Legacy Management Program of U.S. Department of Energy

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U.S. Department of Energy (DOE)
Office of Legacy Management (LM)

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International Atomic Energy Agency (IAEA)

Regulatory Supervision of Legacy Sites (RSLS)

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Origins of Legacy Management

- US DOE began focusing on site cleanups in the aftermath of:
  - passage of various federal statutes and regulations in the late 1970s and early 1980s
  - End of Cold War and downsizing of US Weapons Complex
  - D&D of research reactors and other facilities
- As cleanup of more sites was complete or remedies in place, awareness of need to establish long-term (even perpetual) monitoring and maintenance strategies.
- Decision was made to create a separate organization to address “post-closure” responsibilities of these sites: creation of DOE Office of Legacy Management.

Origins of Legacy Management (cont.)

- USDOE Office of Legacy Management established December 2003 with policy and field elements
- 33 existing closed sites were in the original LM inventory. Many of these uranium mill sites.
- Other types of sites have been added to program as remediation is completed, including:
  - Uranium metal production sites
  - Sites where weapon components were manufactured.
  - Nuclear device testing sites.
  - Reactors and other research sites.
  - Non-nuclear energy testing facilities.

Mission

- Fulfill DOE's post-closure responsibilities and ensure the future protection of human health and the environment
- Includes
  - Maintaining the remedy
  - Monitoring to ensure integrity of the remedy
  - Complying with regulatory requirements
  - Providing for disposition and beneficial reuse of legacy assets
  - Maintaining records of sites

Current LM Sites (2011)

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LM Sites (continued)

- 87 sites in 28 states (including 12 sites on or adjacent to Native American tribal nation land) plus Puerto Rico
- More than 108 total sites are expected by 2015
- Sites are regulated by numerous federal and state cleanup regulations and regulated by:
  - U.S. Nuclear Regulatory Commission
  - U.S. Environmental Protection Agency
  - State environmental agencies
  - DOE Orders

Tuba City, Arizona, UMTRCA Disposal Cell

Tuba City, Arizona, Groundwater Treatment System

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Grand Junction, Colorado, UMTRCA Disposal Site

Fernald, Ohio, disposal cell, former uranium metal production site

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Weldon Spring Site, Missouri, disposal cell, former uranium metal production site

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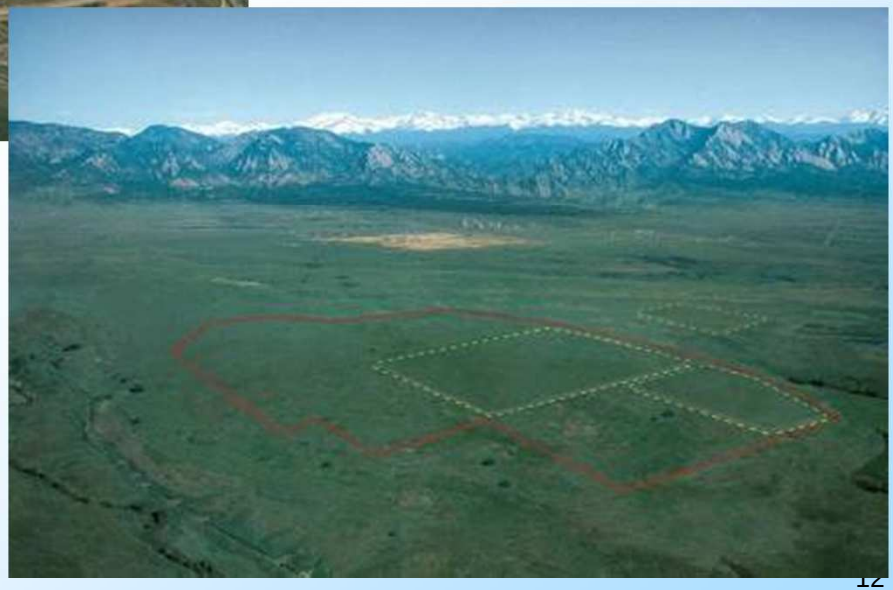
Rocky Flats Site, Denver, Colorado, former facility for production of plutonium components for weapons

