Environmental Air Monitoring for the Moab UMTRA Project

December 14, 2005 – Thompson Springs

December 15, 2005 – Moab

Agenda

- Purpose of Monitoring
- Types of Radiation and Exposure Pathways
- Constituents Monitored
- Monitoring Locations
- Data Collectors
- Monitoring Results
- Comparison of Exposure Risks
- Protection of Workers and the Public
- Summary
- Contacts

Purpose of Monitoring

- Collect baseline data now
- Compare to future data collected as project progresses
- Compare data to applicable standards and watch for data trends

Types of Radiation and Exposure Pathways

- Alpha
  - Particles
  - Radon gas is an alpha emitter
  - Pathway is inhalation
  - Low energy; can be shielded by paper
- Gamma and radioparticulates
  - Gamma waves and particles
  - Pathways are ingestion and direct exposure (through skin)
  - High energy; requires lead or steel to shield

Constituents Monitored as Required by DOE Order

- Radon gas (radon-222)
  - Picocuries per liter (pCi/L) is unit of measure
  - Guideline is 3.0 pCi/L above background
- Gamma
  - Millirem per year (mrem/yr) is unit of measure
  - Guideline is 100 mrem/yr above background
- Fugitive dust emissions
  - Visible emissions; DOE's goal is 0 percent opacity
  - Controlled through dust suppression (calcium chloride) and administrative procedures such as speed limits
  - State of Utah standard is 20 percent opacity

Constituents Monitored as Required by DOE Order (continued)

- Radioparticulates
  - Thorium-230, polonium-210, radium-226, and total uranium
  - Microcuries per milliliter (µCi/mL) is unit of measure
  - Monitor to determine if mill tailings are becoming airborne

Guidelines for Radioparticulates

- DOE published derived concentration guide (DCG) values for inhaled air for various radioisotopes
- A DCG value represents the concentration from a specific radionuclide that would cause a member of the public, residing at the point of collection, to receive a dose of 100 mrem/yr
  - Exposures to public above this limit are considered unacceptable
- DCG values for the radionuclides included in DOE monitoring program at the Moab site are shown in the following table

Summary of Derived Concentration Guide Values for Inhaled Air Radionuclides Monitored at the Moab Site

Radionuclide	Derived Concentration Guide Value (µCi/mL)[a]
Radium-226	1×10^{-12}
Thorium-230	4×10^{-14}
Polonium-210	1×10^{-12}
Total uranium	2×10^{-12}

[a]µCi/mL = microcuries per milliliter.

Constituents Monitored as Best Management Practice (continued)

