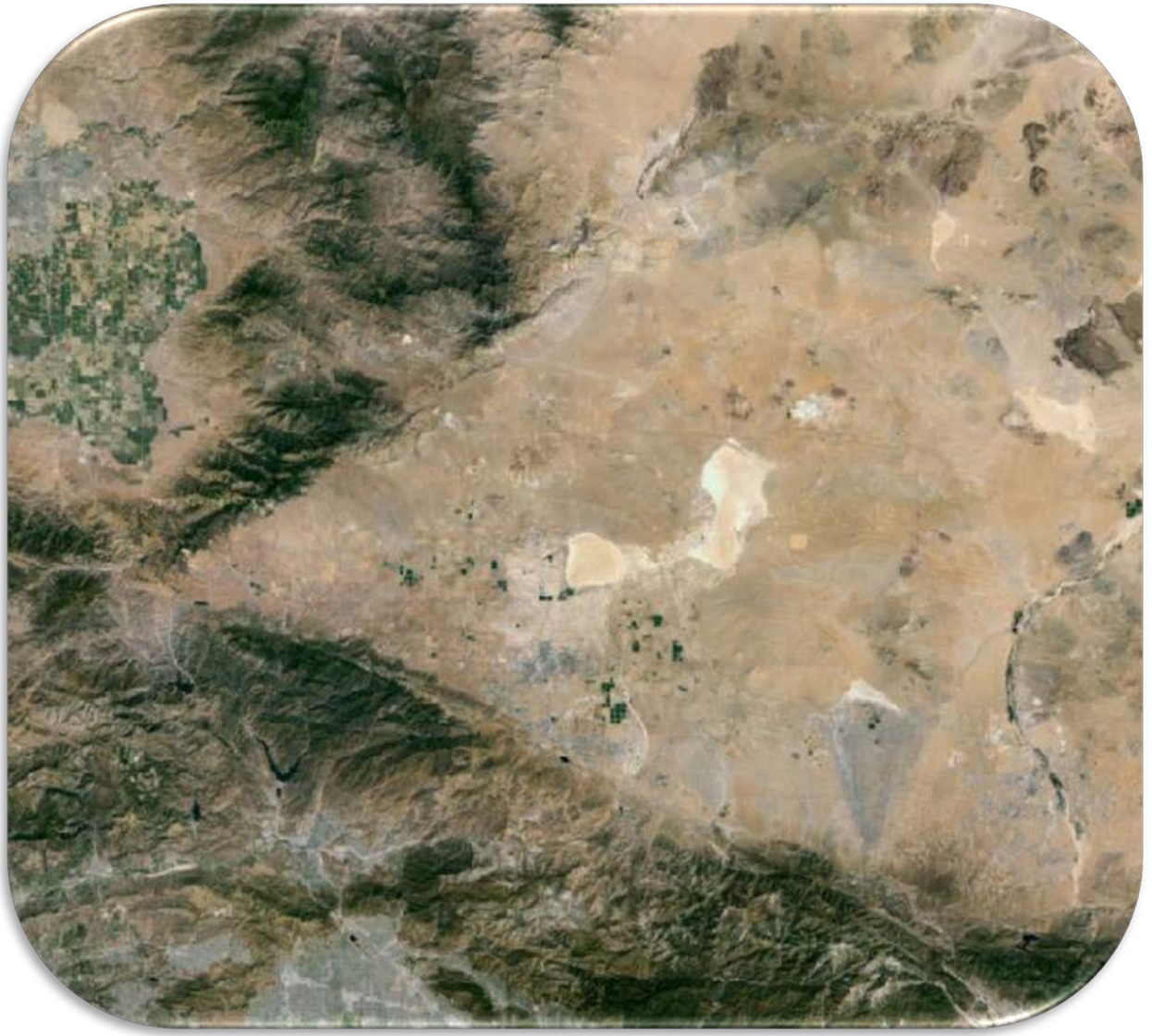
Final SNMP
- August 2014



AV SNMP Stakeholders

- AV Integrated Regional Water Management Plan (IRWMP) Stakeholder Group
- Water, wastewater, regulators, & community participants
- Website & email notifications
- Over 20 meetings since August 2009
- 2013 IRWMP appendix
- Adopted by AV Regional Water Management Group

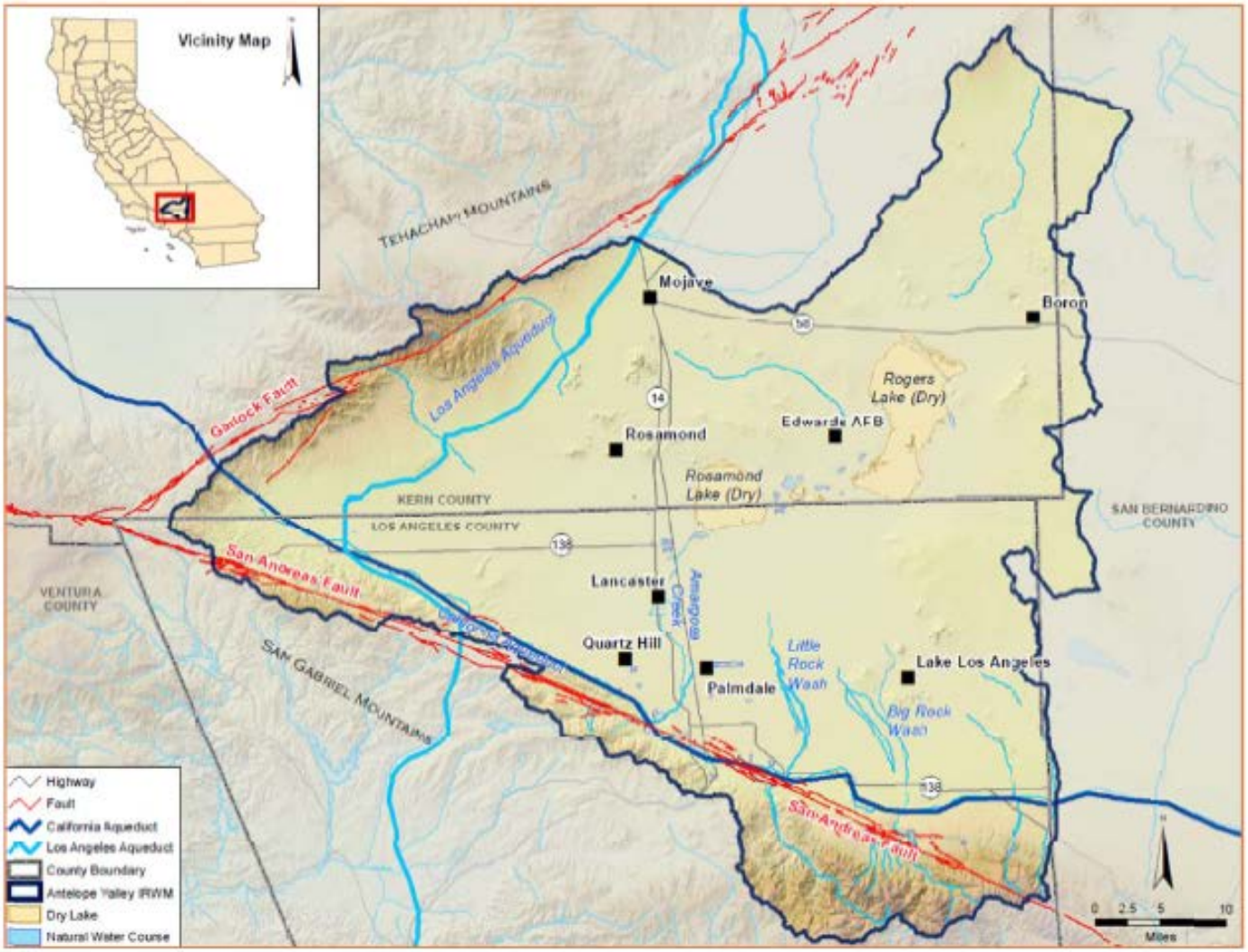
Antelope Valley



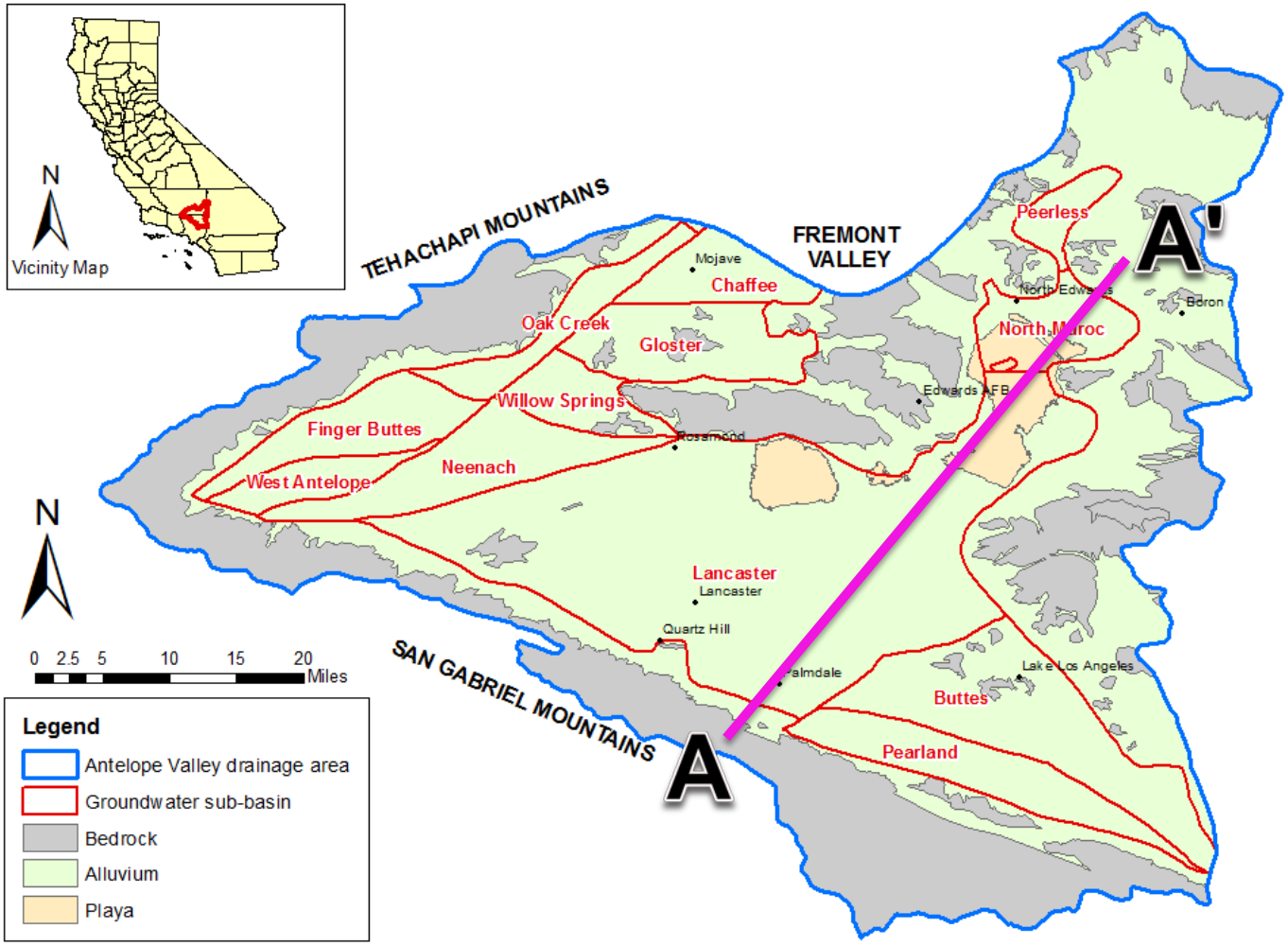
Characterization of the Basin

- Basin & sub-basin boundaries
- Hydrogeology
- Land use
- Clean-up sites
- Beneficial uses
- Constituents of concern
- Water quality

