New Mexico Environment Department

LANL Community Engagement Meeting

Hexavalent Chromium Plume Control Interim Measures Overview

Hazardous Waste Bureau

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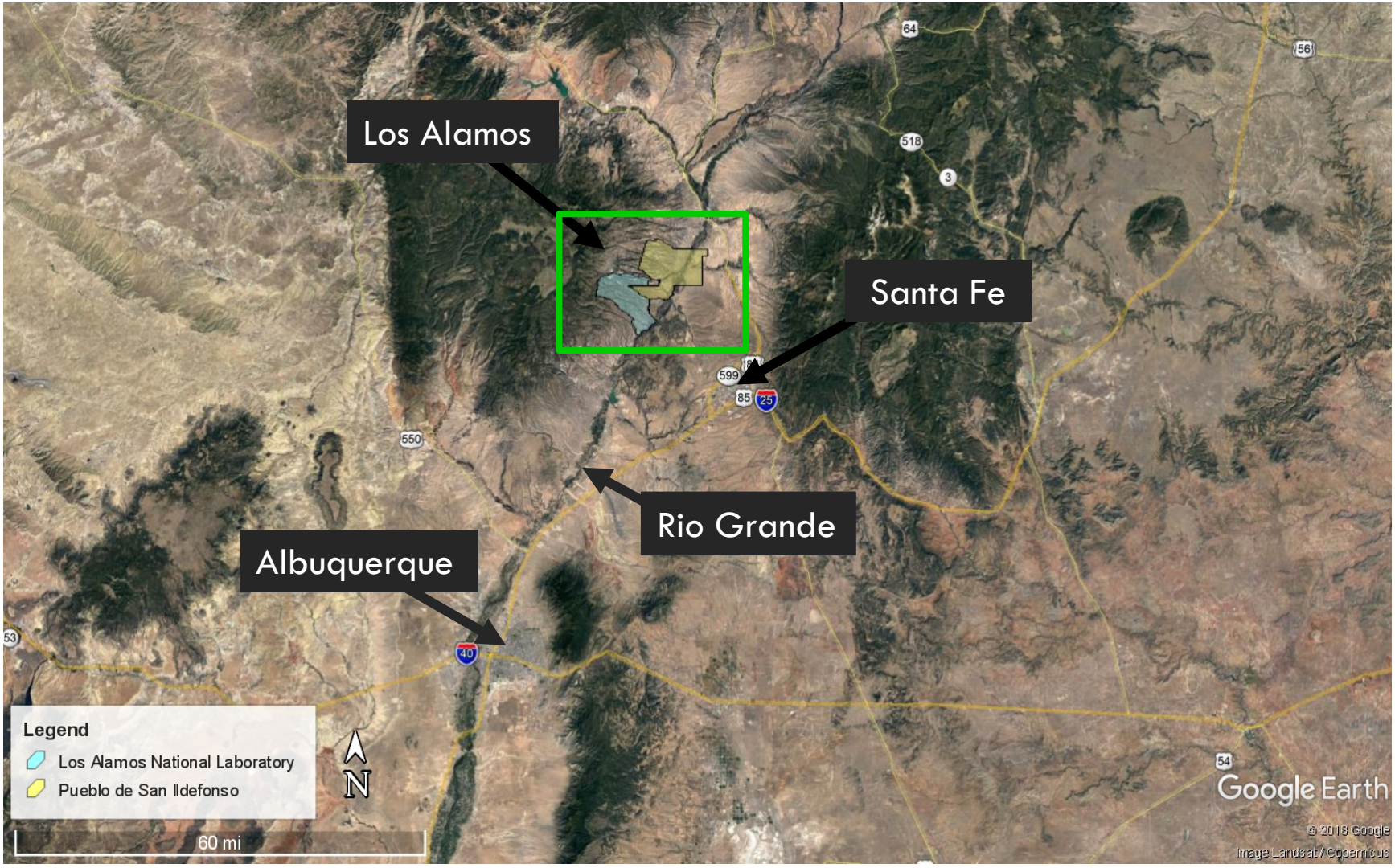
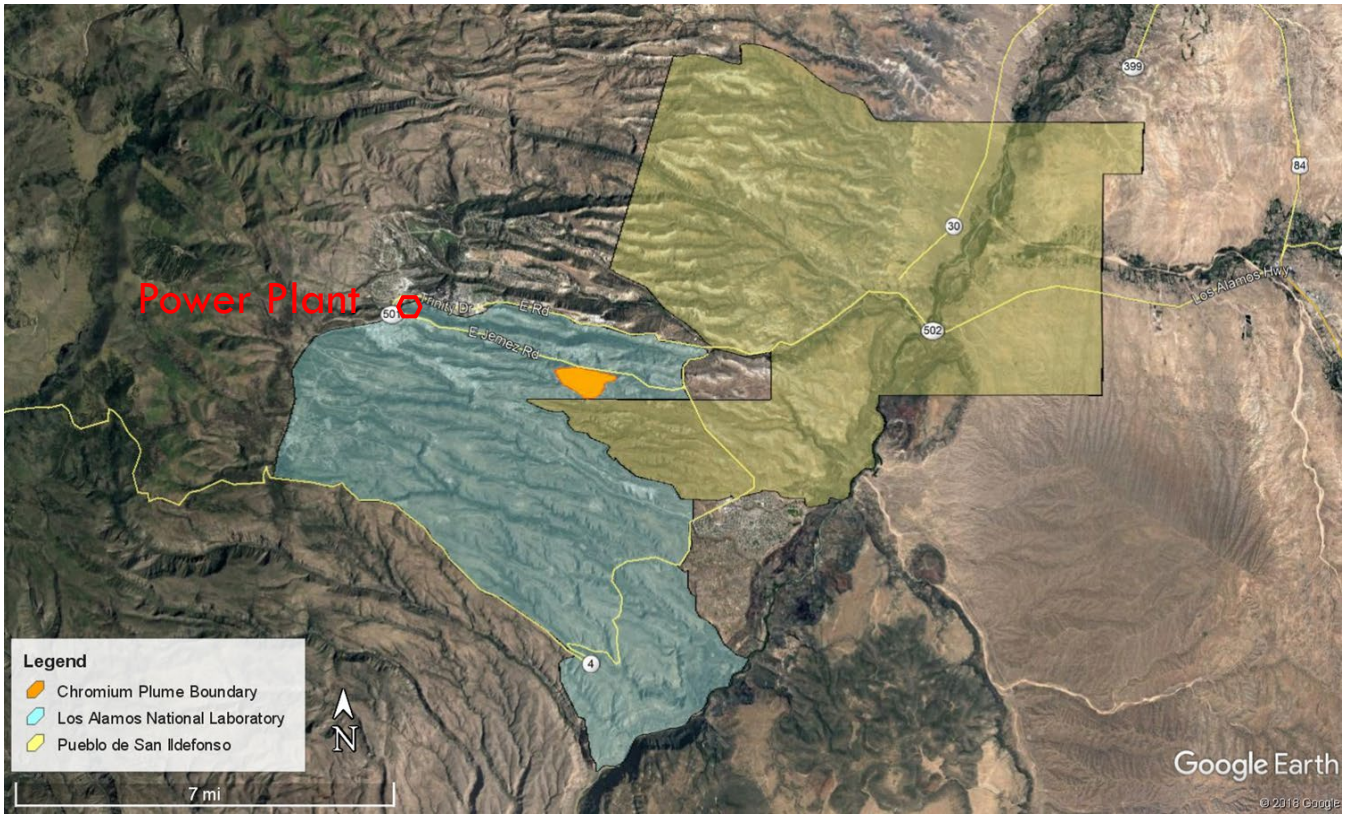
Photo credit Rhett Zyla #IamNMED

