

# Report-back to Blue Gap-Tachee Chapter on soil and water testing by UNM-SRIC METALS Group, 2015



Livestock graze at base of Claim 28 Mine

November 6, 2015; revised December 2015

## Presenters:

José M. Cerrato, PhD, UNM Civil Engineering

Chris Shuey, MPH, Uranium Impact Assessment Program, SRIC

Triva Shirley, Community Member, SRIC field research associate

Paul Robinson, Research Director, SRIC

Seraphina Nez, Community Member

Peter Burns, PhD, University of Notre Dame

# UNM M.E.T.A.L.S. Group

- **METALS** = Metal Exposure Toxicity Assessment on Tribal Lands in the Southwest
- **Purpose:** To work with Native American communities to better understand how metal mixtures at abandoned uranium mine waste sites alter the movement of metals in the environment and also impact health, specifically immune function, DNA damage and repair, and cardiovascular disease in tribal populations.
- **Partners:**
  - University of New Mexico College of Pharmacy (Johnnye Lewis, PhD, and Matthew Campen, PhD, co-directors)
  - UNM Depts. Chemistry, Civil Engineering, Earth & Planetary Sciences
  - Southwest and Information Center
  - Indigenous Education Institute
  - Pueblo of Laguna
  - Red Water Pond Road Community Association
  - Tachee Uranium Concerns Committee/Blue Gap-Tachee Chapter
- **Collaborators:**
  - Navajo Nation Environmental Protection Agency
  - Stanford University
  - Tó Łani Enterprises Uranium Water Quality Environmental Justice Project
  - University of Notre Dame, Center for Sustainable Energy

# Soil, mine waste, water and air sampling, March-September 2015



Community member Christopher Nez helped collect uranium ore samples at the Claim 28 Mine site in 2014



- Purpose: To supplement, fill in gaps in soil and water sampling conducted in January and June 2014
- Further characterize metal content of solid materials on Claim 28 Mine and of soils in drainages around Claim 28 site
- Test water sources for metals and radioactive substances, in collaboration with the Tó Łani Enterprises (TLE) water quality EJ project
- Sampling plan approved by NNEPA, March 2015
- Explore sites for air-particulate monitoring



# METALS Group collaborations apply state-of-the-art analyses of Tachee soils, water



- UNM Earth & Planetary Sciences Dept. Analytical Capabilities:
  - ICP-MS
  - X-ray fluorescence
  - Scanning electron microscope
- TLE Environmental Justice Grant (Tommy Rock) from EPA paid for radionuclide analyses of water samples at ALS Environmental lab in Ft. Collins, CO
- Dust particles collected in August-October to be analyzed for size, mineral content, metals at E&PS lab

# 2015 Soil, waste sampling results



UNM geochemist Johanna Blake collected soil samples next to a stock pond near Claim 28 Mine and in Aspen Creek drainage downstream of Waterfall Spring

- Soil samples collected at 12 sites in March 2015
  - 4 locations on Claim 28
  - 5 locations in drainages downstream of Claim 28 Mine
  - 3 locations in Aspen Creek drainage, downstream of Waterfall Spring
- XRF results confirmed high levels of uranium in 2 samples on Claim 28 and in one drainage west of mine site
- *Confirmed results of 2014 sampling (see next slide)*
- Uranium likely present in soils below the detection limit of the instrument in many samples; further analyses are needed
- Other metals found above detection limits included aluminum, lead, nickel, vanadium

## Results of 2014 tests

# Claim 28 wastes contain high levels of metals, including uranium

	Elemental Content, $\mu\text{g g}^{-1}$ ( $\mu\text{g/g} = \text{parts per million, or ppm}$ )							
	(For comparison, the average U concentration in soils throughout the world is about 3 ppm)							
	Si	S	Al	Fe	Mg	U	V	Ca
Undisturbed Soil	241,950	1,339	52,129	26,739	3,068	BDL*	BDL*	16,441
Mine waste1	235,563	223	69,533	15,259	181	2,248	15,814	855
Mine waste2	243,703	1,834	59,730	3,511	405	6,614	4,328	3,293



- METALS team published 2014 results in July 2015 edition of *Environmental Science & Technology*, a prestigious scientific journal
- Among the conclusions: “Elevated concentrations of metals are of concern due to human exposure pathways and exposure of livestock currently ingesting water in the area”
- U in waste rocks at site equal to levels in uranium ore



