Lake Perris Seepage Recovery Project

California Water and Environmental Modeling Forum

2022 ANNUAL MEETING PROGRAM

Breanna Clabourne

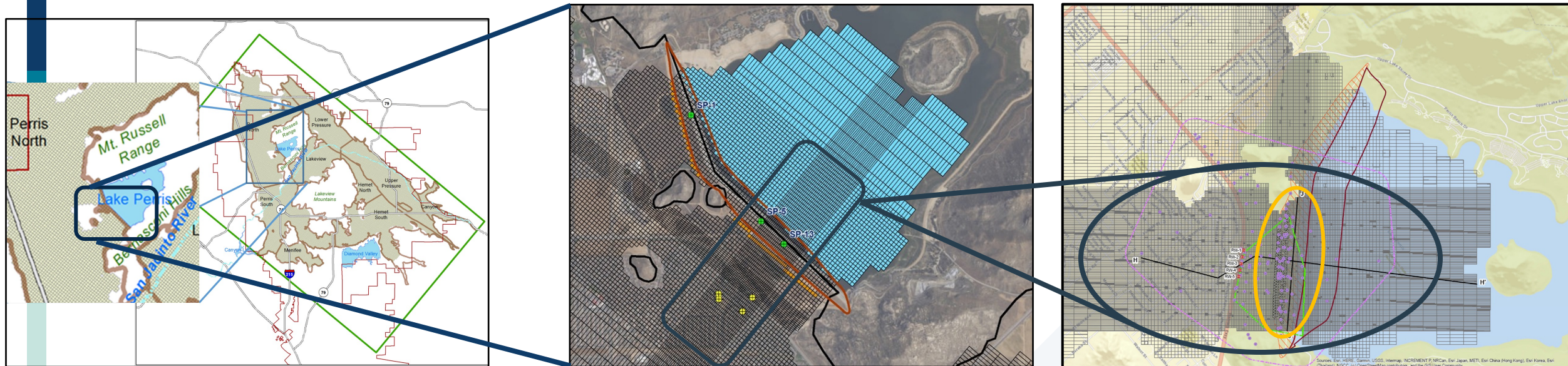**4/6/2022**

Woodard & Curran

Groundwater Model Refinements & Applications
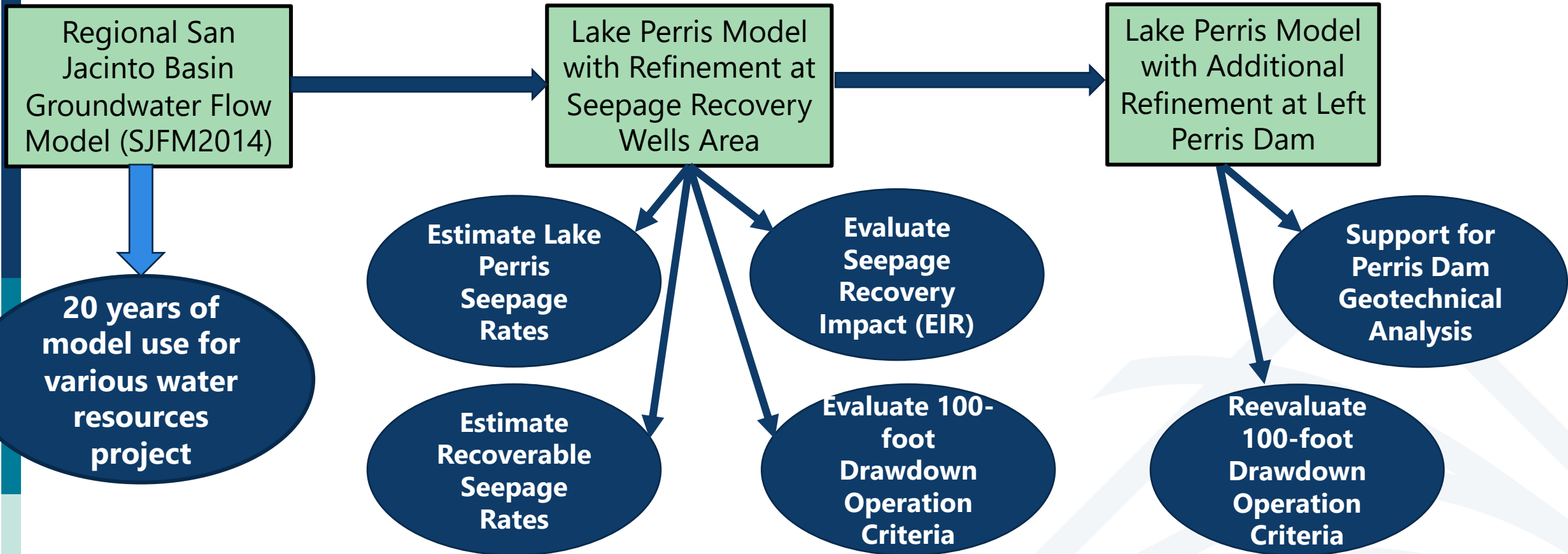
Groundwater Model Refinements & Applications

Regional San Jacinto Basin Groundwater Flow Model (SJFM2014) → Lake Perris Model with Refinement at Seepage Recovery Wells Area → Lake Perris Model with Additional Refinement at Left Perris Dam
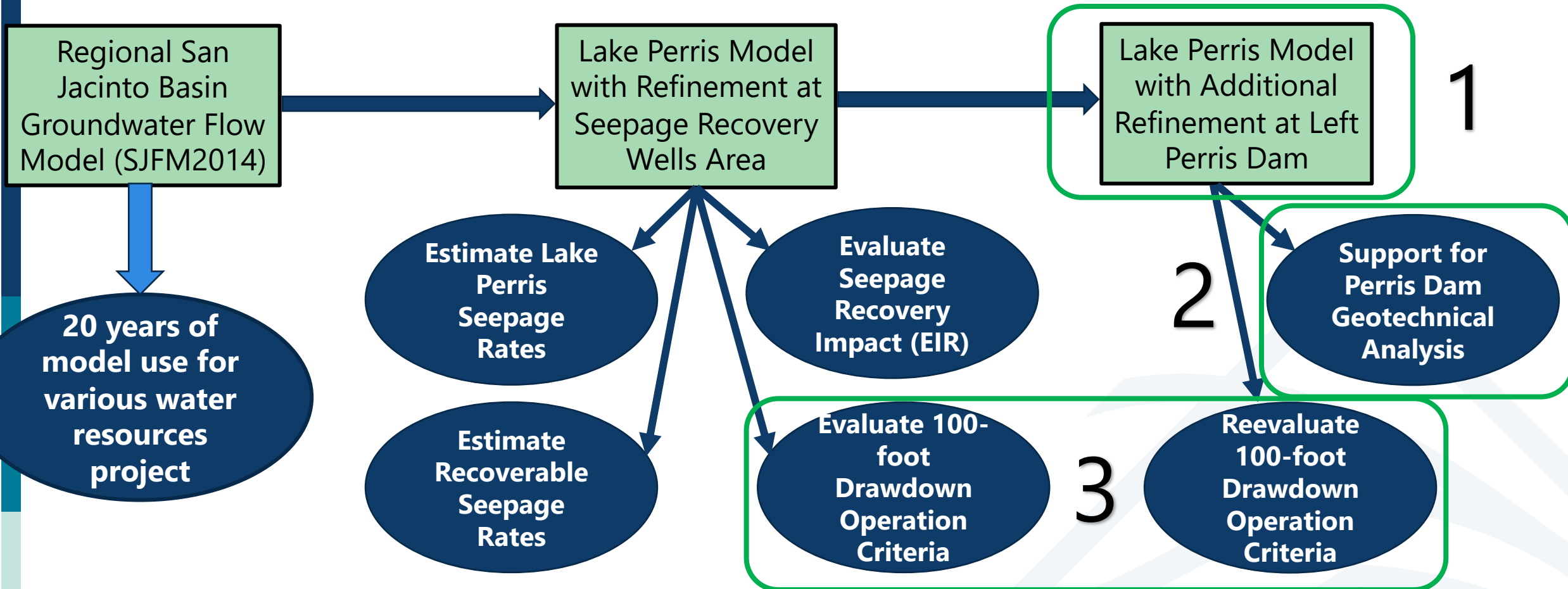
Groundwater Model Refinements & Applications
(continued)

Groundwater Model Refinements & Applications
(continued)