Site Location

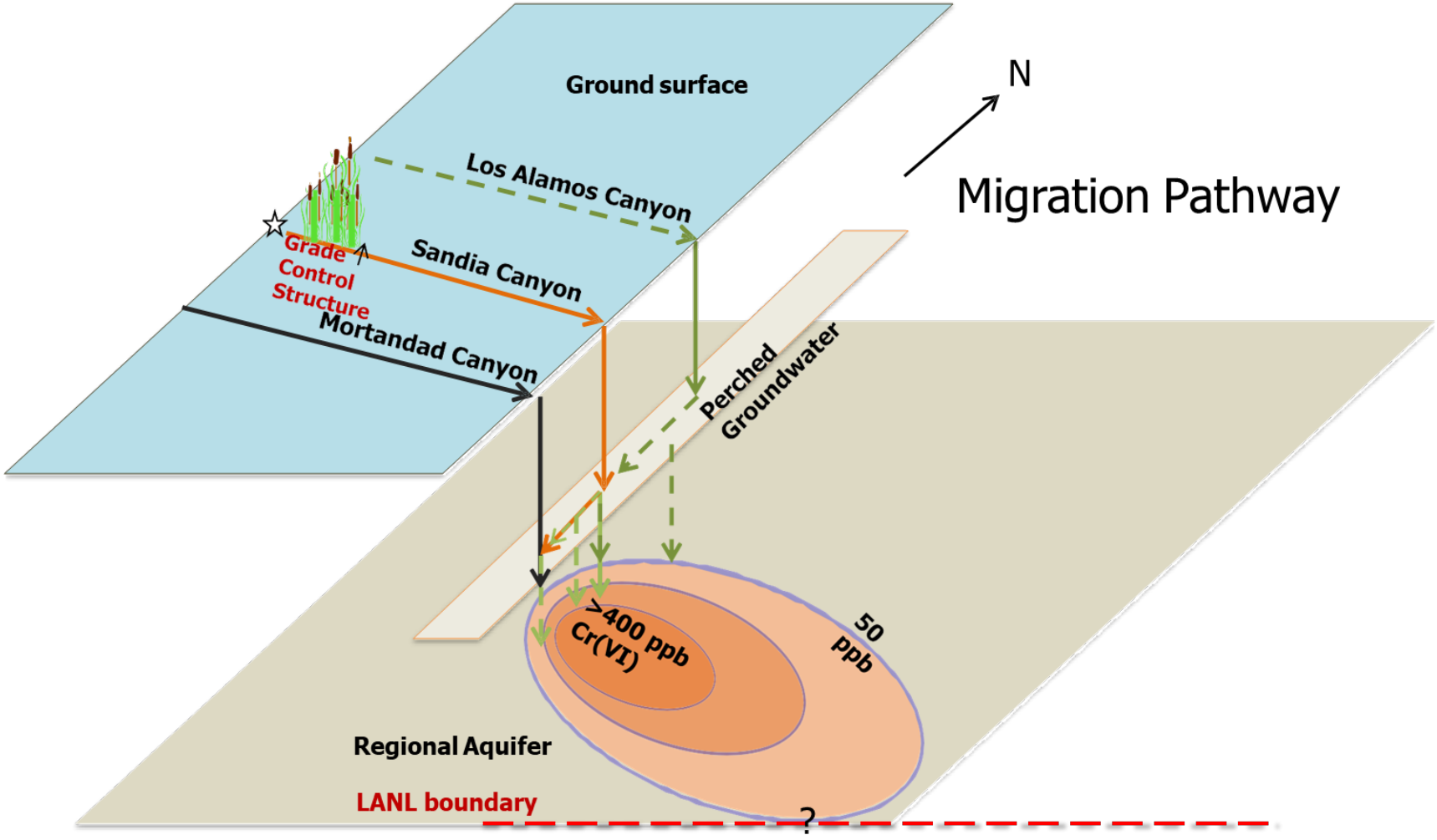


Site Specifics

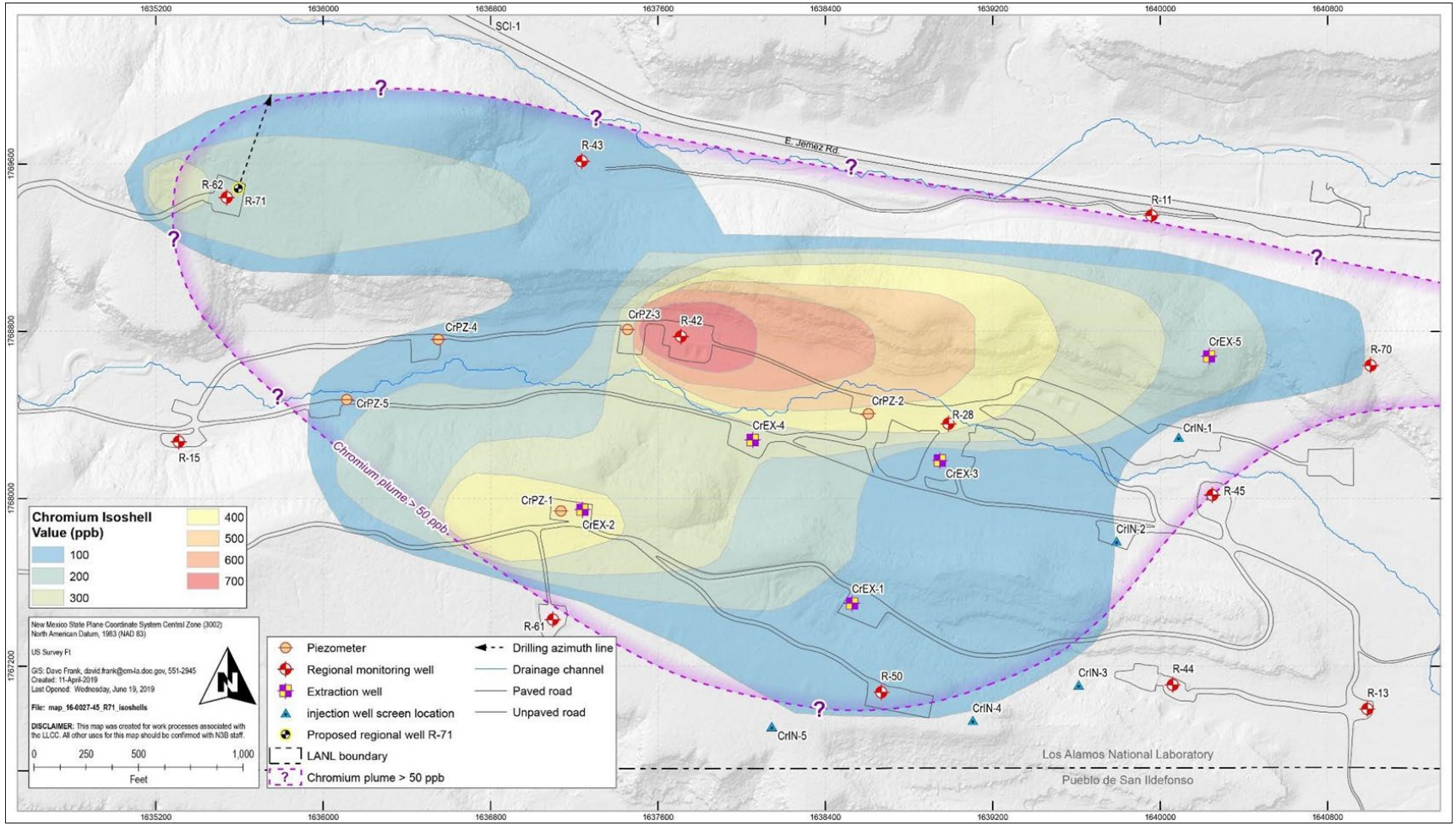
- Potassium dichromate used to control corrosion in power plant cooling towers
- 160,000 lbs. released to canyons between 1956-1972 as Cr(VI)
- Migration from perched aquifer to regional aquifer formed multiple sources
- Discovered in regional aquifer in 2005
- NMED regulates chromium in groundwater at 50 ppb
- Plume is 1 mile long / half mile wide. Thickness is un-certain
- Nature & Extent remains uncertain – in Campaign Approach along with IM
- Interim Measures - mid 2018 along SI boundary



