# Closure for the Seventh Generation

## A Report from the Stewardship Committee of the State and Tribal Government Working Group

National Conference of State Legislatures
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The National Conference of State Legislatures serves the legislators and staffs of the nation's 50 states, its commonwealths and territories. NCSL is a bipartisan organization with three objectives:

- To improve the quality and effectiveness of state legislatures,
- To foster interstate communication and cooperation, and
- To ensure states a strong, cohesive voice in the federal system.

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# 1. INTRODUCTION

*We give thanks to the Creator for these fruits of the Sea. We ask his blessings on the food that we eat and on all generations that follow us down to the Seventh Generation. May the world we leave them be a better one than was left to us.*

Harriet Starleaf Gumbs
Shinnecock

*In our way of life, in our government, with every decision we make, we always keep in mind the Seventh Generation to come. It's our job to see that the people coming ahead, the generations still unborn, have a world no worse than ours—and hopefully better. When we walk upon Mother Earth we always plant our feet carefully because we know the faces of our future generations are looking up at us from beneath the ground. We never forget them.*

Oren Lyons
Onondaga

(From *Wisdomkeepers: Meetings with Native American Spiritual Elders* by Steve Wall and Harvey Arden)

Since 1989, the U.S. Department of Energy's (DOE) Office of Environmental Management (EM) has conducted several analyses of the costs associated with cleaning up DOE sites and the levels of risk they pose. DOE's most recent vision, contained in *Accelerating Cleanup: Paths to Closure,* states that, aside from a few urgent risks, most hazards present little imminent risk because physical and institutional controls greatly limit public access to the sites. (Institutional controls are administrative or legal mechanisms designed to control future use by limiting development and/or restricting public access to a site where there is residual contamination.) Therefore, DOE continues to promote a path toward maintaining institutional controls and developing land-use plans as a means to reduce costs before making decisions on the actual cleanup. Many of these institutional controls might be required for hundreds to thousands of years, necessitating a significant commitment by the federal government.

These long-term institutional controls now have become synonymous with *stewardship*. In the context of environmental management, stewardship can be defined as: *Activities necessary to maintain long-term protection of human health and the environment from hazards posed by residual radioactivity and chemically hazardous materials.* Similar definitions apply to facilities that are undergoing worker transition or operating sites under routine facility management.

States and tribes have particular concerns regarding long-term actions and restrictions at the DOE sites. As a result of these concerns and the issues raised in the *Paths to Closure* reports, the State and Tribal Government Working Group (STGWG) created the Stewardship Committee in March 1998. The committee has focused on three areas of investigation: 1) review of reports and documents related to long-term controls and stewardship, 2) communications with other organizations that also are looking into stewardship issues, and 3) a survey of long-term stewardship activities at DOE and similar sites. Committee members also participated in other stewardship discussions hosted by the Environmental Management Advisory Board, Resources for the Future and the Department of Energy. The results of the survey (discussed below), the document review and discussions with other organizations, along with the experiences of the various states and tribes, were used by the committee to develop this report and recommendations for DOE. A list of the references that were reviewed in the production of the report appears after the appendices.

# 2. Site Summaries

As part of preparing this report, the Stewardship Committee, with support from the National Conference of State Legislatures (NCSL) and other STGWG members, surveyed various radioactively contaminated sites and facilities to determine if remedies—including long-term institutional controls—are effective and how each site or responsible party is planning and/or implementing a stewardship program. A written response was received from 12 sites. The surveys solicited information about the types of contaminants at the site, the extent of the contamination, the types of cleanup decisions being made, and steps toward defining and implementing institutional controls. Survey results, along with the results of the document reviews and other discussions, are presented in the following sections. The completed surveys are included as appendix A; appendix B contains a report about long-term stewardship at the Nevada Test Site.

# 3. Findings of the Committee

- DOE's past activities have resulted in widespread contamination that is long-lived and difficult to remediate.
- Long-term institutional controls have become a common remedy element of closure decisions at DOE contaminated sites during the last few years.
- Institutional controls are being identified in very general terms in the Records of Decision (ROD) at DOE Superfund sites (those sites designated under the Comprehensive Environmental Restoration, Compensation and Liability Act, or CERCLA).
- Long-term institutional controls and stewardship responsibilities have not been addressed by the Formerly Utilized Sites Remedial Action Program (FUSRAP), which addresses sites that were contaminated by DOE's predecessor agencies under the Manhattan Project.
- The CERCLA process and DOE orders appear to be the primary impetus for the long-term institutional control or stewardship decision pathway for DOE.
- Long-term institutional controls relating to ownership transfer or lease of contaminated facilities or land have not been addressed.
- No unique funding provisions have been developed at the facilities to ensure that the long-term institutional control requirements of the ROD can be carried out.
- The federal government has asserted, and states and tribes have historically accepted, that long-term funding for institutional controls is adequately assured through reliance on annual congressional appropriations.
- State and tribal governments' positions on long-term institutional controls appear to be developed and implemented on a site-specific basis, although common themes exist.
- Various interest groups are attempting to help DOE to define what stewardship really involves and to develop an acceptable stewardship program.

# 4. Conclusions of the Committee

- The greatest challenge of a good stewardship program also should be the number one goal: *long-term* protection of human health, the environment and cultural resources.

- DOE's strategies contained in *Accelerating Cleanup: Paths to Closure* and the designated end states encourage use of long-term institutional controls.

- DOE expects to convince a significant number of stakeholders (individuals, organizations or others that have a stake in site activities) that full remediation of many of the department's contaminated areas is cost prohibitive, not feasible, impractical, or simply too "risky." Therefore, decision makers are often left with a CERCLA feasibility study where in-place closure with long-term institutional controls becomes the most attractive alternative, even though this alternative may be more costly over time.

- DOE's current method of costing long-term institutional controls does not accurately represent the relative cost of long-term actions. If present worth values are used to compare the costs of remedial alternatives, annual costs associated with the use of institutional controls become negligible beyond a few decades.

- The concept of making long-term institutional control decisions for wastes whose hazards could outlast those very decisions has not been adequately addressed, thus discouraging effective stakeholder involvement in decision making.

- Today's land use plans do not necessarily reflect what future land use will actually be, nor can future land use needs be accurately predicted.

- In many states, legal mechanisms to enforce land or water use restrictions imposed as part of CERCLA or Resource Conservation and Recovery Act (RCRA) cleanups against subsequent owners and users either do not exist, or are untested for this purpose.

- Today's decisions to rely on institutional controls in lieu of additional cleanup shifts burdens to future generations.

# 5. Recommendations

The committee's findings and conclusions highlight deficiencies in DOE's current efforts to ensure adequate long-term protection of human health, the environment, and cultural resources. Because long-term institutional controls will likely be needed at many DOE sites, the committee has formulated several recommendations to mitigate the identified deficiencies.

The STGWG Stewardship Committee offers the following recommendations to DOE to address the unresolved issues facing the successful implementation of long-term stewardship at DOE sites.

- **Goals of Long-Term Stewardship.** Any accepted long-term institutional control or stewardship program must ensure long-term protection of human health, the environment and cultural resources.

- **Long-Term Stewardship Planning.** A good stewardship program requires careful thought and planning. Simply stating that "institutional controls will be maintained" does not address even the currently identified deficiencies described above. The following recommendations propose specific actions to improve stewardship planning.

    - ❐ Because institutional controls are a significant part of many remedies, the specifics concerning the goals of the controls, the types of controls required, the manner in which the controls will be implemented, and how the controls will be maintained should be evaluated for each alternative being considered in a feasibility study.

