Desktop Groundwater Contaminant Mobilization Study

Zone 7 Water Resources Committee

January 23, 2024

Agenda

Background

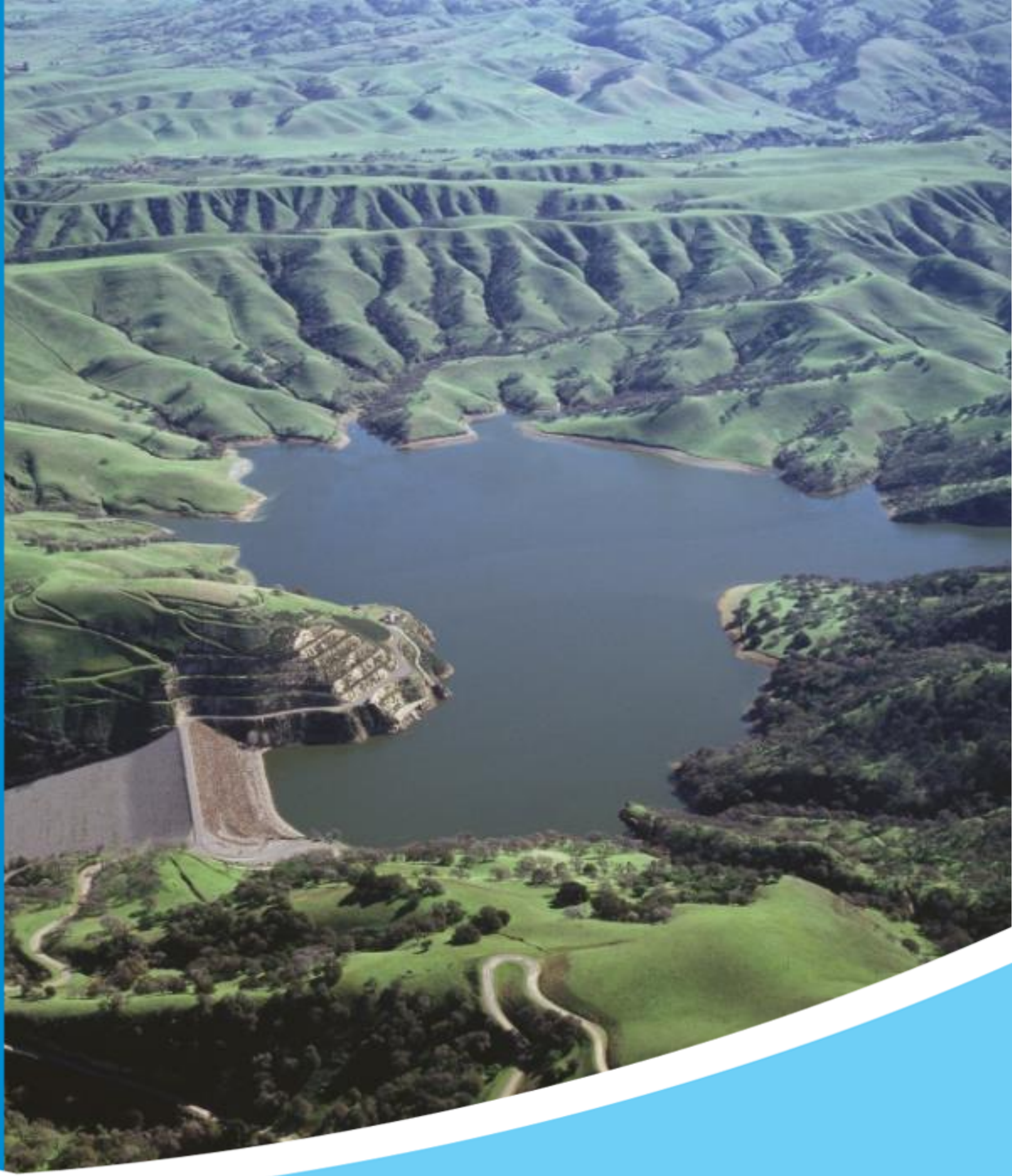
Overview

Results

Takeaways

Questions

Background



Project Supports Zone 7's Strategic Plan

GOAL A
Reliable Water Supply and Infrastructure

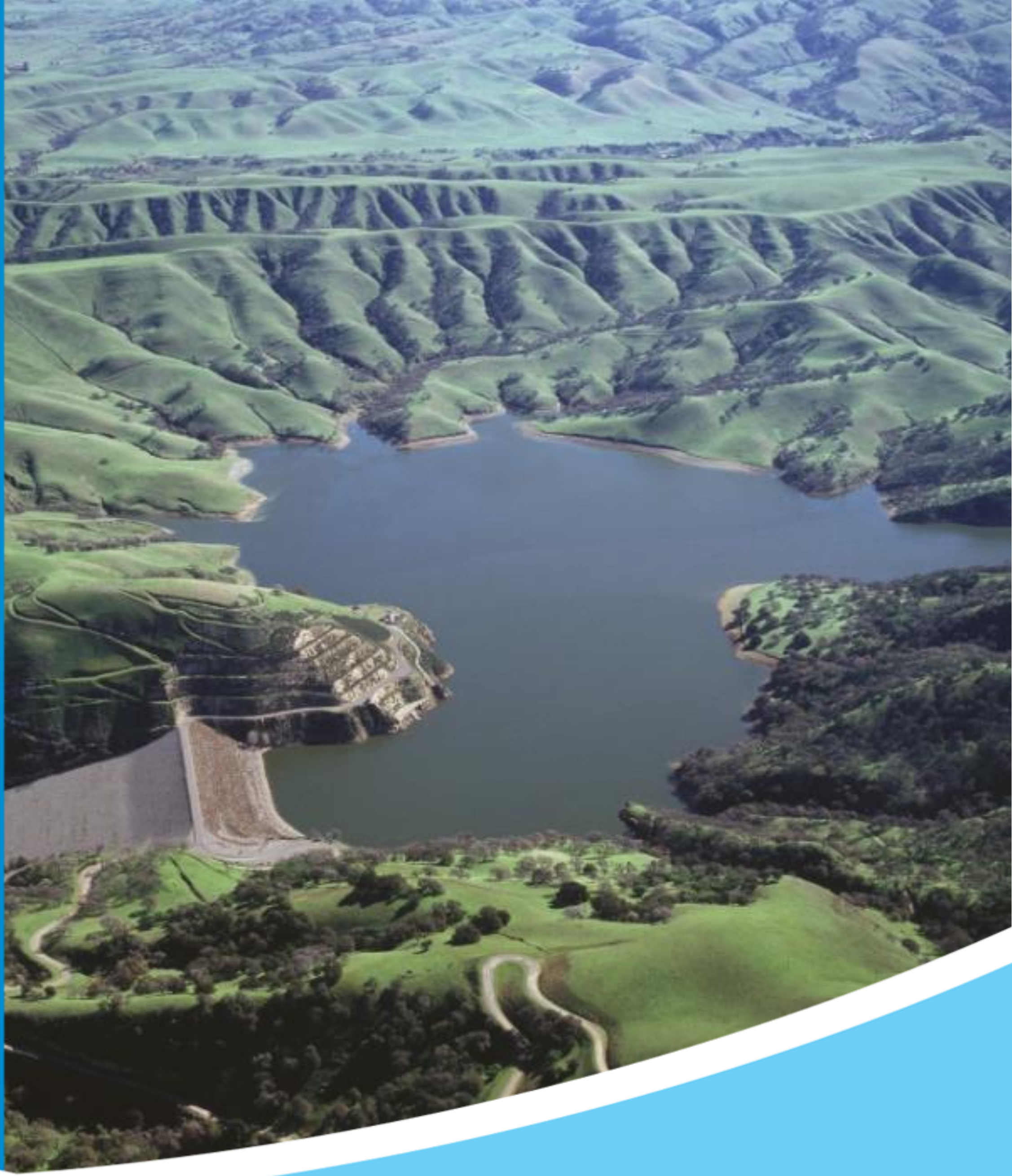
Provide customers with reliable water supply and infrastructure.