Chromium Migration Schematic



Plume Detail – Coalesced Plumes



Overview of Plume Control IM Issues

Interim Measures Goals

- Three Workplans
- Two Consent Orders
- First workplan: April 2013
  - Extraction/mass recovery
  - Found to be feasible – CrEX-1 (2014)
- Second workplan: May 2015
  - Migration Control
- Third workplan: April 2018
  - Assumption Cr(VI) in top 50-60 ft
  - Metrics and reporting
  - 3-Yr performance timeline
  - 6th semi-annual report now submitted covering 3.5 years

Interim Measures Performance

- Assumption not valid
- Plume depth unexplored
- Water table mapping
- No hydraulic control
- Unfavorable response
- NMED Issued Numerous Technical Comments

DOE'S INTERIM MEASURES OBJECTIVES

"The overarching assumption guiding the IM strategy is that the dominant mass and mass flux of contamination in the medial and peripheral portions of the plume is in the upper 50–60 ft of the water table in the strata with the highest hydraulic conductivity."

- The principal objective is to achieve and maintain the downgradient chromium plume edge with a specific metric of reduction of chromium concentrations at IM monitoring well R-50 to concentrations of 50 µg/L or less over a period of approximately 3 yr.
- The principal objective has been met.
- A secondary objective is to hydraulically control plume migration in the eastern downgradient portion of the plume.
- The IM operations are in the early stages of implementation to meet the secondary objective.

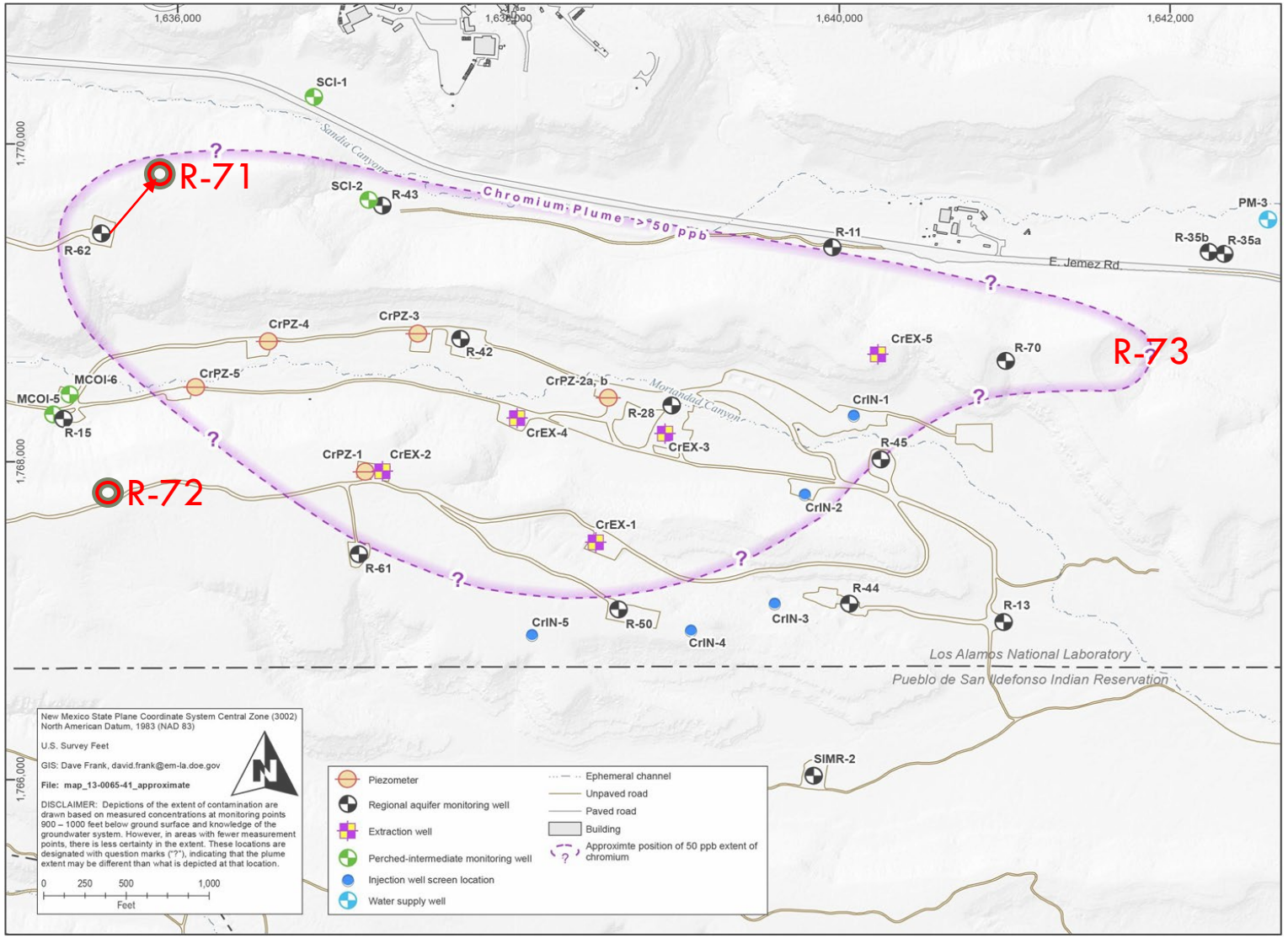
DOE's Interim Measures Performance

The key evaluation tools for interim measures performance evaluation:

- Time-series plots that include data for chromium, perchlorate, nitrate, and tritium from monthly sampling in performance monitoring wells, and from extraction wells for capture zone analysis.
- Time-series plots that include data for injection well tracers from monthly sampling in performance monitoring wells.
- Water-table maps that evaluate potential changes in gradient associated with IM operations are used as an additional line of evidence for evaluating IM performance.
- Cumulative chromium mass removal estimates. Although mass removal rates and efficiency are not directly related to IM performance, they may provide insights into observed plume response.

