U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT



Monitoring of Storm Water Related to Legacy Contamination Across LANL

Presentation to the
Northern New Mexico Citizens' Advisory Board
August 23, 2023

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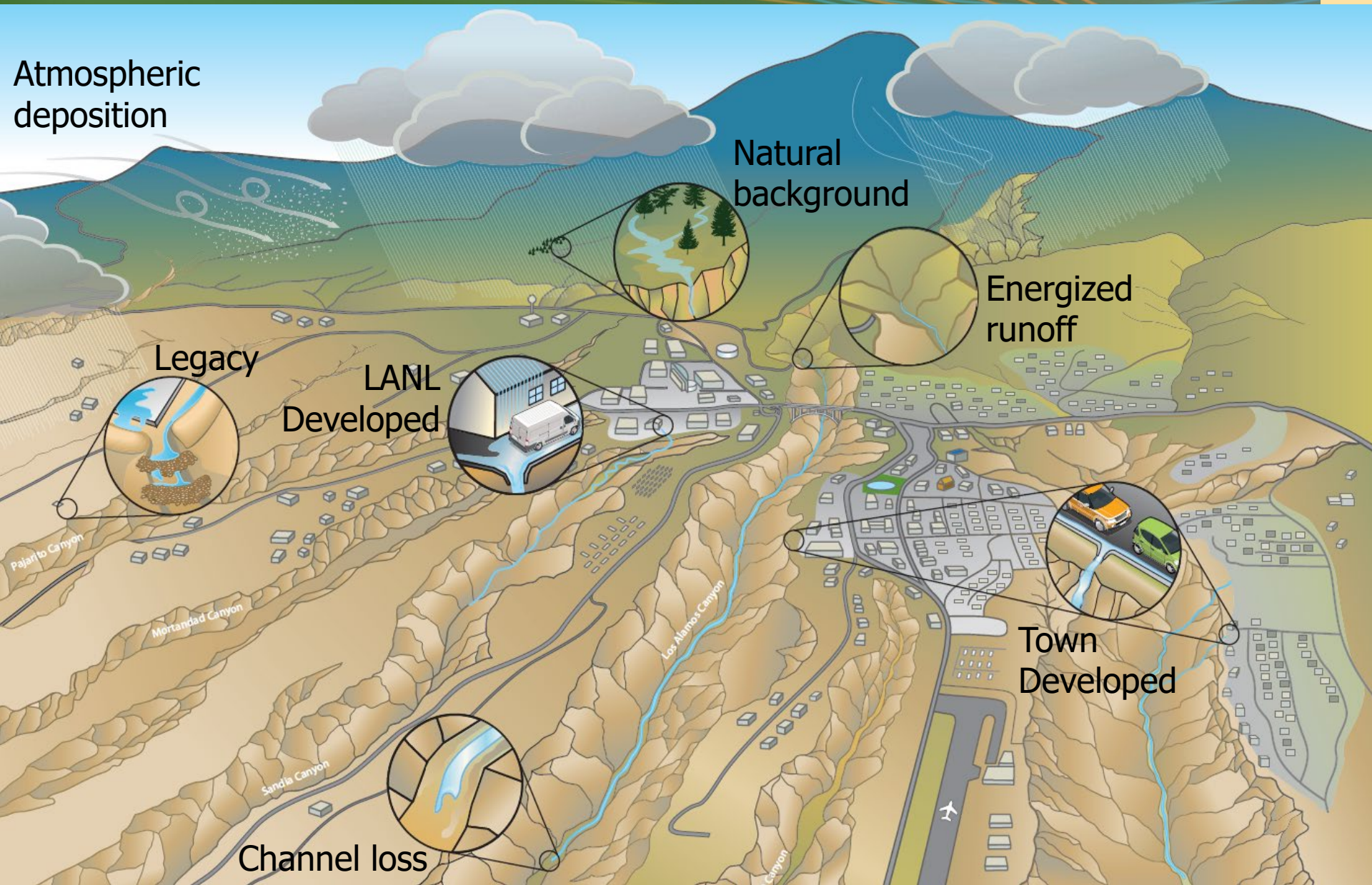
ENVIRONMENTAL MANAGEMENT
SAFETY ❖ EFFICIENCY ❖ TRANSPARENCY

