LA-UR-11-11250
Approved for public release; distribution is unlimited.

Title:	Summary of 2010 Environmental Report
Author(s):	Lopez, Lorraine Brock, Burgandy Cruz, Ria B. Lavadie, Anita F.
Intended for:	DOE NNMCAB, 2011-08-10 (Pojoaque, New Mexico, United States) NMED Environmental monitoring and surveillance Reading Room DOE 540.1a

Summary of 2010 Environmental Report

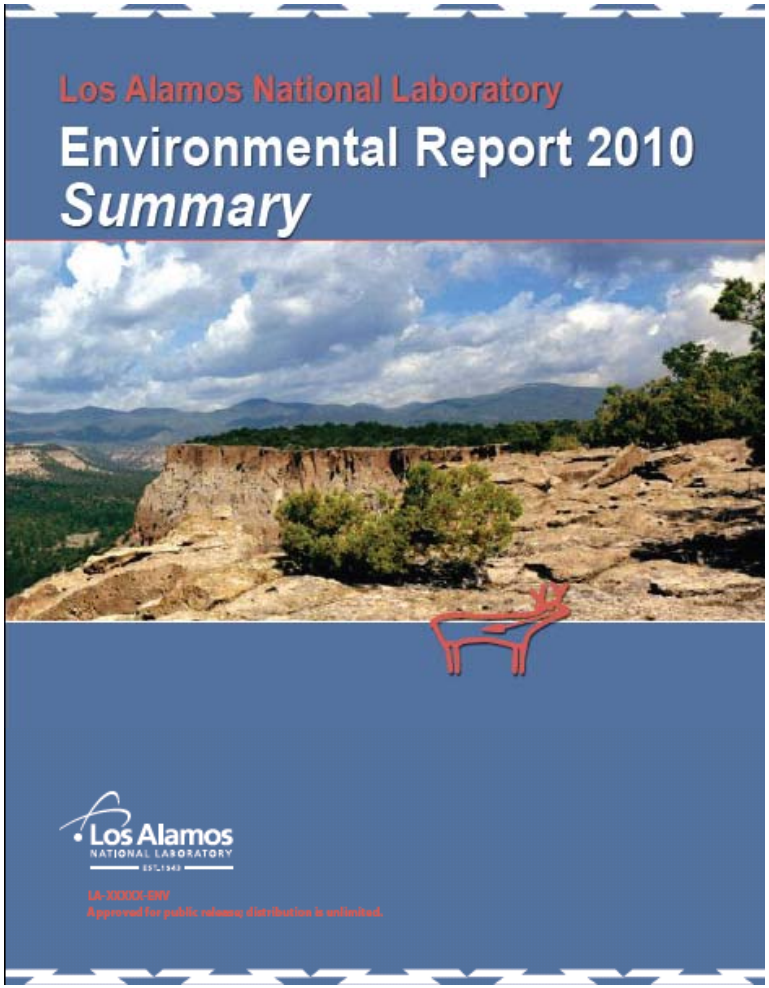
A project by Ria Cruz, Burgandy Brock and Anita Lavadie

Mentors: Jean Dewart and Lorrie Bonds Lopez

LANL Waste and Environmental Services

Purpose of the Summary Report
Why have students write it?

- **To present the methods and results of environmental monitoring done in a form that is understandable and inviting to the public.**
- **To help explain scientific concepts in lay terms.**
- **Students**
  - Are closer to the technical level of the public and have the same questions
  - Have some technical training and can translate the ESR into public terms
  - Get good experience, allowing them to publish a public document

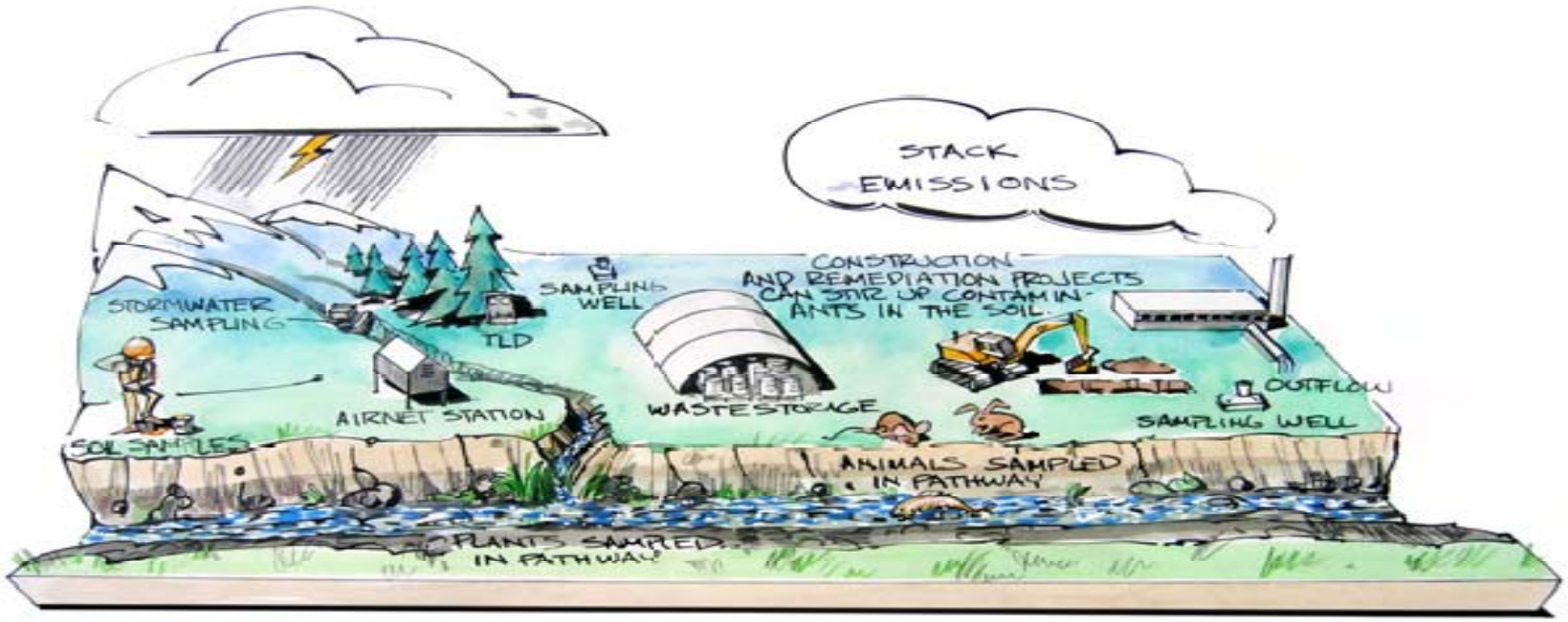


This presentation will…

- Outline the summary report's contents
- Give examples of the layout and presentation of the summary
- Give examples of the figures and topics discussed in the summary
- Specific ideas for the summary

- This presentation will not address detailed data from the ESR.