    - ❐ DOE should more fully explain and quantify the required long-term cost and funding commitment required for long-term institutional controls.

    - ❐ DOE should develop plans to ensure the availability of adequate funding for long-term institutional controls.

    - ❐ DOE should formally acknowledge that decisions requiring long-term institutional controls will not be considered final until DOE can implement an acceptable stewardship program that includes an acceptable funding mechanism.

    - ❐ Where decisions include long-term institutional controls, monitoring or maintenance, DOE should either develop a method for accurately reflecting these commitments in the decision process, or identify and emphasize the uncertainty surrounding these commitments.

- DOE should establish mechanisms for the collection, retrieval and storage of site data and information necessary for stewardship and historic preservation purposes.

- DOE should continue to work with regulators and stakeholders to develop an acceptable stewardship program. Each site should develop a stewardship plan, defining constraints (anticipated and known), ongoing costs, and mechanisms for implementation.

- The nature of long-term activities necessarily requires that stewardship planning and implementation be an iterative process. DOE, at both the site and headquarters levels, should reevaluate and revise stewardship plans and implementation on a routine basis to reflect decisions made and changing conditions.

- **Long-Term Stewardship Implementation.** DOE sites that have ongoing missions in both defense and nondefense related areas will likely continue to make self-regulated stewardship decisions outside the EM program, under the Atomic Energy Act and the National Environmental Policy Act. Since consistency in applying stewardship principles across the DOE weapons complex is the preferred approach, DOE needs to establish consistent policy and guidance for stewardship across all departmental programs.

  - DOE should create a specific program office to manage stewardship responsibilities. This is needed because stewardship at DOE sites is not limited only to Environmental Management (EM) programs. Stewardship may be required during cleanup or closure and during operation of related facilities with continuing missions.

  - DOE should retain ownership of lands for which institutional controls are necessary to protect human health or the environment unless the affected state and/or tribe certifies that adequate institutions and legal mechanisms exist to enforce the use restrictions against subsequent owners and users.

  - A successful stewardship program will require a long-term commitment of resources. Experience shows that implementing legislation facilitates maintaining such long-term commitment. DOE should continue to work with the states, tribes and other stakeholders to explore the parameters of statutory long-term stewardship.

  - For new construction and new facilities, the closure and long-term commitments associated with the facility should be addressed in the initial approval decision. Provisions should be made for closure and post-closure funding for the facility.

- **Public Education and Awareness.** In accordance with *Accelerating Cleanup: Paths to Closure*, DOE needs to complete the final report, *Moving From Cleanup to Stewardship,* and distribute it for public comment as soon as possible. This report complements *Paths to Closure* and serves as a catalyst to inform stakeholders of stewardship issues. It also focuses the public education and dialogue process.

# Appendix A. Survey Form and Responses From DOE Sites

**State and Tribal Government Working Group**
**Application or Consideration of Long-Term Stewardship at DOE Sites**
**Survey Form**

*The following questions are intended to provide a summary of the manner in which long-term stewardship is being applied or considered at a given site. It is understood that some of the questions may not apply to a particular site. Nevertheless, please attempt to answer the questions as they are presented. If there is other pertinent information, please attach additional sheets.*

**I. Introduction**

A. Provide a brief description of the site. Include the site's name, location, owners (both current and future), approximate size, proximity to populated areas, and general topography features.

B. Describe the general contamination problem(s) associated with the site. Include the types of contamination present, types of media that have been impacted, and the types and quantity of waste both before and after remedial actions were taken. Also, please describe any ongoing remedial actions (groundwater pump and treat, etc.) associated with the site.

**II. Decision Process**

A. State the regulatory process (CERCLA, RCRA, Orders, etc.) used at the site.

B. Describe the final decision(s) for closure and the justification for not obtaining clean closure.

**III. Postclosure**

A. What was the final land use chosen? Are there restrictions on other resources? How long are these restrictions necessary? What process was used to select the land use?

B. What are the specific requirements/actions associated with the institutional controls? What mechanism is used to ensure that long-term operation, monitoring, and institutional controls are maintained?

C. Briefly describe the responsibilities of all of the parties involved in the institutional control agreement. Please specify the organization(s) responsible for enforcing the institutional control and, if applicable, discuss the role of parties (local governments, future owners, etc.) not involved in the institutional control agreement.

D. Provide a summary of any funding provisions (i.e., who provides funds, how much funding is needed, how often is funding obtained, legal funding drivers, etc.) associated with the long-term operations, monitoring, and institutional controls.

## Denver Radium Sites, Colorado

### I. Introduction

A. *Provide a brief description of the site. Include the site's name, location, owners (both current and future), approximate size, proximity to populated areas, and general topography features.*

The Denver Radium Sites resulted from radium processing in the then-industrial areas of Denver over the 1916 to 1922 time period. Recoveries of radium were poor, compared to modern methods, and wastes included high amounts of radium, uranium and other radioactive materials. Following the closure of the Denver radium industry, the properties were used for other diverse purposes. Materials from the sites were left on site, used as fill on other properties, and used in paving materials for approximately 23 blocks of urban Denver. Approximately 65 different properties were contaminated directly or from fugitive materials.

B. *Describe the general contamination problem(s) associated with the site. Include the types of contamination present, types of media that have been impacted, and the types and quantity of waste both before and after remedial actions were taken. Also, please describe any ongoing remedial actions (groundwater pump and treat, etc.) associated with the site.*

Contamination problems were limited to direct exposure to radium, uranium and related radioactive materials and radon accumulation in onsite or nearby structures.

### II. Decision Process

A. *State the regulatory process (CERCLA, RCRA, Orders, etc.) used at the site.*

The Denver Radium Sites were listed on the National Priorities List (Superfund) in 1980. CERCLA processes were used to evaluate and select remedial actions.

B. *Describe the final decision(s) for closure and the justification for not obtaining clean closure.*

The RODs specified that management plans were required for properties where contamination remained. Most of the sites were remediated to unrestricted use, using the EPA Inactive Uranium Mill Tailings Regulations in 40CFR192.

The Denver Radium sites include three properties with appropriate management plans to control remaining contamination. The City and County of Denver plan, covering streets, has been incorporated into the City ordinances and is extremely effective (and may be a good model for other such agreements). The Shattuck Chemical property plan is keyed to the treatment and onsite disposal of the contamination and includes continued ownership and operation of the Shattuck parent company. The Robinson Brick property cleanup and reuse was dealt with in a shared scope and cost manner between EPA, the Colorado Dept. of Public Health and Environment (CDPHE) and a private party. Controls are included in the Prospective Purchaser Agreement, which includes CDPHE and EPA, and offers some limits on future CERCLA liabilities from potential preexisting conditions for the redeveloper and owner.

**III. Postclosure**

A. *What was the final land use chosen? Are there restrictions on other resources? How long are these restrictions necessary? What process was used to select the land use?*
See above.

B. *What are the specific requirements/actions associated with the institutional controls? What mechanism is used to ensure long-term operation, monitoring, and institutional controls are maintained?*
See above. The first five-year review under CERCLA is underway by EPA.

C *Briefly describe the responsibilities of all of the parties involved in the institutional control agreement. Please specify the organization(s) responsible for enforcing the institutional control and, if applicable, discuss the role of parties (local governments, future owners, etc.) not involved in the institutional control agreement*
See above.