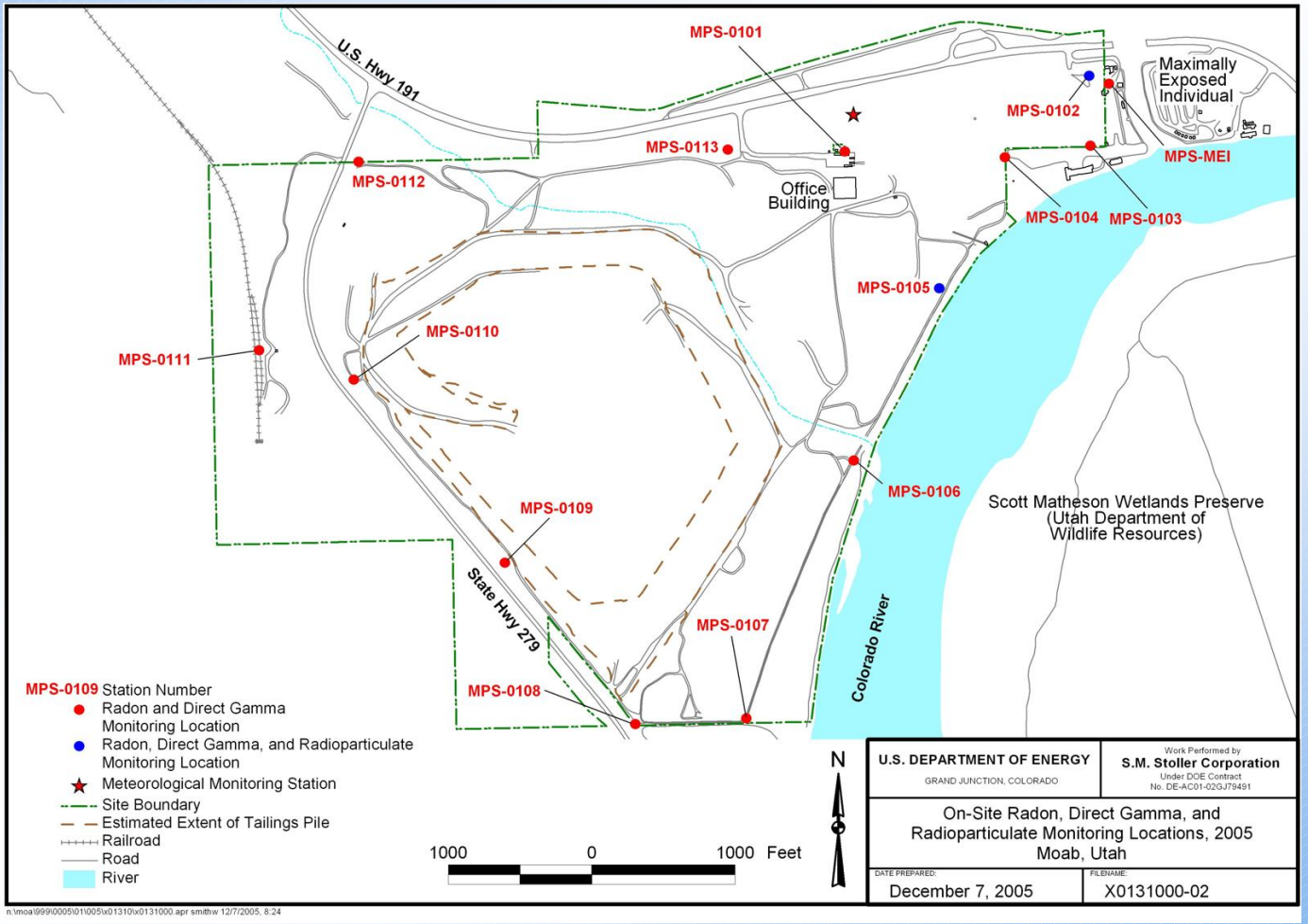
- Meteorological parameters
  - Wind speed and direction
  - Evaporative transpiration potential
  - Solar radiation
  - Relative humidity
  - Temperature
  - Precipitation

Constituents Monitored as Best Management Practice (continued)

- Particulate matter-10 (PM-10)
  - PM-10 is particulate matter smaller than 10 microns, which is about 4/1000 inch
  - Will be monitored in future; monitoring equipment not installed yet
  - Data will be used to determine how much dust is being generated during project operations
  - No State of Utah standard or DOE guideline

