

Updates from the Carlsbad Environmental Monitoring & Research Center (CEMRC)

Radioactive and Hazardous Materials Committee
August 13, 2026

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College of Engineering

Carlsbad Environmental Monitoring & Research Center (CEMRC)



New Mexico State University



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Outline

- Introduction to CEMRC
- Introduction to WIPP
- Current scope of CEMRC work
- Departments and capabilities



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Introduction to CEMRC

- Created in 1991
- Component of the College of Engineering
- Light Hall completed in December of 1996
- **Mission:** *To develop, implement, and sustain an **independent health and environmental monitoring program** in the vicinity of the Waste Isolation Pilot Plant (WIPP) facility, making results easily accessible to all stakeholders*



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Introduction to WIPP

- Deep geological repository licensed to store transuranic waste related to the production and testing of nuclear weapons for 10,000 years
- Site selected in 1973
- U.S. Congress authorized construction in 1979 (PL 96-164)
 "... for the express purpose of providing a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission."



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Introduction to WIPP

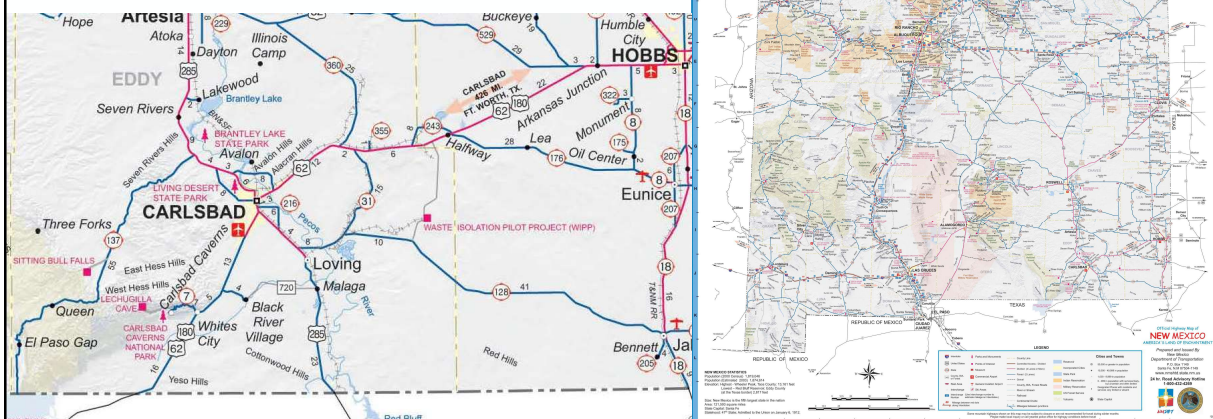
- Only deep geologic repository in the US
- Salt mine located approximately 30 miles east of Carlsbad
- Located in Salado Formation of the Delaware Basin, formed during the Permian period 250 million years ago
- Located approximately 2,150 ft below surface



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Introduction to WIPP



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The map displays the following facilities and their primary components:

- Idaho:** Idaho National Engineering Laboratory (Assembly and Disassembly)
- Washington:** Lawrence Livermore National Laboratory (Assembly and Disassembly), Energy Technology Engineering Center (Fuel and Target Fabrication)
- California:** Nevada Test Site (Fuel and Target Fabrication)
- Colorado:** Green Valley (Assembly and Disassembly), Rifle (Assembly and Disassembly), Rocky Flats (Assembly and Disassembly)
- Utah:** Los Alamos National Laboratory (Assembly and Disassembly), Trinity (Assembly and Disassembly)
- Arizona:** Sandia National Laboratories (Assembly and Disassembly)
- Nebraska:** Waste Isolation Pilot Plant (Assembly and Disassembly)
- Mississippi:** Plowshare (Assembly and Disassembly)
- Illinois:** Kansas City Plant (Assembly and Disassembly)
- Minnesota:** Burlington Assembly Plant (Assembly and Disassembly)
- Wisconsin:** Weldon Spring (Assembly and Disassembly)
- Michigan:** Mound Plant (Assembly and Disassembly)
- Indiana:** Palisades Plant (Assembly and Disassembly)
- Ohio:** Oak Ridge Reservation (Assembly and Disassembly)
- Alabama:** Savannah Site (Assembly and Disassembly)
- Georgia:** Savannah River Site (Assembly and Disassembly)
- South Carolina:** Savannah River National Laboratory (Assembly and Disassembly)
- Florida:** Pinellas Plant (Assembly and Disassembly)
- West Virginia:** West Valley Separations Plant (Assembly and Disassembly)
- Pennsylvania:** Fermi Plant (Assembly and Disassembly)
- New York:** Portsmouth Plant (Assembly and Disassembly)
- Connecticut:** Separation Process Research Unit (Assembly and Disassembly)
- Massachusetts:** Brookhaven National Laboratory (Assembly and Disassembly)
- New Jersey:** Y-12 (Assembly and Disassembly)
- Delaware:** Delaware River (Assembly and Disassembly)
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- Salt haul truck fire – February 5, 2014
- Radiation release – February 14, 2014



