



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION IV  
1600 E. LAMAR BLVD.  
ARLINGTON, TX 76011-4511

May 20, 2016

MEMORANDUM TO: Docket File 040-08905

THROUGH: Jack E. Whitten, Chief /RA/  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety

FROM: Robert J. Evans, PhD, CHP, PE, Senior Health Physicist /RA/  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety

SUBJECT: AMBROSIA LAKE SITE VISIT, MCKINLEY COUNTY, NEW MEXICO

On April 19-21, 2016, U.S. Nuclear Regulatory Commission (NRC) staff conducted a visit to Rio Algom Mining LLC's Ambrosia Lake site in McKinley County, New Mexico. The purpose of the site visit was to observe the status of site construction activities, discuss previous construction and radiological survey activities, and collect available construction records and radiological surveys. During the visit, the NRC staff participated in a public meeting with the licensee regarding three future license submittals. The NRC staff also observed a second public meeting hosted by the U.S. Environmental Protection Agency (EPA) regarding its future plans for the Section 4 property.

Enclosed with this memorandum is the NRC's trip report for this site visit. No significant regulatory issues or safety concerns were identified during the site visit and public meetings. The licensee indicated that it plans to gather the information necessary to support future inspections of construction-related work and radiological surveys. The licensee also plans to submit three license amendment requests to the NRC at a future date, after further discussion with NRC staff. Finally, the NRC plans to hold an agency-to-agency meeting with EPA in the near future regarding the Section 4 area.

License: SUA-1473  
Docket: 040-08905

CONTACT: Robert J. Evans, DNMS/FCDB  
817-200-1234

Enclosure:  
NRC Trip Report

Attachments:

1. Photographs Taken at the Ambrosia Lake Facility
2. Licensee Presentation-Groundwater Overview
3. Licensee Presentation-Section 4 Ponds Dose Assessment
4. Licensee Presentation-Proposed Changes to Health Physics Manual and License Conditions
5. Licensee Presentation-Approach for Proposed ACLs in Upper Bedrock Units
6. EPA Presentation-Tronox Settlement Agreement, Designated Navajo Area Mines

cc:

T. Ballaine, Rio Algom Mining LLC  
S. Rodriguez, New Mexico Environment Department  
M. Hunter, New Mexico Environment Department  
K. Shade, EPA

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket: 040-08905

License: SUA-1473

Licensee: Rio Algom Mining LLC

Facility: Ambrosia Lake Facility

Location: McKinley County, New Mexico

Dates: April 19-21, 2016

Inspector: Robert J. Evans, PhD, CHP, PE, Senior Health Physicist  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety

Accompanied by: Varughese Kurian, Health Physicist  
Materials Decommissioning Branch  
Division of Decommissioning, Uranium Recovery,  
and Waste Programs  
Office of Nuclear Material Safety and Safeguards

Adam L. Schwartzman, Risk Analyst  
Performance Assessment Branch  
Division of Decommissioning, Uranium Recovery,  
and Waste Programs  
Office of Nuclear Material Safety and Safeguards

Approved by: Jack E. Whitten, Chief  
Fuel Cycle and Decommissioning Branch  
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## **NRC Trip Report**

### **1. Background**

The Ambrosia Lake mill processed approximately 33 million tons of uranium ore from 1958-1985. The licensee started to reclaim the two tailings ponds in 1989, and the licensee demolished the mill in 2003-2004. The licensee also reclaimed Ponds 3-10 in the vicinity of the two tailings impoundments and Ponds 11-21 in the Section 4 area.

All site structures have been demolished and placed into the onsite disposal areas. The licensee completed most windblown material cleanup by 1999. The licensee also constructed diversion channels and erosion protection features as necessary to divert water away or around the various impoundments and disposal areas.

### **2. Site Status**

At the time of the site visit, reclamation activities were nearly complete. The remaining activities include removal of several concrete slabs, remediation of the borrow pit, and release of site construction equipment and trailers. The borrow pit provided a source of shale-clay soil for use in site construction activities. A section of the north disposal area remained open for any residual contaminated material that will be disposed onsite. After all residual radioactive material has been placed into the disposal area, the licensee plans to install the final cover on this portion of the cell. Two electrical substations will remain onsite after completion of all reclamation activities.

During the site visit, the licensee's contractor was observed conducting final status surveys of the property in accordance with guidance provided in Section 8 of the Soil Decommissioning Plan (ADAMS Accession No. ML050400566) and approved by License Amendment 57, dated August 16, 2006 (ML061940206). The licensee also continues to conduct groundwater compliance monitoring in accordance with License Condition 34 requirements.

### **3. Site Tour**

The NRC staff toured the site with the licensee and their contractor to observe the status of the site and to gain a better perspective of the site layout. The areas toured included the mine affected area, the windblown cleanup areas, tailings impoundments, former evaporation ponds, Section 4 area, alternate disposal area, north disposal area, two electrical substations, borrow pit, 1,000-year flood berm, and diversion channels. The construction efforts appeared to be of good quality with no evidence of subsidence.

During the site tour, the inspector conducted limited radiological measurements using a Ludlum microRoentgen survey meter calibrated to radium-226 (NRC No. 015546, calibration due date of August 12, 2016). The exposure rates varied across the site, based in part on the status of reclamation and past mining activities. The lowest measurement, 8 microRoentgen per hour ( $\mu\text{R/hr}$ ), was measured on top of Tailings Impoundment 1. This low measurement indicated that the cover material was effectively reducing gamma radiation exposures to background levels as required by Code of



Federal Regulations 10 (CFR) Part 40, Appendix A, Criterion 6. The highest measurement, 60  $\mu\text{R/hr}$ , was recorded north of the former mill site in an area that was affected by previous mining activities. The remainder of the measurements were equivalent to background measurements (15-18  $\mu\text{R/hr}$ ).

#### **4. Technical Meetings with Licensee Staff**

The NRC staff held three technical meetings with licensee staff. The first technical meeting included an overview of reclamation activities recently completed as well as those in progress. This discussion included an overview of the current groundwater program (see Enclosure 2).

The second technical meeting included a discussion of all reclamation completed, including availability of records. These records include the original submittals, any changes to the original submittals, NRC approval of the submittals (including technical evaluations), as well as construction completion and quality assurance/quality control records. The NRC's request for these records is necessary for two reasons. First, many of the older documents, including the 1986 Closure Plan, need to be added to the docket file in the Agency-wide Documents Access and Management System (ADAMS). Second, the NRC staff needs the records to support future inspections of construction activities. The licensee's staff agreed to provide the records necessary to support the NRC's review of construction activities during the August 2016 inspection.

The third technical meeting involved a discussion of past, present, and future final status survey records. The NRC requested this information, in part, to support future confirmatory surveys and to ensure that the facility has been completely surveyed. The licensee discussed the current status of survey records for the tailings impoundment, various ponds, disposal areas, windblown areas, and the pipeline between the mill site and the Section 4 area. The NRC also identified past confirmatory surveys conducted by staff from the Oak Ridge National Laboratory (ORNL) and the Oak Ridge Associated Universities (ORAU) on behalf of the agency. These confirmatory surveys included the windblown material (1999-2000) and Section 4 area (2009 and 2015) surveys.

The licensee and NRC staff discussed the implementation of the final status survey plan. The requirements for the final status survey are provided in the Soil Decommissioning Plan (ML050400566). During the site tour, the licensee's contractor was conducting scan surveys of the surface areas of the site using gamma-detecting scintillation detectors. The licensee's contractor started this activity in September 2015. These surface scans will continue for a few more weeks. At a later date, the licensee's contractor will collect several hundred soil samples from around the site in a predetermined pattern for analysis. Based on these sample results, the licensee will determine if any particular area requires additional remediation. The NRC plans to conduct a confirmatory survey of the entire site, perhaps in conjunction with the licensee's implementation of its final status survey.

The NRC staff questioned the licensee about the status of radon flux measurements as required 10 CFR Part 40, Appendix A, Criterion 6. The radon flux data have been

collected, and some data have been sent to the NRC (for Pond 3). The licensee is expected to submit all data to the NRC as part of the reclamation completion report.

## **5. Public Meeting Summaries**

On April 20, 2016, the NRC staff held a public meeting with licensee staff in Grants, New Mexico. This meeting was a Category 1 meeting in which the public was invited to observe the meeting. The purpose of the meeting was to give the licensee an opportunity to present three potential amendments to NRC Materials License SUA-1473. These potential amendments included Section 4 radiological dose modeling, updates to the license based on current site conditions, and updated alternate concentration limits (ACLs). The licensee's presentations are included in Enclosures 3-5.

The first proposed amendment involves the licensee's dose modeling results for free-release of the 256-acre Section 4 area where Ponds 11-21 were previously located. The Section 4 ponds were constructed in the 1970s and were used to evaporate liquid wastes. This area had been remediated twice by the licensee and underwent confirmatory surveys twice by the NRC's contractor (ORAU). The first confirmatory survey was conducted in September 2009 (ML100560099), and the second confirmatory survey was conducted in August 2015 (ML15337A392). The results of both confirmatory surveys suggested that additional remediation was necessary due primarily to thorium 230 contamination. In response to the second confirmatory survey findings, the licensee elected to shift to dose modeling as a basis for requesting release of the property for unrestricted use. The dose modeling approach is described in Section 2.5.1 of NUREG-1757, Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria, Volume 2, Revision 1. The licensee concluded that the Section 4 property could be free-released using the dose modeling approach without the need for additional remediation. The NRC staff questioned some of the licensee's dose modeling inputs and suggested that the licensee provide more information to justify these inputs in its submittal to the NRC. The licensee plans to submit this amendment request to the NRC in mid-2016.

The second proposed amendment includes license changes based on site conditions. For example, the licensee believes that most of the radiation protection and environmental monitoring programs can be suspended based on current site conditions. If the licensee needed to conduct additional work involving radioactive material in the future, it would issue radiation work permits and reactivate portions of the radiation protection program as necessary to support the work activity. The NRC staff did not have any significant concerns with the licensee's proposed license conditions. The licensee plans to submit this license amendment request to the NRC in mid-2016.

The third proposed amendment involves the licensee's plans to submit revised ACLs to the NRC for groundwater in the four subsurface sandstone units. The licensee plans to propose revised ACLs for beryllium and cadmium in the Dakota sandstone and revised gross alpha in three upper bedrock units. The NRC discussed the guidance provided in NUREG-1620, Revision 1, Appendix K, Content and Format for Alternate Concentration Limit Applications. The NRC and licensee staff agreed that the licensee should provide another detailed technical presentation to NRC staff prior to submittal of the proposed

amendment request. The licensee plans to submit the amendment request for revised ACLs to the NRC prior to the end of 2016.

On April 21, 2016, a second public meeting was hosted by the U.S. Environmental Protection Agency (EPA), Region 6 Office. The NRC staff observed this meeting. The EPA's presentation is included as Enclosure 6. The EPA discussed its plans to use about 300 acres of the Section 4 property for permanent disposal of approximately 3 million cubic yards of mine wastes. Funding for this work will be provided as part of the 2011 Tronox Inc. bankruptcy settlement agreement. The NRC staff informed EPA that the Section 4 property will have to be released (partial site release) from License SUA-1473 prior to EPA using the property for disposal of mine wastes. After the meeting, the NRC and EPA staff agreed to have an agency-to-agency meeting to discuss the various options for releasing the property from the license. This inter-agency meeting is expected to be held in the June-July 2016 timeframe.

## **6. Conclusions**

In summary, no significant regulatory issues or safety concerns were identified during the site visit, technical meetings, and public meetings. The licensee agreed to locate and consolidate construction and final status survey records to support future inspections. The licensee plans to submit three proposed license amendment requests to the NRC at a future date, possibly after further discussion with NRC staff. The NRC also plans to hold an agency-to-agency meeting in the near future regarding the EPA's plans for the Section 4 area.

## **7. Persons Contacted**

### Site Status Meeting/Site Tour (April 19, 2016)

K. Applegate, Site Specialist, RAML  
T. Ballaine, Manager, RAML  
D. Barr, Site Manager, U.S. Department of Energy, Office of Legacy Management  
A. Marek, Site Specialist, RAML  
B. Ray, Manager, BHP Billiton  
M. Reakes, Senior Manager, BHP Billiton  
M. Schierman, Senior Health Physicist, Environmental Restoration Group  
R. Schietinger, Civil Engineer, BHP Billiton  
B. Squibb, Radiation Safety Officer, Solutient Technologies LLC

### License Amendment Request/EPA Public Meetings (April 20-21, 2016)

K. Applegate, Site Specialist, RAML  
C. Ardito, Senior Hydrologist, INTERA  
R. Arthur, Principle Geochemist, INTERA  
T. Ballaine, Manager, RAML  
D. Barr, Site Manager, U.S. Department of Energy, Office of Legacy Management  
G. Boomer, Member of Public  
Z. Cruz, Geotechnical Engineer, U.S. Nuclear Regulatory Commission

D. Johnson, UMTRCA Title II Manager, Navarro  
J. Lewellin, Hydrologist, New Mexico Environment Department  
A. Marek, Site Specialist, RAML  
T. McLaughlin, Member of Public  
M. Meyer, Hydrogeologist, U.S. Nuclear Regulatory Commission  
S. Miller, Counsel, BHP Billiton  
D. Orlando, Senior Project Manager, U.S. Nuclear Regulatory Commission  
S. Pelletier, Manager, Corporate Affairs  
A. Persico, Environmental Scientist, INTERA  
B. Ray, Manager, BHP Billiton  
M. Reakes, Senior Manager, BHP Billiton  
M. Schierman, Senior Health Physicist, Environmental Restoration Group  
R. Schietinger, Civil Engineer, BHP Billiton  
R. Schoenfelder, Radiological Programs Manager, Weston Solutions, Inc.  
K. Shade, GMD Coordinator, U.S. Environmental Protection Agency  
C. Short, Geochemist, INTERA  
B. Squibb, Radiation Safety Officer, Solutient Technologies LLC  
K. Volibrecht, Program Manager, New Mexico Environment Department  
M. Widdop, Site Lead, Navarro



Figure 1: Top of tailings impoundment 1, looking south (Mt. Taylor in background)



Figure 2: Boundary between tailings impoundment 1 (left) and impoundment 2 (right)





Figure 3: Tailings impoundment 2 (looking southwest to northeast)



Figure 4: North disposal area, location of mill debris





Figure 5: Alternate disposal area (electrical substation in background)



Figure 6: Section 4 area (Mt. Taylor in background)





Figure 7: Remaining open area for disposal of wastes in north disposal cell



Figure 8: Concrete slabs being demolished for disposal in north disposal cell



## RAML's Ambrosia Lake Mill – Groundwater Overview



Presented by:

**Rio Algom Mining LLC**



April 19, 2016

Attachment 2

# Presentation outline

- **Groundwater Conceptual Model**
- **Groundwater Regulatory Timeline**
- **NRC Groundwater Corrective Action Program**
- **NRC Groundwater Compliance Monitoring Program**
- **Alternative Compliance Limits**
- **NMED DP-169 Summary**
- **Other Discharge Permit Summary**



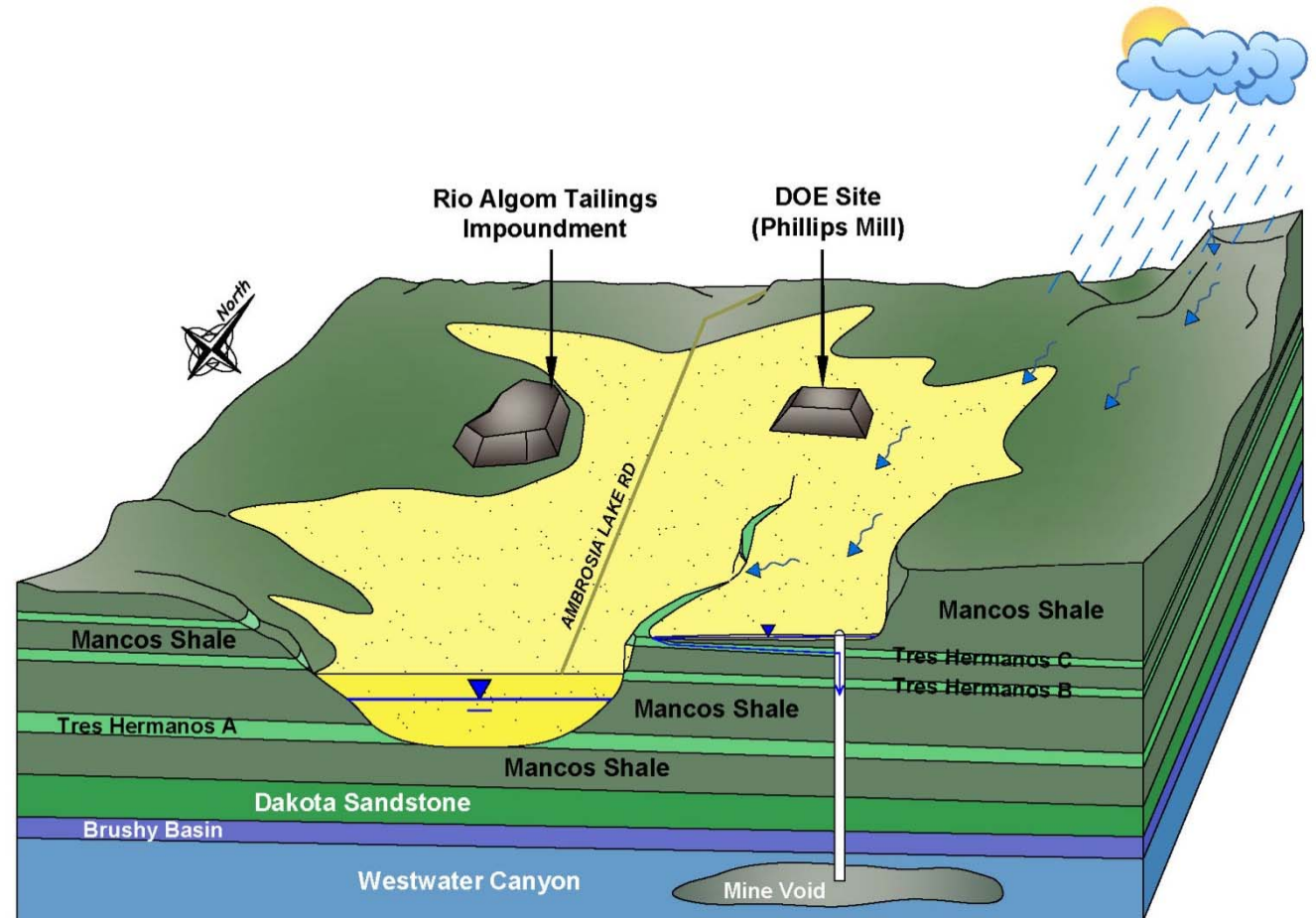
## Mill Site Groundwater

Groundwater occurs in three sandstone units, two “upper bedrock” and the ore-bearing unit:

1. Tres Hermanos a, b, and c,
2. Dakota
3. Westwater Canyon

Alluvium was artificially recharged during mine water discharge/corrective action program.

Alluvium began rapidly draining immediately after discharge ceased.



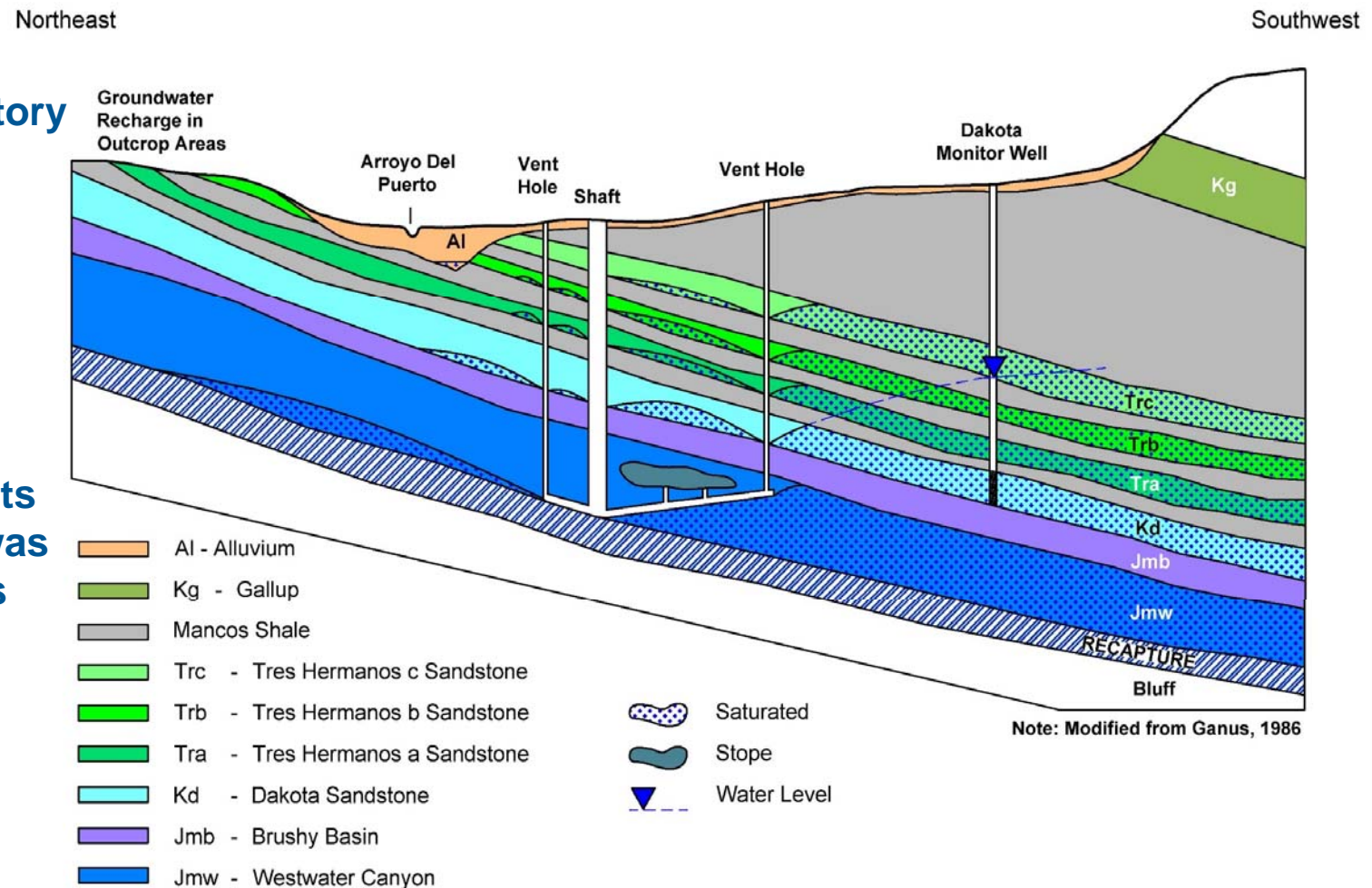


# Mill Site Groundwater

Milling-related impacts to “groundwater” and regulatory drivers:

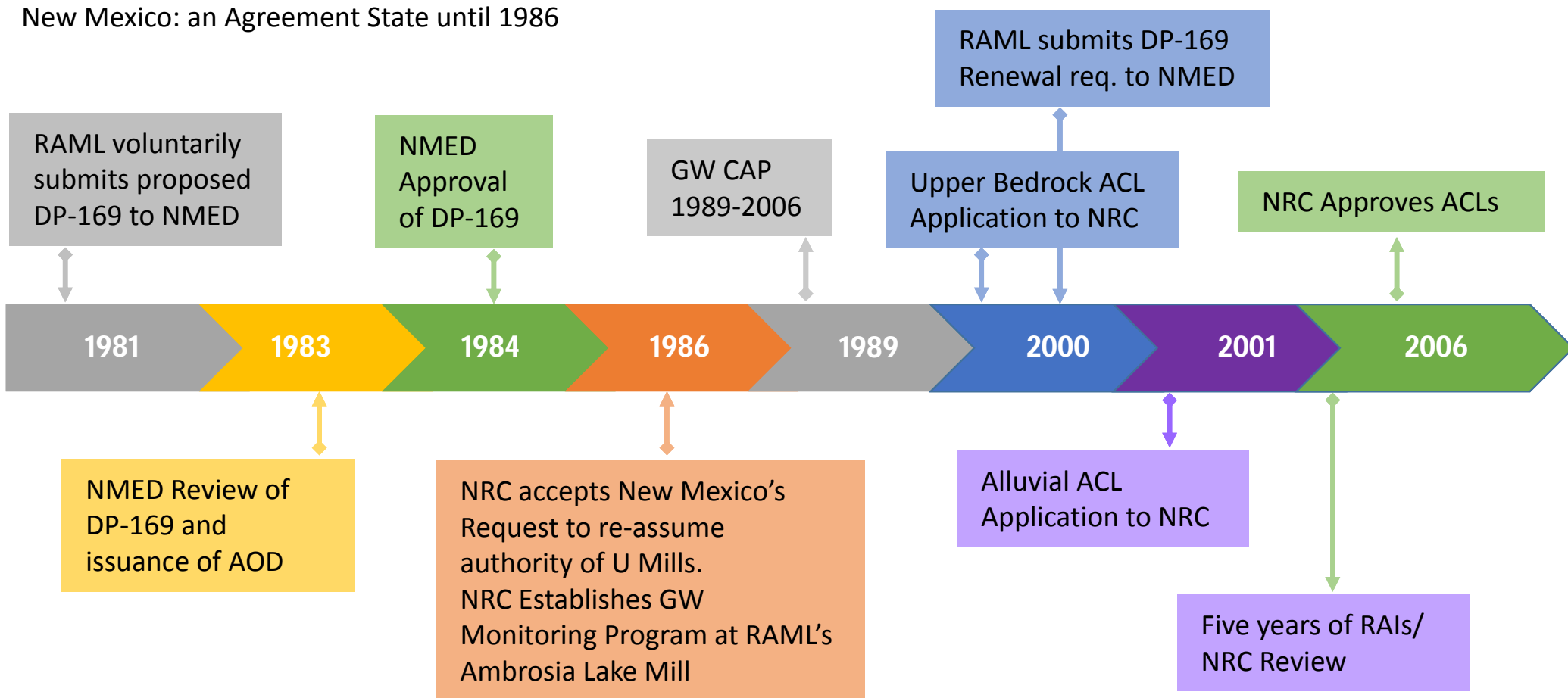
1. Alluvium (NRC, NMED)
2. Tra and Trb (NRC)
3. Dakota (NRC)

Water drains from upper bedrock units through vents and shafts into Jmw and was pumped out and treated as mine water.



