

Independent Monitoring of the Waste Isolation Pilot Plant (WIPP)

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CEMRC Origins

- Created in 1991 as a division within NMSU's College of Engineering
- Funded primarily by the Department of Energy Office of Environmental Management (DOE-EM) through a financial Assistance Grant
 - Guarantees *less substantial involvement* by DOE
 - Non-competitive, \$3M per year (~80% of total funding)
 - Independent monitoring of WIPP's impact on human health and the environment



Environmental Monitoring of WIPP Operations

■ Monitoring activities:

- WIPP Underground Exhaust Air
- Ambient Air
- Drinking Water
- Soil and sediments
- Surface Water
- Whole Body Counting
- R&D on extraction and analytical methods

■ Very unique capabilities:

- Detection of radionuclides at sub-compliance levels
- Radionuclide source identification
- Very rapid sample turnaround and publication of results



Exhaust Air (Station A)



Ambient Air Station



Soil & sediments



Drinking water



Surface water

In- vivo Bioassay

- State-of-the-art lung & whole body counting facility
 - 30 minute count times
- Free *in-vivo* bio-assay services to citizens in the vicinity of the WIPP
- Screens for over 30 natural and anthropogenic gamma and X-ray emitting radionuclides
- Ages 13+, following the 2014 accidental release; 18+ yr prior