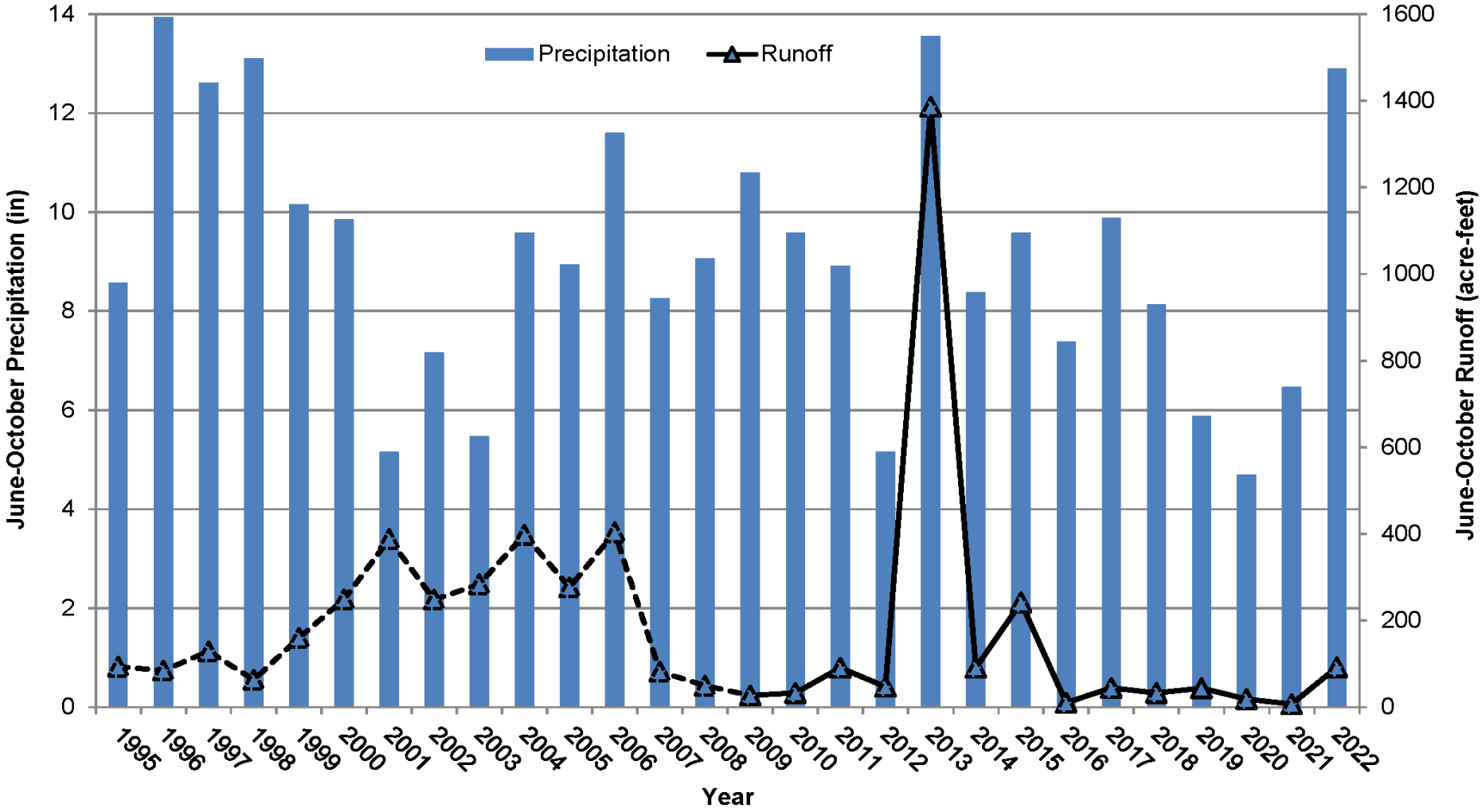
N3B Los Alamos

Multiple Sources and Complex Surface Water Pathways



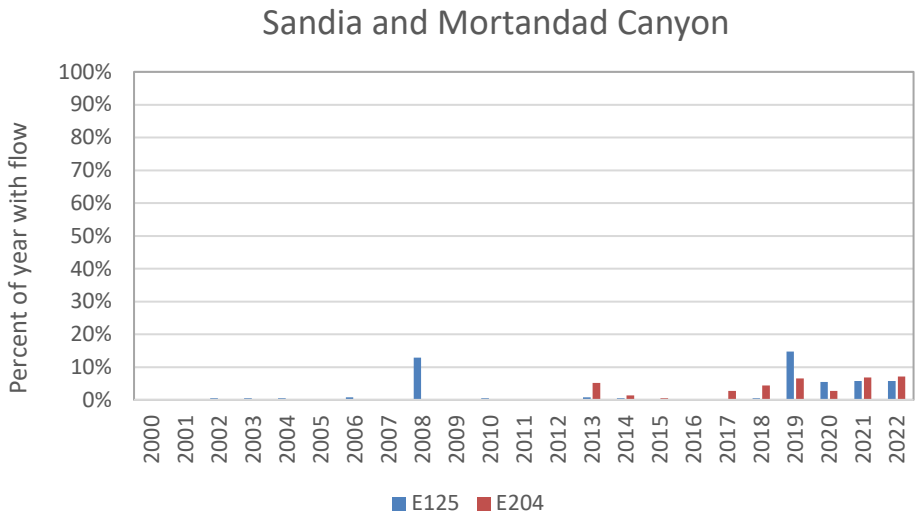

Los Alamos Townsite
N
Los Alamos
Santa Fe National Forest
Bandelier National Monument
Los Alamos National Laboratory
Kwage Overlook
Tsankawi Prehistoric Sites
Mortandad Canyon
Sandia Canyon
Los Alamos Canyon
White Rock
White Rock
White Rock Overlook
Rio Grande
Buckman Direct Diversion Intake
Google Earth

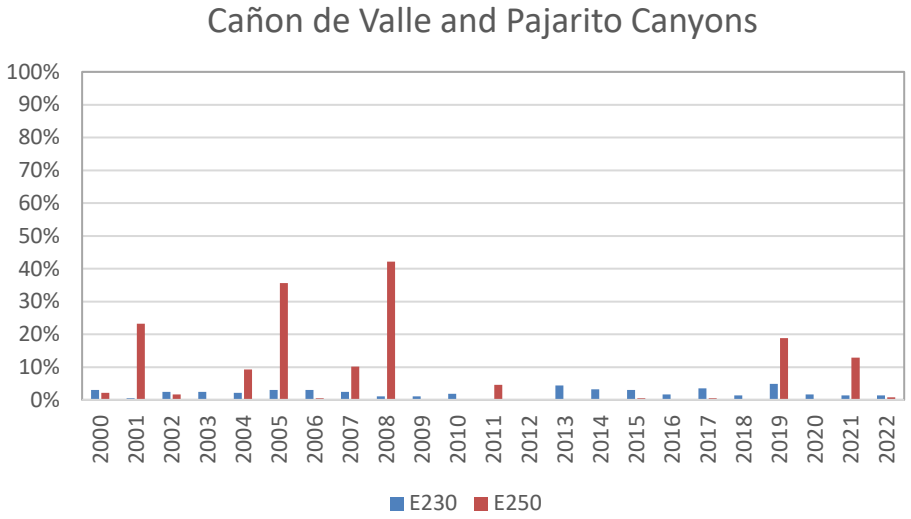
Precipitation and Storm Water Runoff

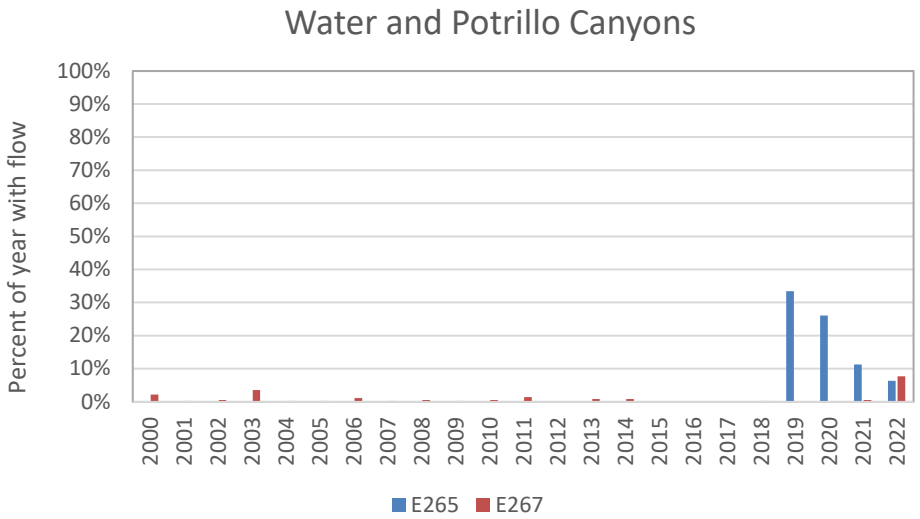


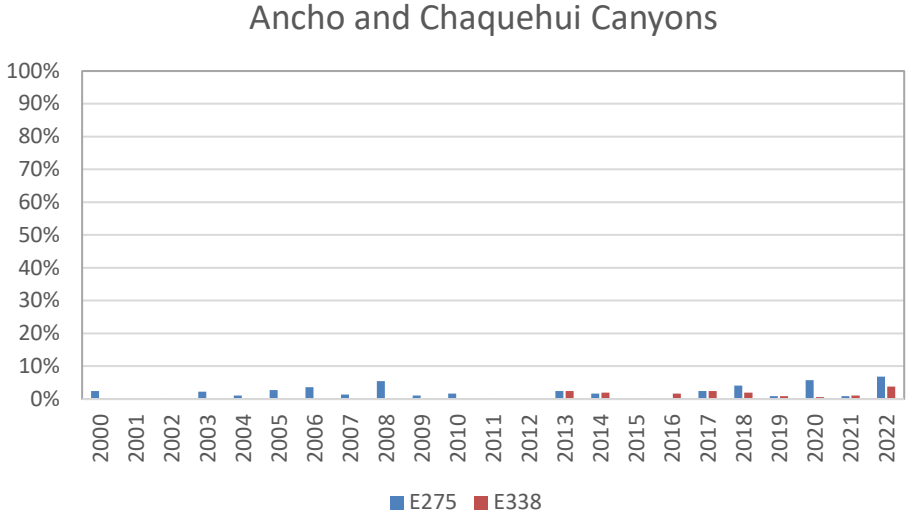
*Note: dashed line indicates raw runoff data