D. *Provide a summary of any funding provisions (i.e., who provides funds, how much funding is needed, how often is funding obtained, legal funding drivers, etc.) associated with the long-term operations, monitoring, and institutional controls.*
Operating funding is provided by the property owners. CERCLA funds are provided through EPA's annual budget for the five year review.

*STGWG contact*: Steve Tarlton, Colo. Dept. of Public Health and Environment, (303) 692-3423.

*Prepared by*: Steve Tarlton with assistance from Jeff Deckler and Larry Bruskin, HMWMD Remediation Program, Colo. Dept. of Public Health and Environment (1998).

## Denver UMTRA, Colorado

### I. Introduction

A. *Provide a brief description of the site. Include the site's name, location, owners (both current and future), approximate size, proximity to populated areas, and general topography features.*

The Uranium Mill Tailings Remedial Action Program (UMTRA) addresses the closure and long term surveillance and maintenance of approximately 24 inactive uranium mill and processing sites. Site attributes vary nationwide, however most are in the desert west, and most are in unpopulated areas, except for a local community associated with the mine and mill. (An exception is Canonsburg, Pennsylvania, included on another survey form). Most sites consist of a remediated mill site, some with minor amounts of contamination remaining, and a disposal site, where the mine tailings and mill debris are entombed. Adjacent or nearby properties contaminated by the mill activities, known as vicinity properties, may have been remediated or may yet contain contamination.

B. *Describe the general contamination problem(s) associated with the site. Include the types of contamination present, types of media that have been impacted, and the types and quantity of waste both before and after remedial actions were taken. Also, please describe any ongoing remedial actions (groundwater pump and treat, etc.) associated with the site.*

Site contamination has historically been uranium or related contaminants, spread through milling operations and inadequate tailings disposal. The resultant problems include widespread contamination of soils, surface water impacts from runoff, and groundwater contamination. Soils dispersion has occurred through wind, negligent disposition, and reuse of the tailings for building materials, backfill and roads. Remedial actions have focused on source removal and containment. Contaminated groundwater will be remediated through no action, passive remediation (natural attenuation or natural flushing with compliance monitoring and institutional controls) or active remediation. Three sites are targeted for active remediation, nine for passive remediation and the remainder for no action.

### II. Decision Process

A. *State the regulatory process (CERCLA, RCRA, Orders, etc.) used at the site.*

UMTRA sites are cleaned up under the Uranium Mill Tailings Radiation Control Act (UMTRCA), which specifies the decision making process required for closure. UMTRCA also provides funding for the program. Regulatory oversight for the program is provided by the Nuclear Regulatory Commission.

B. *Describe the final decision(s) for closure and the justification for not obtaining clean closure.*

EPA has set regulations for inactive uranium mill site cleanup in 40CFR192. These regulations specify levels for clean closure and allow for supplemental standards to be met if the clean closure requirements cannot be achieved.

Disposal sites must obtain a license for radioactive waste disposal from the Nuclear Regulatory Commission (NRC). License requirements specify siting, design, operating, closure and post-closure activities. The NRC has responsibility for assuring compliance. As opposed to many licensing activities, these occur after the fact, rather than prior to disposal.

**III. Postclosure**

A. *What was the final land use chosen? Are there restrictions on other resources? How long are these restrictions necessary? What process was used to select the land use?* UMTRCA assumes unrestricted use of the mill site properties and requires that the properties be transferred to the states (to prevent windfall profits to the private property owner from cleanup). The states are allowed to

- keep the property
- sell the property and return 90 percent of the price to DOE
- donate the property to local government

In all cases, deed annotation, and probably deed restrictions, are required by UMTRCA. Deed annotation will include a description of the cleanup, identification of levels of cleanup for different areas, and identification of any areas where unrestricted clean up was not achieved.

Deed restrictions include, as appropriate:

a) no groundwater use unless specifically approved by the state and DOE;
b) onsite construction specifically approved by the state and DOE;
c) construction of onsite habitable structures require radon detection approved by the state and DOE; and
d) no disturbance of specified (contaminated) areas unless specifically approved by the state and DOE.

B. *What are the specific requirements/actions associated with the institutional controls? What mechanism is used to ensure long-term operation, monitoring, and institutional controls are maintained?*
Once remediation is complete, and the property transferred to the state, DOE has no ongoing funding responsibilities for the properties. Ongoing review is accomplished through the existing state regulatory program, but is not funded by DOE, as discussed below. No mechanism now exists in Colorado to identify or control contaminated groundwater on adjacent private property.

Vicinity properties have a separate program in Colorado, funded by the state UMTRA trust fund and administered by the Colorado Department of Public Health and Environment (CDPHE). In Grand Junction, notice to the property owner and the state occurs through the building permit process, and the county will not issue a building permit without CDPHE approval. Otherwise, these properties are privately owned and no mechanism exists to enforce compliance. The program provides funding for local government disposal of contaminated materials, with some DOE support for disposal over the next 25 years.

C. *Briefly describe the responsibilities of all of the parties involved in the institutional control agreement. Please specify the organization(s) responsible for enforcing the institutional control and, if applicable, discuss the role of parties (local governments, future owners, etc.) not involved in the institutional control agreement*
See above.

D. *Provide a summary of any funding provisions (i.e.., who provides funds, how much funding is needed, how often is funding obtained, legal funding drivers, etc.) associated with the long-term operations, monitoring, and institutional controls.*
Long-term operation of the disposal sites is provided through annual funding for the DOE Grand Junction Office Long-Term Surveillance and Maintenance Program. No funding is provided for remediated sites or vicinity properties, except as noted in the preceding answers.

*STGWG contact:* Steve Tarlton, Colo. Dept. of Public Health and Environment, (303) 692-3423.

*Prepared by:* Steve Tarlton with assistance from Jeff Deckler, Program Manager, HMWMD Remediation Program, Colo. Dept. of Public Health and Environment (1998).

## Idaho National Engineering and Environmental Laboratory

### I. Introduction

A. *Provide a brief description of the site. Include the site's name, location, owners (both current and future), approximate size, proximity to populated areas, and general topography features.*

The Idaho National Engineering and Environmental Laboratory (INEEL) is located on 890 square miles of cool, dry, high desert steppe in the Snake River Plain of eastern Idaho. All land is federally owned and the average elevation is 5,000 feet above sea level. Average precipitation is less than 10 inches per year.

Topography is that of rolling basalt flows covered with wind blown sediments. Vegetation is primarily sagebrush and native grasses.

Of the 890 square miles that make up the INEEL, only about 1 percent is actually within the fence lines around the eight major facilities located there. The remaining area is largely undisturbed.

Idaho Falls is the nearest population center of real significance and is located 42 miles east of the INEEL. Other large nearby towns include Blackfoot to the southeast and Pocatello to the south.

Underlying the INEEL and most of the eastern portion of the Snake River Plain is the Snake River Plain Aquifer, a large and very productive groundwater body that is vital to the economy of eastern Idaho. Depth to the aquifer ranges from 200 feet to 800 feet at the INEEL. There is rarely any surface water on the INEEL and when there is it flows onto the INEEL and then into the ground via a series of sinks.

The INEEL is operated by the Department of Energy's Idaho Field Office through their primary contractor Lockheed Martin Idaho Technologies Co. The Navy Nuclear Propulsion Program and the DOE Chicago Field Office also maintain facilities on the INEEL.

Originally the area was used by the US Navy as a gunnery range. In the late 1940s and early 1950s it became a testing and development center for nuclear reactor technology. Currently the INEEL's largest mission is environmental restoration and waste management.