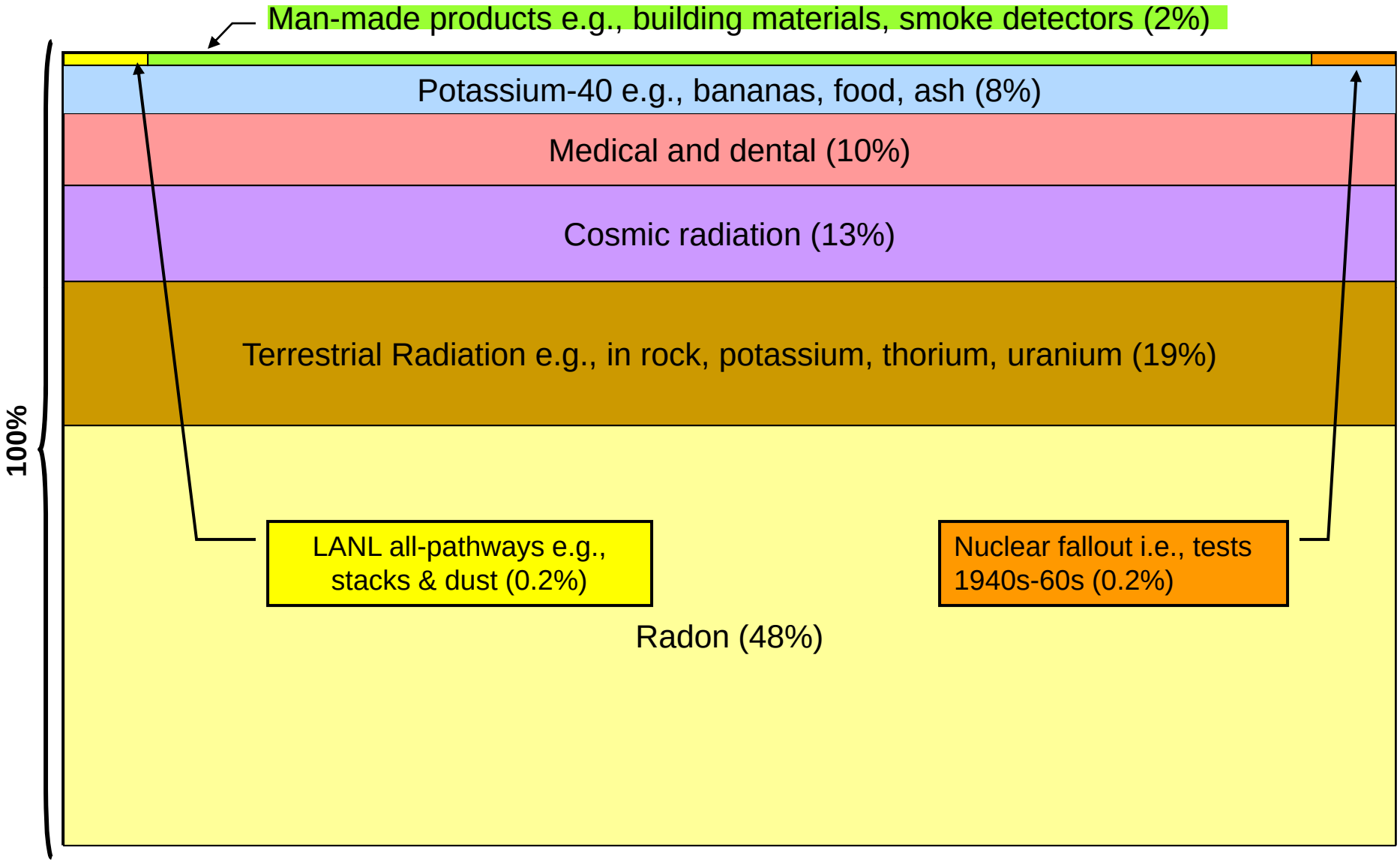
What types of Environmental Surveillance are done at LANL?



In 2010 LANL collected samples from more than 4000 locations and received almost 1.4 million analyses.

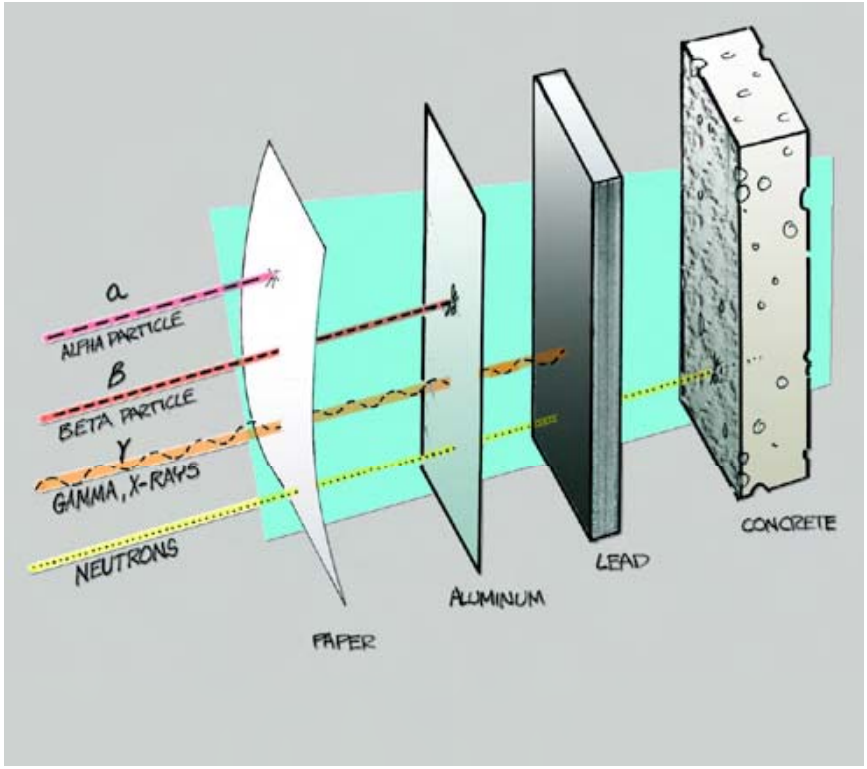
Sources of Airborne Radiation Exposure Around LANL

Background radiation ~ 500 mrem/year: Additional from LANL < 1 mrem/year



Screening Levels, Regulations and Standards Compared

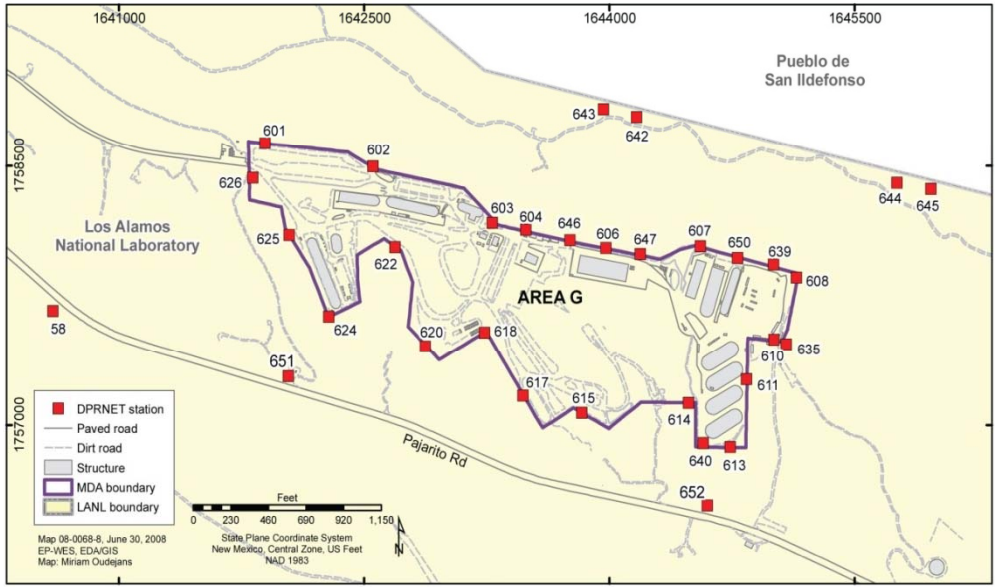
What is Radiation?



- **Alphas will not penetrate the skin, so they can only do harm if the radioactive material is inside you.**
- **Betas will not penetrate more than 20 feet of air, so they can only do harm if the source is close.**
- **Gammas and neutrons can penetrate more than 100 meters of air, and are examples of “direct penetrating radiation”.**

What is DPRNET?