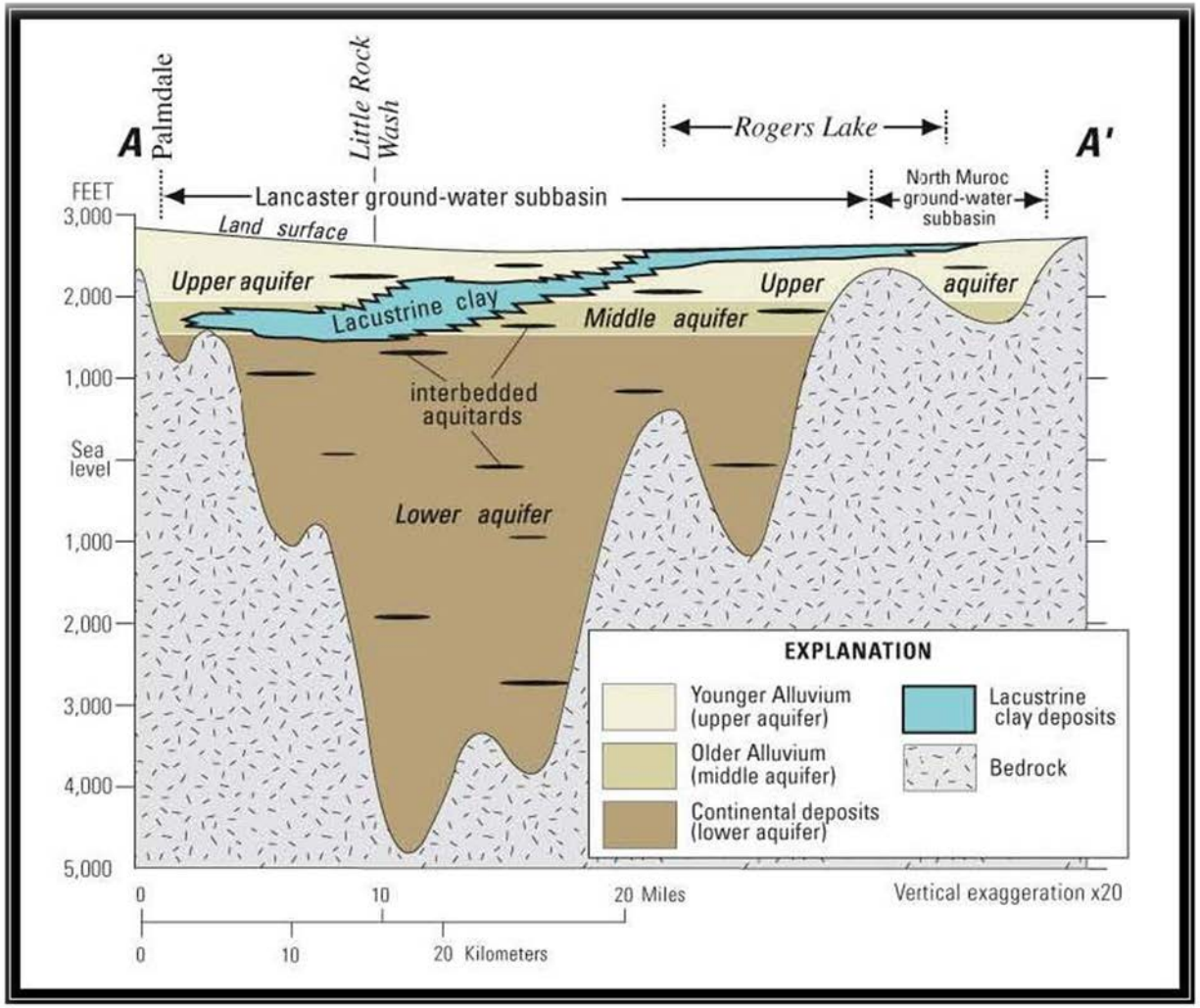
Hydrologic Features



Antelope Valley Groundwater Basin



AV Basin Cross-Section



AV Salts, Nutrients, & Other Constituents of Concern

- Total Dissolved Solids (TDS)
- Chloride
- Nitrate
- Arsenic
- Fluoride
- Boron
- Chromium

SNMP Water Quality Management Goals

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

a. California Notification Level

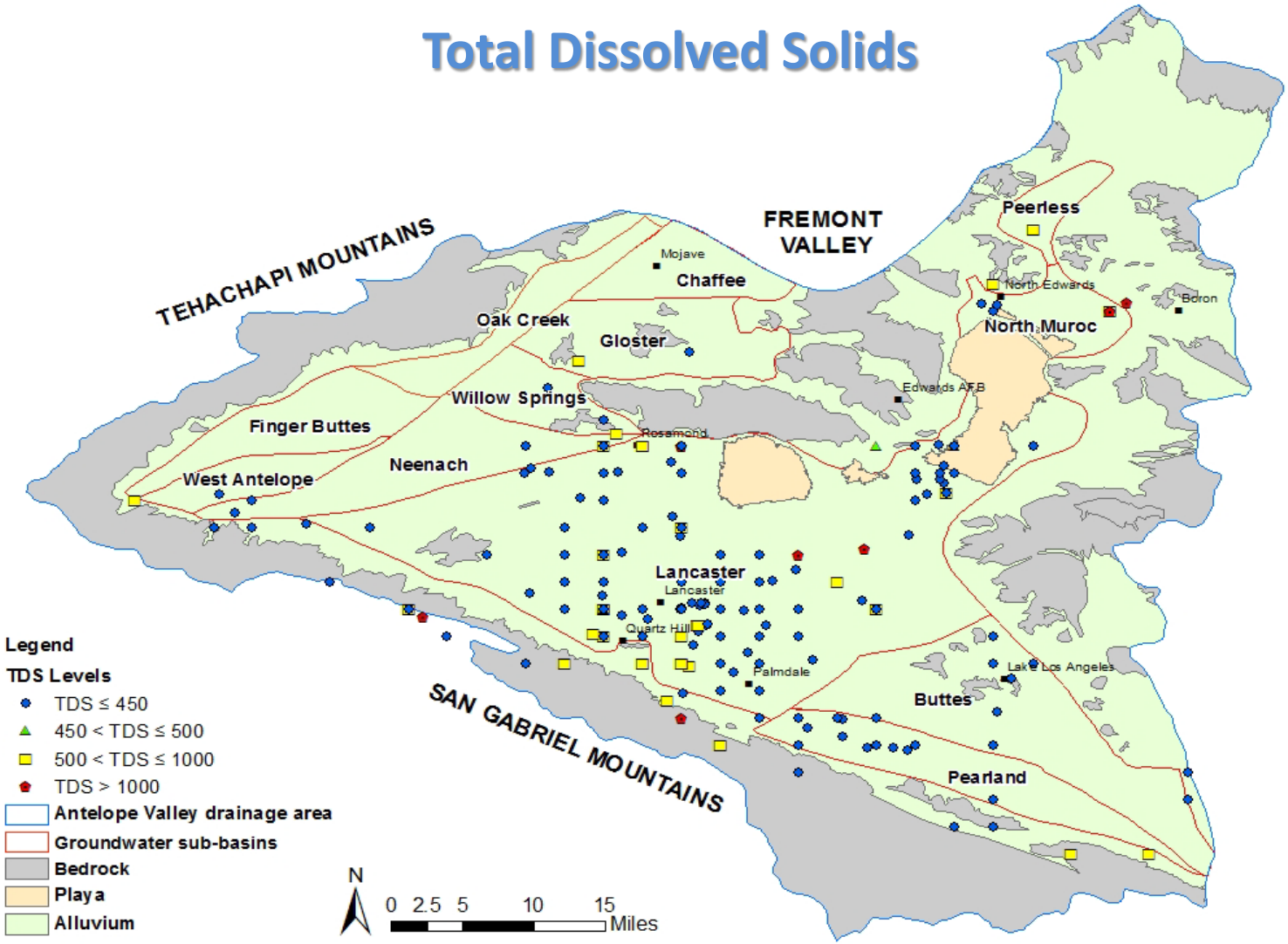
b. Basin and sub-basin goals are based on baseline groundwater quality

Existing AV groundwater quality is generally good

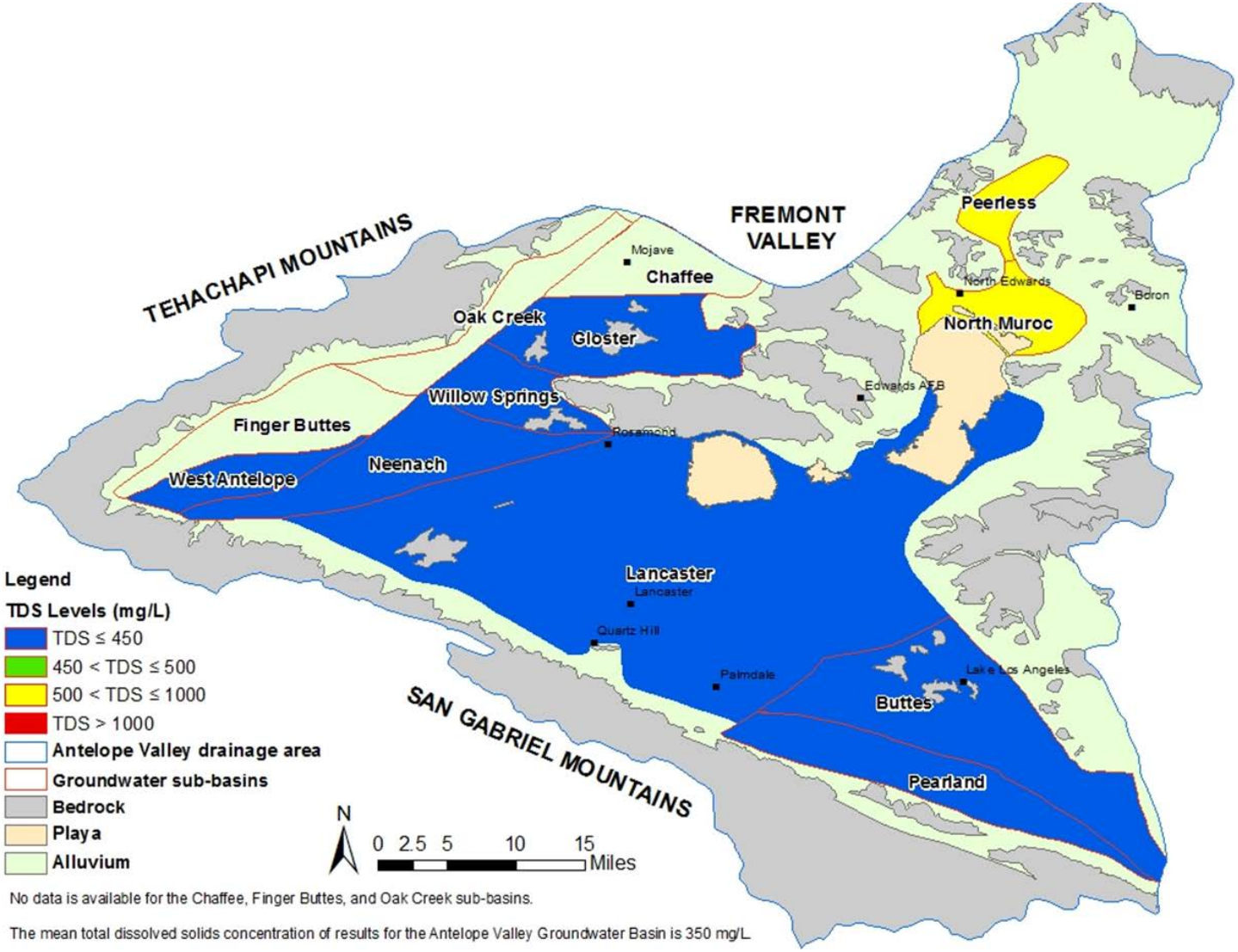
- Groundwater quality is excellent within the upper or “principal” aquifer
- Degrades toward the northern portion of the dry lake areas and deep aquifer.
- Suitable for domestic, agricultural, and industrial uses.
- Most AV supply wells draw groundwater from the principal aquifer.