# Mill Site Groundwater Regulatory Timeline

New Mexico: an Agreement State until 1986

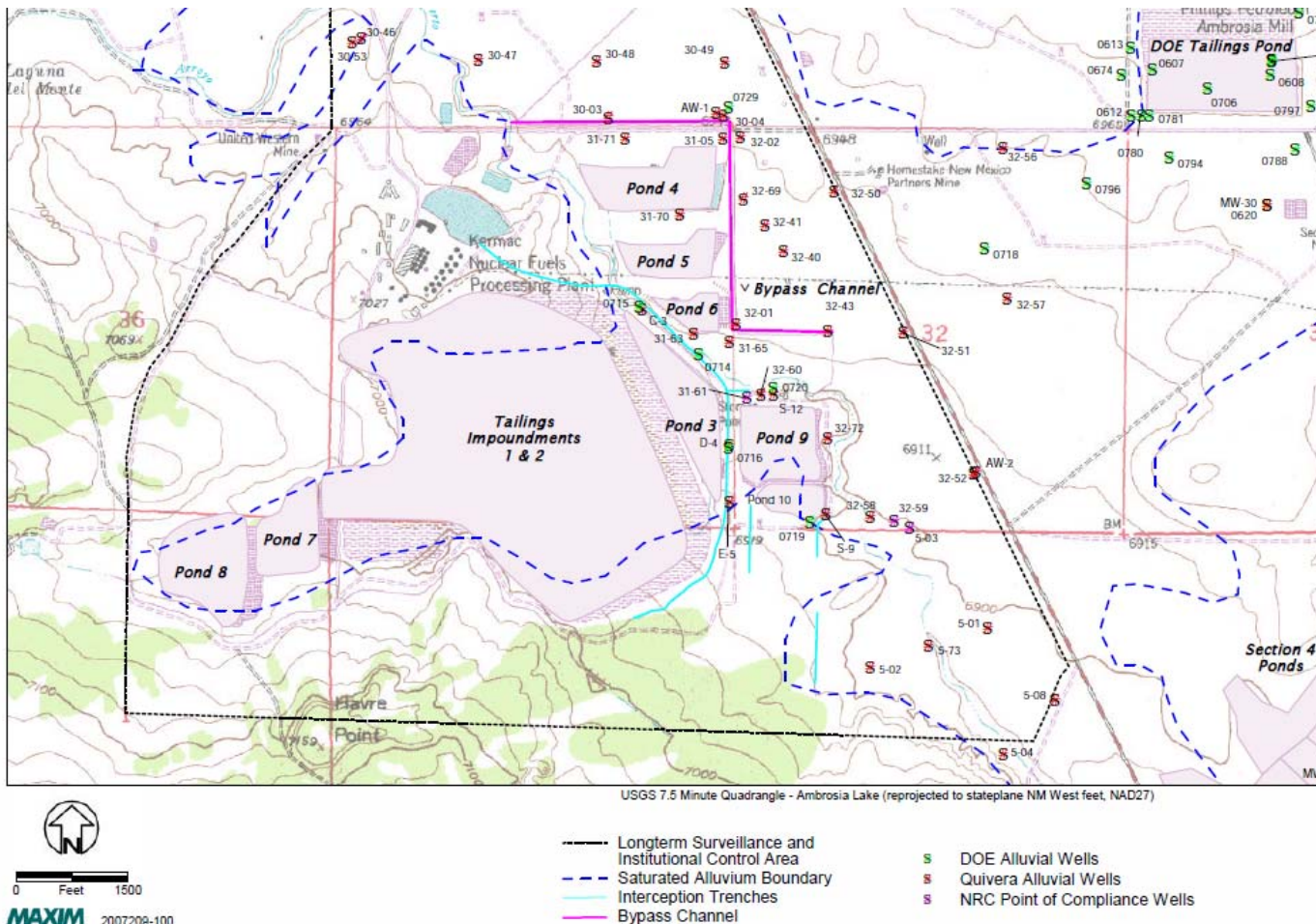


# Mill Site Groundwater Corrective Action Program

## Corrective Actions:

- **Realignment of Arroyo del Puerto (1976)**
- **Discontinued use of all unlined evaporation ponds and removal of solutions (early 80s)**
- **Construction of Interceptor trench adjacent to Tailings Impoundment 1 (1980s)**
- **Pump-back system from Interceptor trench back to Tailings Impoundment 1**
- **Pump, treat, then discharge mine water into ADP**

# Mill Site Groundwater Corrective Action Program



**Diversion channel created in 1976 to prevent ADP flow through the ponds/impoundments**

**Alluvial CAP- discharge treated mine water (pumped for bedrock CAP) into ADP. Pump back system in interception trenches to capture seepage and flushed mine water**

# NRC Summary- Mill Site Groundwater Compliance Program

## **SUA-1473 License Condition No. 34**

- **Semi-annual monitoring and reporting**
- **Monitoring well networks in Dakota, Trb, Tra, and alluvium**
- **Parameters must meet alternate concentration limits or groundwater protection standards**

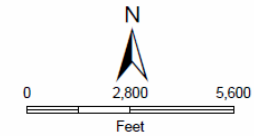
**Wells, parameters, and standards (ACLs) established during the ACL petition process (2000-2006)**

**GPS established during a round of “background well” sampling in 1988**



# NRC Monitoring Well Network

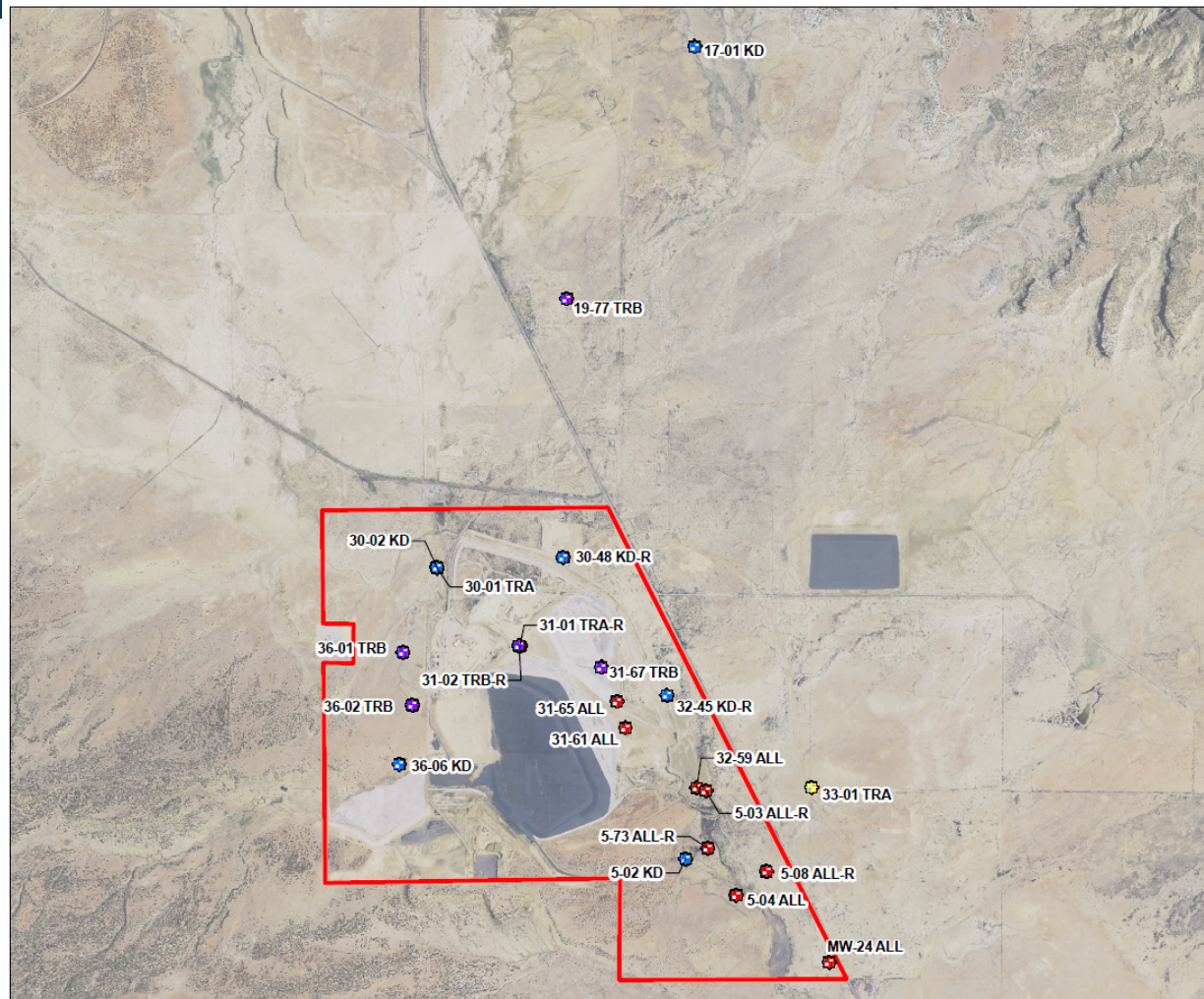
INTERA



Aerial – NAIP imagery, dated 2014

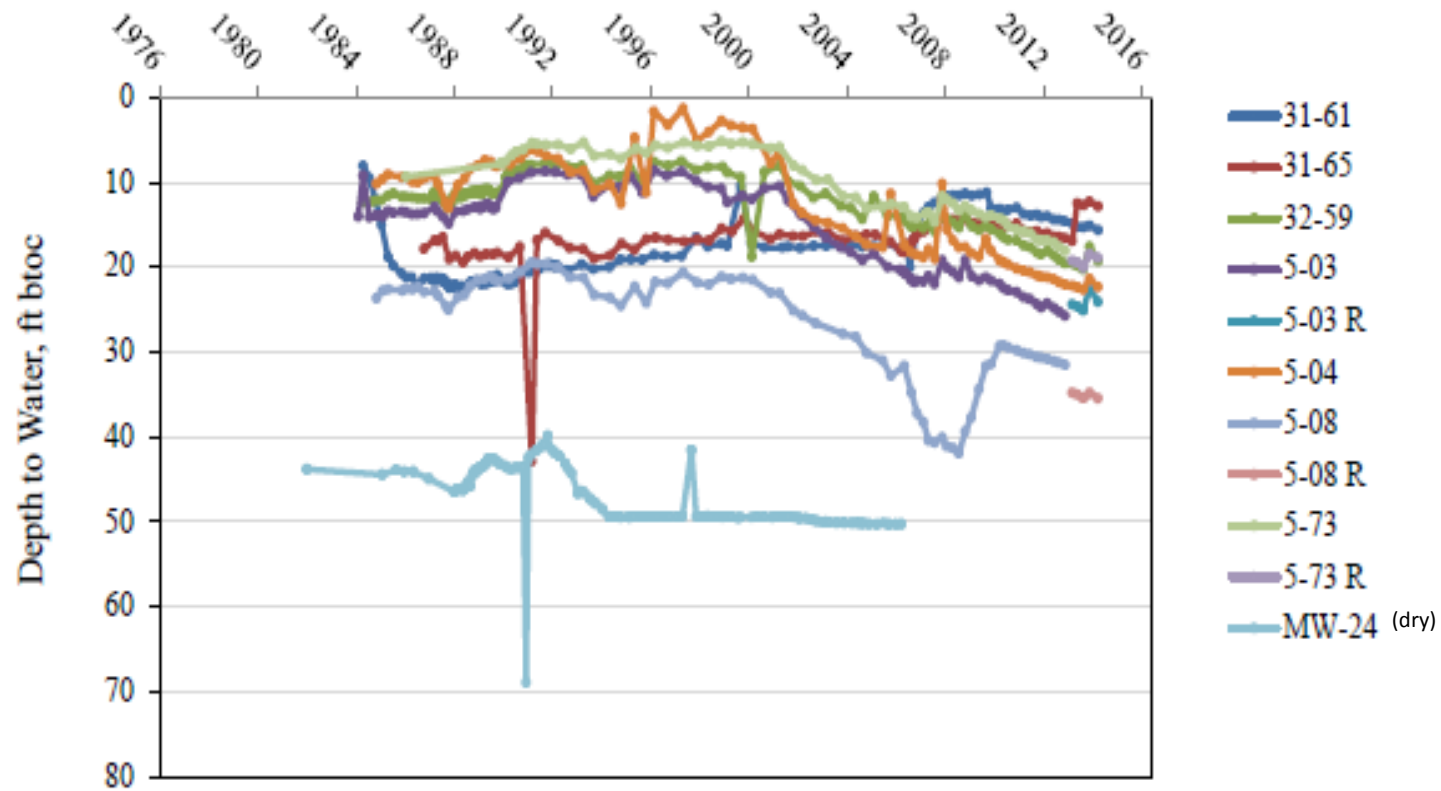
## Legend

- Alluvium
- Dakota Sandstone
- Tres Hermanos A Sandstone
- Tres Hermanos B Sandstone
- LTSM Boundary



NRC Well Map  
Rio Algom DP-169 Semi-Annual Report

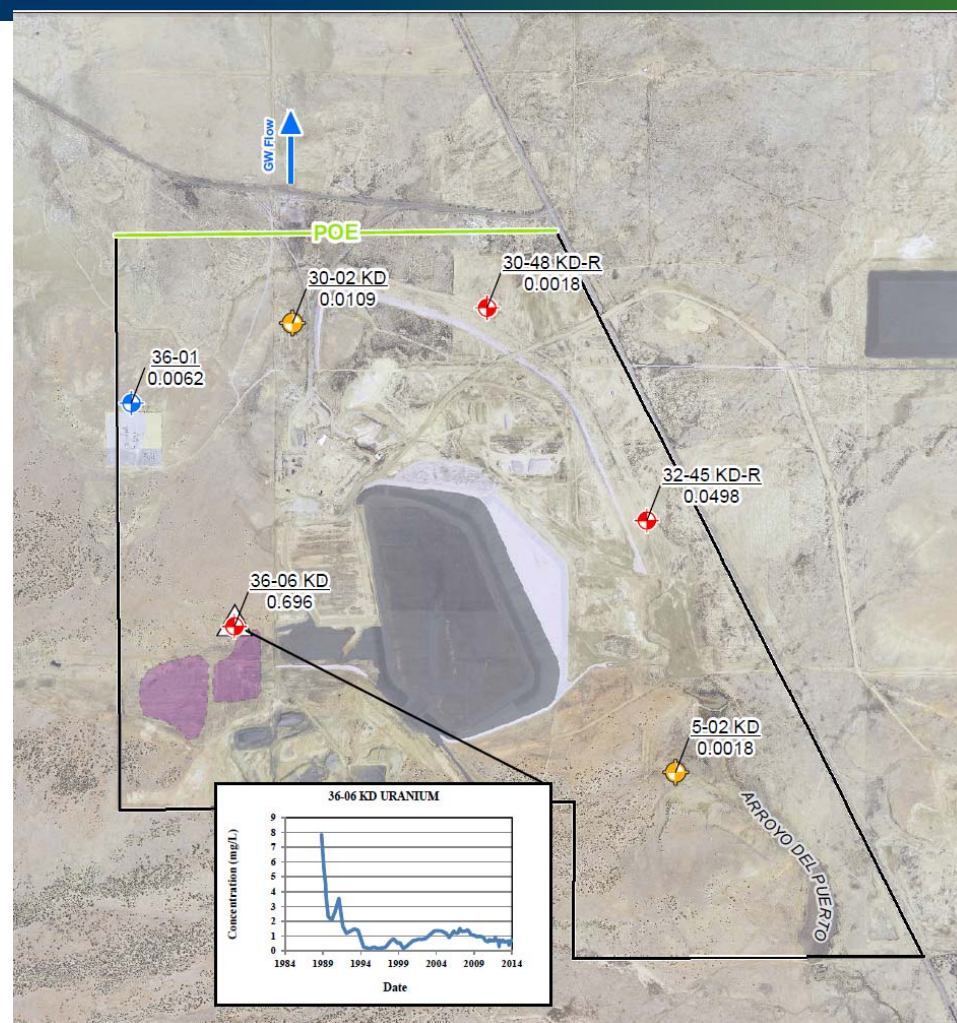
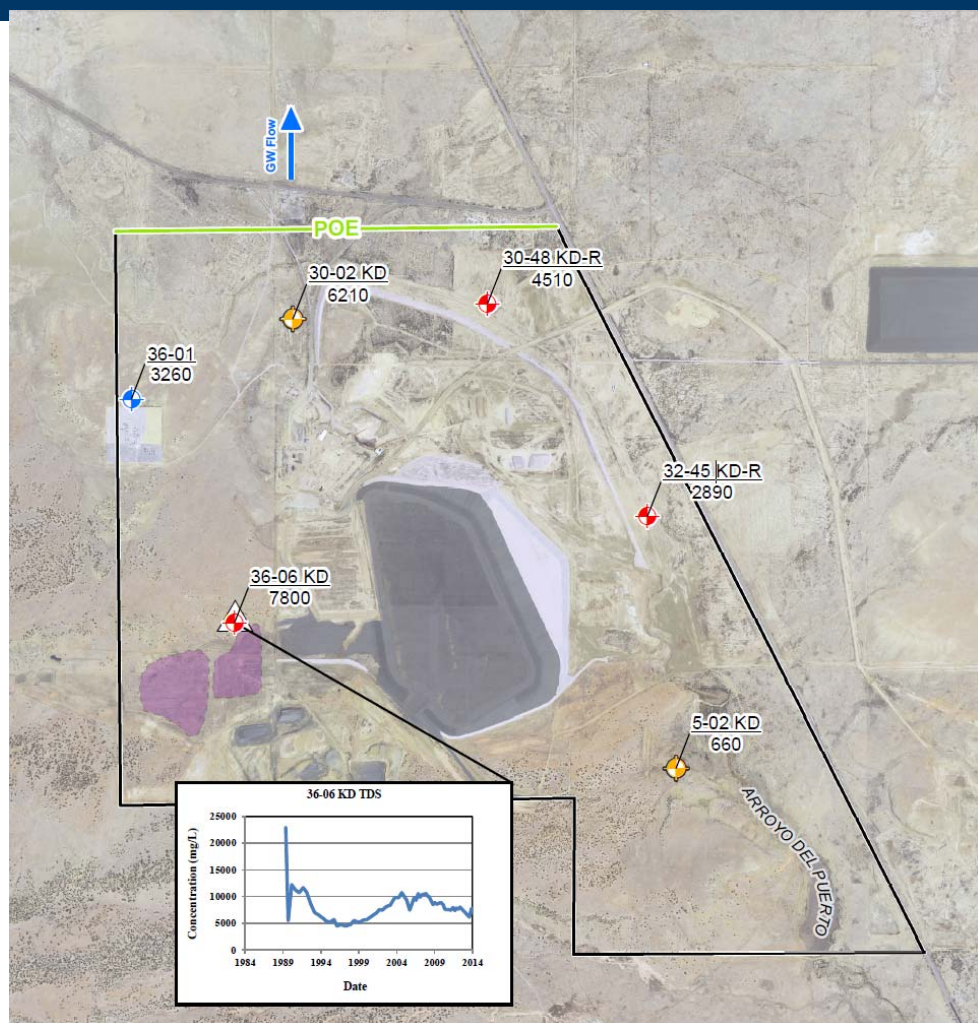
## Water Levels in the Alluvial Wells