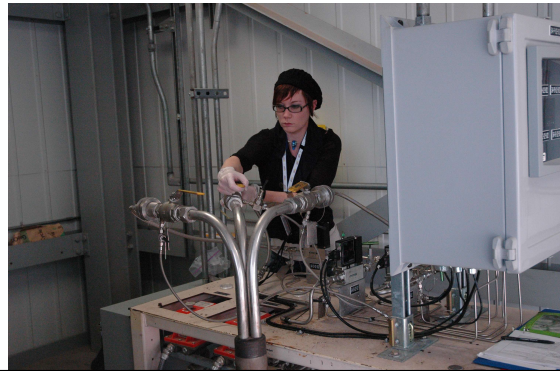
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CEMRC Current Scope of Work

- WIPP airborne effluent monitoring – Fixed Air Samplers (FAS), Stations F (unfiltered) and G (HEPA-filtered)
- Airborne particulate monitoring (6 sites)
- Soil sampling (4 sites)
- Surface water sampling (7 sites)
- Drinking water sampling (6 sites)
- Groundwater sampling (6 sites)
- Sediment sampling (3 sites)
- Vegetation sampling (6 sites)
- *In-vivo* monitoring



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WIPP Airborne Effluent Monitoring

- Fixed air sampler (FAS) Station F (unfiltered) composited weekly
- Fixed air sampler (FAS) Station G (HEPA-filtered) composited monthly
- Radiological components: Gross alpha and gross beta;
 ^{241}Am , ^{90}Sr , ^{238}Pu , $^{239+240}\text{Pu}$, $^{233+234}\text{U}$, ^{235}U , ^{238}U , ^{60}Co , ^{137}Cs , ^{40}K ;
adding in 2026: ^{237}Np , ^{242}Pu , ^{226}Ra , ^{228}Ra , ^{99}Tc , ^{230}Th , ^{232}Th , ^{236}U
- Non-radiological components: NH_4^+ , Al, Cd, Ca, Pb, Mg, K, Si, Th, Na, U; Cl^- , NO_3^- , CO_3^{2-} , SO_4^{2-} , PO_4^{3-}



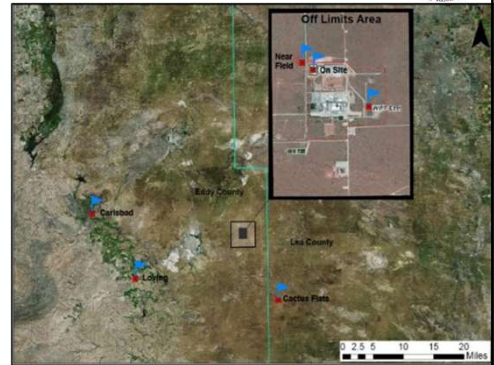
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Airborne Particulate Sampling

- On Site, Near Field, Cactus Flats, WIPP East, Carlsbad, Loving (6 sites)
- Radiological components:
 ^{241}Am , ^{90}Sr , ^{238}Pu , $^{239+240}\text{Pu}$, $^{233+234}\text{U}$, ^{235}U , ^{238}U , ^{60}Co , ^{137}Cs , ^{40}K ;
adding in 2026: ^{237}Np , ^{242}Pu , ^{226}Ra , ^{228}Ra , ^{99}Tc , ^{230}Th , ^{232}Th , ^{236}U
- Non-radiological components: NH_4^+ , Al, Cd, Ca, Pb, Mg, K, Si, Th, Na, U; Cl^- , NO_3^- , CO_3^{2-} , SO_4^{2-} , PO_4^{3-}