B. *Describe the general contamination problem(s) associated with the site. Include the types of contamination present, types of media that have been impacted and the types and quantities of waste both before and after remedial actions were taken. Also, please describe any ongoing remedial actions (groundwater pump and treat, etc.) associated with the site.*

Contamination problems at the INEEL are primarily subsurface although there are some areas of contaminated soil at the surface. Contaminants consist largely of radionuclides, heavy metals and chlorinated hydrocarbons. Affected media are subsurface soils, fractured basalt, and ground water in the Snake River Plain Aquifer. Estimates of contaminated media range up to 4.7 billion cubic meters of material.

Currently there is an ongoing pump and treat removal action of groundwater associated with the old injection well at Test Area North located at northern end of the INEEL. There is also a vapor extraction process used at the Radioactive Waste Management Complex, where waste containing hydrocarbons was buried in a subsurface disposal area.

## II. Decision Process

A. *State the regulatory process (CERCLA, RCRA, Orders, etc.) used at the site.*
Environmental restoration at the INEEL is conducted under CERCLA. More specifically it is conducted under the Federal Facilities Agreement and Consent Order (FFA/CO) signed by the State of Idaho, DOE and U.S. EPA in 1991. This agreement laid out the scope, schedule and process by which environmental clean up would be conducted at the INEEL and seems to be working well. Of the numerous milestones in the agreement only two are behind schedule.

The State of Idaho also has RCRA authority over the INEEL. Additionally the State has permitting authority for air issues and the land application of waste waters.

Contaminated structures at the INEEL are usually dispositioned by the DOE's decontamination and decommissioning (D&D) process.

B. *Describe the final decision(s) for closure and the justification for not obtaining clean closure.*
The FFA/CO CERCLA process is an ongoing activity that has yet to reach a final Record of Decision (ROD) on every site at the INEEL subject to clean up. At some sites where decisions have been reached, contaminated material has been left in place. The justification for doing so is that the material does not pose a significant risk under CERCLA criteria to human or ecological receptors. In some cases, these risks have been adequately reduced by actions that isolate or immobilize the material, such as capping an area with an impermeable layer of material. Also, in making a decision on whether or not to leave contamination in place, risk assessments take into consideration doses to workers who would have to remove, treat, transport, and dispose of materials.

## III. Postclosure

A. *What was the final land use chosen? Are there restrictions on other resources? How long are these restrictions necessary? What process was used to select the land use?*
No formal process had taken place to determine future land use at the INEEL, as the property still belongs to the federal government and is administered by DOE. What has happened is that the DOE Idaho Field Office has compiled a *Comprehensive Facility and Land Use Plan* which, with stakeholder input, forecasts future land use at the INEEL.

In this plan, the boundaries of the INEEL remain unchanged for 100 years with DOE or another federal entity controlling the site. Any future development at the INEEL would be industrial in nature and concentrated at current facility sites or along a central corridor. No development would take place at the north end of the INEEL.

As part of the FFA/CO CERCLA process certain areas on the INEEL will not be candidates for development due the presence of contamination or buried waste. Additionally contamination in the Snake River Plan aquifer may restrict or limit the use of ground water in some areas of the INEEL.

B. *What are the specific requirements/actions associated with the institutional controls? What mechanism is used to ensure long-term operation, monitoring, and institutional controls are maintained?*
The exact institutional controls employed at the INEEL under CERCLA vary from site to site and are spelled out in the ROD for that site along with their long term care and maintenance. DOE as the responsible party under CERCLA is of course charged with ensuring that the agreed upon remedies including institutional control are carried out. In the context of CERCLA and in the larger context as the federal agency responsible for the INEEL, DOE is responsible for the operation and monitoring of the entire INEEL for the foreseeable future.

C. *Briefly describe the responsibilities of all of the parties involved in the institutional control agreement. Please specify the organization(s) responsible for enforcing the institutional control and, if applicable, discuss the role of parties (local governments, future owners, etc.) not involved in the institutional control agreement.*
Under the FFA/CO, DOE and its contractors are responsible for investigating and mitigating the risks associated with past releases of hazardous materials to the environment at the INEEL. The State of Idaho and U.S. EPA in turn monitor the progress of the investigations and must approve any proposed remedies before they can be implemented. Once approved under a ROD, the proposed remedies become a binding agreement on all parties.

Individuals and organizations have the right and opportunity to comment on proposed remedies prior to the final ROD being signed for that action. Other opportunities also exist for stakeholders comment on land use issues, an example being the input that went into the Comprehensive Facility and Land Use Plan for the INEEL.

D. *Provide a summary of any funding provisions (i.e., who provides funds, how much funding is needed, how often funding is obtained, legal funding drivers, etc.) associated with the long-term operations, monitoring and institutional controls.*
In the FFA/CO Agreement, DOE commits to taking all necessary steps and using its best efforts to obtain timely funding to meet its obligations under that agreement. A section of that agreement also stipulates the penalties that can be imposed if DOE fails to meet a milestone.

Similarly, in the 1995 Settlement Agreement between the State of Idaho, the U.S. Navy and DOE, DOE again commits to meeting the schedule contained in the FFA/CO.

Additionally, CERCLA is federal law that applies to DOE. DOE must meet its legal obligations with regard to cleanup at the INEEL.

Funding for CERCLA activities at the INEEL (including institutional controls) is included in the annual INEEL budget.

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(1998)

## Maxey Flats Disposal Site, Fleming County, Kentucky

### I. Introduction

A. *Provide a brief description of the site. Include site name, location, topography, approximate size, proximity to populated areas, and general topography features.*

The Maxey Flats Disposal Site (MFDS) is located in southern Fleming County, Kentucky, approximately 10 miles northwest of the city of Morehead. Local topography consists of relatively flat upland plateaus, or "flats", bounded by steep hillsides with deeply incised surface drainageways. The MFDS property occupies 280 acres of Maxey Flat, the steep hillsides bounding the flat, and three adjacent valley floors.

The MFDS property ranges in elevation from 660 feet above mean sea level (msl) in the Rock Lick valley, to 1060 feet msl in the Restricted Area atop Maxey Flat. The MFDS Restricted Area encompasses approximately 45 acres of the Maxey Flat plateau. Fifty-two disposal trenches, penetrating up to 40 feet into underlying bedrock, occupy 27 acres of the Restricted Area. Restricted Area elevations range from 970 feet msl, East and Northeast of the 40 series trenches, to 1060 feet msl on a topographic high in the west-central portion of the trench area.

Approximately 30 acres of the Restricted Area, including the disposal trenches, are presently covered with an exposed high-density polyethylene (HDPE) liner (Figure 2). As part of the Consent Decree remedy, additional HDPE liner is being installed in the northwest corner of the Restricted Area at the location of the leachate disposal bunkers. New liner is also being installed in the central and southeast portions of the Restricted Area.

B. *Describe the general contamination problem associated with the site. Include the types of contamination present, types of media that have been impacted, and the quantity of waste both before and after remedial actions were taken.*

**Waste.** From 1963 to 1977, approximately 5.0 million cubic feet of low-level waste were disposed of in 46 trenches. This includes source material and special nuclear material.

Most of the waste was in solid form: paper, glassware, shielding material, and carcasses. These materials were generally shipped to the site in wooden crates, cardboard boxes, and 55-gallon drums.