Model Refinement at Perris Dam

Model Refinement at Perris Dam

- ▸ Grid Refinement
  - ▪ Increased resolution at Perris Dam (~ 30 feet grid cells)
  - ▪ Increased model layers from 4 to 10
- ▸ Developed Lithology and Temperature 3D models
- ▸ Updated model parameters
- ▸ Recalibrated groundwater model
- ▸ Verified groundwater model (2018-2020)
- ▸ Developed baseline and scenario models
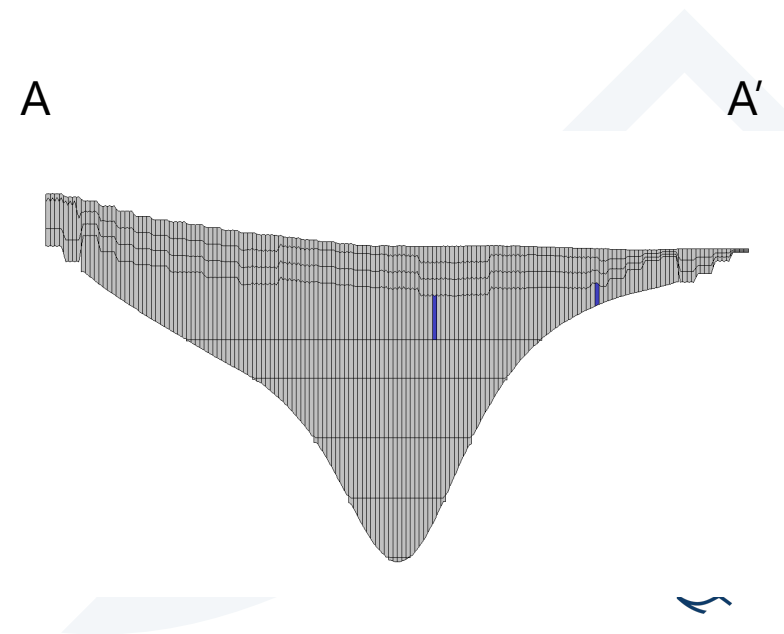 - ▪ Data for Geotechnical Analysis
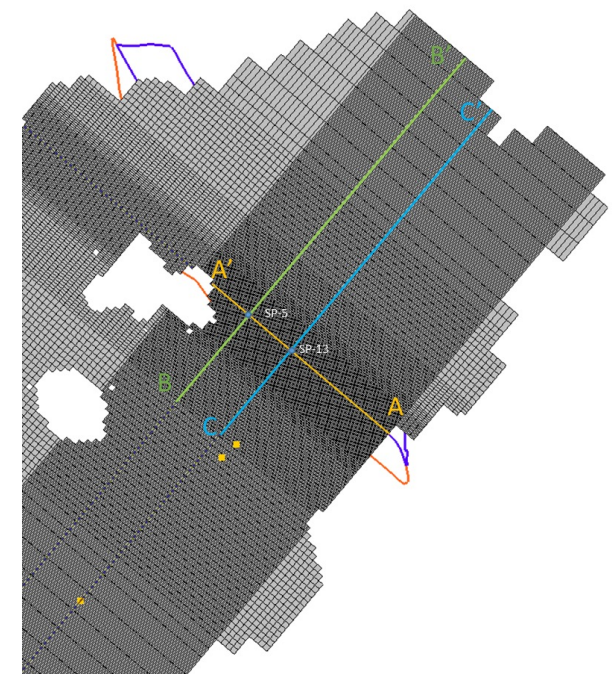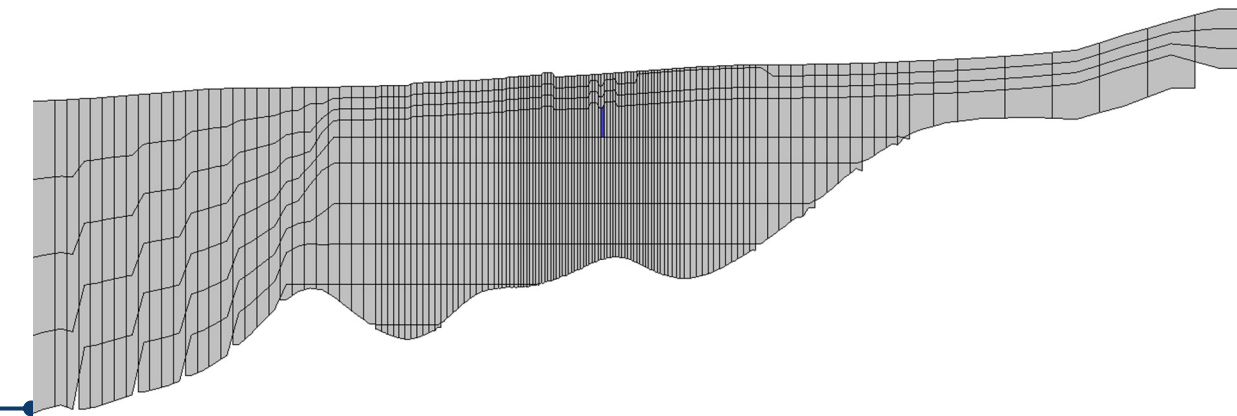 - ▪ Evaluate Operation Criteria scenarios
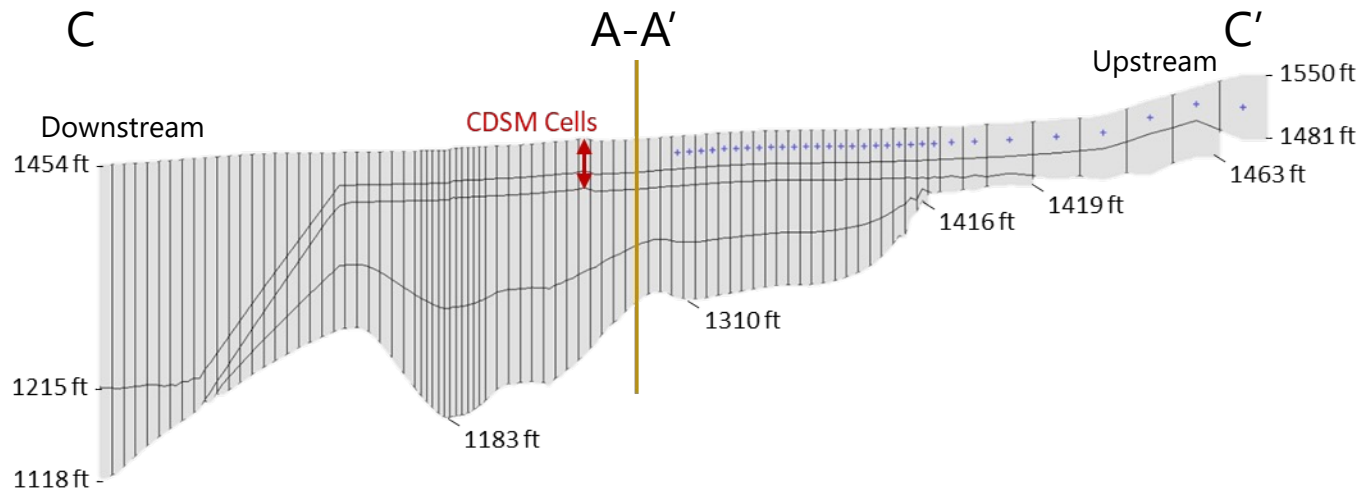
Woodard & Curran
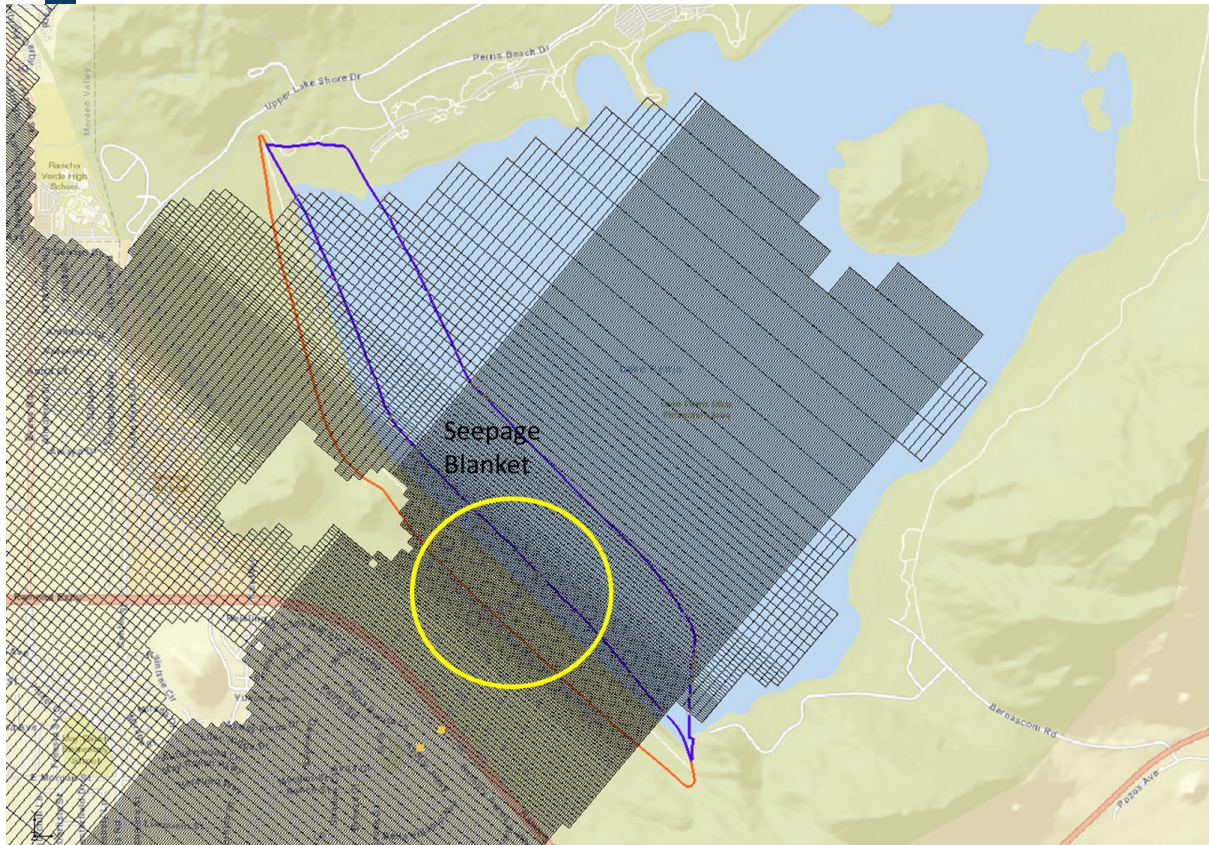
Grid Refinement
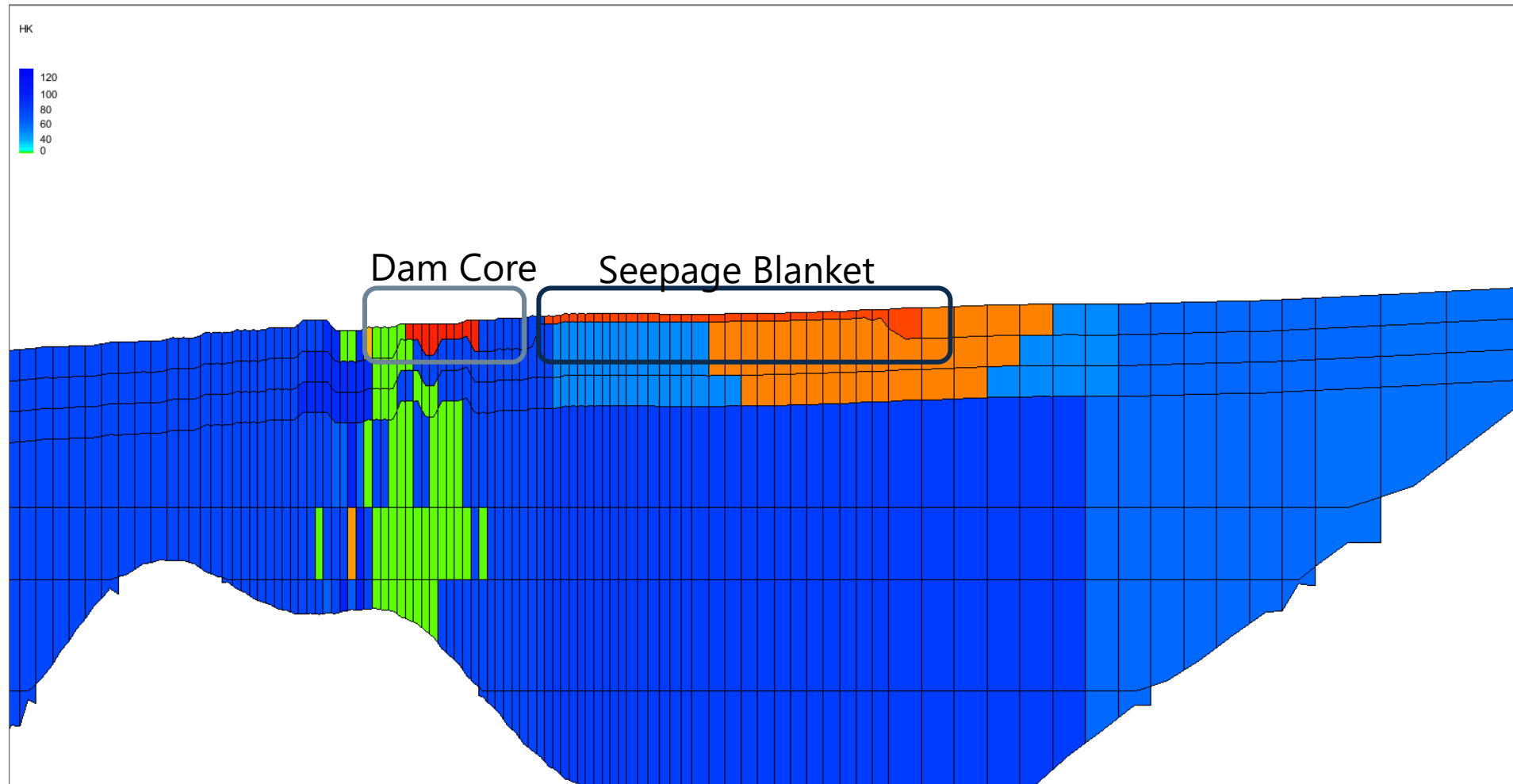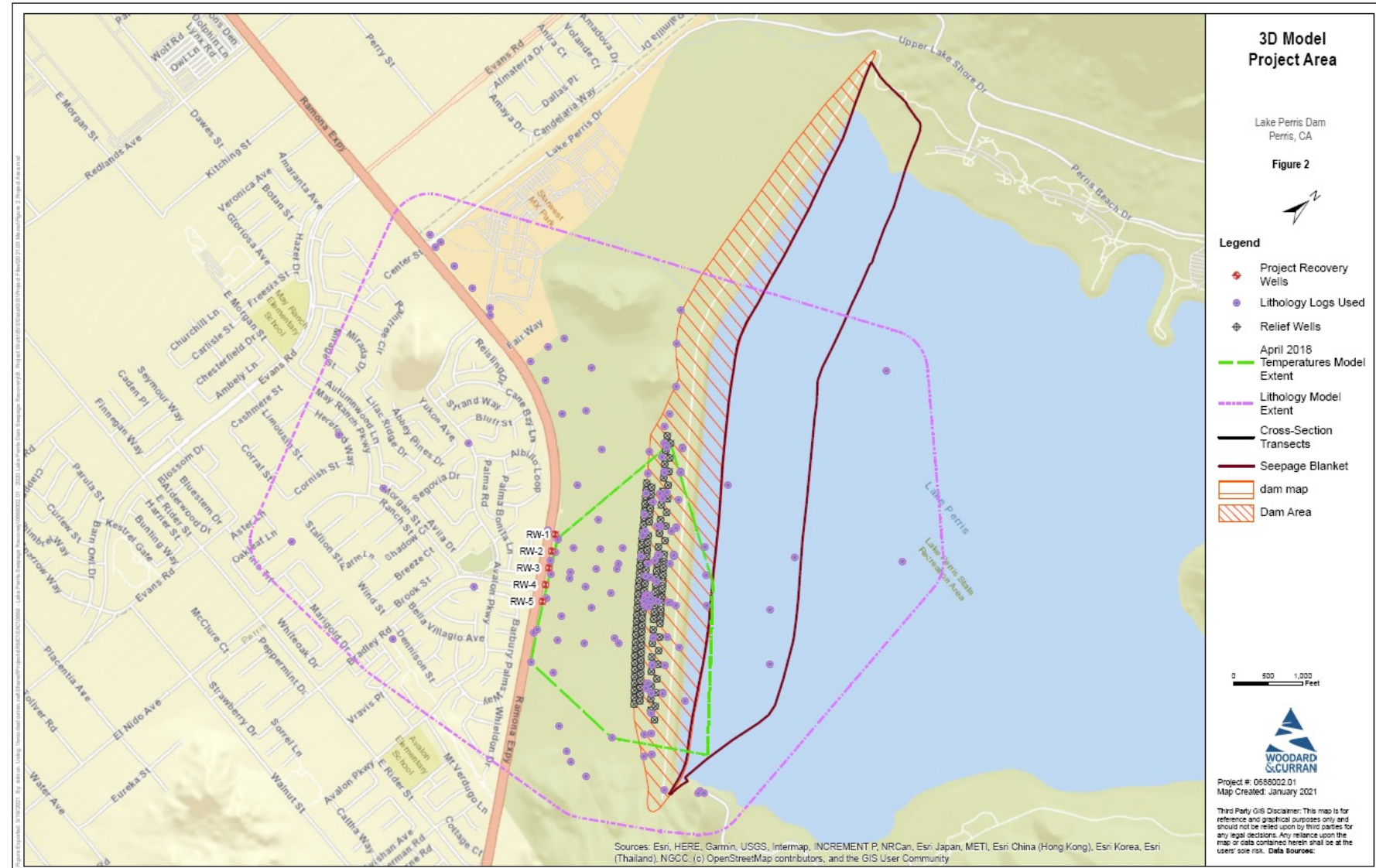

Grid Size: 31.25 ft. square
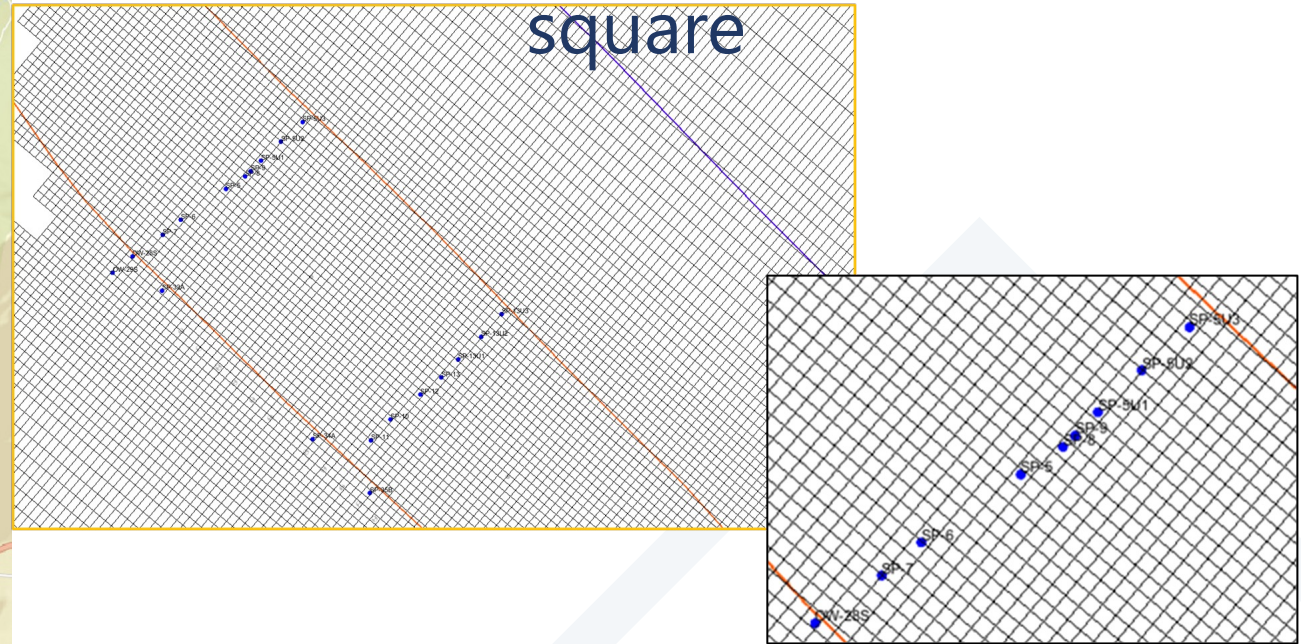
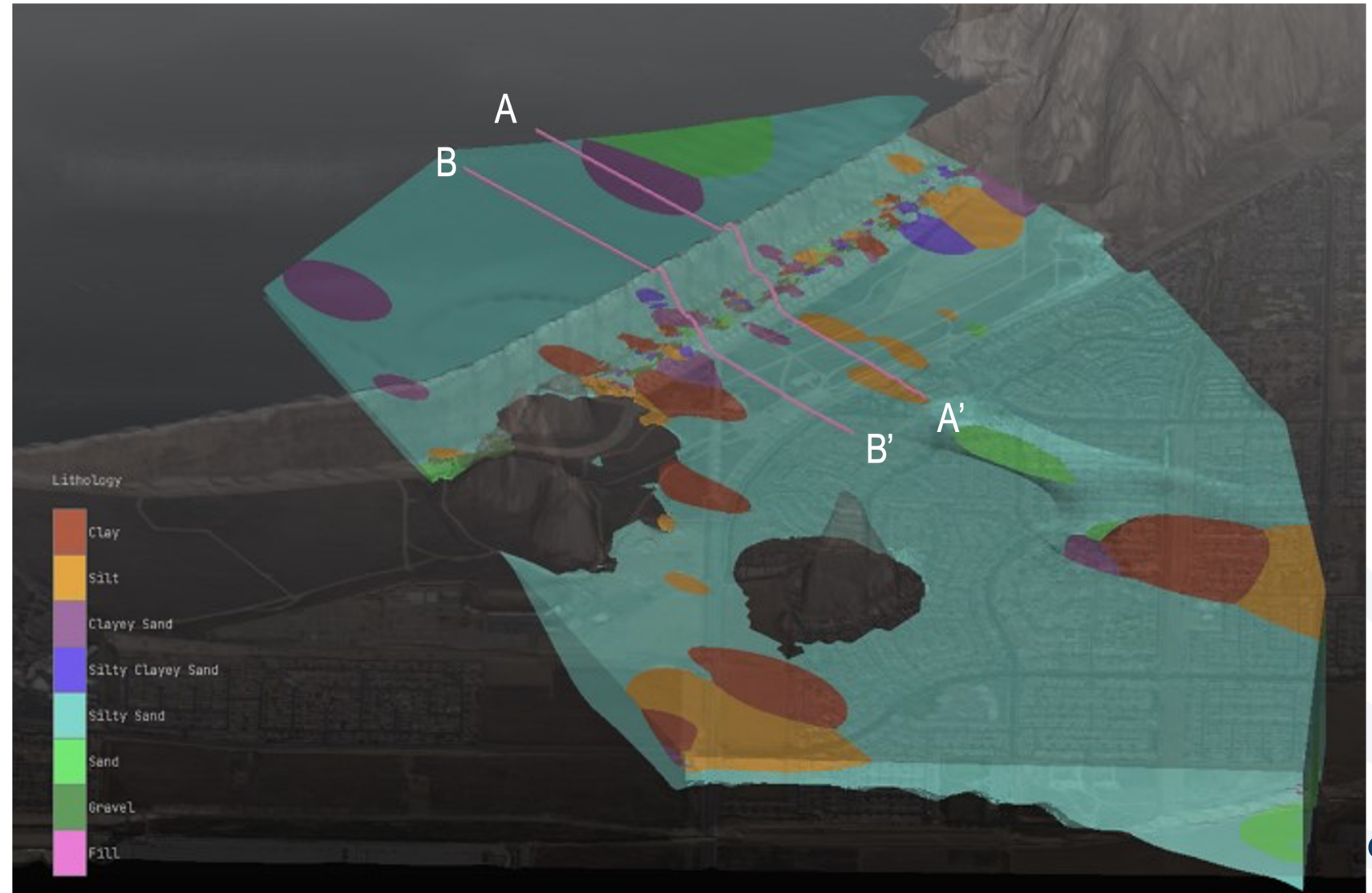# Layer Refinement