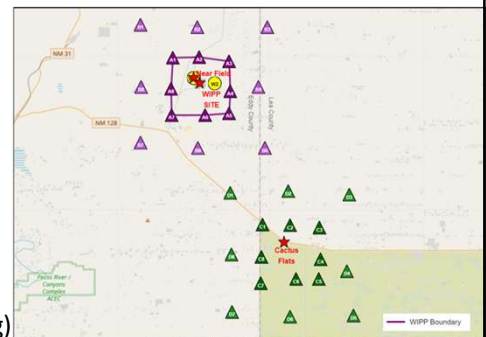
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Soil Sampling

- Near Field, Cactus Flats, and 2 additional sites with NMED/WIPP coordination (4 sites total)
- Multiple sampling points per site
- Sampling of 3 different depths at each point (depth profiling)
- Radiological components:
 ^{241}Am , ^{90}Sr , ^{238}Pu , $^{239+240}\text{Pu}$, $^{233+234}\text{U}$, ^{235}U , ^{238}U , ^{60}Co , ^{137}Cs , ^{40}K ;
adding in 2026: ^{237}Np , ^{242}Pu , ^{226}Ra , ^{228}Ra , ^{99}Tc , ^{230}Th , ^{232}Th , ^{236}U



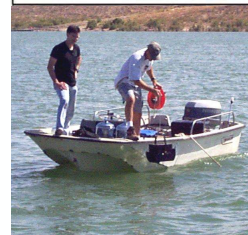
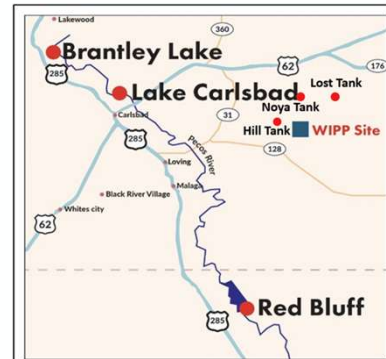
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Surface Water Sampling

- Lake Carlsbad, Brantley Lake, Red Bluff Lake, and 3 additional sites with NMED/WIPP coordination (6 sites total); *adding in 2026*: monthly sampling of Laguna Cinco spring near WIPP
- Shallow and deep samples in each reservoir
- Radiological components:
 ^{241}Am , ^{90}Sr , ^{238}Pu , $^{239+240}\text{Pu}$, $^{233+234}\text{U}$, ^{235}U , ^{238}U , ^{60}Co , ^{137}Cs , ^{40}K ;
adding in 2026: ^{237}Np , ^{242}Pu , ^{226}Ra , ^{228}Ra , ^{99}Tc , ^{230}Th , ^{232}Th , ^{236}U
- Non-radiological components: Density, conductivity, alkalinity, pH, TOC, TDS, TSS, Ca, Mg, K, Na, Cl^- , NO_3^- , SO_4^{2-} , PO_4^{3-} , Sb, As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Tl, V



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Drinking Water Sampling

- Sheep Draw, Double Eagle, Hobbs, Loving, Malaga, Otis (6 sites)
- Radiological components:
 ^{241}Am , ^{90}Sr , ^{238}Pu , $^{239+240}\text{Pu}$, $^{233+234}\text{U}$, ^{235}U , ^{238}U , ^{60}Co , ^{137}Cs , ^{40}K ;
adding in 2026: ^{237}Np , ^{242}Pu , ^{226}Ra , ^{228}Ra , ^{99}Tc , ^{230}Th , ^{232}Th , ^{236}U
- Non-radiological components: Density, conductivity, alkalinity, pH, TOC, TDS, TSS, Ca, Mg, K, Na, Cl^- , NO_3^- , SO_4^{2-} , PO_4^{3-} , Sb, As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Tl, V