Liquid wastes were accepted from 1963 to 1972. Some liquid wastes were "solidified" with papier-mache and other materials. Liquid and solidified liquid wastes were disposed of in special liquids trenches (L-trenches).

Waste of high specific activity was placed in "hot" wells.

It is estimated that in excess of 2.5 million Curies of by-product material has been discarded at MFDS.

**Contaminants.** Primary contaminant at the site is Tritium (HTO). Other contaminants include 11 organics, As, Na, Mn, $^{99}Tc$, $^{233}U$, $^{234}U$, $^{235}U$, $^{238}U$, $^{238}Pu$, $^{239}U$, $^{240}U$, $^{60}Co$, $^{90}Sr$, $^{14}C$ and $^{226}Ra$.

**Impacted media.** Affected media include surface and subsurface soils, groundwater, and surface water. Forest resources on the slopes adjacent to the site have also been impacted via uptake of contaminated groundwater.

The vertical extent of groundwater and soil contamination in the subsurface beneath the disposal trenches has not been characterized site-wide. Laterally, the highest contamination is confined to surface and subsurface soils, groundwater, and surface water on MFDS property.

Remedial actions at the site are required under the MFDS ROD and Consent Decree. The goal of remedial action is to remove leachate from the disposal trenches in order to stop present and future releases to the environment. Principal components of the remedial action are:

- Dewatering or removal of leachate from the disposal trenches;
- Solidification of leachate;
- Disposal of solidified leachate in concrete, earth-mounded bunkers;
- Placement of a cap over the Restricted Area;
- Stabilization of the site outside of the Restricted Area via improvement of the surface water drainage system; and
- Long term monitoring and maintenance.

**Quantity of waste before and after remedial actions.** There will be a reduction of the volume of leachate in the disposal trenches via the remedy. However, the volume of solid waste at the site will increase because leachate will be batched with a substance similar to Portland cement and disposed of in the bunkers.

## II. Decision Process

*A. State the regulatory process used at the site.*

The MFDS is a Superfund Site. The site was investigated and a remedy was evaluated under CERCLA. The MFDS Consent Decree defined the remedy, institutional controls, Responsible parties (RPs), the obligations of the RPs to effect the remedy, and institutional controls for 200 years following placement of the remedy.

*B. Describe the final decisions for closure and the justification for not obtaining clean closure.*

The components of the physical remedy are described above. Clean closure was determined to be technically and financially impractical.

**III. Postclosure**

*A. What was the final land use chosen? Are there restrictions on other resources? How long are these restrictions necessary?*
The site will remain in perpetuity. Portions of the site will have restricted access and land use for up to and possibly beyond 200 years.

*B. What are the specific requirements/actions associated with institutional controls?*
Monitoring of the environment, monitoring of the performance of the remedy, and maintenance of the site including ;the components of the remedy.

*C. Briefly describe the responsibilities of all of the parties involved in the institutional control agreement.*
The Commonwealth of Kentucky is responsible for the administration and execution of the institutional controls.

Two five-year review cycles will occur to evaluate the remedy after the USEPA certifies completion. After the five-year cycles, the site becomes the sole responsibility of the Commonwealth, and the USEPA and Responsible parties are no longer liable.

*D. Summarize the funding for institutional controls.*
The Commonwealth of Kentucky is responsible for funding the institutional controls. Up to $1 million annually will be required to administer, maintain, and monitor the site for the next 200 years. Funding will be provided through the Commonwealth's General Fund and the annual budgets of the Natural Resources and Environmental Protection Cabinet and the Cabinet for Health Services.

*STGWG contact*: Tuss Taylor, Kentucky Dept. for Environmental Protection, (502) 564-6716

The majority of this report was drafted by Dr. John Volpe, Health Services, Kentucky Radiation Control Branch. (1998)

## Missouri Formerly Utilized Sites Remedial Action Program (FUSRAP)

### I. Introduction

A. *Provide a brief description of the site. Include site's name, location, topography, approximate size, proximity to populated areas, and general topography features.*

**General.** The U.S. Army Corps of Engineers (USACE) is administering a program for the management and remediation of radioactive contamination at the St. Louis site in St. Louis, Missouri. In 1974, the U.S. Congress authorized the Atomic Energy Commission (AEC), a predecessor to the U.S. Department of Energy (DOE), to institute the Formerly Utilized Sites Remedial Action Program (FUSRAP). FUSRAP was initiated to identify and remediate mandated sites where residual radioactivity remains from activities conducted under contract to the Manhattan Engineer District (MED) and AEC during the early years of the nation's energy program, or from other operations assigned via congressional legislation. Congress authorized USACE to take over management of FUSRAP in October 1997.

Mallinckrodt Inc., (Mallinckrodt) in downtown St. Louis separated uranium from ore from 1942 to 1957. These processing activities, conducted under MED and AEC contracts, resulted in radioactive contamination at Mallinckrodt in downtown St. Louis. Subsequent disposal and relocation of processing wastes resulted in radioactive contamination at other locations near the Lambert-St. Louis International Airport.

The St. Louis site consists of two general locations, the downtown area and the airport area. The downtown area consists of the Mallinckrodt facilities where the ore was processed, and adjacent vicinity properties. Taken together, this group of properties is known as the St. Louis Downtown Site (SLDS). The airport area consists of the St. Louis Airport Site (SLAPS), SLAPS vicinity properties, and Latty Avenue properties. Some component sites of the airport area-are on the U.S. Environmental Protection Agency's (EPA's) National Priorities List (NPL). The NPL is a list of sites identified for remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). The downtown area properties are not on the NPL but are designated for remedial action under FUSRAP.

**St. Louis Downtown Site.** The St. Louis Downtown Site is located in an industrial area on the eastern boarder of St. Louis, 18km (11 mi) southeast of the airport area. SLDS consists of the Mallinckrodt Inc. property and adjacent commercial and city owned properties, collectively referred to as the vicinity properties. Mallinckrodt Inc. is 90 m (300 ft.) West of the Mississippi River, covers approximately 18 ha (45 acres), and contains many buildings that house Mallinckrodt Inc. Offices and non-MED/AEC related chemical processing operations. Mallinckrodt Inc. has used, blended, and/or manufactured chemicals at this facility including organics (e.g., 1,2-dichloropropane, dichloromethane, phenol, zinc phenol sulfonate, toluene, hexane, dimethyl aniline, chloroform, alcohols, propoanediols, nitrobenzene, nitrophenols, xylenes, trichloroethylene, hexachlorobutadiene, oxydianiline tars, steartes, biphenyl, acetonitrile) and inorganics (e.g., aluminum chloride, hydroxide salts, zinc, sulfuric acid, nitric acid, hydrochloric acid, chromium, sodium iodide, magnesium salts, palladium, bismuth oxychloride). A number of chemicals and compounds that may have been associated with Mallinckrodt operations have been detected in soil and groundwater. A levee/flood wall located to the east of SLDS, protects the area from flood waters.

The Mallinckrodt Inc. facility is bordered by a large metals recycling company (McKinley Iron Works) to the north; the Mississippi River, a defunct food processing company (PVO Foods) and City of St. Louis property to the east; a large lumber yard (Thomas and Proetz Lumber) to the south; and North Broadway and small business to the west. Additionally, the Norfolk and Wester Railroad (now Norfolk Southern), the Chicago, Burlington, and Quincy Railroad (now Burlington Northern and Santa Fe), and the St. Louis Terminal Railroad Association have active rail lines passing in a north/south direction throughout the facility. These businesses and railroads make up the vicinity properties. An extensive network of utility lines across the site includes underground sewer, sprinkler, water, and natural gas lines, overhead electricity and telephone lines, and plant process pipes. Some of the sewers and subsurface utilities (e.g., electricity) are owned by municipal or public utility companies. Runoff from the property is directed to a sewer system that discharges to a publicly owned treatment works which discharges to the river.