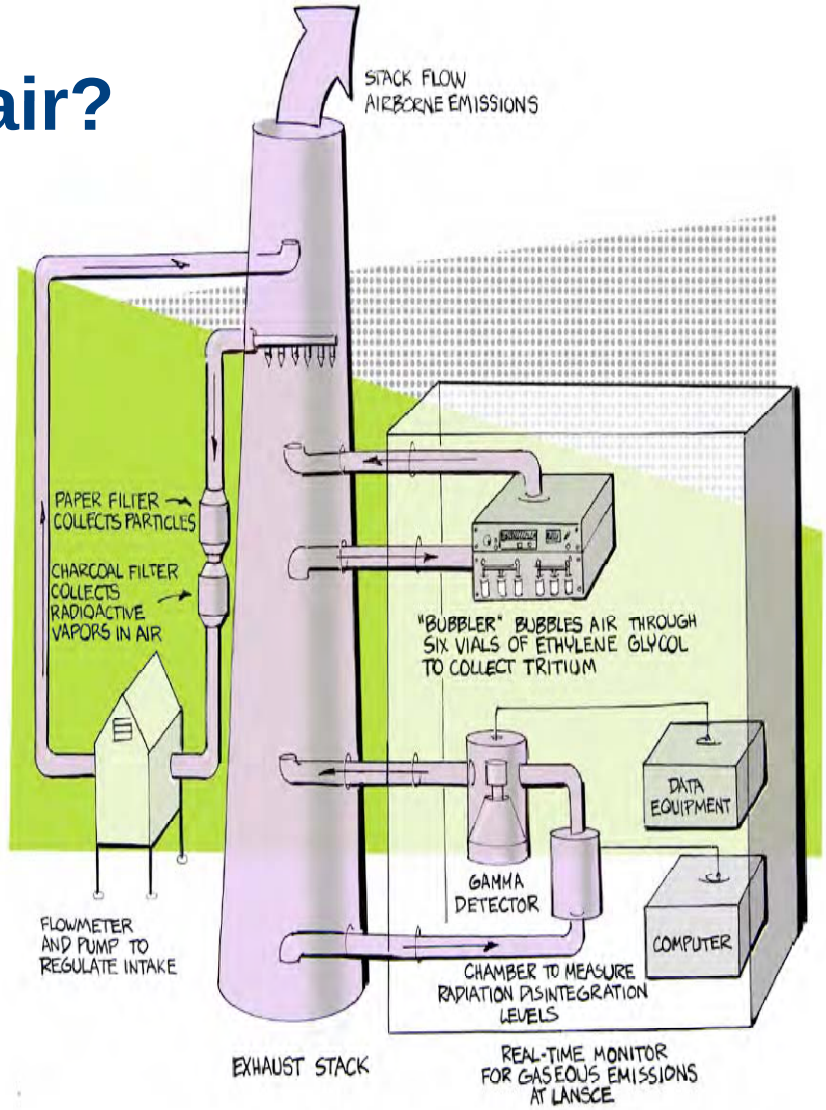
- Direct penetrating radiation = gamma & neutrons
- LANL uses thermoluminescent (TLDs) dosimeters to monitor direct penetrating radiation
- 98 locations around LANL, worn by employees
- Distinguishing background radiation from LANL radiation



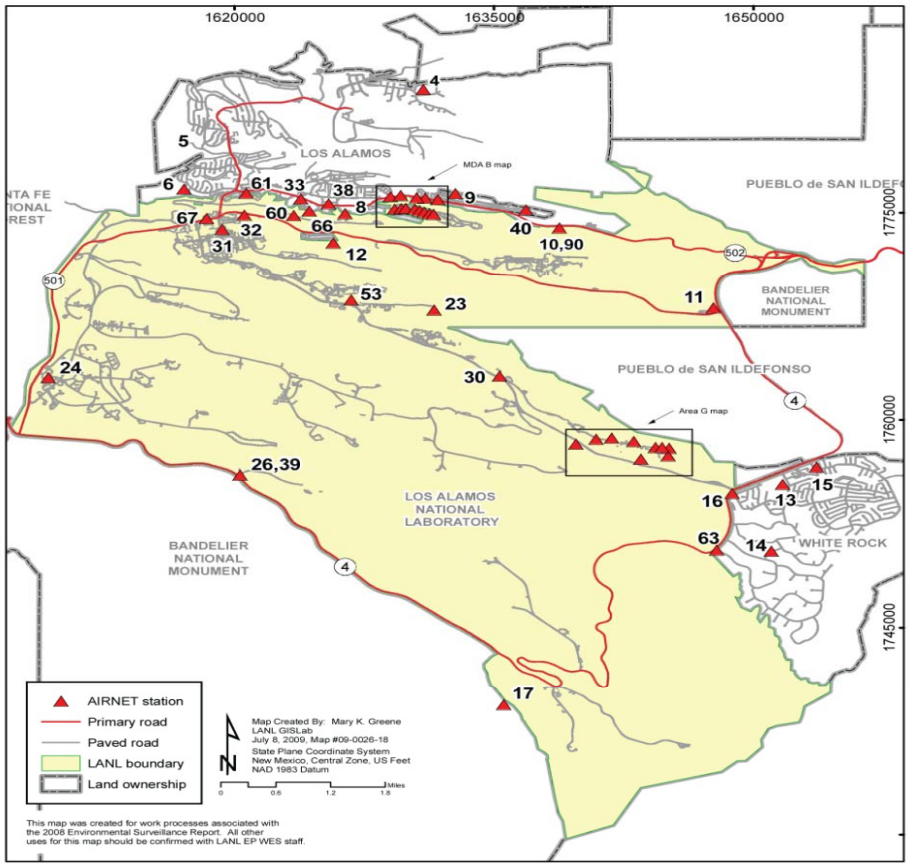
How does LANL monitor air?

Stack Monitoring

- **Monitoring at the emission source**
- **Samples analyzed for particulate matter, radioactive vapors, tritium, and radioactive gases**
- **CAP88 determines dose to receptor**



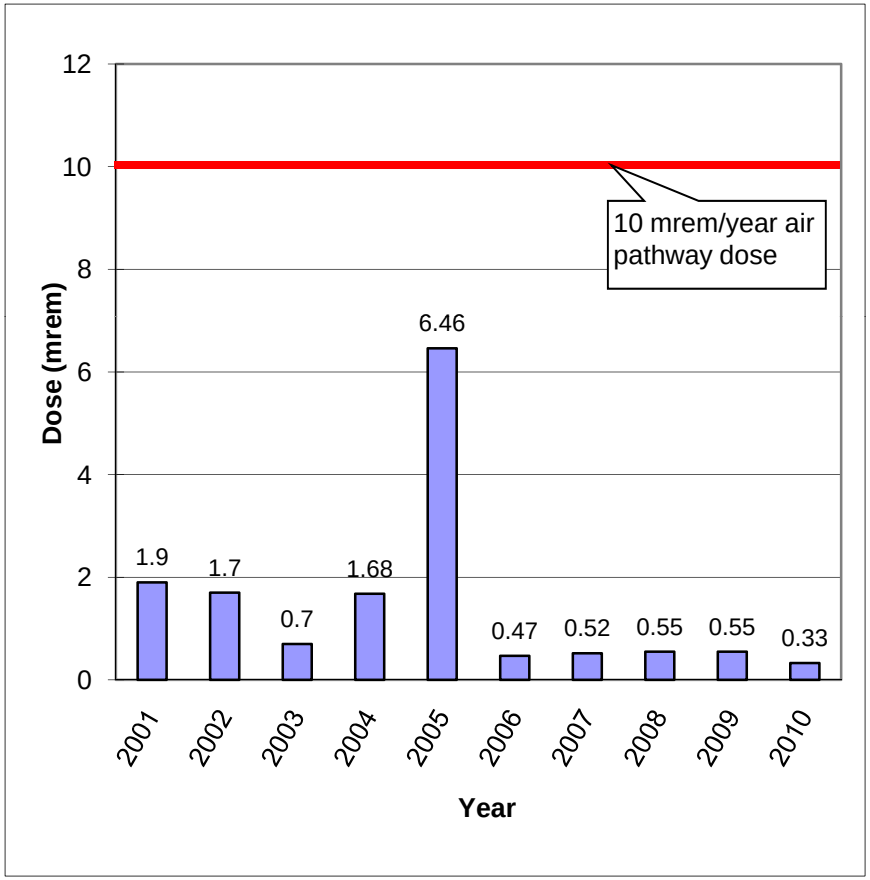
What is AIRNET?



- **60 AIRNET stations sample for radionuclides**
- **Continuous monitoring**
- **Analytes monitored**
- **LANL detected no airborne radioactivity that exceeded the 10 mrem/yr dose limit**

What is the MEI?

- **Maximally exposed individual: receives greatest dose from LANL operations while offsite.**
- **Airborne Pathway MEI: LA Inn South**
  - Dose at location: 0.33 mrem/yr
- **All-Pathways MEI: boundary between Area G and San Ildefonso sacred area**
  - Dose at location: 0.9 mrem/yr



BB

How is surface water monitored?