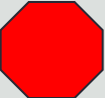


**We count at least 17 homes within 1 mile of the Claim 28 AUM, including the homes shown in distance. Metals in mine wastes (foreground) shown in table below.**





# Communicating water testing results: the “Stop Light Method”



Symbol	Definition
	<b>STOP! Don't Use!</b> <ul style="list-style-type: none"><li>Contaminant levels in water exceed federal and Navajo Nation safe drinking water standards, called “Maximum Contaminant Levels” (or, MCLs).</li></ul>
	<b>USE CAUTION!</b> <ul style="list-style-type: none"><li>Contaminant levels in water do <u>not</u> exceed any MCL, but some contaminants may be greater than one-half of the MCL level;</li><li>Water contaminants exceed one or more secondary drinking water standards (SDWS) that cause foul tastes or odors</li><li>Water source is <u>unregulated</u>; Navajo Nation policy is no human use of “livestock-only” water sources</li></ul>
	<b>OK TO USE!</b> <ul style="list-style-type: none"><li>In <i>regulated</i> water systems, water is regularly tested and treated to meet all MCLs</li><li>Water satisfies most SDWS, is not too salty</li><li>Water is good for livestock</li></ul>



# Summary of Water Quality Data in Blue Gap-Tachee Water Sources, and Use Recommendations

Well or water source	Contaminants >MCLs	Contaminants >SDWS	Test period	2015 Status (Uses)	Use Recommendations		
					Human	Domestic	Livestock
<b>NTUA System</b> (NN0403004)	None	None published	2011-2012	OP (PWS)			
<b>4K-388</b> (Chapter Windmill)	Arsenic: >1/2MCL	Aluminum, iron, TDS	2015	OP (UNR:LS)			
<b>4T-386</b> (Old School Windmill)	Radium: >1/2MCL	Aluminum, iron, manganese	1998	INOP (UNR: LS)	<i>Produces no water; will need testing if returned to operation</i>		
<b>Claim 28 Mine seep</b>	Gross alpha, total radium, uranium, fluoride, nitrate; lead: >1/2MCL	Aluminum, iron, manganese, pH, TDS	2014-2015	INOP (no uses)			
					<i>Do NOT go on to this site! High radiation levels, unsafe footing</i>		
<b>Waterfall Spring</b>	Gross alpha, total radium, uranium, fluoride, nitrate; lead: >1/2MCL	Aluminum, iron, sulfate, TDS	1998, 2013-2015	OP (UNR:LS)			
					<i>Avoid use for livestock if another, safer water source is available</i>		
<b>White Clay Spring</b>	Gross alpha, uranium, radium: >1/2MCL	Aluminum, iron, sulfate, TDS	1998, 2014-2015	OP (UNR:LS)			
<b>Private Stock Pond</b>	Lead, gross alpha, uranium: >1/2MCL	Aluminum, iron, sulfate	2014-2015	OP (UNR:LS)			
<b>Polacca Wash</b> near Chapter House	None	Not enough data	2015	OP (runoff)			
<b>Private Well</b>	Arsenic, lead: >1/2MCL	Aluminum, iron, pH, sulfate, TDS	2015	OP (UNR:LS)			

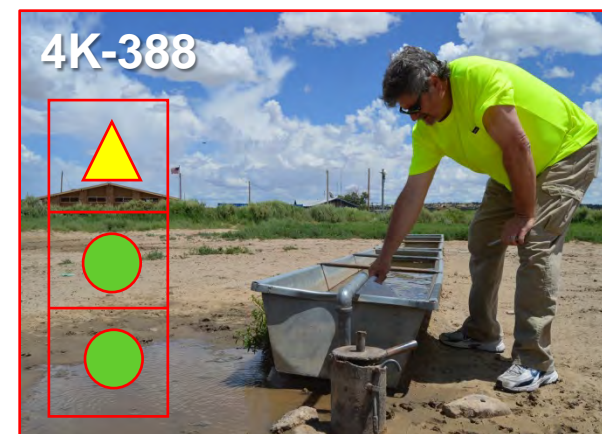
Key: INOP = inoperative; LS = livestock; MCL = Maximum Contaminant Level; OP = operating; PWS = public water supply (regulated); UNR = unregulated

# Symbols used for water-use recommendations

- We use water quality results to evaluate —
  - Human use (drinking and cooking)
  - Domestic use (bathing, cleaning, washing)
  - Livestock use (animal watering)
- Compare results with USEPA MCLs and SDWSs\*\*
- Unregulated wells never receive “green light” for human use
  - We don’t test for all contaminants, like bacteria, pesticides and petroleum products
  - *Navajo Nation policy is that livestock-use-only water sources are not to be used for human drinking water*
- **We NEVER close or shut down wells!**