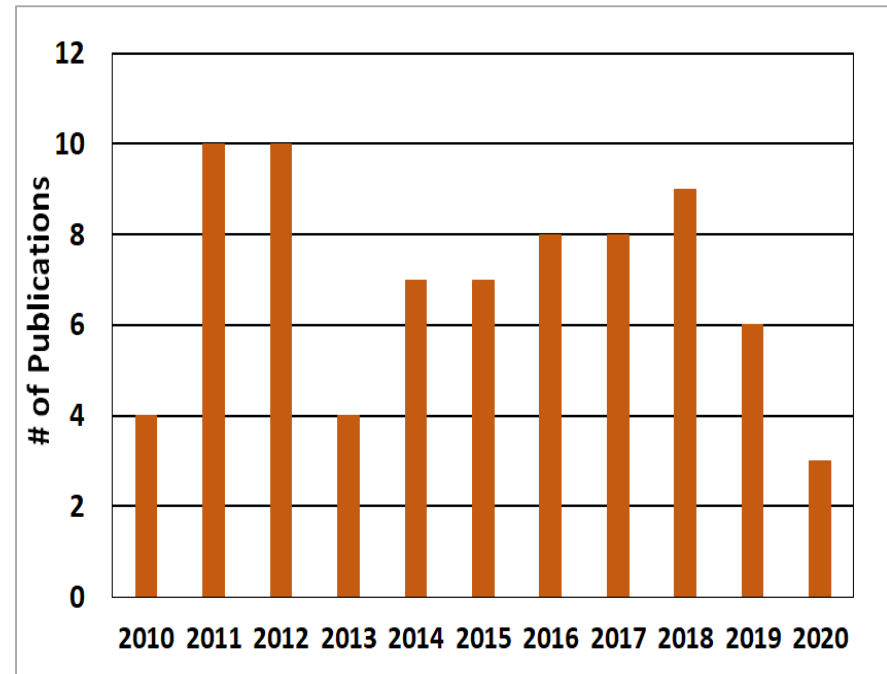
CEMRC's Whole body counting facility

Importance to the DOE/SE New Mexico

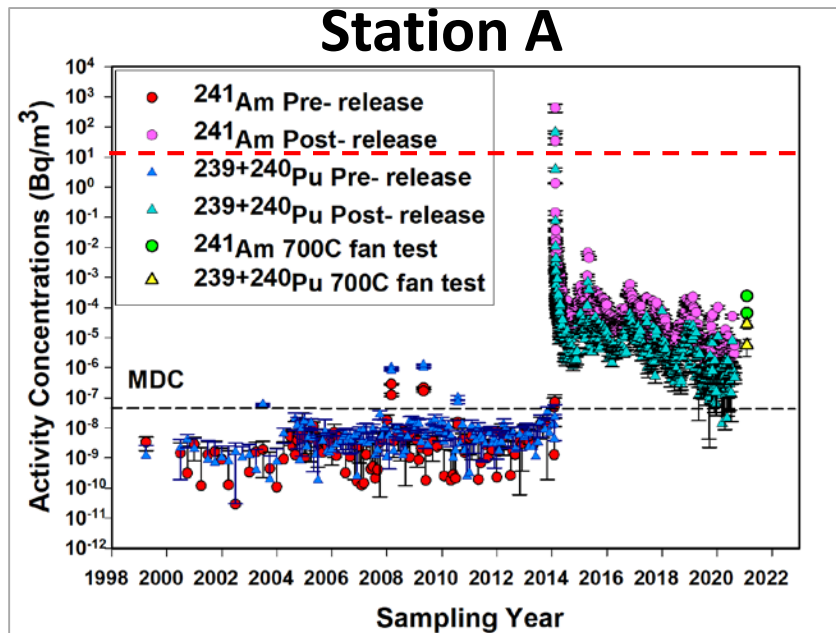
- DOE and WIPP remain welcomed neighbors in SE NM, largely because of commitment to safety and transparency (e.g., CEMRC, NMED-DOE-OB)
- CEMRC's independence and community-base increases credibility in oversight, bringing balance to the relationship with the DOE
 - *Minimal concern in the region over radioactive releases*
 - *Easier to alleviate community fears and restore confidence*
- Recognized by the Blue-Ribbon Commission on America's Nuclear Future as model relationship, between an Implementer and a Host Community.
- University affiliation and economy of scale help to maintain costs, a benefit to long-term program like WIPP.

CEMRC's Accomplishments (Last 10 Years)

- Detected Fukushima NPP fallout in 2011
- First to detect radioactive release following the WIPP 2014 event
- Developed a capability to analyze and report radionuclide activities within **48 hr** of a release
- Evidence-supported recommendation for restart of 700 Fans and return to unfiltered exhaust, as far back as 2017
- First to report data from 700C fan 4-hr test in late Jan 2021.
- Innovative methods to characterize radionuclides associated with unconventional oil and gas, and to separate from WIPP-related isotopes.