- **ISCO samplers**

- Automated samplers
- Collect water from first hour of storm event
- 60 ISCOS on laboratory property and perimeter

Watershed Monitoring at Los Alamos During 2010

Anita Lavadie

Environmental Protection Division

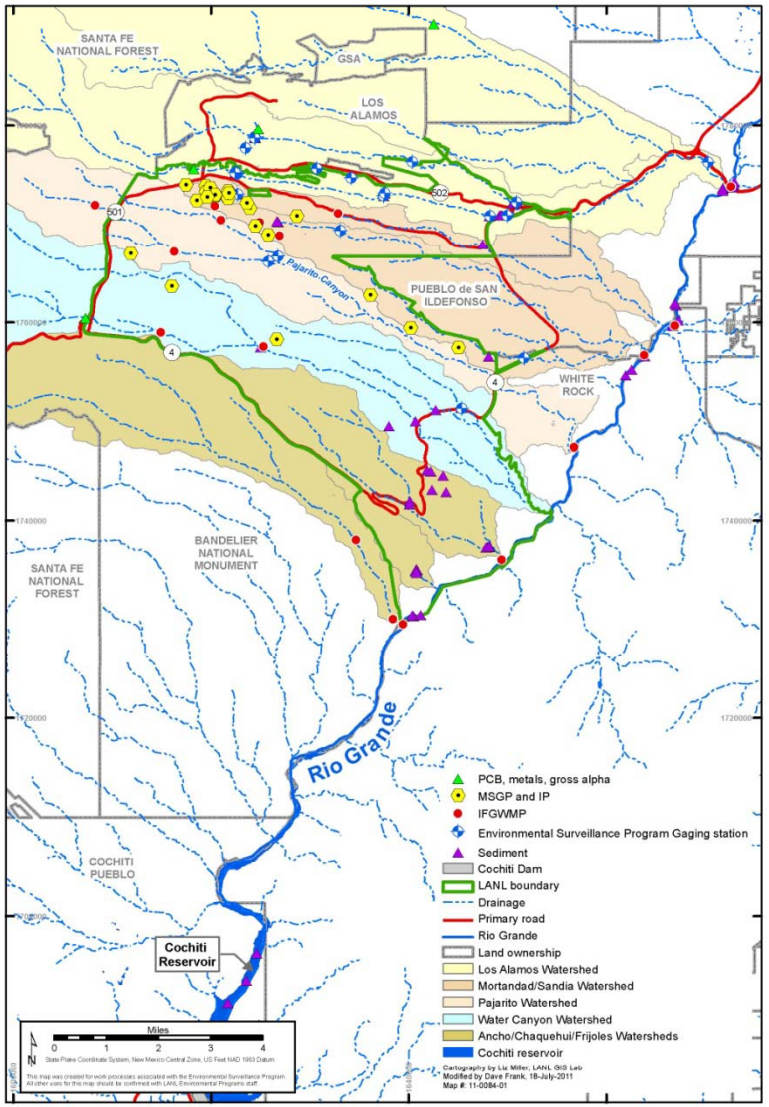
Los Alamos National Laboratory

Watershed Monitoring Drivers

- DOE Order 450.1A, Environmental Protection Program
- Interim Facility-Wide Groundwater Monitoring Plan
- Multi-Sector General Permit (MSGP)
- Consent Order
- Individual Permit (IP) effective in 2011

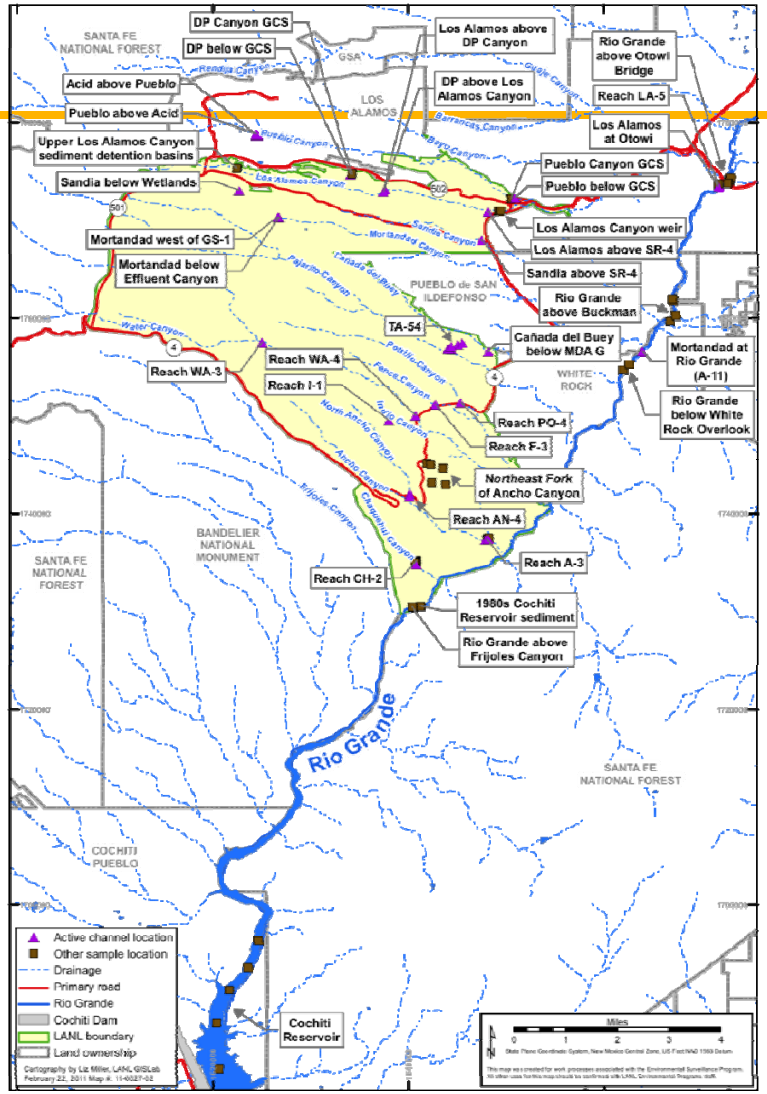
Surface Water Data

- Extensive network of surface water sampling locations in 2010
- Includes storm water runoff, snowmelt runoff, and locations with persistent surface water
- On-site and off-site
- Filtered and non-filtered samples



Sediment Data

- Extensive evaluation of sediment in active channel and floodplain sediment deposits
- Data used to evaluate trends in concentration
- Data used to evaluate PCB sources



Screening Levels and Standards

- **Sediment data compared to:**
  - Background values
  - Human-health based screening levels
  - Biota concentration guides (BCGs) (for radionuclides)
  - No standards applicable to sediment
- **Surface water data compared to:**
  - New Mexico water quality standards for surface water
  - Derived concentration guidelines (DCGs) (for radionuclides)
  - BCGs
  - Tap water screening levels (where other screening levels not available)

Surface Water Results

Contaminants Found in Surface Water Samples		
Analyte	Percentage of Samples with Detected Results Above Standard or Guide	Master Watersheds with Detected Results Above Standard or Guide
Gross alpha radiation	56%	Los Alamos, Mortandad, Pajarito, Sandia, and Water Canyons and several non-LANL canyons
Chromium	1% (ca)	Mortandad Canyon
Mercury	1% (wh)	Los Alamos Canyon
Selenium	2% (wh and ca)	Mortandad and Sandia Canyons
Zinc	2% (aa) 2% (ca)	Los Alamos and Sandia Canyons
PCBs by Aroclor Method	5% (hh) 5% (wh)	Sandia Canyon
PCBs by Congener Method	82% (hh) 57% (wh)	Los Alamos, Mortandad, Pajarito, and Sandia Canyons and several non-LANL-affected canyons
*aa = acute aquatic life standard; ca = chronic aquatic life standard; hh = human health standard; wh = wildlife habitat standard		

Sediment Results

Contaminants Found in Sediment Samples from 2010		
Analyte	Percentage of Samples with Detected Results Above Background Value	Master Watersheds with Detected Results Above Background Value
Americium-241	36%	Los Alamos, Mortandad, and Pajarito Canyons
Cesium-137	25%	Los Alamos and Mortandad Canyons
Plutonium-238	29%	Los Alamos, Mortandad, Pajarito, and Water Canyons
Plutonium-239/240	47%	Los Alamos, Mortandad, and Pajarito Canyons
Strontium-90	4%	Los Alamos Canyon
Uranium-234	5%	Los Alamos Canyon
Uranium-235/236	5%	Los Alamos Canyon
Uranium-238	5%	Los Alamos Canyon
Antimony	8%	Los Alamos, Sandia, and Pajarito Canyons
Chromium	13%	Los Alamos, Mortandad, and Sandia Canyons
Copper	10%	Los Alamos Canyon
Mercury	3%	Sandia Canyon
Selenium	3%	Los Alamos Canyon
Silver	3%	Sandia Canyon
Zinc	16%	Los Alamos, Mortandad, and Sandia Canyons
Dioxin and Furan Congeners	100%	Los Alamos and Pajarito Canyons
PCBs by Aroclor Method	18%	Los Alamos and Sandia Canyons
PCBs by Congener Method	100%	Ancho, Chaquehui, and Los Alamos Canyons