Initiative 2
Evaluate and develop appropriate new water supply and reliability opportunities

Background

- In 2018, Zone 7 and its four retailers completed the Potable Reuse Study
- Potable Reuse Study Goals:
  - Evaluate feasibility of wide range of potable reuse options
  - If potable reuse is found to be feasible, recommend next steps
- The Potable Reuse study found that potable reuse for the Tri-Valley is technically feasible and identified no fatal flaws
- One of the next steps identified in the Potable Reuse study was to characterize the potential for contaminant mobilization in the Livermore Valley Groundwater Basin

Overview



Study Overview

Objectives

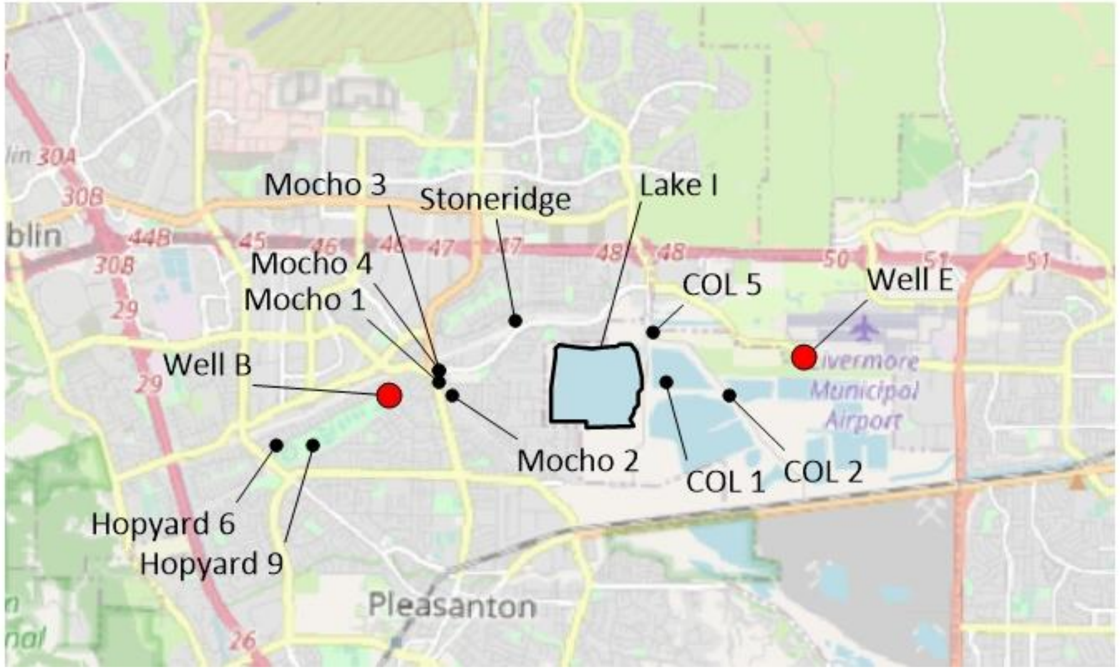
- Evaluate potential water quality impacts from recharging purified water in the Livermore Valley Groundwater Basin
  - Characterize impacts to naturally occurring constituents
- Identify future considerations for evaluating potable reuse

Approach

- Desktop simulation with U.S. Geological Survey's PHAST reactive transport model (based on Zone 7's groundwater flow model) and PHREEQC geochemical simulator module
- Simulate four purified water recharge scenarios based on short-listed options from Potable Reuse Study