Groundwater Quality

Total Dissolved Solids

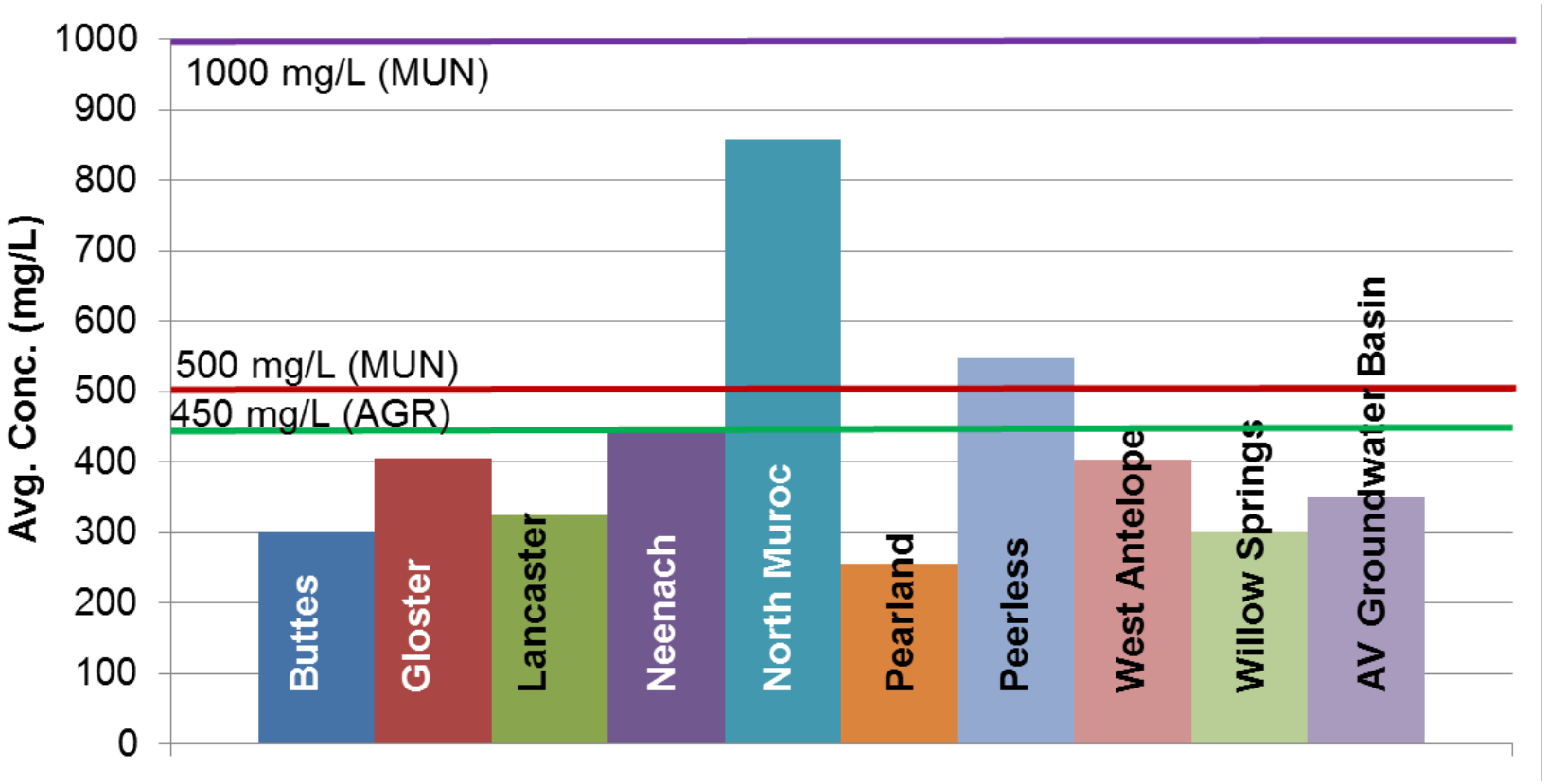


Total Dissolved Solids

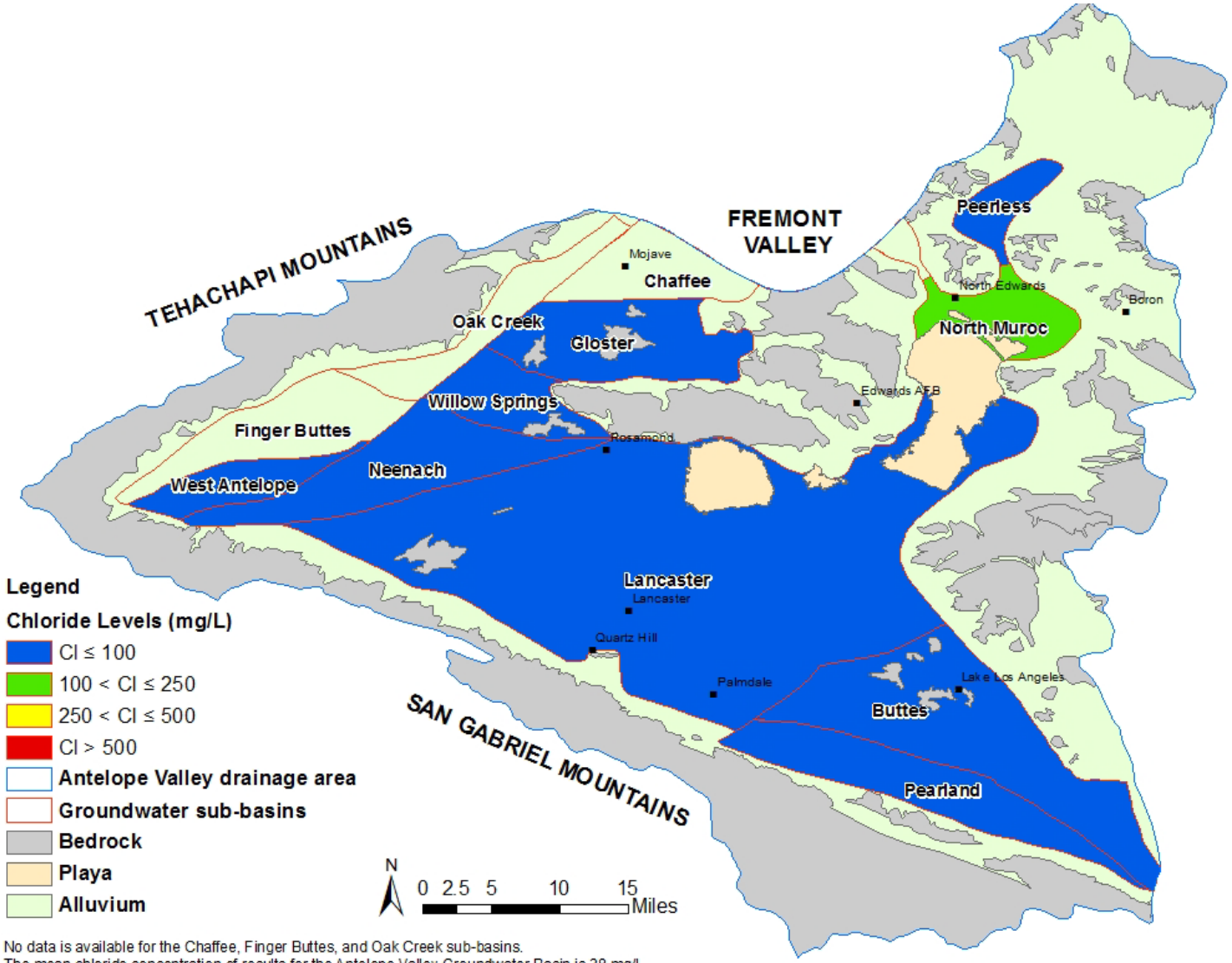


Assimilative Capacity

TDS



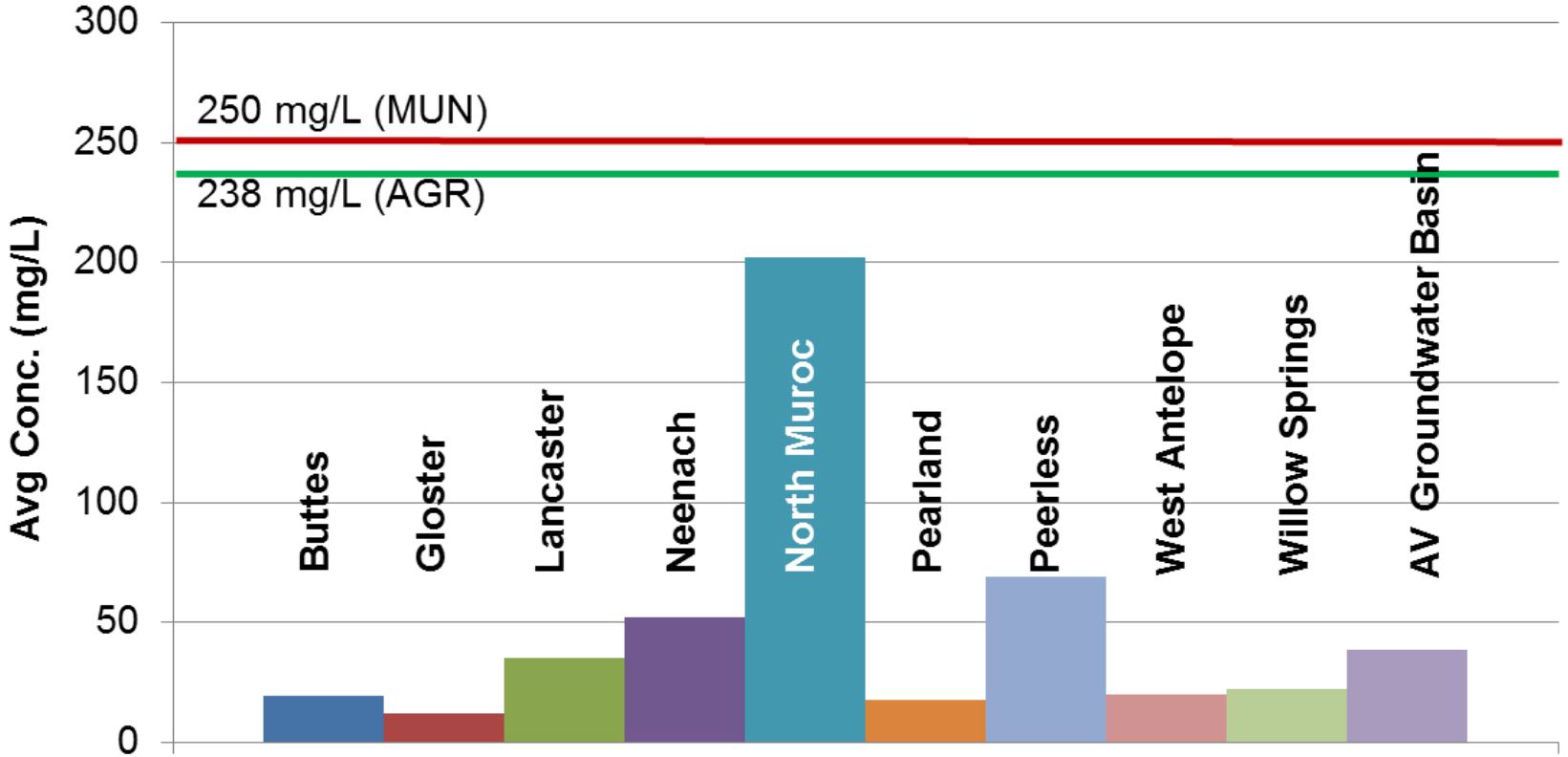
Chloride



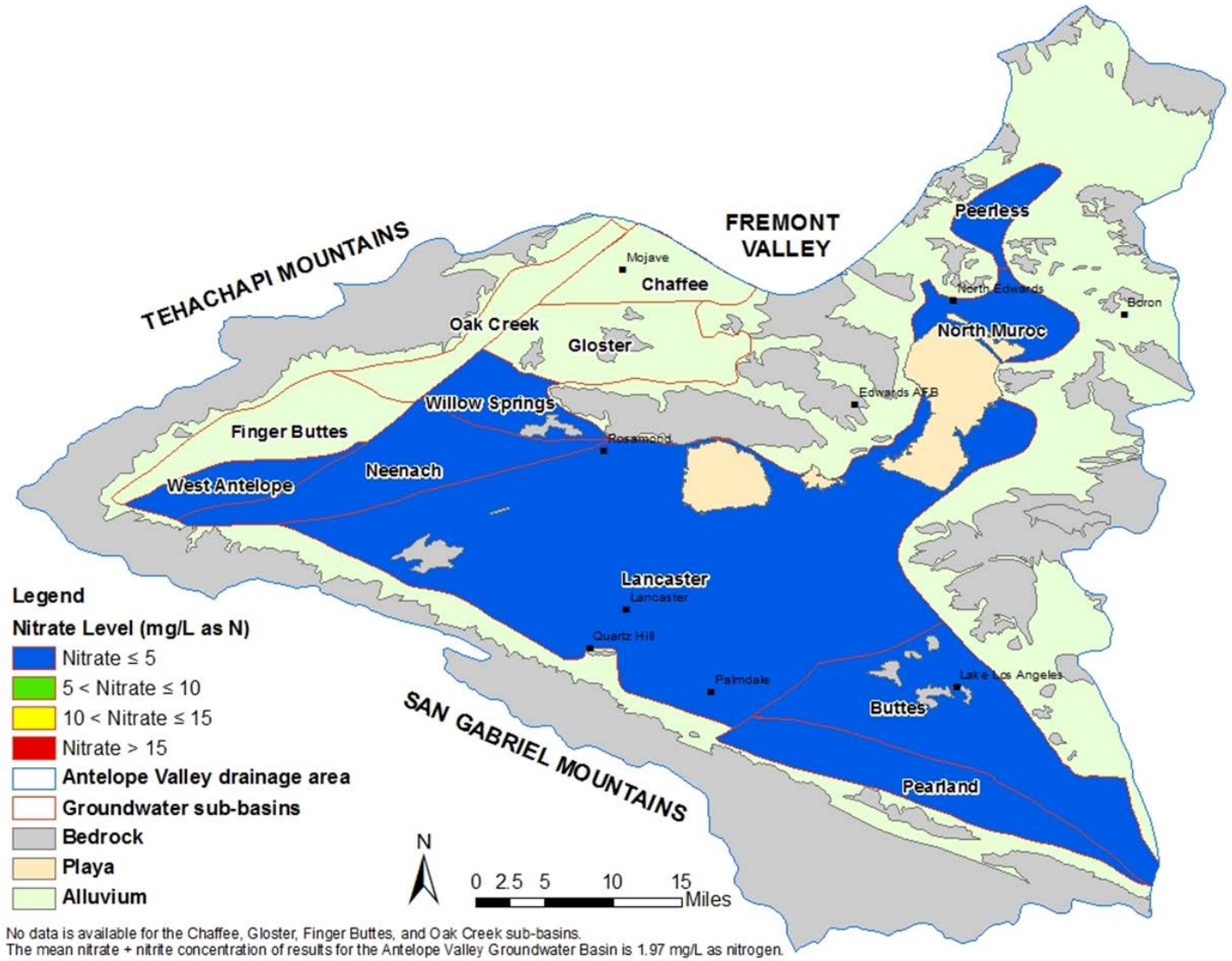
No data is available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.
The mean chloride concentration of results for the Antelope Valley Groundwater Basin is 38 mg/L.