Storm Water Runoff at LANL Boundary Gaging Stations



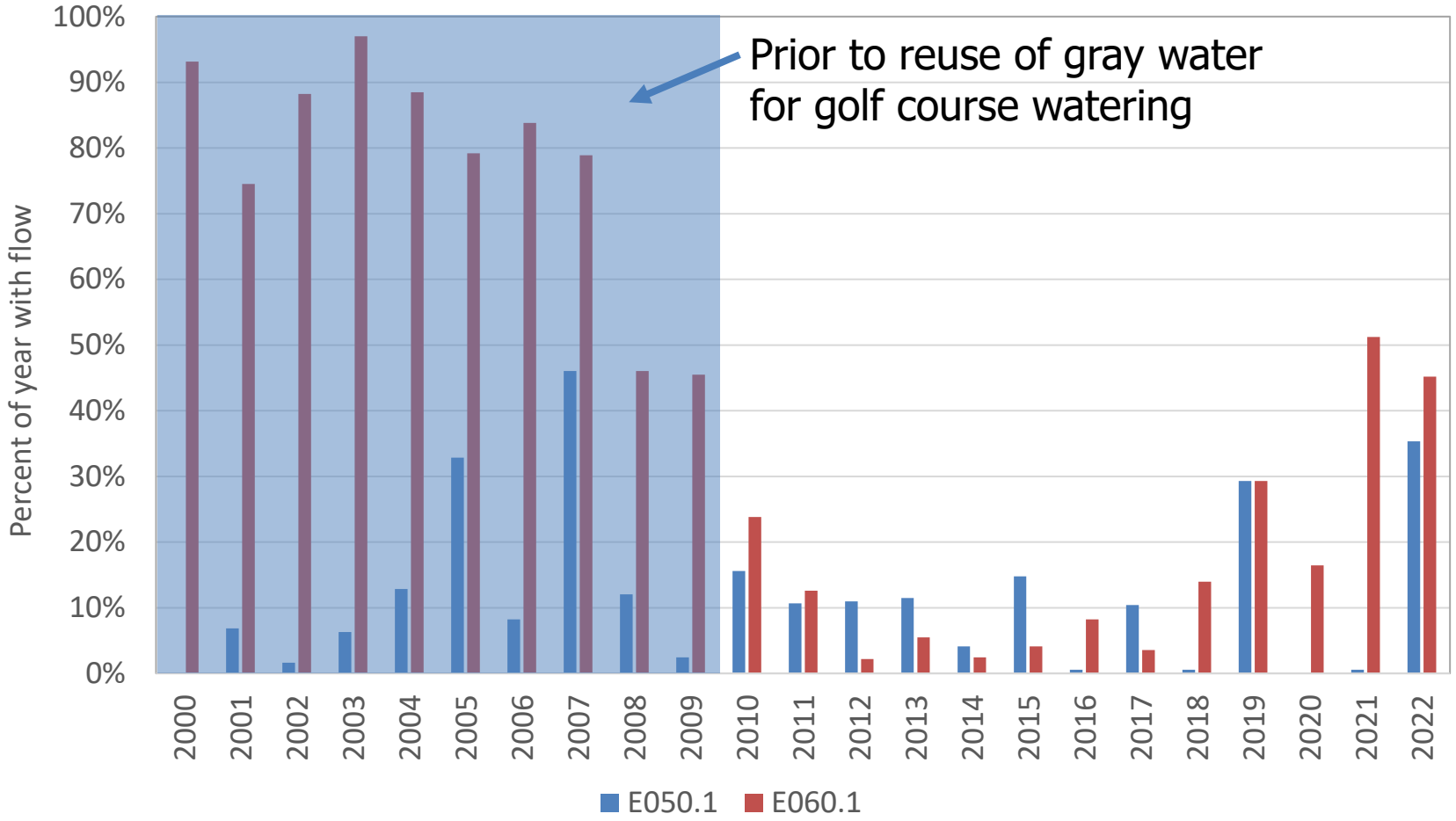






Summary: minimal flow off most of LANL

Storm Water Runoff at LANL Boundary Gaging Stations – Los Alamos & Pueblo Canyon



E050.1 = Los Alamos Canyon gaging station
E060.1 = Pueblo Canyon gaging station

Surface Water Monitoring Programs

- Individual Permit
  - EPA prime regulator
  - NMED-SWQB ensures compliance for NM

- Management of storm water runoff over SWMUs (Solid Waste Management Units) & AOCs (Areas of Concern)

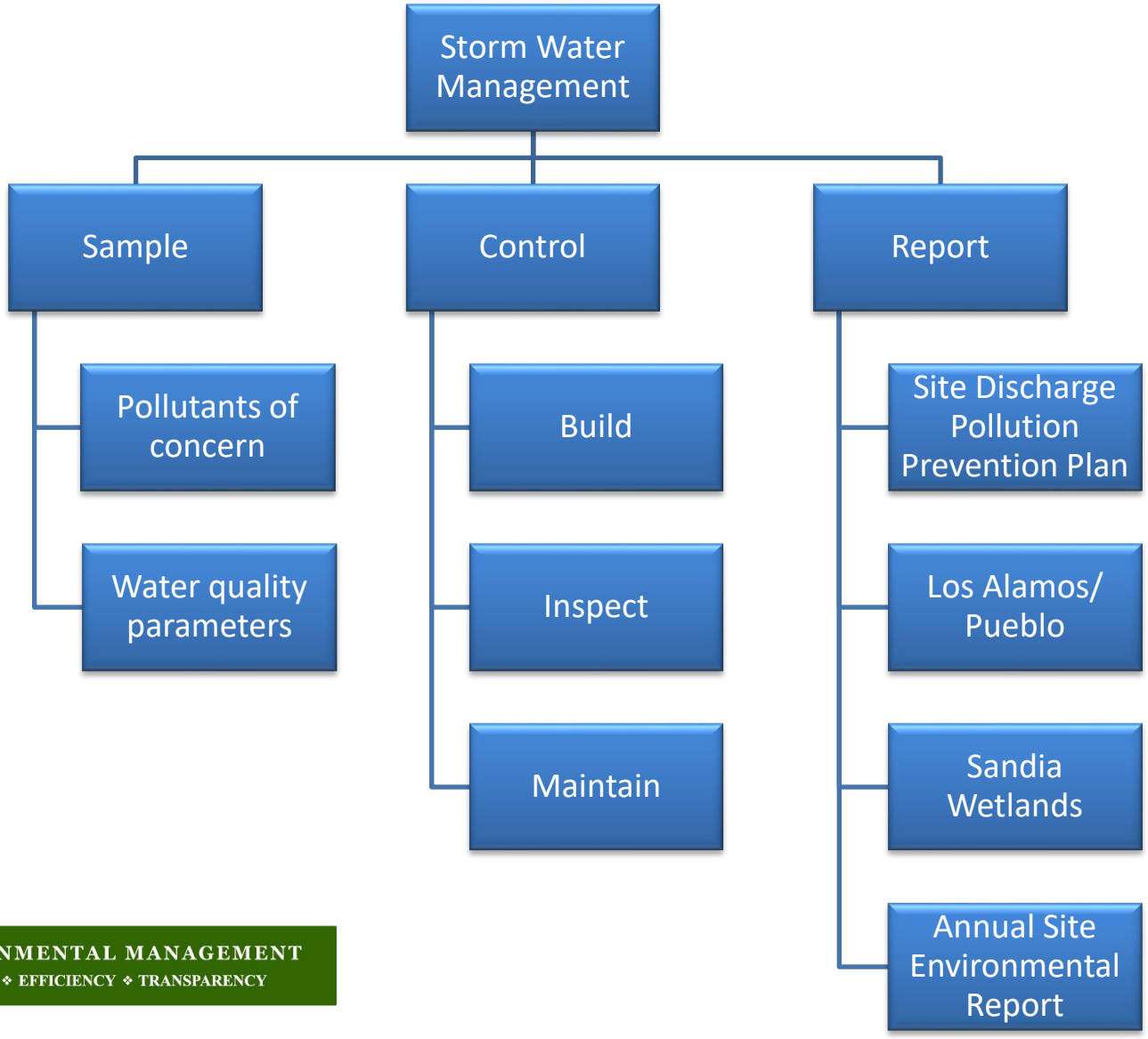
- Consent Order
  - NMED-HWB regulator
  - Los Alamos/Pueblo Canyon & Pueblo Wetlands
  - Sandia Wetlands
  - IFGMP (Interim Facility Groundwater Management Plan)

- Storm water management in stream channels
- Wetland vegetation & geomorphic monitoring
- Baseflow monitoring

- Environmental Surveillance
  - DOE program

- Storm & surface water management in stream channels
- Sediment monitoring

Storm Water Management



Legacy-related Pollutants of Concern

- **Copper**
  - Firing sites
  - Surface disposal areas
  - Septic systems
- **Lead**
  - Firing sites
  - Burning areas
  - Surface disposal/storage areas
- **Zinc**
  - Firing sites
  - Septic systems
- **Mercury**
  - Firing sites
  - Waste-water treatment plants
  - Coal-fired power plants
- **Silver**
  - Photo processing facilities
- **Radionuclides**
  - Firing sites/pits/areas
  - Operational and systematic releases
  - Septic systems
  - Waste-water treatment plants
- **Polycyclic Aromatic Hydrocarbons (PAHs)**
  - Surface disposal area
  - Tank farms
  - Incinerator/ash tank
  - Asphalt batch plant
- **Polychlorinated Biphenyls (PCBs)**
  - Transformers
  - Material disposal areas
  - Septic systems
- **High Explosives**
  - HE machining
  - Firing sites/pit/range
  - Burn pads/trays/sites
  - Septic systems