Groundwater Recharge of Purified Water Scenarios

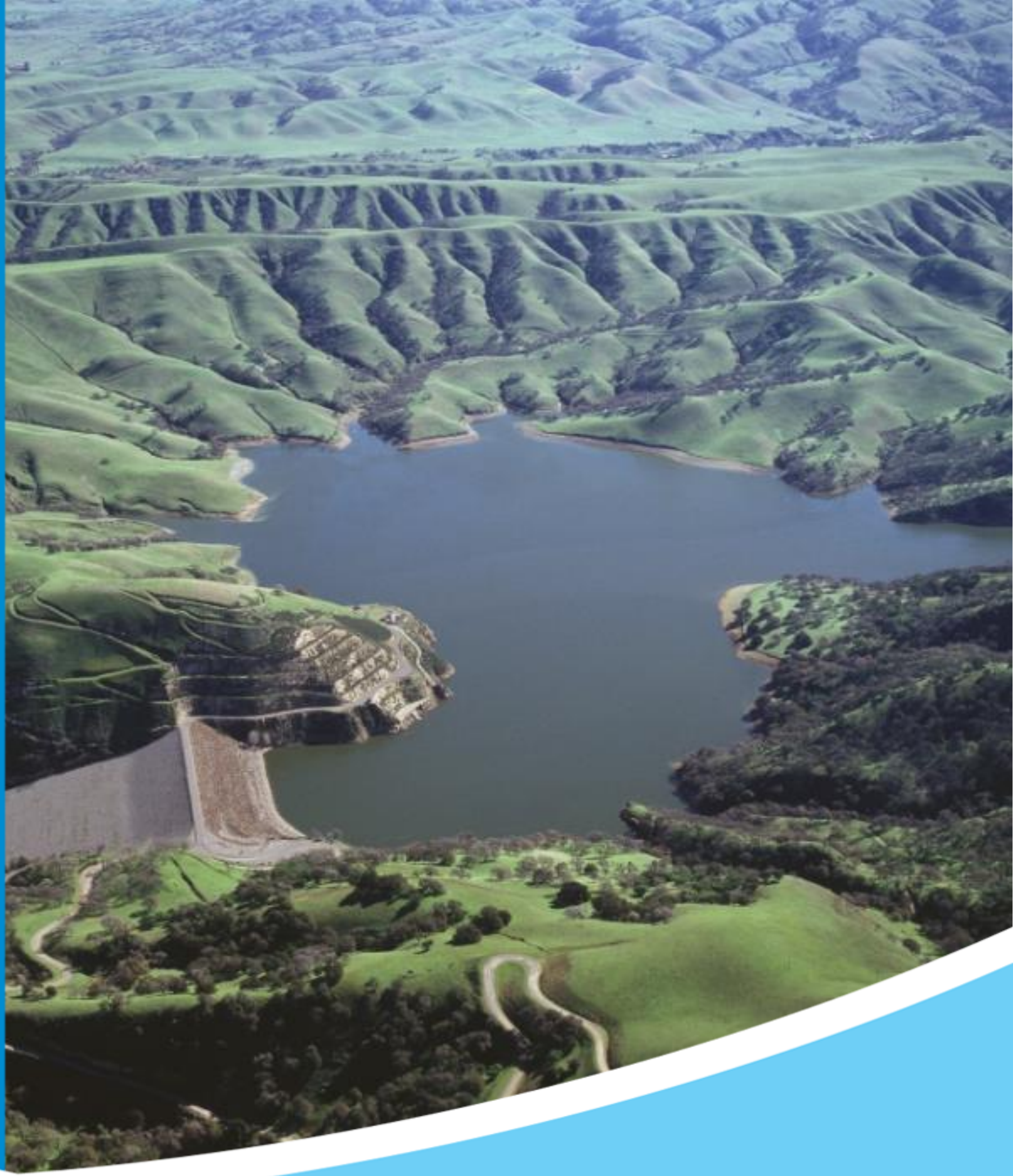
Scenario	Recharge Location	Recharge Rate[1] (AFY[2])
1	Surface Spreading in Lake I	3,600
2	Surface Spreading in Lake I	9,600
3	Hypothetical Injection Well E in Livermore	3,600
4	Hypothetical Injection Well B in Pleasanton	9,600



Notes:

1. Simulated recharge rates are not indicative of actual recharge capacity. Bookend recharge rates are used to analyze the sensitivity of aquifer response.
2. AFY = acre-feet per year

Results



Results Summary

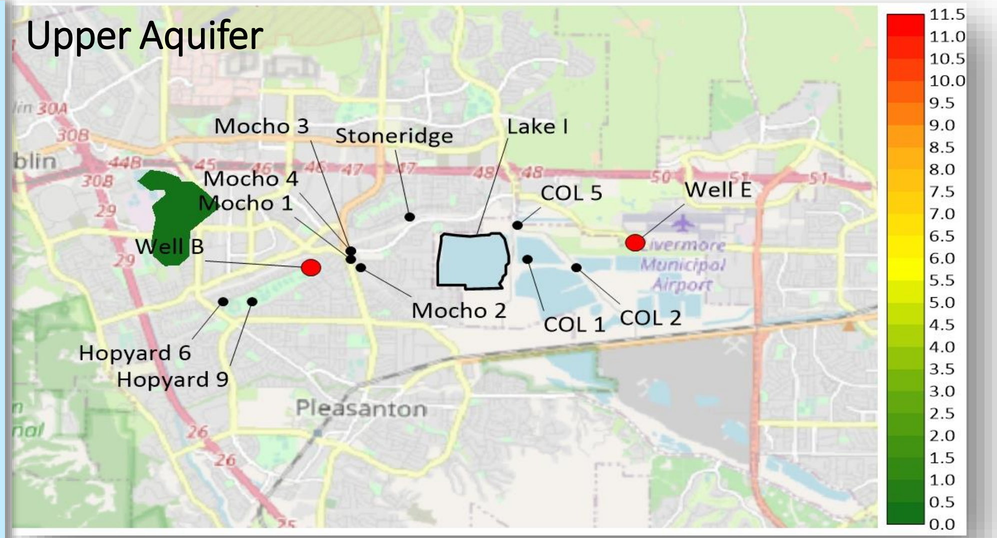
Constituent	Scenario 1: Lake I, 3,600 AFY	Scenario 2: Lake I, 9,600 AFY	Scenario 3: Well E, 3,600 AFY	Scenario 4: Well B, 9,600 AFY
Nitrate	↓	⬇	↓	⬇
Chloride	↓	↓	↓	⬇
Boron	↓	⬇	↓	⬇
pH	↑	⬆	↑	⬆
Arsenic	↑	↑	⬆	↑
Hexavalent Chromium	↑	⬆	⬆	⬆