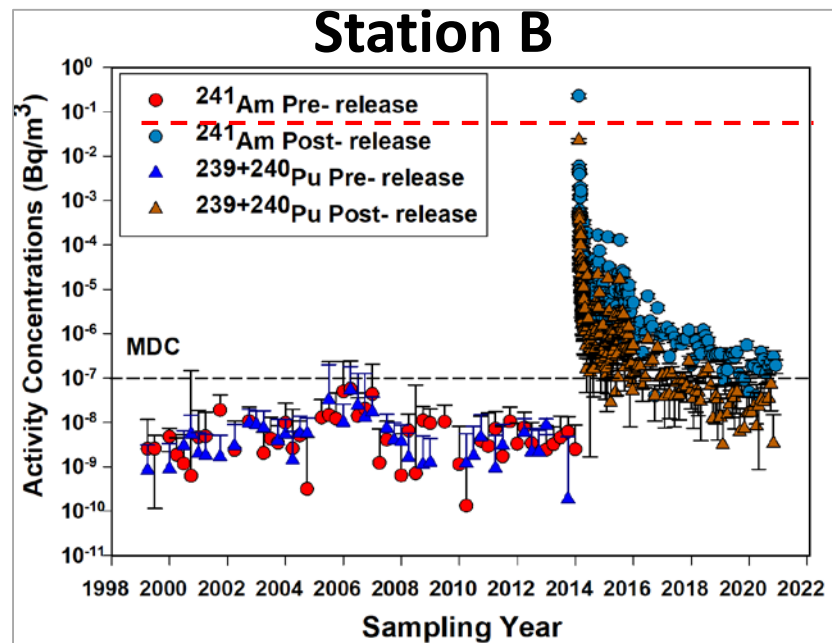


Overview of Radiation levels in WIPP Underground Air



1 DAC Pu-239

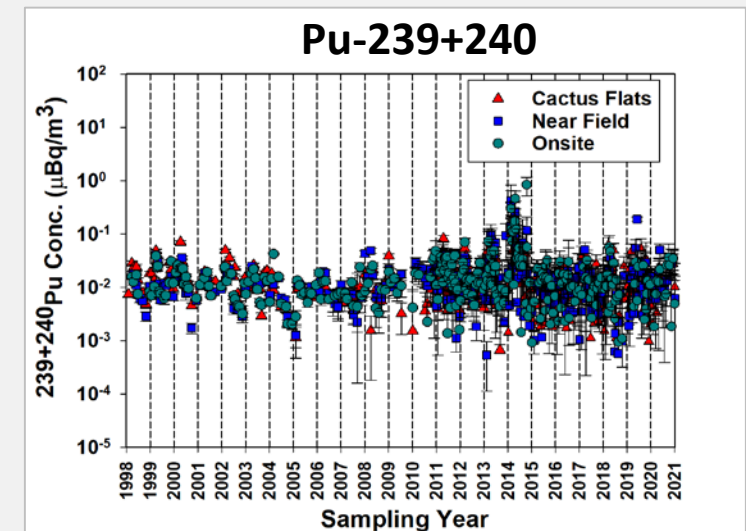