Assimilative Capacity

Chloride



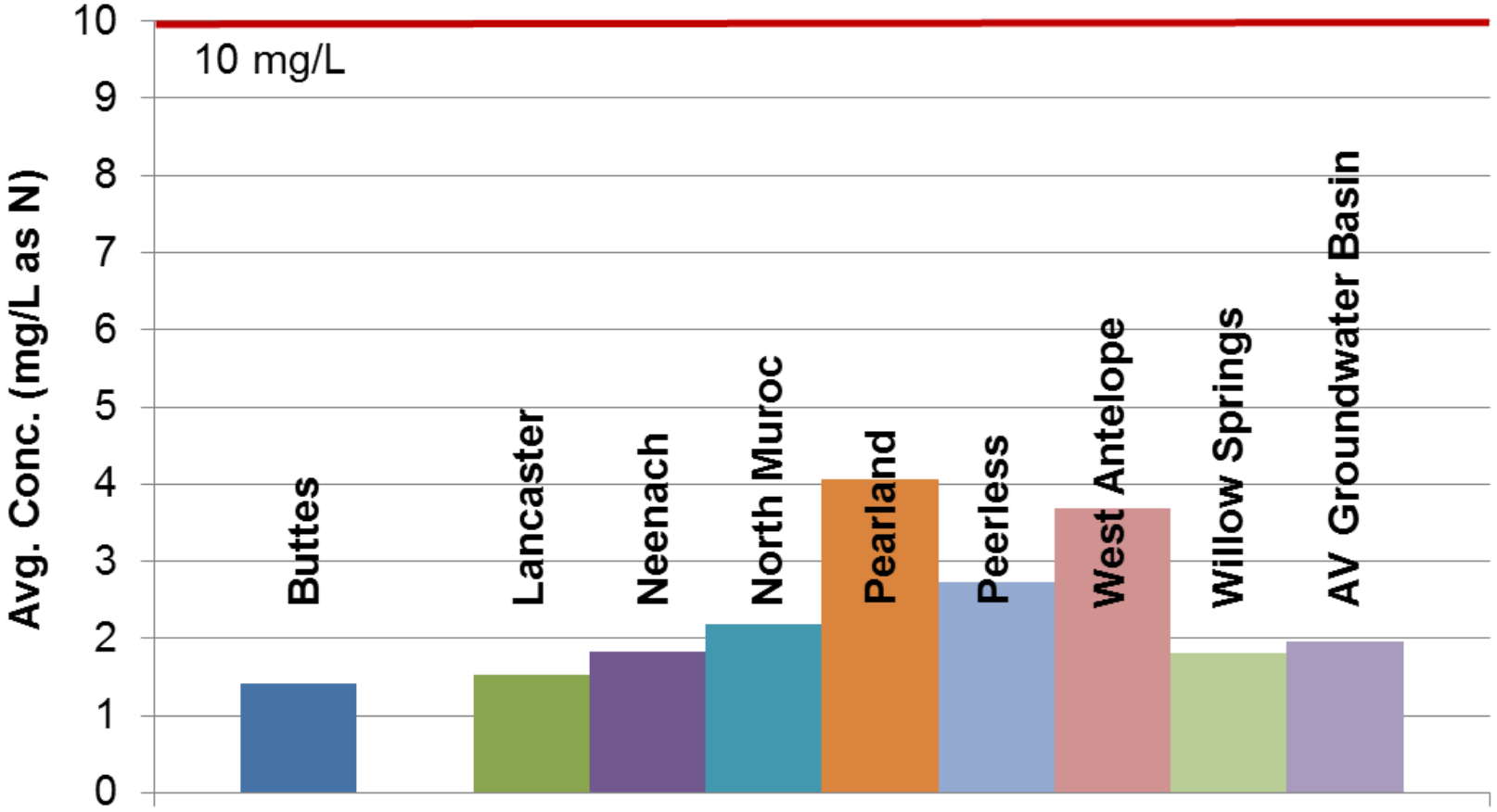
Nitrate



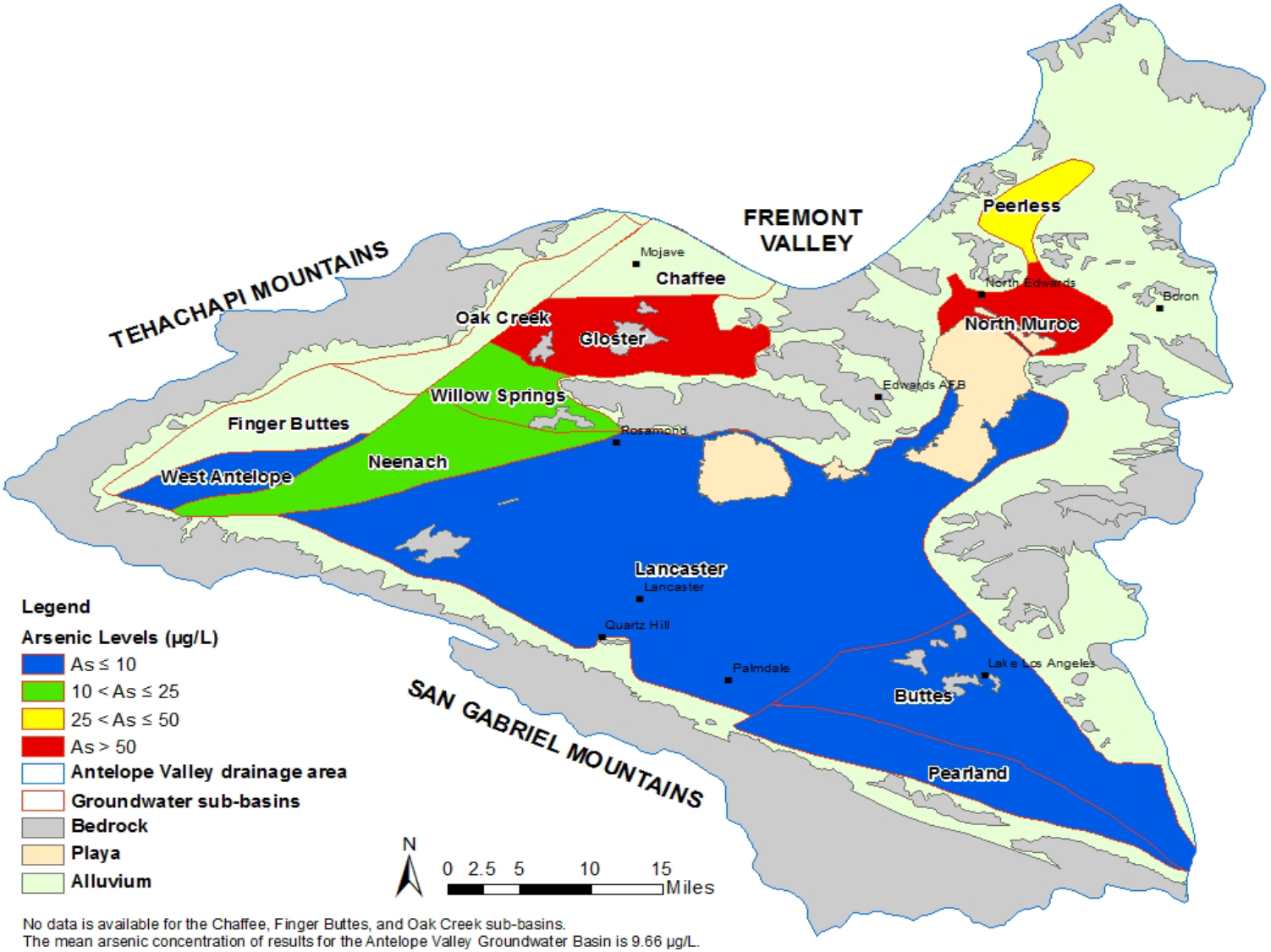
No data is available for the Chaffee, Gloster, Finger Buttes, and Oak Creek sub-basins.
The mean nitrate + nitrite concentration of results for the Antelope Valley Groundwater Basin is 1.97 mg/L as nitrogen.