Model Grid- Dam Core and Seepage Blanket

3D Lithology and Temperature Models
Model Extent

Lithology Model

Lithology
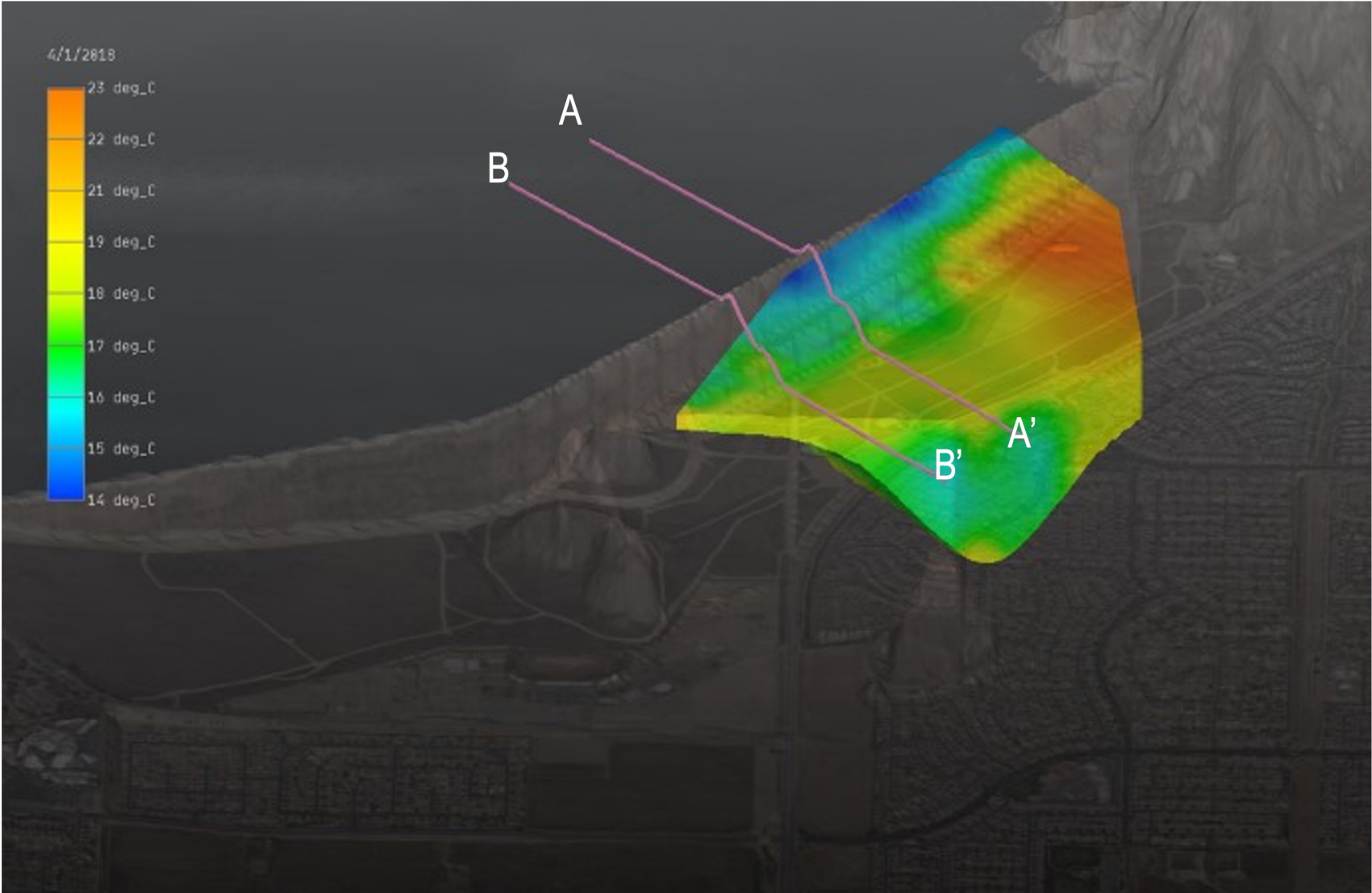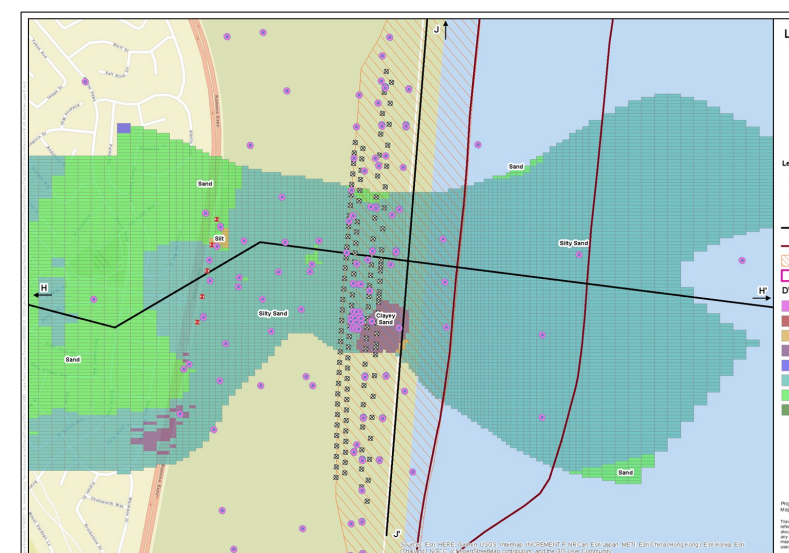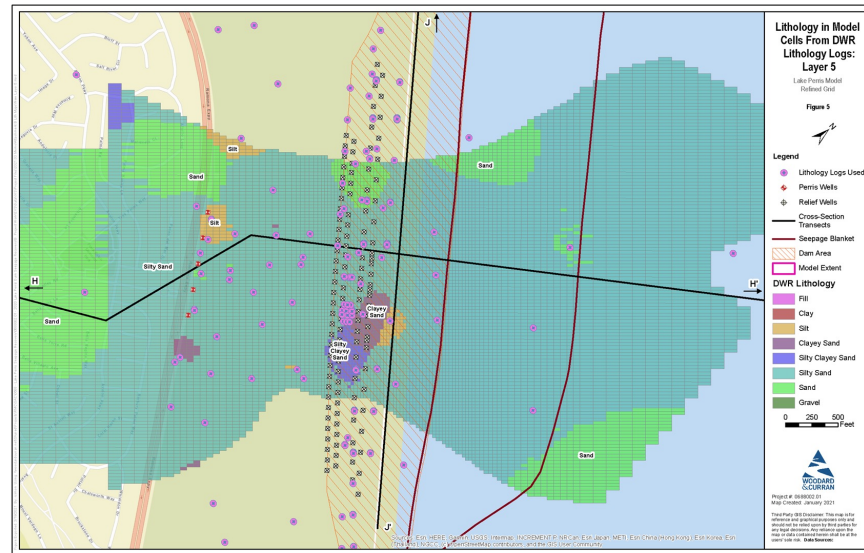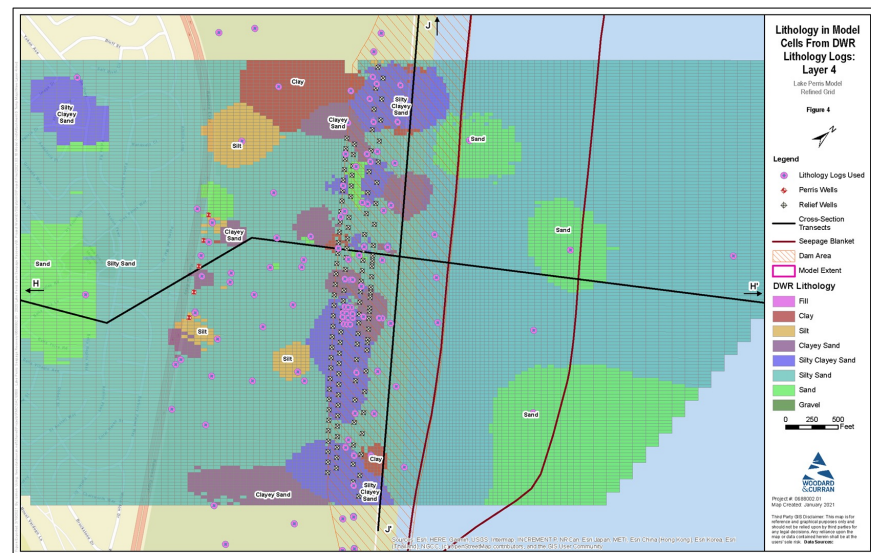- Clay
- Silt
- Clayey Sand
- Silty Clayey Sand
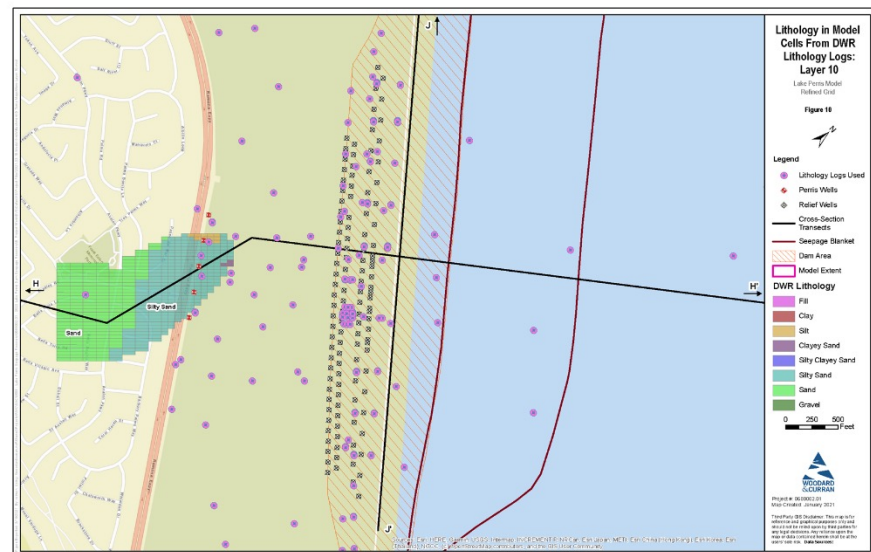- Silty Sand
- Sand
- Gravel
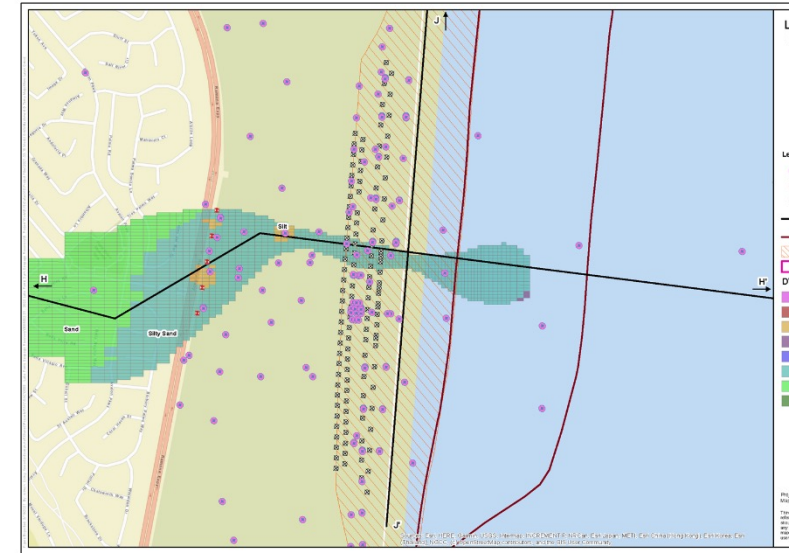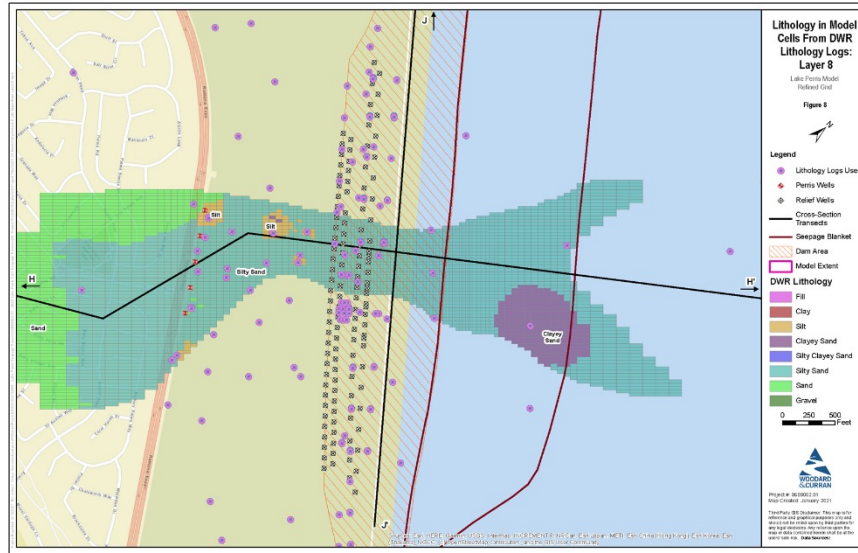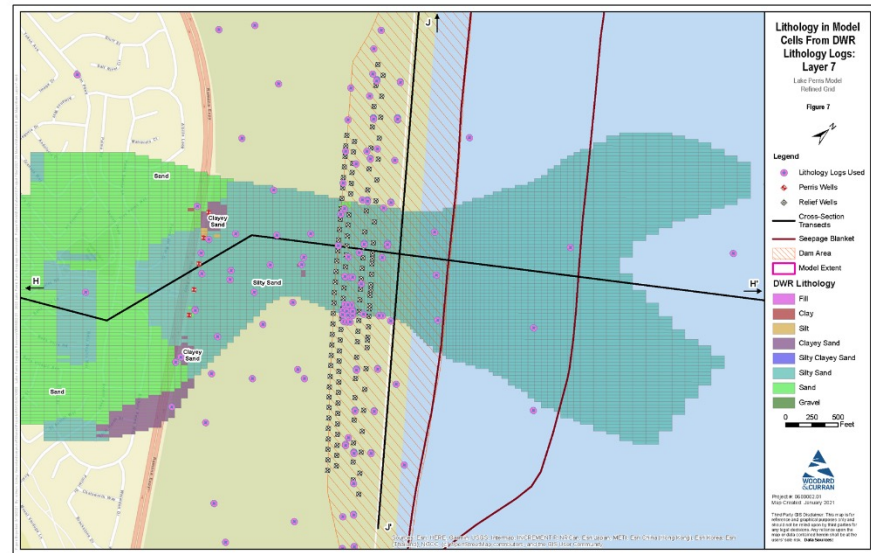- Fill