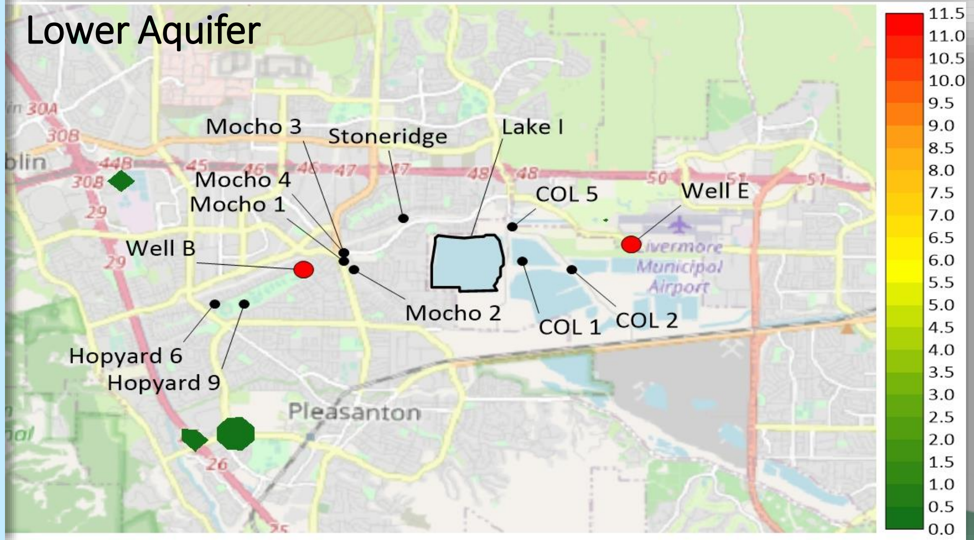
Legend

- ↓ Relatively smaller decrease
- ⬇ Relatively larger decrease
- ↑ Relatively smaller increase
- ⬆ Relatively larger increase

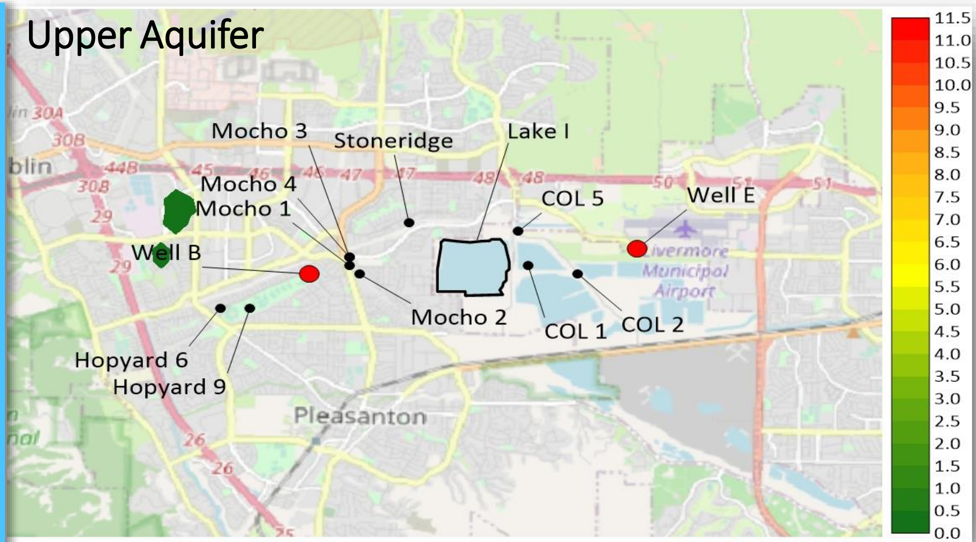
Arsenic MCL Exceedance (Scenarios 1 & 2)