Assimilative Capacity

Nitrate



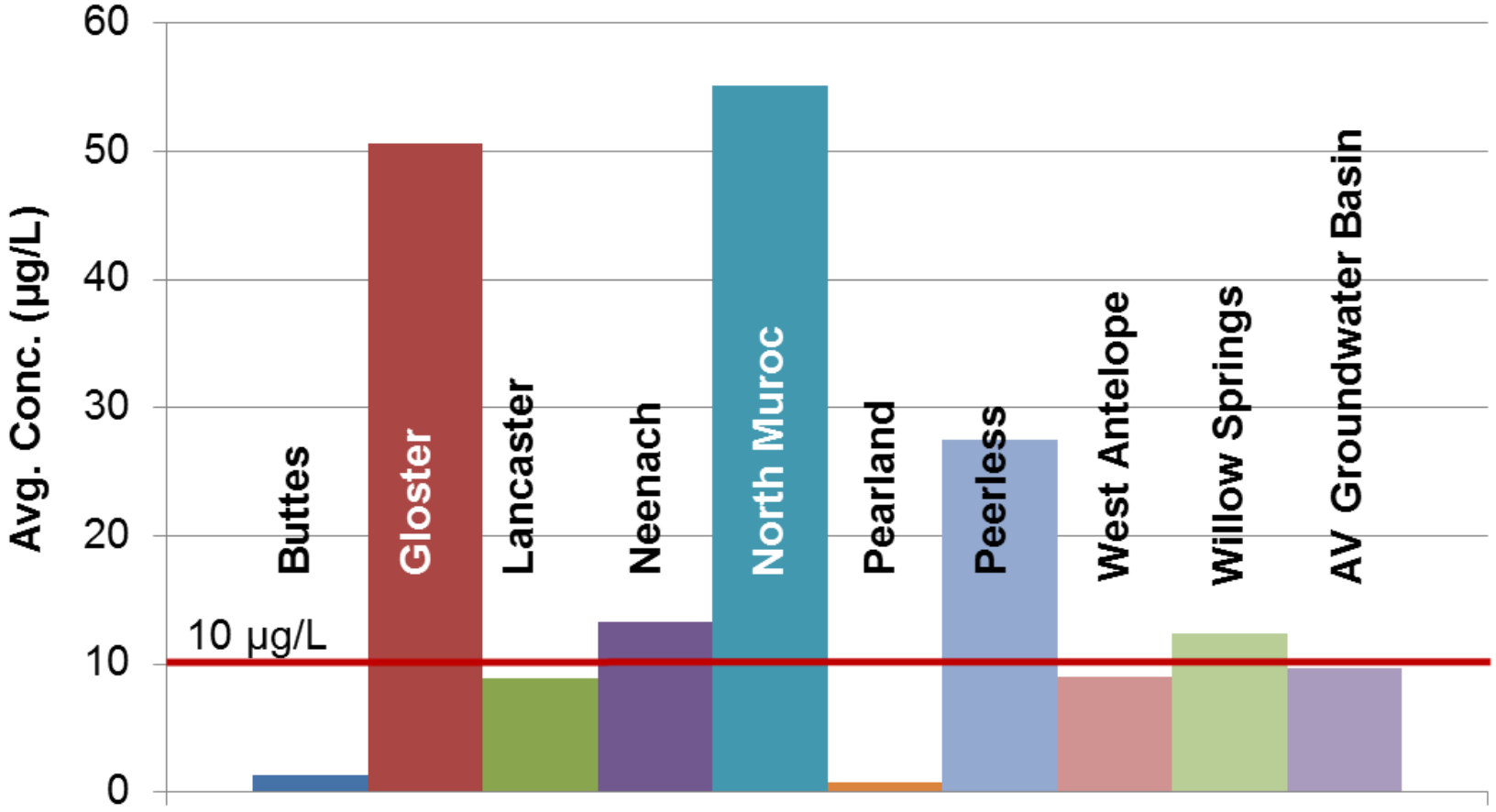
Arsenic



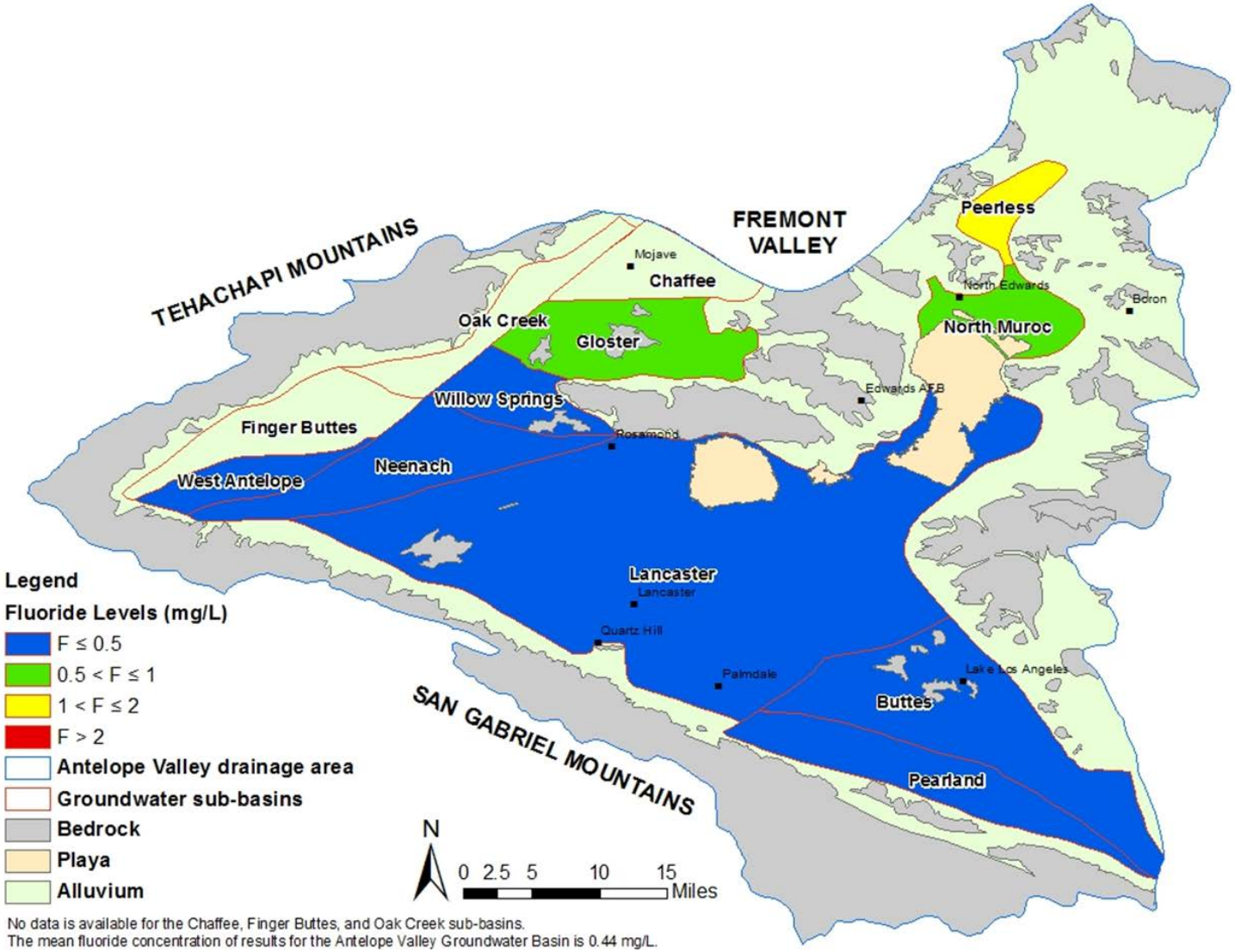
No data is available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.
The mean arsenic concentration of results for the Antelope Valley Groundwater Basin is 9.66 µg/L.

Assimilative Capacity

Arsenic

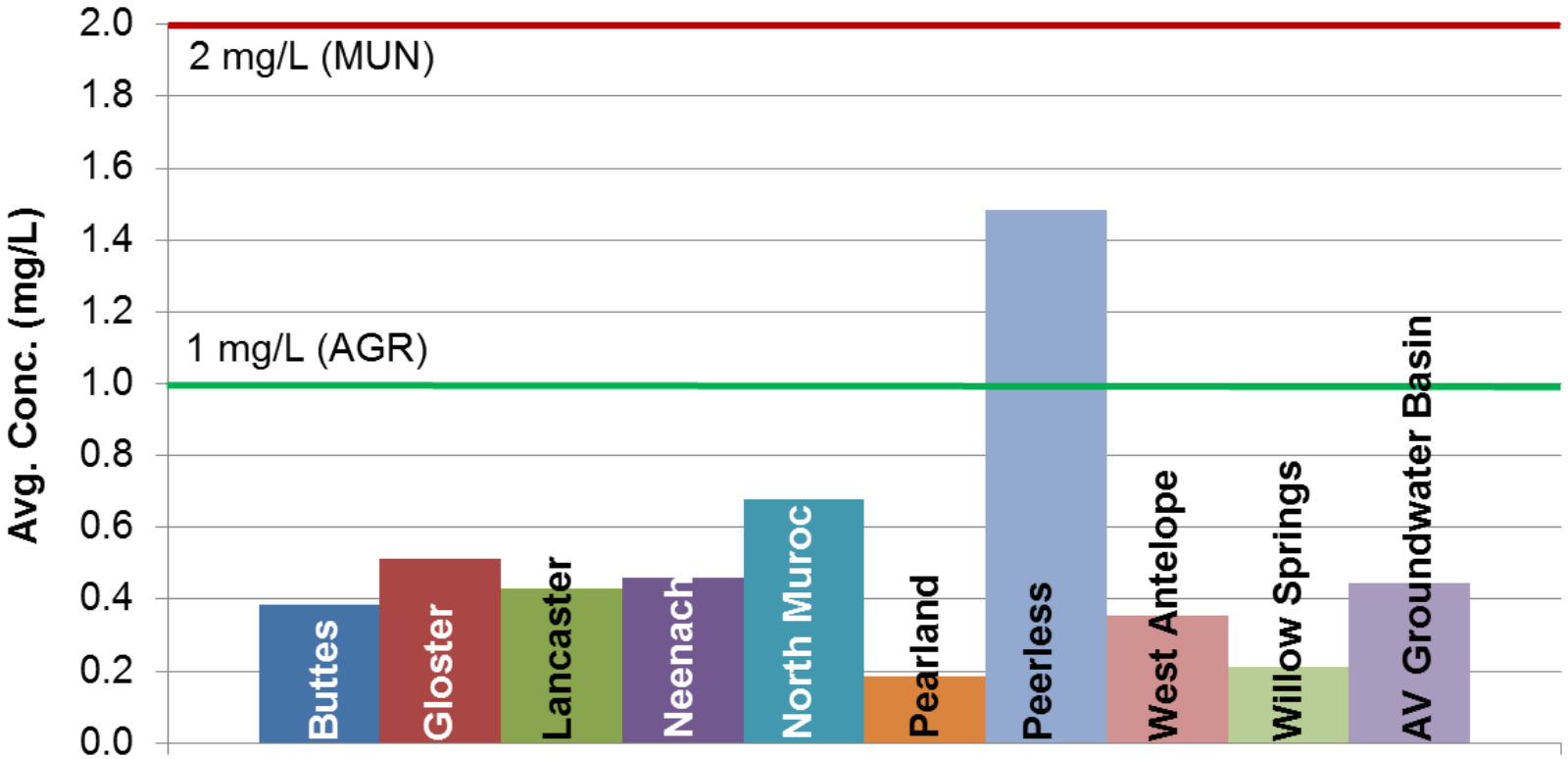


Fluoride

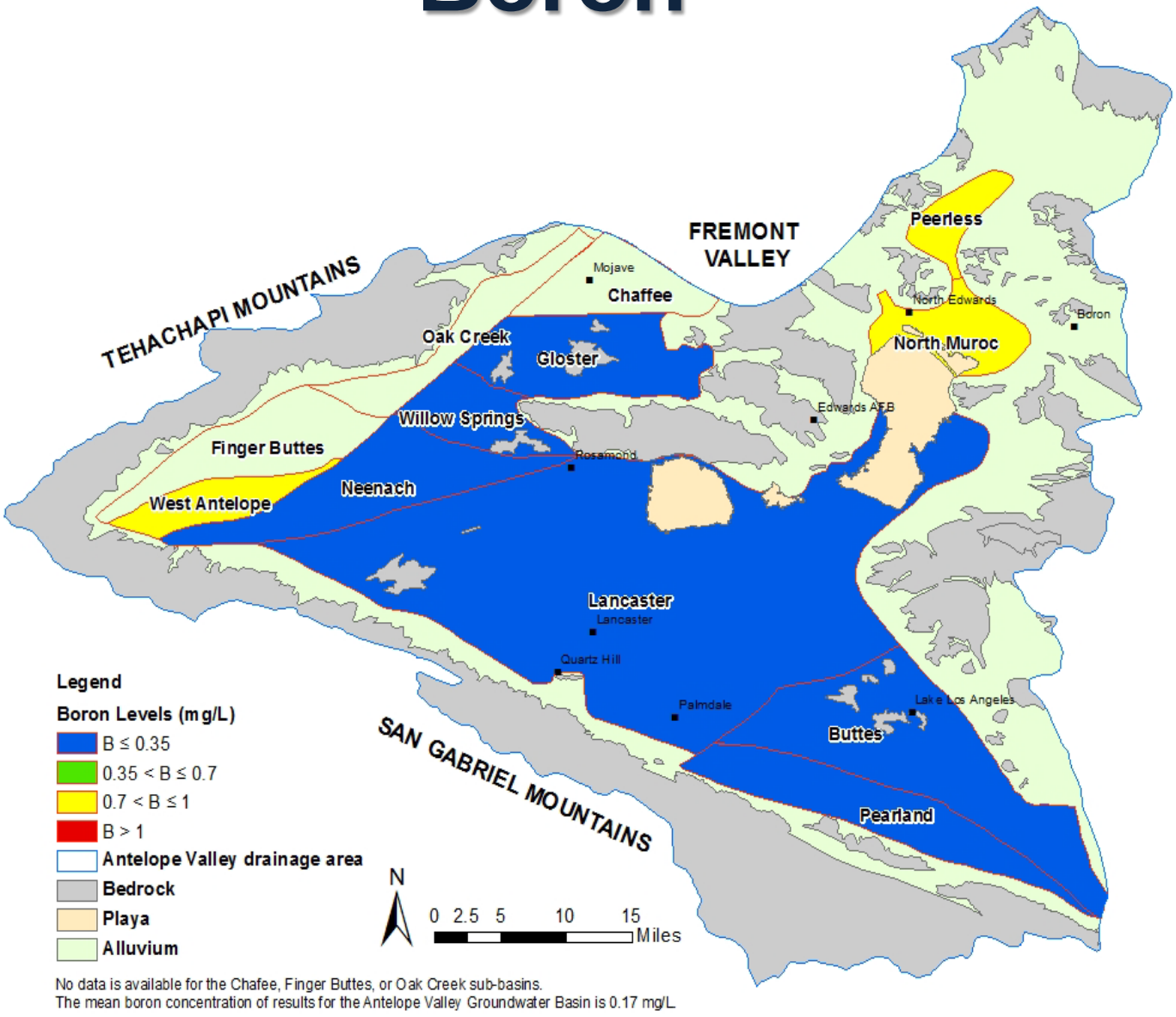


No data is available for the Chaffee, Finger Buttes, and Oak Creek sub-basins.
The mean fluoride concentration of results for the Antelope Valley Groundwater Basin is 0.44 mg/L.