Curran

Thermal Model

Transfer Lithology Model Information to Groundwater Model (Layers 1 to 6)
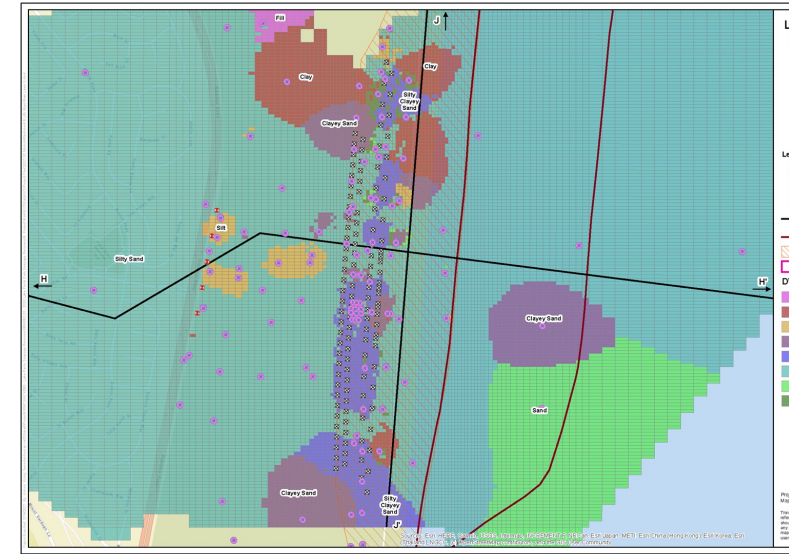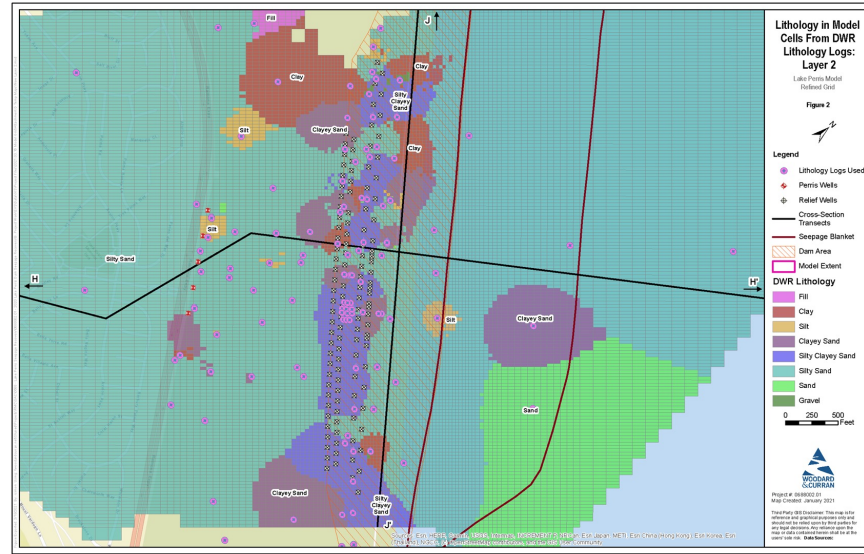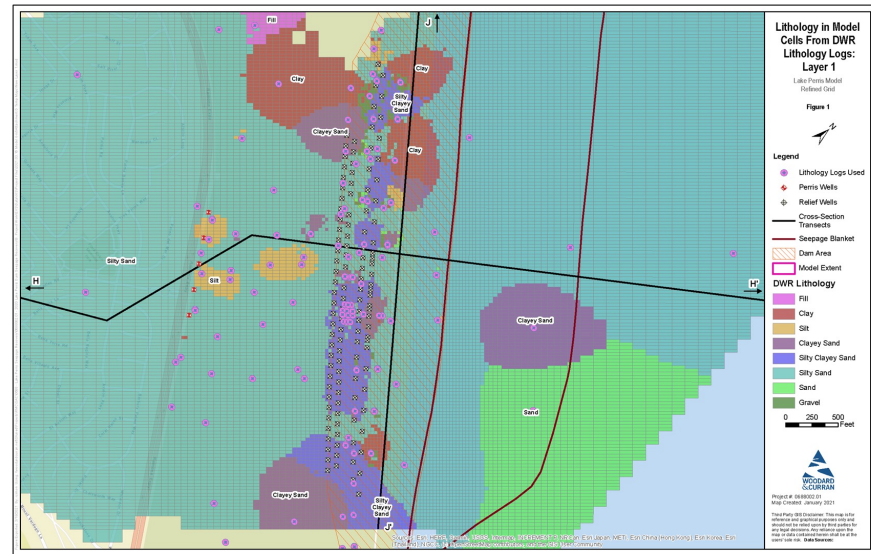
Transfer Lithology Model Information to Groundwater Model (Layers 7 to 10)
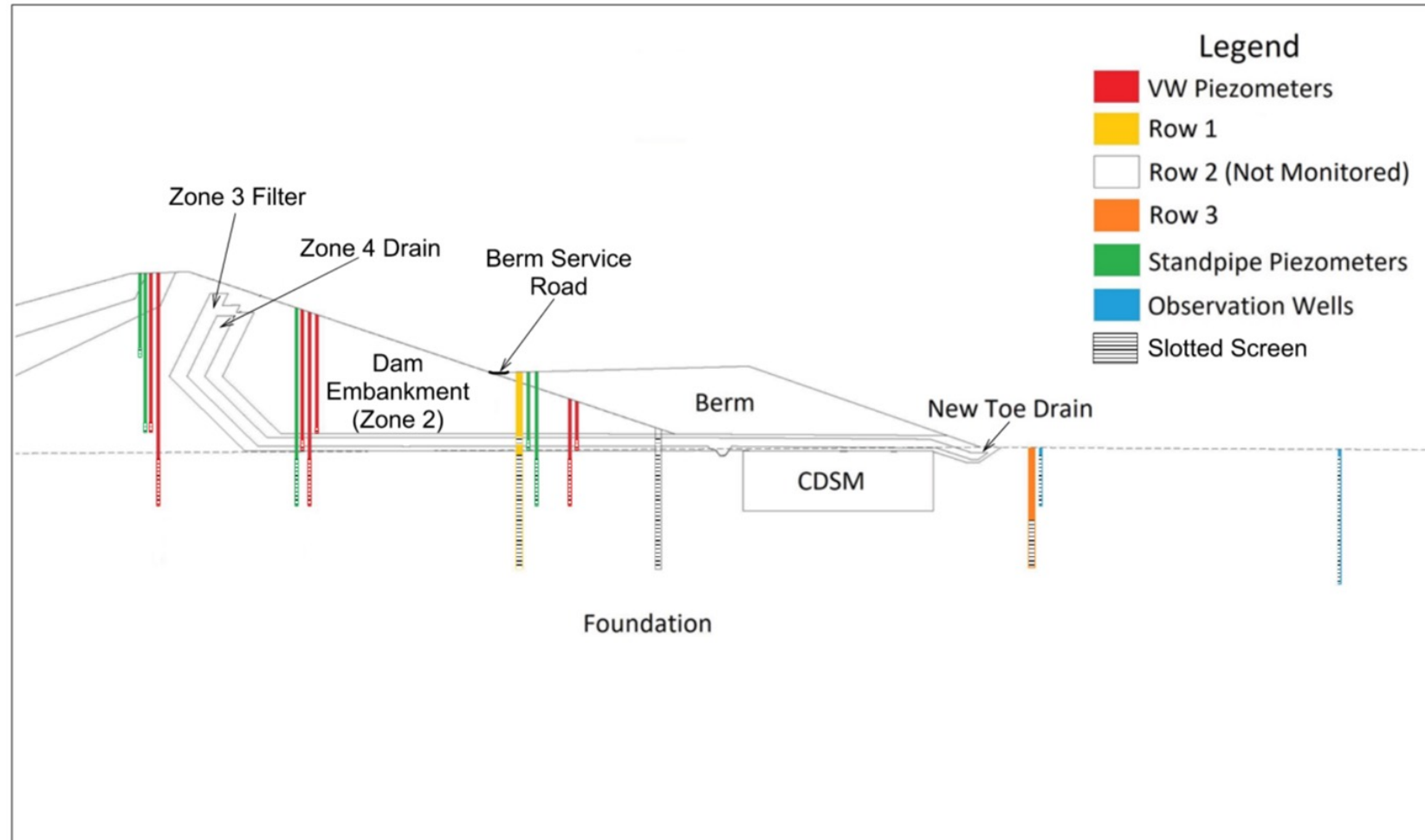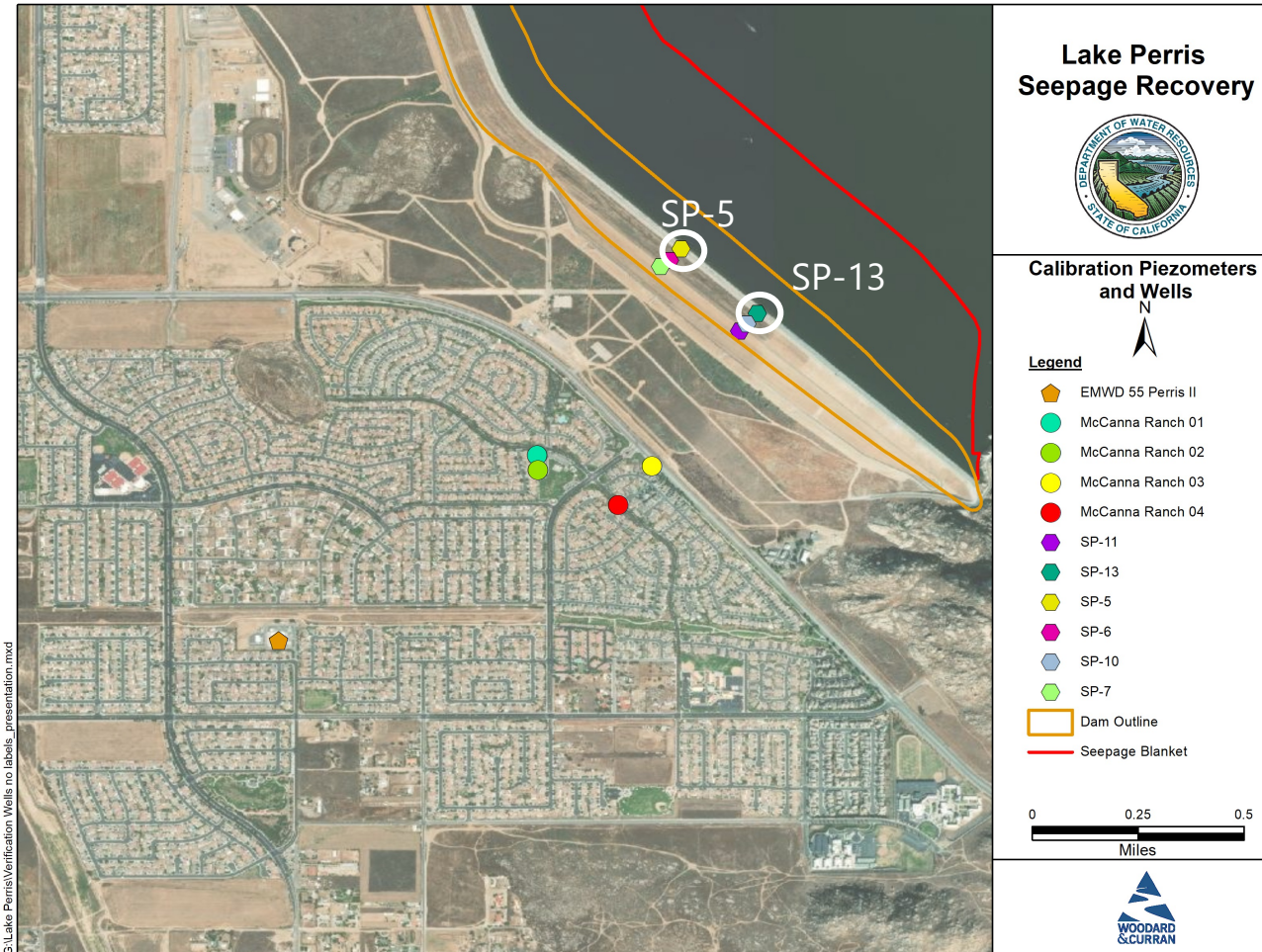
Dam Instrumentation

Figure B-17: Typical Cross Section for the Piezometers/Observation Wells
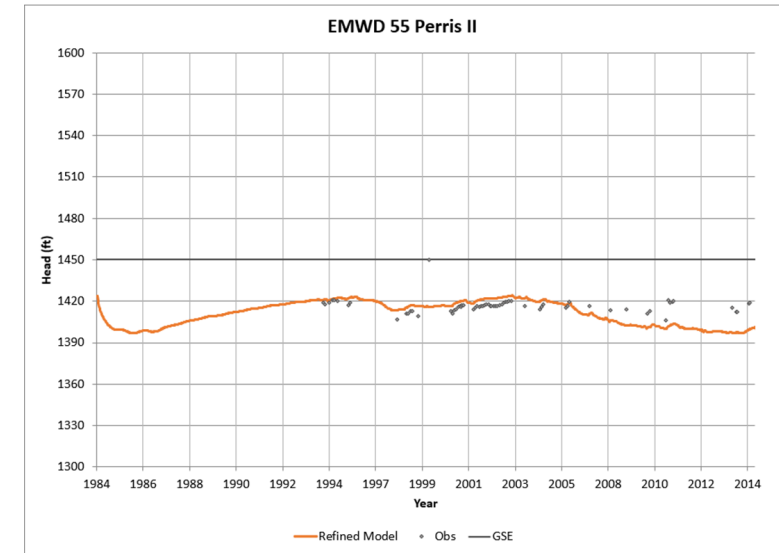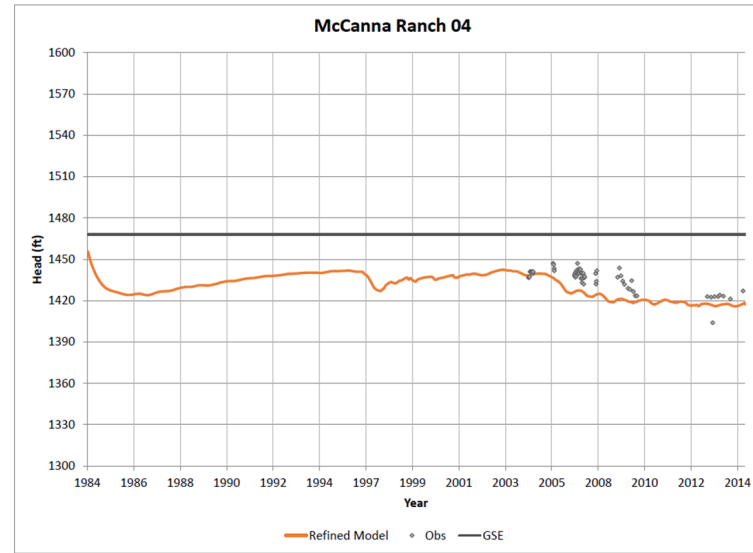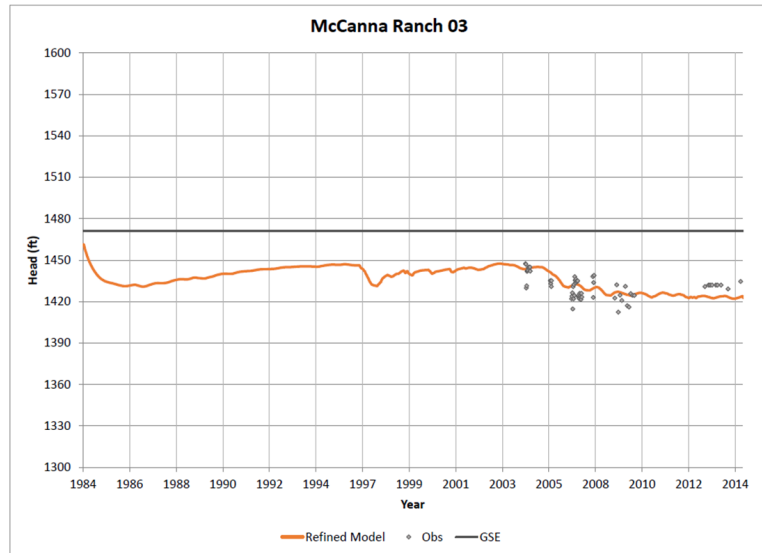
Locations of Calibration Piezometers and Wells