Potential Impacts to the Rio Grande

Text

Summary

Text

Groundwater Monitoring at Los Alamos during 2010

Groundwater Monitoring

- **Three levels of groundwater**
  - Alluvial
  - Intermediate
  - Regional aquifer
- **ONLY the regional aquifer is a source of drinking water for people.**
- **The drinking water produced by Los Alamos County meets all state and federal requirements.**

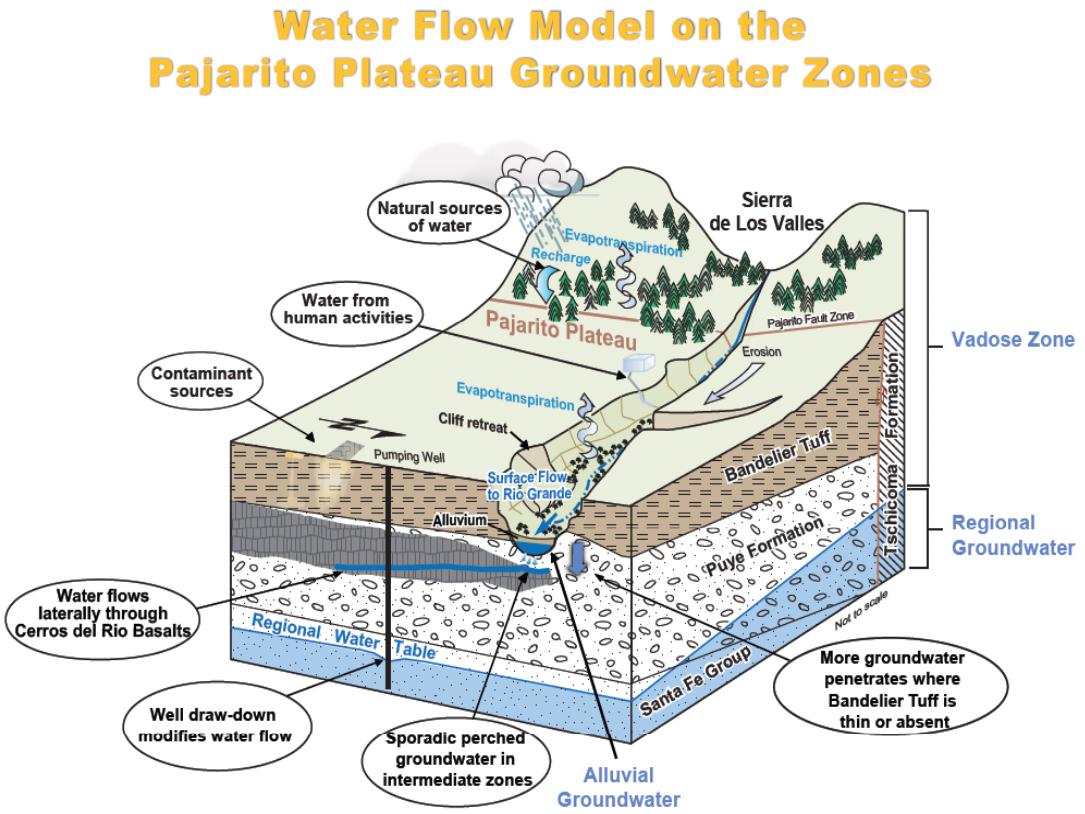


Figure: Illustration of the levels of groundwater occurrence

Where is Groundwater Monitored?

- **In 2010, LANL sampled:**
  - 232 groundwater wells, well ports, and springs in 561 separate sampling events.
- **LANL installed:**
  - 2 perched-intermediate monitoring wells
  - 12 regional monitoring wells.
- **Plugged and abandoned 8 older wells.**
- **Replaced six wells to improve their reliability and usability for monitoring groundwater.**

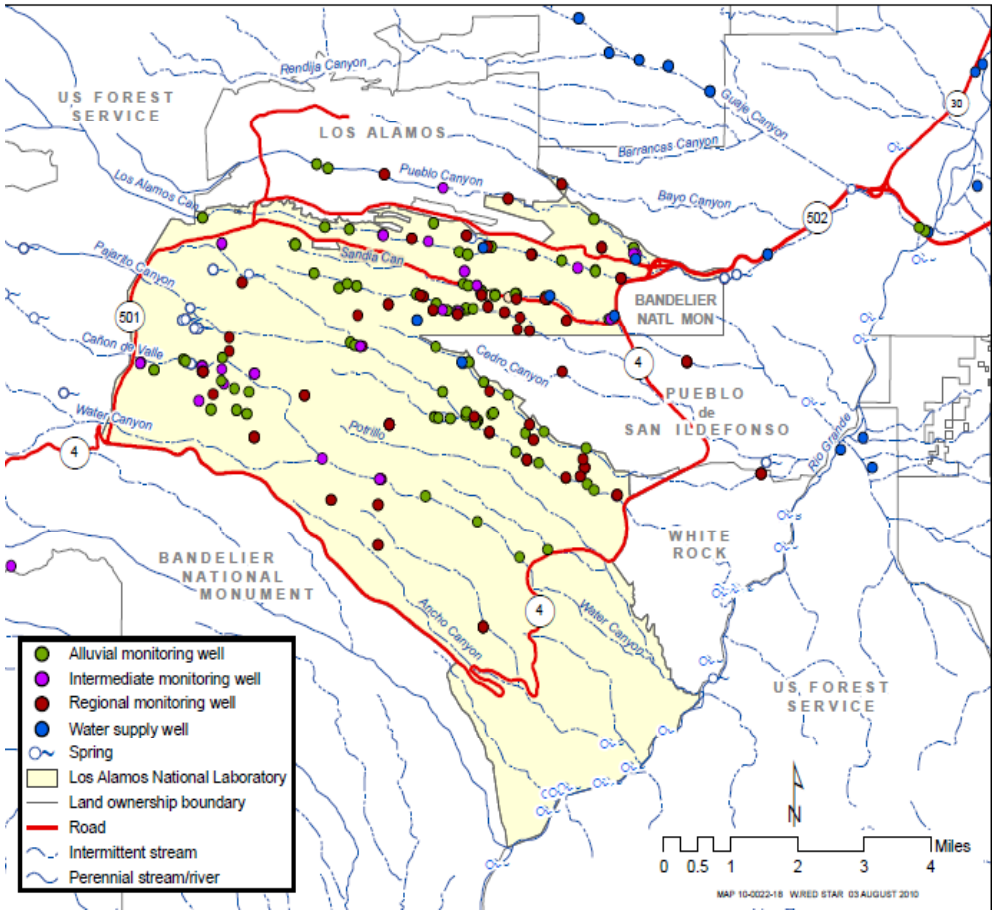
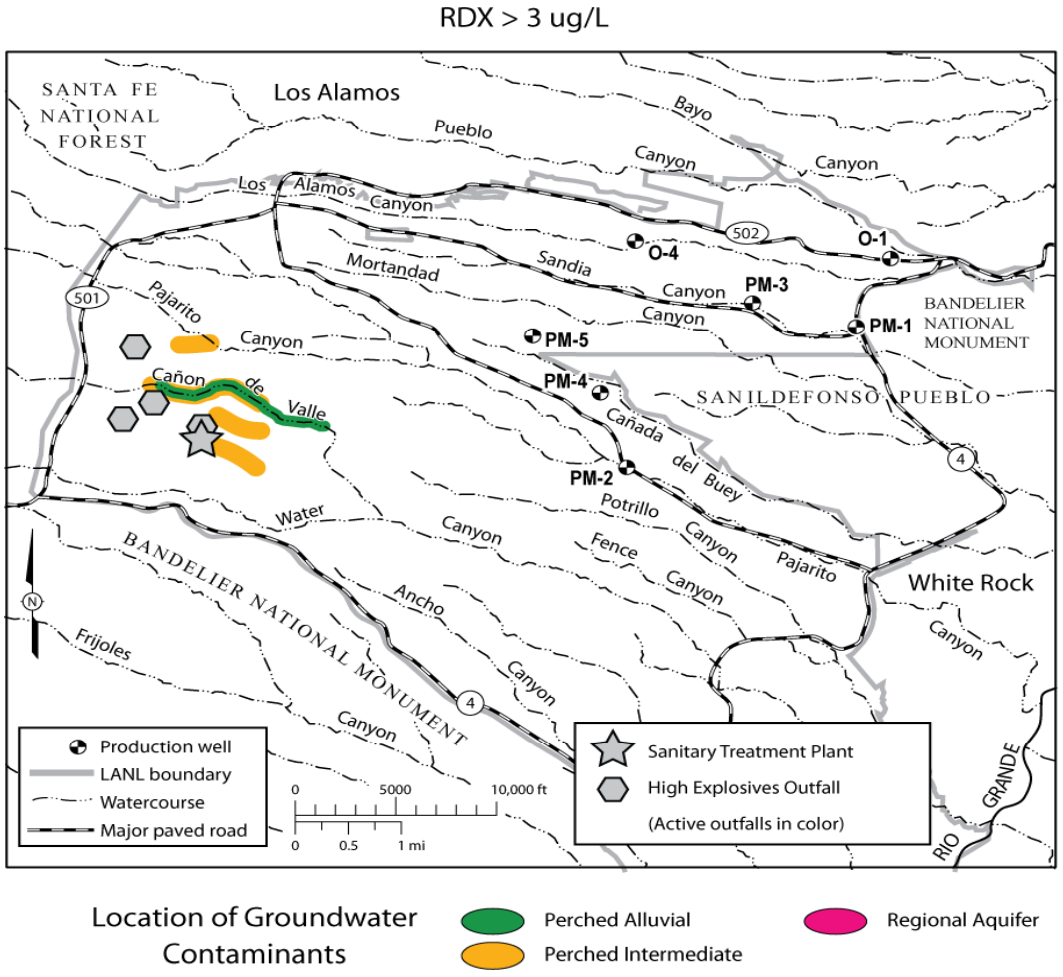