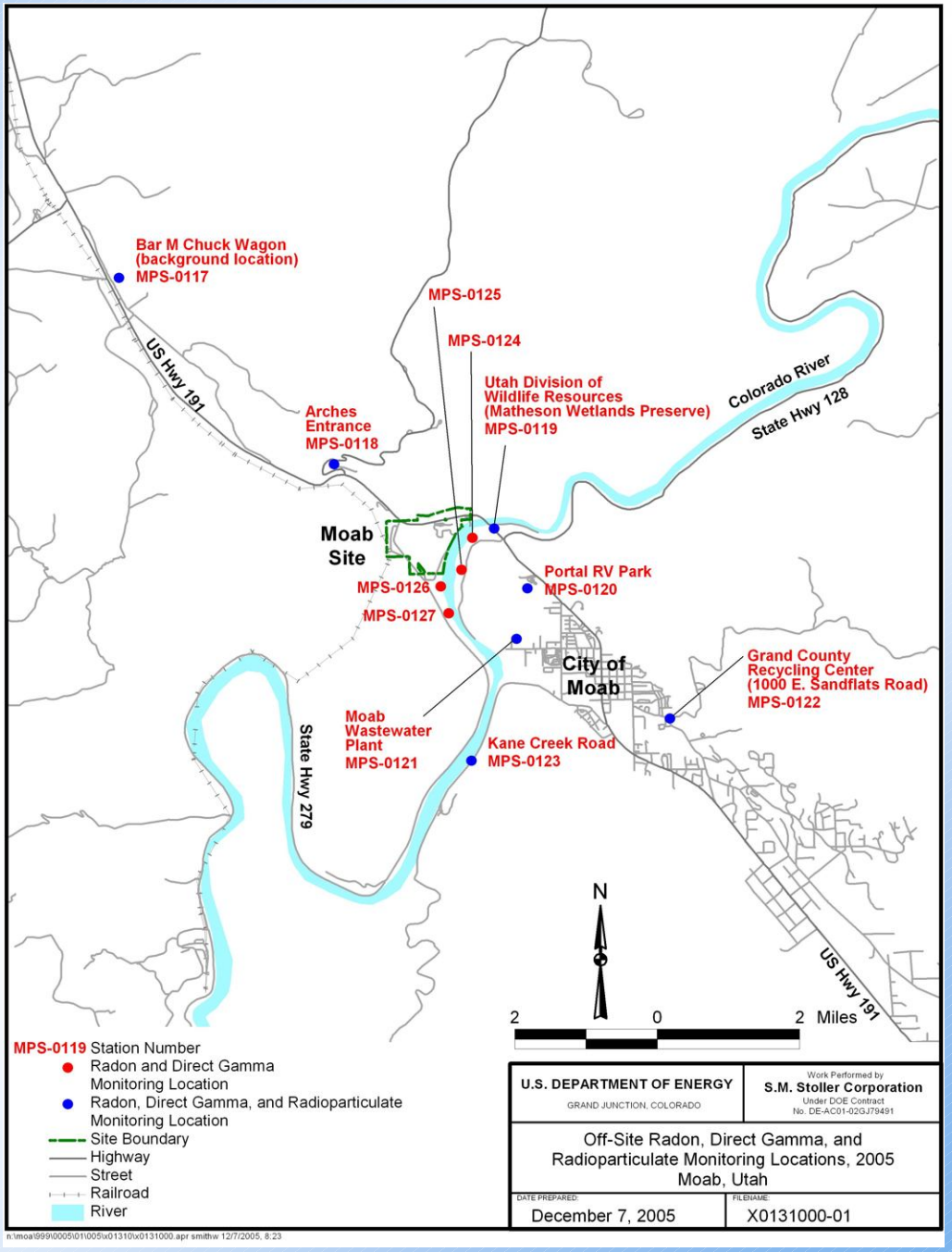
Monitoring Locations

Moab On Site



Monitoring Locations (continued)