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Groundwater Sampling

- Groundwater wells on site (WQSP-1, WQSP-2, WQSP-3, WQSP-4, WQSP-5, and WQSP-6)
- Radiological components:
 ^{241}Am , ^{90}Sr , ^{238}Pu , $^{239+240}\text{Pu}$, $^{233+234}\text{U}$, ^{235}U , ^{238}U , ^{60}Co , ^{137}Cs , ^{40}K ;
adding in 2026: ^{237}Np , ^{242}Pu , ^{226}Ra , ^{228}Ra , ^{99}Tc , ^{230}Th , ^{232}Th , ^{236}U
- Non-radiological components: Density, conductivity, alkalinity, pH, TOC, TDS, TSS, Ca, Mg, K, Na, Cl^- , NO_3^- , SO_4^{2-} , PO_4^{3-} , Sb, As, Ba, Be, Cd, Cr, Pb, Hg, Ni, Se, Ag, Tl, V

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Vegetation Sampling

- On Site, Near Field, Cactus Flats, WIPP East, Carlsbad, Loving (6 sites) – locations around airborne particulate sampling locations
- Radiological components:
 ^{241}Am , ^{90}Sr , ^{238}Pu , $^{239+240}\text{Pu}$, $^{233+234}\text{U}$, ^{235}U , ^{238}U , ^{60}Co , ^{137}Cs , ^{40}K ;
adding in 2026: ^{237}Np , ^{242}Pu , ^{226}Ra , ^{228}Ra , ^{99}Tc , ^{230}Th , ^{232}Th , ^{236}U



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Sediment Sampling

- Lake Carlsbad, Brantley Lake, and Red Bluff Lake (3 sites)
- Radiological components:
 ^{241}Am , ^{90}Sr , ^{238}Pu , $^{239+240}\text{Pu}$, $^{233+234}\text{U}$, ^{235}U , ^{238}U ,
 ^{60}Co , ^{137}Cs , ^{40}K ;
adding in 2026: ^{237}Np , ^{242}Pu , ^{226}Ra , ^{228}Ra , ^{99}Tc ,
 ^{230}Th , ^{232}Th , ^{236}U



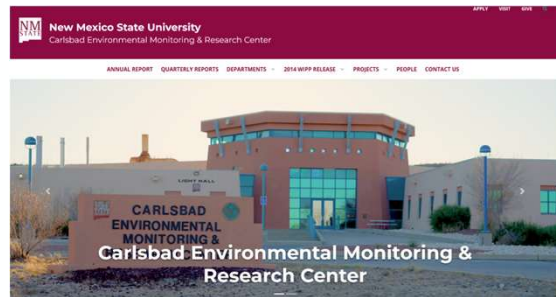
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CEMRC Unique Capabilities

- Rapid detection of accidental releases of radionuclides
- State-of-the-art whole-body counting system that can detect radioactive elements at extremely low levels
- Ability to monitor radionuclides to below background levels, not just compliance levels
- Free access of the public to the whole-body counting program and monitoring data (www.cemrc.org)
- Only organization combining all aspects of monitoring, including sampling, analyzing, and reporting



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Departments and Capabilities

- Radiochemistry
- Environmental Chemistry
- Internal Dosimetry
- Field Programs
- Information Management
- Quality Assurance

www.cemrc.org



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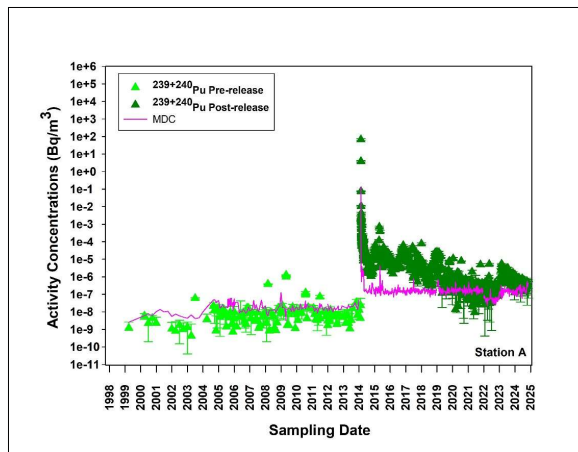
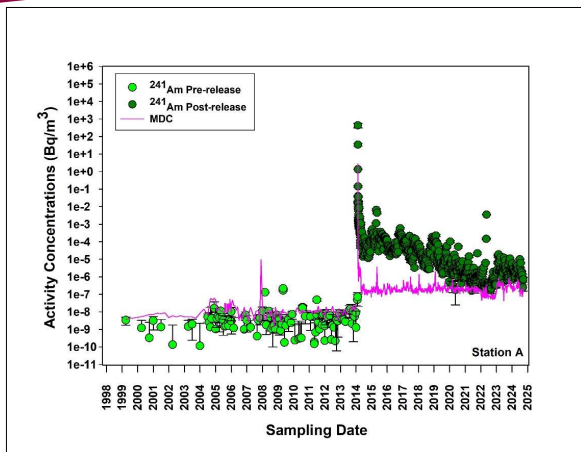
Radiochemistry