Dam breach project



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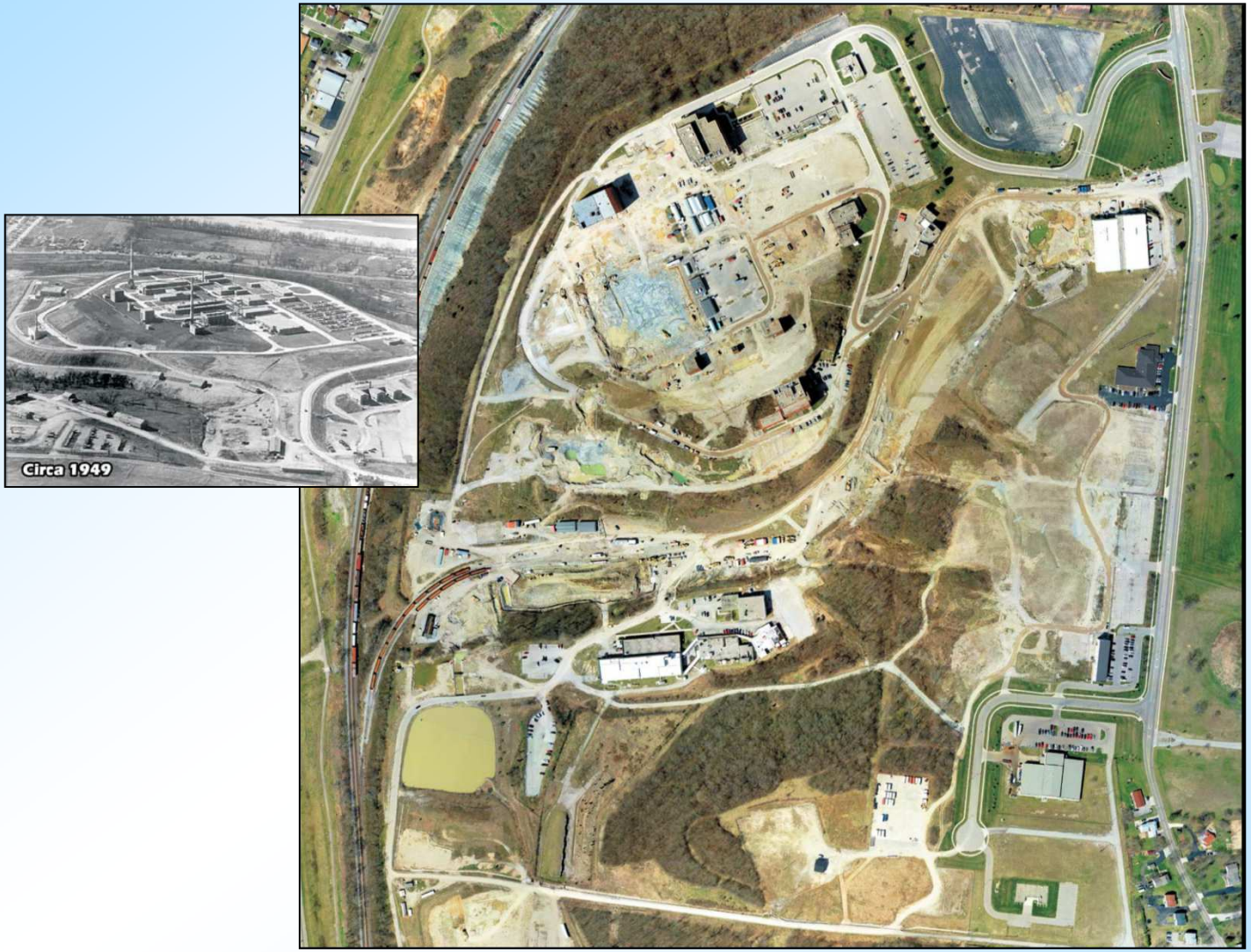
Pinellas, Florida, Groundwater Site, former facility for production of neutron generators