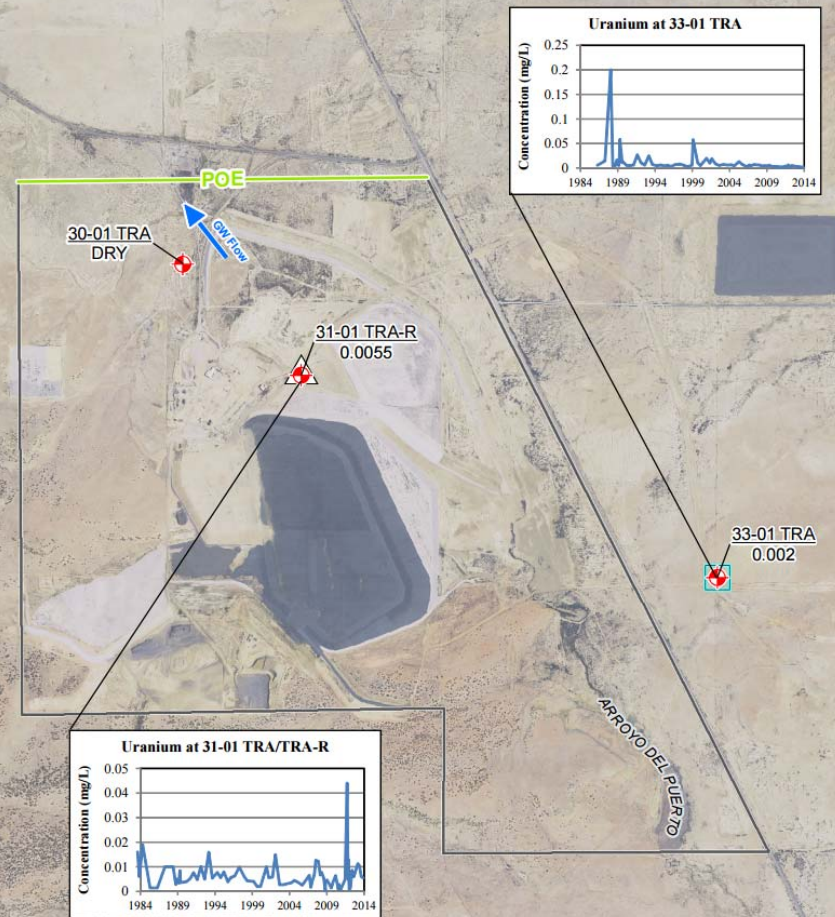
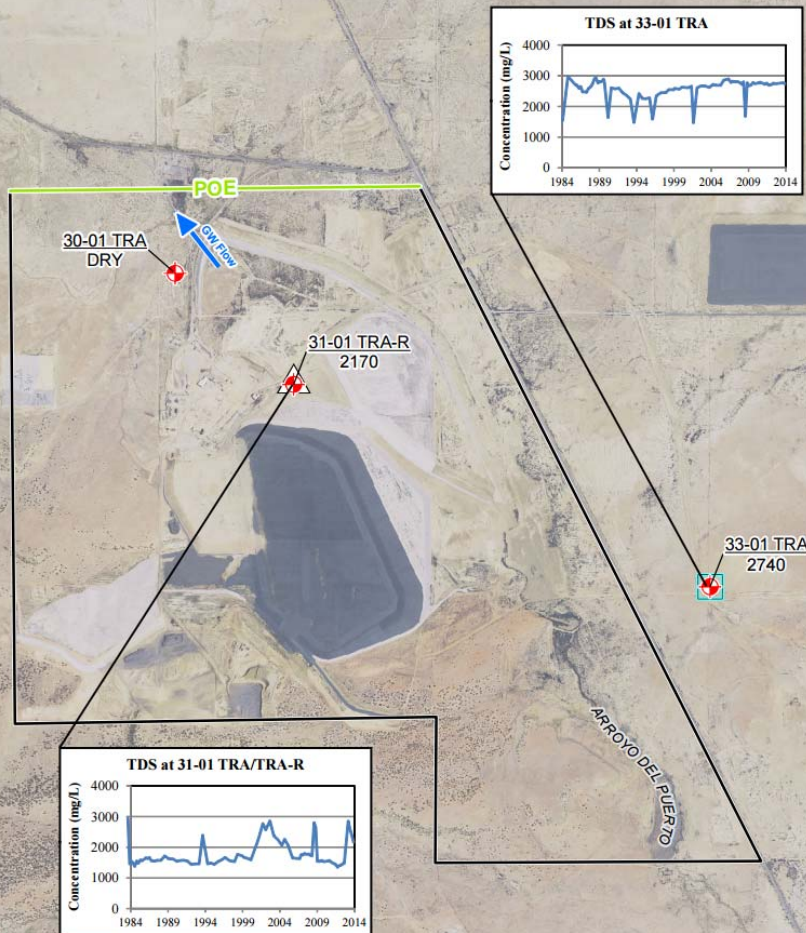


# KD Monitoring Well Network: TDS and U



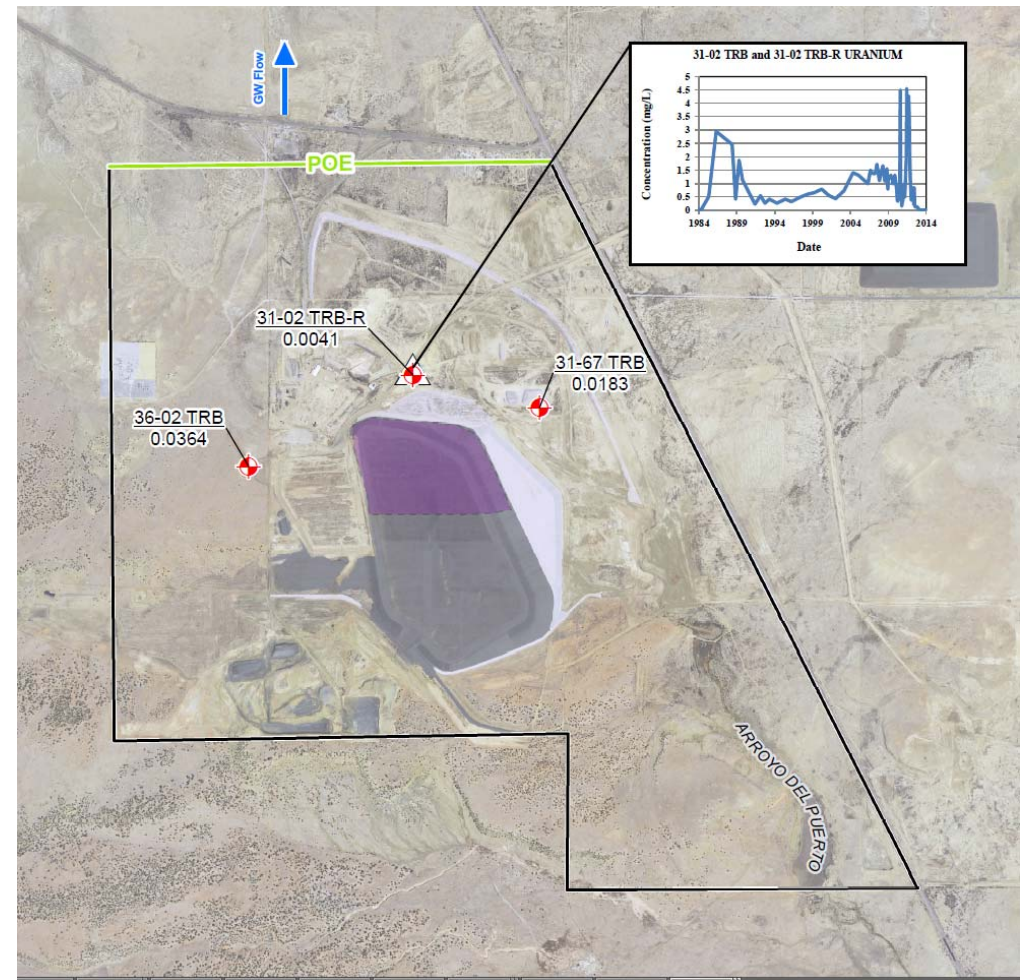
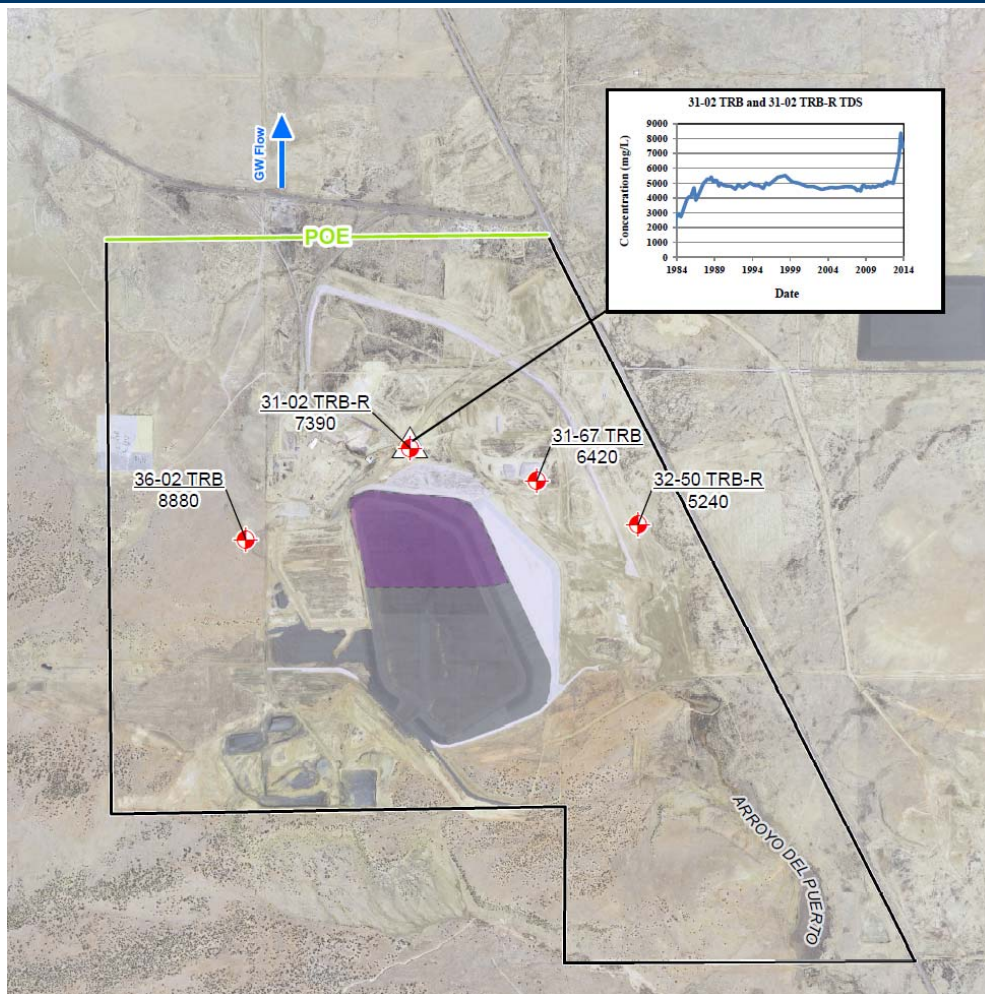


# TRA Monitoring Well Network: TDS and U



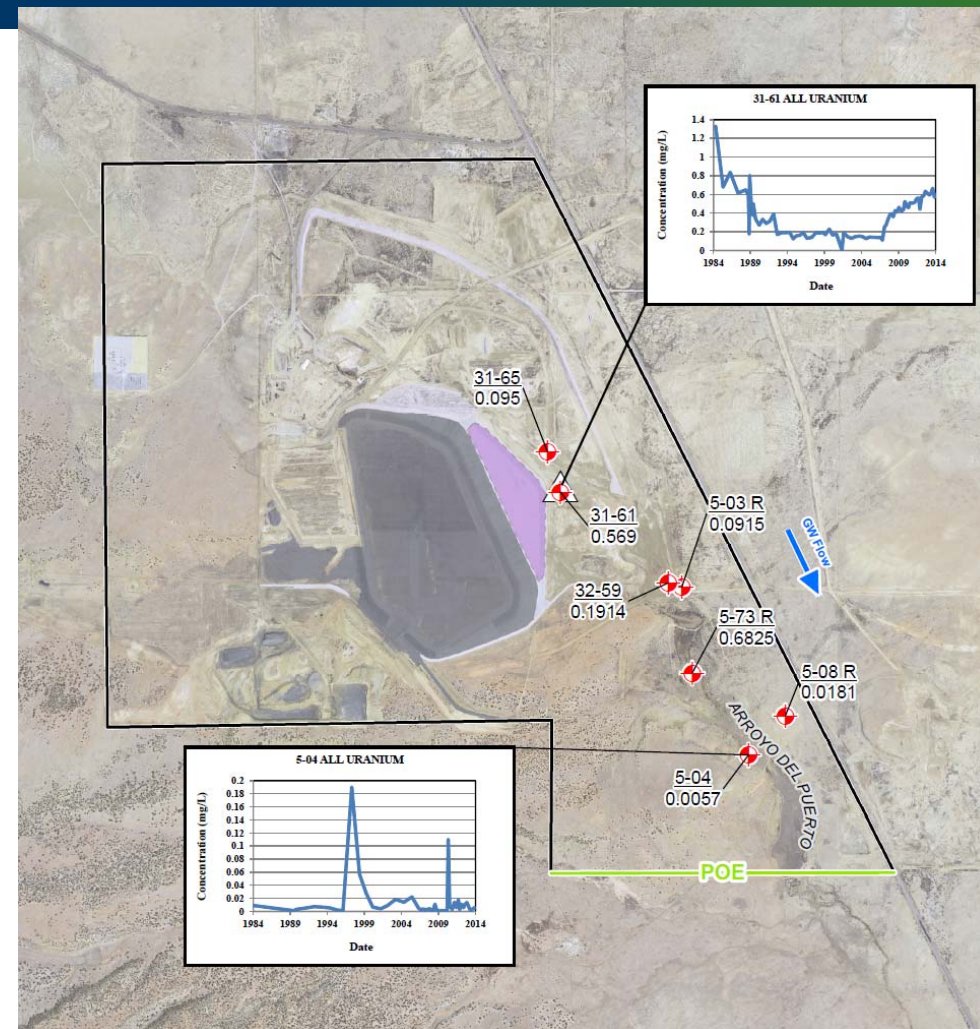
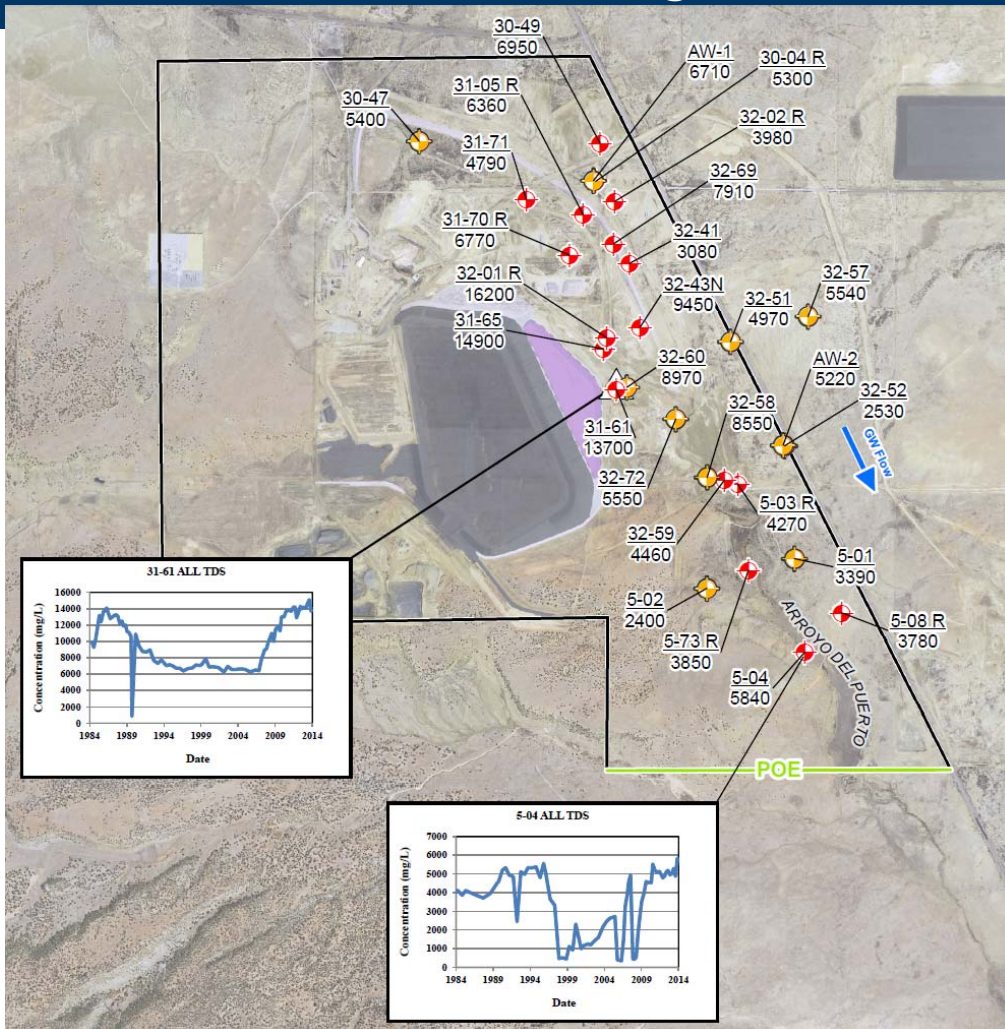


# TRB Monitoring Well Network: TDS and U





# ALL Monitoring Well Network: TDS and U



## NRC Summary- ACLs and GPSs

**ACLs were accepted in 2006 after five years of review and requests for additional information**

- **COCs that did not exceed GPS during the compliance monitoring period did not receive ACLs**
- **Upcoming license amendment will propose modified GPSs and additional ACLs not included in the original application**



## NRC Summary- ACLs and GPSs

Groundwater Protection Standards (GPS) and Alternative Concentration Limits (ACL)		Alluvium		Tres Hermanos A		Tres Hermanos B		Dakota	
Parameter	Unit	GPS	ACL	GPS	ACL	GPS	ACL	GPS	ACL
Antimony	mg/l	-	-	-	-	-	-	0.05	-
Arsenic	mg/l	-	-	-	-	-	-	0.1	-
Beryllium	mg/l	-	-	-	-	-	-	0.01	-
Cadmium	mg/l	-	-	-	-	-	-	0.01	-
Chloride	mg/l	-	7110	-	1070	-	2810	-	3200
Cyanide	mg/l	-	-	0.01	-	0.01	-	0.04	-
Gross Alpha - U	pCi/l	57	8402	18	-	21	-	56	-
Lead	mg/l	-	-	-	-	-	-	0.14	-
Lead-210	pCi/l	4.9	1274	4.14	88	0.9	88	1.9	88
Molybdenum	mg/l	0.06	176	0.03	-	0.08	-	0.06	-
Nickel	mg/l	0.06	98	0.05	-	0.06	6.8	0.03	6.8
Nitrate	mg/l	-	351	-	9.2	-	7.7	-	22.8
Radium-226 & Radium-228	pCi/l	5.0	3167	5.0	218	7.4	218	5.0	218
Selenium	mg/l	0.05	49	0.03	-	0.04	-	0.04	-
Sulfate	mg/l	-	12000	-	2584	-	4760	-	6480
Thorium-230	pCi/l	3.1	13627	4.3	945	2.2	945	2.3	945
Total Dissolved Solids	mg/l	-	26100	-	6400	-	11700	-	14100
Uranium	mg/l	0.06	23	0.01	-	0.02	1.6	0.02	1.6

## NMED Summary- Mill Site Groundwater

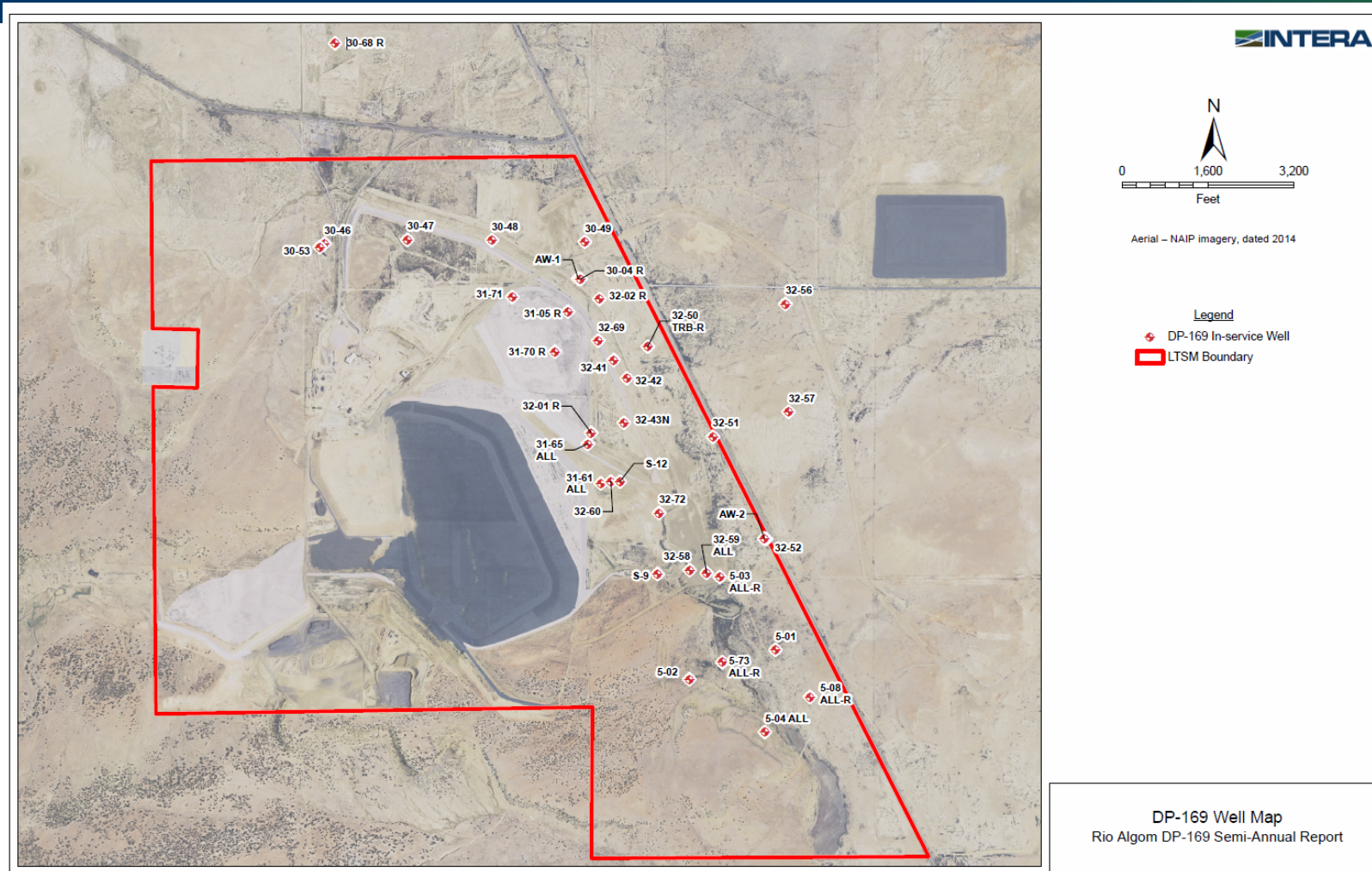
### Relevant conditions from the 1995 DP-169 for which RAML continues to comply

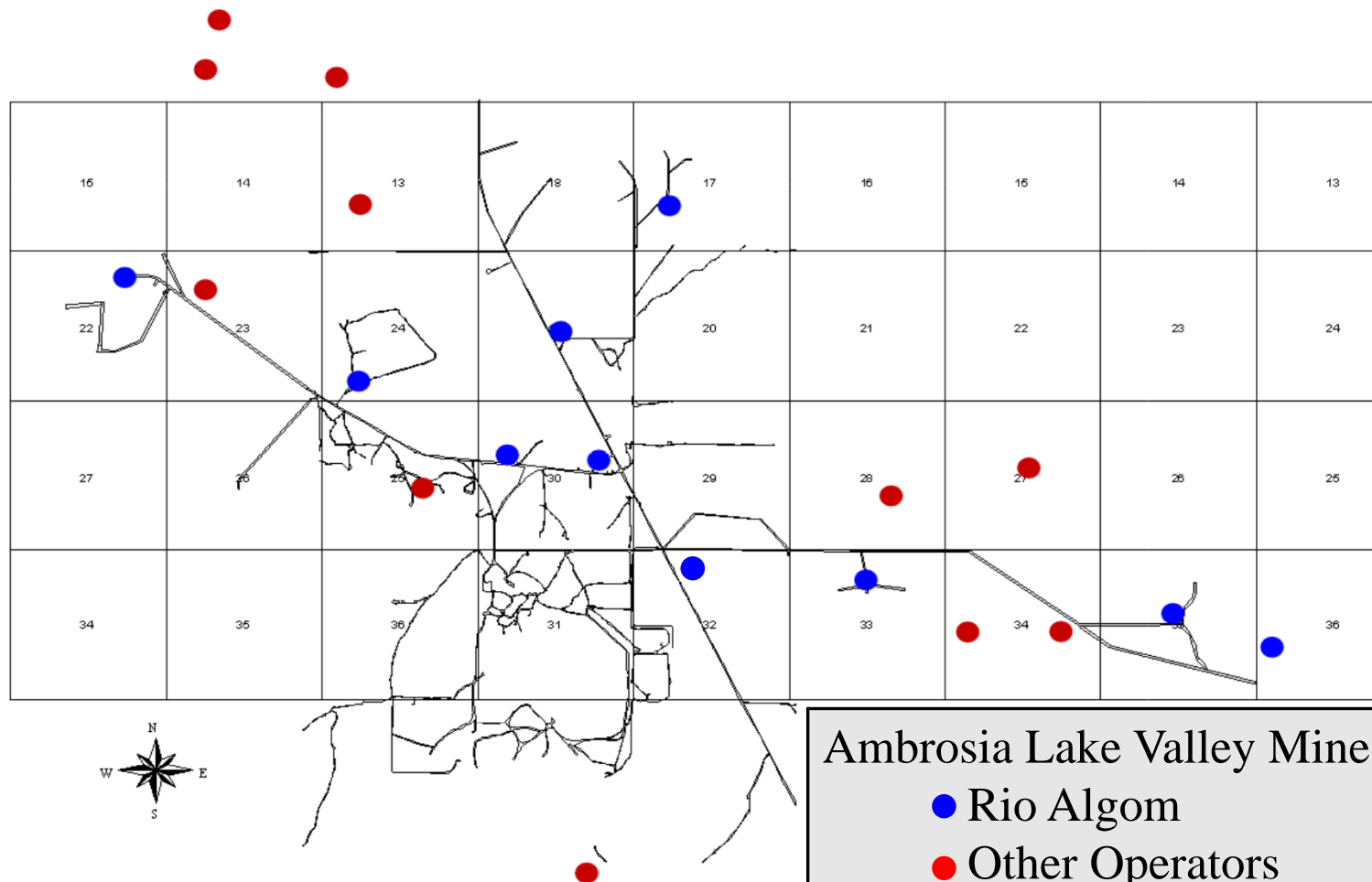
- Semiannual monitoring of 43 alluvial monitoring wells for chloride, nitrate, sulfate, TDS
- Semiannual reporting requirements