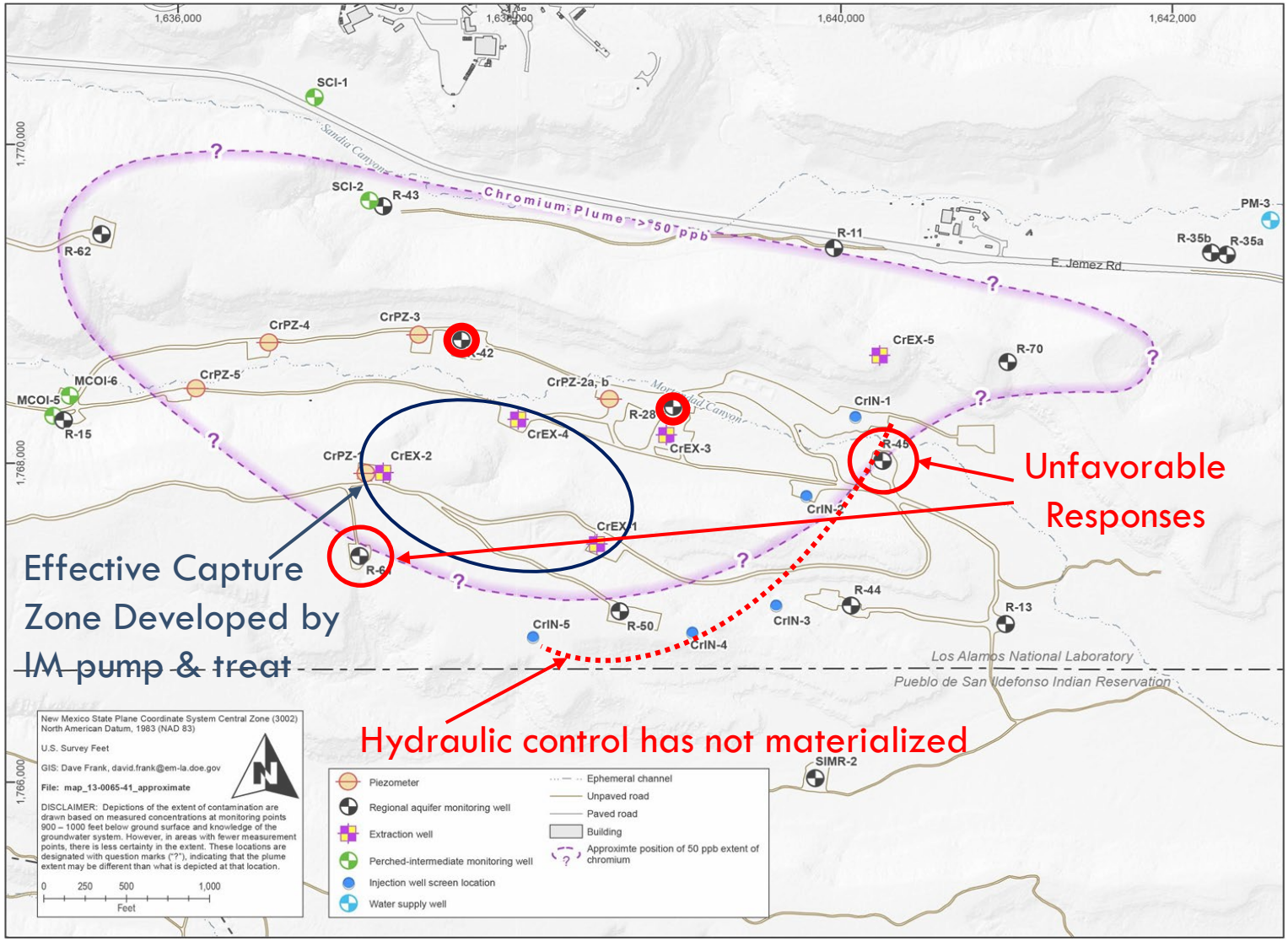
Monitoring and Interim Measures Wells

- 5 IM injection wells (blue)
- 5 IM extraction wells (purple/yellow)
- PM-3 (light blue)
- DOE agreed to 3 new monitoring wells
- FY2022 Milestones include additional monitoring wells
- Need accurate water table maps, flow calculations and modeling to site



Interim Measures Performance Issues

- In-situ treatment
- Hydraulic control in 3-year period
- Extraction is effective – but only 472 lbs. removed since 4th Q of 2016
- With injection - unfavorable response noted
- NMED requested calculations and modeling