Model Recalibration

▸ Calibration to

- Data from piezometers
  - SP5, SP6, SP7, SP10, SP11, SP13
- Downstream wells
  - McCanna Ranch Wells
  - EMWD Well 55
  - Observation wells downstream of Perris Dam
- Seepage recovery rates

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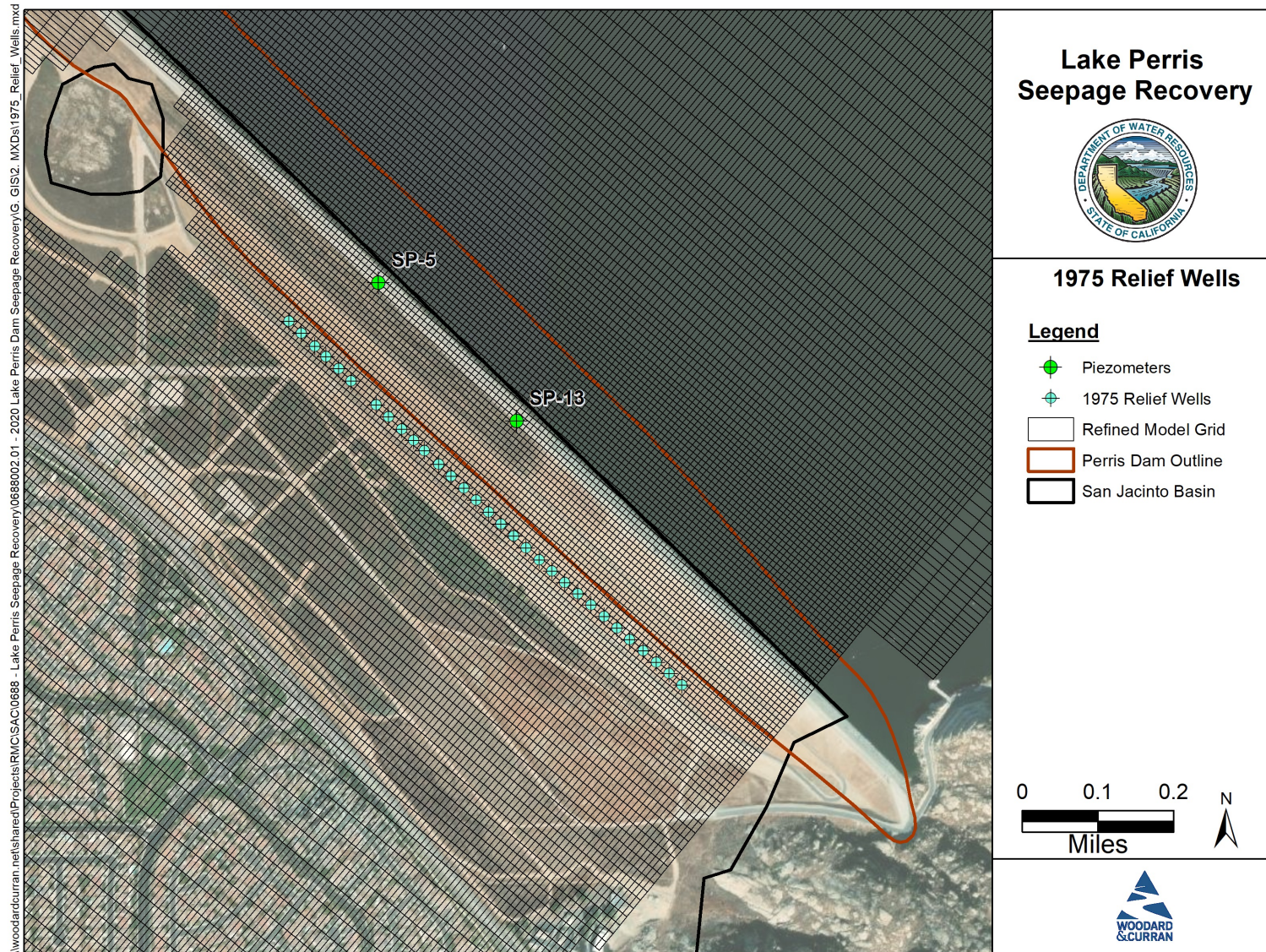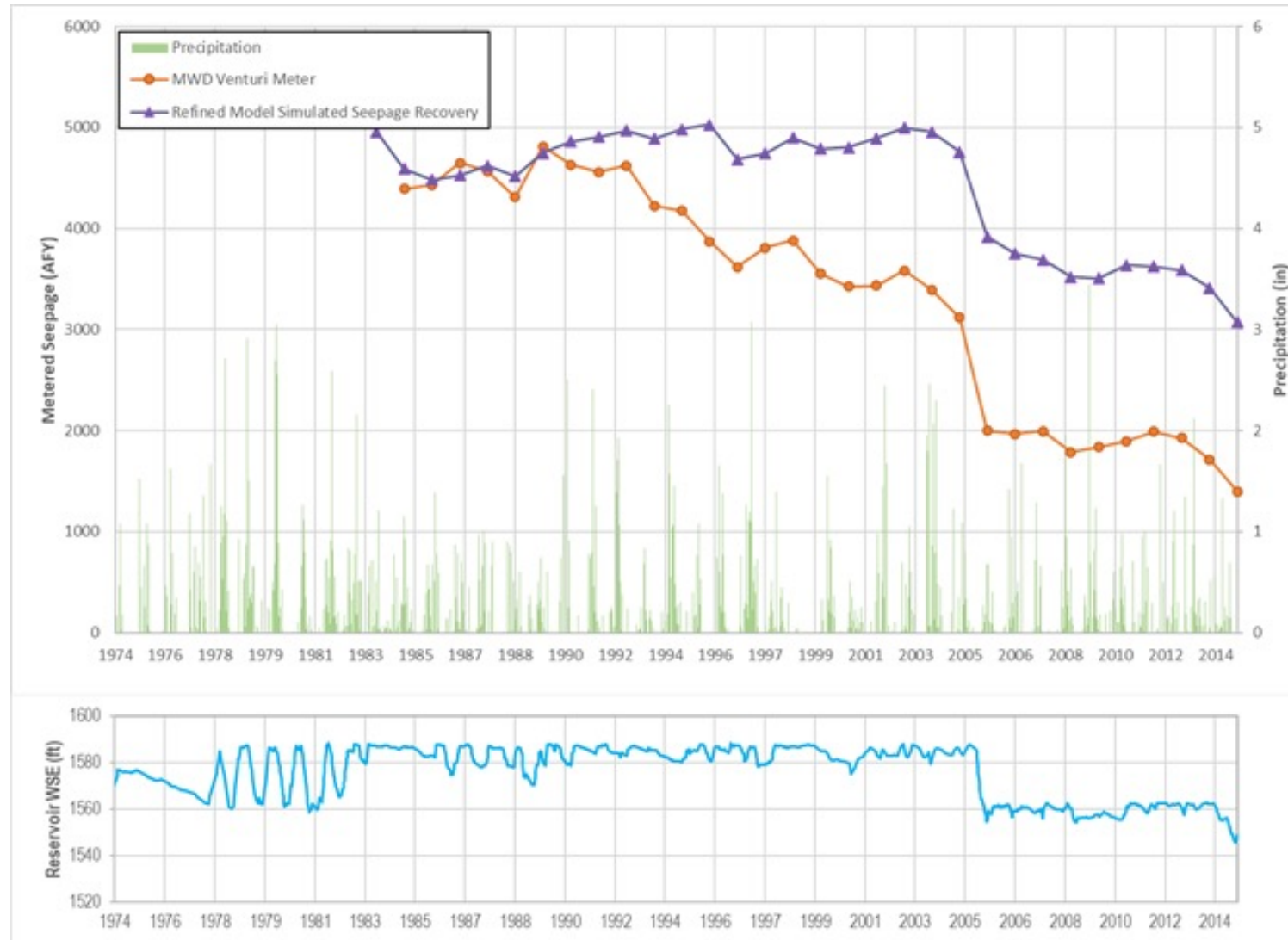# Calibration- Piezometers
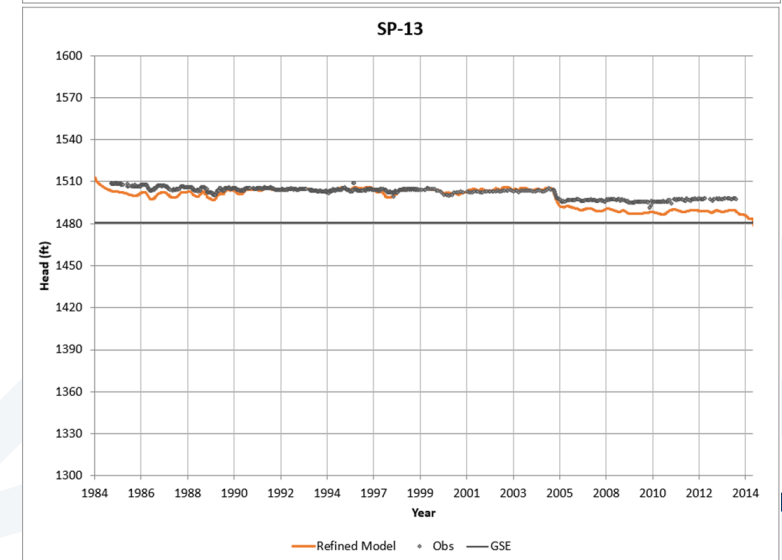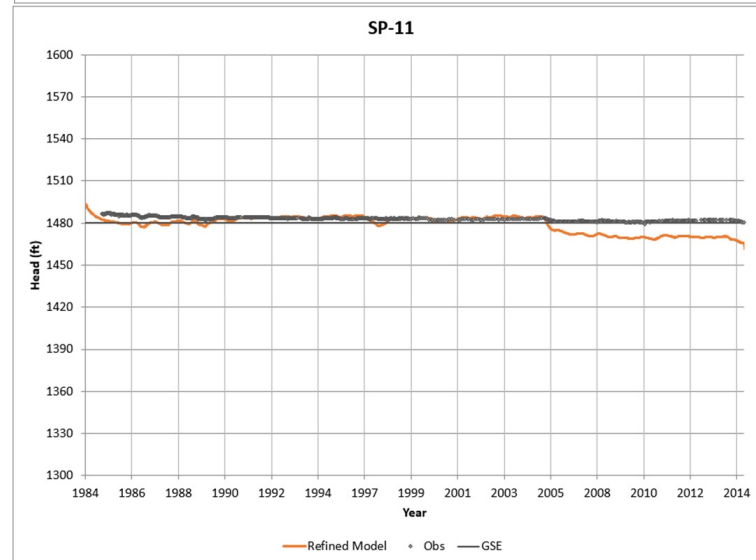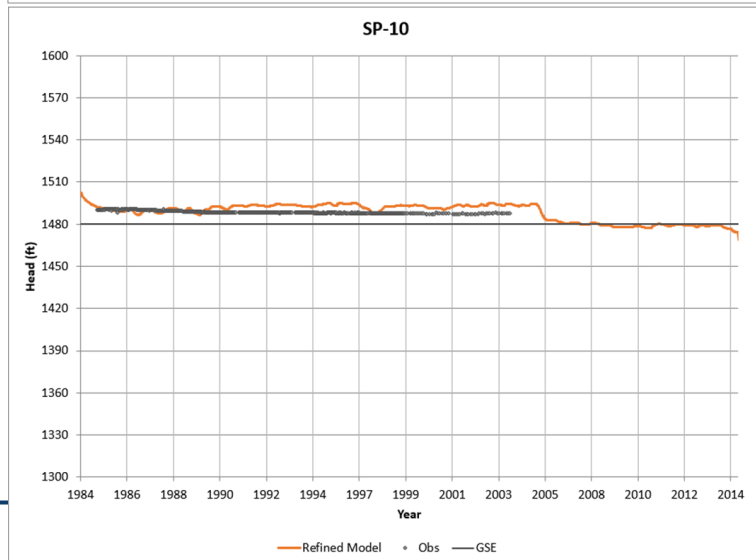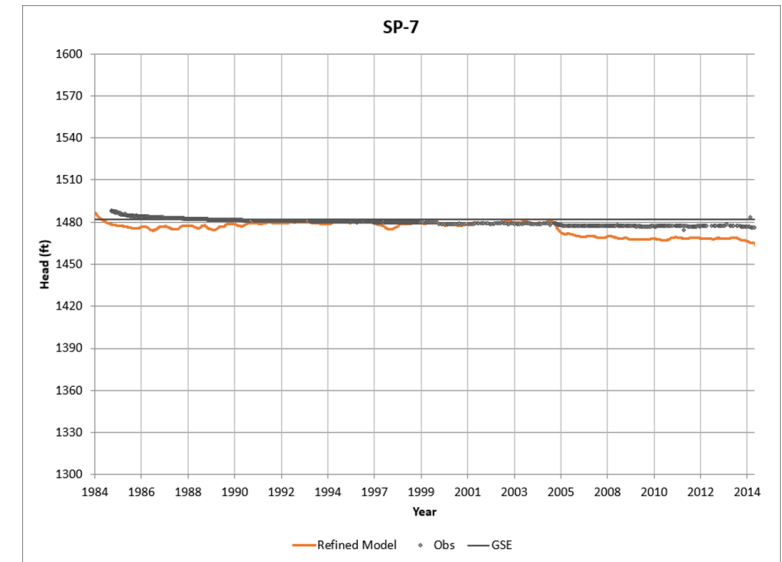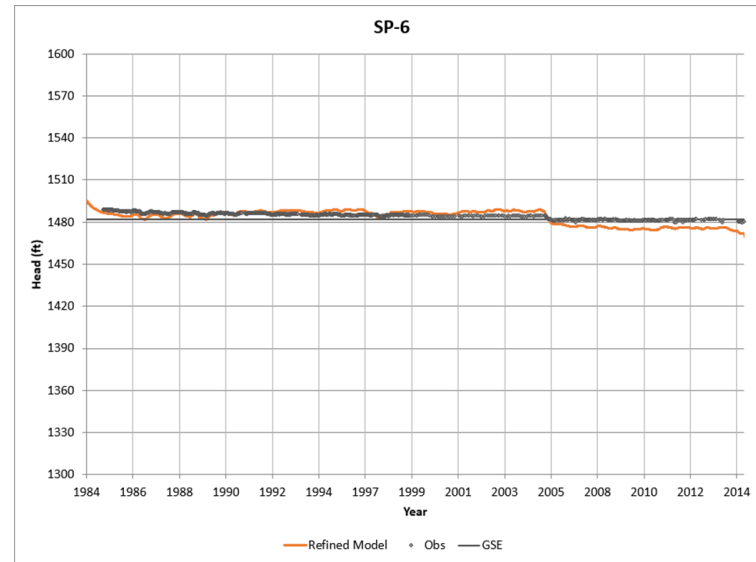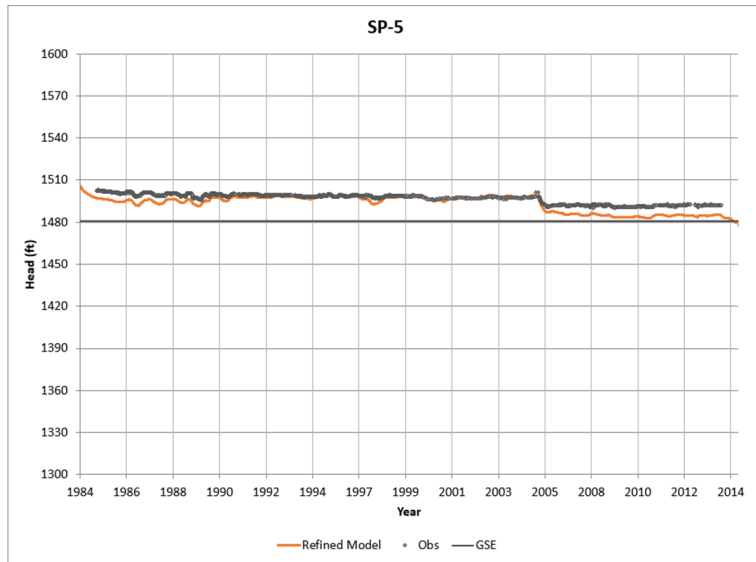
Calibration- Wells