### Steps toward “closing out” DP-169

- RAML is voluntarily working with NMED to satisfy NMWQCC groundwater requirements
- Draft Alternate Abatement Standard (AAS) petition is being prepared
- RAML will propose the existing NRC ACLs as the AASs for closure of DP-169

# NMED DP-169 Monitoring Well Network





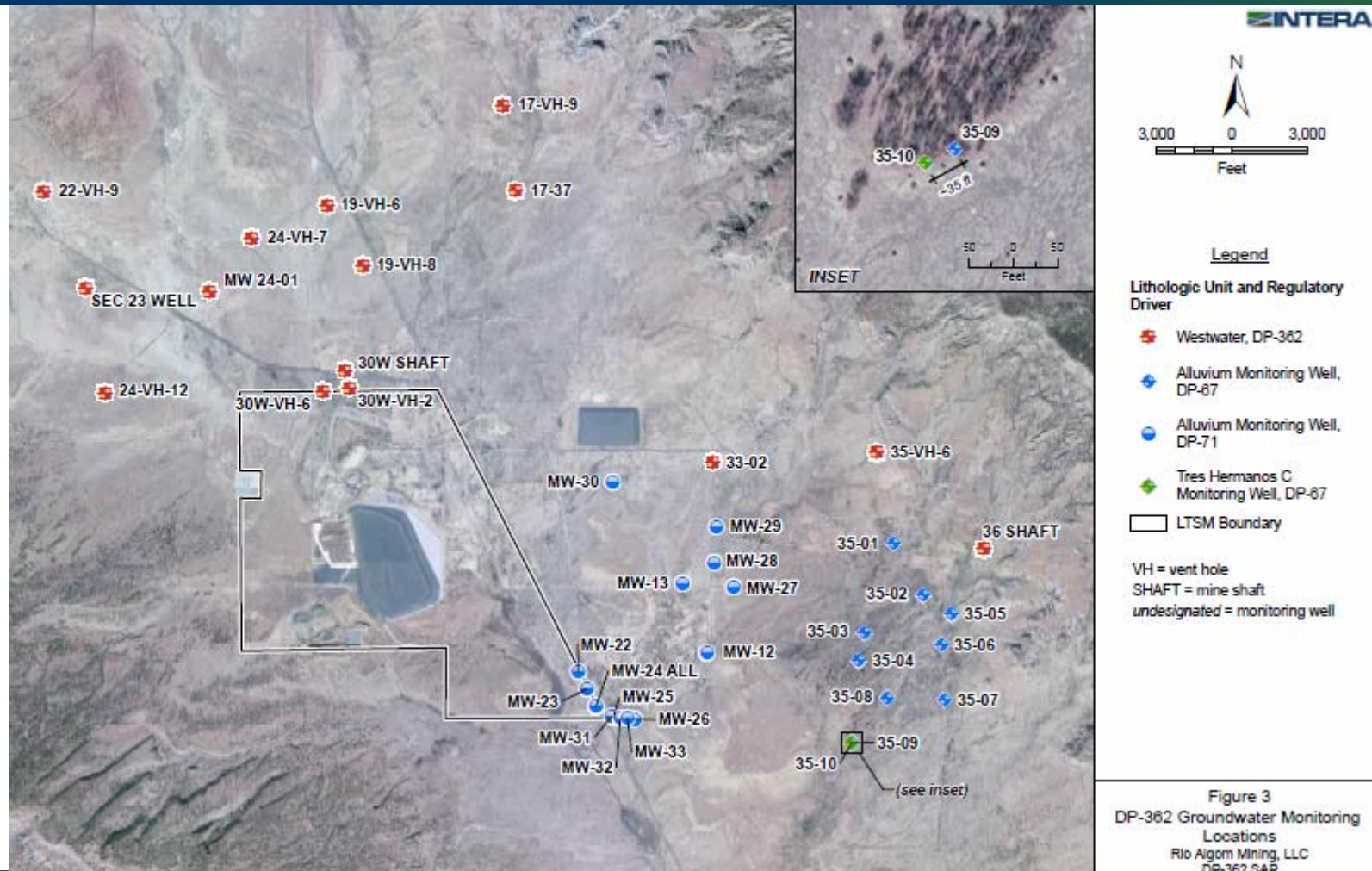
### Ambrosia Lake Valley Mines

● Rio Algom

● Other Operators

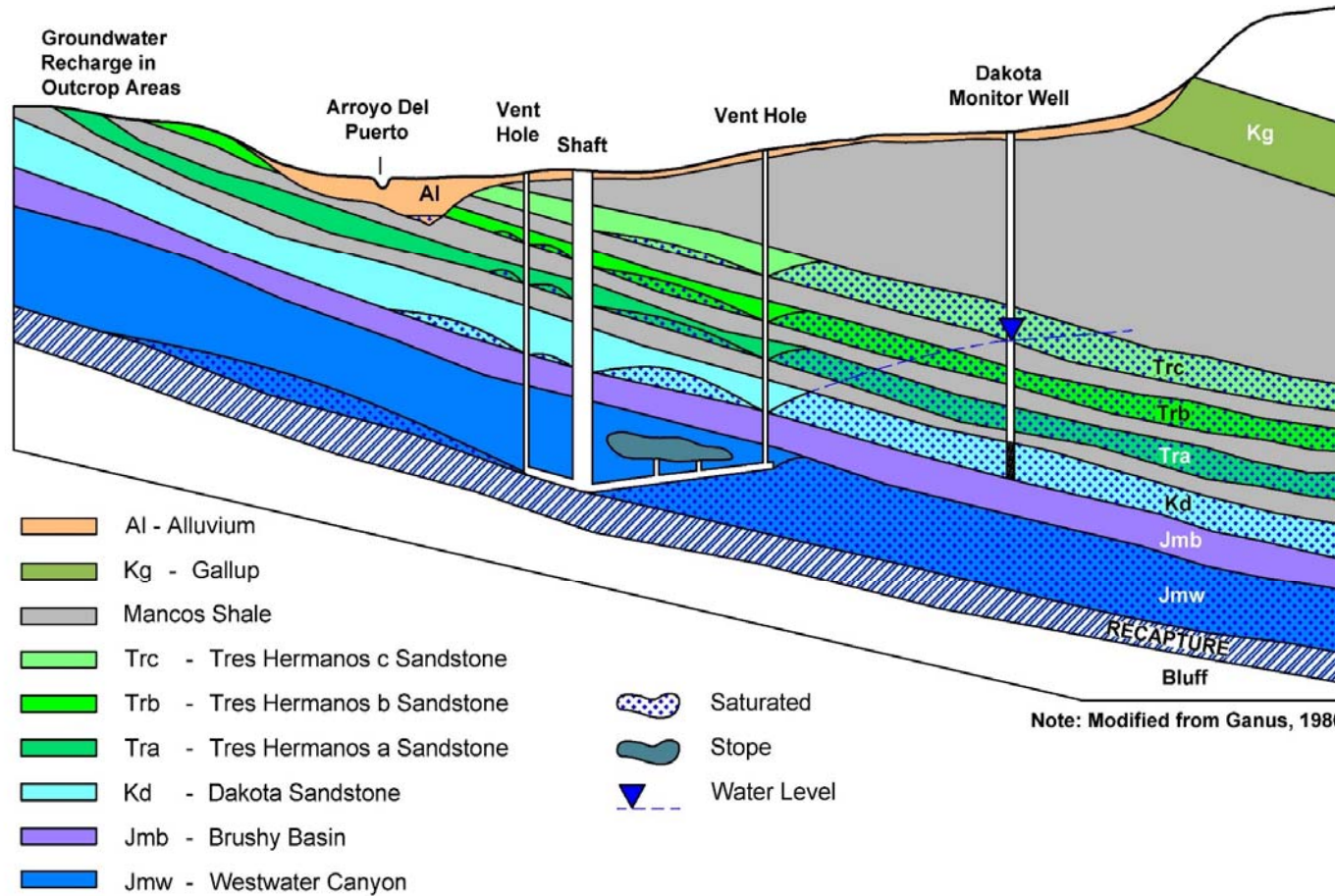


## Other Discharge Permits



Northeast

Southwest



## Hydrogeologic and Geochemical Conceptual Model

- Groundwater is moving toward the hydraulic sink created by extensive mine dewatering by numerous mining entities
- Flow modeling predictions show impacted groundwater contained for over hundreds of years before regional gradients are re-established
- No 'plume' of contamination exists in Westwater – ore deposit with highly variable geochemical conditions
- No quantitative geochemical models could be developed to predict groundwater quality at any particular point or time

## Hydrogeologic and Geochemical Conceptual Model

- **Water quality influenced by redox conditions and presence of reactive minerals in the aquifer matrix.**
- **Water quality improves as reducing conditions are re-established.**
- **Mine stopes flood SE to NW. Oxygen consumed and water quality improves.**
- **Distribution of reactive minerals is variable over short distance.**
- **Mine stopes constitute a complex 3-D void. Air/Water interface will migrate in a complex way. Difficult to predict at any one location.**

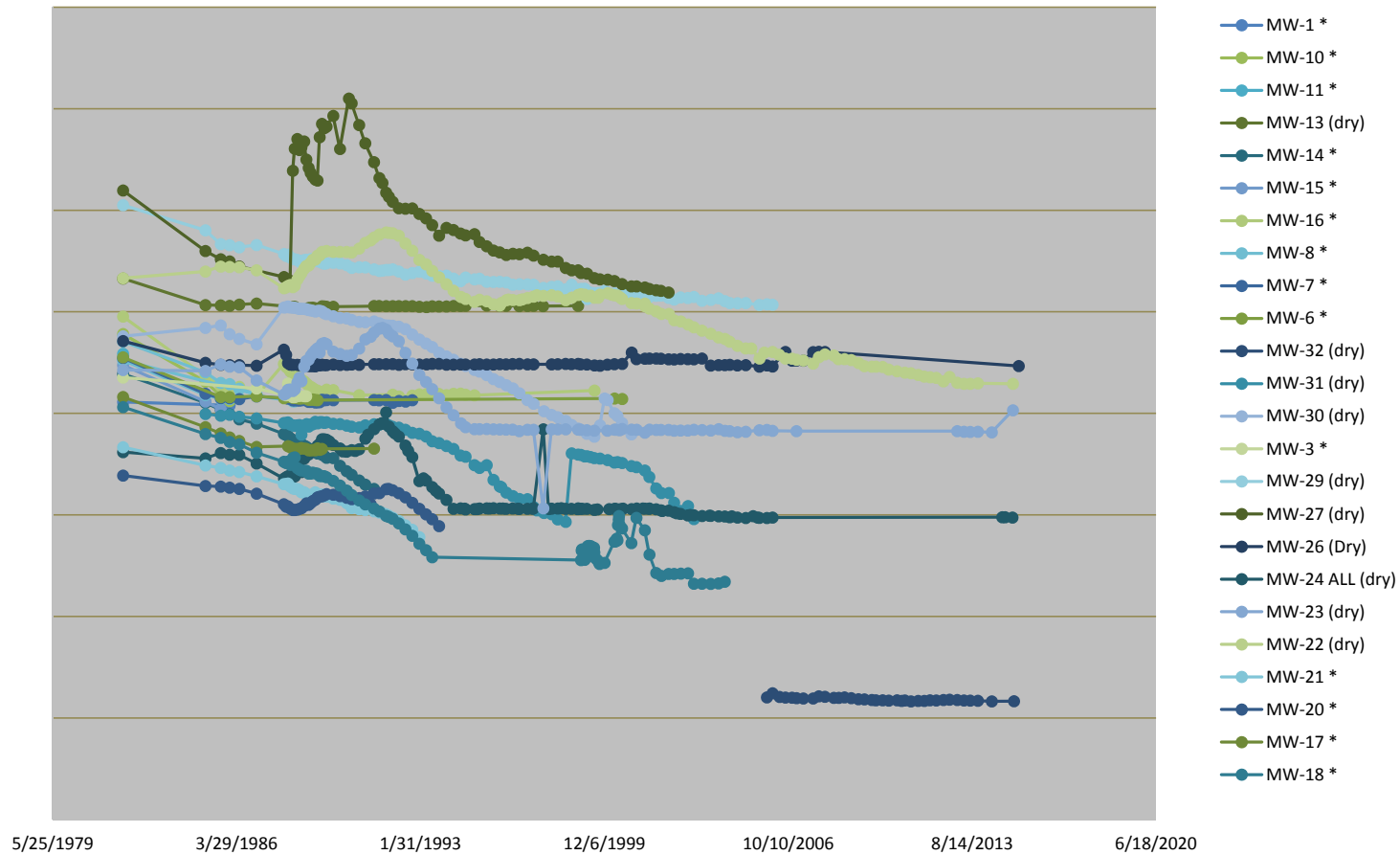


## DP-71 History

- **DP-71 covered discharges to Section 4 Ponds**
- **Renewed in 2008 –**
  - **3 additional wells south of ponds,**
  - **Bottom of paleochannel (MW-32)**
  - **Most wells dry**
- **Material consolidation to Pond 2 complete at Section 4 – authorized by NRC, supported by NMED**
- **No wells contain enough water to collect a sample**

## DP-71 Depth to Water

\* Indicates well is no longer in service



QUESTIONS?

FEEDBACK?

# Section 4 Ponds Dose Assessment

**Rio Algom Mining LLC.  
SUA-1473**

**20 April 2016**

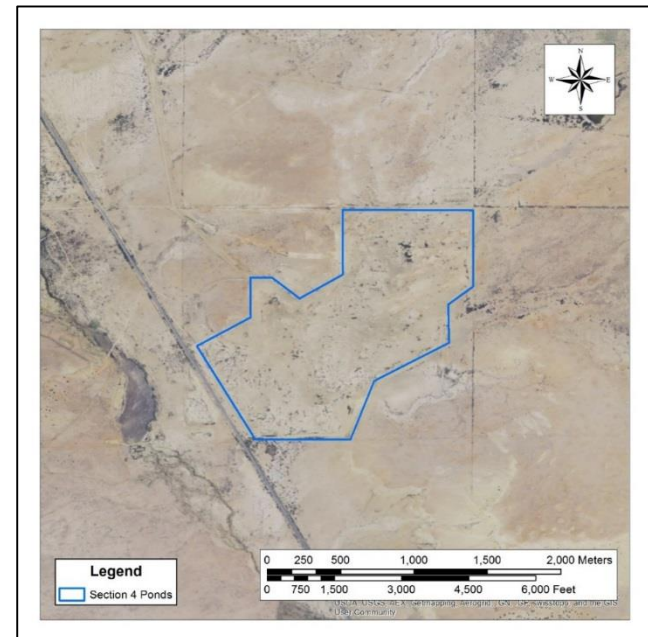
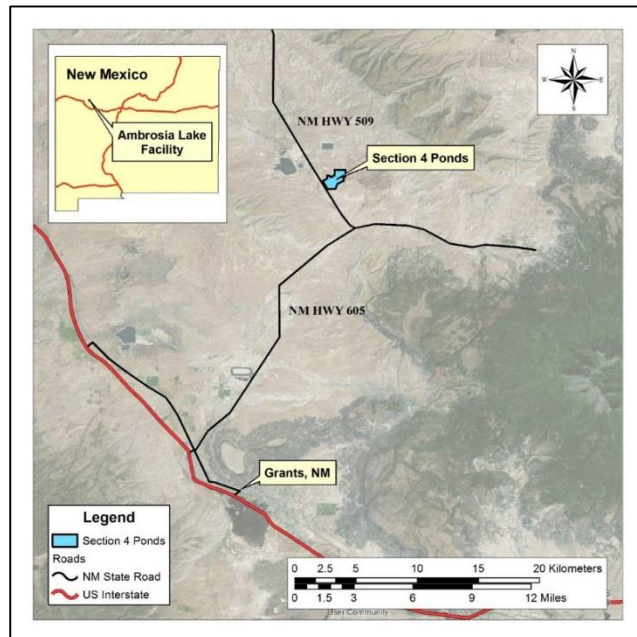
Attachment 3





# Section 4 Ponds Dose Assessment

## Site Location



- Section 4 ponds
  - Northern ponds constructed in 1976, southern ponds constructed in 1979
  - 256 acres in area
  - Used to evaporate liquid waste from the mill and groundwater from the alluvial remediation plan.
  - Active through 2004

- This dose assessment
  - Adopts the parameters used in the 2010 Dose Assessment (Twin Lines, 2010), which in turn adopts those in the Soil Decommissioning Plan (KOMEX, 2006)
  - Incorporates the long-lived radionuclide concentrations reported by ORAU in 2015
  - Includes a scenario of industrial occupancy
  - Was developed using RESRAD v 7.0

- Resident Rancher Scenario
  - Pathways Included
    - External gamma
    - Inhalation
    - Soil, plant, surface water, and meat ingestion
  - Parameters adopted from NRC-approved Decommissioning Plan (RESRAD defaults and site-specific values)
  - Impacted Area is 390 acres
- Industrial Worker Scenario
  - Pathways Included
    - External gamma
    - Inhalation
    - Soil ingestion
  - Parameters adopted from NRC-approved Decommissioning Plan
  - Modification: Worker spends 24% of time on site, all of which is outdoors



- Medians of concentrations of uranium series radionuclides determined by ORAU in 2105
  - Non-normal distributions
  - Assumed one, 210 cm thick layer with no cover
  - Data were not adjusted for background
  - Lead-210 and polonium-210 were assumed to be in secular equilibrium with radium-226

## Modeled Radionuclide Concentrations (pCi/g)

U-238	U-234	U-235	Th-230	Ra-226	Pb-210
2.74	2.74	0.12	12.5	1.5	1.5

- Incorporated into the model the more conservative of the ORAU vs. RAML results

<u>Data Set</u>	<u>Concentration (pCi/g)</u>		
	<u>U-238</u>	<u>Th-230</u>	<u>Ra-226</u>
ORISE Surface Soil Samples 2015	2.74	12.5	1.5
RAML Surface Soil Samples 2014	1.49	1.49	0.84

## Resident Rancher

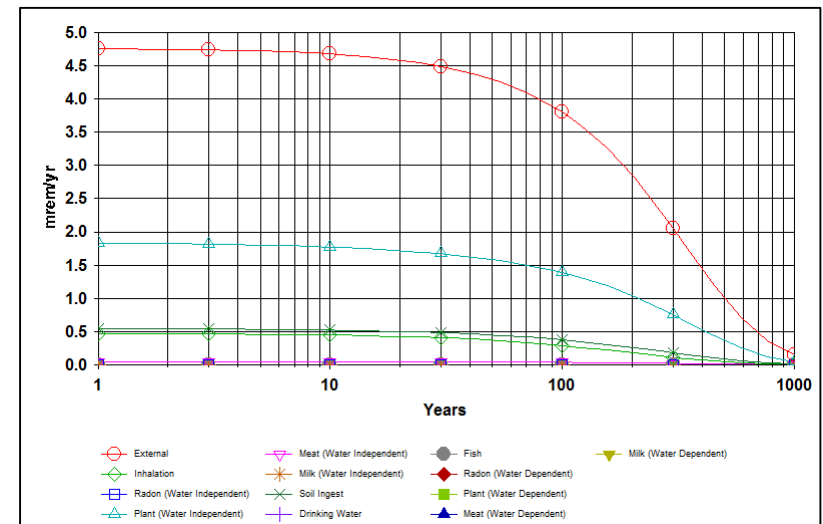
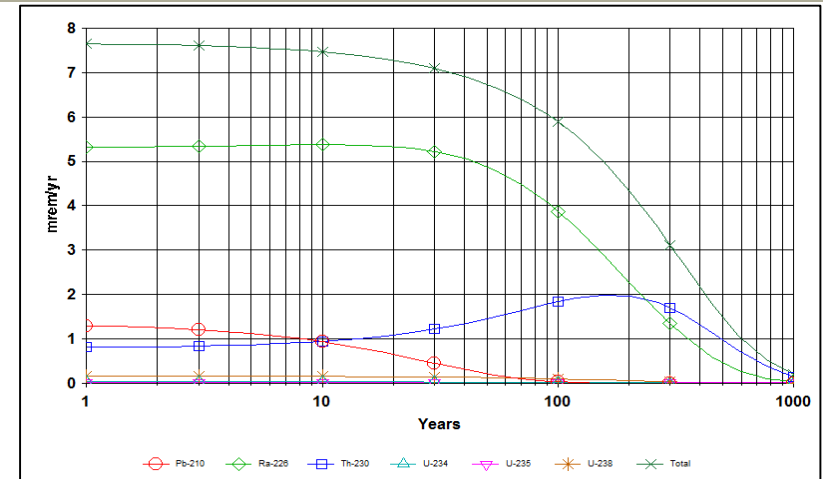
- Occupancy Factors
  - On-site Outdoor: 0.2
  - On-site Indoor: 0.45
  - Off-site (no exposure): 0.35
- Shielding Factor (inhalation): 0.56
- Shielding Factor (gamma): 0.21
- 5 percent of diet produced on site
- No soil cover

## Industrial Worker

- Occupancy Factors
  - On-site Outdoor: 0.24
  - On-site Indoor: 0
  - Off-site (no exposure): 0.76

# Results: Resident Rancher

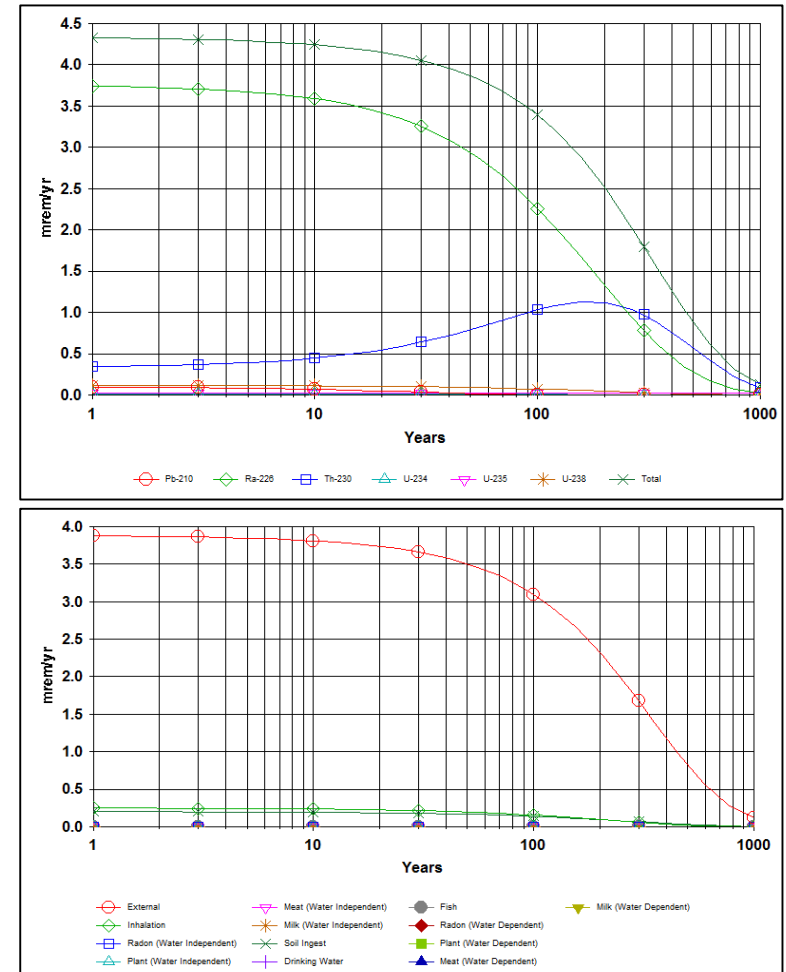
- Maximum dose is 7.67 mrem/yr at  $t=0$ , below the 25 mrem/year decommissioning standard
- Radium-226 concentration in soil is most sensitive input parameter
- Majority of the dose is from direct exposure to gamma radiation
- Maximum dose is likely overestimated since input parameters were conservatively estimated





# Results: Industrial Worker

- Maximum dose is 4.33 mrem/yr at  $t=0$ , below the 25 mrem/yr decommissioning standard
- Radium-226 concentration in soil is most sensitive input parameter
- Dose is largely from direct exposure to gamma radiation
- Maximum dose is likely overestimated since input parameters were conservatively estimated



# CONCLUSIONS

- Adopted conservative assumptions and site-specific data that include soil concentrations determined by ORAU
- Maximum dose to a potential resident rancher is 7.67 mrem/yr at  $t=0$ , below the 25 mrem/yr decommissioning standard
- Maximum dose to a potential industrial worker is 4.33 mrem/yr at  $t=0$ , below the 25 mrem/yr decommissioning standard
- Doses for both scenarios are largely from direct exposure to gamma radiation
- Doses are below Radium-226 benchmark dose value of 18 mrem/yr.