Moab Off Site

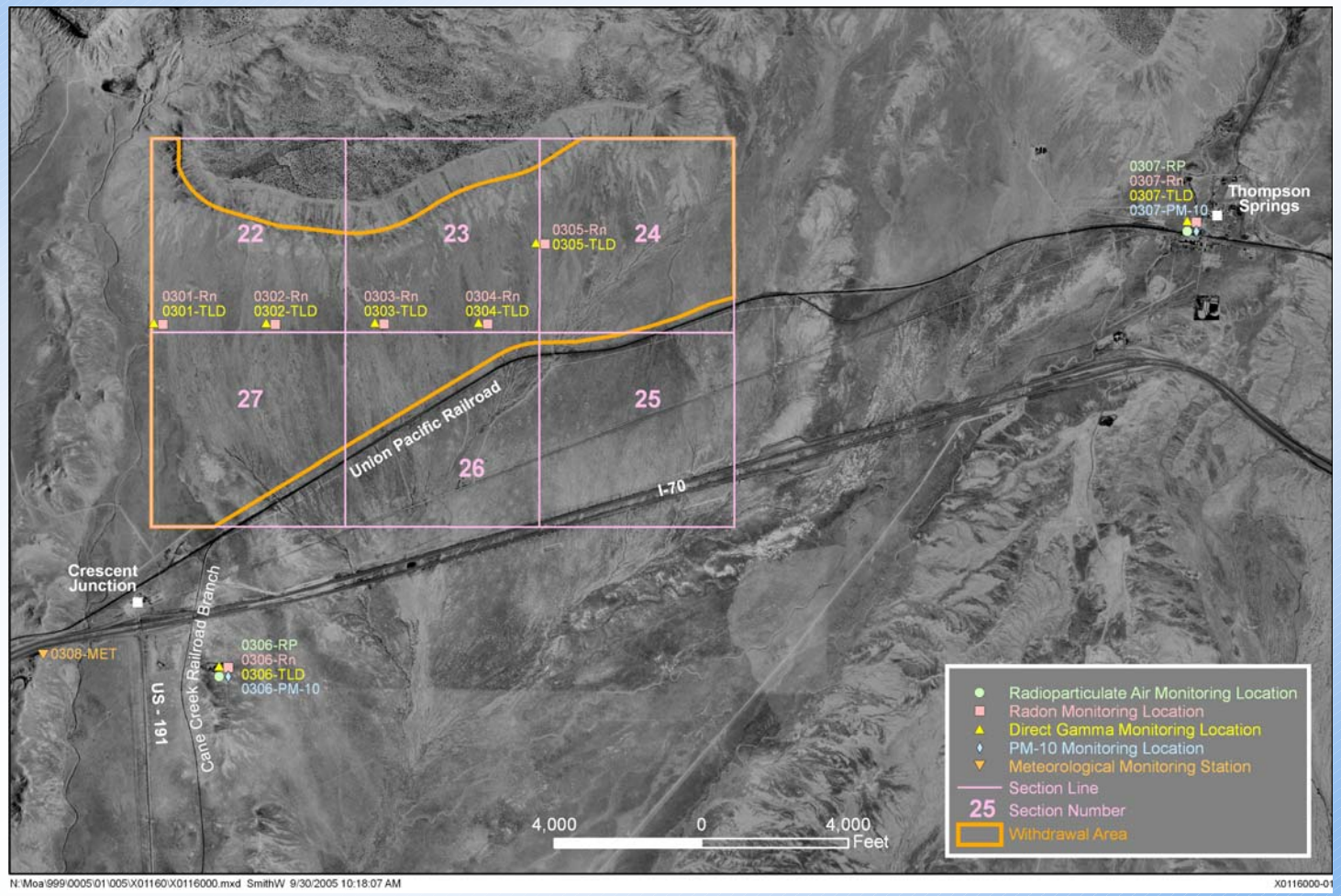


Monitoring Locations (continued)

- Moab
  - 13 on-site stations for radon and gamma
  - 11 off-site stations for radon and gamma
  - 9 radioparticulate monitoring stations (2 on site and 7 off site)
  - Residential monitoring at maximally exposed individual (MEI) location (radon and gamma)
  - Meteorological monitoring station at Moab Project Site
  - DOE will be moving one off-site location from maintenance building at the Arches National Park to Visitor's Center

Monitoring Locations (continued)

Crescent Junction and Thompson Springs



Monitoring Locations (continued)

- Crescent Junction
  - Five air monitoring stations for radon and gamma within disposal cell sections
  - Residential monitoring at one location
    - Exterior air monitoring station for radon, direct gamma, and radioparticulates
    - Indoor radon monitoring
  - Meteorological monitoring station at Rest Area near Crescent Junction
- Thompson Springs
  - Residential monitoring at one location
    - Exterior air monitoring station for radon, gamma, radioparticulates, and indoor direct gamma
    - Indoor radon monitoring