H	Human Use
D	Domestic Use
L	Livestock Use

Example:

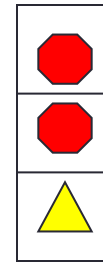
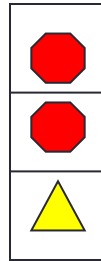


\*MCL = maximum contaminant level; \*\*SDWSs = secondary drinking water standards

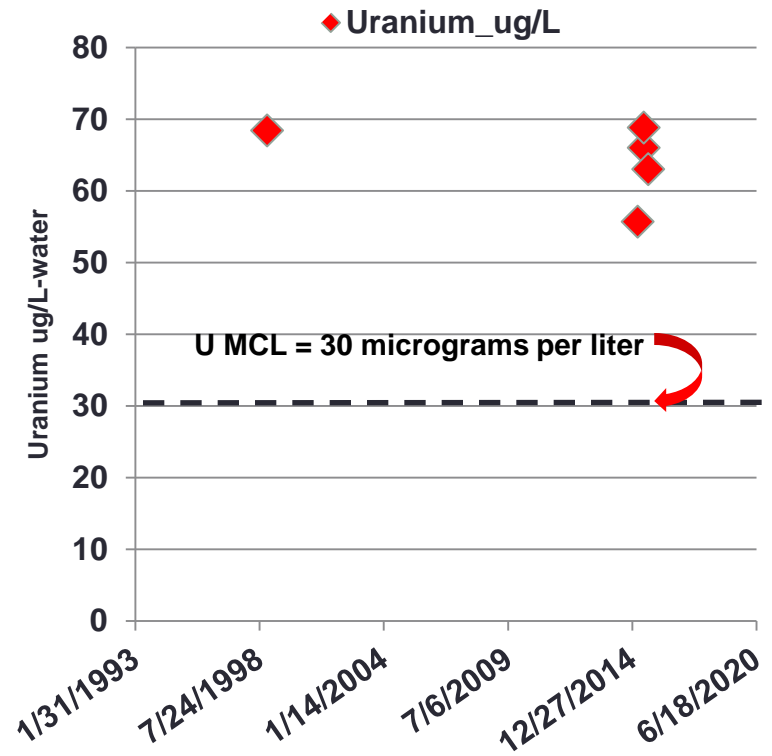
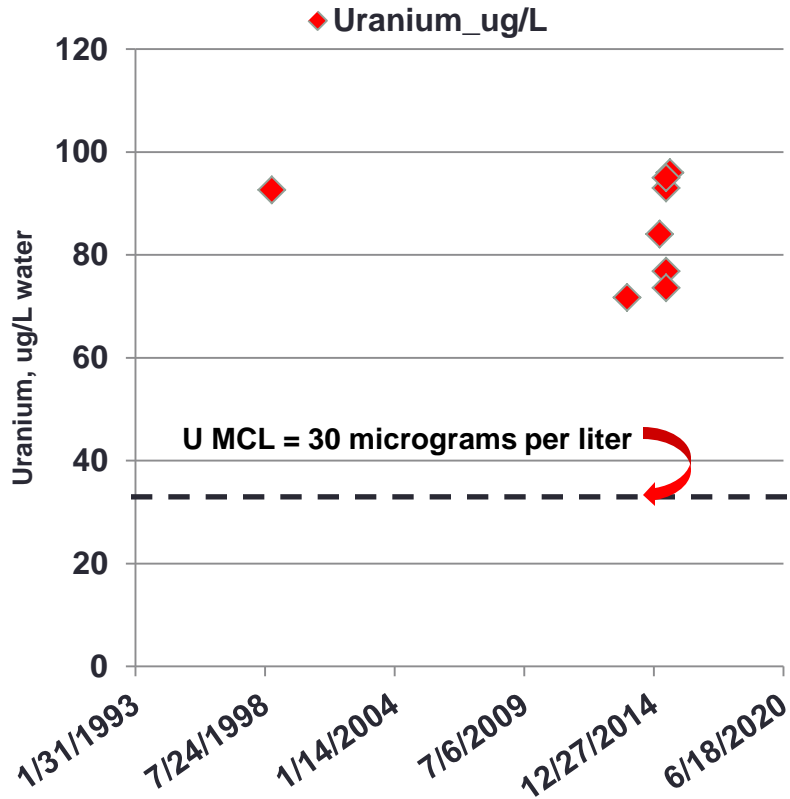
# Uranium in two springs, since 1998