Summary of All 2022 Surface Water Results

Chemical or Radioactive Constituent	Irrigation and irrigation storage	Livestock Watering	Wildlife Habitat	Acute Aquatic Life	Chronic Aquatic Life	Human Health-Organism Only	
Total Aluminum	—‡	—	—	27 (93%)	12 (41%)	—	Geology
Dissolved Copper	0	0	—	13 (45%)	8 (28%)	—	
Total Iron	—	—	—	—	12 (41%)	—	Geology
Dissolved Lead	0	0	—	0	8 (28%)	—	
Total Mercury	—	0	4 (14%)	—	—	—	
Total Selenium	—	—	13 (45%)	5 (17%)	3 (10%)	—	Geology
Dissolved Silver	—	—	—	1 (3%)	—	—	
Dissolved Zinc	0	0	—	3 (10%)	3 (10%)	0	
Gross Alpha	—	20 (67%)	—	—	—	—	Geology
Total PCB	—	—	19 (79%)	2 (8%)	6 (25%)	23 (96%)	
Dioxin*	—	—	—	—	—	18 (67%)	
Benzo(a)anthracene	—	—	—	—	—	1 (13%)	PAHs
Benzo(a)pyrene	—	—	—	—	—	1 (13%)	
Benzo(b)fluoranthene	—	—	—	—	—	1 (13%)	
Benzo(k)fluoranthene	—	—	—	—	—	1 (13%)	
Dibenzo(a,h)anthracene	—	—	—	—	—	2 (25%)	
Indeno(1,2,3-cd)pyrene	—	—	—	—	—	2 (25%)	

‡A dash indicates there is no standard

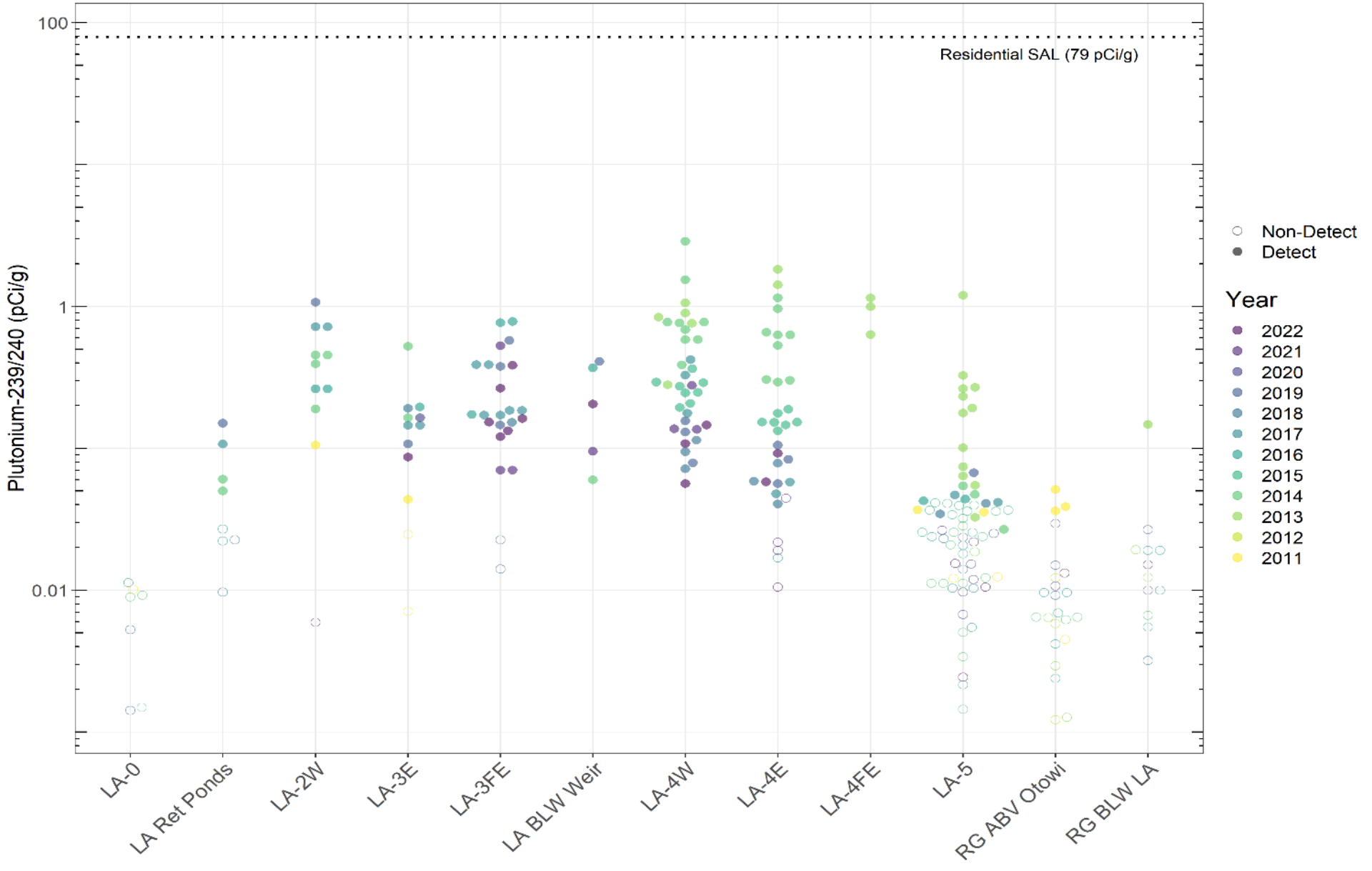
*Dioxin is based on toxicity equivalents (TEQs)

Note: The percentage in parentheses represents the percentage of locations that have an exceedance for that analyte

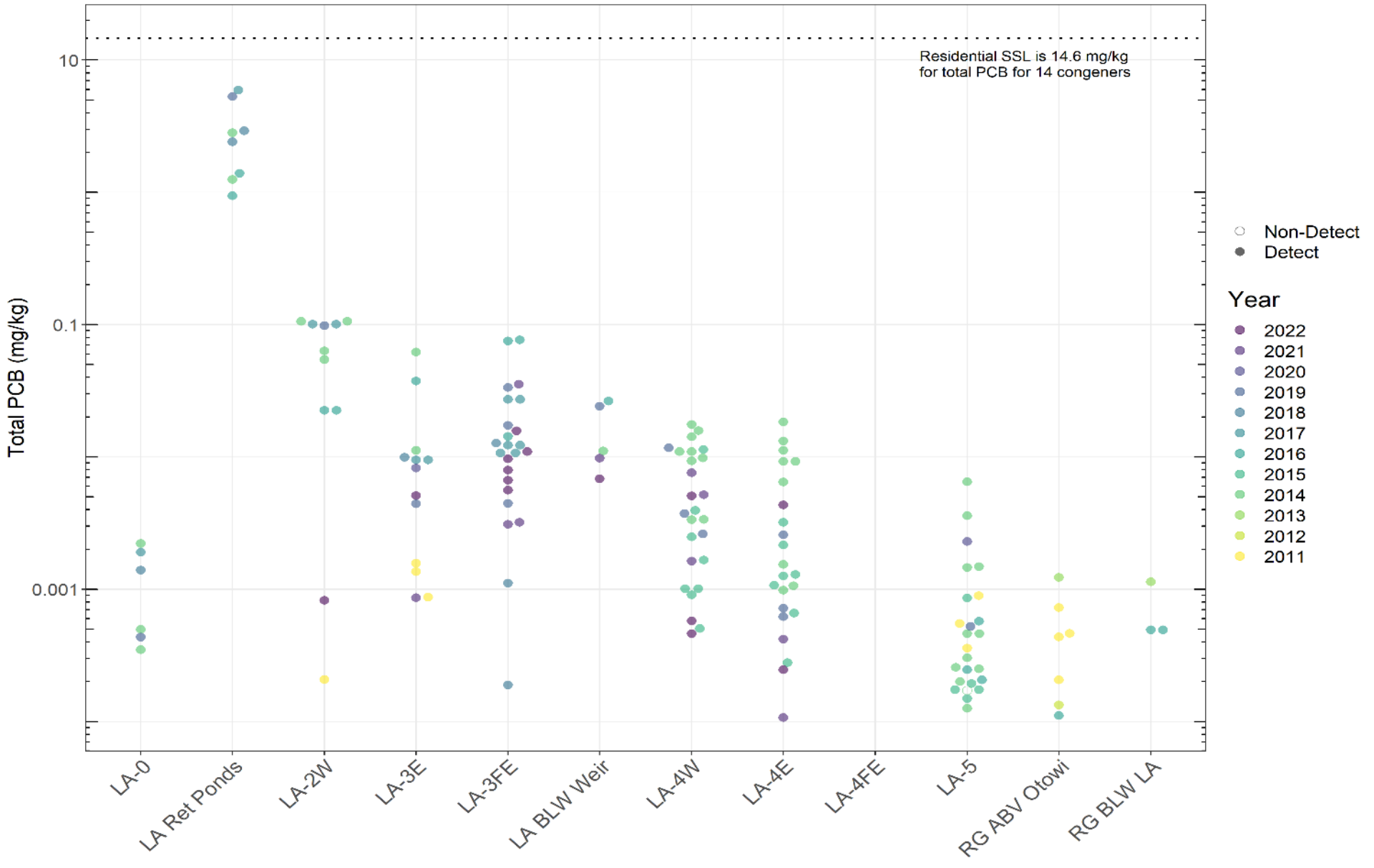
What is the Human Health–Organism Only Surface Water Quality Standard?

