NMED
New Mexico Environment Department

GOLD KING MINE CITIZENS' ADVISORY COMMITTEE UPDATE

July 25, 2016

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Agenda

1. Site visit to Gladstone
2. Result from the 2016 Spring runoff
3. EPA's Fate and Transport Model
4. Portable XRF

Inspection of the Gladstone Treatment Plant March 7, 2016

- Visit to the GKM wastewater treatment facility (GKMWTF) at Gladstone, at Navajo Nation EPA's request
- EPA, NN EPA, CDPHE, CRMS and NMED
- Plant was constructed in response to GKM event of 8/5/2015
- Basic layout involves:
  - capturing flow from GKM
  - piping to Gladstone
  - pH adjustment and chemical feed
  - settling and filtration in geotubes

Inspection of the Gladstone Treatment Plant March 7, 2016

- Deficiencies and questions about treatment noted, including:
  - What **control of flow** from GKM Adit #7 does EPA have and how is flow managed?
  - What **operating data** have been collected since the start of operations of the GKMWTF (i.e., flow, pH, turbidity, etc.)? What data have EPA or the contractor decided to no longer collect, and why? Who collected the data and maintains the record of operations? How often does EPA staff inspect the data and discuss results with the contractor? Are records maintained of these discussions and of changes required by EPA based on these meetings or discussions?
  - How are **lime and polymer feeds monitored** and adjusted? How are stocks of these materials monitored and tracked?
  - What are the **internal monitoring and control points** for the GKMWTF?

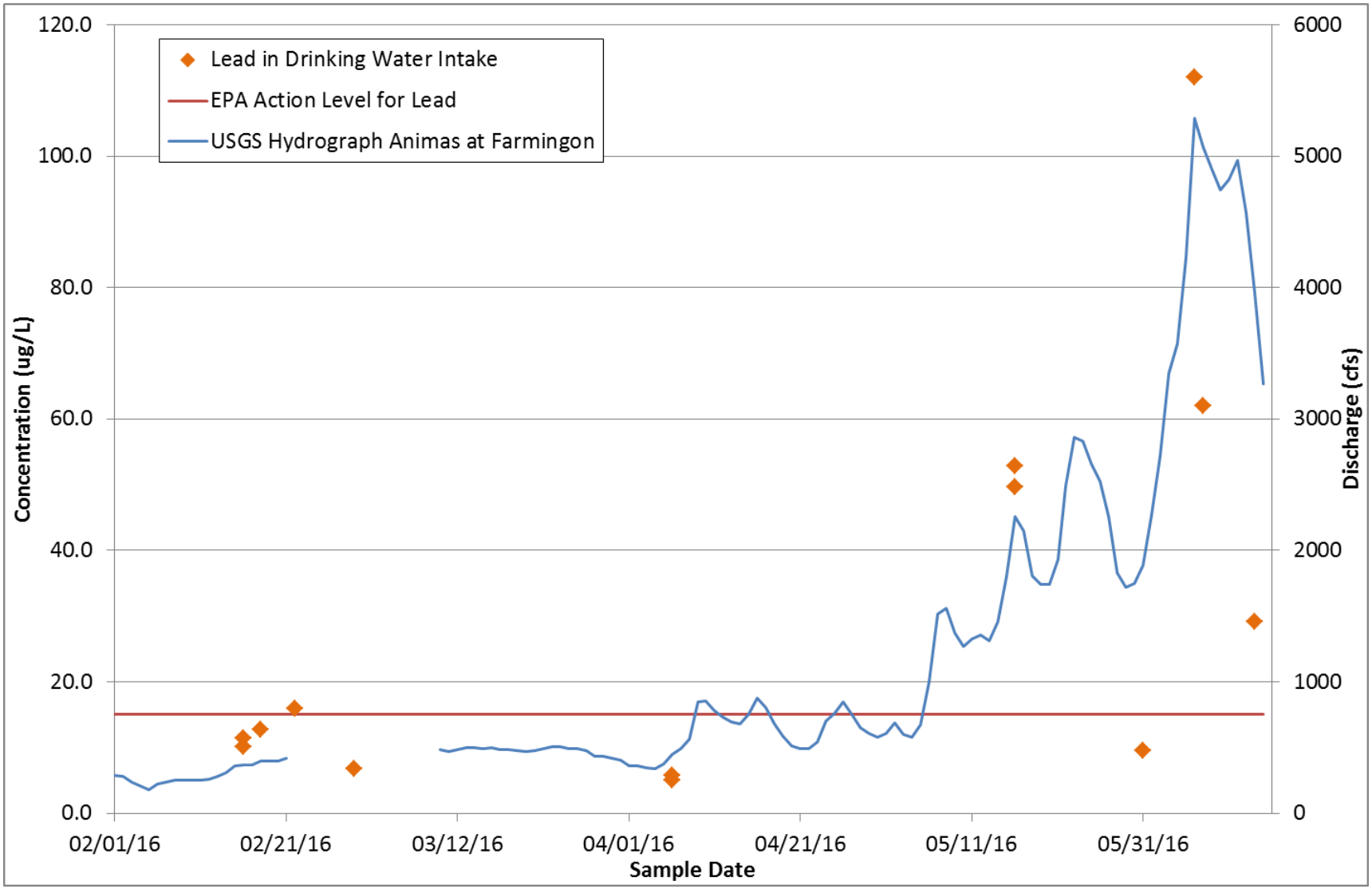
Inspection of the Gladstone Treatment Plant March 7, 2016