DOE Water Table Map

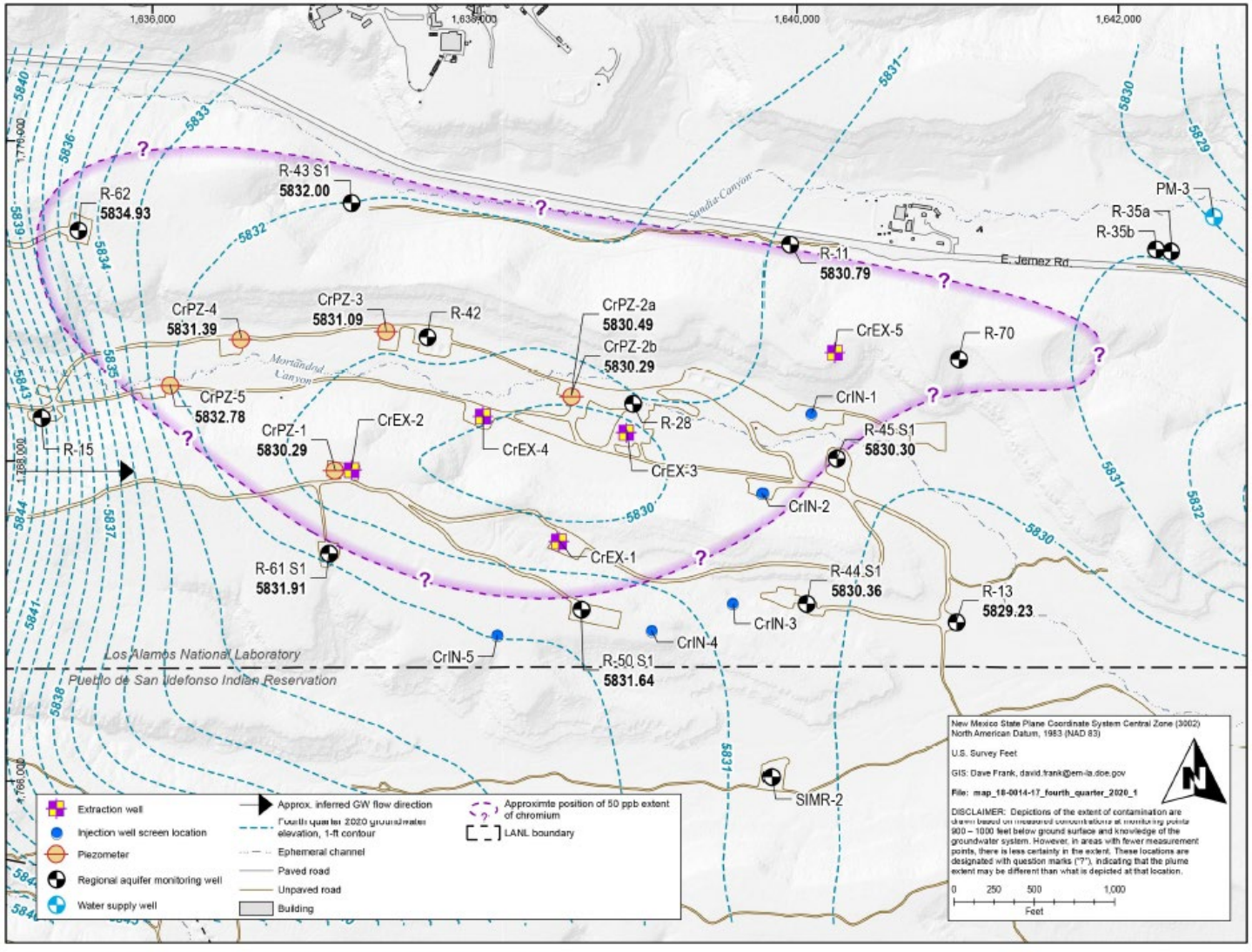
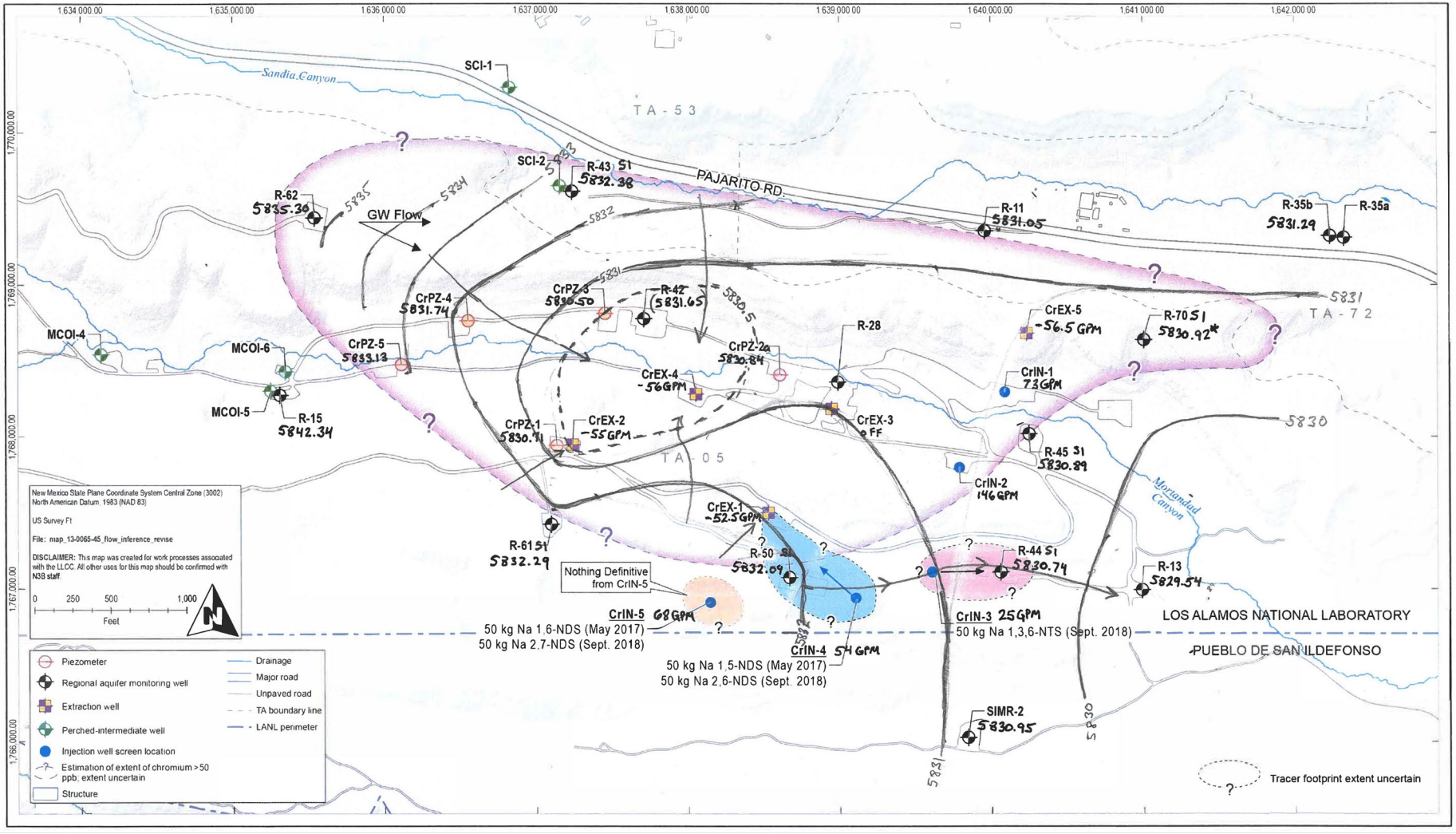


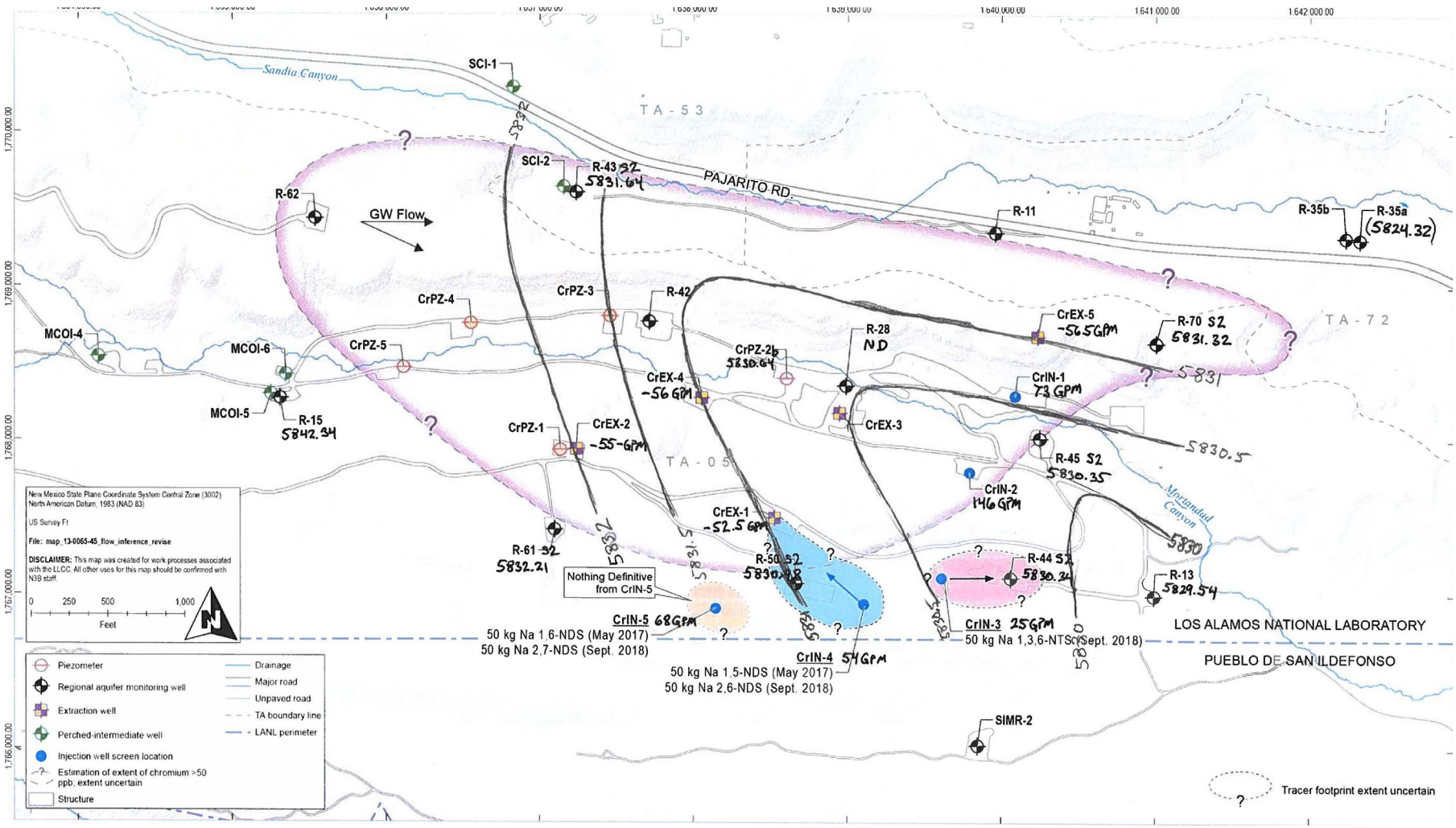
Figure 3.3-1 Water table showing average water levels for November 2020