Calibration- Passive Recovery System

Calibration- Seepage Recovery Rates

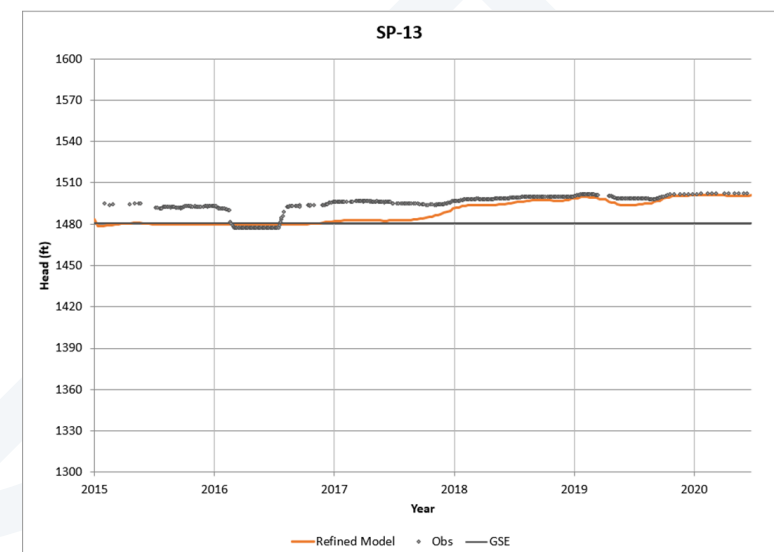# Model Verification

- Verification for 2018-2020 data
  - Calibration wells
  - Residential wells
  - Seepage recovery rates

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Verification- Piezometers

Verification- Wells

McCanna Ranch 03 — Head (ft) vs. Year. Legend: Refined Model, Obs, GSE.

McCanna Ranch 04 — Head (ft) vs. Year. Legend: Refined Model, Obs, GSE.

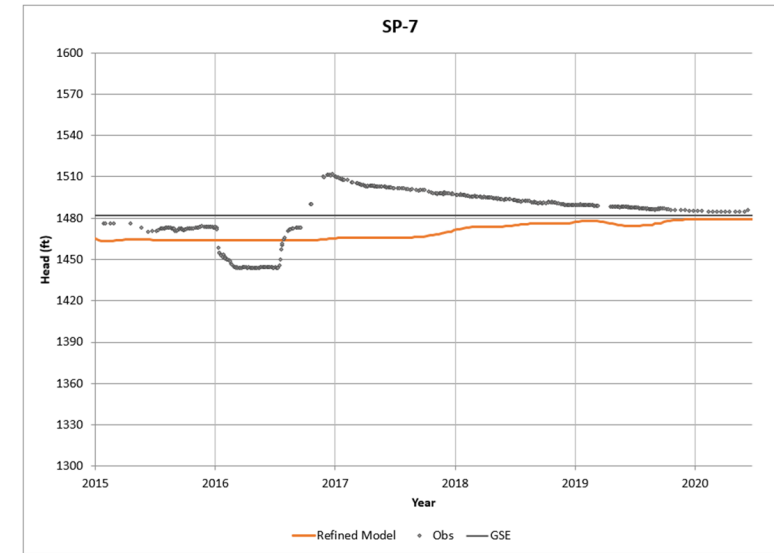EMWD 55 Perris II — Head (ft) vs. Year. Legend: Refined Model, Obs, GSE.
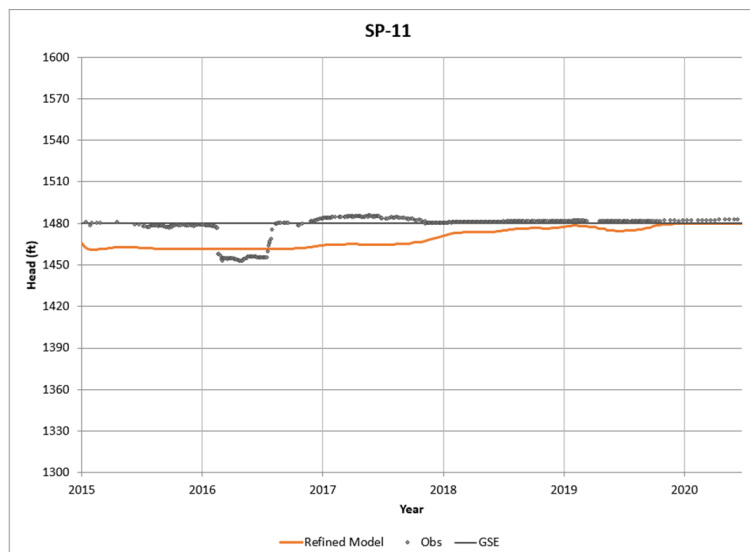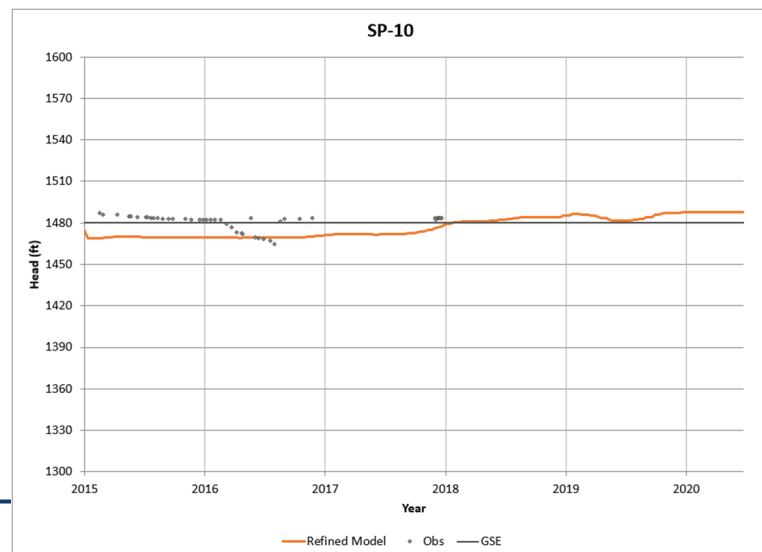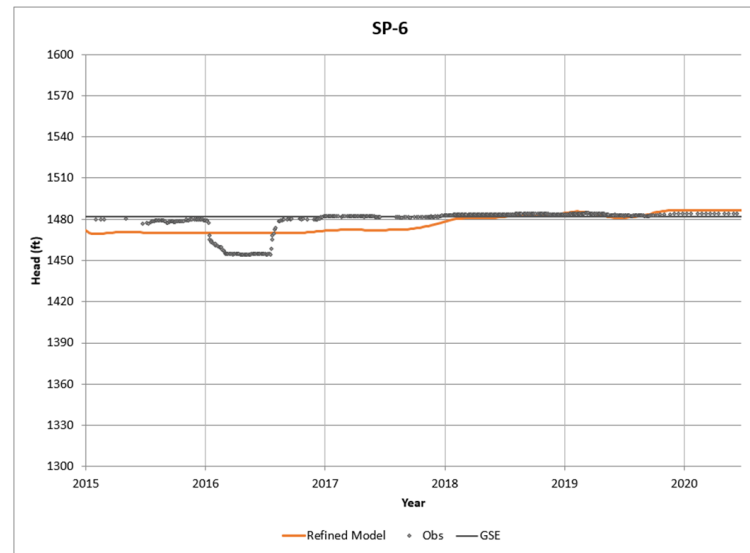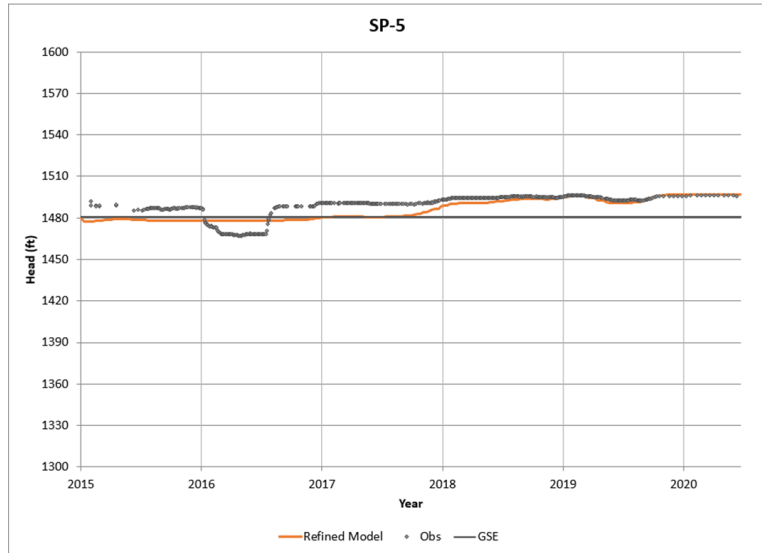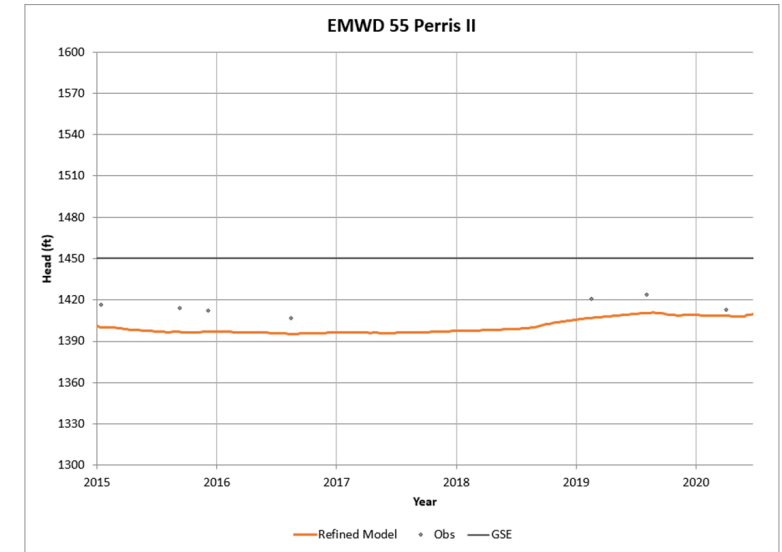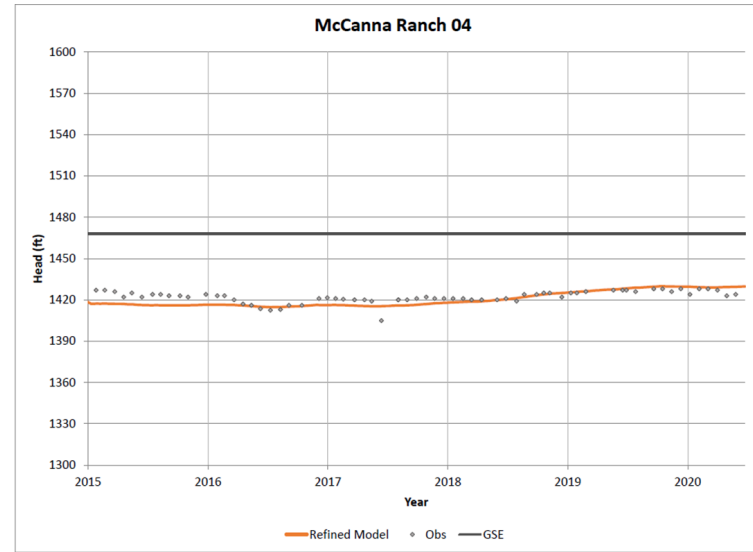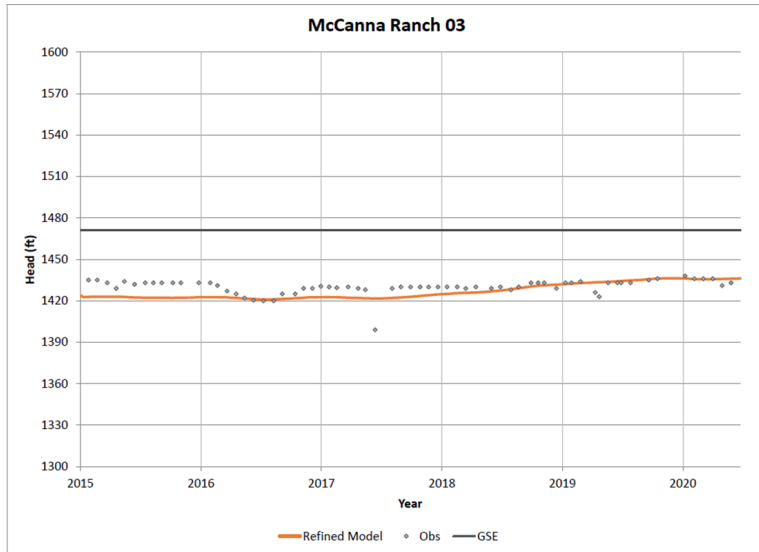
Verification- Passive Recovery System
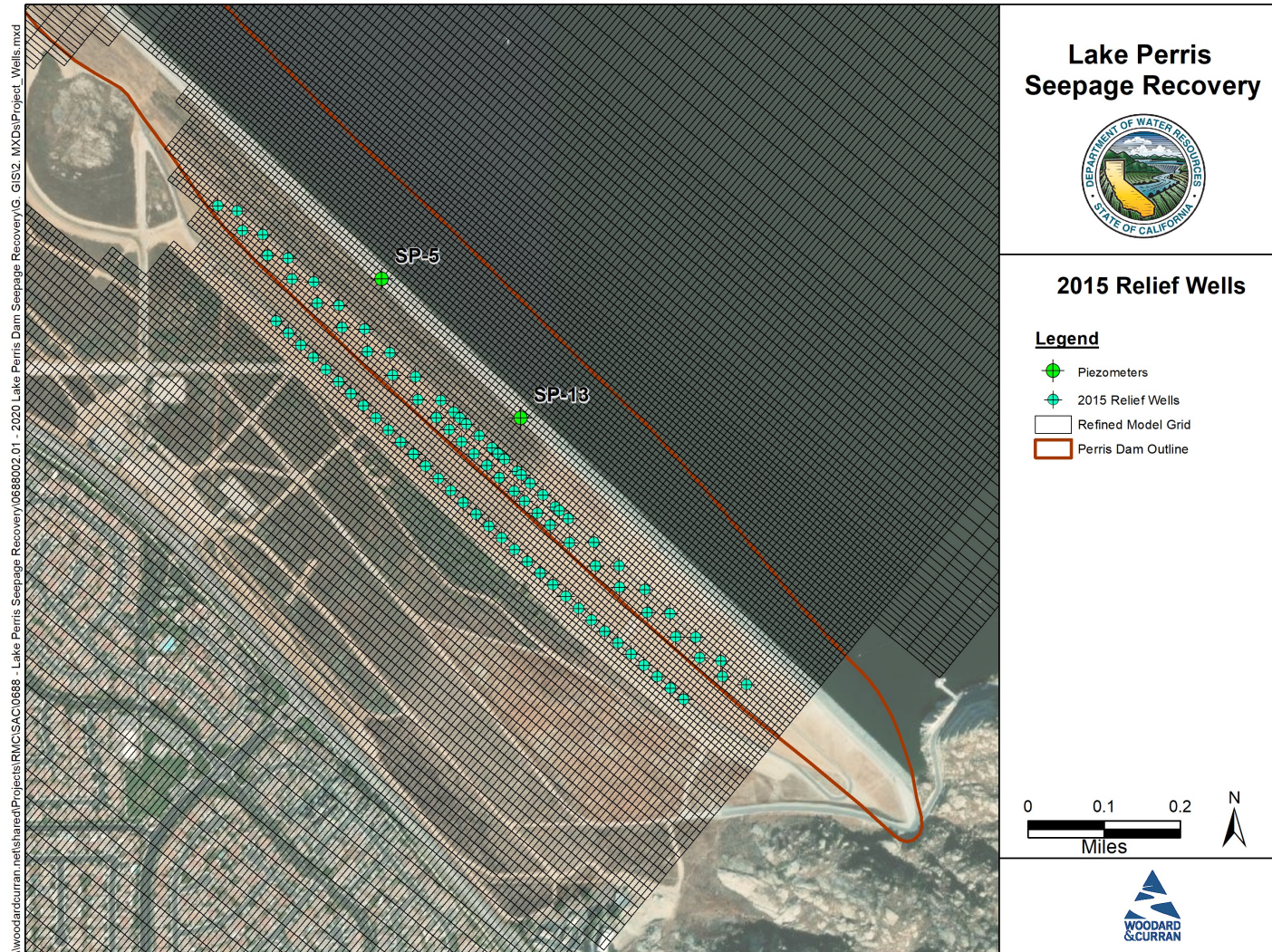
Verification- Seepage Recovery Rates