Mound, Ohio, Site, former facility for plutonium testing & non-nuclear parts



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Amchitka Island, Alaska
Site of three underground nuclear tests

Western Aleutian Islands, Alaska

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Boiling Nuclear Superheater Decommissioned Reactor (BONUS)

Western Puerto Rico

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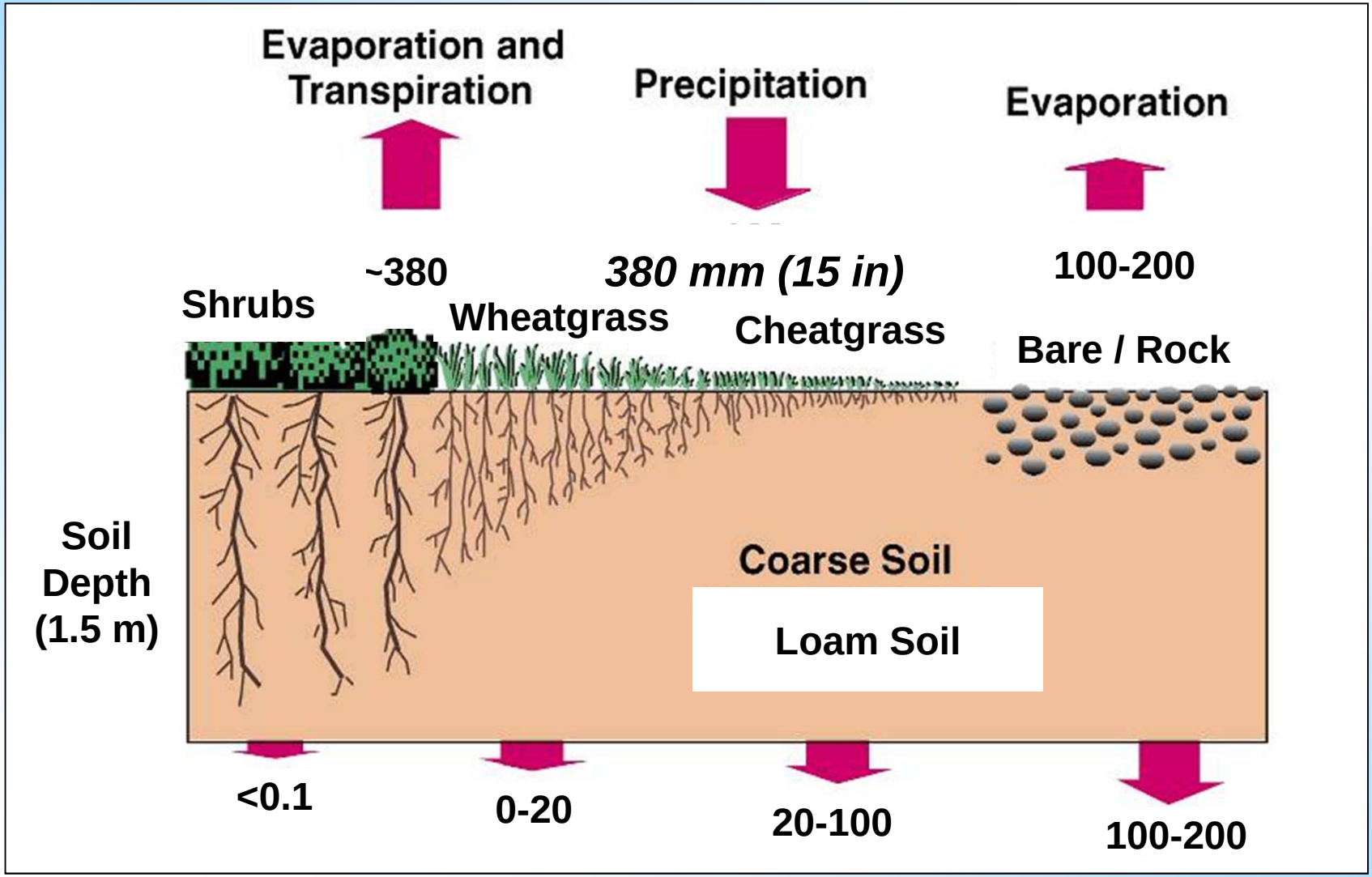
Types of Remedies: Disposal Cells