**St. Louis Airport Site.** SLAPS, an unincorporated property in St. Louis County, is bounded on the north and east by McConnell Boulevard, on the south by Banshee Road and the Norfolk and Western Railroad, and by Coldwater Creek on the west. SLAPS covers 8.8 hectares (ha) areas inside the security fencing at the SLAPS site; adjacent areas; and the Ballfields areas across McDonnell Boulevard (e.g., SLAPS vicinity properties). A water main runs along the northern boundary of SLAPS and a gas line crosses the northwest corner of SLAPS and runs parallel to the property on the north. There are overhead utility lines on the western end of SLAPS.

Coldwater Creek flows for 153 m (500 ft.) along the western border of SLAPS. The creek originates 5.8 km (3.6 miles) to the south and continues for 24 km (15 miles) in a northeasterly direction through Hazelwood, Florissant, unincorporated areas of the county, and along the northern edge of the unincorporated community of Black Jack, until it discharges into the Missouri River. The creek, except for the 1.2 miles it travels under the airport, is accessible to the public.

**Hazelwood Interim Storage Site.** The HISS site occupies the eastern half of the 9200 Latty Avenue property in the city of Hazelwood, Missouri. The HISS is bordered on the west by the Futura site, on the north by Latty Avenue, on the east by the Stone Container property, and on the south by a railroad spur. The HISS property is owned by Jarboe Realty and Investment Company and leased to the USACE. The Stone Container site is located along Latty Avenue just to the east of HISS. The Latty Avenue properties are located in an area that is primarily commercial/industrial. The vicinity properties include the Wagner property on the north side of Latty Avenue across from HISS, areas on the Stone Container property along Latty Avenue and adjacent to HISS, and haul roads used to transport waste from SLAPS to the property on Latty Avenue (current location of HISS). The contiguous property addressed in the document is the area adjacent to the railroads.

*B. Describe the general contamination problem associated with the site. Include the types of contamination present, types of media that have been impacted, and the quantity of waste both before and after remedial actions were taken.*

**St. Louis Downtown Site.** Mallinckrodt and Company, manufacturing chemists, were founded in 1867 by three brothers, Gustav, Edward, and Otto Mallinckrodt, on a portion of their father's land at the corner of Mallinckrodt and Second streets. The original plant, consisting of a stone building, and acid house, and a wooden shed, produced anhydrous ammonia, nitrous ether, acetic and carbolic acids, chloroform, and burnt alum. By 1896, the company had grown to include 50 brick buildings extending from one to seven stories occupying the area now known as Plant 1. The company expanded into manufacture of chemicals for producing dry plates for the fledgling field of photography, morphine, codeine, hydrogen peroxide, and tannic, gallic and pyrogallic acids. The firm was incorporated as Mallinckrodt Chemical Works in 1882.

Edward Mallinckrodt's son, Edward Jr., joined the family business in 1901 after graduating from Harvard University. As a result of his interest in research, such products as a pure and stable ether, analytical reagents to test the purity of chemicals, iodeikon (the first x-ray contrast medium for viewing the gall bladder), and phenobarbital were developed and manufactured between 1914 and 1920 (Historic American Buildings Survey 1997).

Mallinckrodt Chemical Works was contracted by the MED and AEC from 1942 until 1957, to process uranium ore for the production of uranium metal. The process involved the digestion of uranium ore using nitric acid. Residuals of the process, including spent ore, process chemicals and radium, thorium, and uranium were inadvertently released into the environment through handling and disposal practices.

Residuals from the process had elevated levels of radioactive radium, thorium, and uranium. From 1942 to 1945, Plants 1,2, and 4 (now Plant 10) developed uranium processing techniques, produced uranium compounds and metal, and recovered uranium metal from residues and scrap. Mallinckrodt, under contract to AEC, decontaminated Plants 1 and 2 from 1948 through 1950 to meet the AEC criteria then in effect, and the AEC released the plants for use without radiological restrictions in 1951.

Starting in 1946, the newly constructed Plant 6 produced uranium diode from pitchblende ore. Uranium ore was digested in acid and filtrate to form uranyl nitrate, which was extracted and denigrated to produce uranium oxide. Hydrofluoric acid was used to fluorinate the uranium oxide to create uranium tetraflouride (green salt). The green salt was combined with magnesium and heated to produce uranium metal and magnesium fluoride.

During 1950 and 1951, Plant 4 (now Plant 10) was modified and used as a metallurgical pilot plant for processing uranium metal until it was closed in 1956. During this period, operations began at Plants 6E, 7, 7E, 7N, and 7S. AEC operations in Plant 6E ended in 1957. AEC managed decontamination efforts (removal of radiologically contaminated buildings, equipment, and soil disposed off site) in Plants 4 and 6E to meet AEC criteria in effect at that time and returned the plants to Mallinckrodt in 1962 for use without radiological restrictions. Since 1962, some buildings have been razed, and new buildings have been constructed at Plants 4 and 6. Plant 7, used to produce green salt, was also used to store reactor cores and to remove metallic uranium from slag by a wet grinding mill/flotation process. Following decontamination to meet AEC criteria, Plant 7 was released for use with no radiological restrictions in 1962. Plant 7 is currently used primarily for material storage. The company's name was changed to Mallinckrodt Inc. In 1974.

In 1977, a radiological survey conducted at SLDS found that alpha and beta-gamma contamination levels exceeded guidelines for release of the property for use with radiological restrictions. Elevated gamma radiation levels were measured at some outdoor locations and in some of the buildings formerly used to process uranium ore. Ra-22a6 concentrations as high as 2,700 picoCuries per gram (pCi/g) above background and U-238 concentrations as high as 20,000 pCi/g above background were found in subsurface soil. Additionally, radon and radon daughter concentrations in two buildings exceed guidelines for nonoccupational radiation exposure. In response to this, survey, a Remedial Investigation (RI) was conducted to characterize the nature and extent of contamination.

Operations that produced radiologically contaminated materials which could have led to contamination in the sewers and drains include the MED/AEC contract work, the columbium-tantalum processing (C-T) work, and the euxenite processing performed under a separate NRC source material license number 226 which was performed under subcontract for the U. S. Government. However, the MED/AEC operation comprised most of the radioactive materials processed at Mallinckrodt.

**St. Louis Airport Site.** MED acquired SLAPS in 1946 to store uranium-bearing residuals from SLDS from 1946 until 1966. In 1966, these residuals were purchased by Continental Mining and Milling Company of Chicago, removed from SLAPS, and placed in storage at Latty Avenue under an AEC license. After most of the residuals were removed, site structures were demolished and buried on the property along with approximately 60 truckloads of scrap metal and a vehicle that had become contaminated (EPA 1989). Clean fill material was spread over the disposal area from 0.3 to 1.0 meters (1 to 3 feet) to achieve surface radioactivity levels acceptable at that time. In 1973, the U.S. Government and the City of St. Louis agreed to transfer ownership of SLAPS by quitclaim deed from AEC to the St. Louis Airport Authority.