- Deficiencies and questions about treatment noted, including:
  - Please list all **permits issued to EPA** or the contractor for the construction or operation of the GKMWTF. Please provide copies of the permits.
  - Please list all **effluent limits** imposed by the permits and the basis for how the effluent limits were calculated.
  - Other than the electronic monitoring for pH, turbidity, and specific conductance are **other tests of water quality parameters** conducted to manage or optimize operations? If so, what are the test parameters, who conducted or conducts the tests, and what role does EPA play in reviewing the results?
  - Please describe the **SCADA system**, what is monitored, how the call-out system is set up, and who is responsible for responding to SCADA alarms.
    - SCADA = **S**upervisory **C**ontrol **a**nd **D**ata **A**quisition

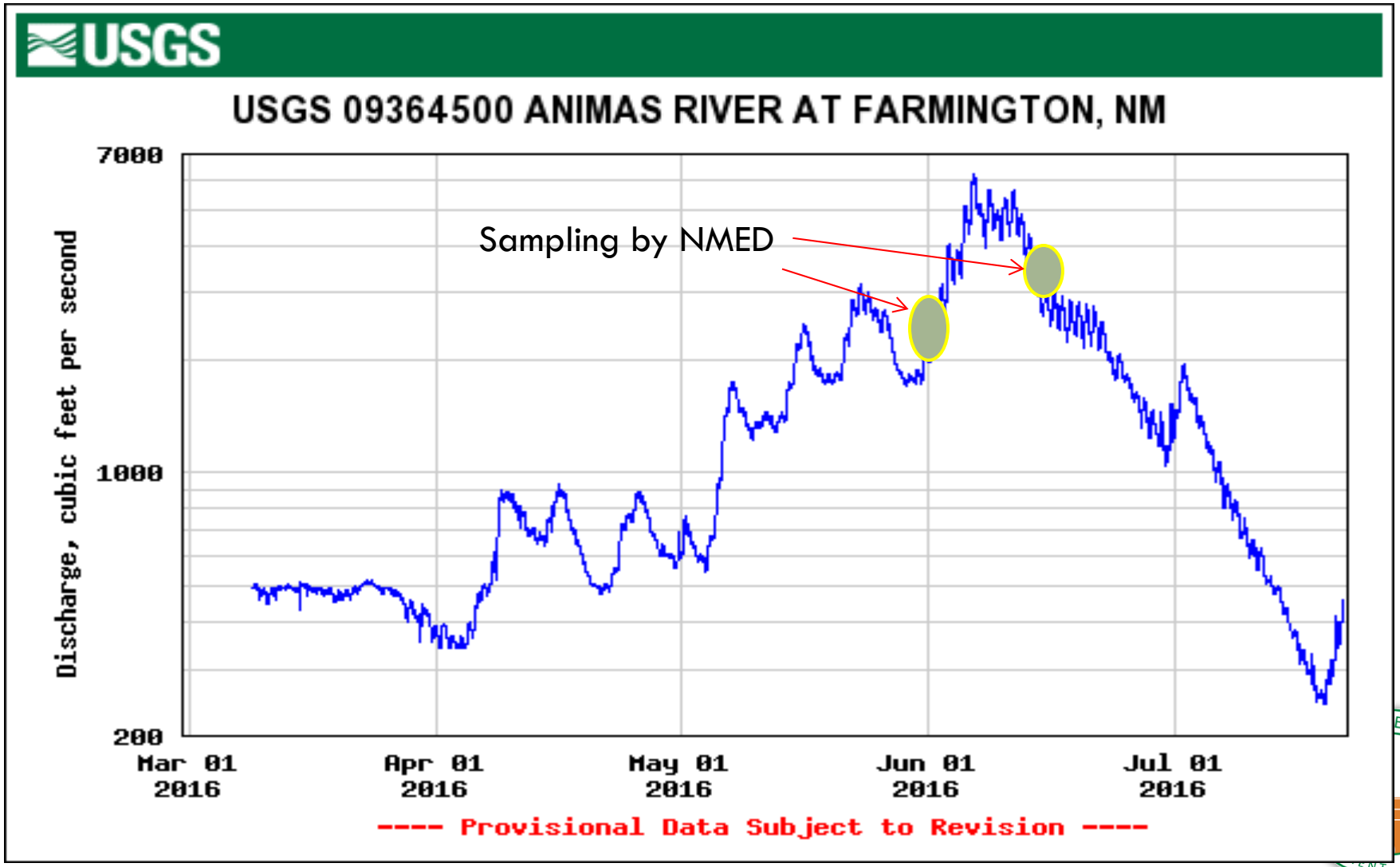
Inspection of the Gladstone Treatment Plant March 7, 2016