NMED's Triangulation of 3-point problem better represents IM performance



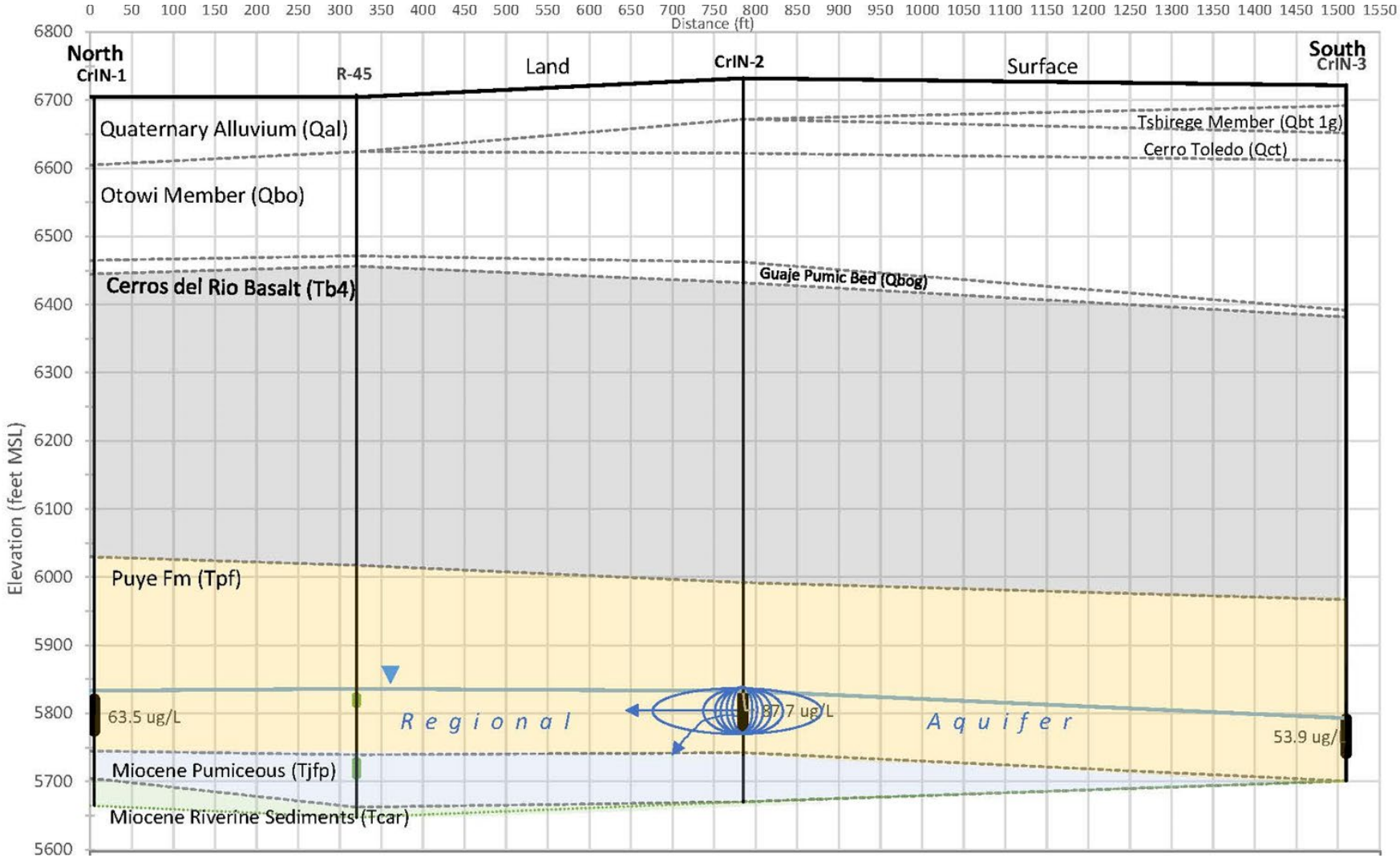
November 9, 2020, 07:00 potentiometric surface near the regional aquifer water table (monitoring well screen 1 heads)

Deep screen 2 water level map



November 9, 2020, 07:00 potentiometric surface at depth (monitoring well screen 2 heads)