In 1982, a radiological characterization of the ditches to the north and south of SLAPS and of portions of Coldwater Creek [Bechtel National Incorporated (BNI) 1983] indicated radioactivity levels exceeding DOE guidelines then in effect.

In 1986, a radiological and limited chemical characterization of SLAPS determined that radioactive impacts extended as deep as 5.5 meters (18 feet) below grade (BNI 1987). A radiological characterization of airport area properties was subsequently conducted from 1986 through 1990 to further define the extent of radioactive contamination and to evaluate possible disposal alternatives.

One previous removal action has been completed at the west end of SLAPS. Excavation of contaminated soils in the area adjacent to the gabion wall on the eastern bank of Coldwater Creek, south of McDonnell Boulevard, began in September 1997. The excavation ran the length of the gabion wall and extended approximately 90 feet to the east. The excavation was accomplished in six discrete units or areas.

Area 1 was located at the southern end of the gabion wall. Area 1 was excavated to the maximum design depth of 13 feet below ground surface. Groundwater was encountered at 12.25 to 13.3 feet below ground surface. Excavation was halted after the design depth was achieved and the water table was encountered. Radiologically contaminated soils remain below the groundwater table in Area 1. Areas 2 through 6 were remediated to the cleanup criteria for radionuclides. Approximately 5,100 cubic yards of contaminated material (in situ) was removed from the west end. Backfilling was completed in December 1997.

**Hazelwood Interim Storage Site.** In 1966, Continental Mining and Milling Company of Chicago, Ill., purchased the wastes stored at SLAPS and began moving them to a property at 9200 Latty Avenue for storage. In 1967, the Commercial Discount Corporation of Chicago, Ill., purchased the residues and shipped much of the material to Canon City, Colorado, after drying. Cotter Corporation purchased the remaining residues in 1969 and dried and shipped more material to Canon city during 1970. In 1973, the remaining undried material was shipped to Canon City and leached barium sulfate was mixed with soil and transported to a St. Louis county landfill. During these activities, improper storage, handling, and transportation of materials caused the spread of materials along haul routes and adjacent vicinity properties.

In 1979, the owner of the property excavated approximately 13,000 cubic yards from the western half of the property prior to constructing a manufacturing facility. The material excavated at this time was stockpiled on the eastern half of the property that now constitutes the HISS. In 1984, BNI performed remedial action activities including clearing, cleanup, and excavation of the property at 9200 Latty Avenue and surrounding vicinity properties. This action created about 14,000 cubic yards of additional contaminated soil, which was stockpiled on HISS.

In 1986, the DOE provided radiological support to the cities of Hazelwood and Berkeley for a drainage and road improvement project. Soil with constituents in excess of DOE remedial action guidelines was excavated and stored at HISS. This action resulted in an additional 4,600 cubic yards of material being placed at HISS in a supplemental storage pile.

In 1996, the owner of the property to the east of the HISS, Stone container Corporation, expanded its facility. The owner stockpiled approximately 8,000 cubic yards of soil on the southwestern corner of the property. This material is known as the Stone Container pile (or the Latty Vicinity Property No. 2 pile).

**Contaminants.** Primary contaminants at the St. Louis FUSRAP sites are radium, thorium, and uranium. Other contaminants include Ac 227, Pa 231, TCE and degradation products, and the following:

| | | | |
|---|---|---|---|
| arsenic | cadmium | lead | petroleum products |
| barium | chromium | molybdenum | vanadium |
| boron | copper | nickel | zinc |

**Impacted Media.** Affected media include surface and subsurface soils, groundwater, and surface water.

The vertical extent of groundwater and soil contamination in the subsurface has not been characterized site-wide. Laterally, the highest contamination is confined to surface and subsurface soils, groundwater, and surface water on SLAP, HISS, and SLDS.

**Quantity of waste before and after remedial actions.** The volumes shown will be excavated and shipped to a disposal site. The quantities represent soil volumes above cleanup criteria.

| *Site* | *Volume (cubic yards)* |
|---|---|
| SLDS | 120,140 |
| HISS[1] | 87,850 |
| SLAPS | 269,858 |

## II. Decision Process

A. *State the regulatory process used at the site.*
SLAP/HISS and vicinity sites are designated as the Superfund Site, the SLDS site was investigated and a remedy was evaluated under CERCLA.

B. *Describe the final decisions for closure and the justification for not obtaining clean closure.*
The components of the physical remedy are described above. Clean closure was preliminarily determined to be technically and financially impracticable.

## III. Postclosure

A. *What was the final land use chosen? Are there restrictions on other resources? How long are these restrictions necessary?*
Portions of the site will have restricted access and land use restriction. If contamination remains onsite at a level which doesn't allow any use, i.e., residential.

1. Volume is based on the HISS Supplemental and Main piles, Stone Container pile, and Vicinity Properties. Volume does not include possible contaminated soil below the HISS piles.

| *Site* | *Land Use* |
|---|---|
| SLDS | Industrial |
| SLAPS & VP | Unrestricted |
| HISS & VP | Unrestricted |

*What are the specific requirements/actions associated with institutional controls?*
Monitoring the environment, monitoring the performance of the remedy, and maintenance of the site including the components of the remedy.

C. *Briefly describe the responsibilities of all of the parties involved in the institutional control agreement.*
Five-year review cycles will occur to evaluate the remedy after the USEPA certifies completion by US EPA, MDNR, and USACE. For those portions of the site which is owned by Mallinckrodt Chemical Co. and or other private parties where contamination will remain in excess of unrestricted use levels enforceable institutional controls are envisioned which include all parties, although none have actually been developed for existing records of decision, they are referred to.

D. *Summarize the funding for institutional controls.*
The USACE have responded in general by stating that they intend to develop institutional controls and a long term monitoring plan. The USACE is looking to Congress to either fund the Corps for this or designate another federal agency for this responsibility.

*STGWG contact:* Bob Geller, Missouri Department of Natural Resources, (573) 751-3907

Report coordinated by Bob Geller with input from Scott Honig, Missouri Department of Natural Resources (1998).

## Weldon Spring Site, St. Charles County, Missouri

### I. Introduction

A. *Provide a brief description of the site. Include site's name, location, topography, approximate size, proximity to populated areas, and general topography features.*
The Weldon Spring Site is located in St. Charles County, Missouri, about 30 miles west of St. Louis.

In 1941, the U.S. Department of the Army (Army) acquired about 17,000 acres of land in St. Charles County to construct and operate the Weldon Spring Ordnance Works to manufacture trinitrotoluene (TNT) and dinitrotoluene (DNT) explosives. The Army closed the ordnance works and declared it surplus in 1946. By 1949, all but about 2,000 acres of the property had been transferred to the State of Missouri and eventually became the Weldon Spring Wildlife Area and the August A. Busch Memorial Wildlife Area. Except for several small parcels transferred to St. Charles County, the remaining property became the Weldon Spring Uranium Feed Materials Plant and the U.S. Army Reserve and National Guard Training Area [the Weldon Spring Training Area (WSTA)].

The land for the feed materials plant (now referred to as the chemical plant) was the result of a transfer of 205 acres of the former ordnance works from the Army to the U.S. Atomic Energy Commission (AEC). Additional land was later acquired to the construct a fourth raffinate pit to increase waste storage capacity. From 1957 to 1966, the AEC produced uranium trioxide, uranium tetrafluoride, and uranium metal from uranium and thorium ore concentrates. Plant operations generated several chemical and radioactive waste streams, including raffinates from the refinery operation and magnesium fluoride slurry (washed slag) from the uranium recovery process. Raffinates and waste slurries were piped to the raffinate pits from which supernatant liquids were decanted to the plant process sewer. This sewer drained offsite to the Missouri via a 1.5 mile natural drainage channel termed the Southeast Drainage.