- Ages range from 10 to 30 years old
- Oldest ones were built to isolate uranium mill tailings as part of Uranium Mill Tailings Radiation Control Act (UMTRCA)
- Effective to date in isolating contaminants and mitigating radon exposure at UMTRCA sites
- Most disposal cells have rock covers to armor compacted soil radon barrier against wind and surface water erosion
- Several have vegetative covers to improve the water balance and reduce impacts to groundwater

Uranium Mill Tailings Disposal Cell (Rock Cover) at Gunnison, Colorado

Uranium Mill Tailings Disposal Cell (Vegetative Cover) at Monticello, Utah

Cover Water Balance: Role of Plants



Estimated Ranges of Annual Recharge (mm/yr)

Groundwater Contamination and Treatment

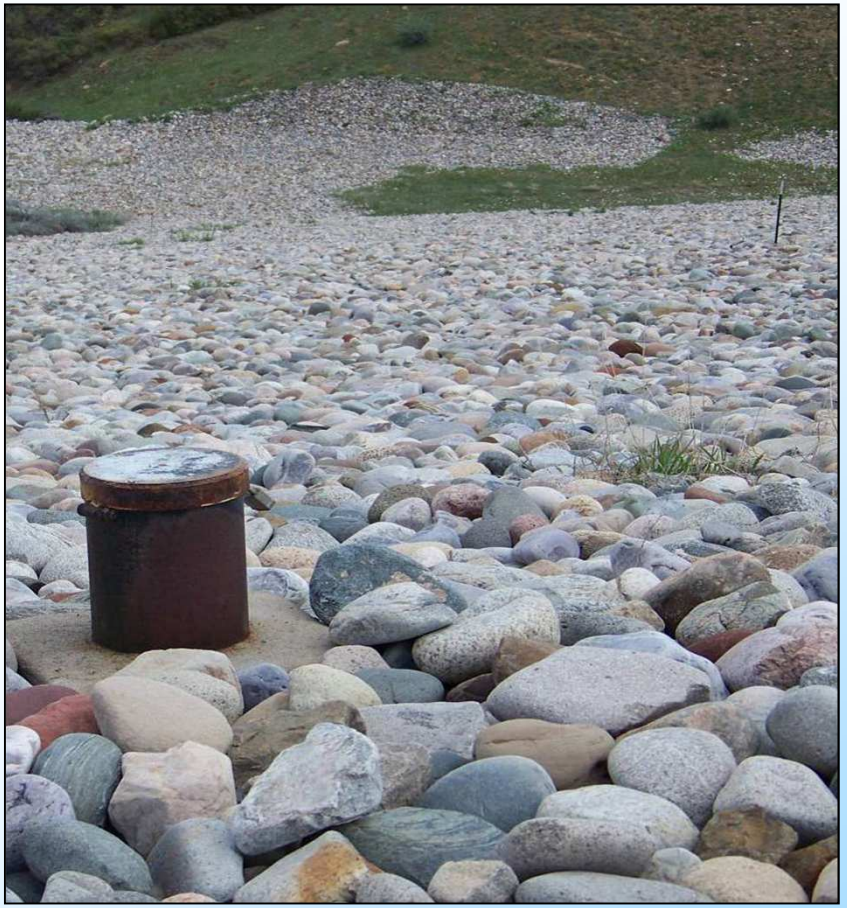
- At many Legacy Management sites, remediation of surface is complete, but groundwater and other subsurface contaminants remain.
- Types of Treatment/Management
  - Ion exchange
  - Permeable reactive barriers
  - Monitored natural attenuation
  - Phytoremediation
  - Distillation
  - Evaporation
  - Air stripping
- Institutional Controls in conjunction with treatment.