Groundwater Model Information for Geotechnical Analysis

Groundwater Model Information for Geotechnical Analysis

- ▸ 2D Geotechnical analysis
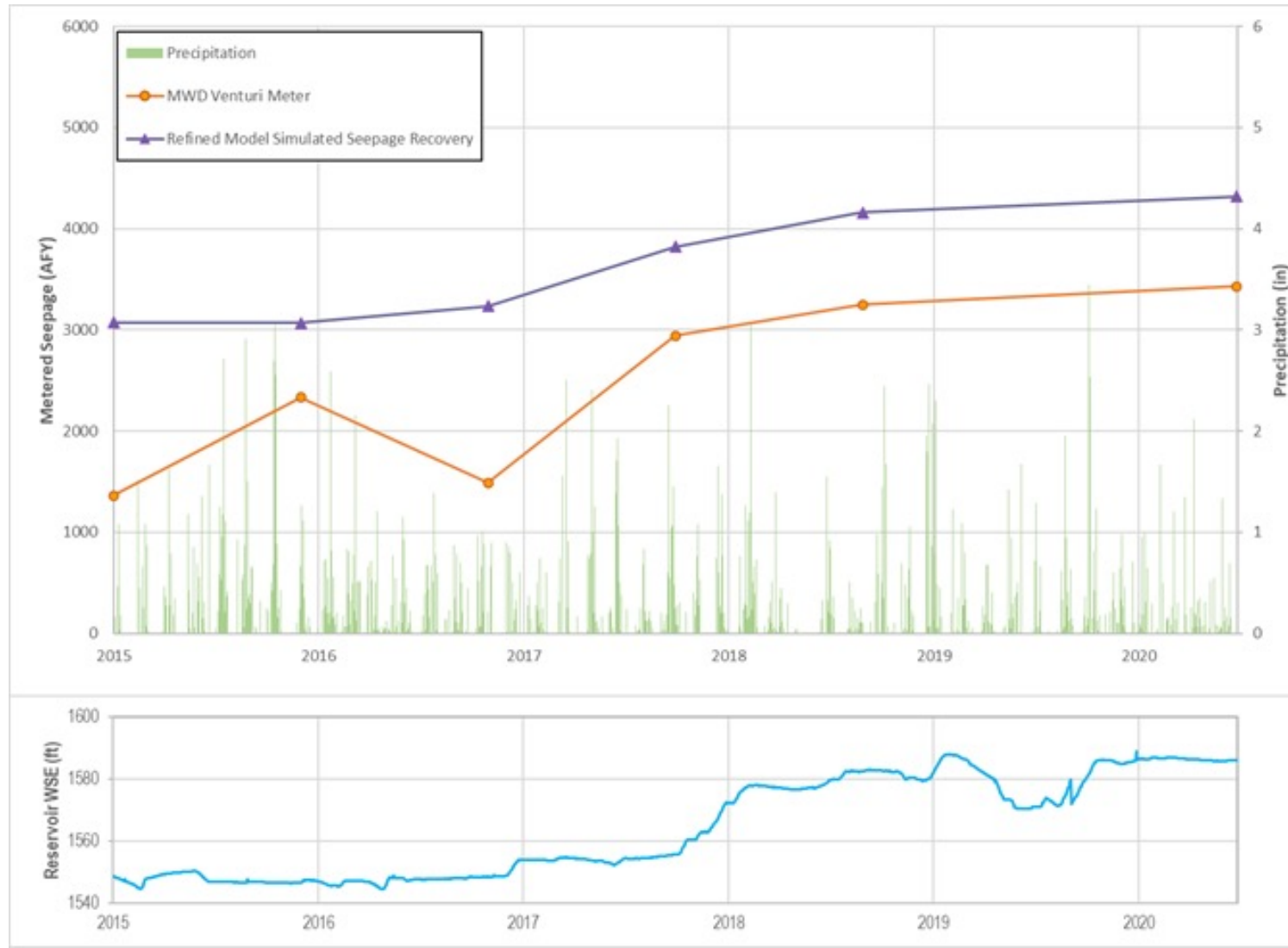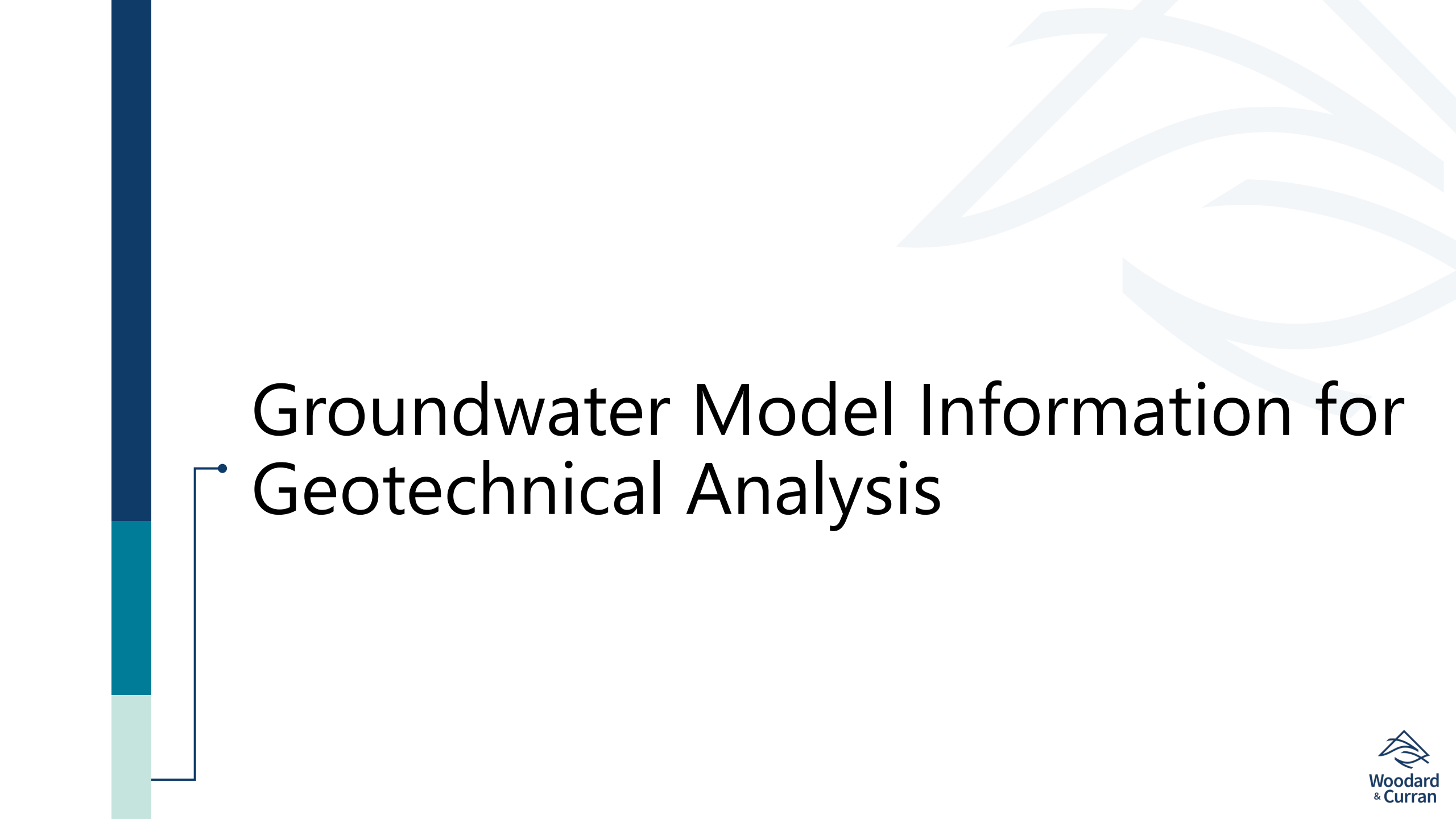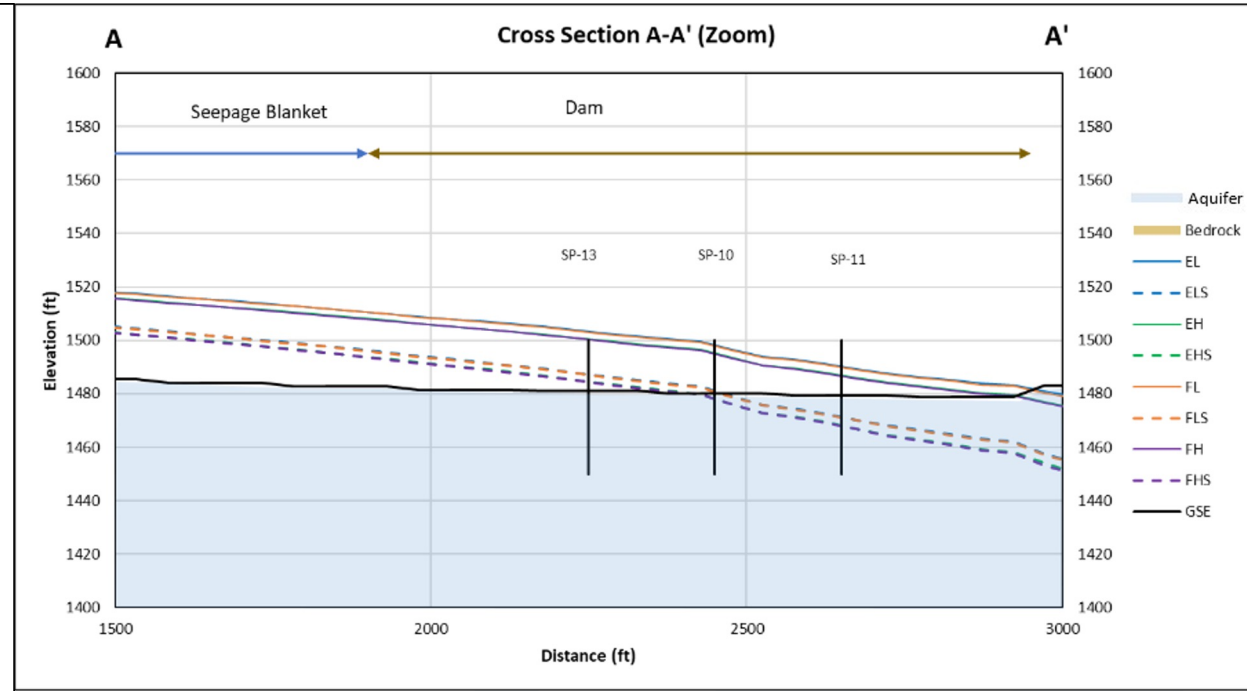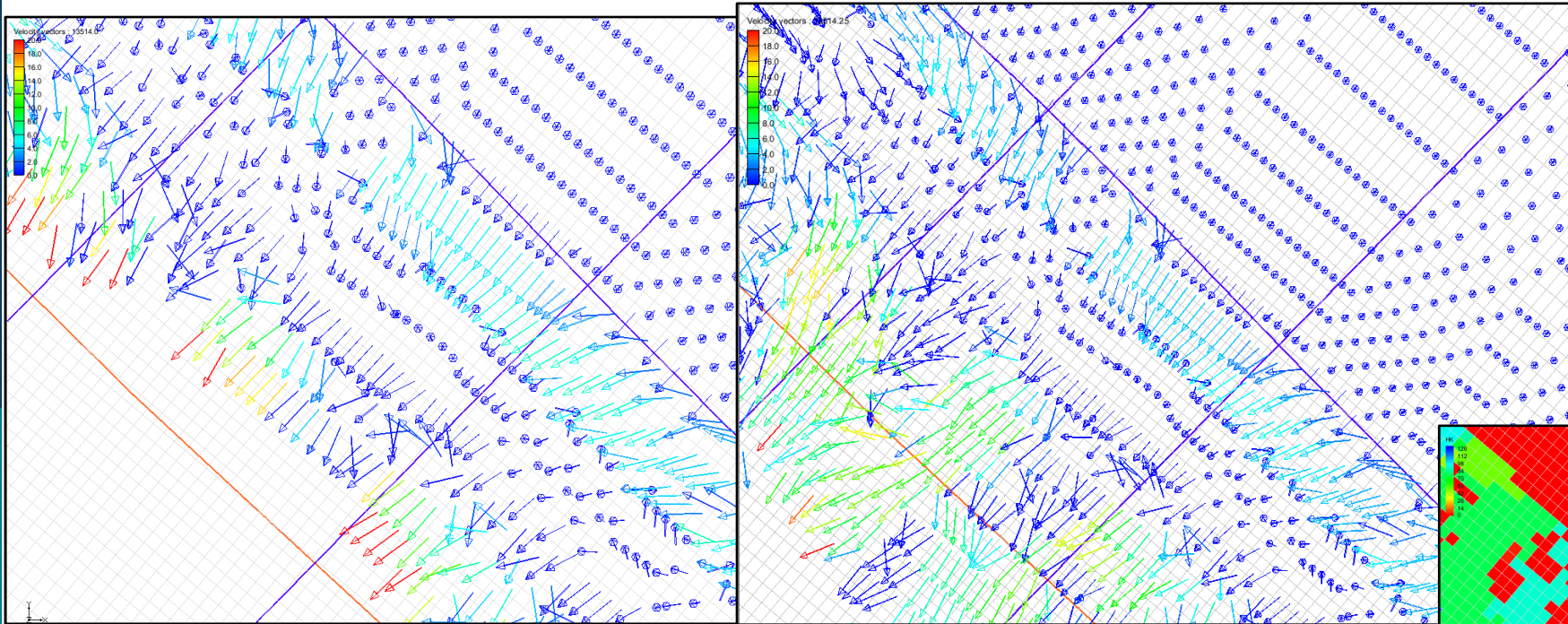 - ▪ Two cross sections along SP-5 and SP-13 piezometers
- ▸ Aquifer properties
- ▸ Seepage velocities
- ▸ Groundwater elevations
- ▸ Groundwater drawdowns
- ▸ Sensitivity analysis
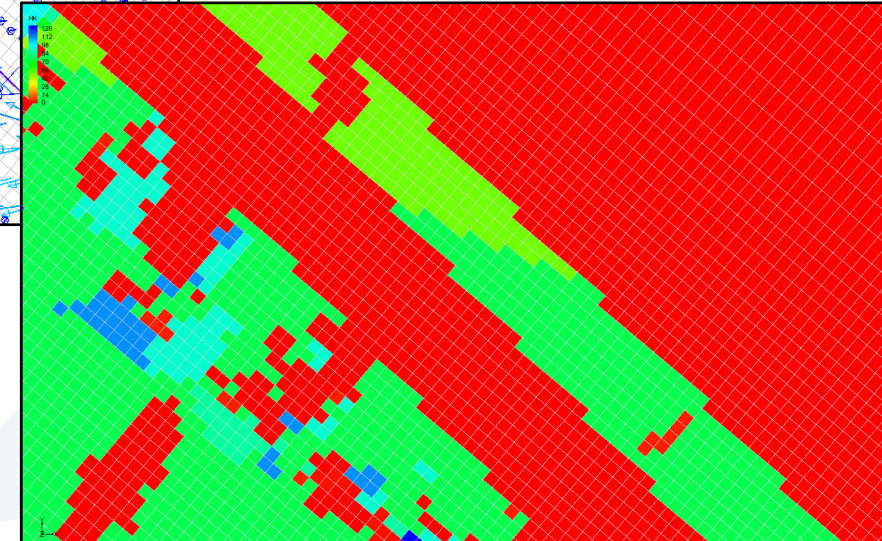
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Baseline and Scenario Hydrographs
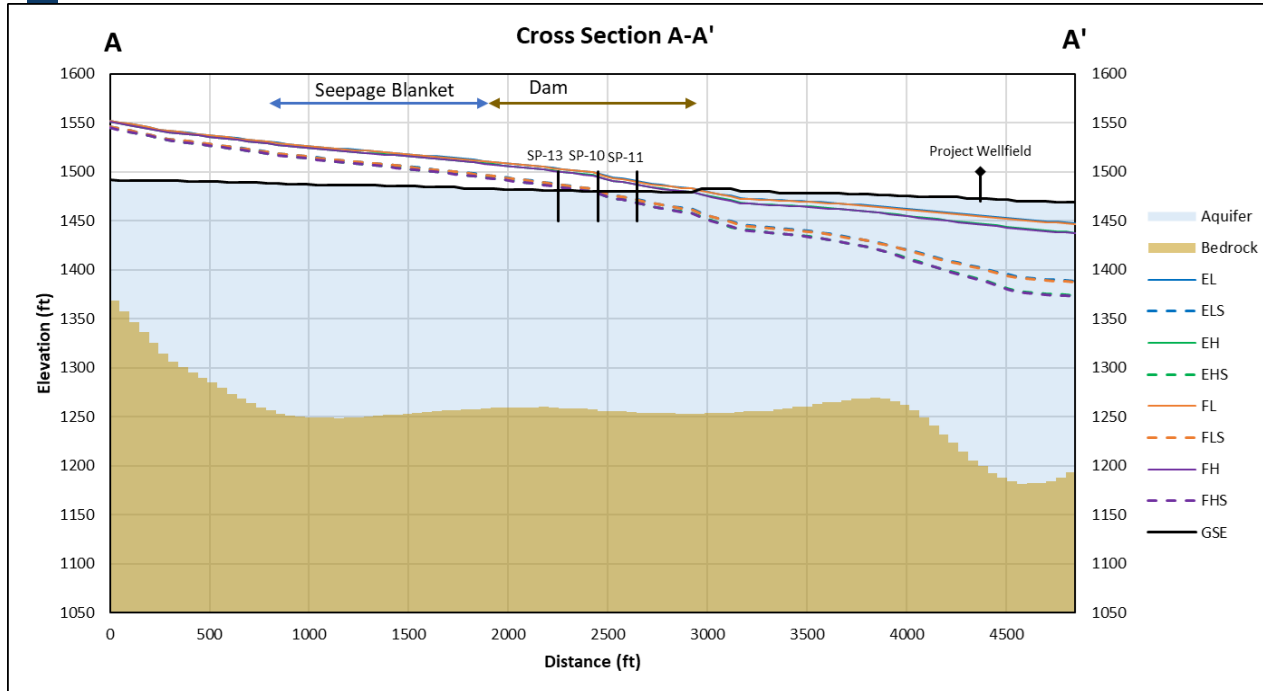
Velocity Vectors under Dam- Layer 1