Figure: Location of wells used to monitor groundwater

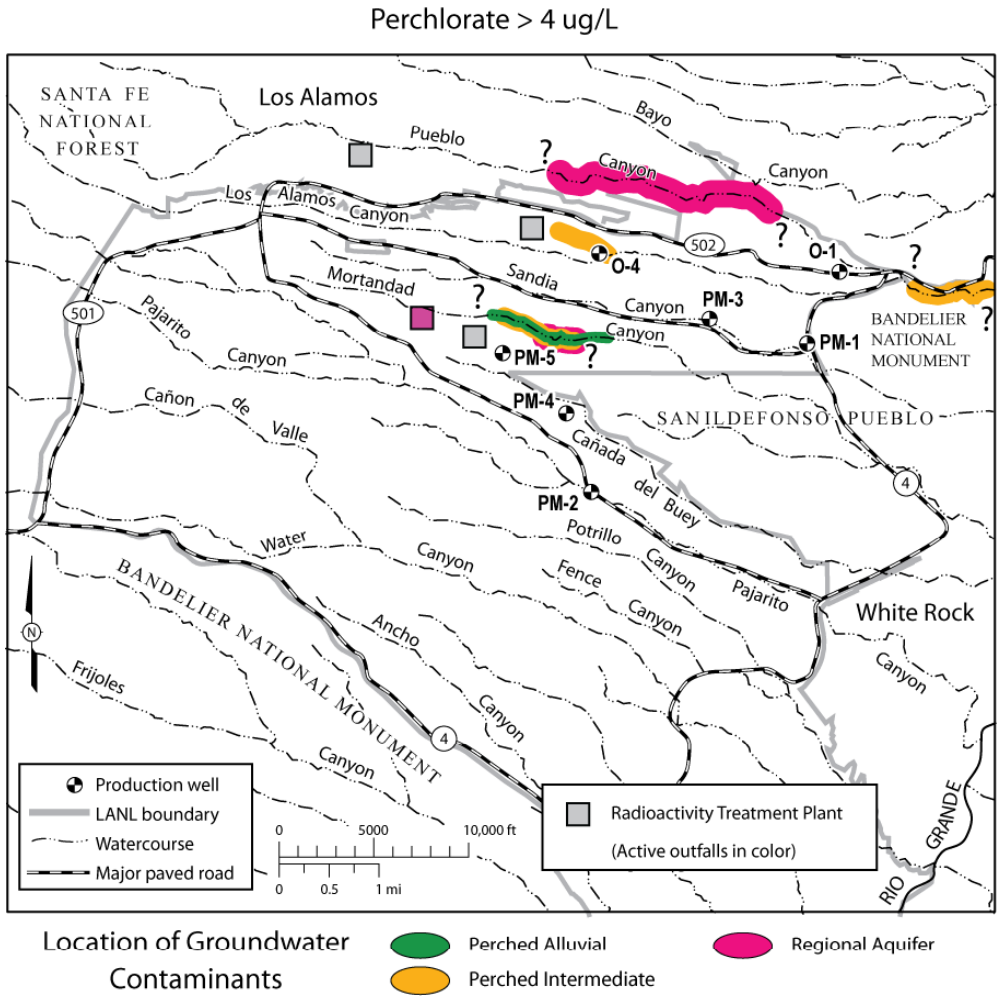
What do the monitoring results show for RDX (a high explosive)?

- Map shows approximate extent of RDX above ½ the EPA Human Health tap water screening level
- RDX source reflects historical discharges that no longer occur



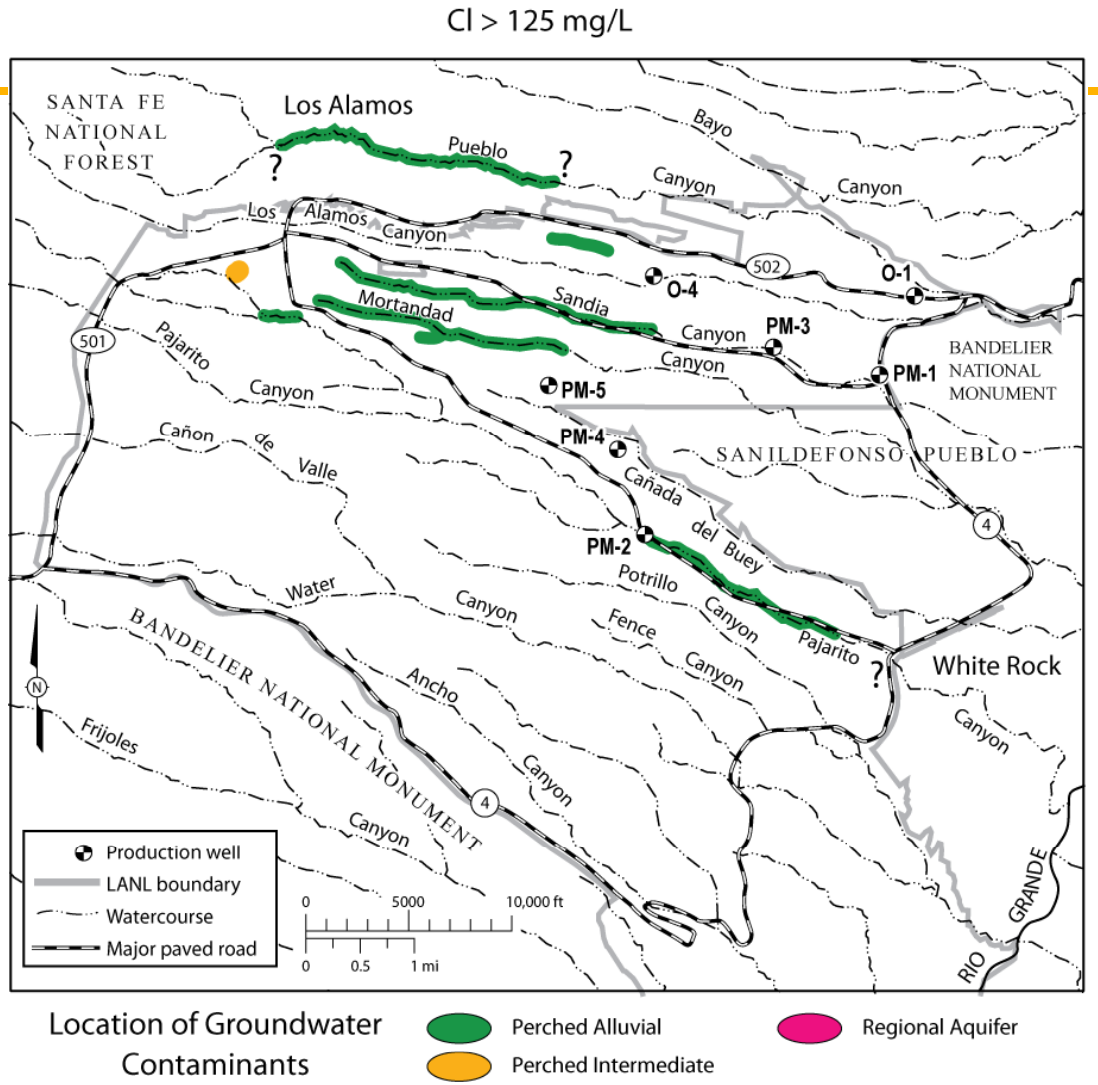
What do the monitoring results show for Perchlorate?