Long-term Surveillance and Maintenance (LTSM)

- Conducted at least annually at all LM sites where contaminants remain.
- Methods to be used and features to be examined are described in Long-term Surveillance and Maintenance Plans (LTSP) that are reviewed and approved by regulators
- Results of LTSM are published annually.
- Typical LTSM activities include:
  - Monitoring of environmental media—water, air, plants.
  - Evaluating condition of disposal cells or engineered barriers and maintaining the remedies.
  - Checking the condition of institutional controls such as fences, signs, and also administrative controls such as deed restrictions

Long Term Surveillance and Maintenance - Monitoring

- Collecting and analyzing samples of **groundwater and surface water** is the most common type of monitoring at LM sites
  - Wells plus surface water monitoring locations at all sites: >2000
  - 8000 samples during last 12 months
  - 19,000 analyses during last 12 months
- Other types of monitoring:
  - Plants to measure vegetation recovery
  - Air
  - Condition of rock on cells



Institutional Controls

- Usually required as part of the remedy to impose restrictions on use or access to land or groundwater to prevent exposure to people or the environment
- CERCLA and RCRA requirements
- DOE Policy 454.1, *Use of Institutional Controls*
- "DOE policy is to use institutional controls as essential components of defense-in-depth strategy that uses multiple independent layers of safety to protect human health and the environment…"
  - Administrative controls
  - Notices
  - Engineered components and structures

Institutional Controls (cont.)

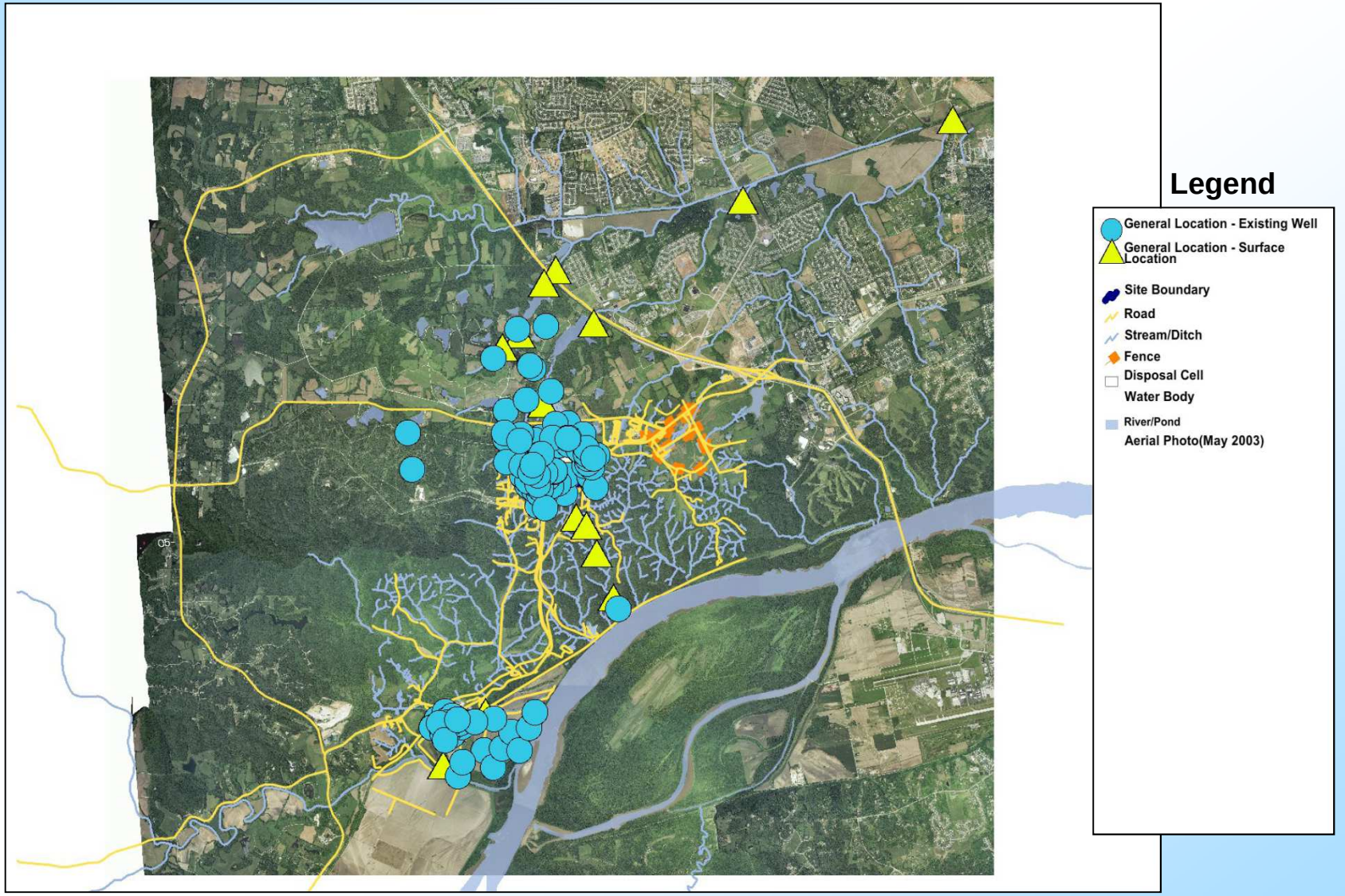
- IC's should be visible, durable and enforceable
  - Government to government access agreements, Memorandums of Agreement (MOA) or Memorandums of Understanding (MOU)
  - Real estate lease or other encumbrance on title
  - Regulation specific to area to impose restriction
- IC's can also be positive in nature
  - Visitor center or Interpretive Center to educate population of residual contamination
  - Use of surface for trails, native prairies, wildlife habitat, even if contaminants are still in subsurface.