Data Collectors

- Thermoluminescent dosimeter (TLD) badge
- Radon TrackEtch cup
- Particulate sampler

Monitoring Results

Moab air monitoring results for first quarter of 2005

- **Radon-222:** Guideline of 3.6 pCi/L exceeded at one on-site monitoring location
  - No off-site radon monitoring locations exceeded guideline; radon dissipates quickly
- **Direct gamma:** Elevated gamma measurements (above DOE gamma dose limit of 181 mrem/yr for Moab Site) observed at eight on-site monitoring locations
  - No off-site monitoring locations exceeded dose limit

Monitoring Results (continued)

Moab air monitoring results for first quarter of 2005 (continued)

- **Radioparticulates:** No guidelines or radiological exposure limits exceeded at any of the nine radioparticulate monitoring locations
  - Annual averages for airborne radioparticulate concentrations do not exceed the DCG values at any of the on-site or off-site locations
  - These data demonstrate that emissions of airborne radioparticulate matter do not exceed levels or concentrations that would result in an unacceptable public exposure
  - Monitoring data show that actual airborne concentrations were consistently 2 to 4 orders of magnitude below their respective DCG values

Monitoring Results (continued)

No results available yet for Crescent Junction and Thompson Springs

- Expect results similar to sampling location at Bar-M Chuckwagon in Moab

Monitoring Results (continued)

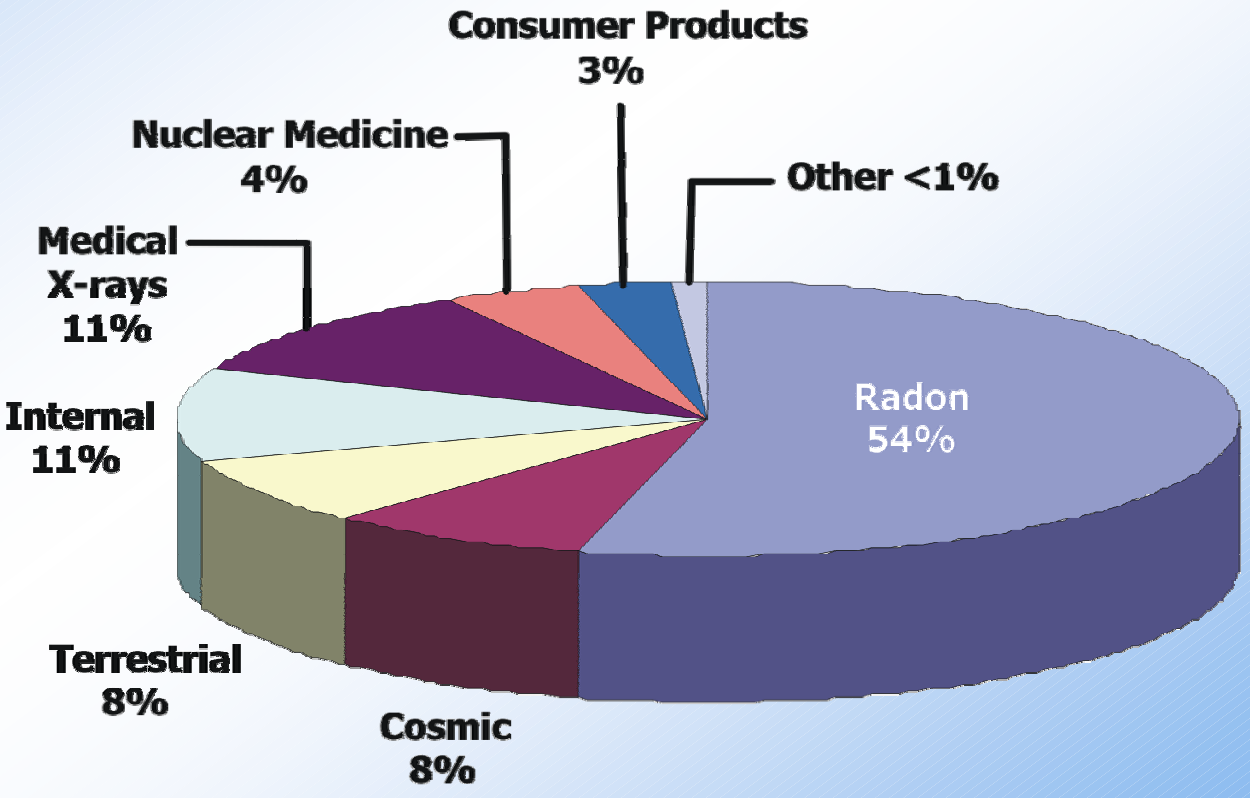
- Availability of monitoring results
  - Quarterly reports for Moab stations are currently available on Moab Project website and in Public Reading Rooms
  - Separate quarterly report will be produced for Crescent Junction and Thompson Springs stations; first one will be published in January 2006
  - Residential results will be discussed with property owner
- Evaluation and review of data
  - Internal data validation provided by contractor