- Map shows approximate extent of perchlorate above ½ the NM groundwater standard
- Perchlorate source reflects historical discharges that no longer occur.
- Decreasing in alluvial groundwater in Mortandad Canyon due to improvement in treatment process



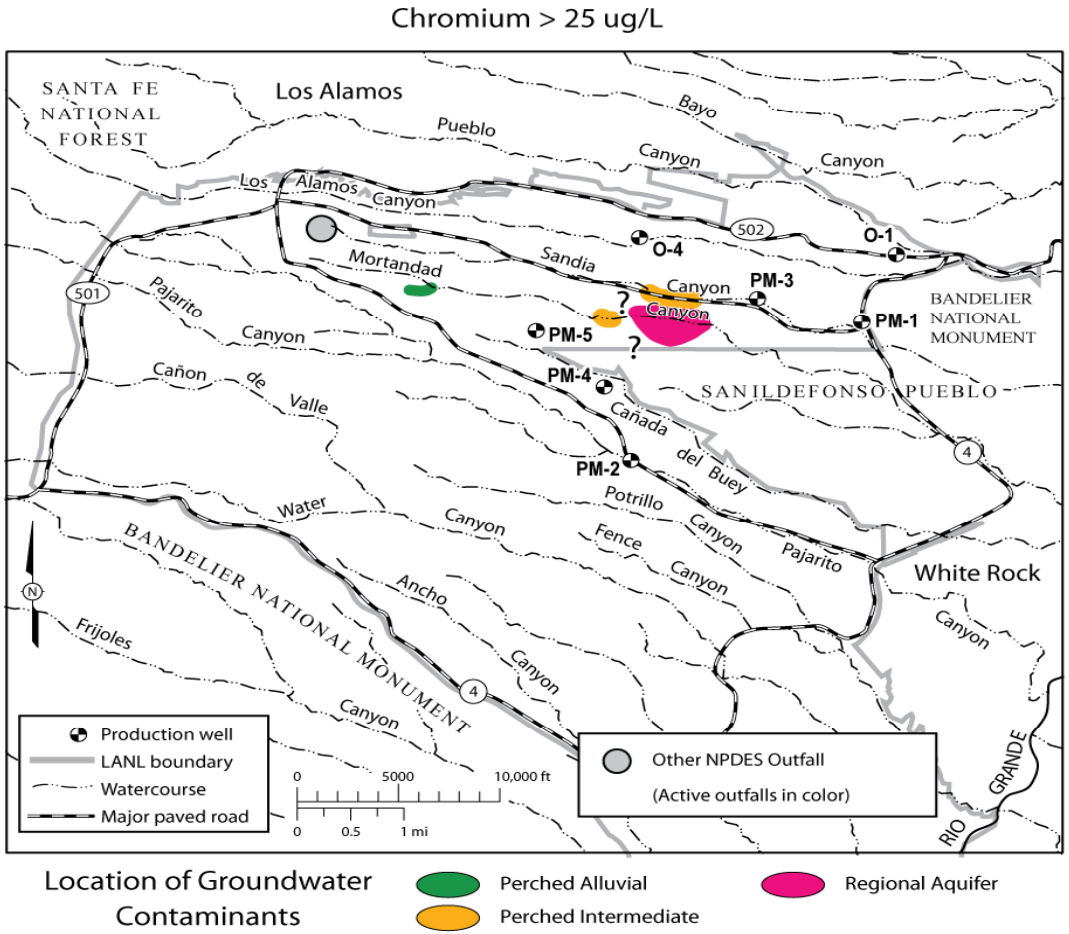
What do the monitoring results show for Chloride?

- **Map shows approximate extent of chloride above ½ the NM Groundwater Standard**
- **Source is snow melt runoff from road salt**



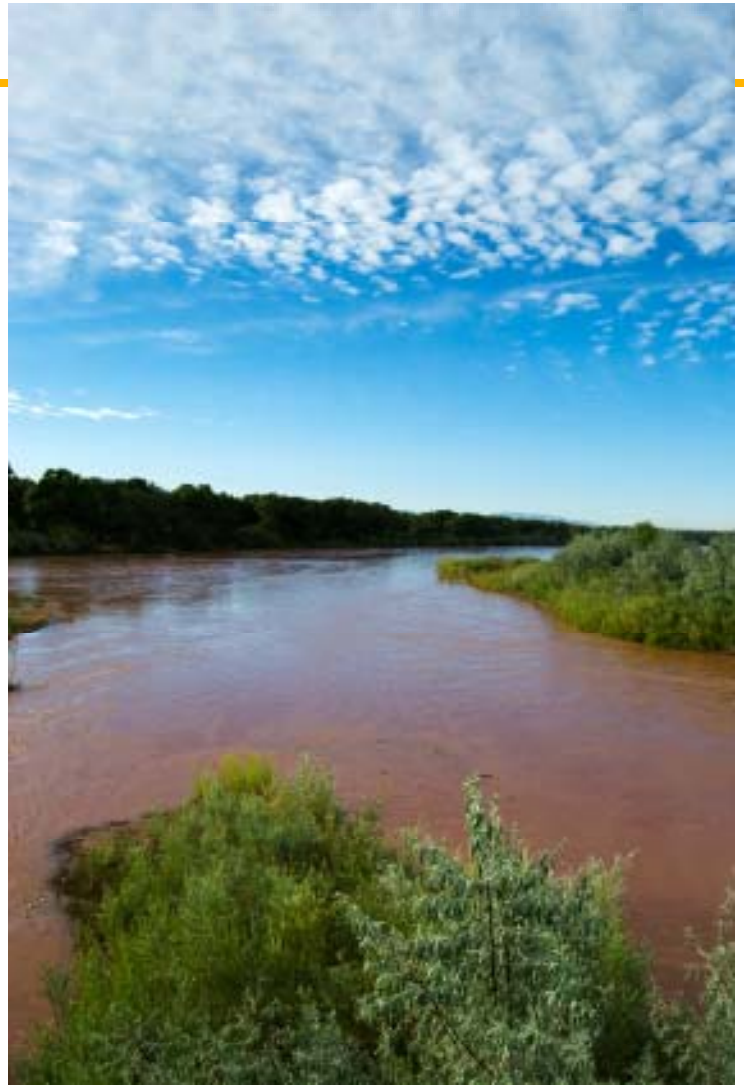
What do the monitoring results show for Hexavalent Chromium?

- Map shows approximate extent of hexavalent chromium above ½ the NM groundwater standard
- Chromium source is past cooling tower discharges
- Not detected in municipal water supply wells



Does LANL impact the City of Santa Fe's Buckman Well?

- LANL sampled 3 wells
- Wells contain natural uranium that is below the NM groundwater standard.
- Well contain natural metals (arsenic and boron)
- None of these contaminants are due to LANL discharges



Groundwater monitoring in 2010 – Summary

- **Only about 0.2% of the groundwater sampling results had contaminant values above screening levels.**
- **LANL has characterized much of the groundwater system and defined contaminant extent.**

Slide 30

Soil, Foodstuffs and Biota Monitoring at Los Alamos during 2010

Slide 31

Monitoring of soil around LANL

- **Soil sampling is performed to:**
  - Determine radionuclide and chemical concentrations in soil and compare these results to regional (background) areas,
  - Determine concentration trends over time, and
  - Estimate potential radiation dose and chemical exposure risk to residents and biota.