- Deficiencies and questions about treatment noted, including:
  - Please describe the **effluent monitoring** conducted for flows from the GKMWTF to Cement Creek, including the frequency, type of analysis, laboratory conducting the analyses, and turn- around time for results. Who reviews the effluent data and what decisions, if any, can and do they make on the basis of their analysis? Please provide the results of all effluent data.
  - What plans does EPA have to **operate the GKMWTF beyond November 2016**? Are additional flows from other mines or the American Tunnel being considered for treatment at GKMWTF, and if so what modifications would be needed?
  - EPA claimed the sediment in the bags can be disposed in a solid waste landfill. Please provide any **TCLP and paint filter test results** that support this conclusion or any other information that supports the disposal decision.
  - What is the **contingency plan** if storm events and/or spring runoff exceed the stated GKMWTF capacity of 900-1200 GPM?

Lead in Animas River at Farmington Drinking Water Intake



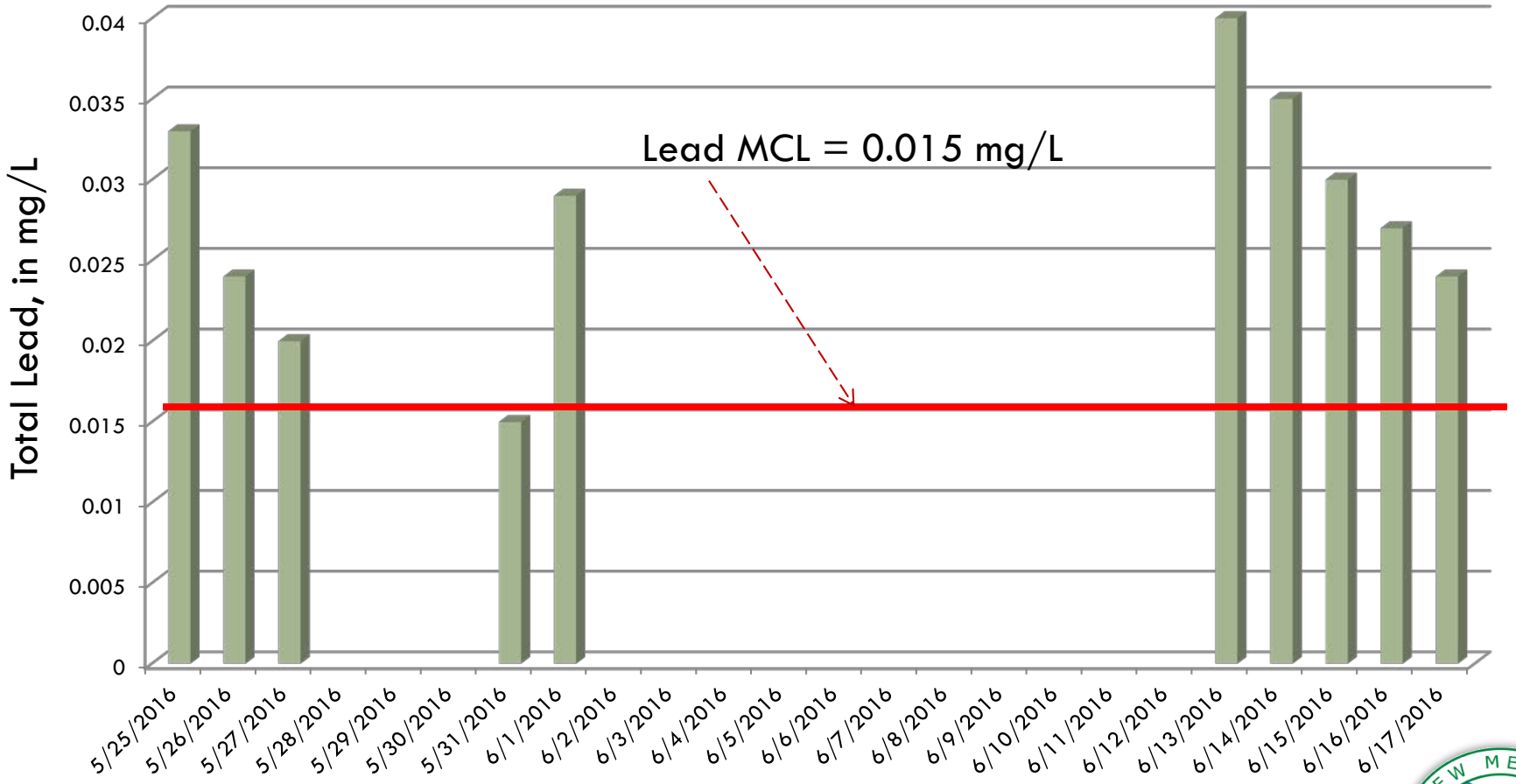
USGS 09364500
Animas River at Farmington NM