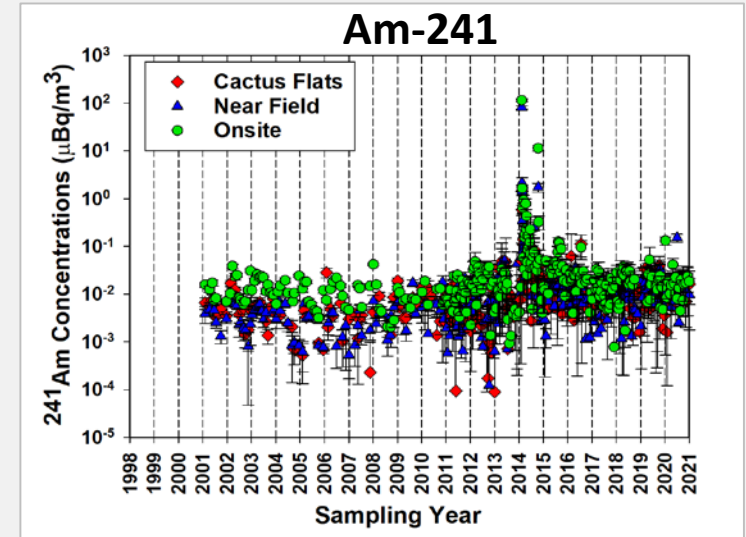
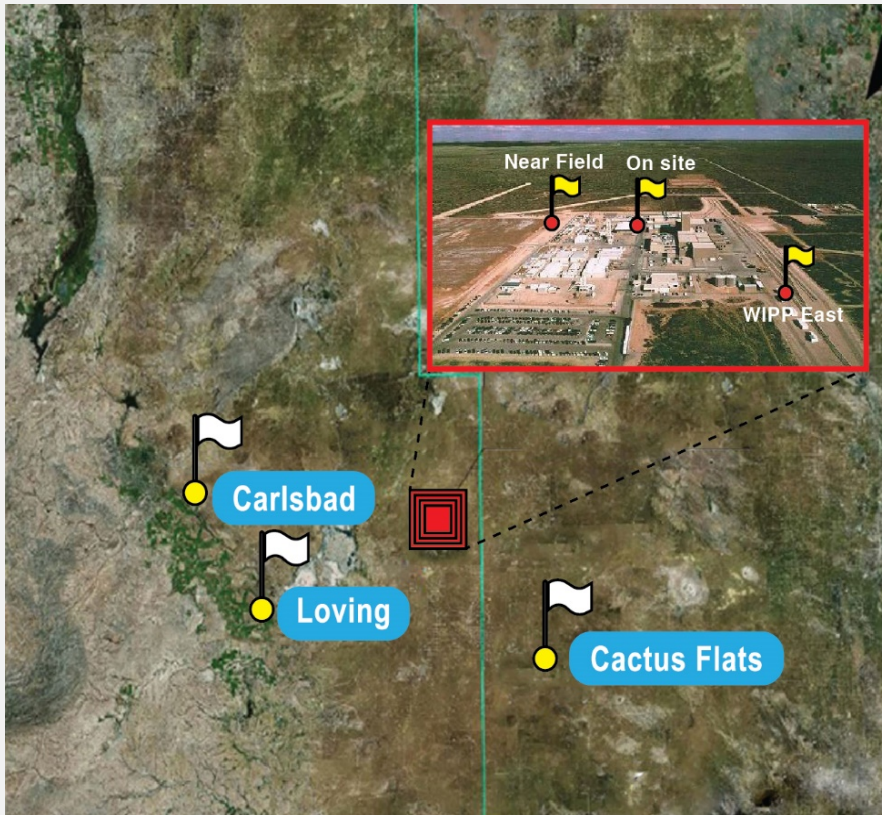
Unfiltered (Pre-HEPA) exhaust air