This is one of the surface water quality standards used by the State of New Mexico to identify whether a water body or stream reach has adequate water quality for its designated use(s). The intent of this standard is to protect the health of humans who eat fish or other aquatic wildlife (such as crayfish) that live in a lake, river, or stream.

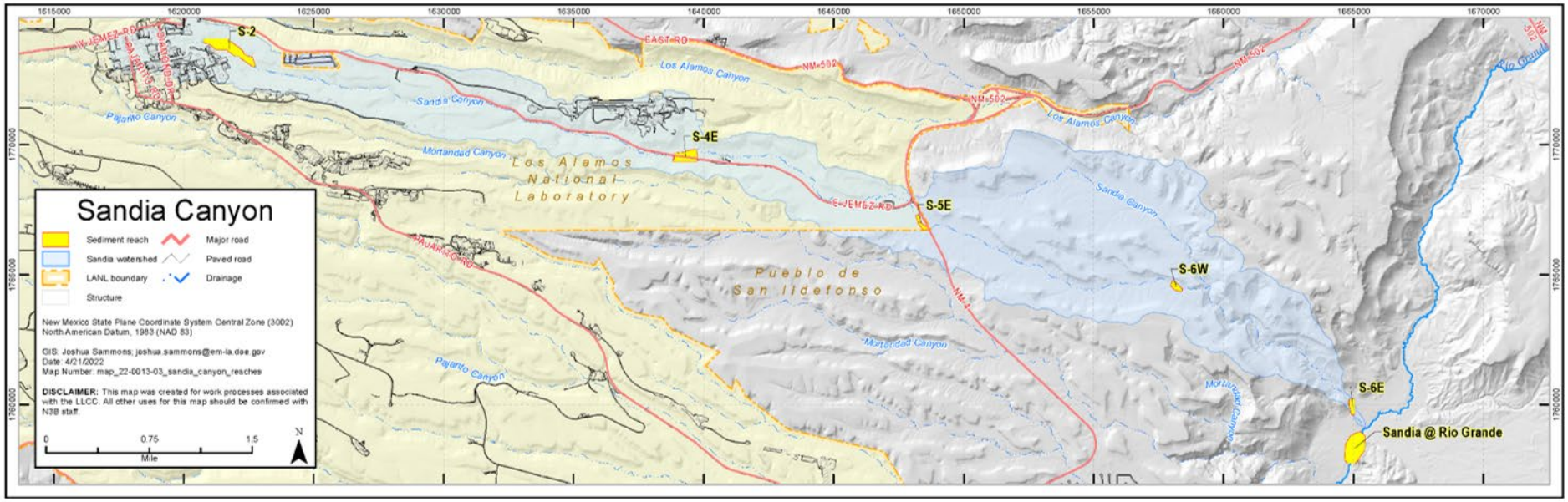
Plutonium-239/240 in Los Alamos Canyon *Sediment*