Total Lead

Animas River at Farmington

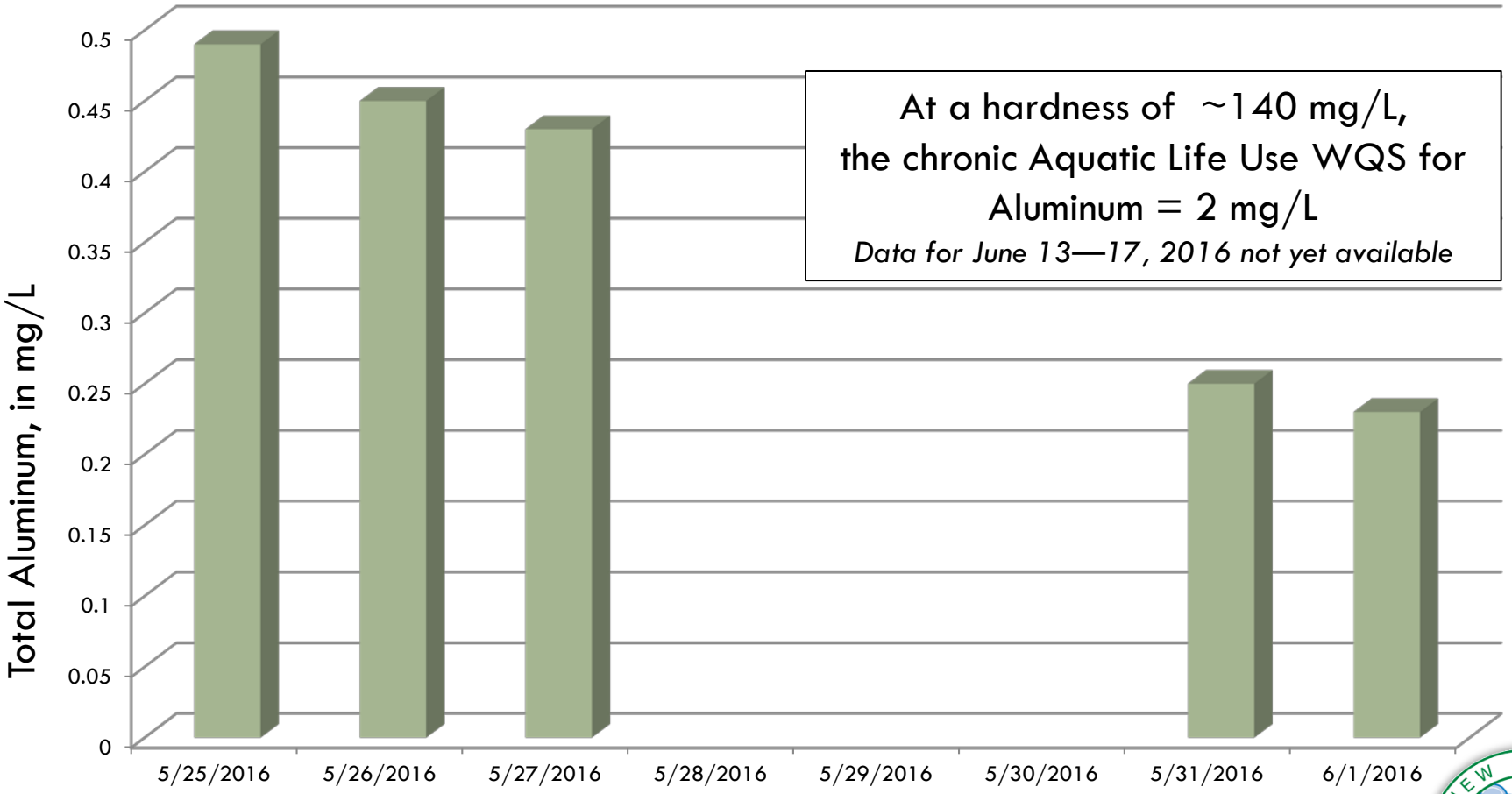
May 26 - June 17, 2016



Total Aluminum (mg/L)

Animas River at Farmington

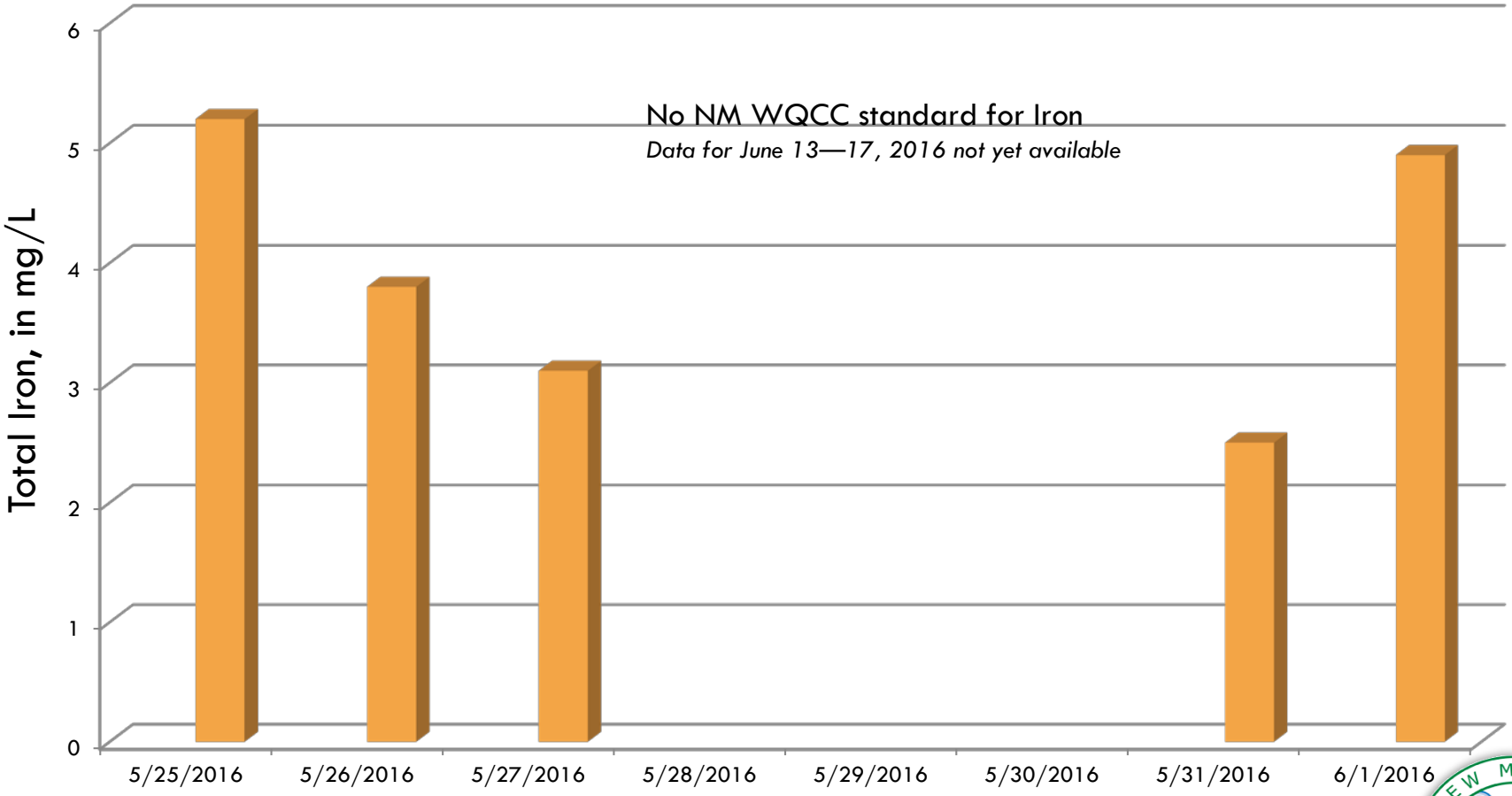
May 26 - June 1, 2016



Total Iron (mg/L)

Animas River at Farmington

May 26 - June 1, 2016



Summary for the 2016 Spring Runoff

- Lead concentrations appear to track well with flow, with slight differences between the “rising leg” “descending leg” of the hydrograph.
- From CoF and NMED data, lead MCL is exceeded frequently.
- Al relatively low compared to the water quality standard (WQS).
- Fe—no WQS—but relatively high concentrations.