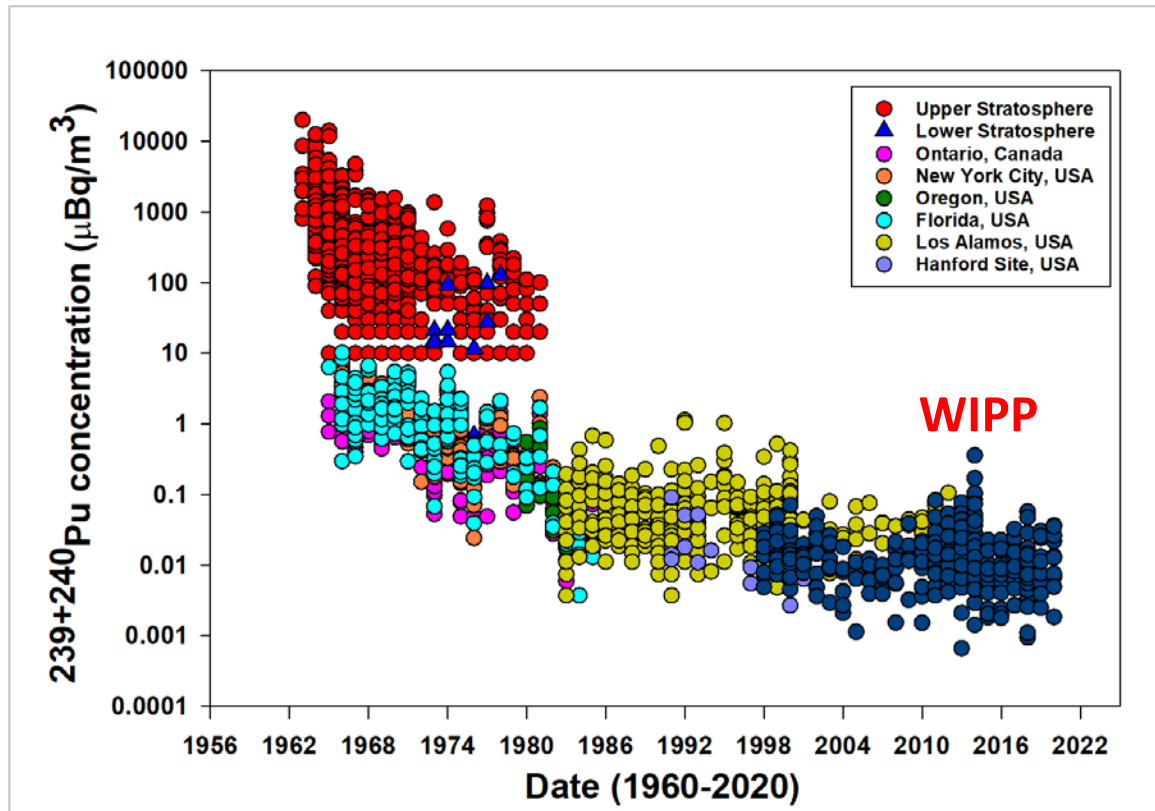
Post-HEPA (Filtered) exhaust air after 2014
Event