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# Proposed Changes to Health Physics Manual and License Based on Current Site Conditions

**Rio Algom Mining LLC.  
SUA-1473**

**20 April 2016**

Attachment 4





**Current Commitment:** A member of the Health Physics staff shall perform a daily visual inspection of active work areas associated with the license to ensure proper radiation protection practices are being used. This inspection shall be documented with any necessary corrective actions addressed.

## **Proposed Change: Eliminate**

**Justification:** Construction will be completed in April 2016 and no site activity other than environmental monitoring will exist. If future surface remediation is required, commitments for inspections will be incorporated into Radiation Work Permits.

**Current Commitment:** Conduct weekly inspections of pertinent work areas at the site to observe and evaluate whether the radiation protection practices are used properly.

**Proposed Change: Change frequency from weekly to monthly**

**Justification:** Due to the decrease in site activity, monthly inspections of work areas are more reasonable. This will include an inspection of the LTSM perimeter fence and postings.

**Current Commitment:** The RSO shall develop a monthly report that presents results associated with the radiation protection program including trends in data and proposed corrective measures for unacceptable conditions.

## **Proposed Change: Eliminate**

**Justification:** Due to the expected decrease in site activity, the results associated with the radiation protection program, including trends in data and proposed corrective measures for unacceptable conditions, will be included in the RSO's annual report. Unacceptable conditions and proposed corrective actions can also be captured in the monthly inspections.

**Current Commitment:** The RSO shall perform an annual audit of the radiation protection program to ensure all aspects of the program are in compliance with the license. This audit shall be documented.

**Proposed Change: Eliminate**

**Justification:** An evaluation of the radiation protection program regarding compliance with the license will be incorporated into the Annual Report.



**Current Commitment:** The RSO shall develop a site Fire Plan to address measures to be taken in the event of a fire involving radioactive materials. The Fire Plan shall be reviewed at least annually by the RSO.

**Proposed Change: Eliminate**

**Justification:** No operational facilities containing radioactive material exist.

**Current Commitment:** Semiannual gamma surveys are conducted to evaluate compliance with posting requirements, determine actions to achieve ALARA, and supplement the personnel dosimetry program.

## **Proposed Change: Eliminate**

**Justification:** A current gamma survey map of the site will be produced in 2016. Changes to gamma dose rates will not change unless remediation occurs, in which case they will be lowered.

**Current Commitment:** The sampling frequency for surface contamination surveys in clean rooms/structures shall be at least monthly.

**Proposed Change: Eliminate**

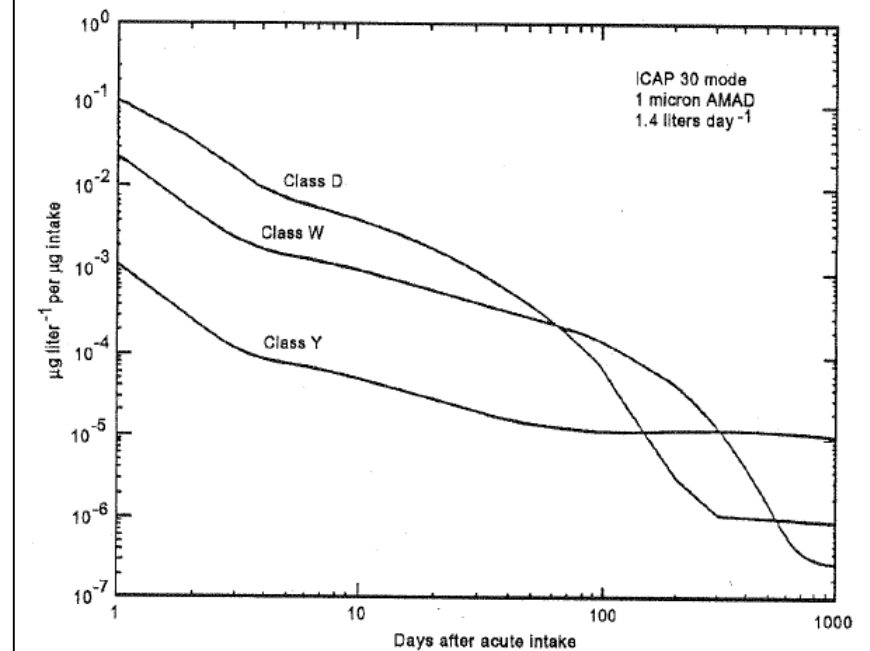
**Justification:** After July 1<sup>st</sup>, there will not structures within the LTSM.

**Current Commitment:** The RSO shall be responsible for the development and implementation of a Bioassay Program. The current program requires quarterly routine uranium in urine bioassays of site personnel.

**Proposed Change:** Eliminate the routine bioassay requirement. Bioassay samples will be collected, if applicable, based on requirements of RWPs.

**Justification:** The largest sources of uranium have been mitigated and the quarterly frequency is not sufficient to detect intakes if they occur.

Fig. B.1. Urinary Uranium Excretion Function -- Following Acute Intake





**Current Commitment:** Airborne particulate sampling at 7 locations using high volume air samplers.

- Weekly filter exchanges
- Quarterly Composites
- Analyze for natural uranium, thorium-230, radium-226 and lead-210

**Proposed Change: Compile historic data to show this is not needed.**

**Justification:** The largest sources of airborne particulates have been mitigated. Semi-annual reports document particulate concentrations of radionuclides in air are well below effluent concentrations. If future remediation occurs, focused environmental monitoring of remediation areas will be driven by RWP requirements, if applicable.

**Current Commitment:** Radon-222 sampling at 7 locations using passive track-etch detectors.

- Quarterly detector exchanges

**Proposed Change: Compile historic data to show this is not needed.**

**Justification:** The largest sources of radon-222 have been mitigated. If future remediation occurs, focused environmental monitoring of remediation areas will be driven by requirements in RWPs, if applicable.

**Current Commitment:** Exposure rate monitoring at 7 locations using environmental dosimeters.

–Quarterly detector exchanges

**Proposed Change: Compile historic data to show this is not needed.**

**Justification:** The largest sources of radioactive material have been mitigated. If future remediation occurs, focused environmental monitoring of remediation areas will be driven by requirements in RWPs, if applicable.

**Current Commitment:** Surface Water – Data submitted monthly to the EPA.

**Proposed Change: Eliminate**

**Justification:** No discharges are occurring, therefore there is no surface water to sample. An NPDES point-source permit is no longer in place or needed for site operations.



**Current Commitment:** Annual soil sampling at 7 locations.

–Analyzed for RG 4.14 parameters

**Proposed Change: Compile historic data to show this is not needed.**

**Justification:** The largest sources of radioactive material have been mitigated. If future remediation occurs, focused environmental monitoring of remediation areas will be driven by requirements in RWPs, if applicable.

**Current Commitment:** Annual vegetation sampling at 7 locations for 3 out of 4 quarters.

–Analyzed for RG 4.14 parameters

**Proposed Change: Compile historic data to show this is not needed.**

**Justification:** The largest sources of radioactive material have been mitigated. If future remediation occurs, focused environmental monitoring of remediation areas will be driven by requirements in RWPs, if applicable.

**Current Commitment:** Annual sediment sampling at 4 locations in Arroyo del Puerto.

–Analyzed for RG 4.14 parameters

**Proposed Change: Compile historic data to show this is not needed.**

**Justification:** The largest sources of radioactive material have been mitigated. If future remediation occurs, focused environmental monitoring of remediation areas will be driven by requirements in RWPs, if applicable.

**Current Commitment:** Site access will be controlled through the use of security personnel and procedures. Currently using 24 hour security.

## **Proposed Change:**

- 1. When GHD has completed work on the site at the end of April the, Security presence would be reduced from the current 3 shifts per day (24 hour presence) to one shift per day, 8:00AM – 5:00PM.**
- 2. On June, 30th 2016 the security presence would be eliminated, after June 30th our security will be existing fences and locked gates with required posting contained in LC 28.**

**Justification:** The largest sources of radioactive material have been mitigated and secured. This level of security is consistent with other uranium mill site in similar stages of deconditioning.



# Radioactive Materials License: SUA-1473

## Current Commitment: LC 10

This licensee shall maintain a health physics and environmental monitoring program as described within submittals dated August 30, 1990; January 31, 1991; and January 13, 1998. The programs described in these submittals will be reviewed in a manner consistent with the requirements of License Condition 14.

Any changes to the mill circuit as described in Section 6.2 of the August 30, 1990 submittal or as authorized by subsequent license conditions shall require approval by the NRC in the form of a license amendment.

**Proposed Change:** “This licensee shall maintain a health physics and environmental monitoring program as described within the Site Health Physics Manual. The programs described in these submittals will be reviewed in a manner consistent with the requirements of License Condition 14.”

**Justification:** The commitments in the submittals dated August 30, 1990; January 31, 1991; and January 13, 1998 are no longer applicable to site conditions and the mill circuit no longer exists.

## **Current Commitment: LC 16**

The licensee shall establish written procedures for all surveillance activities including in-plant and environmental monitoring bioassay analysis and radiation monitoring instrument calibration. These procedures shall be reviewed and approved by the RSO annually to ensure that proper and current radiation protection principles are being applied.

## **Proposed Change: Delete**

**Justification:** Requirements contained in LC 16 are also contained in LC14.

# Radioactive Materials License: SUA-1473

## Current Commitment: LC 17

Occupational exposure calculations shall be performed in accordance with 10 CFR 19.13.b and 10 CFR Part 20, Subpart C and documented in accordance with 10 CFR 20.2106. Routine airborne ore dust and yellowcake samples shall be analyzed in a timely manner to allow exposure calculations to be performed in accordance with this condition. RWP ore dust and yellowcake samples shall be analyzed and the results reviewed by the RSO or his designee within two (2) working days after sample collection. Any time a uranium action level of 35 ug/l for two consecutive urine specimens or 130 ug/l for any one specimen is reached or exceeded, the licensee shall provide documentation within 30 days to the NRC indicating what corrective actions have been performed.

**Proposed Change:** Occupational exposure calculations shall be performed in accordance with 10 CFR 19.13.b and 10 CFR Part 20, Subpart C and documented in accordance with 10 CFR 20.2106. Routine and RWP airborne samples shall be analyzed in a timely manner to allow exposure calculations to be performed in accordance with this condition. Any time a uranium action level of 35 ug/l for two consecutive urine specimens or 130 ug/l for any one specimen is reached or exceeded, the licensee shall provide documentation within 30 days to the NRC indicating what corrective actions have been performed.

**Justification:** Clarifying requirements

# Radioactive Materials License: SUA-1473

## **Current Commitment:** LC 26

Before engaging in any activity other than reclamation and which is not authorized by the license, the licensee shall prepare and record an environmental evaluation of such activity. The licensee shall provide a written evaluation of the activity and obtain prior approval of the NRC in the form of a license amendment.

## **Proposed Change: Delete**

**Justification:** The intent of this condition is not clear since any activity not authorized by the license will require a license amendment.



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# Approach for Proposed ACLs in Upper Bedrock Units Ambrosia Lake Facility



Presented by:

**Rio Algom Mining LLC**

Draft – For Discussion Only



April 2016

Attachment 5

# Presentation Outline

- **What are Groundwater Protection Standards (GPSs)?**
- **What are Alternate Concentration Limits (ACLs)?**
- **Current NRC Accepted ACLs at Ambrosia Lake**
- **Monitoring Well Network**
- **Proposed ACLs and Approach**
  - Beryllium in the Dakota Sandstone
  - Cadmium in the Dakota Sandstone
  - Gross Alpha in all upper bedrock units
- **Molybdenum in the Dakota Sandstone**

# Groundwater Protection Standards

**Groundwater at a Title II Site must meet Groundwater Protection Standards (GPSs) which were established for the Ambrosia Lake Facility based on the higher of:**

1. Background values established in 1989
- or*
2. Values listed in Appendix A. 5c of 10 CFR Part 40

# Establishing Alternate Concentration Limits

**Pursuant to 10 CFR Part 40 Appendix A, Criterion 5B(6): ACLs may be established by the NRC after considering multiple site-specific factors including but not limited to:**

- Hydrogeological characteristics
- Physical and chemical characteristics of the waste and its potential for migration
- Current and future use of groundwater in the area
- Potential for adverse effects to human health and the environment

# What are Alternate Concentration Limits?

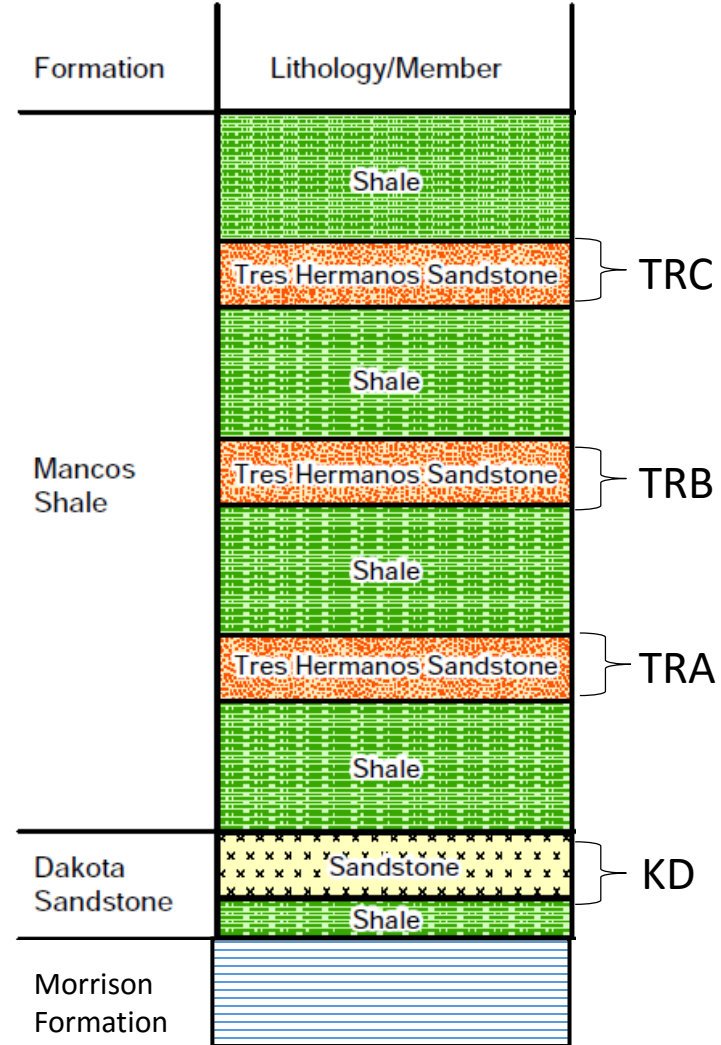
- ACLs are site-specific risk-based concentration limits that must be met at the **point of compliance (POC)** well(s)
- ACLs ensure that substantial present or potential hazard to human health and the environment will not occur at the **point of exposure (POE)** as long as ACLs are met at the POC



# A Brief History of ACLs at Ambrosia Lake

- ACL applications were submitted in 2000 and 2001 and were accepted in 2006 after five years of review and requests for additional information (RAIs)
  - Employed a conservative attenuation factor for U and applied to other constituents of concern (COCs)
- ACLs were established in accordance with 10 CFR Part 40 Appendix A, Criterion 5 and NUREG 1620
- Finding of No Significant Impact (FONSI) granted after NRC conducted an Environmental Assessment and Technical Review (2006)

# Stratigraphic Column of Ambrosia Lake – Upper Bedrock Units



Each unit has separate standards

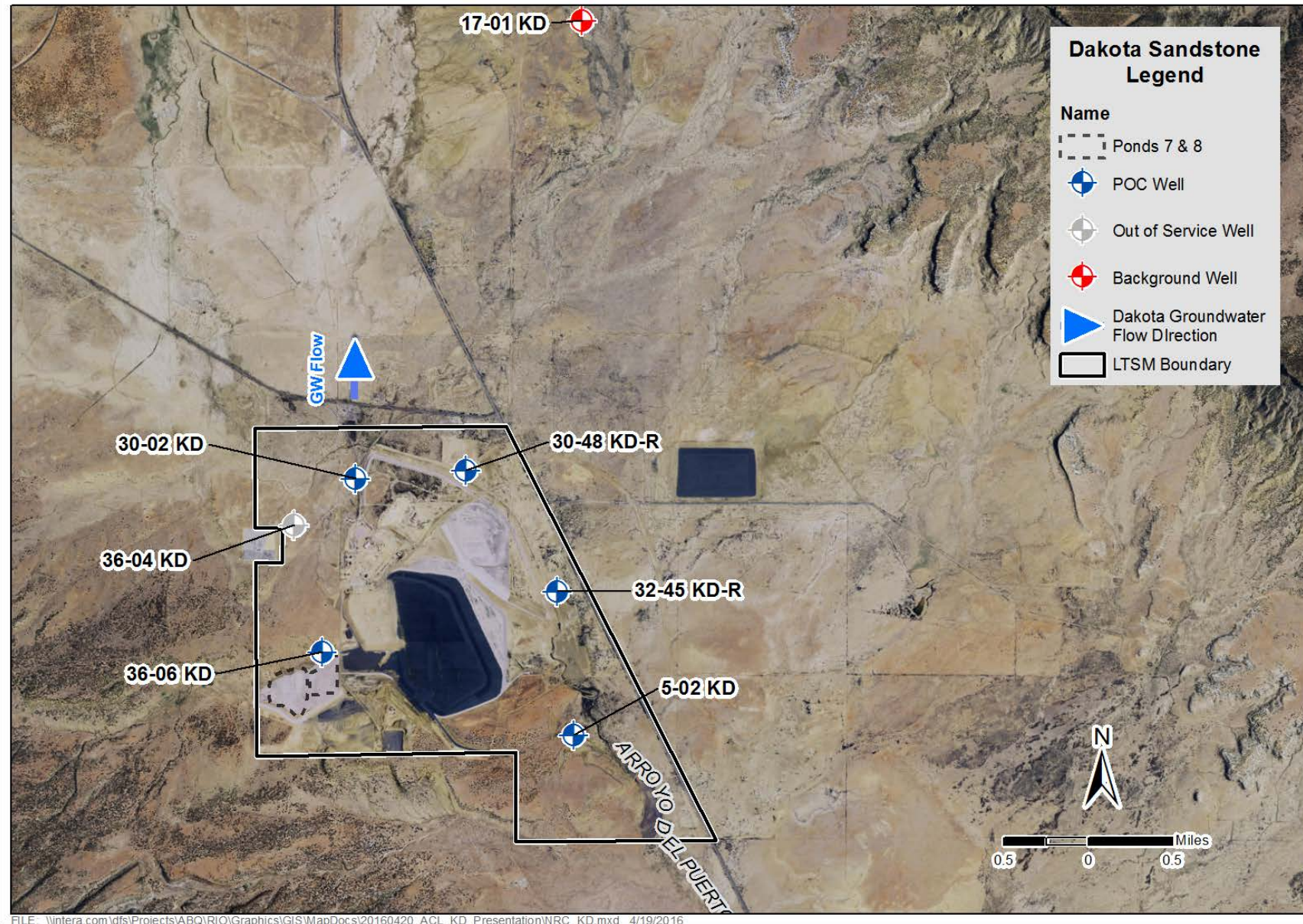
# NRC Summary - ACLs and GPSs

Groundwater Protection Standards (GPS) and Alternative Concentration Limits (ACL)		Tres Hermanos A		Tres Hermanos B		Dakota	
Parameter	Unit	GPS	ACL	GPS	ACL	GPS	ACL
Antimony	mg/l	-	-	-	-	0.05	-
Arsenic	mg/l	-	-	-	-	0.1	-
Beryllium	mg/l	-	-	-	-	0.01	-
Cadmium	mg/l	-	-	-	-	0.01	-
Chloride	mg/l	-	1070	-	2810	-	3200
Cyanide	mg/l	0.01	-	0.01	-	0.04	-
Gross Alpha	pCi/l	18	-	21	-	56	-
Lead	mg/l	-	-	-	-	0.14	-
Lead-210	pCi/l	4.14	88	0.9	88	1.9	88
Molybdenum	mg/l	0.03	-	0.08	-	0.06	-
Nickel	mg/l	0.05	-	0.06	6.8	0.03	6.8
Nitrate	mg/l	-	9.2	-	7.7	-	22.8
Radium-226 & Radium-228	pCi/l	5.0	218	7.4	218	5.0	218
Selenium	mg/l	0.03	-	0.04	-	0.04	-
Sulfate	mg/l	-	2584	-	4760	-	6480
Thorium-230	pCi/l	4.3	945	2.2	945	2.3	945
Total Dissolved Solids	mg/l	-	6400	-	11700	-	14100
Uranium	mg/l	0.01	-	0.02	1.6	0.02	1.6