- Sample preparation and processing, including separation and purification to determine the activity of alpha, beta, and gamma-radiation emitting radioisotopes
- Gas proportional counters
- Alpha spectrometers
- Gamma spectrometers



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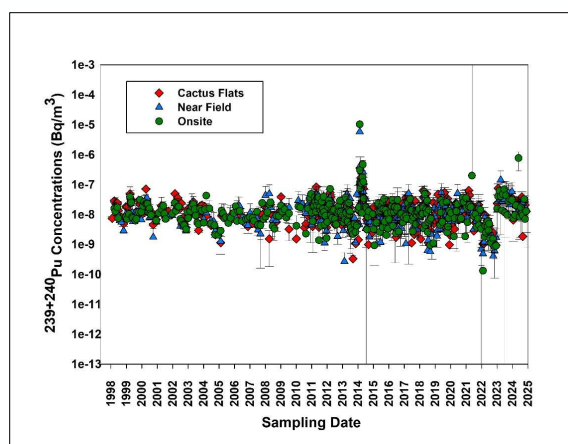
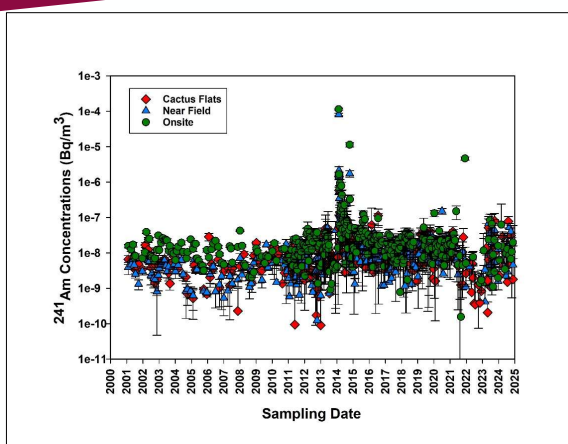
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Historical Concentrations of ^{241}Am and $^{239+240}\text{Pu}$ at Station A

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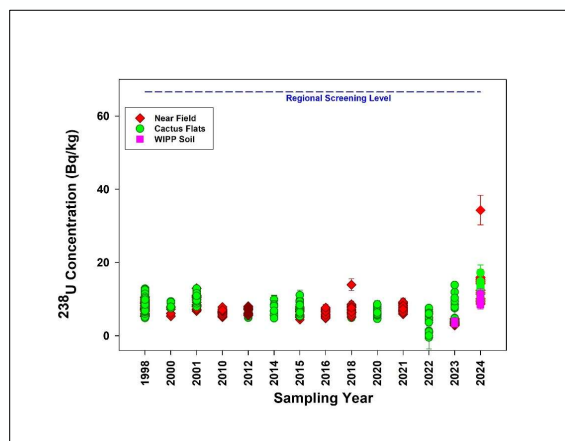
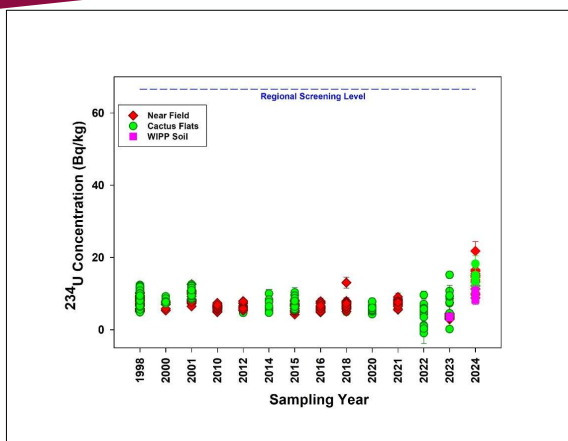
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Historical Concentrations of ^{241}Am and $^{239+240}\text{Pu}$ at the Cactus Flats, Near Field, and Onsite Stations