LM Website for Documents and Data

- www.lm.doe.gov
- Site-specific documents searchable by date range, descriptive words, etc.
- Can view, download, or print the document in some cases, or request a copy to be mailed
- General information, fact sheets, program information
- Data available online through Geospatial Environmental Mapping System (GEMS)

Maintaining Institutional Knowledge of Past Activities at Sites Can Be a Critical Part of Protecting Public Health and Environment at LM Sites

Geospatial Environmental Mapping System



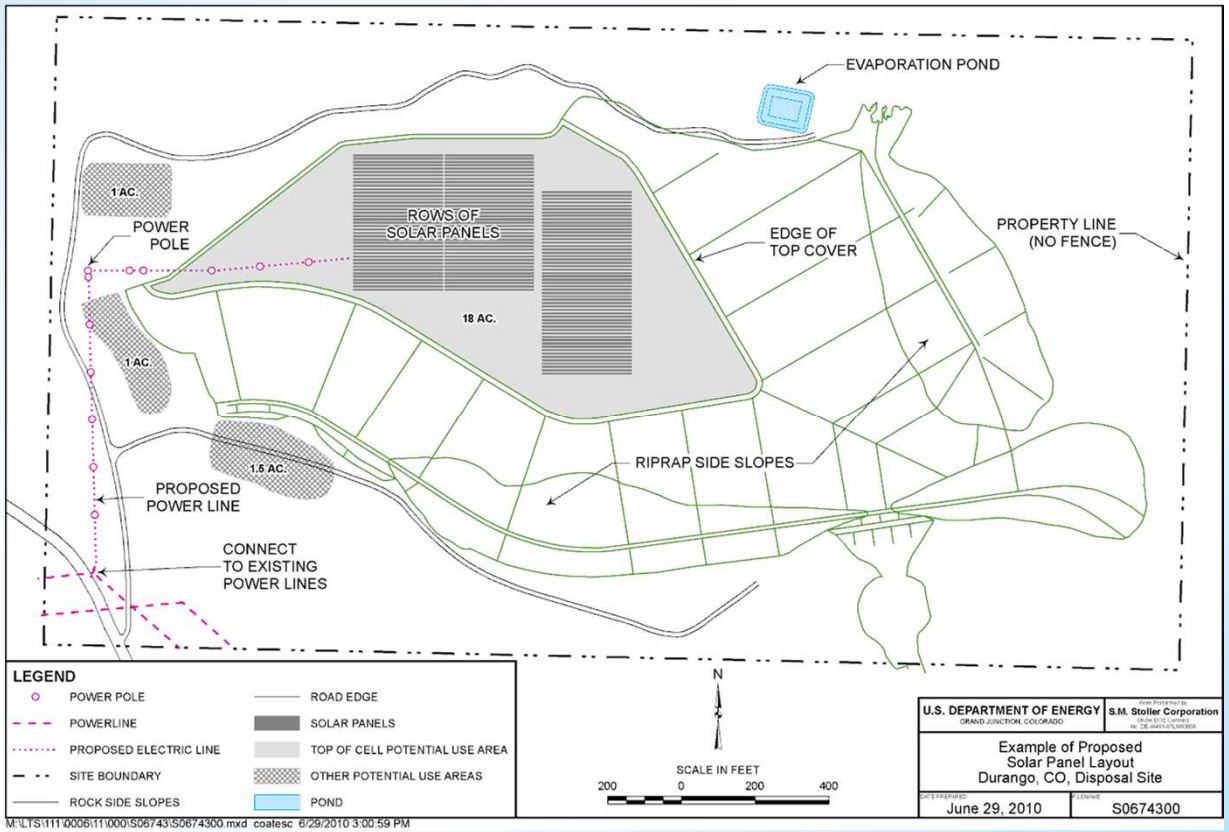
Beneficial Reuse

- DOE is fourth-largest federal landholding agency
- DOE is leader for renewable energy in federal government
- LM reviewed all sites for renewable energy potential
- Also looked at other reuse potentials and disposal (selling) of land no longer needed by DOE.
- Site reuse must be compatible with maintaining remedies of legacy sites.

Durango, Colorado, Disposal Site: uranium mill tailings disposal cell that was attractive for solar photovoltaic development; model for future reuse

Durango Disposal Site

Reuse at the Durango site is a good example of the balance between beneficial reuse and maintaining the restrictions needed to preserve the integrity of the site and its associated structures.



Other Beneficial Reuses

- Restoration of land for plant and animal habitat.
- Grazing, especially at remote sites in western U.S.
- Some sites suitable for recreational uses: hiking, biking, educational experiences
- Some sites can have surface rights transferred to other land management government agencies