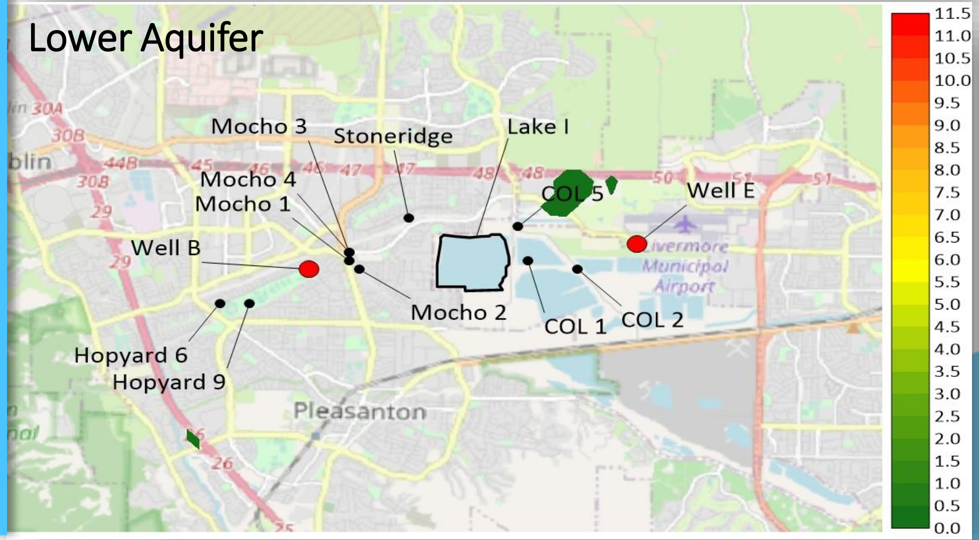
Scenario 1: Lake I, 3,600 AFY





Scenario 2: Lake I, 9,600 AFY

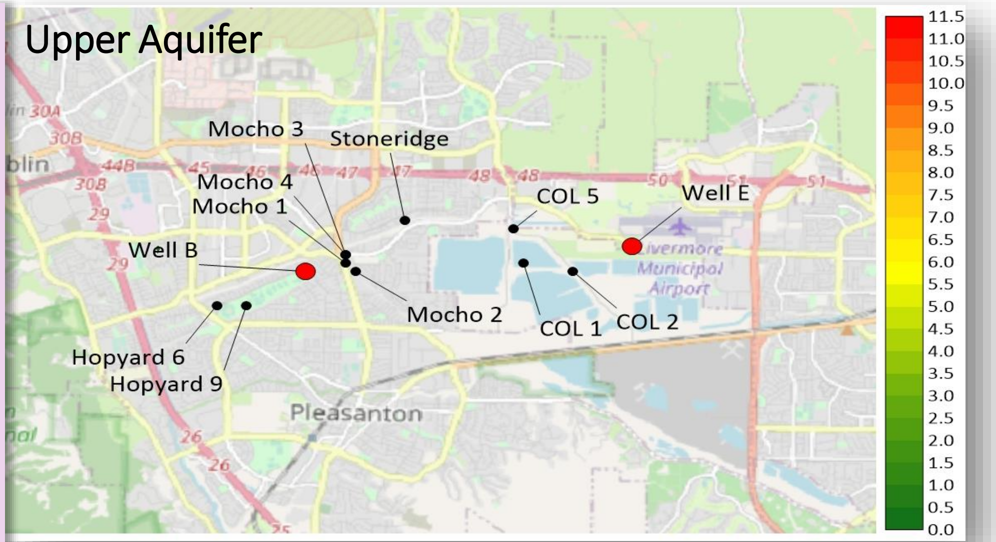


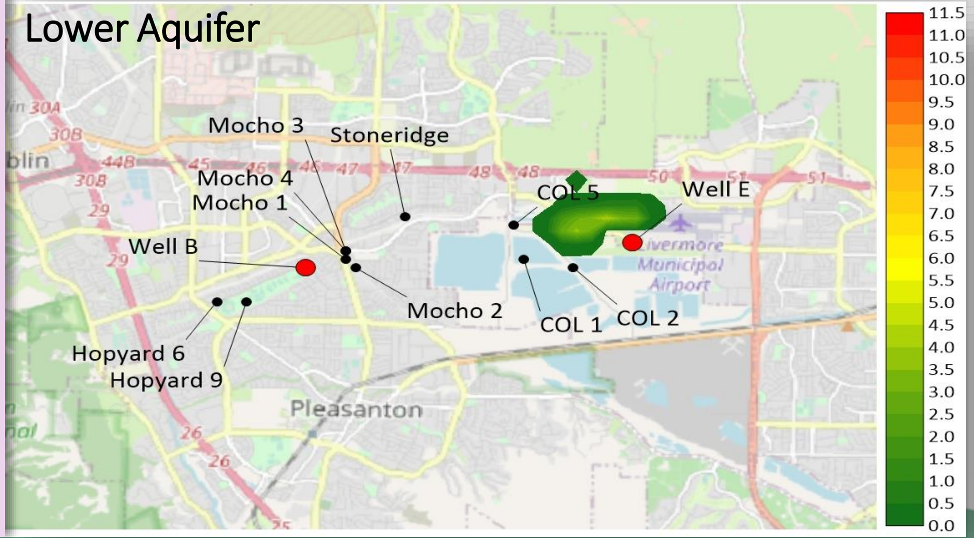


Scale: Change in Arsenic Resulting in MCL Exceedance (parts per billion)

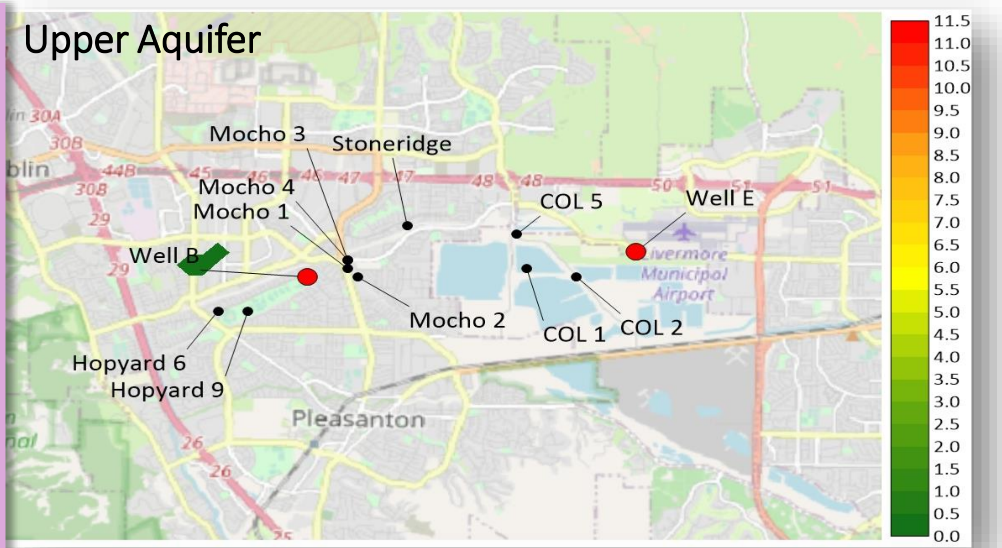
Arsenic MCL Exceedance (Scenarios 3 & 4)