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Historical Concentrations of ^{238}U and ^{234}U in Soils

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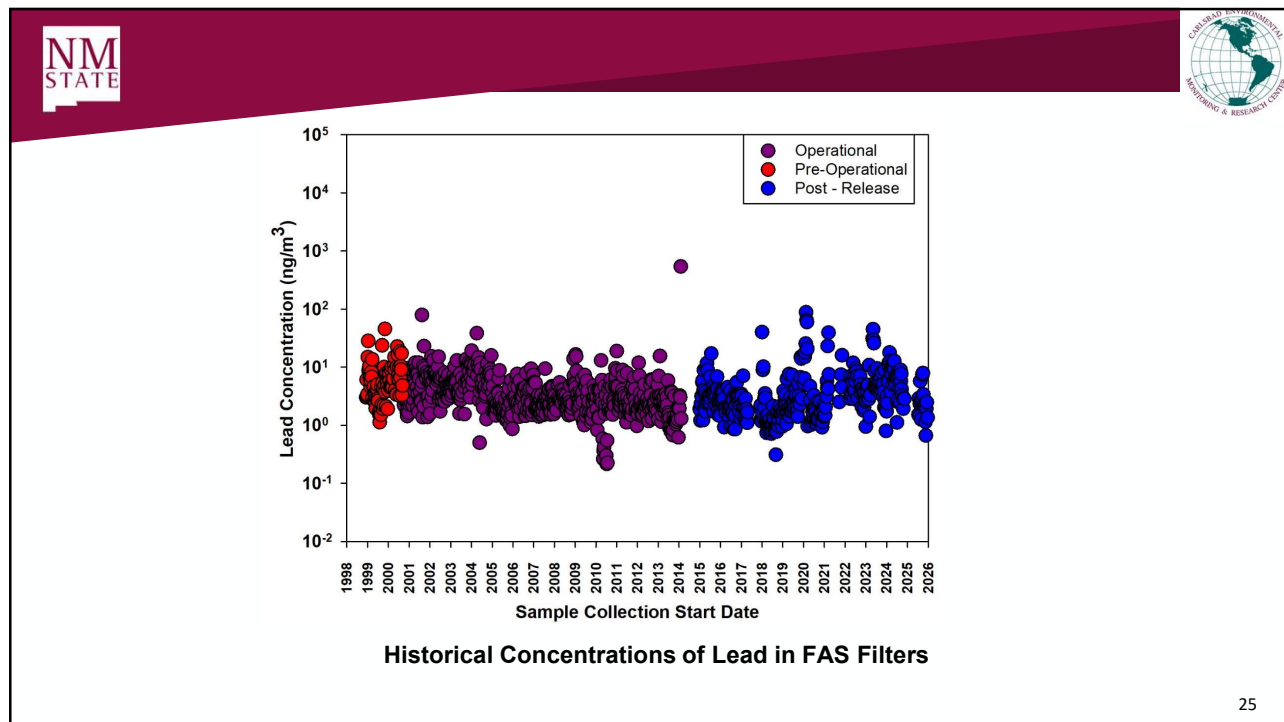
Environmental Chemistry

- Sample preparation and processing, including digestion and purification to determine the concentration of anions, cations, metals, and metalloids
- Microwave ovens (digestions)
- Ion chromatograph (IC) – anions and cations
- Inductively coupled plasma – mass spectrometer (ICP-MS) – metals and metalloids



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Internal Dosimetry

- *In-vivo* radiobioassays, including lung and whole-body counts
- *Lie Down and Be Counted* (LDBC) public program

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CEMRC Monitoring Contract Renewal

- Funded through U.S. Department of Energy – Office of Environmental Management
- Performance Period: 7/1/2026 to 6/30/2031
- Total Funding: \$22,122,374
- Equipment: \$2,253,983 (10.19% of total)

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Challenges – Infrastructure



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