EPA's Fate and Transport Model

- The EPA's Office of Research and Development, National Exposure Research Laboratory has been conducting an analysis of the release of acid mine drainage from the Gold King Mine on August 5, 2015 and its fate and transport within the Animas and San Juan Rivers.

- This project's objectives are to provide analysis of water quality following the release of acid mine drainage in the Animas and San Juan Rivers in a timely manner in order to:
  1. generate a comprehensive picture of the plume at the river system level;
  2. help inform future monitoring efforts; and
  3. to predict potential secondary effects that could occur from materials that may remain stored within the system.

- The project focuses on assessing metals contamination in the rivers following the release of metals from the mine and during the movement of the plume and in the first several months following the release.

EPA's Fate and Transport Model Primary Areas of Interest

- How much was released and what was its composition?
- Where did the material in the release volume go?
- How was water quality affected?
- What was the potential for water user exposure to metals?
- Did any of the material stay in the river system, sequester to the streambed?
- If so, will that material be released into the river and will it have secondary impacts after the initial spill?
- Were groundwater drinking water or irrigation sources potentially impacted?
- Have metal concentrations in the water and sediment returned to pre-event levels?

EPA's Fate and Transport Model Initial Findings

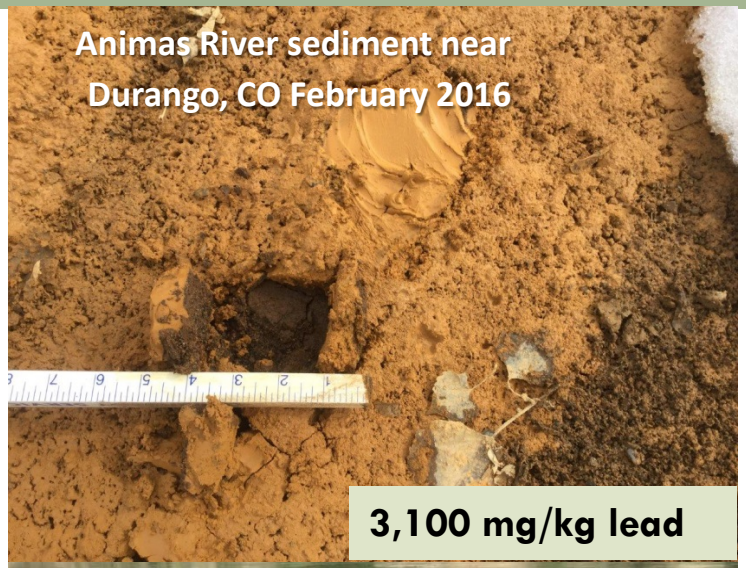
- Dissolved and total metals concentrations declined sharply from very high concentrations near the GKM source as the plume traveled in the downstream direction due to dilution, deposition, and geochemical transformations.
- The potential toxicity of the dissolved metals in the AMD was mitigated as high pH in the Animas River neutralized the acidity and precipitated metals as the plume traveled.
- Dissolved metals were at pre-release levels by the time the GKM plume entered the San Juan River. Metals concentrations generally increased in the San Juan River in the downstream direction.
- Concentrations retreated close to pre-event conditions within hours to days after the plume passed.
- Despite high metals concentrations, water quality criteria for most uses and metals were not exceeded.
  - Most exceedances in the upper Animas; few in the lower Animas.
  - Exceedances in the San Juan river occurred in lower reaches but not upper reaches, with most due to total aluminum

EPA's Fate and Transport Model Current Status of the Report

- EPA provided a 4-part webinar to the states and tribes in late June
- Peer review complete
  - Review committee consisted of 2 from USGS, 2 from private consultants and 1 from OSU
- EPA's response to the peer review now online
  - https://www.epa.gov/goldkingmine/documents-related-gold-king-mine-release (see the July 12, 2016 entry)
- "The analysis is now undergoing stakeholder review and is slated for release later this year."