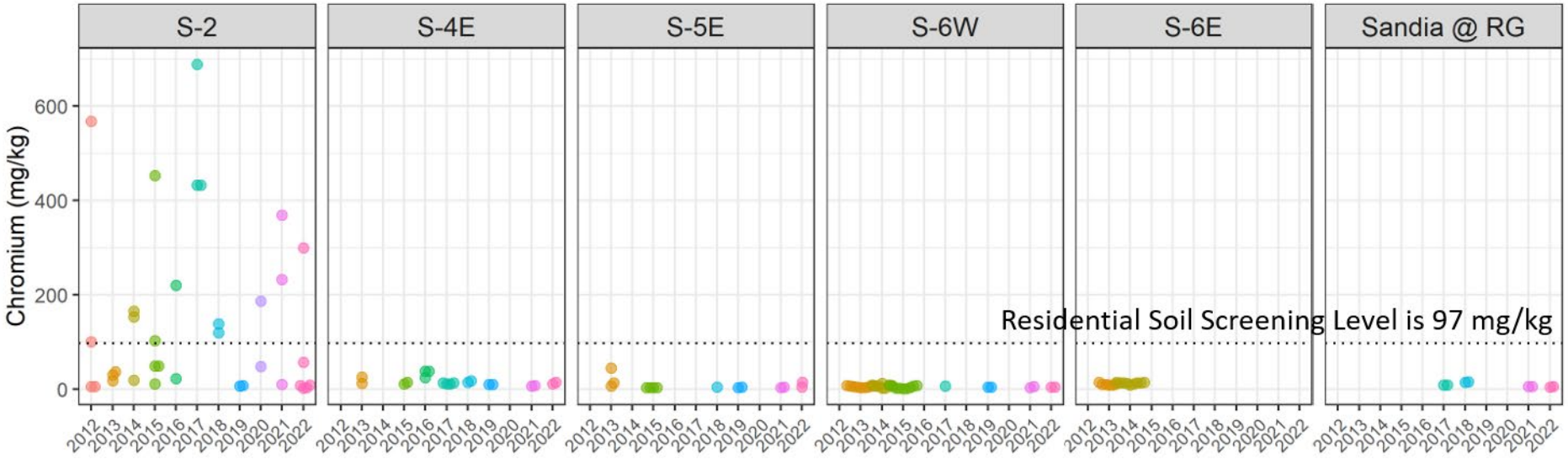


Total PCBs in Los Alamos Canyon Sediment

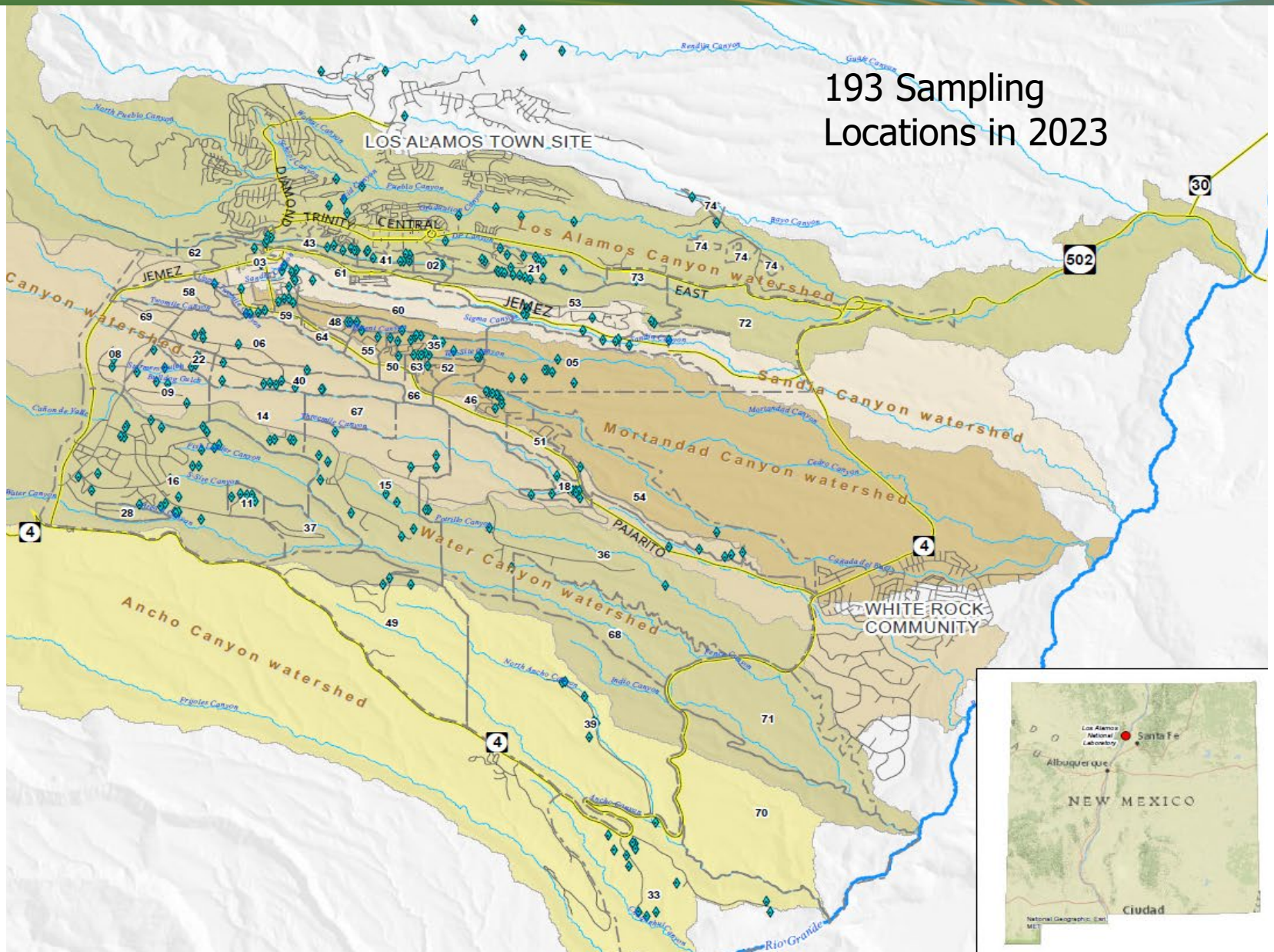


Total Chromium in Sandia Canyon Sediment

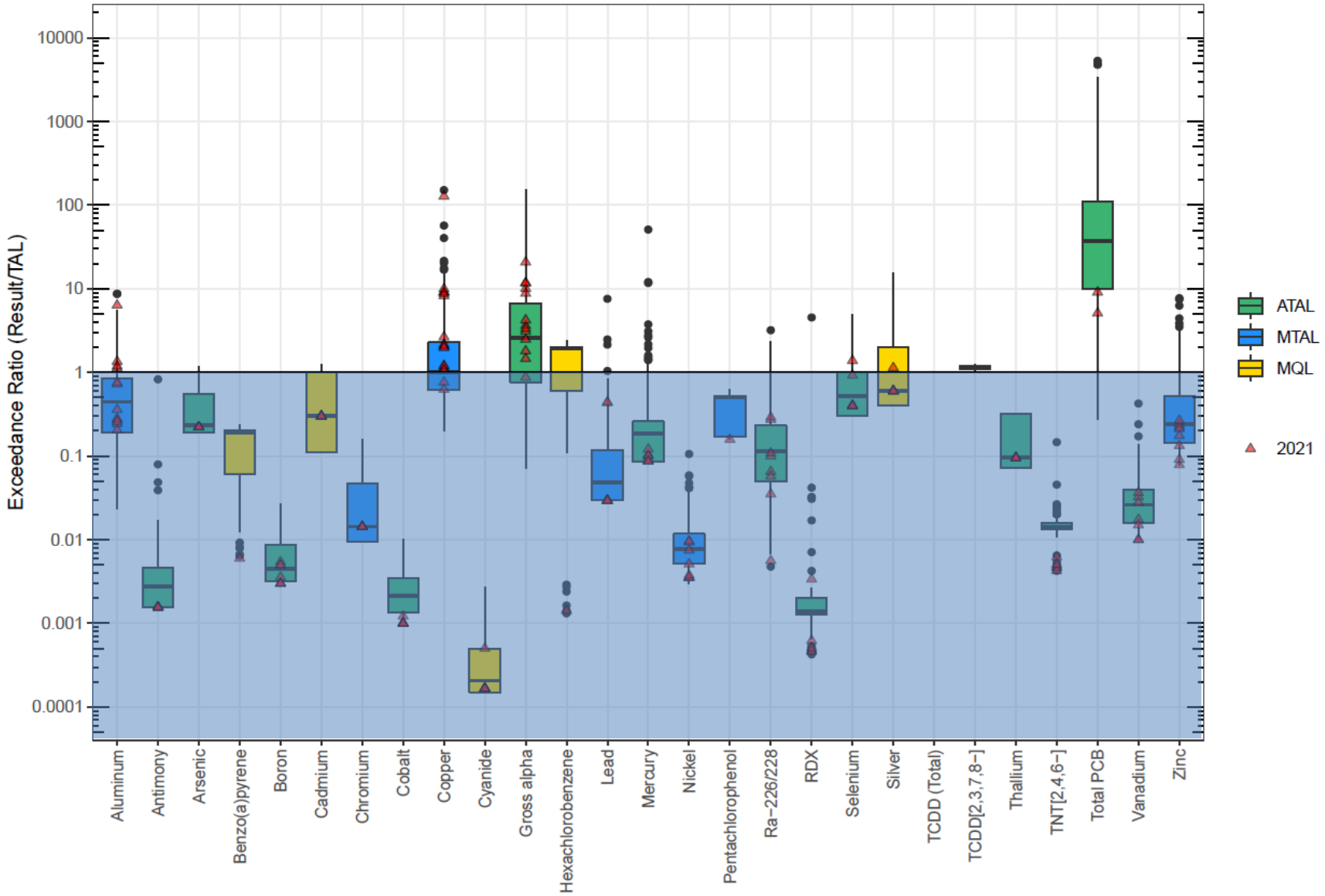




NPDES Individual Permit Sampling Across LANL



IP Sample Results since 2010



ATAL: Average Target Action Level MTAL: Max Target Action Level MQL: Min Quantification Level

What is a storm water control?

Contaminated soil

- PCBs
- Copper
- Lead
- Silver
- Organics

Intense rain causes soil erosion

- Contaminants tend to attach to soil particles

If you reduce erosion, you reduce contaminants moving downstream

How do you reduce soil erosion?

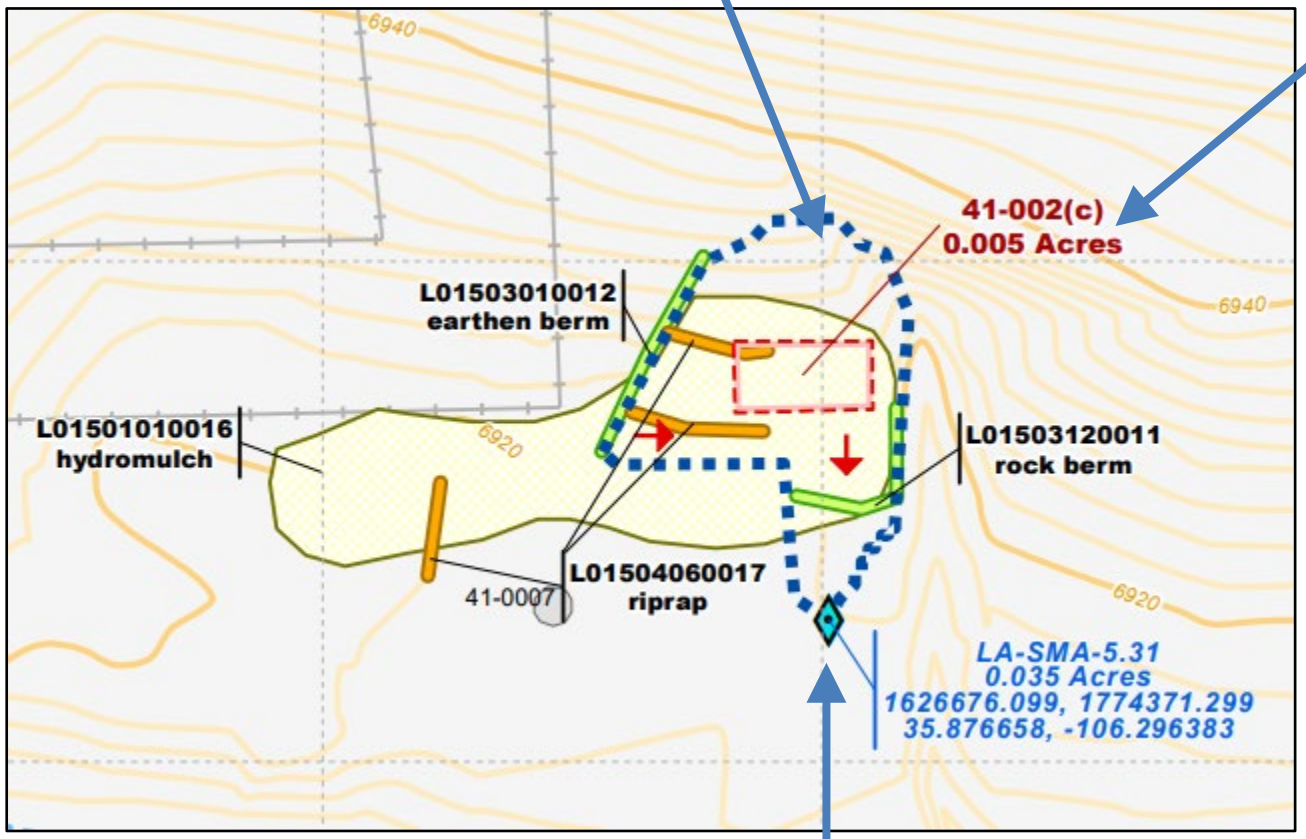
Storm water controls!

