WATER AGENCY

Hydrogeologic Investigations and Groundwater Model Update

Board of Directors Meeting September 20, 2023



Manage and protect the groundwater basin as the State designated Groundwater Sustainability Agency.

Initiative 7

Manage the Groundwater Sustainability Agency (GSA) and implement the groundwater management plan

Initiative 8

Study and refine knowledge of the groundwater basins.



Outline

- Background
 - About Groundwater Models
 - Review of Existing Livermore Valley Basin Groundwater Model
 - Reasons to Update Groundwater Model
- DWR's Airborne Electromagnetic Surveys (AEM)
- Project Scope of Work
- Budget and Schedule
- Summary



About Groundwater Models

- Numerical Representation of Groundwater
 - Used To Simulate Response Under Hypothetical Conditions
- Two Components
 - "Flow" = Groundwater Movement and Elevations
 - Solute "Transport" = Constituents in Groundwater
- Model "Calibration"
 - Using past data to estimate model parameters
 - Formerly by Trial and Error
 - Now "PEST" automates calibration
- Limitations
 - "All Models Are Wrong, Some Models Are Useful"
 - Not for Predicting Specific Values
 - E.g., what is level/concentration at a specific well
 - Best for Predicting Trends
 - E.g., will level/concentration increase or decrease
 - Model Geology is Constant
 - But our Mining Area Geology Changes





Existing Livermore Valley Groundwater Model

- Used to Support
 - Sustainable Groundwater Management (e.g., Storage)
 - Groundwater Development (e.g., Well Master Plan)
 - Analyzing Groundwater Quality (e.g., Salt, PFAS)
- 10 Layers
 - Layer 1 = Clay Overburden
 - Layers 2-4 = Upper Aquifer
 - Layer 5 = Clay Aquitard
 - Layers 6-10 = Lower Aquifer
- MODFLOW Platform
 - MODFLOW-NWT for Flow
 - MODFLOW-MT3D-USGS for Solute Transport
 - Groundwater Vistas for Interface





Reasons to Upgrade Model

- Model Domain
 - Only includes Main and NW Fringe Basins
 - DWR recommended including all fringe and upland areas
- New Studies and Data
 - 2021 Alternative Groundwater Sustainability Plan (GSP)
 - IWFM Demand Calculator (IDC) for recharge
 - 3D Hydrogeologic Conceptual Model (HCM) in Rockworks
 - 3 Cross Sections
 - DWR Airborne Electromagnetic Survey (AEM)
 - Updated Electronic Log (Elog) Database
 - 8 More Water Years of Data Including
 - Two droughts
 - Near Record Wet Year
- Difficult to Run
 - Requires Consultant
- BUT Still Have Data Gaps
 - Aquifer Properties
 - Structure of Layers and Faults







Project Scope of Work

- 1. Project Administration
- 2. Implement Hydrogeologic Field Investigations Aquifer Pumping Tests & Geophysical Studies
- 3. Update 3D Hydrogeologic Conceptual Model (HCM) & Create Cross Sections
- 1. Update Groundwater Model Refine Layers & Calibrate
- 5. Perform Predictive Model Simulations Well Master Plan & Another Scenario
- 6. Develop Decision Support Tool (DST)
- 7. Model User Guide and Training
- 8. As-Needed Support



Task 2 – Field Investigations

A. Aquifer Pumping Tests

- To Improve Understanding Of:
 - Aquifer properties
 - Connectivity of major structural features

B. Geophysical Surveys

Seismic Refraction + Electrical Resistivity Tomography (ERT)

E

♦ 11B1
♦ 10001
12D2

12K3 18F

^{7B2} Parks Boundary
 ^{7B12} ^{8B1}
 ^{8B1} ^{St1}
 ^{St1} Fault 14

N2

- Mocho I/II boundary, i.e. "The Gap"
- Transient Electromagnetic Method (TEM) ^{17Da1} Concannon Boundary 1513
 - 2 Arroyo Valle
 - Arroy_Mocho



Geophysical Investigation Methods

- Seismic Refraction
- Electrical Resistivity Tomography (ERT)
- Transient Electromagnetic Method (TEM) Ground Based
 - Stationary
 - Towed (tTEM)



The ERT system in operation at a study site in California.











Task 6 - Decision Support Tool (DST)

- Select Inputs to Model
 - Hydrology
 - Water Supplies
 - Well Pumping
- Run the Model
- View Outputs
 - Hydrographs
 - Maps of
 - Gradients
 - Water Level Change
 - Custom Graphs
- Compare Scenarios





Budget and Schedule

| | TASKS | Budget | 2023 | 2024 | | | 2025 | | | | |
|---|--------------------------|--------------|------|------|----|----|------|----|----|----|----|
| | | | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| | 1. Project Admin | \$ 67,700 | | | | | | | | | |
| | 2. Field Investigations | \$ 206,100 | | | | | | | | | |
| | 3. Update 3D HCM | \$ 76,000 | | | | | | | | | |
| - | 4. Model Update | \$ 348,300 | | | | | | | | | |
| | 5A. WMP Scenarios | ¢ 195 400 | | | | | | | | | |
| | 5B. Other Scenarios | 7 \$ 185,400 | | | | | | | | | |
| | 6. Decision Support Tool | \$ 74,700 | | | | | | | | | |
| | 7. User Guide/Training | \$ 40,900 | | | | | | | | | |
| | 8. As-Needed Support | \$ 100,000 | | | | | | | | | |
| | TOTAL | \$1.1M + 10% | | | | | | | | | |



Summary

- Model Needs to be Updated/Modified to Support Sustainable Groundwater
 - Management (groundwater storage, well permitting)
 - Development (well master plan)
 - Quality (salt, PFAS)
- Comprehensive Project Scope Includes
 - Field Investigations to Fill Data Gaps
 - Update 3D Hydrogeologic Conceptual Model
 - Update Groundwater Model
 - Run Simulations
- Selected EKI Environmental & Water, Inc.
- Budget \$1.21M
 - \$1.1M + 10% Contingency
- Overall Schedule 2 Years
 - October 2024
 - Complete the model
 - Run WMP scenarios