Fate and Transport of GKM Metals

- Metals stored in sediment can be re-suspended in high flow
- Contaminated sediment can release metals into surface water
- Metals may sequester into groundwater
- Some sediment contains metals exceeding residential risk levels
- NMSU and NMED purchased hand-held XRF analyzers
- Soil, sediment, and crop tissue sampling for heavy metals



NM STATE All About Discovery! New Mexico State University

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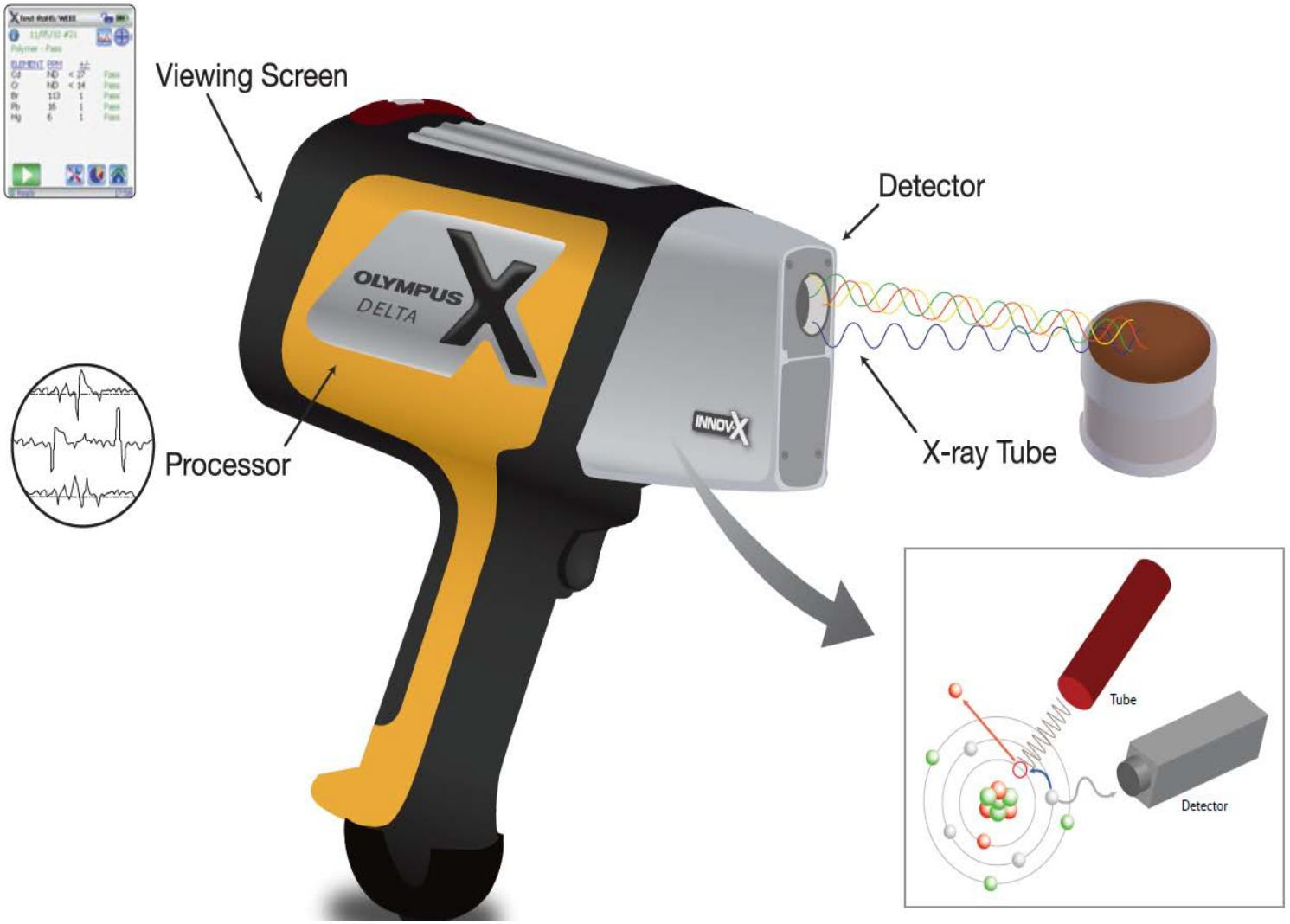
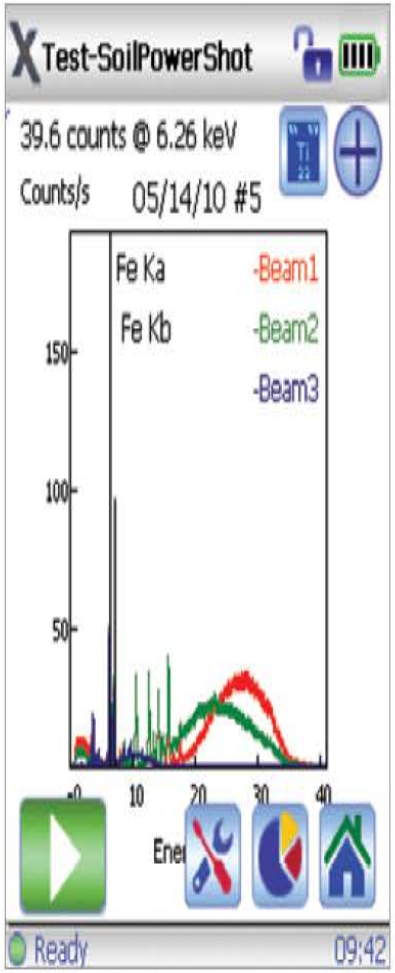
Delta Handheld XRF Configuration