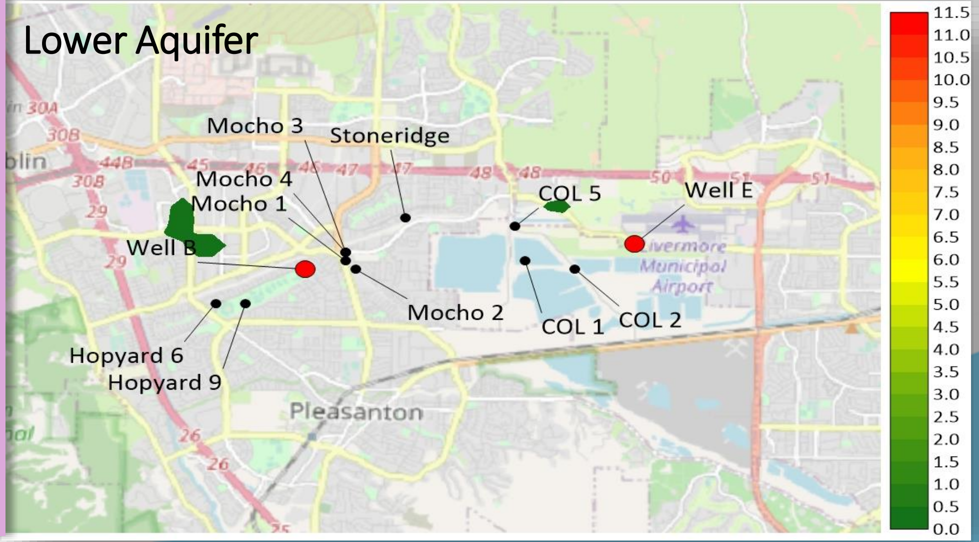
Scenario 3: Well E, 3,600 AFY





Scenario 4: Well B, 9,600 AFY

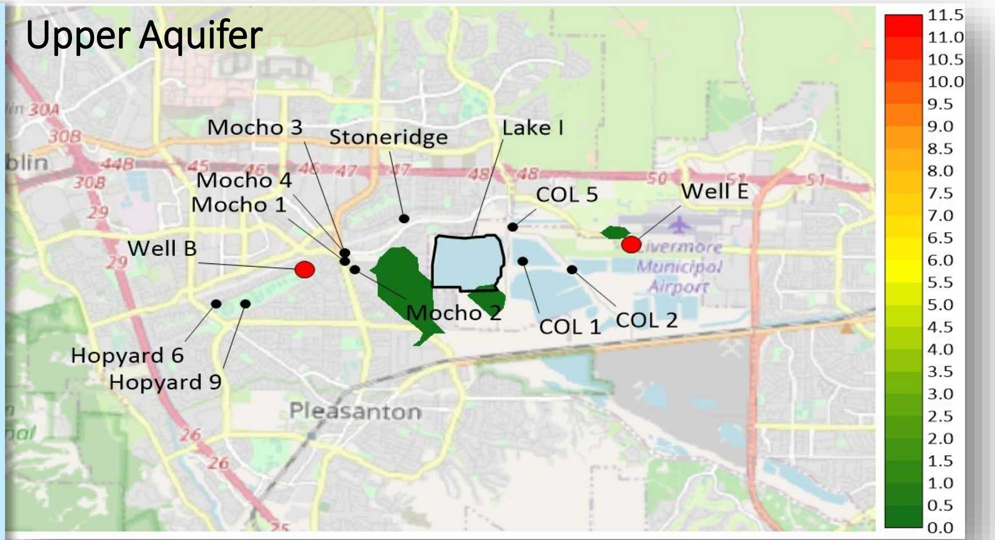


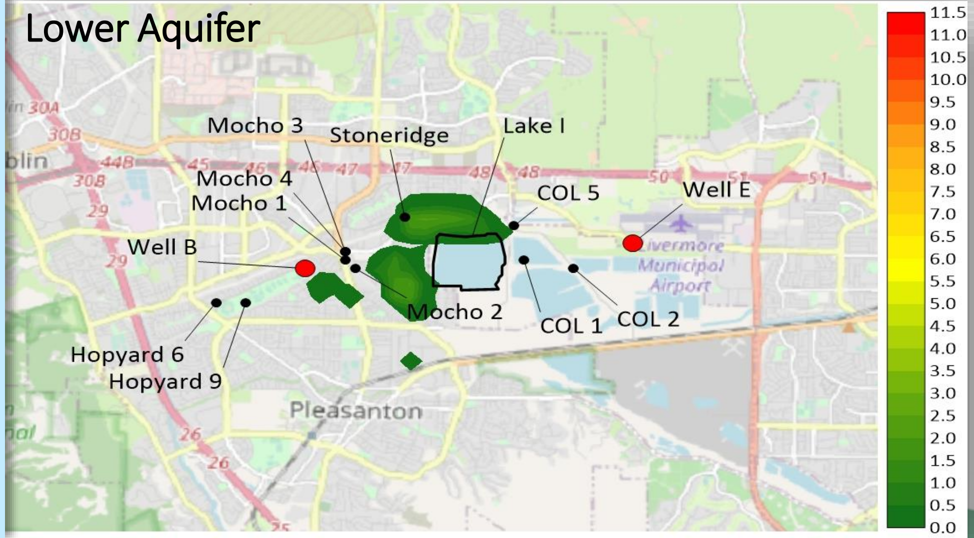


Scale: Change in Arsenic Resulting in MCL Exceedance (parts per billion)

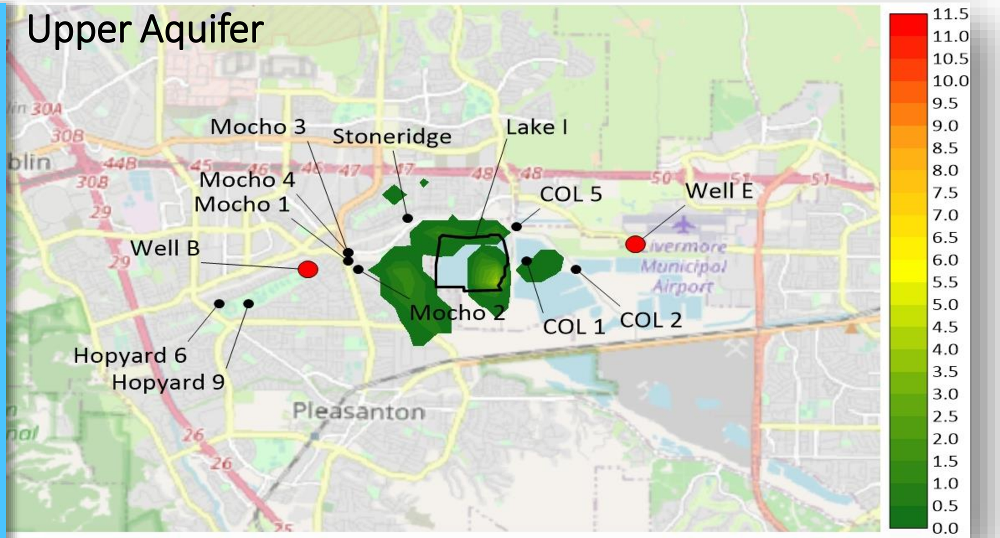
Hexavalent Chromium MCL Exceedance (Scenarios 1 & 2)