Assimilative Capacity
Fluoride



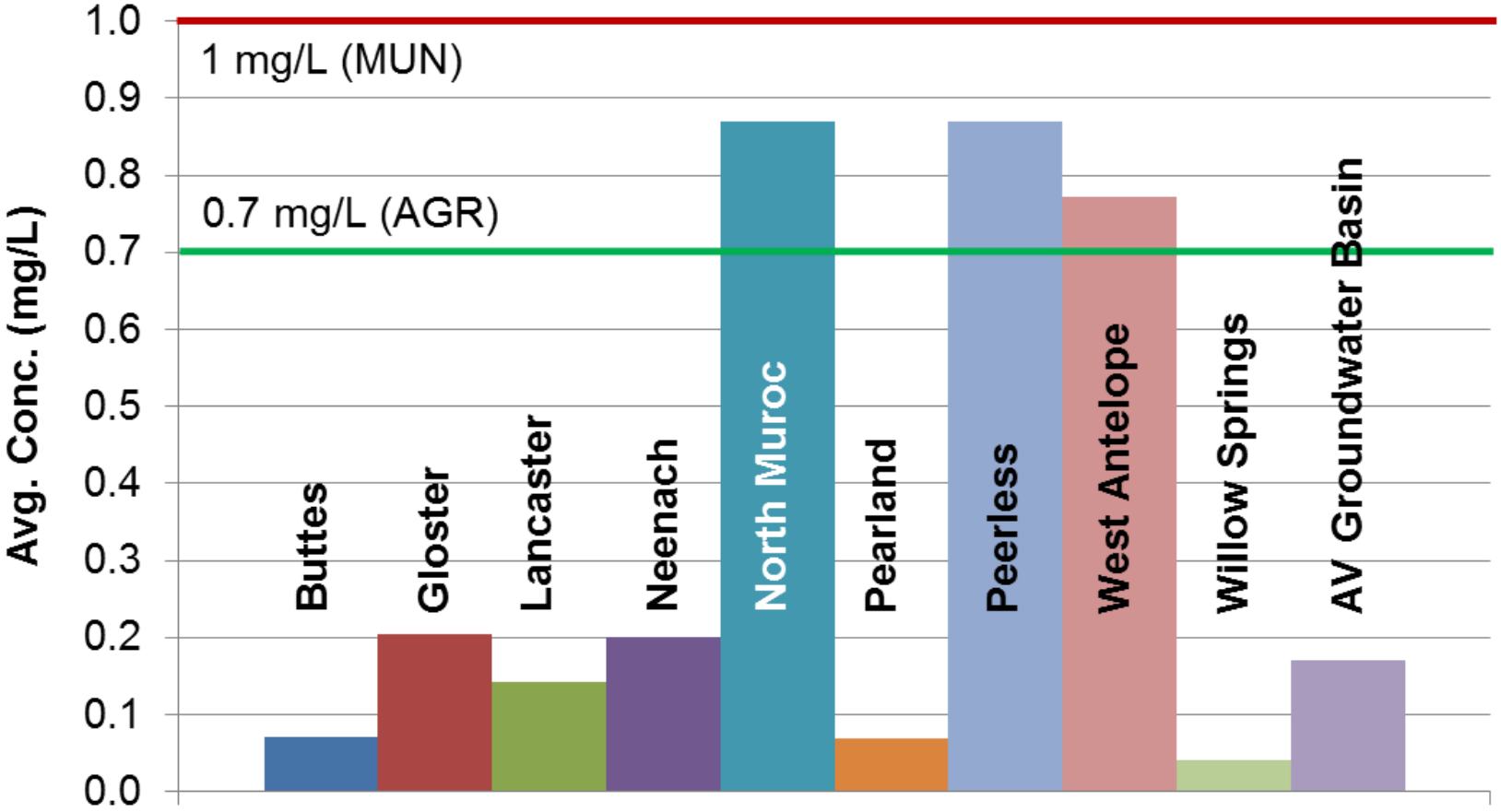
Boron



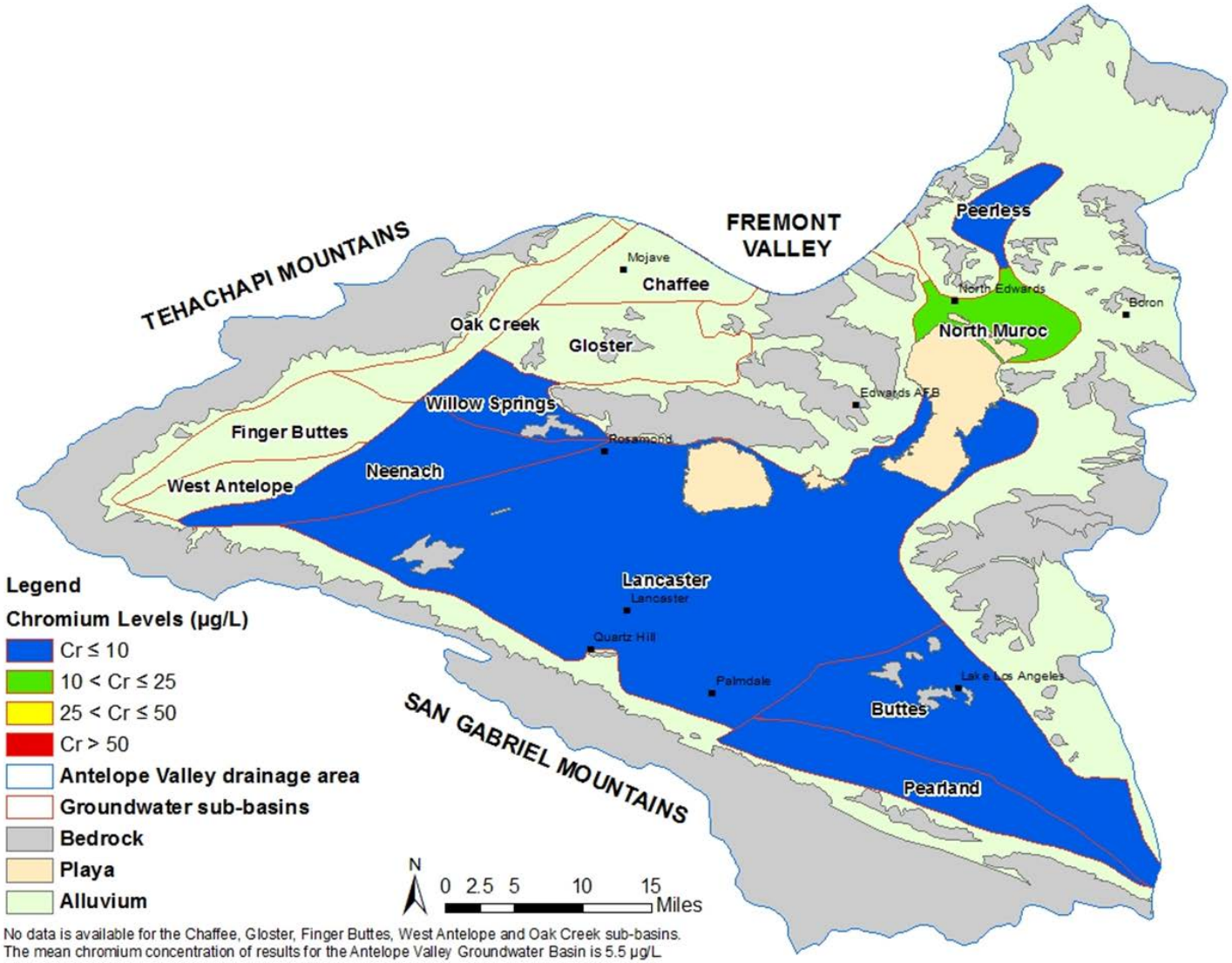
No data is available for the Chafee, Finger Buttes, or Oak Creek sub-basins.
The mean boron concentration of results for the Antelope Valley Groundwater Basin is 0.17 mg/L

Assimilative Capacity

Boron

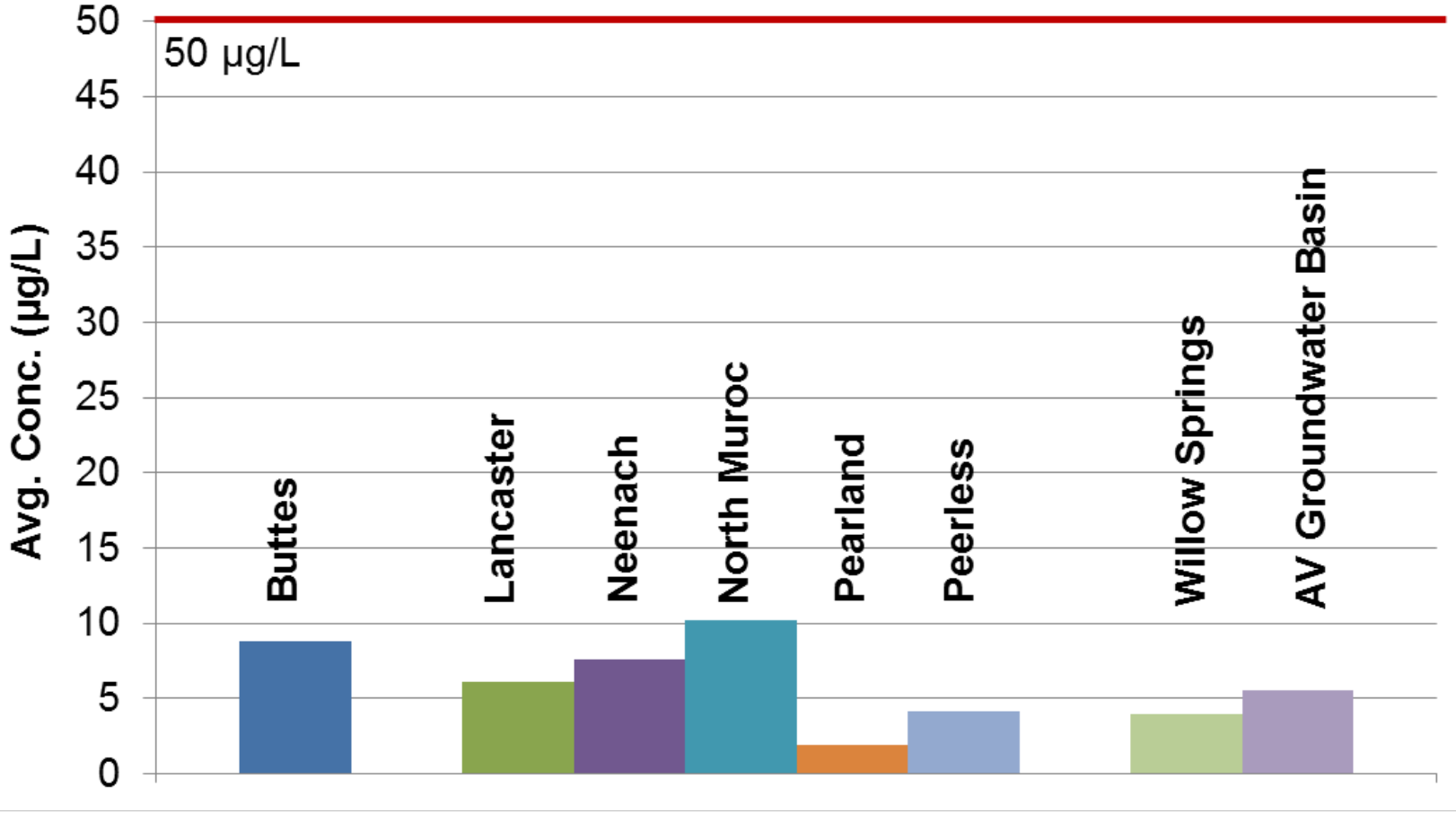


Total Chromium



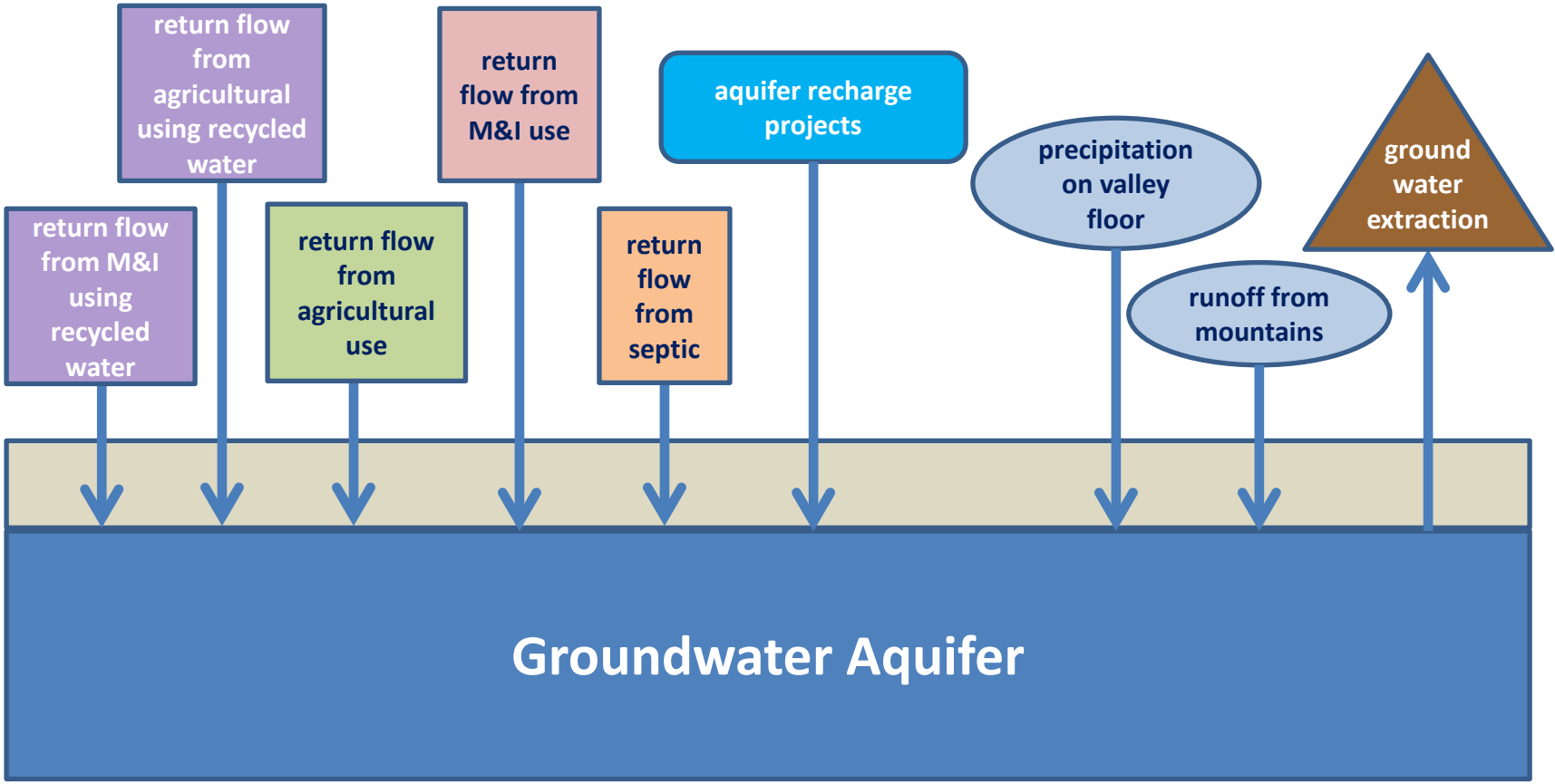
No data is available for the Chaffee, Gloster, Finger Buttes, West Antelope and Oak Creek sub-basins.
The mean chromium concentration of results for the Antelope Valley Groundwater Basin is 5.5 µg/L