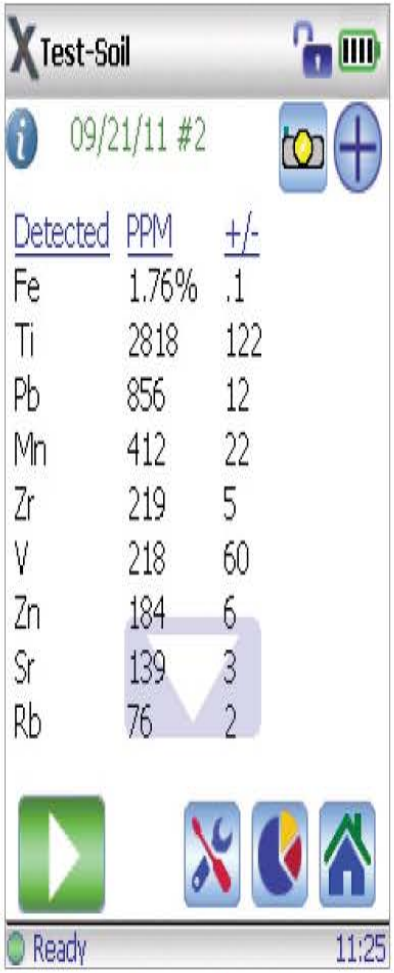


XRF Research and Education

The DELTA can provide qualitative and semi-quantitative elemental information to guide research and identification of unknown or complex materials. It provides fast and relevant results.



Qualitative Analysis for Elemental ID



Semi-Quantitative analysis of composition

Prior use in the Animas River area by Texas Tech/NMSU

- **"Rapid Assessment of Soil Metal Concentrations Along the Animas River, New Mexico"**, September, 2015
  - David C. Weindorf
    - Associate Dean for Research & BL Allen Endowed Chair of Pedology, Department of Plant and Soil
  - Kevin Lombard
    - Associate Professor of Horticulture, New Mexico State University Agricultural Science Center at Farmington and San Juan College Department of Science and Math

Prior use in the Animas River area by Texas Tech/NMSU

Methods & Findings

- Sept 1- 3, 2015; 140 samples of irrigated and non-irrigated lands and riverbank sediment

- "Areas of metal laden sludge showed higher levels of Fe, Cu, Zn, As, and Pb relative to natural soils of the area. The sludge itself exceeds the residential screening limits of permissible metals levels in soils."

Prior use in the Animas River area by Texas Tech/NMSU

Methods & Findings

Location	Pb avg	Pb range
Control	53	12 – 230
Irrigated	67	5 – 271
Riverbank	153	10 – 487
Riverbank sludge	637	509 – 859

Units in mg/Kg

- Also analyzed: V, Cr, Fe, Co, Ni, Cu, Zn, W, Hg, As, Se, Pb, Bi, Rb, U, Sr, Y, Zr, Th, Mo, Ag, Cd, Sn, Sb, Ti, Mn, Mg, Al, Si, P, S, Cl, K, and Ca.

NMED's Plan to Analyze Sediment with the pXRF

- How the testing plan will be rolled out:
  - Develop a QAPP and Sampling Plan
  - Provide the QAPP and Plan to interested parties for review (CAC, EPA, CDPHE, USGS, Utah DEQ, Navajo Nation EPA, Ute Mountain Tribe, and Southern Ute Tribe)
  - Begin sampling in August 2016
  - Make data available on our web site: https://www.env.nm.gov/river-water-safety/

Questions?

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