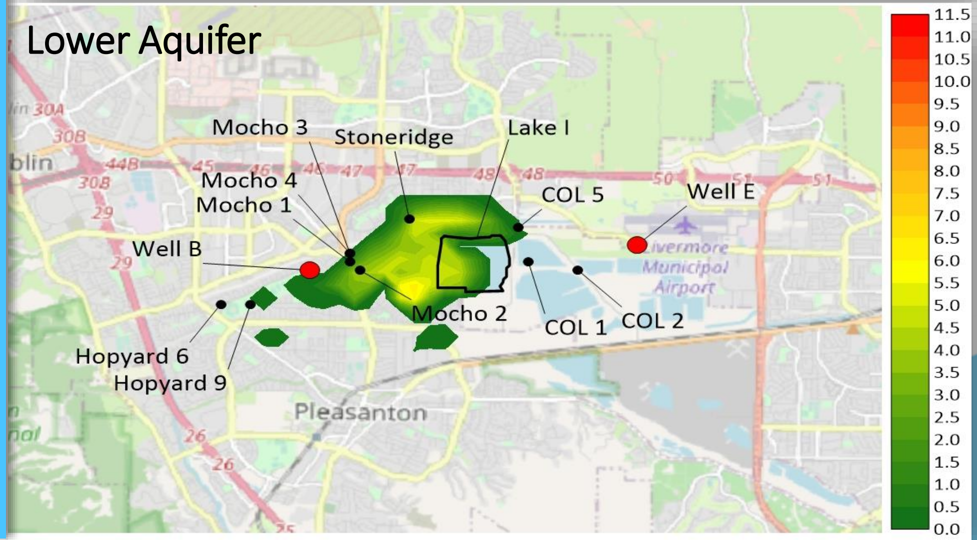
Scenario 1: Lake I, 3,600 AFY





Scenario 2: Lake I, 9,600 AFY

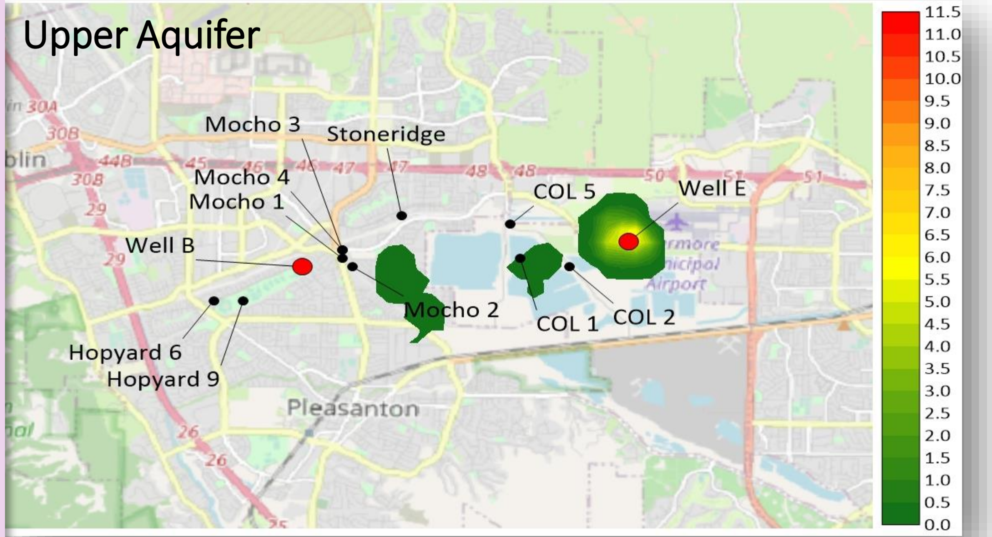


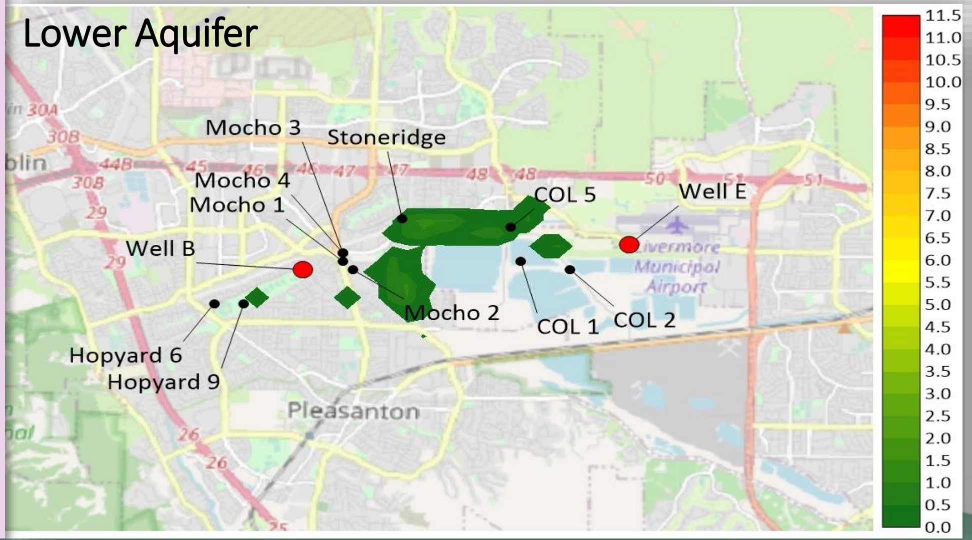


Scale: Change in Hexavalent Chromium Resulting in MCL Exceedance (parts per billion)

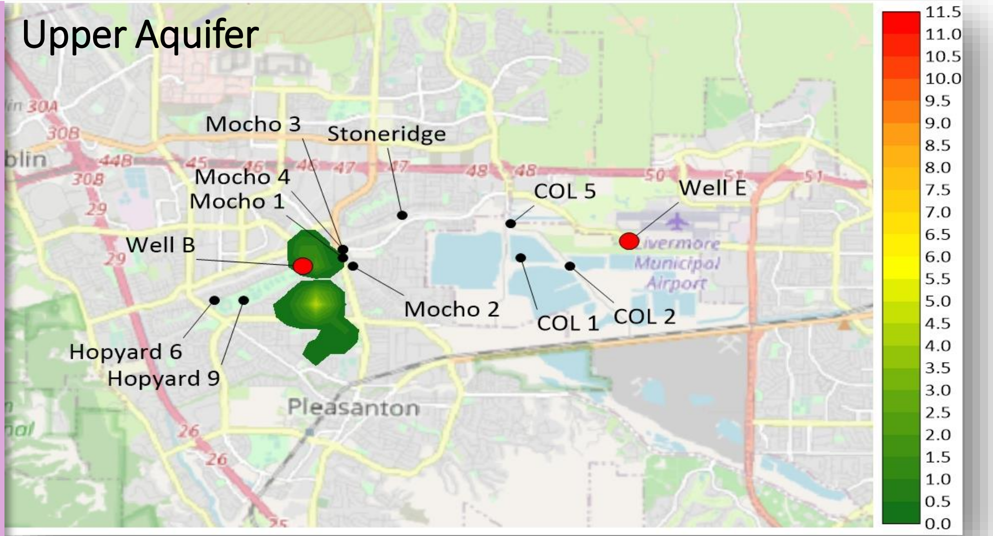
Hexavalent Chromium MCL Exceedance (Scenarios 3 & 4)