Assimilative Capacity
Chromium



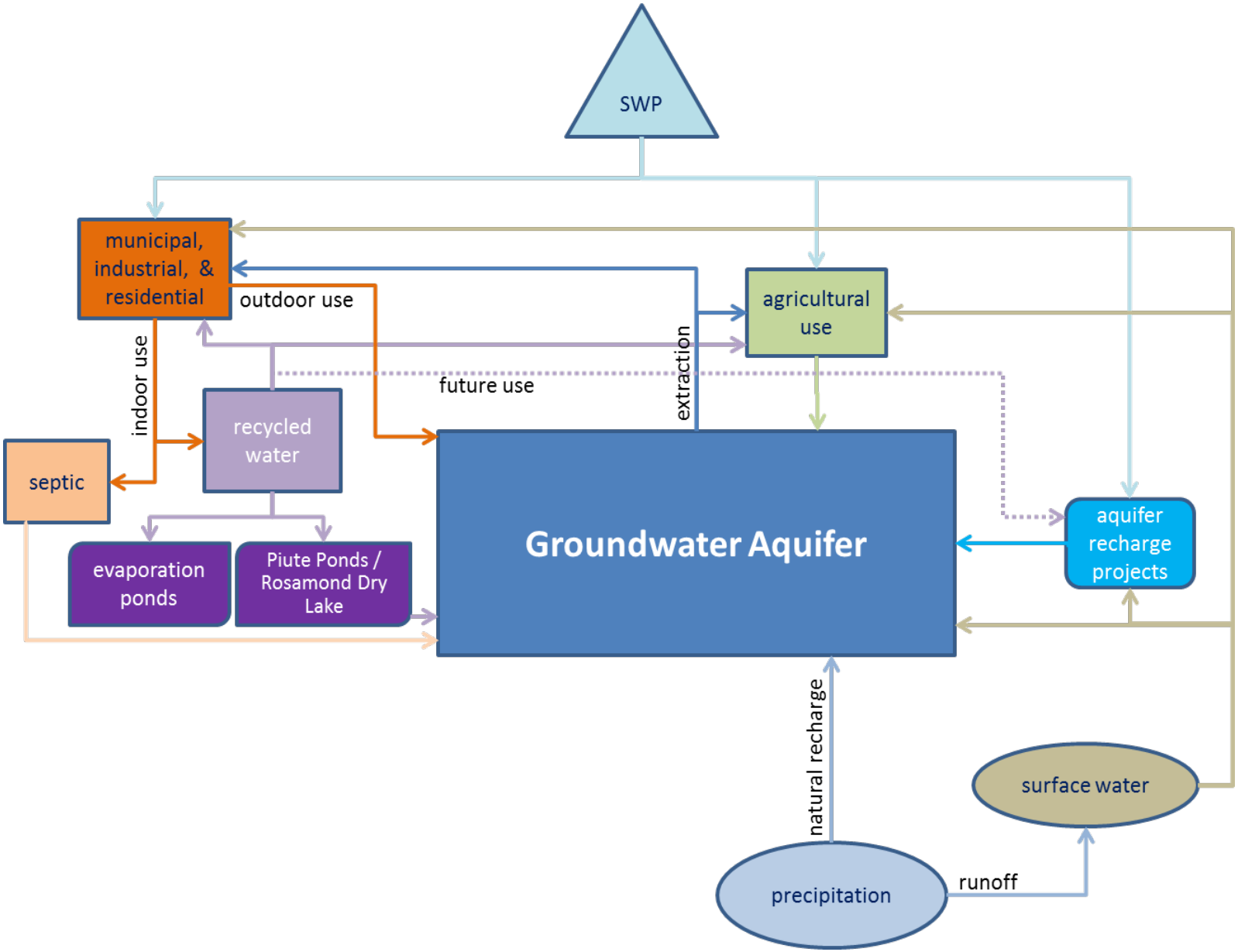
Water Quality Balance

Aquifer Loading & Unloading

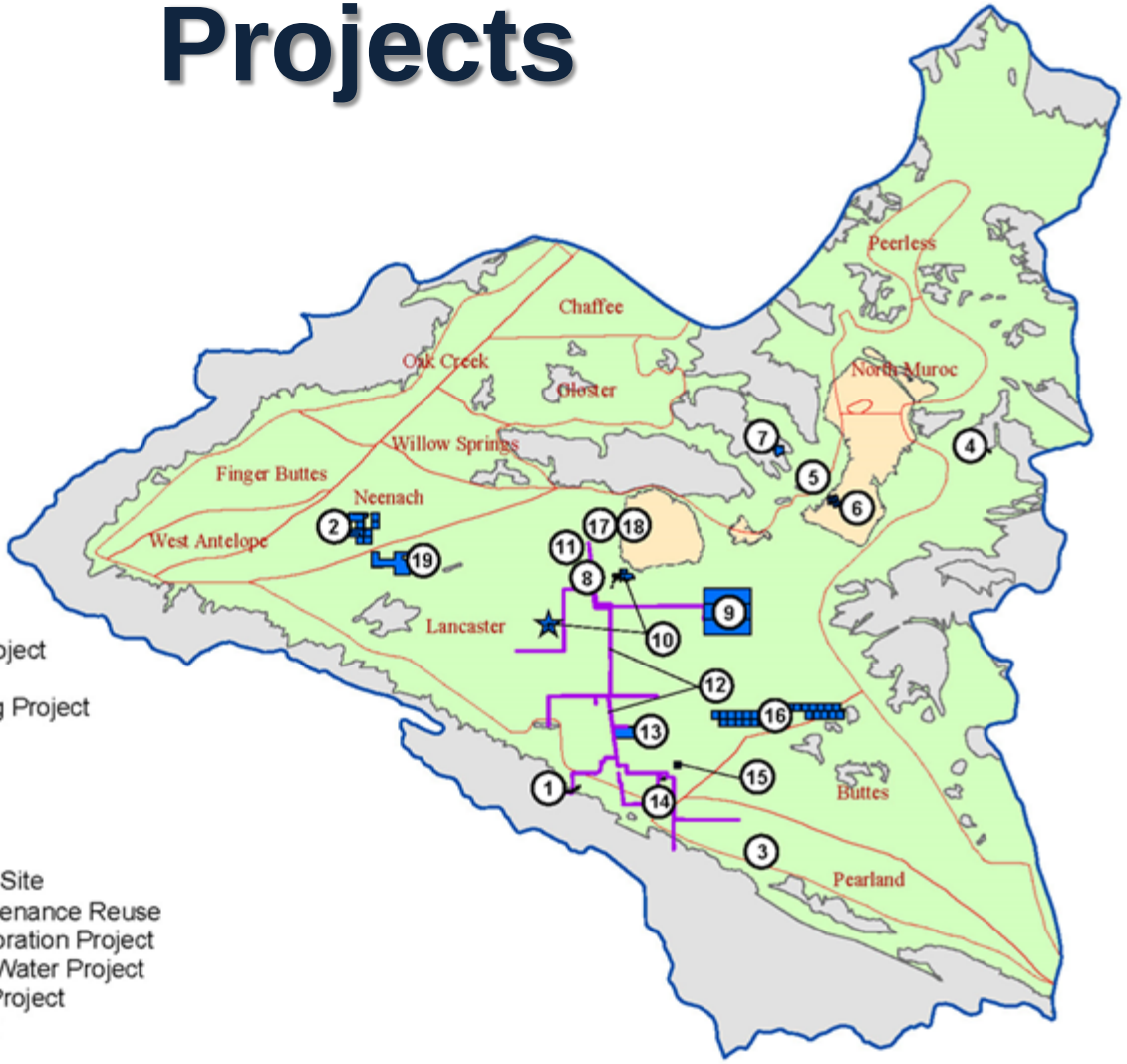


Considered insignificant:
– subsurface inflow from other basins
– subsurface outflow

Mass Balance



Current and Future Water Projects



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

Source Water Quality

Constituent	Average Concentration (mg/L, unless otherwise noted)							
	State Water Project (California Aqueduct)		WRP/WWTP (Recycled Water)					Stormwater
	Raw [a]	Treated, potable [a]	Palmdale [b]	Lancaster [b]	Air Force Research Lab [c]	EAFB Main Base [d]	RCSD [e]	Littlerock Reservoir [f]
TDS	300	285	489	444	430	815	-	152
Chloride	85	84	158	128	50	330	-	3.7
Nitrate as N	0.90	0.93	3.07	6.31	3.3	16	6	0.08
Arsenic (µg/L)	3.8	1.3	< 1	< 1	7.2	2.3	-	< 2
Fluoride	0.1	0.1	-	-	-	0.36	-	0.3
Boron	0.162	0.188	-	-	0.25	0.67	-	< 0.1
Chromium (µg/L)	< 10	< 10	< 0.5	< 0.5	< 10	< 10	-	< 10

Data Sources:

(a) AVEK Annual Water Quality Report s(2001-2010) - Los Angeles County System; Kern County System. Boron was tested only in 2009.
(b) 2013 LACSD Annual Monitoring Report – Lancaster WRP; Palmdale WRP. Tertiary treated effluent water quality.
(c) 2011 EAFB Air Force Research Laboratory (AFRL) Treatment Plant Annual Monitoring Report.
(d) 2012 EAFB Main Base WWTP Annual Monitoring Report.
(e) Water quality in May 2013 for RCSD WWTP. Additional water quality testing after RCSD obtains permit from the Lahontan Regional Board.
(f) PWD water quality (2001-2010).

Conservative Preliminary Screening Analysis

Constituent	Baseline Basin Conc. (mg/L)	Baseline Basin Mass[a] (tons)	Recycled Water Avg. Conc. (mg/L)	Total Mass to Basin in 25 Years[b] (tons)	Basin Conc. After 25 Years (mg/L)	Assimilative Capacity Used
TDS	350	26,000,000	545	5,100,000	418	68%
Chloride	38.4	2,900,000	167	1,600,000	59	10%
Nitrate as N	1.97	150,000	7	66,000	2.8	11%
Arsenic	0.0097	720	0.0055	52	0.0103	>100%
Fluoride	0.44	33,000	0.36	3,400	0.5	8%
Boron	0.17	13,000	0.6	5,600	0.25	14%
Chromium	0.0055	410	0.01[c]	94	0.006	3%

[a] Assume volume of the aquifer is 55 million AF.
[b] Assume mass from entire volume of contracted imported (165,000 AFY) and sustainable yield (110,500 AFY).
[c] Detection limit concentration is used.