- Slows storm water runoff
- Allows sediment and contaminants to drop out
- Stabilizes slopes and channels

IP Storm Water Controls Serve as "Goalie" for SWMUs/AOCs

Watershed Boundary (Site Monitoring Area or SMA)

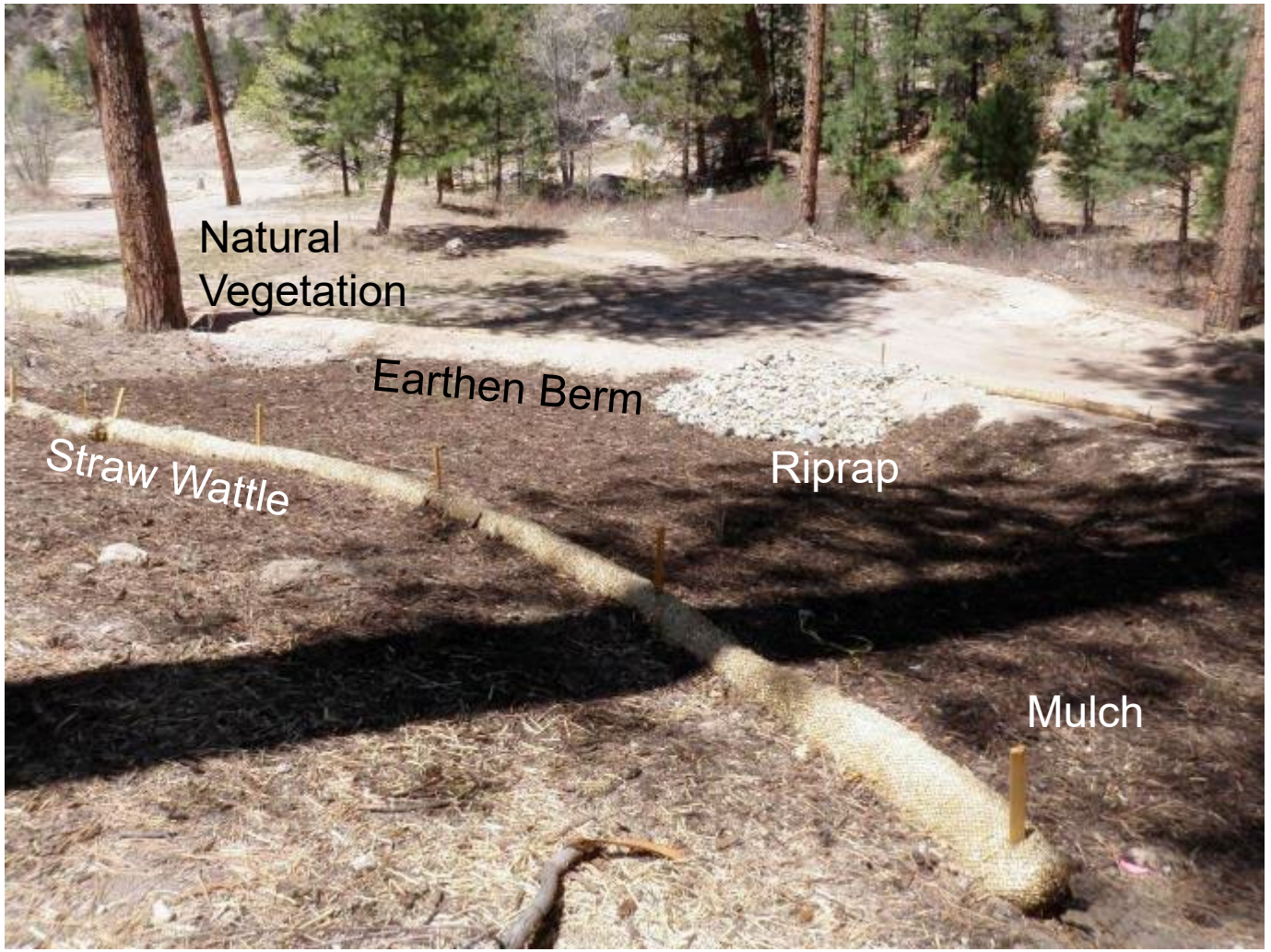
Solid Waste Management Unit (sludge drying bed)