On site and Off Site Monitoring Stations

CEMRC Air sampling sites



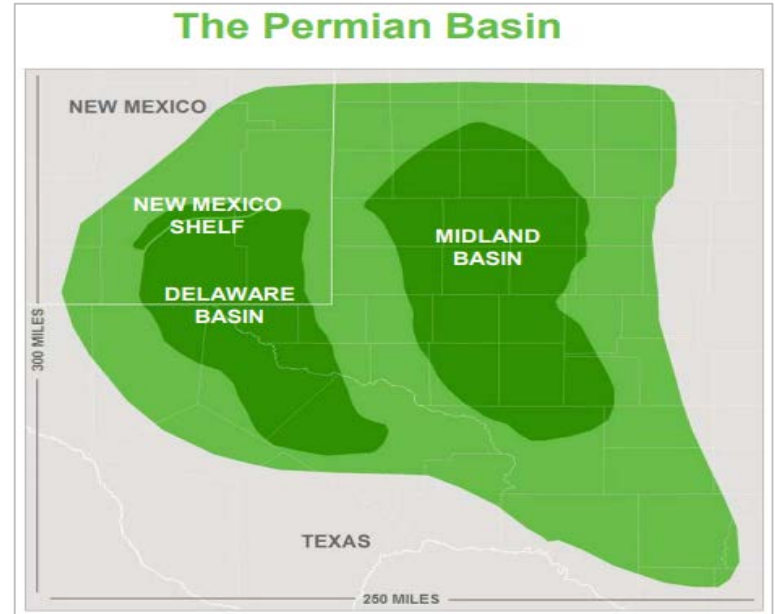
Putting WIPP Radiation into Context



Plutonium Ambient Air Concentrations in the US
since 1960

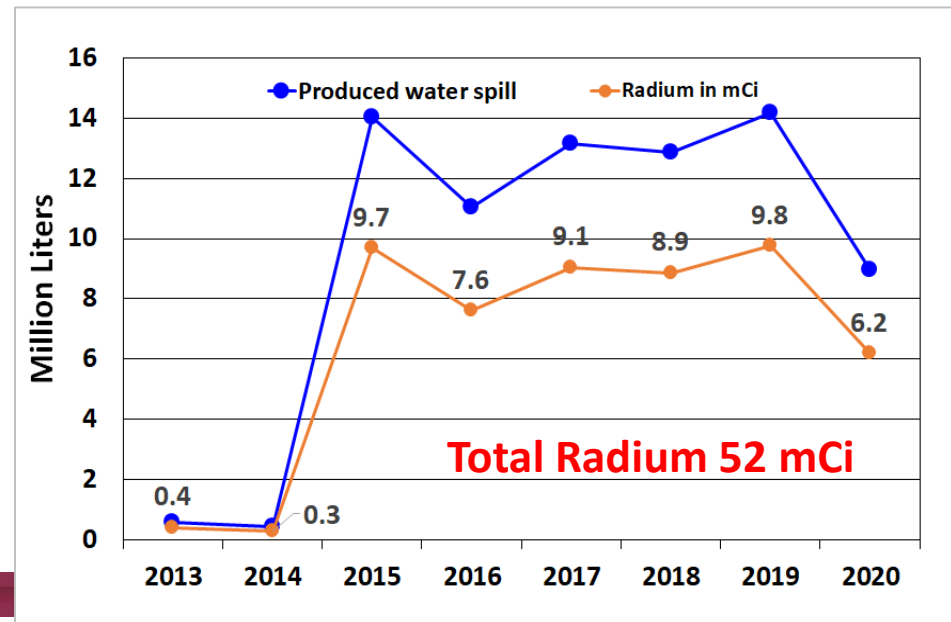
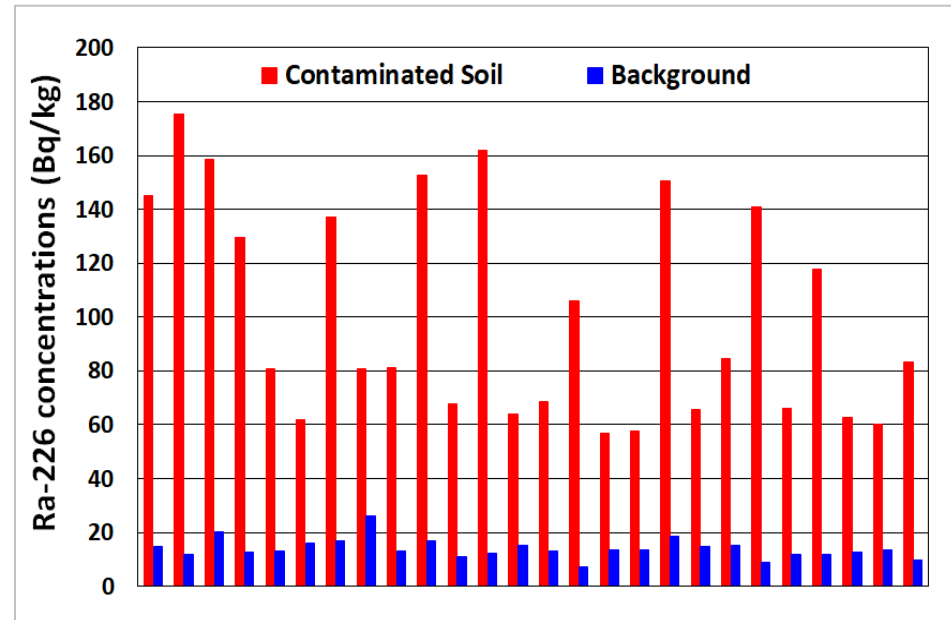
Oil and Gas Wastes in Southeastern New Mexico

- The Permian Basin of Southeastern NM and West Texas is the largest petroleum producing basin in the United States.
- Fracking generates technologically enhanced natural occurring radioactive materials (TENORM).
- Dominant radionuclides in TENORM: Ra, U, Th, Po and Pb.
- One emerging concern is the water use and the risk from fracking wastes to the human health and to the environment.