# Proposed ACLs in the Dakota Sandstone



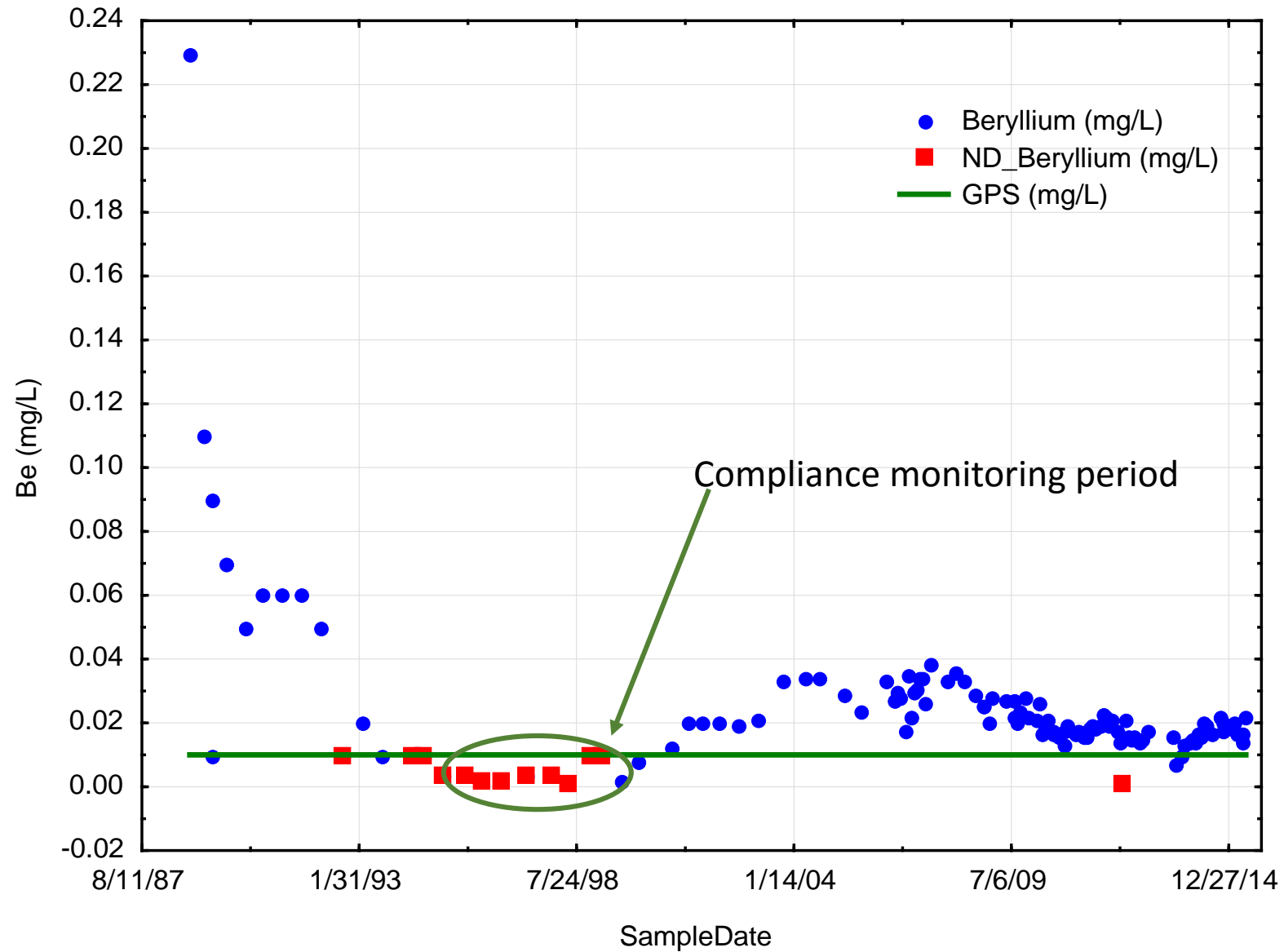
# Dakota Sandstone Monitoring Well Network



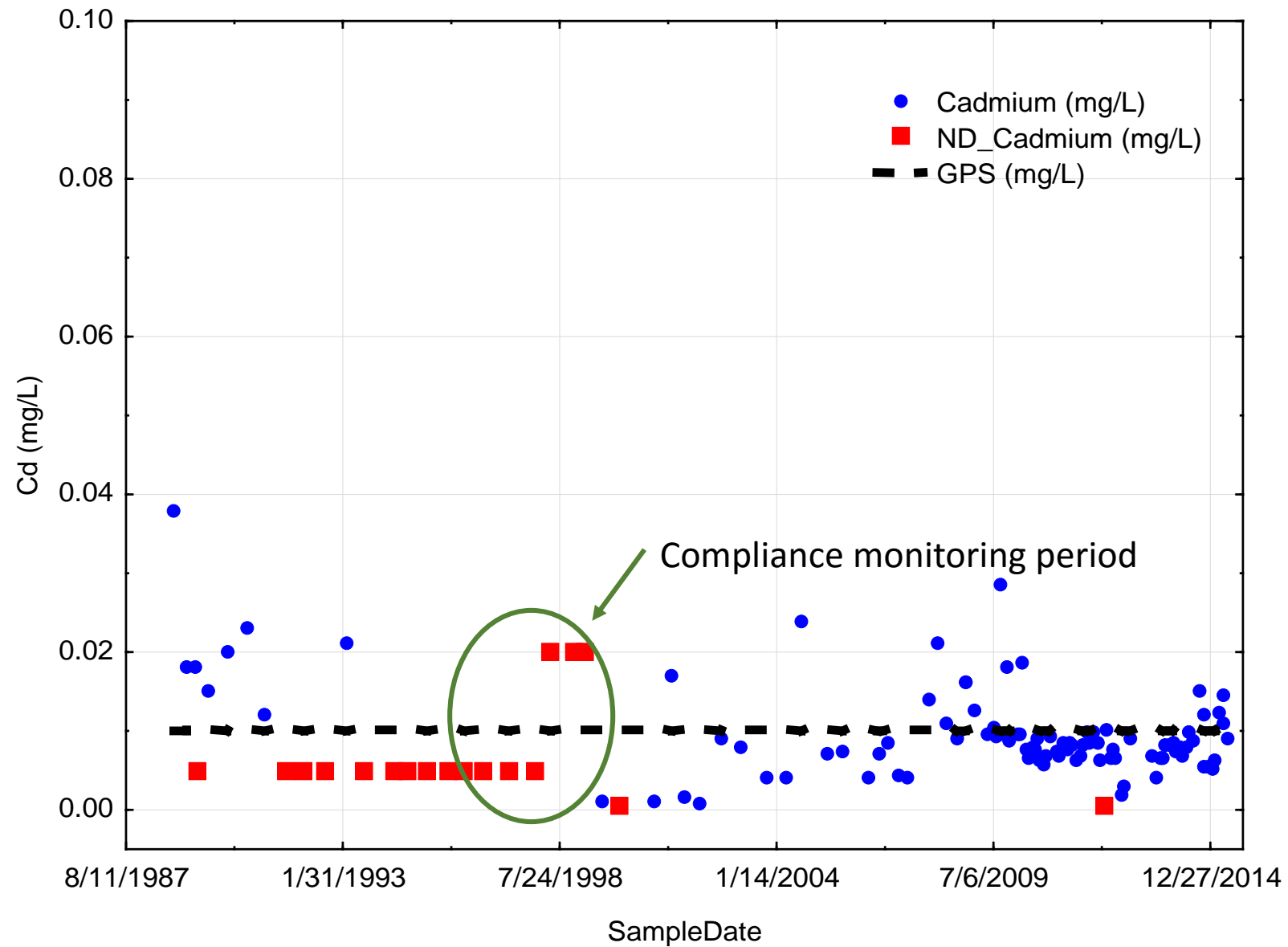
# Beryllium and Cadmium in 36-06 KD



# Beryllium in 36-06KD



# Cadmium in 36-06KD



# Considerations for Evaluating Proposed ACLs for Be, Cd

- Low pH in 36-06 KD
- Is U more mobile than Be, Cd?
  - We can test this with a simple sorption model

# What is sorption and why is ferrihydrite important?

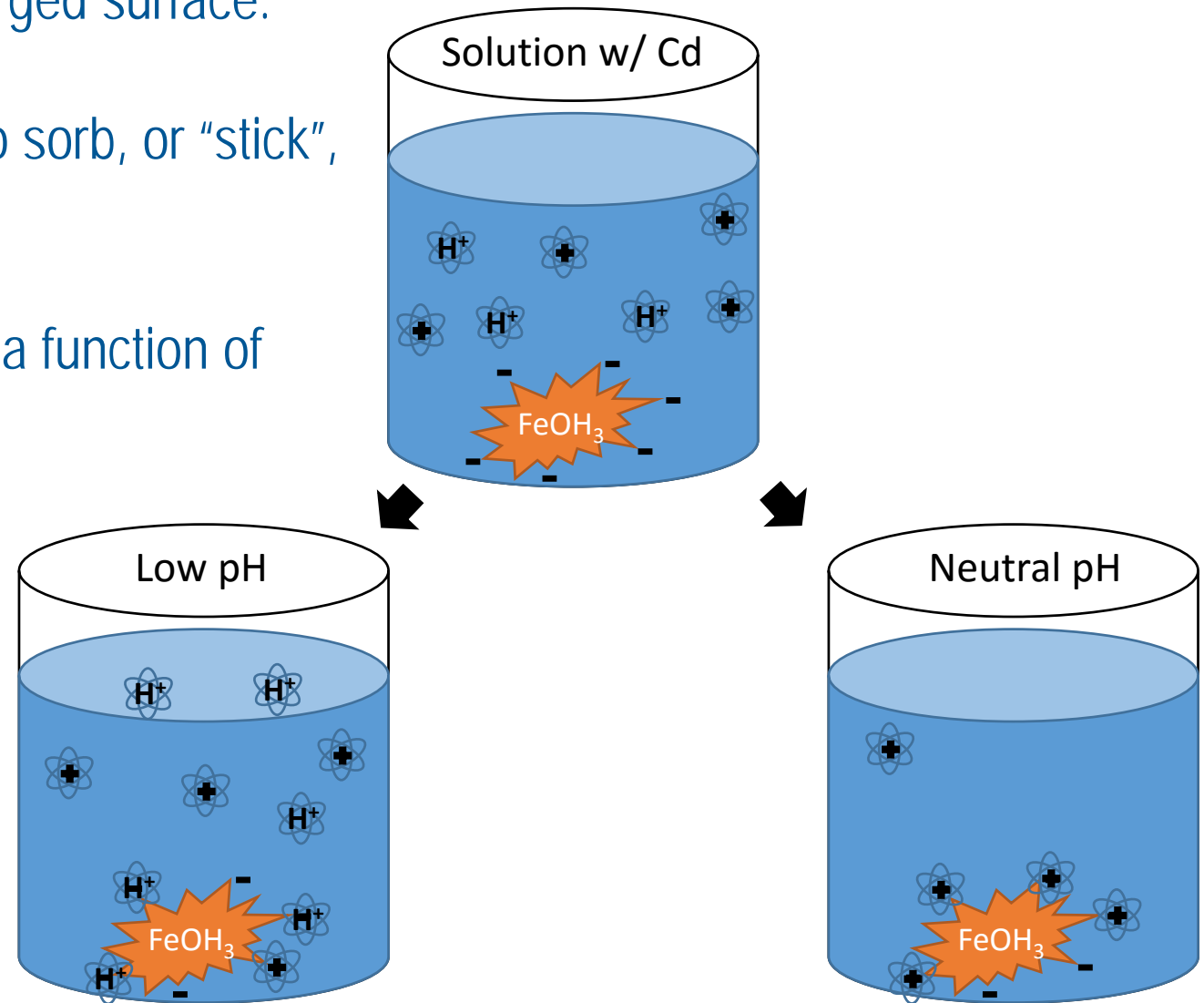
Ferrihydrite is an iron-bearing mineral with a charged surface.

The charged mineral surface allows metal ions to sorb, or “stick”, to the ferrihydrite.

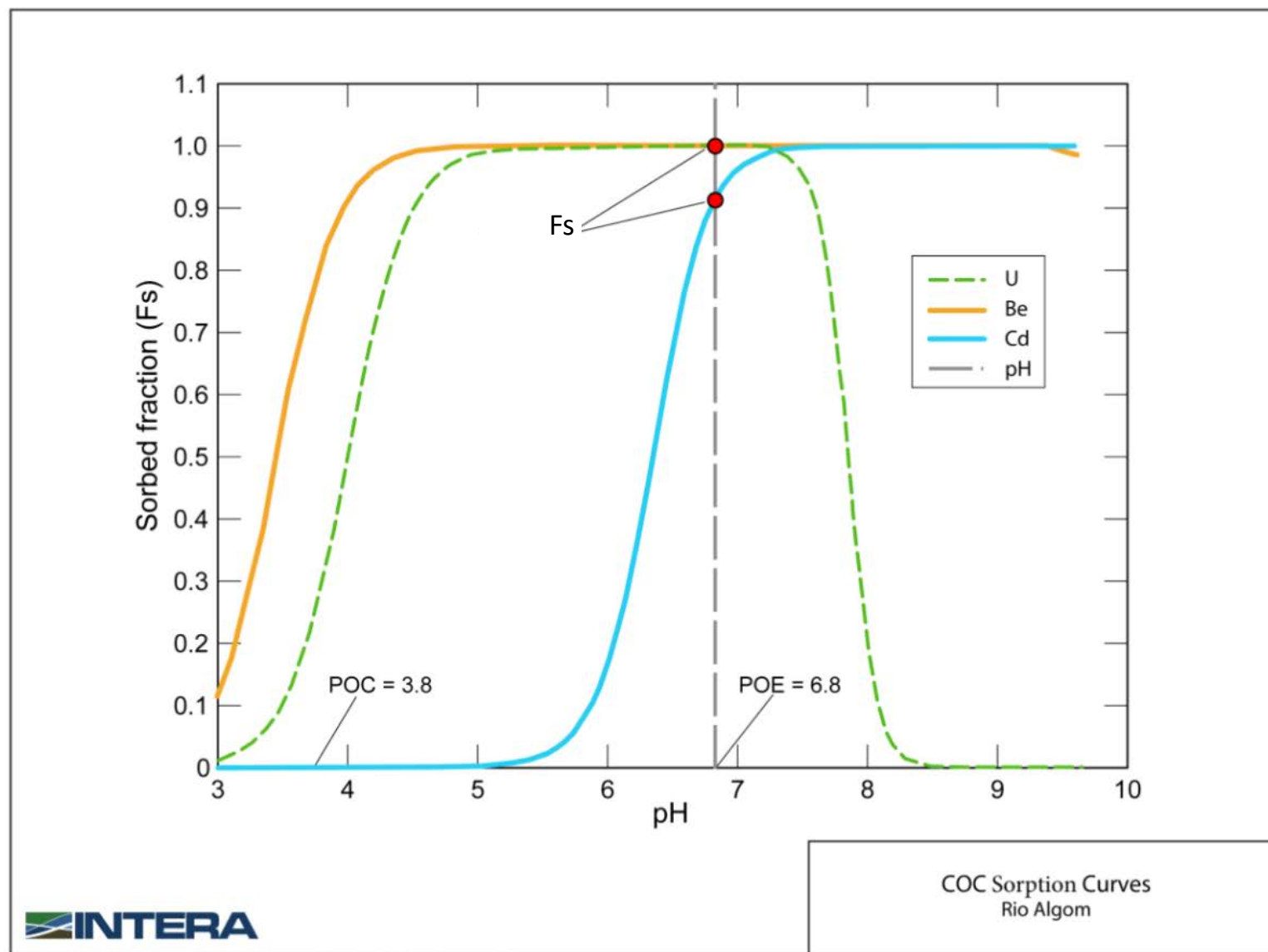
The extent to which metals stick to ferrihydrite is a function of water chemistry, including pH.

Metals sorbed to ferrihydrite are immobilized and cannot travel with groundwater.

Ferrihydrite is a common mineral in sandstones. Its ubiquity and capacity to sorb metals can strongly influence metal mobility.



# Calculated Sorbed Fractions as a Function of pH: U, Be, Cd



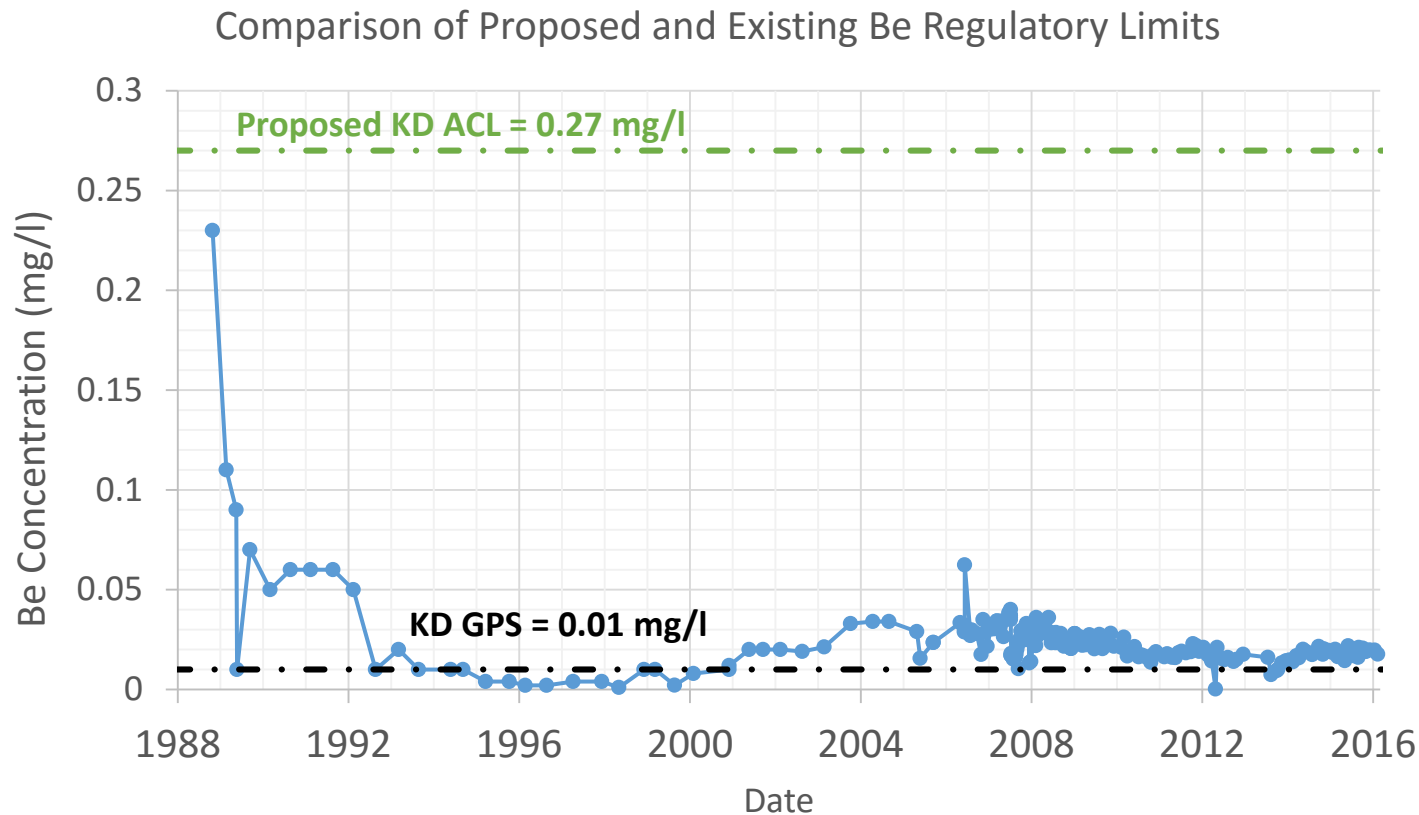
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# Beryllium ACL Approach



# Original ACL Approach for Estimating an ACL for Be

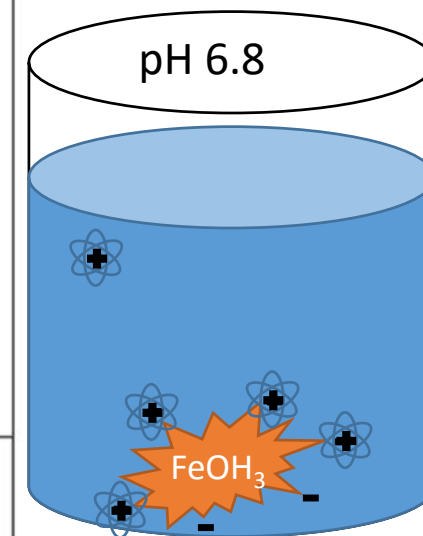
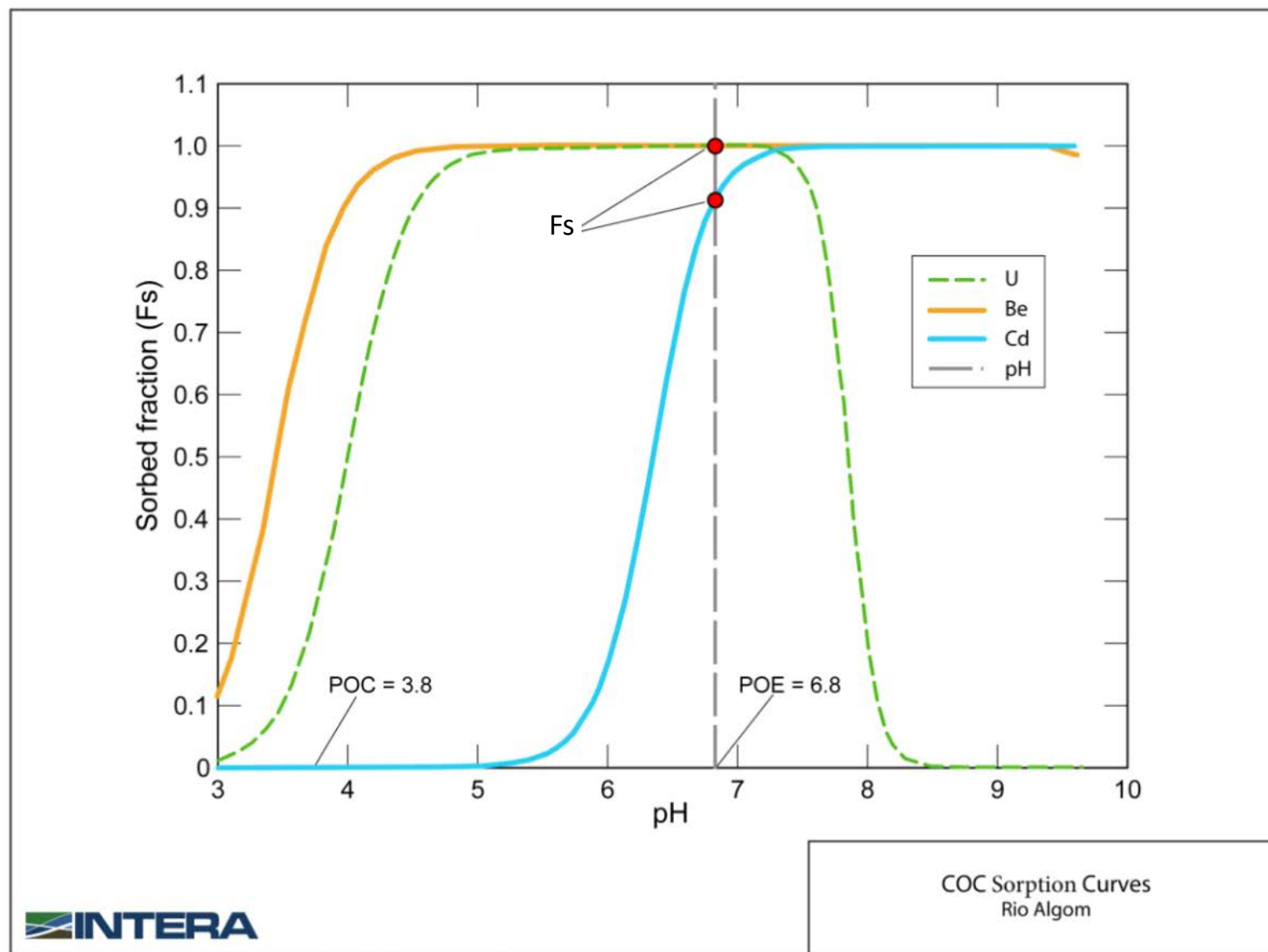
$$\text{Be ACL} = \frac{\text{EPA MCL}}{\text{U Attenuation Factor}} = \frac{0.004 \text{ mg/l}}{0.0147} = 0.27 \text{ mg/l}$$