- **Last soil sampling event in 2009**
  - Radionuclides found at very low concentrations
  - PCBs, HE, and semi-volatile organic compounds not detected

Slide 32

Soil Monitoring at Area G

- **Area G is the Laboratory's main radioactive waste storage and disposal facility**
- **LANL annually monitors soil at the Pueblo de San Ildefonso downwind of Area G**
  - All measured levels of radionuclides and metals were within levels considered safe for residential occupancy
  - Concentrations are generally not increasing over time.

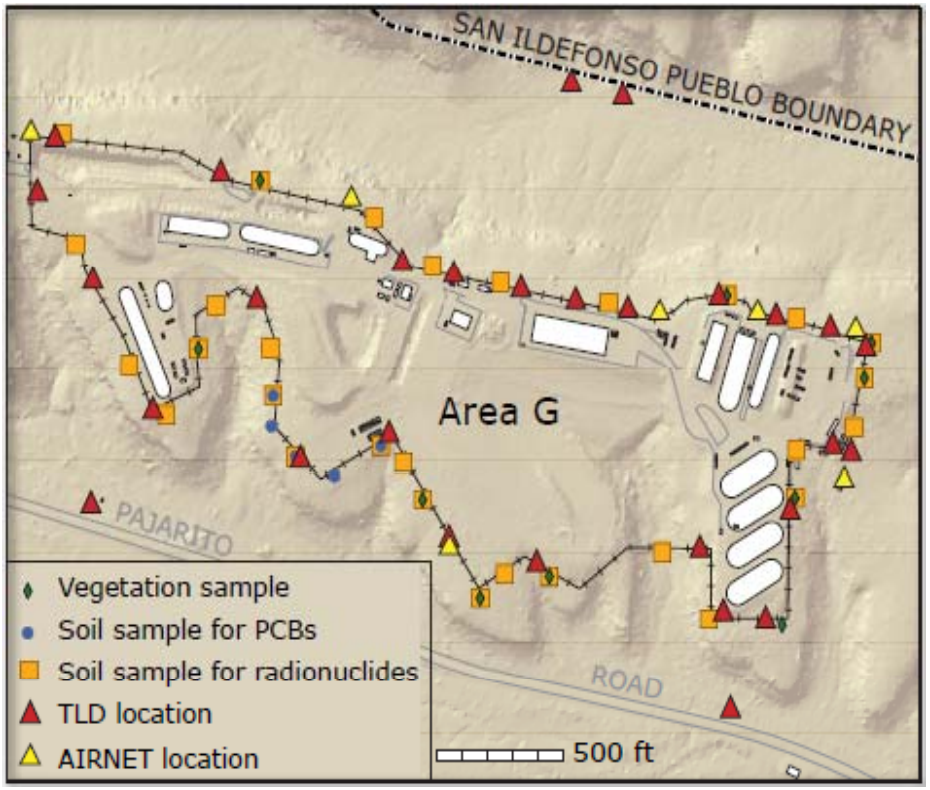
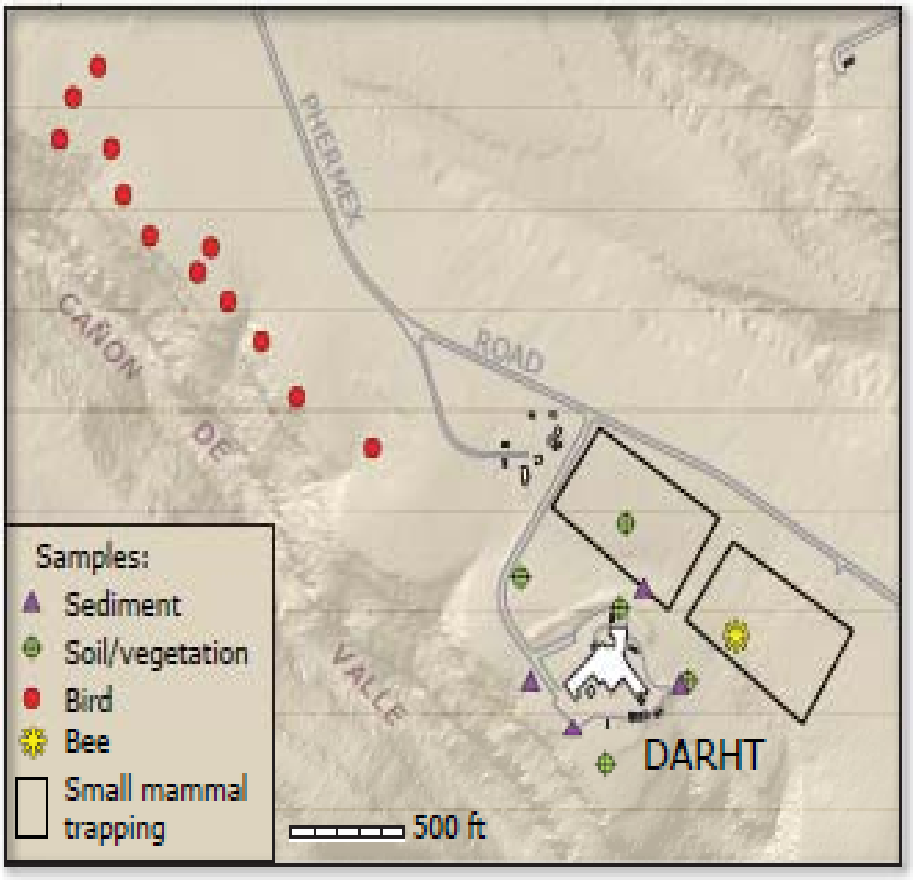


Figure: Soil Monitoring at Area G

Soil Monitoring at DARHT

- **Dual Axis Radiographic Hydrodynamic Test Facility (DARHT)**
  - Where scientists simulate nuclear explosions
- **What were the monitoring results?**
  - Most measured level of radionuclides were not detected or below screening levels.
  - Uranium above background levels but amount dramatically lower than in previous years.
  - All metals were below background levels.



Monitoring sites around DARHT.

Monitoring of Foodstuffs around LANL

- **What are foodstuffs?**
  - Fruits, vegetables and animal tissue consumed by humans
- **In 2010, LANL collected:**
  - 107 fruit and vegetable samples,
  - Goat's milk from non-commercial farms,
  - Two dozen chicken eggs from 5 areas, and
  - Honey
- **What were the 2010 results?**
  - Most all radionuclides were either not detected or below background levels.
  - The few above background measurements were far below screening levels and do not pose a harmful does to humans.

Monitoring of Foodstuffs around LANL

Crayfish/Rio Grande

- **Eight crayfish sampled**
  - Edible vs. non-edible parts
- **What were the 2010 results?**
  - Some metals higher downstream
  - Minimal risk to human from ingestion

Slide 36

Monitoring of Foodstuffs around LANL

Deer and Elk Monitoring

- **Two road killed deer and elk samples**
  - Meat and bone analyzed for radionuclides and compared to background
- **What were the 2010 results?**
  - Most all radionuclides either not detected or below background
  - Uranium above background but far below screening levels and naturally occurring
  - PCB concentrations in deer below background levels

Slide 37

Monitoring of Biota around LANL

- **What are biota?**
  - Native vegetation, small mammals, birds, bees not eaten by humans
- **Monitoring at Area G**
  - Branches and needles sampled
  - Most all radionuclides not detected or below background
  - Tritium above background but far below screening levels and did not have adverse impacts on plants
- **Monitoring at DARHT**
  - Sampled branches, needles, field mice, bees, and birds
  - Most all radionuclides and metals not detected or below background
  - Uranium found in field mice samples above background but far below screening levels and do not pose a potential unacceptable dose to the biota sampled.

Slide 38

Soil, Foodstuffs and Biota Monitoring in 2010 – Summary

- **Most parameters measured in soil, foodstuffs, and biota collected within and around LANL were either not detected or below background.**
- **The few parameters that were above background were far below screening levels.**

Slide 39

Public Communication for the ESR