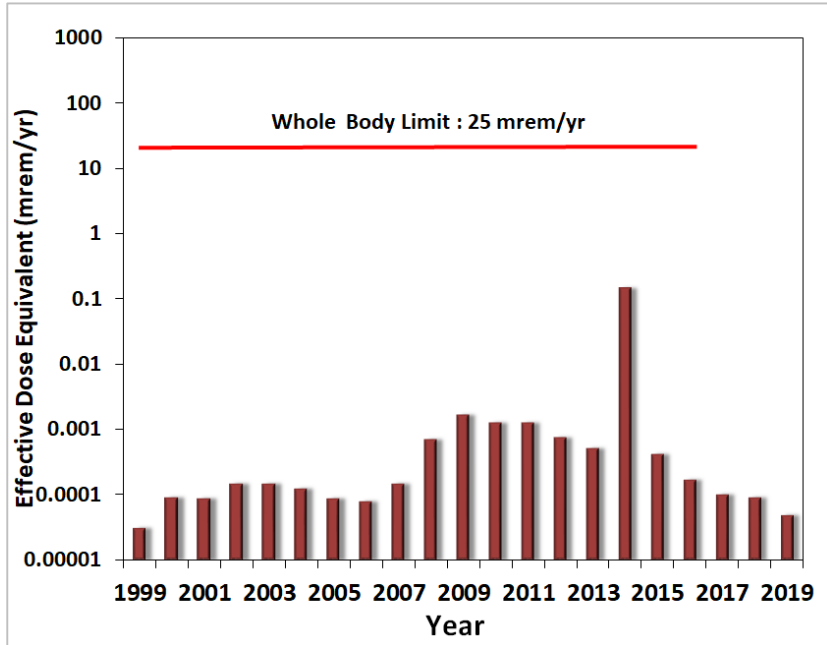
Radionuclides in Fracking wastes

- According to Center for Western Priorities 1,217 oil and gas related spills were reported in New Mexico in 2020.
- About 88% of the spills occurred in Eddy and Lea counties.
 - ~9 million Liters of Produced water
 - >2 million liters of crude oil
 - 1.7 billion cubic feet of natural gas
- In 2020 alone 2.3×10^8 Bq (6.2 mCi) of Radium have been accumulated in top soil.
- Ra-226 in Permian Produced water range from 19-35.9 Bq/L (EPA disposal criteria to surface water **2.22 Bq/L**).

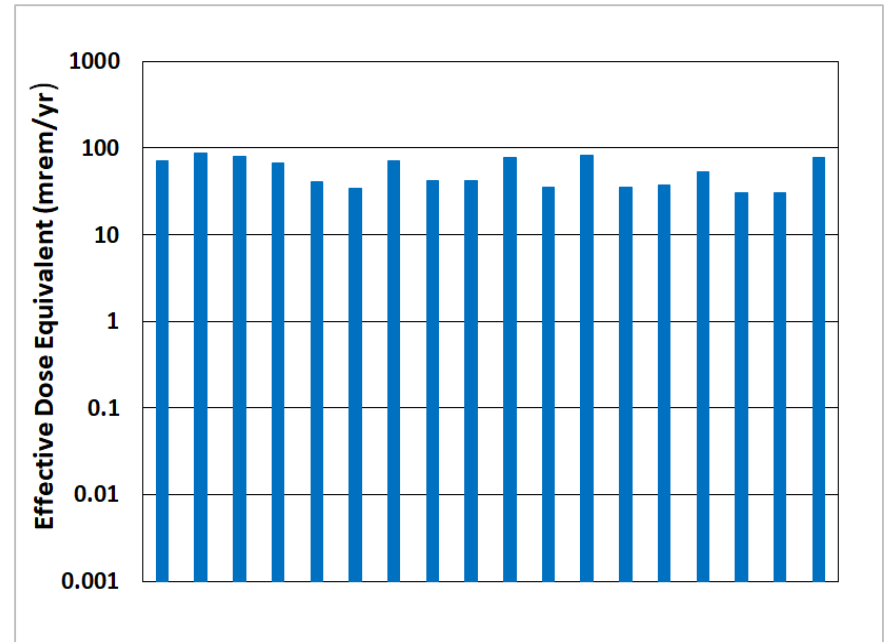


Dose to the Public

Natural radiation dose per person in the US 6.2 mSv (620 mrem).



WIPP Operations



Dose from oil and gas operation

Take home message:

- ❖ Nothing in life to be feared, it is only to be understood. Now it is the time to understand more so we may fear less- [Nobel laureate Madam Curie](#)

CEMRC's Strategic Vision: 2021-2025

- Environmental monitoring in the 21st century-expand mission from “legacy” contaminants to include a broad diversity of contaminants in the environments such as radionuclides in the oil and gas exploration.
- Develop capabilities to detect radionuclides in femto- gram (10^{-15}) level of TRU radionuclides in environmental samples.
- Develop an automatic on-line separation method using EC columns and ICP-MS to reduce the analytical time and effort needed to determine TRU radionuclides in various sample media.
- Develop a centralized and easily accessible WIPP's historical monitoring database to all interested parties.
 - **Radiation data must include information for public to use, to properly interpret data without creating panic.**
- Continue to support WIPP's mission by maintaining relationships with the host community – local and online.