Summary of Constituents Monitored, Units of Measure, Guidelines, and Monitoring Results

Constituent	Unit of Measure	Standard or Guideline	Results From 1st Quarter 2005
Radon gas	pCi/L	3.0 pCi/L above background	One on-site station exceeded guideline, no off-site stations exceeded guideline
Gamma	mrem/yr	100 mrem/yr above background	Elevated gamma at eight on-site locations
Radioparticulates Thorium-230 Polonium-210 Radium-226 Total uranium	µCi/mL	DCG value 1×10^{-12} 4×10^{-14} 1×10^{-12} 2×10^{-12}	No standards or radiological exposure limits exceeded
Fugitive dust emissions	% opacity	20% opacity (State of Utah)	0% opacity achieved majority of time
Particulate matter-10 (PM-10)	N/A	N/A	Will monitor in future

Comparison of Exposure Risks (continued)

The **average annual dose** to a person living in the United States is 360 mrem/yr. All natural and man-made sources of radiation contribute to this number.



Comparison of Exposure Risks (continued)

Occupational Exposure

- In addition to exposure to natural and man-made background radiation, there are occupational sources of radiation
- 10 *Code of Federal Regulations* Part 835 governs occupational radiation protection for all DOE sites
  - The whole body radiation dose limit for general radiological workers is 5,000 mrem/yr
  - The limit for non-radiological workers is 100 mrem/yr
  - This occupational dose is in addition to the average non-occupational dose of 360 mrem/yr
- DOE Moab established an administrative control level of 500 mrem/yr to ensure regulatory limits are not exceeded