Model Flow Assumptions

Summary Export Report

(AV Groundwater Adjudication Case Summary Export Report for Phase 3 – Basin Yield and Overdraft; Beeby et al; 2010)

- Imported water flows and use (ag vs M&I)
- M&I use
  - indoor vs outdoor vs consumptively used
  - sewer vs unsewered
- Natural recharge
- Return flows from each use
- Pumped groundwater = sustainable yield (total inflow)
- Aquifer volume
- Land use (ag vs. M&I)

Model Water Quality Assumptions

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

Model Scenarios

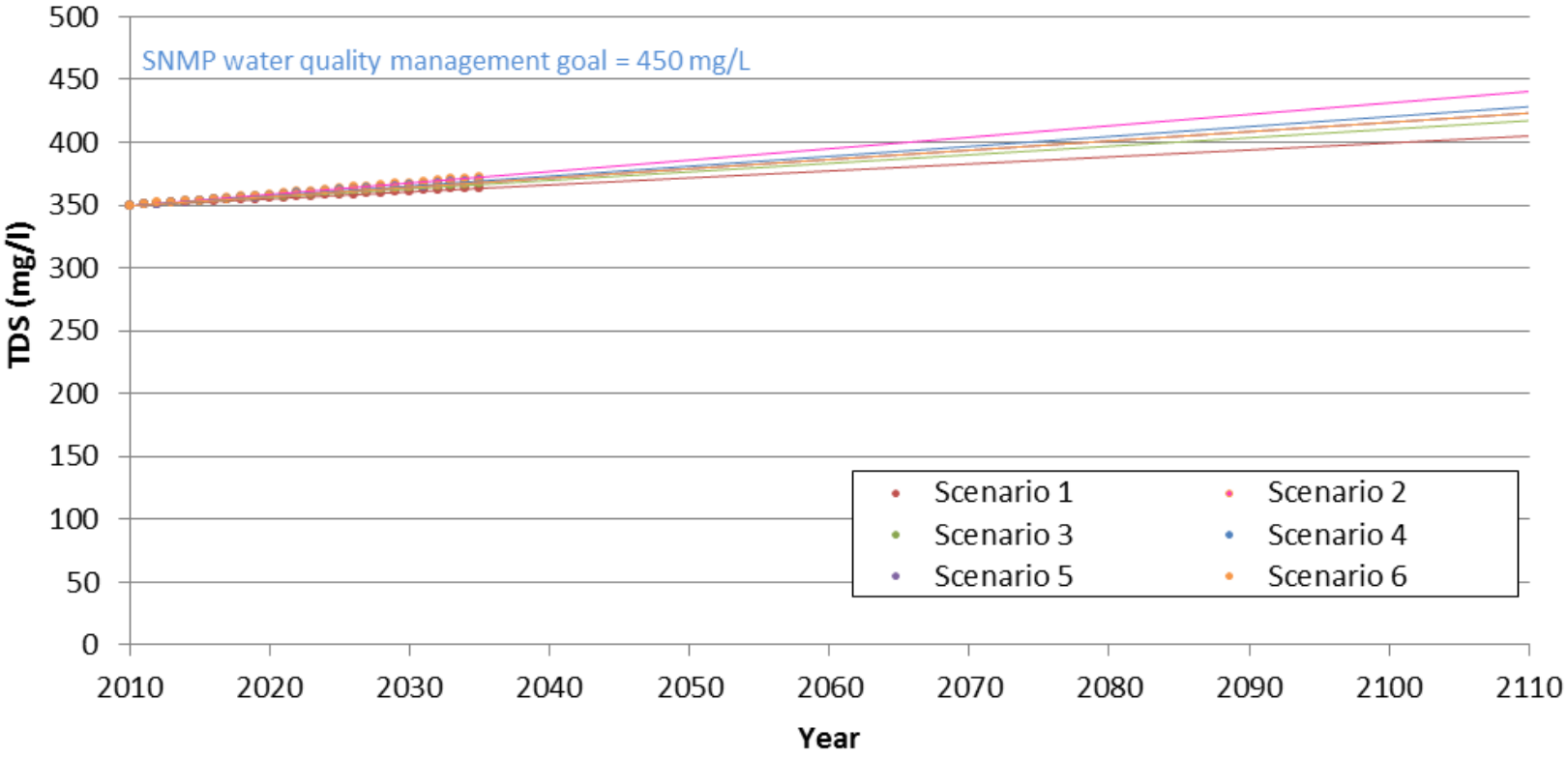
- Scenario 1: Base Case
- Scenario 2: Implement All Future Projects
- Scenario 3: Recycled Water Projects Only
- Scenario 4: Recycled Water & 50% of Groundwater Recharge Projects
- Scenario 5: Recycled Water & 25% of Groundwater Recharge Projects
- Scenario 6: Extreme Drought

Concentration Projections

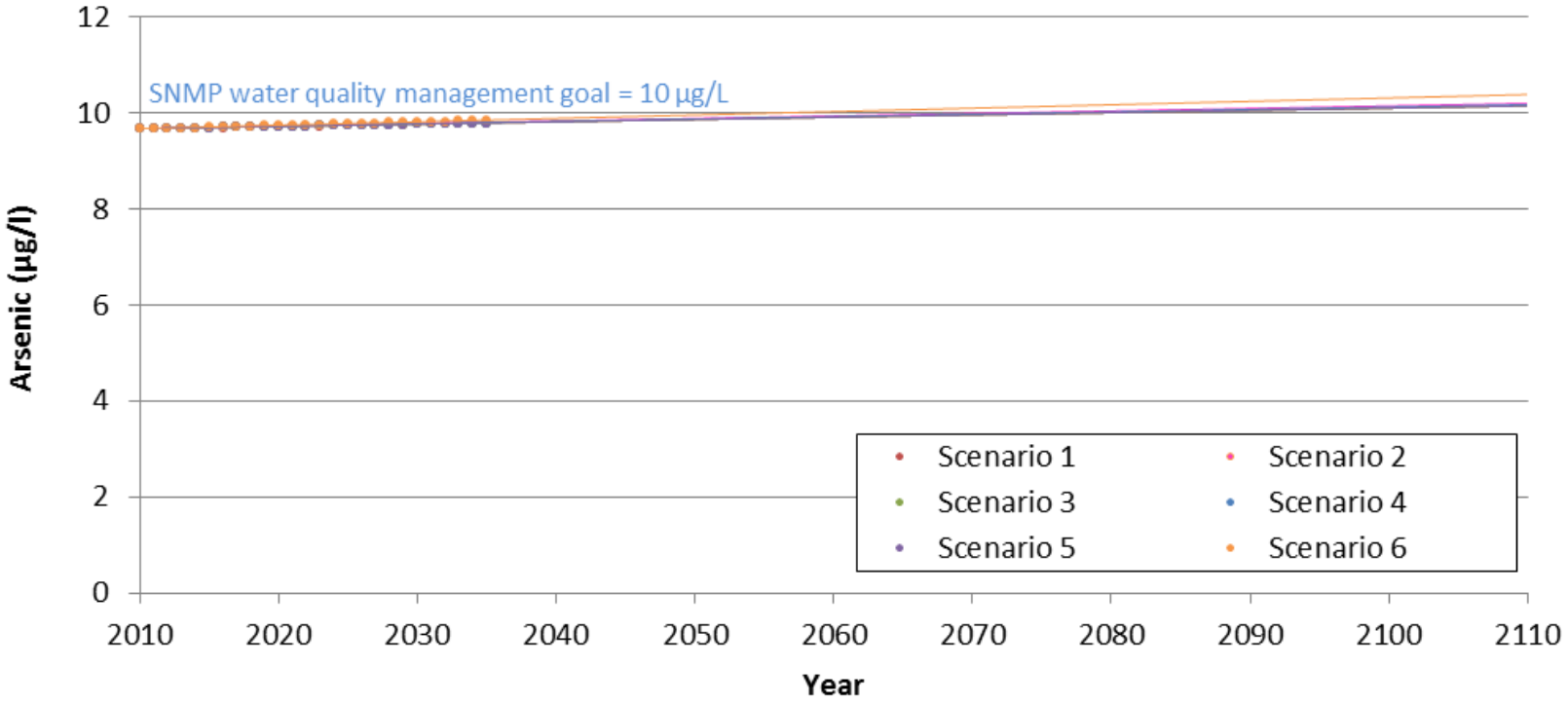
Scenario	Concentration in 2035		Concentration in 2110		Years to Reach SNMP Water Quality Management Goal	
	TDS	Arsenic	TDS	Arsenic	TDS	Arsenic
	mg/L	µg/L	mg/L	µg/L	450 / 500 mg/L	10 µg/L
1 (base)	364	9.78	404	10.13	184 / 276	72
2 (RW)	371	9.79	438	10.19	113 / 170	64
3 (all)	366	9.78	416	10.14	151 / 227	70
4 (25% GWR)	369	9.79	427	10.17	129 / 194	66
5 (50% GWR)	368	9.79	422	10.15	139 / 209	69
6 (drought)	368	9.84	422	10.38	139 / 208	47

Note: Baseline = 350 mg/L of TDS and 9.66 µg/L of arsenic.

TDS


SNMP water quality management goal = 450 mg/L
TDS (mg/l)
500
450
400
350
300
250
200
150
100
50
0
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
2110
Year
Scenario 1
Scenario 2
Scenario 3
Scenario 4
Scenario 5
Scenario 6

Arsenic


SNMP water quality management goal = 10 µg/L
Arsenic (µg/l)
Year
0
2
4
6
8
10
12
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
2110
Scenario 1
Scenario 2
Scenario 3
Scenario 4
Scenario 5
Scenario 6

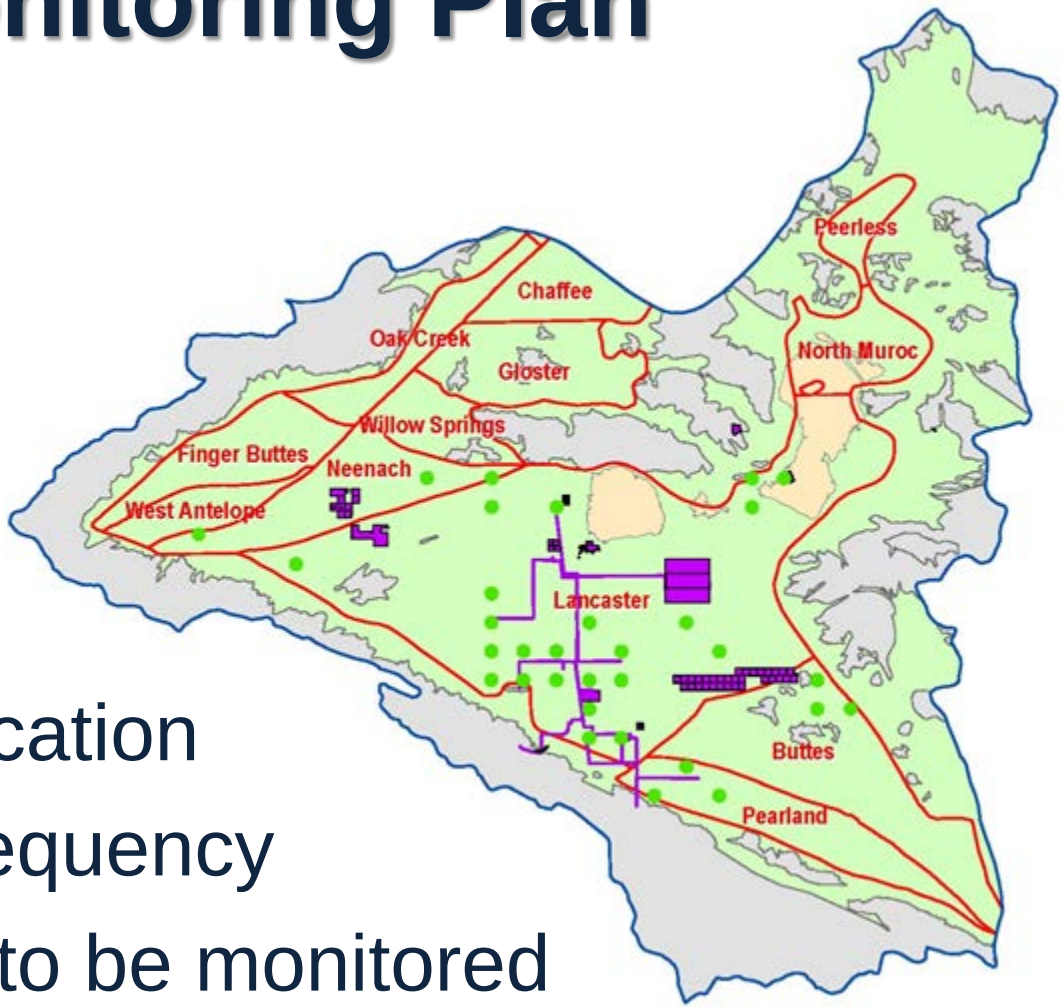
Assimilative Capacity Usage

Scenario	Concentration increase in 10, 25 Years				Assimilative capacity used			
	TDS (mg/L)		Arsenic (µg/L)		TDS		Arsenic	
	10 yrs	25 yrs	10 yrs	25 yrs	10 yrs	25 yrs	10 yrs	25 yrs
1 (base)	5	14	0.05	0.12	5%	14%	14%	35%
2 (RW)	8	21	0.05	0.13	8%	21%	15%	39%
3 (all)	7	16	0.05	0.12	7%	16%	14%	35%
4 (25% GWR)	8	19	0.05	0.13	8%	19%	15%	37%
5 (50% GWR)	7	18	0.05	0.12	7%	18%	14%	36%
6 (drought)	7	18	0.07	0.18	7%	18%	21%	53%

Antidegradation Analysis

- The water quality changes:
  - will not result in water quality less than prescribed in the Basin Plan.
  - will not unreasonably affect present & anticipated beneficial uses.
  - are consistent with the maximum benefit to the people of the state.
- 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.

Monitoring Plan



- Monitoring location
- Monitoring frequency
- Constituents to be monitored
- Data evaluation and reporting

Data Evaluation

- Determine current ambient conditions
- Compare to baseline, water quality management goals, and to model predictions
- Update future & current projects list
- Update and calibrate the SNMP Model
- Discuss the adequacy of the AV SNMP

Managing Salts & Nutrients on a Sustainable Basis

- Municipal wastewater management
- Recycled water irrigation
- Groundwater management
- Onsite wastewater treatment systems
- Agriculture
- Additional implementation measures

SNMP for the Antelope Valley

- Address regional salt & nutrient loading and management
- Demonstrates use of recycled water and other water uses will not degrade the groundwater quality
- Continued management will protect groundwater quality and its uses
- Partnering opportunities and project funding for developing and protecting water supplies




Questions?