**Waterfall Spring**

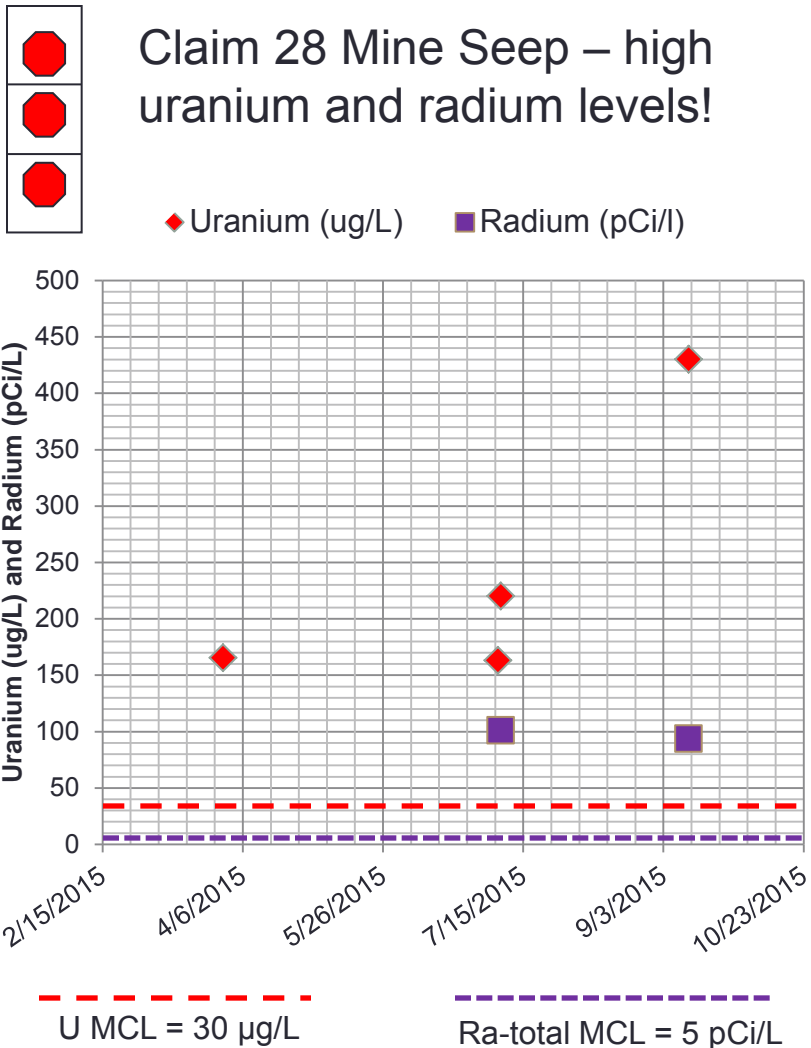


**White Clay Spring**





# Claim 28 Mine Site: high radiation levels, unsafe slope, bad water quality



# Monitoring airborne dust



Above: Home next to Claim 28 Mine. Below: Triva Shirley worked with UNM's Dr. Melissa Gonzales to collect airborne dust samples for inhalation toxicology tests at UNM.



- Hazardous metals and radioactive elements coat fine-grained dust particles at Claim 28 Mine site
- May present inhalation, cardiovascular health risks to people who live nearby
- Dusts collected on filters in two high-volume air samplers located south and southeast of Claim 28
- Community member Triva Shirley trained to operate and maintain samplers, collect exposed filters, and mail them to UNM
- Dusts will be used in animal experiments to assess cardiovascular risks





## Contact Information

- José Cerrato, 505-277-0870, [jcerrato@unm.edu](mailto:jcerrato@unm.edu)
- Paul Robinson and Chris Shuey, 505-262-1862; [srcipaul@earthlink.net](mailto:srcipaul@earthlink.net), [srcic.chris@earthlink.net](mailto:srcic.chris@earthlink.net)
- Johnnye Lewis, 505-991-3489 or (toll free) 877-545-6775, [jlewis@cybermesa.com](mailto:jlewis@cybermesa.com)
- Blue Gap-Tachee Chapter, 928-349-0507, [anitadraper2010@hotmail.com](mailto:anitadraper2010@hotmail.com) (chapter coordinator)
- Tó Łani Enterprises (Tommy Rock), 928-276-0156, [rockt92@gmail.com](mailto:rockt92@gmail.com)