Profile Through Injection Wells

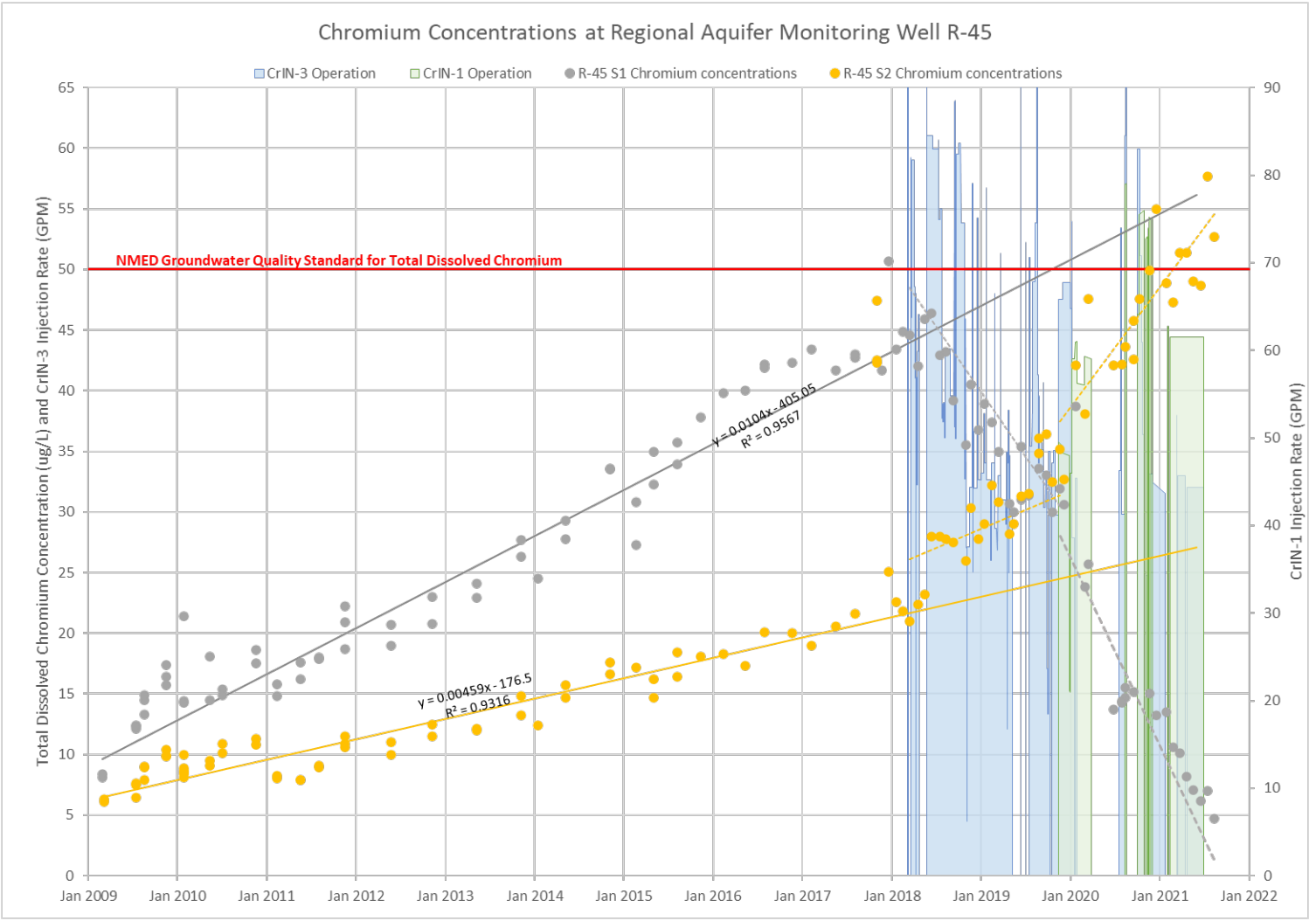


Injection Operations Unfavorable Response at Performance Monitoring Well R-45

Plume migrates with ambient flow linearly until injection starts at CrIN-3 mid-2018

Trends then altered as CrIN-3 started, and again, in late 2019 when CrIN-1 & CrIN-2 went online

Modeling calculations requested by NMED



Injection Operations Unfavorable Response

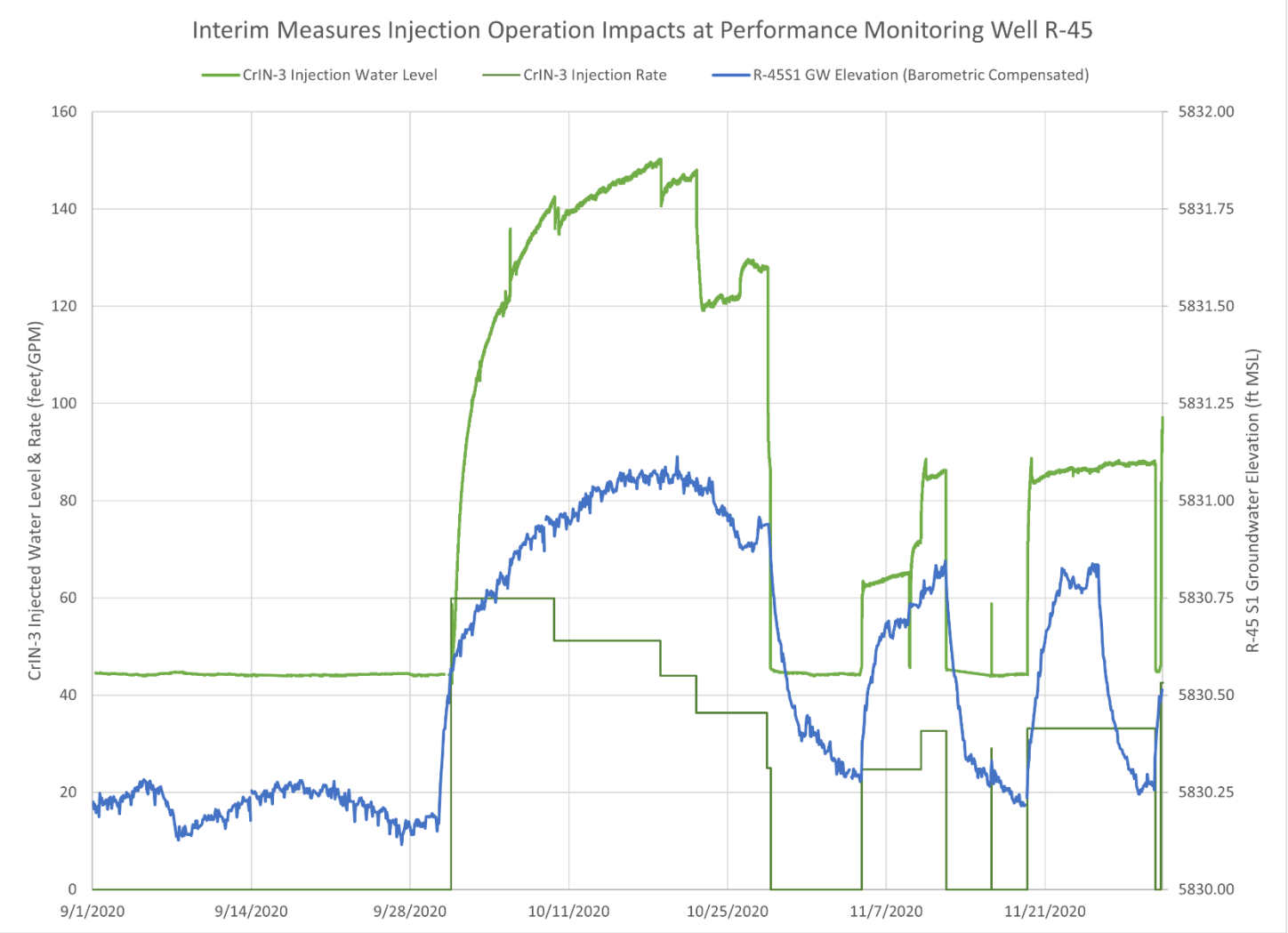
Two Lines of Evidence

High injection rates into CrIN-3 created a distinct pattern of water level rise in the injection well that are also observed in the top screen at R-45 during October 2020

The anomalously high injection rates raise the water level in CrIN-3 by over 100 feet