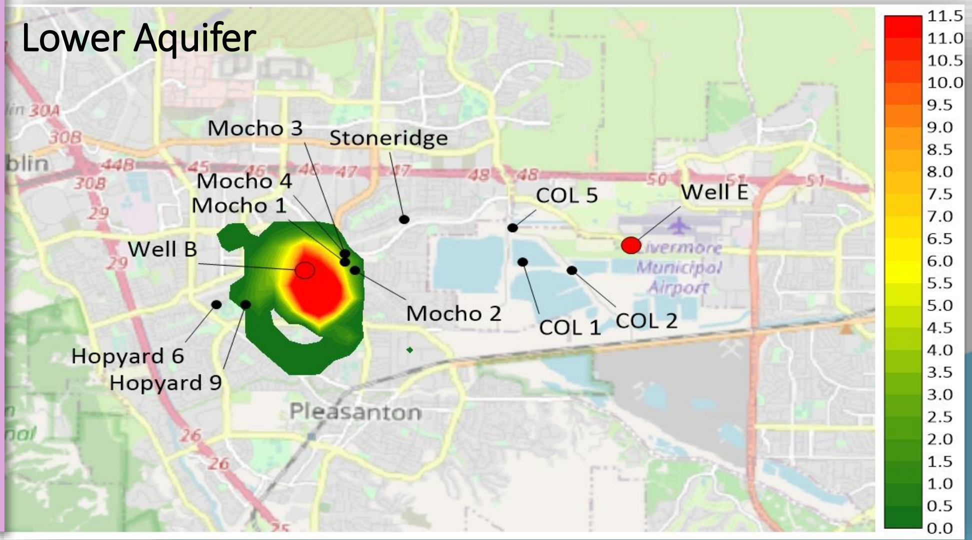
Scenario 3: Well E, 3,600 AFY





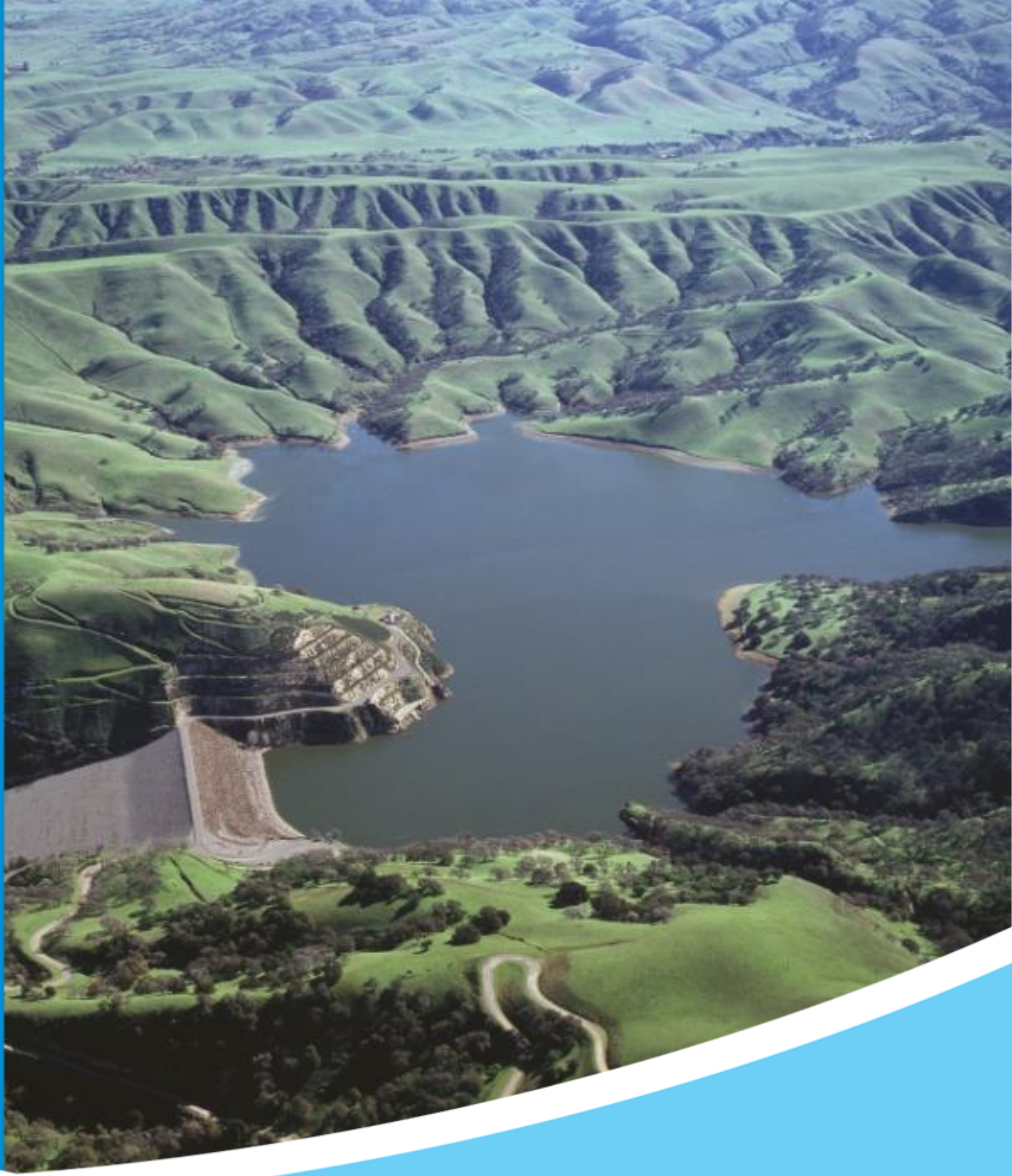
Scenario 4: Well B, 9,600 AFY





Scale: Change in Hexavalent Chromium Resulting in MCL Exceedance (parts per billion)

Takeaways



Findings

- Recharging purified water in the Livermore Valley Groundwater Basin can help dilute pre-existing nitrate, chloride, and boron
- Recharging purified water in the Livermore Valley Groundwater basin can increase arsenic and hexavalent chromium above the MCLs
- Impacts are generally greater with larger volumes of purified water recharge
- Modeling results are highly dependent on several assumptions:
  - aquifer hydrologic conditions, geochemical character of the native aquifer material, and existing distribution of trace elements in groundwater

Potential Future Considerations

- Conduct additional modeling with new groundwater model
- Laboratory and/or field-scale pilot tests to better constrain potential water quality responses to purified water recharge
- Implement a testing program (i.e., groundwater sampling, laboratory leaching tests with purified water and soil cores, push-pull injection tests in the filed)

ZONE 7 WATER AGENCY

KJ

Questions