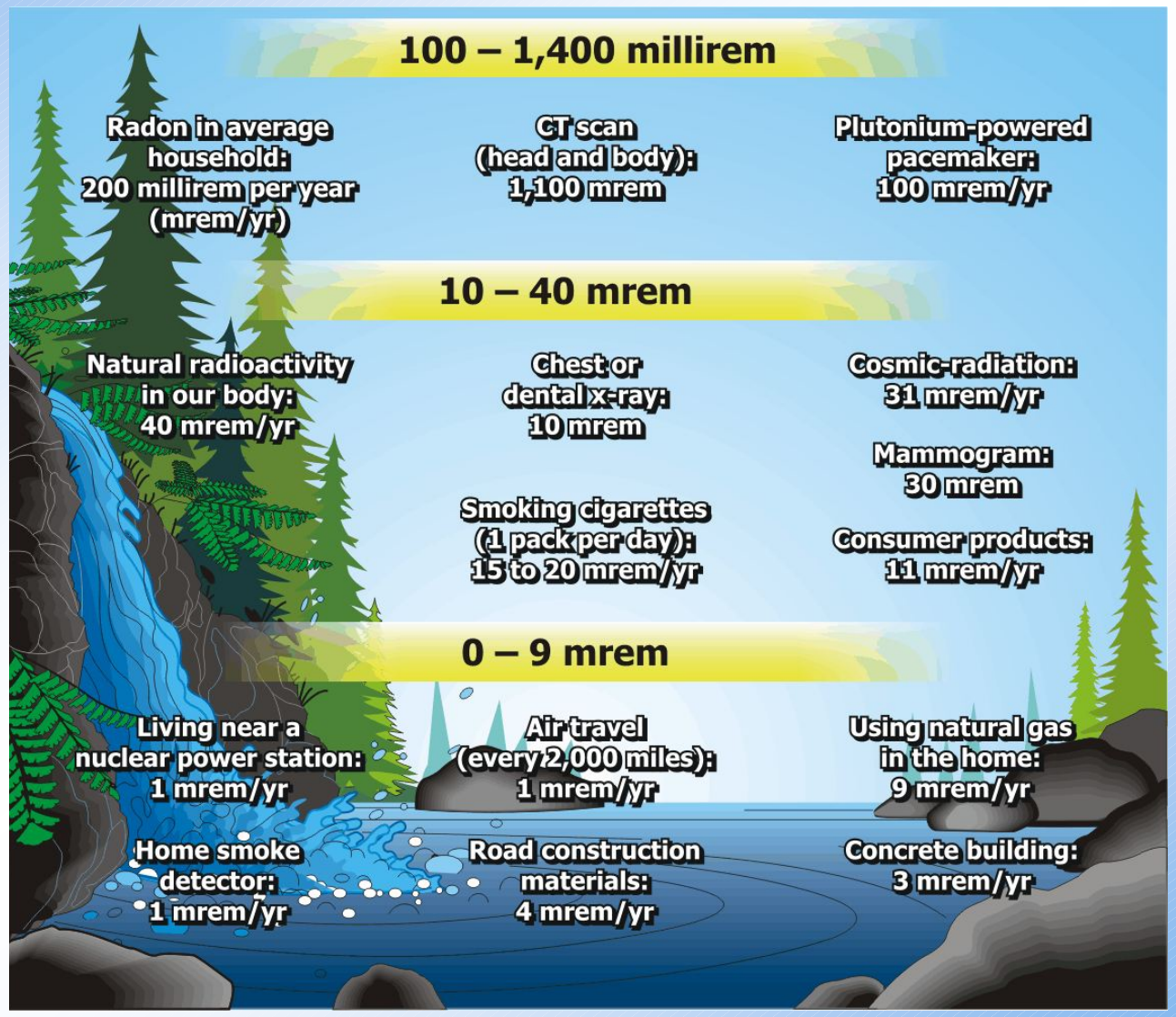
Comparison of Exposure Risks

Average Annual Radiation Dose for Various Occupations

This table compares the average amount of occupational radiation dose DOE-approved radiological workers receive to those in other occupations associated with radiation exposures

Occupation	Attributed Dose (mrem/yr)
Airline Flight Crew Member	400–600
Nuclear Power Plant Worker	300
DOE Radiological Worker	75
Medical Personnel	70

Levels of Radiation



Protection of Workers and the Public

- ALARA Program
  - DOE tries to keep exposures **A**s **L**ow **A**s **R**easonably **A**chievable using these concepts:
    - Time: reducing the time spent in a radiological area reduces your dose
    - Distance: increasing the distance between you and the radiation source reduces your dose
    - Shielding: increasing the amount of shielding around a radiation source reduces your dose

Protection of Workers and the Public (continued)

- Worker monitoring program
  - TLDs
  - Radon TrackEtch cups
- Site boundary monitoring
- MEI monitoring
  - Caretaker for Tex McClatchy
  - Interior measurements are below standards
- Additional radon modeling predictions
- No drying of tailings in floodplain
- Tailings will be kept moist

Summary

- DOE will continue baseline monitoring
- Will compare these results to those determined from samples collected during tailings relocation phase
- Will continue dust suppression efforts to minimize risk of tailings becoming airborne
- Will continue open communication with public
- Let DOE know if concerns arise

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