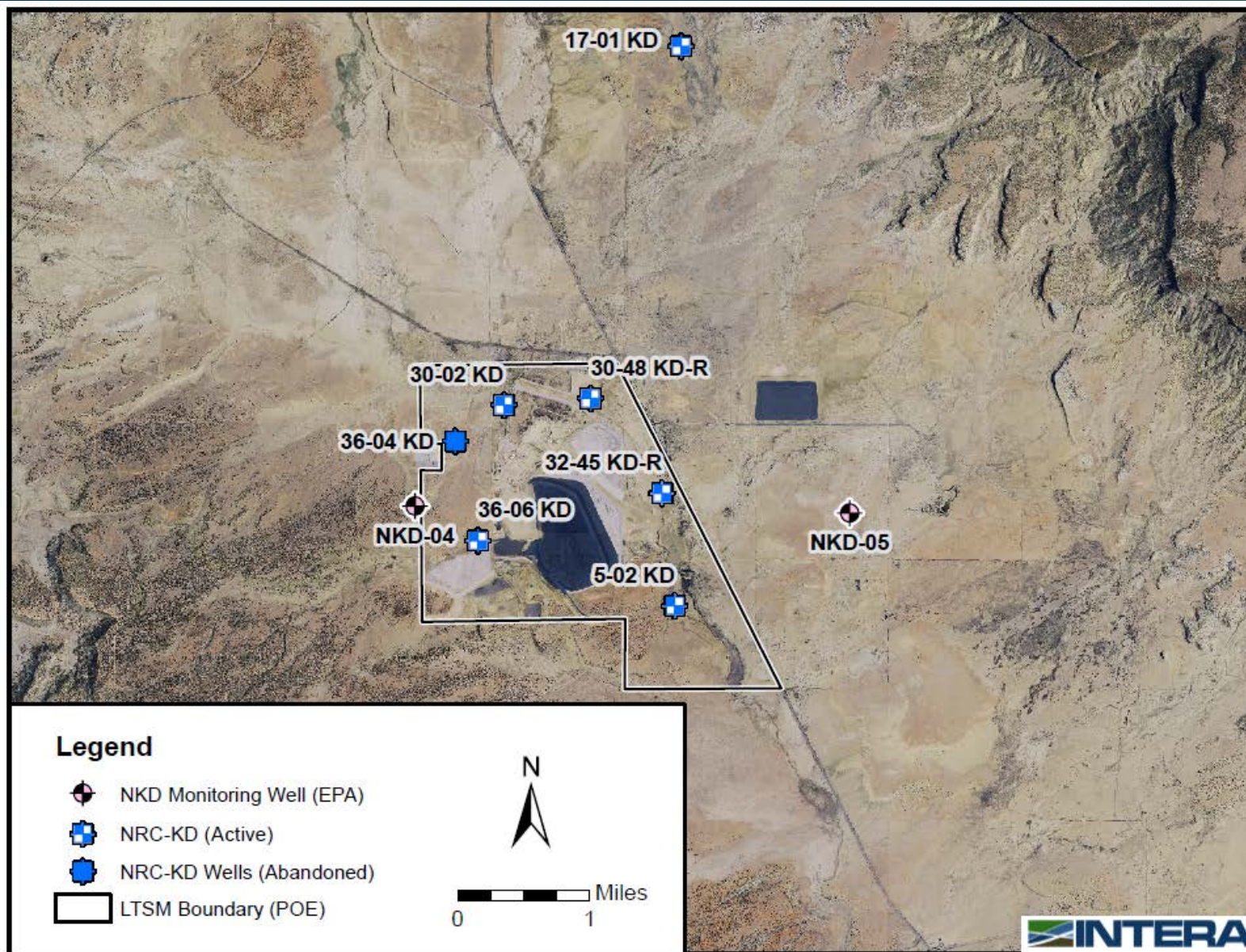
# Cadmium ACL Approach

## Cadmium site specific attenuation factor

# Calculated Sorbed Fractions as a Function of pH: U, Be, Cd



# Location of Core Samples



# Calculation of Ferrihydrite Content of the Dakota Sandstone

## Methods

- 5 samples of KD from EPA boreholes
- Analyzed for Fe content
- NH<sub>4</sub>-Oxalate extraction only removes Fe from ferrihydrite.
- Fe converted to ferrihydrite and used in sorption model

## Results

Digestion/ Leach Method	Average Ferrihydrite in KD (wt. %)	Calculated Cd ACL (mg/l)
NH <sub>4</sub> -Oxalate	0.025	0.047
3-Acid	0.436	0.984



# Calculation of Attenuation Factor and ACLs for Cd

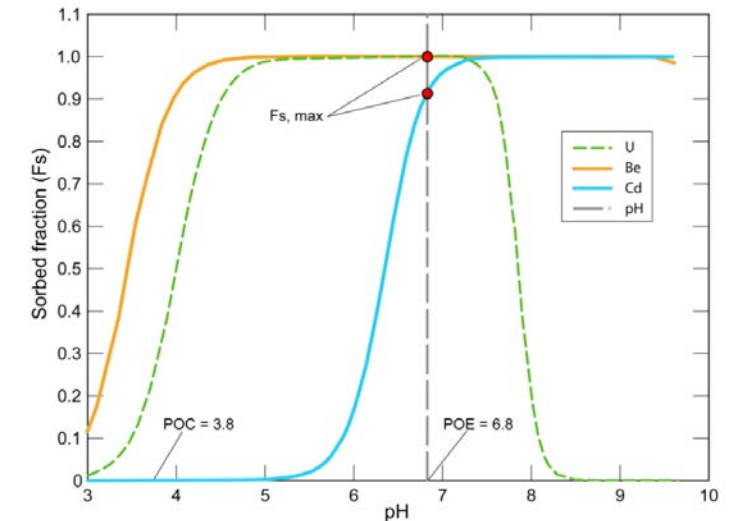
$$ACL = \frac{MCL}{(1-F_s)} = \frac{MCL}{(\% \text{ Cd remaining in solution})}$$

## Calculation of ACLs

- $f_s$  = cadmium sorbed fraction
- $A_{Cd}$  is  $1 - f_s$  = cadmium remaining in solution
- **MCL** is the maximum concentration limit **ACL** is the alternate concentration limit

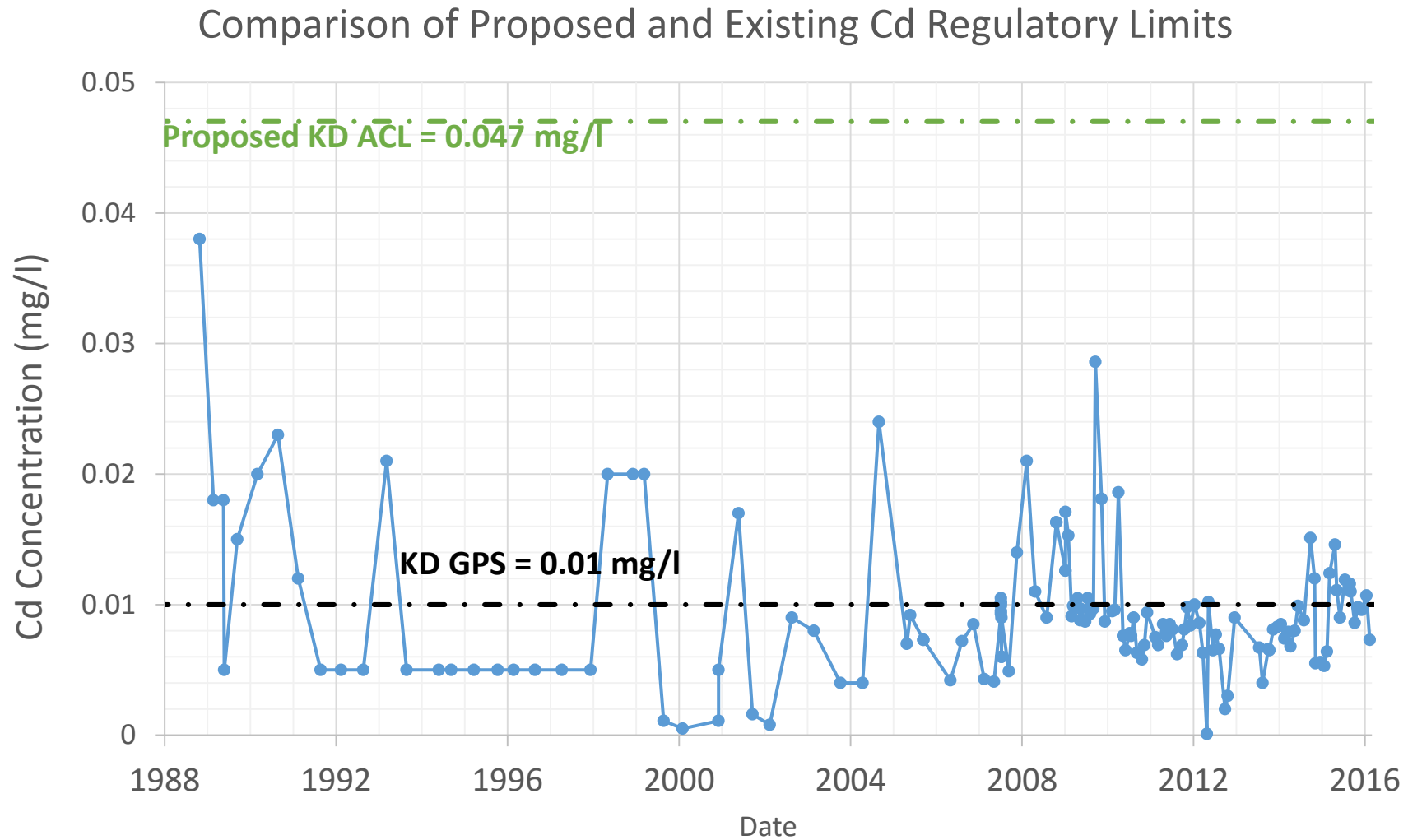
## Example:

$$ACL = \frac{MCL}{A_{Cd}} = \frac{MCL}{1 - f_s} = \frac{0.005 \text{ mg/l}}{1 - 0.894} = \frac{0.005 \text{ mg/l}}{0.106} = 0.047 \text{ mg/l}$$





# Cadmium in 36-06 KD



# Gross Alpha in Upper Bedrock Units

# Gross Alpha – Determining ACLs

- Gross alpha (minus radon and U activity) is listed in 10 CFR Part 40 Appendix A Criterion 5C
- Alluvial ACL petition included an ACL for gross alpha which was approved by NRC
- ACL is being proposed for gross alpha in the upper bedrock units using same approach as the alluvial ACL and other alpha emitters in upper bedrock units

# Approach to Evaluating Additional ACLs for Gross Alpha

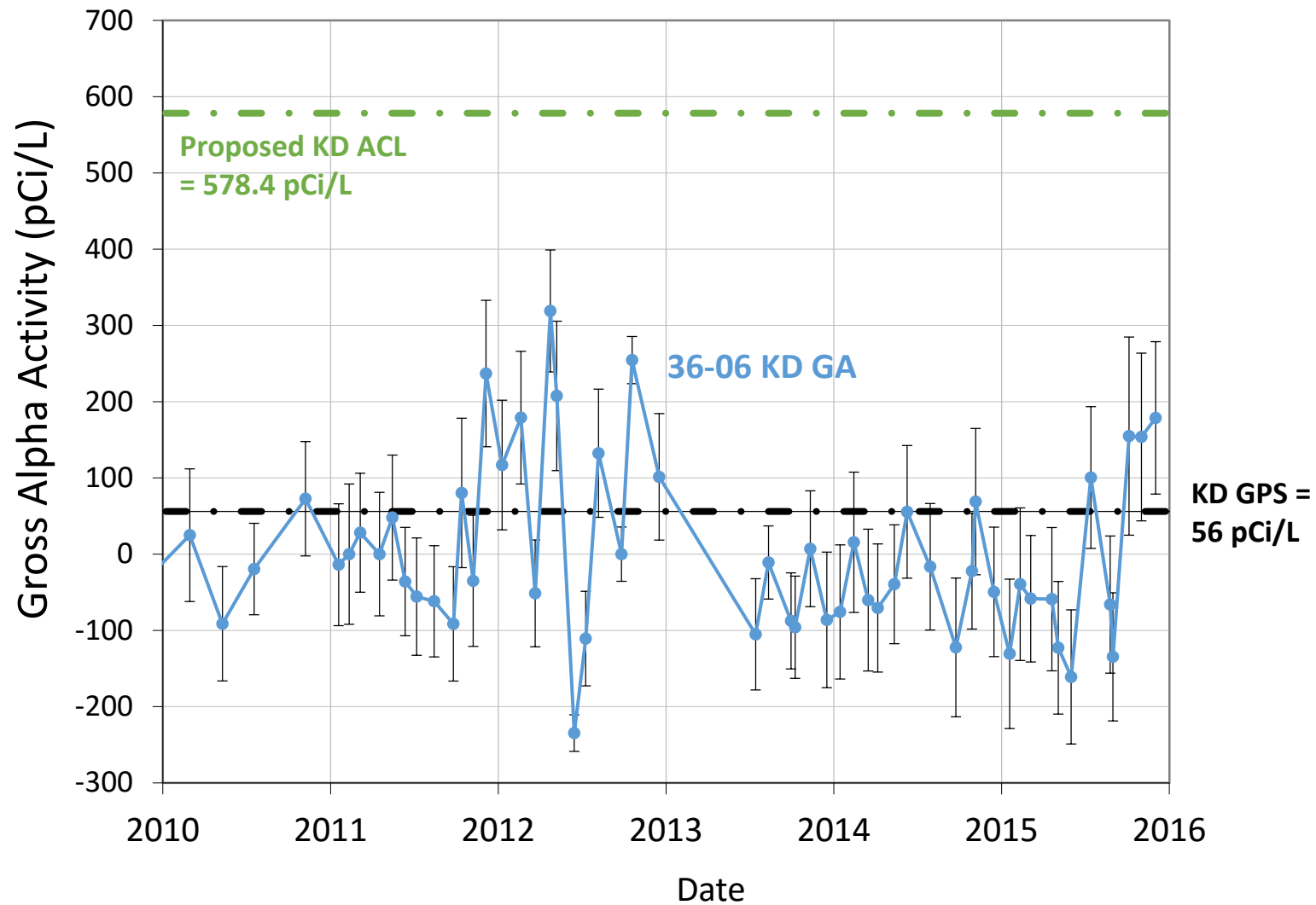
## Using the uranium attenuation factor

The gross alpha ACL was “evaluated as a constituent of concern using the health-risk-based coefficient of Po-210 as a conservative approach to calculating the gross alpha health-risk-based limit (EPA, 1999).” (NRC, 2006).

$$\text{Gross Alpha ACL} = \frac{\text{Po-210 Coefficient}}{\text{U Attenuation Factor}} = \frac{8.57 \text{ pCi/l}}{0.0147} = 578.4 \text{ pCi/l}$$

# Gross Alpha in 36-06 KD

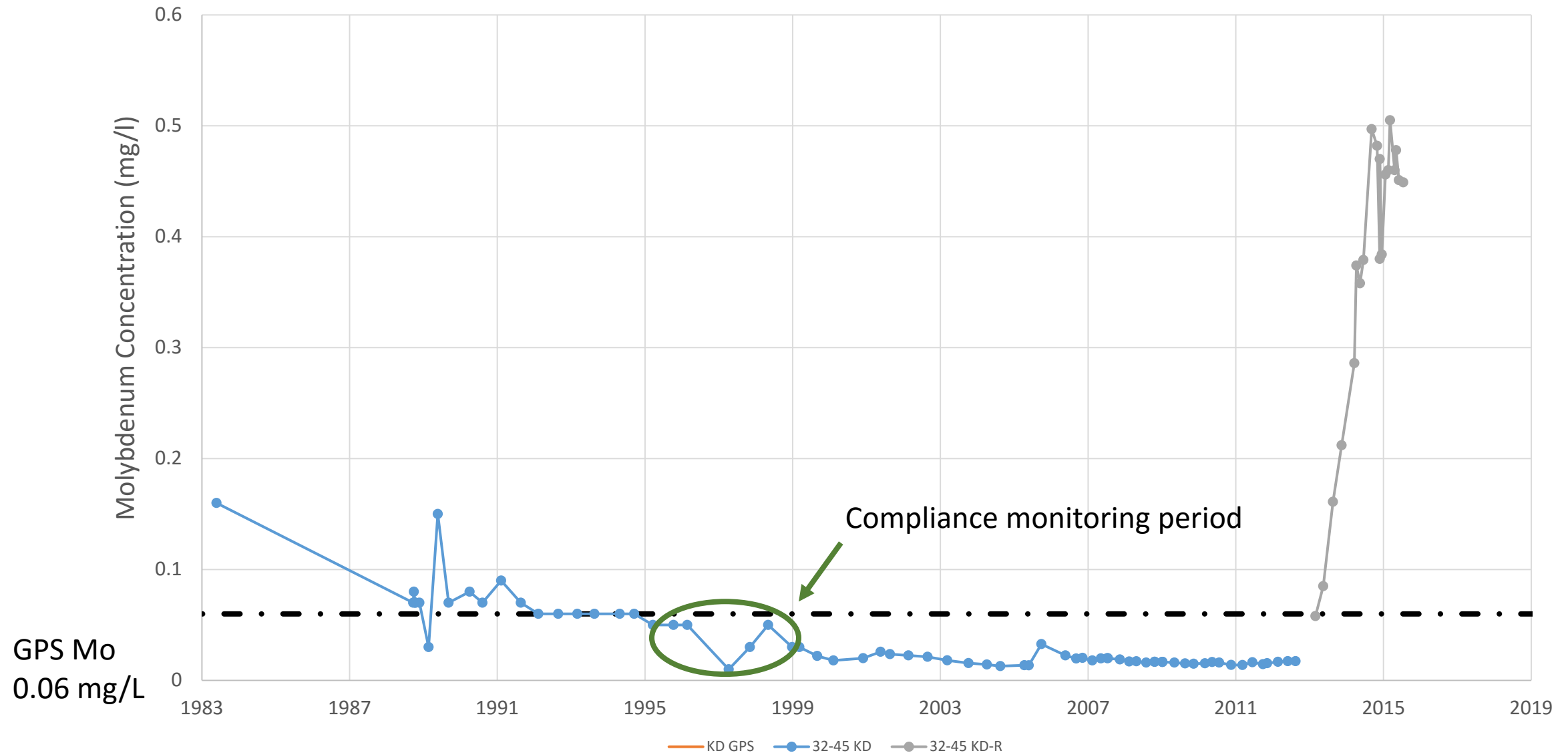
Comparison of Proposed and Existing GA Regulatory Limits



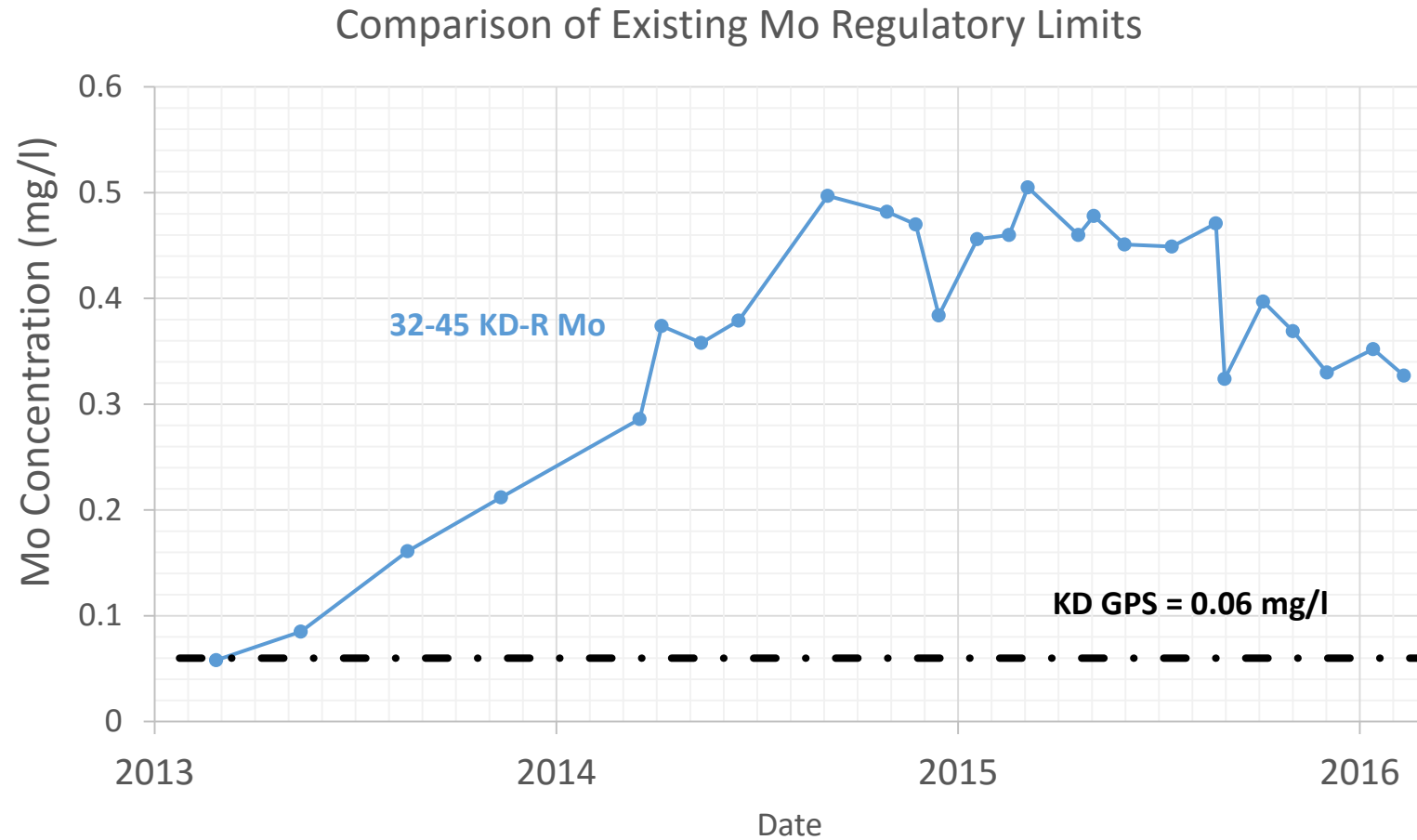
# Molybdenum in 32-45 KD-R



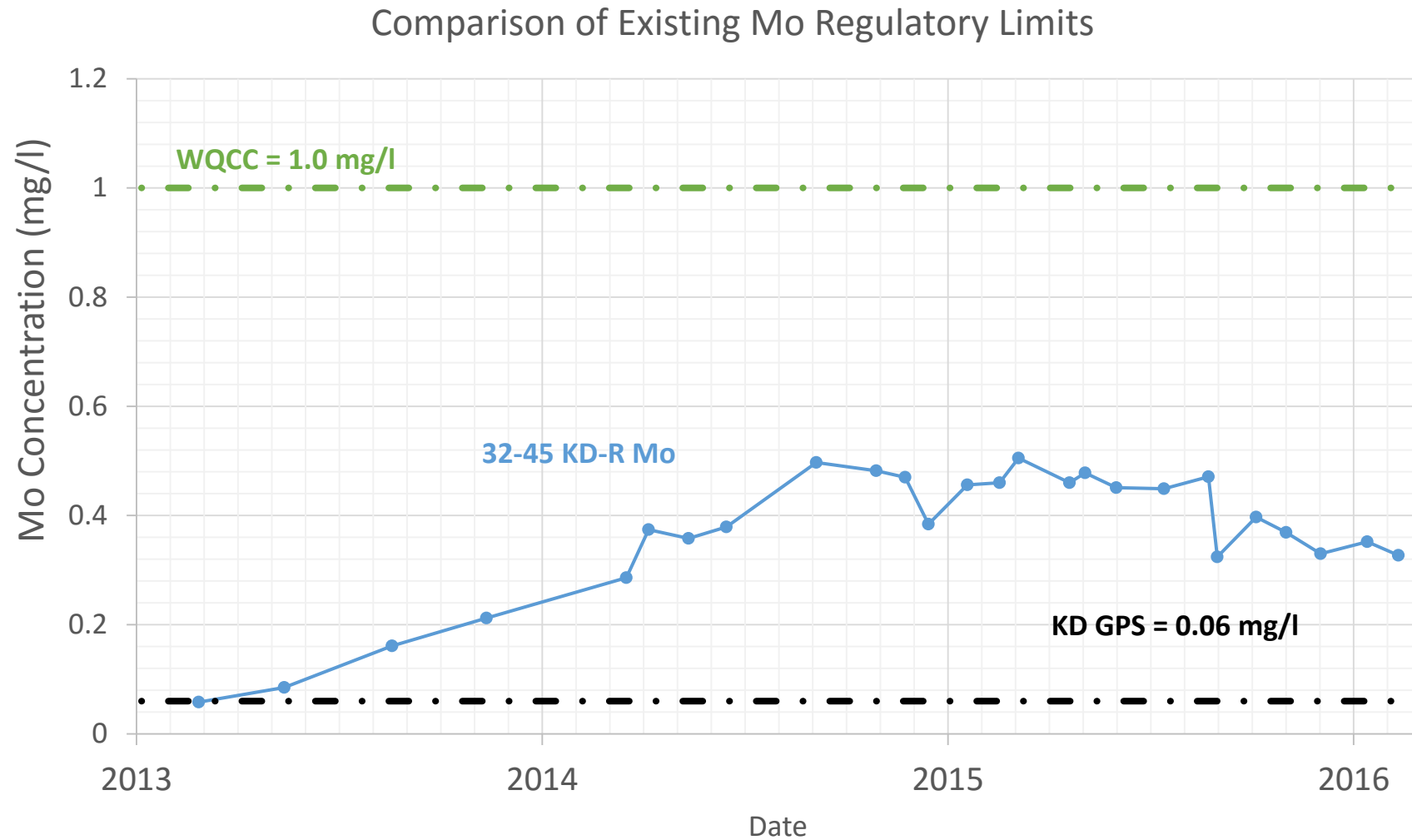
# Mo Concentrations in 32-45 KD and 32-45 KD-R