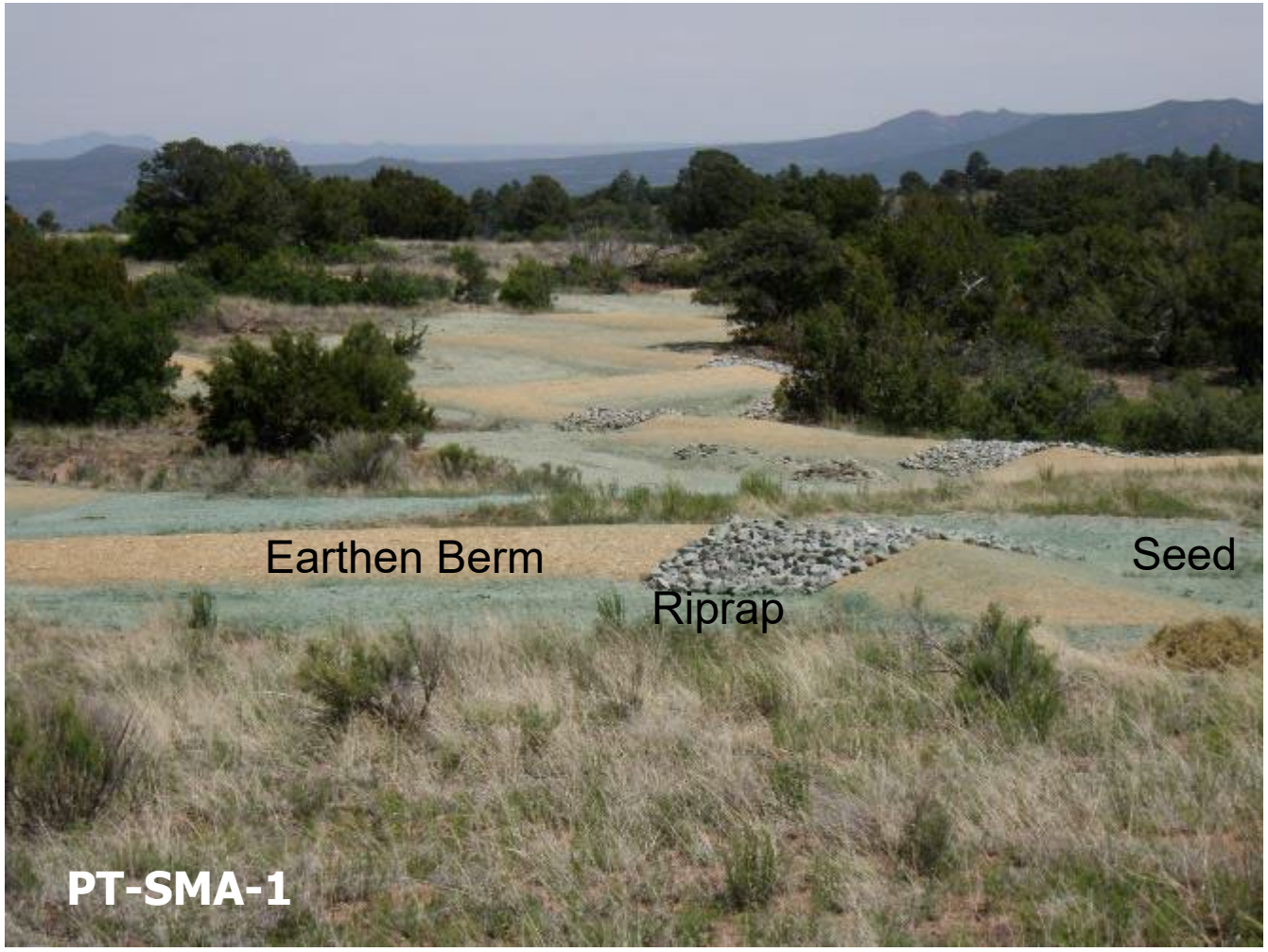
Automated Sampler

IP Storm Water Control Examples

IP Storm Water Control Examples Continued



IP Storm Water Control Examples Continued



- Series of earthen berms and riprap spillways
- Meandering pattern slows water further

Upper Los Alamos Canyon Detention Basins

- In 2010, two detention basins built below SWMU 01-001(f) Septic Tank 140 (hillside)

- In 2015, a pipeline was built to divert storm water runoff from the hillslope and a third detention basin was constructed to capture the runoff from the pipeline

Lower Los Alamos Canyon Detention Basins

- In 2001, the Los Alamos low-head weir and two upstream detention basins were built following the Cerro Grande Fire to help prevent contaminated sediment from being transported farther downstream
- Sediment is excavated from the basins once a sufficient amount has accumulated

DP Canyon Grade Control Structure

- Grade control structures (GCS) are designed to stabilize stream channel and banks
- DP Canyon GCS completed in 2010 in response to 2008 flood and large headcut

Middle Pueblo Canyon Grade Control Structure

- Middle Pueblo Canyon GCS completed in 2015 in response to 2013 flood and large headcut

Lower Pueblo Canyon Grade Control Structure

- Lower Pueblo Canyon GCS completed in 2010 in response to 2008 flood
- Substantial repairs and enhancements were completed in 2015 in response to 2013 flood, including:
  - Expand concrete and gabion baskets across channel and floodplain
  - Install substantial bank stabilization (gabion baskets and concrete) and flow direction controls (jetty-like structures) downstream of GCS

Sandia Canyon Grade Control Structure

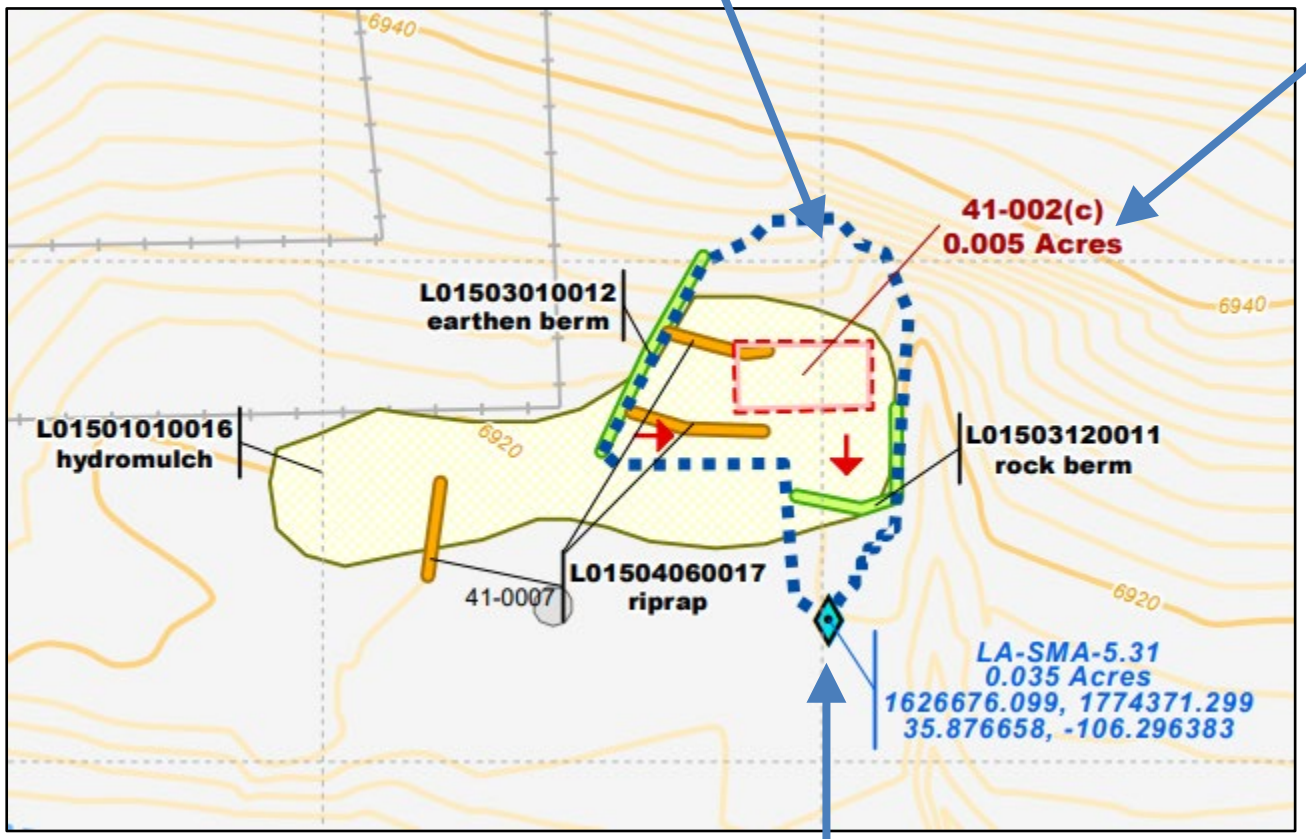
Sandia GCS was completed in December 2013 in response to 2008 flood causing a large headcut

Sandia GCS in October 2021 where willows, cattails, and reed canary grass abound

Integration of N3B Individual Permit (IP) and Aggregate Area Soils (AA) Program Teams

Watershed Boundary (Site Monitoring Area or SMA)

Solid Waste Management Unit (sludge drying bed)



Automated Sampler

Integration of the N3B IP and AA Soils Teams

- Internal N3B monthly coordination meeting
  - Discuss upcoming sampling campaigns and cleanup activities
  - Review recently sampled SWMUs/AOCs
  - Share challenges to facilitate success in the field
- Peer review of documents between groups including:
  - Individual Permit Site Discharge Pollution Prevention Plan (SDPPP)
  - Individual Permit Sampling Implementation Plan (SIP)
  - Aggregate Area (AA) Field Implementation Plans (FIP)
  - Aggregate Area Investigation Work Plans (IWP)

Examples of Integration of the IP and AA Teams

- With the issuance of the new Individual Permit, the teams have worked together to ensure that pollutants of concern under the IP are monitored in AA soil sampling, for example:
  - Adding target action level (TAL) metals to the analytical suite at several locations in the Twomile Canyon AA Campaign
  - Adding PCBs to Chaquehui Canyon AA Campaign sampling when PCBs were detected in a storm water sample
  - Adding total uranium to the analytical suite for locations in the Lower Pajarito Canyon AA Campaign where uranium was required for monitoring under the IP
  - Reviewing the Lower Pajarito Canyon AA Campaign sampling locations to ensure that samples are collected within the IP site monitoring areas

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Questions?