EHS

EH

Simulated Seepage Velocities > 15 ft/day

Model Predicted Seepage Velocity – EHS 9
Oblique Toward North >15

Attachment X

Lake Perris, CA
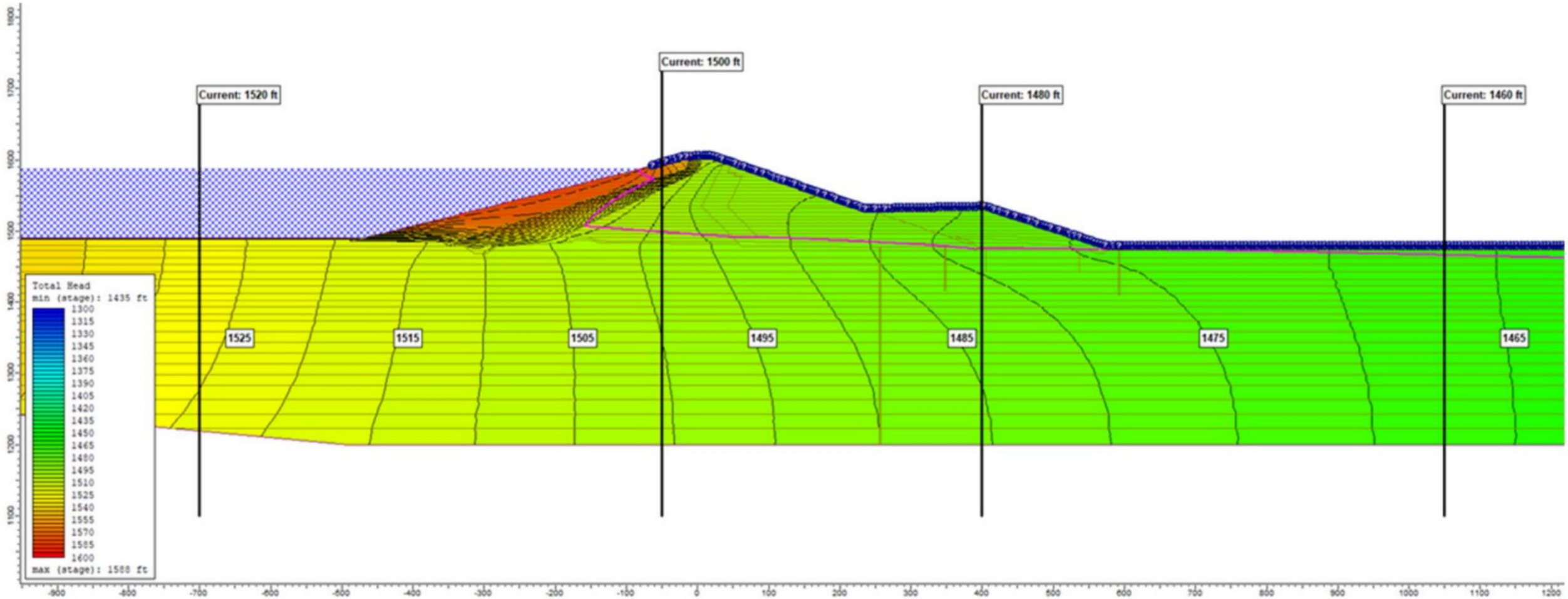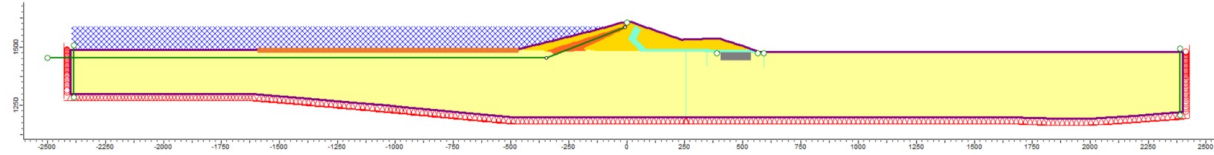
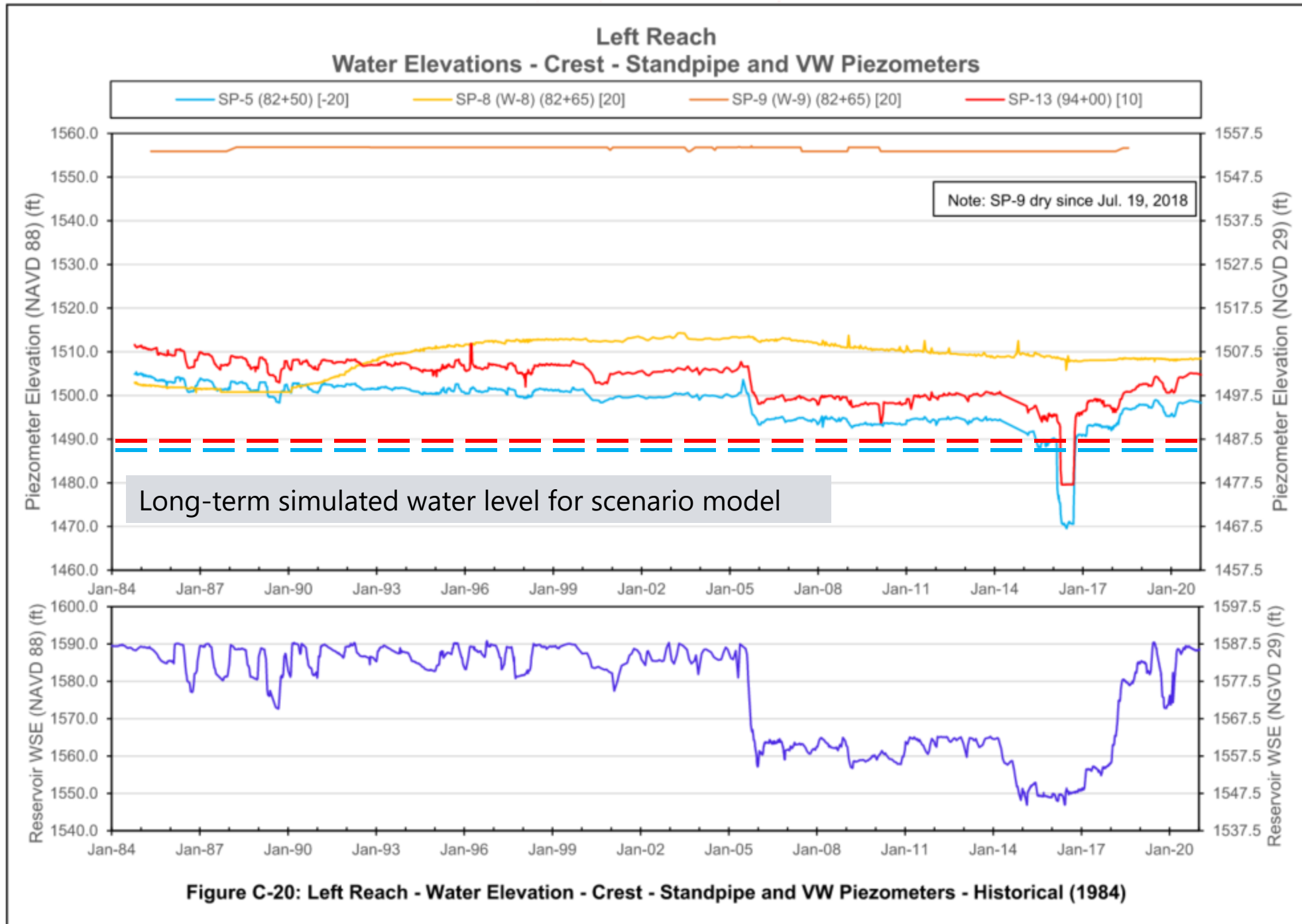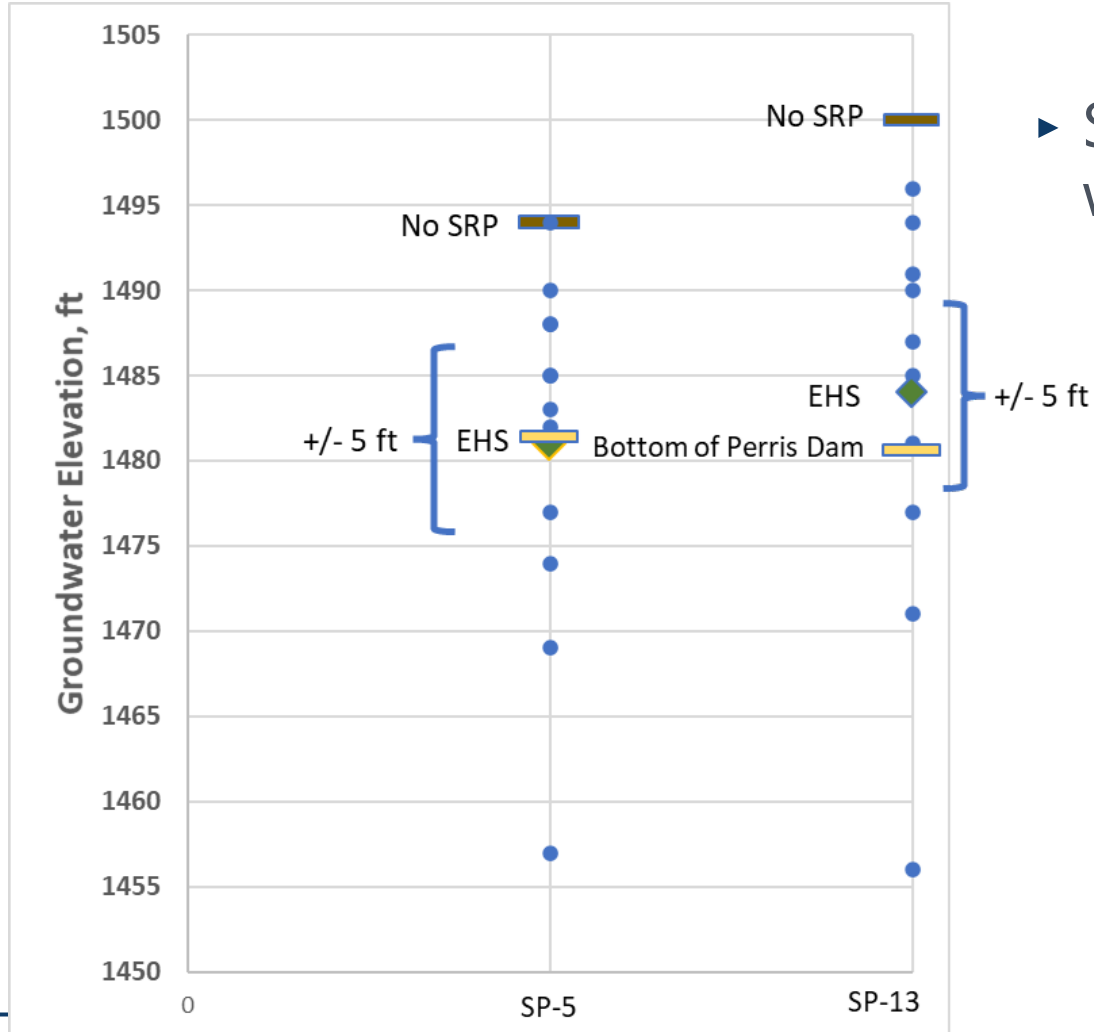# Jacobs 2D Seepage Model

Figure C-20: Left Reach - Water Elevation - Crest - Standpipe and VW Piezometers - Historical (1984)

Sensitivity Analysis

- ► Sensitivity of model (i.e., simulated heads) were evaluated for
  - HK & VK
  - HK & VK of seepage blanket
  - Lakebed conductance
  - Specific yield & specific storage
  - Conductivities of relief wells (passive seepage recovery)

Contacts

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Woodard & Curran