At R-45 S1, a similar rise in the water level is observed to be about 1 ft

Modeling may provide some insight to this observation

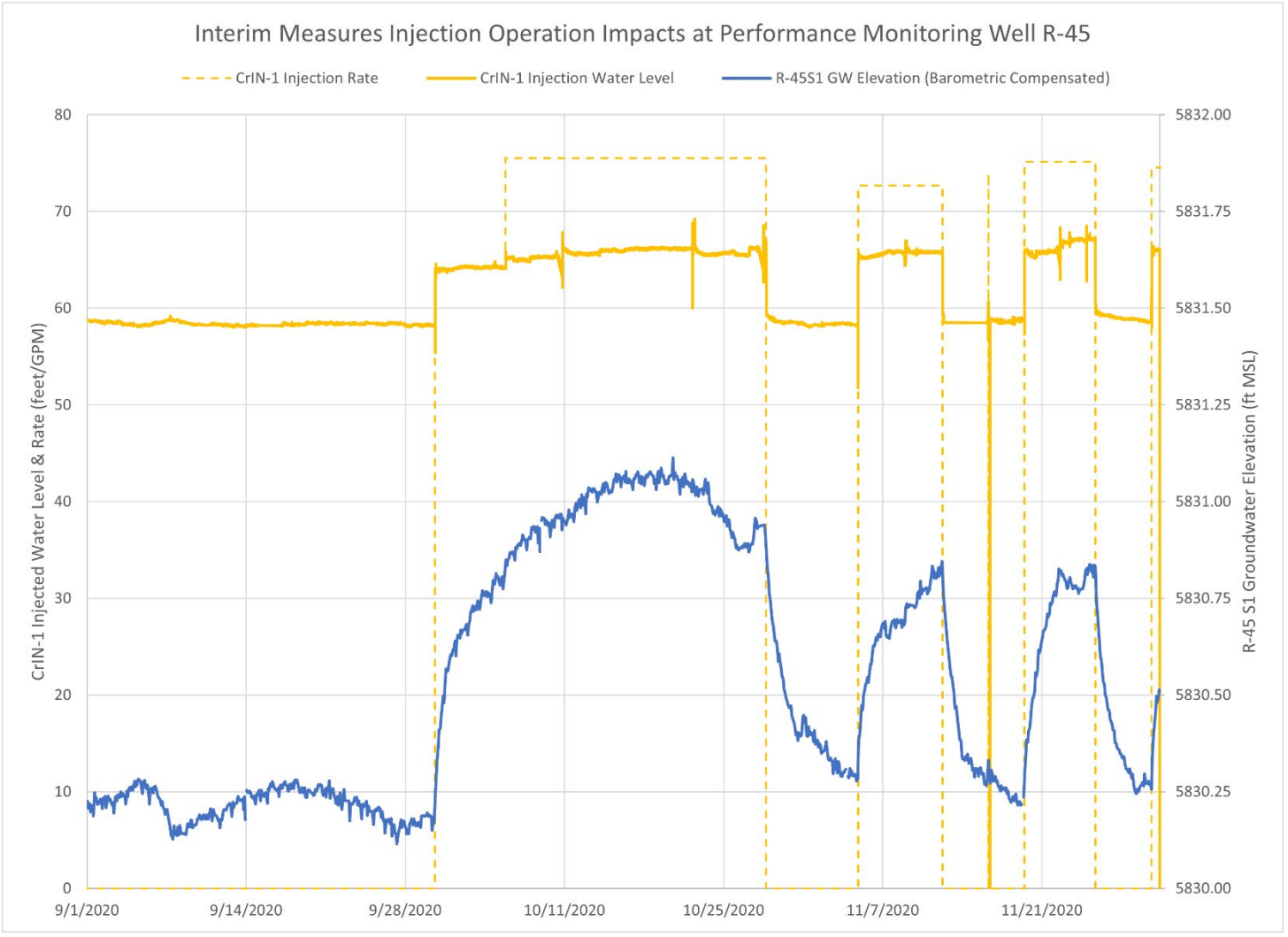


Injection Operations Unfavorable Response

Typical injection rates into CrIN-1 created no distinct pattern of water level rise in the injection well that can explain the pattern observed in the top screen at R-45 during October 2020

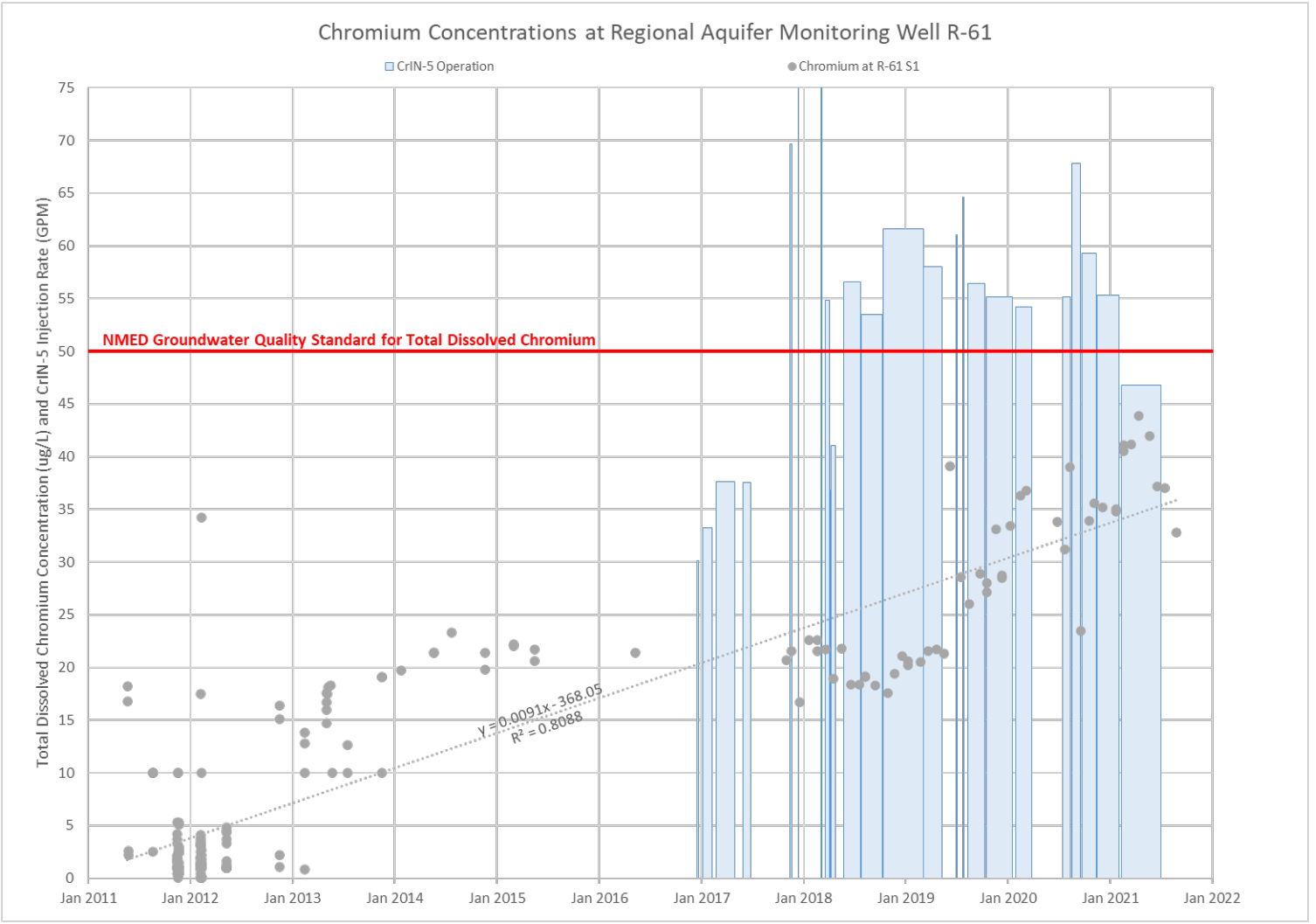
Typical CrIN-1 injection rates only raised the water level in that well by about 5-8 feet

Modeling may provide some insight to this observation



Injection Operations Unfavorable Response at Performance Monitoring Well R-61

- Upgradient to injection operation
- Trends altered after injection operations started
- Appears delayed compared to R-45 response due to distance and upgradient location
- Modeling calculations requested by NMED



Time for Reassessment of IM Strategy

NMED wants DOE to engage in a new workplan that incorporates the new understanding of the system dynamics and goal for mass removal to move to final remedy. The new workplan will:

- Provide flexibility for adjustments to system operation
- Focus upon extraction to control migration and mass removal
- Be model based
- Be able to control migration through the entire plume depth
- Provide better metrics for performance evaluation
- Provide a basis for moving forward to corrective measures

QUESTIONS?