# Molybdenum in 32-45 KD-R



# Molybdenum in 32-45 KD-R



# Summary

Parameter	Proposed ACL	ACL Calculation Method	Current GPS
<b>Cadmium (mg/l)</b> <i>Dakota</i>	0.047	Bedrock ACL method using Cd-specific attenuation factor, as calculated from the average ferrihydrite concentration.	0.01
<b>Beryllium (mg/l)</b> <i>Dakota</i>	0.27	Bedrock ACL method using U attenuation factor.	0.01
<b>Gross Alpha (pCi/l)</b> <i>All Upper Bedrock Units</i>	578	Bedrock ACL method using U attenuation factor. Same approach as used/approved in Alluvial ACL.	56

# QUESTIONS?

## References

**Maxim, 2001. Alluvial ACL Document.**

**EPA, 1999. U.S. Environmental Protection Agency, Cancer Risk Coefficients for Environmental Exposure to Radionuclides, Federal Guidance Report No.13. EPA 402-R-99-001, Washington, DC, 1999.**

**NRC, 2006. Technical Evaluation Report. Subject: Amendment of source materials license SUA-1473 for alternate concentration limits, Rio Algom Mining LLC, Ambrosia Lake Site, McKinley County, New Mexico, Amendment 56 (TAC L51921)**



# TRONOX NAUM SETTLEMENT SITES

Ambrosia Lake Sub-District

NRC Meeting April 2016



# Tronox Settlement Agreement

## “Designated Navajo Area Mines”

- **\$5.2 Billion bankruptcy fraud settlement with Anadarko (Kerr-McGee)**
- **\$985 million of settlement to fund response at 49 closed uranium mines historically owned/operated by Kerr-McGee in and near the Navajo Nation**
- **22 of the 49 mines located in EPA Region 6**



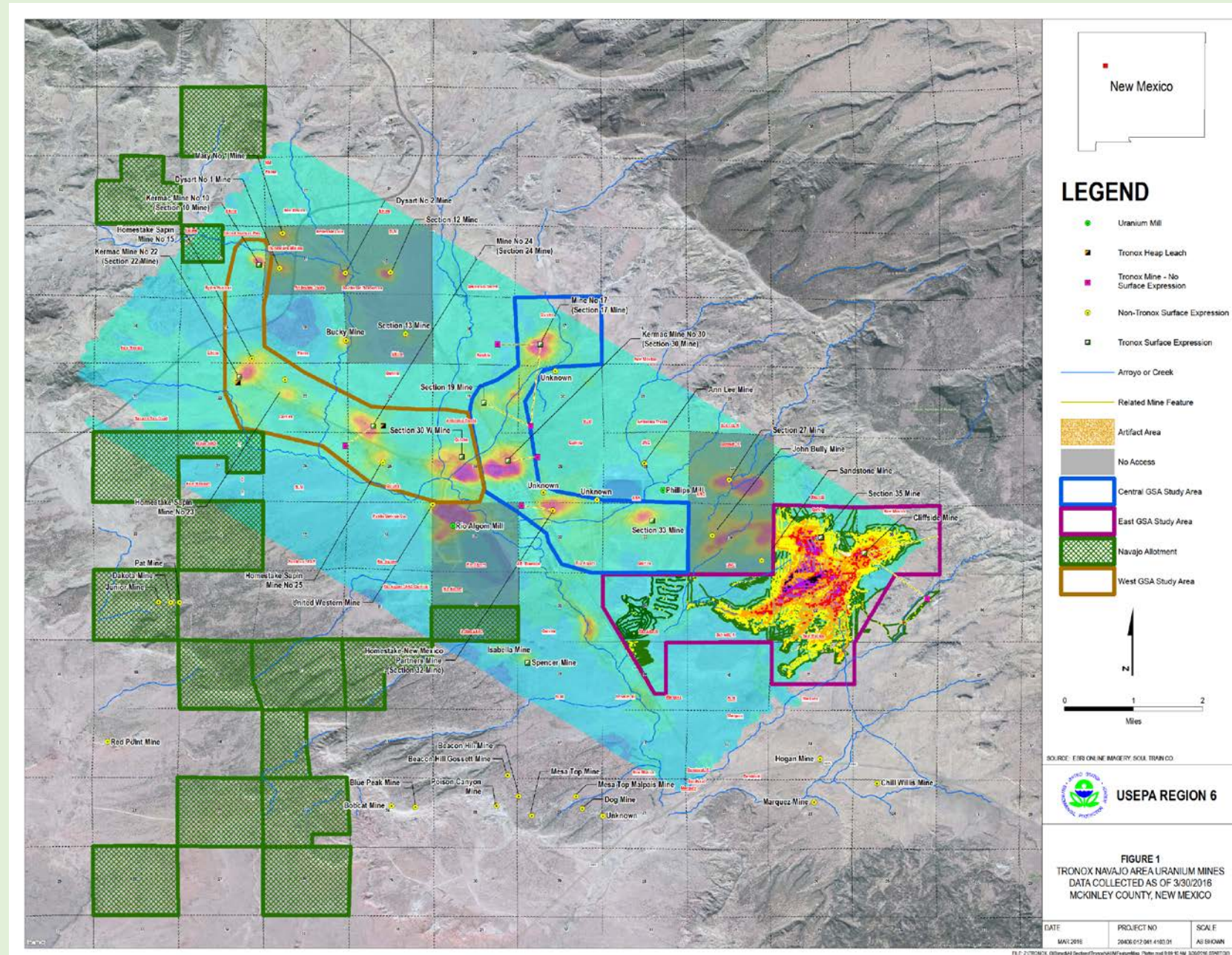
# Background

- 12 uranium mine surface expressions in the Ambrosia Lake Sub-District (ALSD) area of the Tronox settlement
  - 8 EPA 6 lead
  - 3 EPA 6 and 9 co-lead (Section 10, Section 22 and Section 32/33)
  - 1 BLM lead

## ALSD Removal Assessment Areas

- Section 32/33
- 3 Geographic Sub-Areas (GSA)

# EPA 6 TRONOX ALSD Geographic Sub-Areas



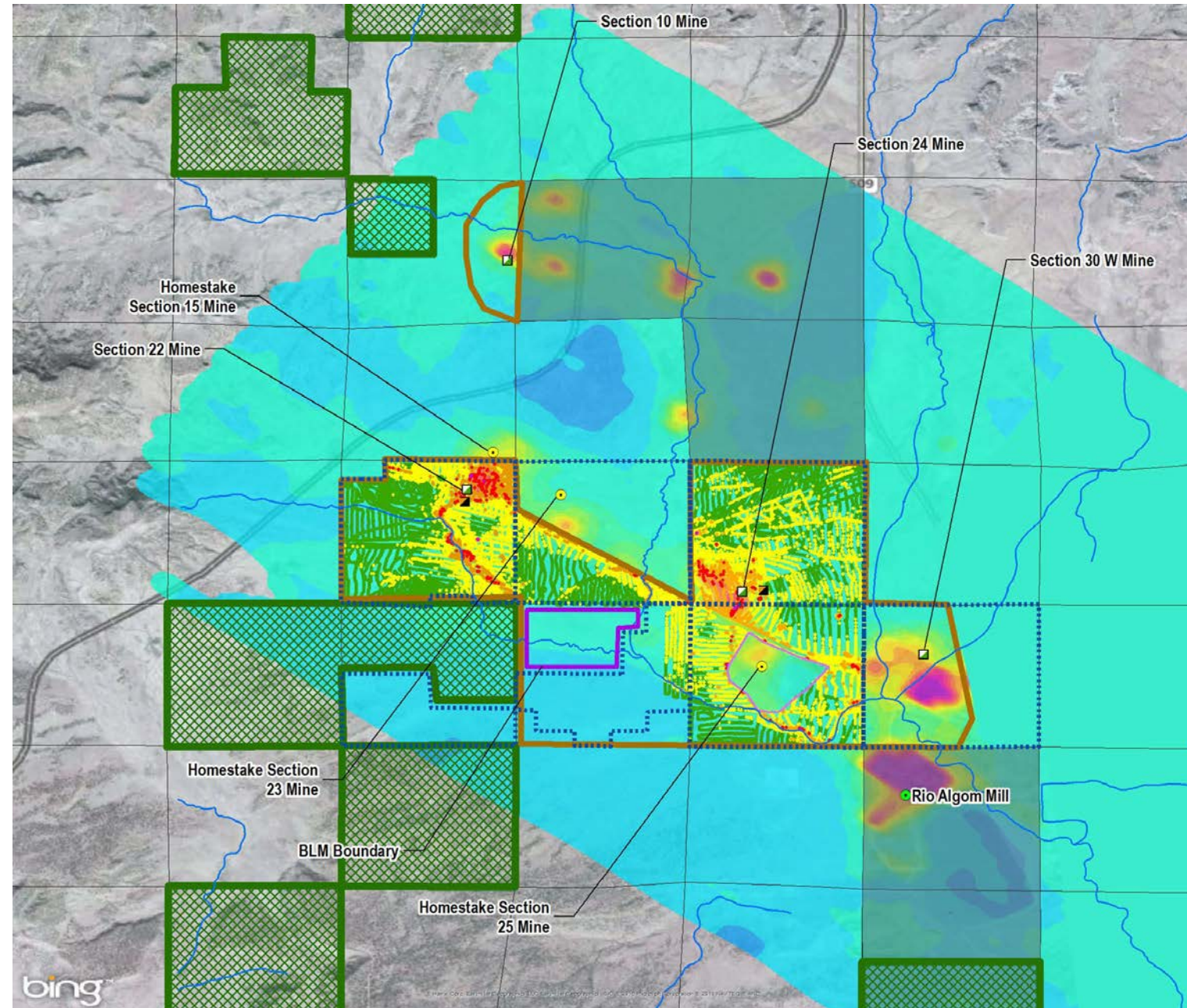
# Key Accomplishments

- ✓ Completed Extent of Contamination Survey in the East GSA
- ✓ Started Extent of Contamination Survey in the West GSA
- ✓ Started engineering evaluation and cost analysis (EE/CA) process for the East GSA in preparation for proposed CERCLA non-time critical removal action
- ✓ Monthly calls, quarterly meetings with Tronox Team



# WEST GSA STATUS

- ❖ Developed Statement of Work (SOW)
- ❖ Work plan for EE/CA process approved
  - ❖ Sampling and Analytical Plan (SAP)
    - ❖ Quality Assurance Project Plan (QAPP)
    - ❖ Quality Assurance Sampling Plan (QASP)
  - ❖ Site Health and Safety Plan (HASP)
- ❖ Establish GSA specific background, process initiated 02/29/2016
  - ❖ Rad survey of area
  - ❖ 1 minute static counts at 20 locations
  - ❖ 5 minute PIC readings at 20 locations
  - ❖ Collect samples for lab at 20 locations
- ❖ Initiated extent of contamination survey on 03/14/2016





# WEST GSA 2016 PLANNED ACTIVITIES

## EXTENT OF CONTAMINATION SURVEY

Establish GSA  
Background Level  
(completed)  
CY16/Q1

Initiate Extent of  
Contamination  
Assessment  
CY16/Q1

Continue rad  
assessment,  
Initiate Eco Risk  
Assessment, 106  
Survey and  
Geotech as  
Necessary  
CY16/Q2

Finalize Extent of  
Contamination  
and Interim Status  
Report  
CY16/Q3

## EE/CA PROCESS

EE/CA  
Approval  
Memo  
Signed  
CY16/Q3

Prepare  
EE/CA  
CY16/Q3

Complete  
EE/CA  
CY16/Q4

EE/CA  
Review/  
Comment  
Period  
(Tronox  
Team)  
CY16/Q4

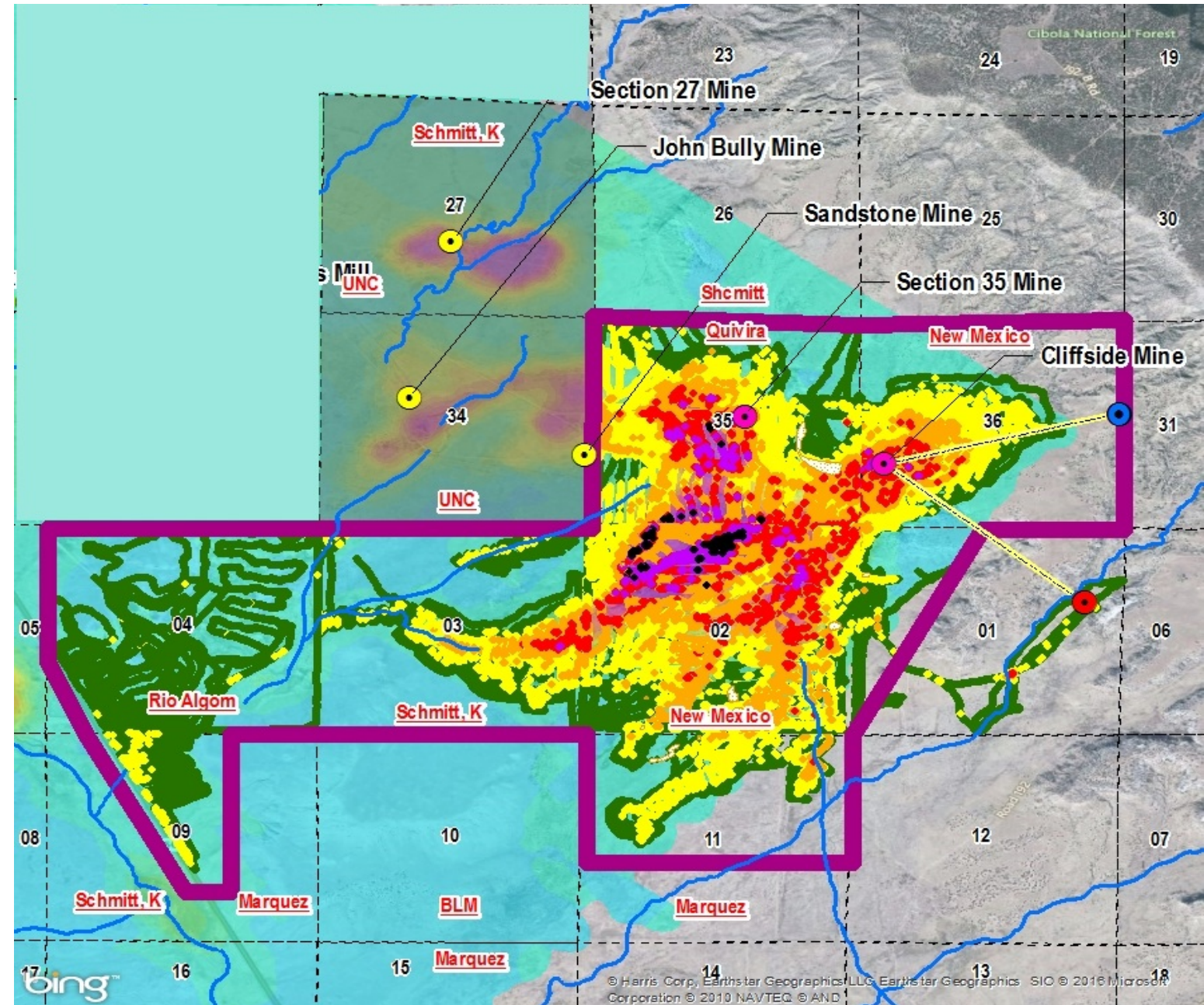
Finalize CIP  
CY16/Q4

EE/CA  
Public  
Comment  
Period &  
Response  
to  
Comments  
CY17/Q1

# EAST GSA STATUS

Extent of contamination assessment started July 2015, completion 03/16

- ❖ Established Site Specific background
- ❖ Surface/near surface gamma survey (@ 1500 acres exceed removal threshold level of 4.9 pCi/g 226-radium + bkgd)
- ❖ Confirmatory sampling with on-site MCA and off-site laboratory
- ❖ Geotechnical Survey for mine debris burial pits/trenches
- ❖ Geological data collection needed to evaluate viability of on-site repository during the upcoming EE/CA process
- ❖ Archaeological survey for Section 106 compliance
- ❖ Ecological baseline risk survey



# EAST GSA PLANNED 2016 ACTIVITIES

EE/CA Approval  
Memo Signed  
(completed)  
CY16/Q2

Prepare EE/CA  
CY16/Q2

EE/CA Review/  
Comment Period  
(Tronox Team)  
CY16/Q3

Finalize CIP  
CY16/Q3

EE/CA Public  
Comment Period  
& Response to  
Comments  
CY16/Q4

Draft Non-Time  
Critical Action  
Memorandum  
CY16/Q4

# CERCLA Non-Time Critical (NTC) Removal Process

## *NTC Removal Action Process Key Components:*

- ❑ Determine nature and extent of contamination present on Site;
- ❑ Evaluate alternatives in a Site specific EE/CA
- ❑ Stakeholder participation in the process (other federal agencies, State, PRP)
- ❑ Public participation in the process
  - Public comment on the EE/CA
  - Site Specific community involvement plan (CIP)

# EE/CA PROCESS GOALS

- ❑ Identify the NTC removal objective(s) for the Site.
  - ❖ Excess radiological risk reduction
- ❑ Analyze the *effectiveness, implementability, and cost* of the various alternatives that may meet the removal objectives. NOTE: *No initial screening of ALL alternatives is required, only review of a few viable alternatives relevant to the EE/CA objective(s).*
- ❑ **Identify** Federal and State ARARs, TBCs, etc. and **consider** compliance to the extent practicable in evaluating the NTC removal alternatives.
- ❑ Stake holder and Community involvement in the process.



# NTC ALTERNATIVES UNDER CONSIDERATION

- ❖ No Action
- ❖ Off-Site Disposal
- ❖ Phytoremediation (hemp, etc.)
- ❖ Slurry back into existing mine shafts
- ❖ On-Site Repository
  - One repository per mine Site
  - One central repository for mine waste associated with RAML owned mines
- ❖ Other



# ON-SITE REPOSITORY OPTION CRITERIA

- ❖ Acceptable Geology
- ❖ Acceptable Ownership and Ability to Restrict Future Use
- ❖ Acceptable Location with Respect to Residential Areas
- ❖ Acceptable Previous Land Use
- ❖ Acceptable Access and Security Buffer Area
- ❖ Viable Entity for Management in Perpetuity
- ❖ No Known or Anticipated Major Community Concerns
- ❖ Options to Ensure Management in Perpetuity

# VIABILITY OF SECTION 4 AS ON-SITE REPOSITORY

- ❑ Section 4 meets all of the EPA Region 6 technical criteria and the programmatic criteria of NMED and NM MMD.
- ❑ Initial discussions with RAML have been positive and no major issues regarding viability of option at this time.
- ❑ Viability of this option pends discussion with NRC regarding license
  - Status of NRC license actions for Section 4
  - Pending future NRC actions for Section 4
  - Time line for any NRC future actions for Section 4
  - Legal and technical discussion between EPA 6 and NRC regarding future actions and viability of Section 4 as a on-site repository option

# QUESTIONS?



MEMORANDUM TO: Docket File 040-08905

THROUGH: Jack E. Whitten, Chief  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety

FROM: Robert J. Evans, PhD, CHP, PE, Senior Health Physicist  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety

SUBJECT: AMBROSIA LAKE SITE VISIT, MCKINLEY COUNTY, NEW MEXICO

On April 19-21, 2016, U.S. Nuclear Regulatory Commission (NRC) staff conducted a visit to Rio Algom Mining LLC's Ambrosia Lake site in McKinley County, New Mexico. The purpose of the site visit was to observe the status of site construction activities, discuss previous construction and radiological survey activities, and collect available construction records and radiological surveys. During the visit, the NRC staff participated in a public meeting with the licensee regarding three future license submittals. The NRC staff also observed a second public meeting hosted by the U.S. Environmental Protection Agency (EPA) regarding its future plans for the Section 4 property.

Enclosed with this memorandum is the NRC's trip report for this site visit. No significant regulatory issues or safety concerns were identified during the site visit and public meetings. The licensee indicated that it plans to gather the information necessary to support future inspections of construction-related work and radiological surveys. The licensee also plans to submit three license amendment requests to the NRC at a future date, after further discussion with NRC staff. Finally, the NRC plans to hold an agency-to-agency meeting with EPA in the near future regarding the Section 4 area.

CONTACT: Robert J. Evans, FCDB/DNMS  
817-200-1234

License: SUA-1473  
Docket: 040-08905

cc:  
T. Ballaine, Rio Algom Mining LLC  
S. Rodriguez, New Mexico Environment Department  
M. Hunter, New Mexico Environment Department  
K. Shade, EPA

**DISTRIBUTION:**

See next page

ADAMS ACCESSION NUMBER: ML **ML16141B267**

<input checked="" type="checkbox"/> SUNSI Review By: <b>RJE</b>	ADAMS <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Publicly Available <input type="checkbox"/> Non-Publicly Available	<input checked="" type="checkbox"/> Non-Sensitive <input type="checkbox"/> Sensitive	Keyword:
OFFICE	RIV:DNMS:FCDB	NMSS:DUWP:MCD	NMSS:DUWP:PAB	C:FCDB
NAME	RJEvans	VKurian	ASchwartzman	JEWhitten
SIGNATURE	/RA/	N/A	Email	/RA/
DATE	5/16/16		5/16/16	5/20/16

OFFICIAL RECORD COPY

Memorandum to Docket File 040-08905 from Jack E. Whitten dated May 20, 2016

SUBJECT: AMBROSIA LAKE SITE VISIT, MCKINLEY COUNTY, NEW MEXICO

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