- Some sites or portions of sites can be sold and restricted for compatible future uses.
- *Uses that are compatible with contaminants that may still be in place can prevent other types of use that could pose a risk to people and the environment.*

Unique Stakeholder Issues:
Legacy Sites on Native American Tribal Lands

- Tribal Nations are recognized as sovereign governments in the U.S.
- LM manages sites on lands that are part of seven tribal nations.
- Five other tribes own lands adjacent to or near LM sites.
- Four UMTRCA Cells are located on the Navajo Nation, largest in U.S.

Navajo Uranium Miners, Circa 1955

Lessons Learned

- Typical Post-Closure Issues
  - Erosion of land near the disposal cells
  - Vandalism, especially at remote sites
  - Deviations from predicted groundwater modeling concentrations
  - Maintenance of active groundwater treatment remedies
  - Regulatory issues can arise due to changing standards
  - Institutional Controls often require additional time to implement
  - Stakeholder concerns linger or often reset. Continuing to educate stakeholders on history of sites is important, especially as generations change.

Lesson's Learned

- LM's mission can only be achieved through close coordination of its activities with stakeholders; Congress; regulators; and state, tribal, and local governments
- LM continues to develop innovative approaches to enhance the long-term sustainability of cells and other waste storage facilities, and groundwater remedies
- LM seeks to improve communication and information sharing by maximizing electronic availability of records and data (visit us at www.lm.doe.gov)
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