As result of past activities, the Weldon Spring Site became contaminated and is listed on the National Priorities List (NPL) of the U.S. Environmental Protection Agency (EPA). The U.S. Department of Energy is responsible for cleanup activities at the site through the Weldon Spring Site Remedial Action Project (WSSRAP). The WSTA is listed on the NPL separate from the Weldon Spring Site. Army is responsible for cleanup activities at the WSTA.

The Weldon Spring site consists of two noncontiguous areas: the 217-acre chemical plant area and a 9-acre limestone quarry. The Weldon Spring site is located in the southwest uplands of St. Charles County, which is bounded by the Mississippi River to the north and the Missouri River to the south; the county land is about half uplands and half floodplain. Site elevations range from approximately 610 feet mean sea level (MSL) near the northern edge to about 670 feet MSL near the south edge. A small portion of land in the northern area of the site is within the 100-year floodplain of nearby Schote Creek. Gently rolling topography characterizes the area to the north and west, whereas wooded ravines characterize the terrain to the south and east.

The site straddles the surface water drainage divide that separates the Mississippi River and the Missouri River watersheds. Runoff south of the divide flows to the Missouri River through the Southeast Drainage, a natural channel with intermittent flow.

More than 64 feet of alluvial deposits blanket the bedrock in the Missouri River valley. Silt loam is the predominant soil type in the area surrounding the site, both in gently rolling terrain to the north and in more hilly terrain to the south. Approaching the Missouri River, the soil types in the floodplain include silt, silty clay, silty loam, and clay loam.

Overlying the bedrock at the site are unconsolidated sedimentary units that range in thickness from 16 to 59 feet. Beneath this unconsolidated material lies the Mississippian Burlington-Keokuk Limestone, which is about 140-160 feet thick at the site and comprised of an upper weathered zone and a lower unweathered zone. The contact between these zones is often difficult to distinguish. Karst features are present in the vicinity of the site, although the site itself is not considered to be situated in an area of collapse potential.

Groundwater at the site consists of perched groundwater in the unconsolidated deposits (e.g., near the raffinate pits), a shallow unconfined aquifer in the Burlington-Keokuk Limestone, and a deep confined aquifer in the St. Peter Sandstone. The shallow limestone aquifer has been contaminated as a result of past processing and disposal activities by the Army and the AEC.

Groundwater in the shallow aquifer appear to flow by diffuse flow, along horizontal bedding planes, and to a lesser extent through fractures. Groundwater offsite-flows by diffuse flow and also via certain free-flow conduits on both sides of the groundwater divide. Discharge points for the conduits are perennial springs such as Burgermeister Spring to the north and springs in the Southeast Drainage to the south.

B. *Describe the general contamination problem associated with the site. Include the types of contamination present, types of media that have been impacted, and the quantity of waste both before and after remedial actions were taken.*
Radioactive contaminants at the site are radionuclides of uranium-238, thorium-232, and the uranium-235 decay series; chemical contaminants include metals and inorganic anions, as well as organic compounds such as polychlorinated biphenyls (PCBs), and nitroaromatic compounds.

As a result of past discharge and disposal activities, the four raffinate pits and two ponds contain sludge and sediment contaminated with radionuclides such as uranium, thorium, and radium; metals such as lead and molybdenum; and inorganic anions such as fluoride, sulfate, and nitrate. Also, dump areas contain soil contaminated with radionuclides such as uranium, thorium, and radium and some metals such as lead and arsenic.

Material from site buildings and other structures includes asbestos-containing material used in construction, concrete and lighting components contaminated with PCBs, and metal and concrete contaminated with radionuclides such as uranium, thorium, and radium as a result of past processing activities. Containerized process wastes include a variety of liquids and solids contaminated with both chemicals and radionuclides.

Bulk (solid) waste was removed from the Weldon Spring quarry as an interim remedial action to mitigate the potential threat associated with this source of contaminants migrating into the air and the underlying groundwater at the quarry. The remedial action was to excavate the bulk waste from the quarry and transport to the chemical plant area for temporary storage and eventual placement in an engineered disposal facility. Quarry bulk waste removal was completed in 1995. Residual contamination in the quarry proper and in the groundwater underlying the quarry are the subject of a separate remedial action.

Onsite soil contains generally low levels of radionuclides (primarily uranium) as a result of airborne releases during plant operations; soil at scattered locations contains radionuclides such as uranium, thorium, and radium and contamination with heavy metals, PCBs, PAHs, and inorganic anions such as sulfate and nitrate. Offsite soil and sediment at the Southeast Drainage, 10 vicinity properties, and three lakes in the adjacent Busch Wildlife Area contain low levels of radionuclides (primarily uranium) that exceed background concentrations as a result of past spills and discharges and ongoing surface runoff.

Contamination is also present in groundwater beneath the site due to leaching from the raffinate pits and other contaminant sources. The groundwater contains elevated levels of uranium, nitrate, sulfate, and nitroaromatic compounds. Some metals have also been detected at levels above background in isolated wells onsite.

Contaminated raffinate pit sludge totals approximately 220,000 cubic yards. Contaminated sediment totals approximately 120,000 cubic yards. Contaminated structural material from chemical plant building demotion and bulk waste from the quarry totals approximately 170,000 cubic yards. Contaminated soil totals approximately 340,000 cubic yards. The total volume of contaminated material at the Weldon Spring site is approximately 880,000 cubic yards.

An engineered onsite disposal facility will be constructed to contain all solid wastes at the Weldon Spring site. The disposal facility is constructed over naturally occurring low permeability material. The disposal facility has a double synthetic liner over compacted clay with redundant leachate collection and removal systems. A cover including a radon barrier will prevent infiltration of water, vegetation, and animals.

Raffinate pit sludge will be stabilized with a binder of cement and fly ash to form a grout which will be pumped into the disposal facility. Soils contaminated with nitroaromatic compounds will be also be stabilized and placed in the disposal facility. Contaminated structural material and demolition debris will be placed in the disposal facility and surrounded with compacted contaminated soil or grout.

**II. Decision Process**

A. *State the regulatory process used at the site.*
The Weldon Spring site is a Superfund site. The site was investigated and a remedy was evaluated under CERCLA. The Quarry Bulk Waste Operable Unit (QBWOU) was completed in 1995 and is closed. The Chemical Plant Operable Unit (CPOU) involves the disposal of contaminated sludge, soils, sediments, and debris in an engineered disposal facility. The CPOU remedial action continues. Disposal facility closure is expected in 2002. Records of Decision for the Quarry Residuals Operable Unit (QROU) and Groundwater Operable Unit (GWOU) are expected to be signed in 1998 and 1999, respectively.

B. *Describe the final decisions for closure and the justification for not obtaining clean closure.*
The components of the physical remedy are described above. Clean closure of the QBWOU is complete. Clean closure of the CPOU will be completed in approximately 2002. Selection of the final remedial action for the QROU and GWOU is yet to be determined.

**III. Postclosure**

A. *What was the final land use chosen? Are there restriction on other resources? How long are these restrictions necessary?*
The site will remain in perpetuity. Portions of the site will have restricted access and land use in perpetuity.

B. *What are the specific requirements/actions associated with institutional controls?*
Monitoring of the environment, monitoring of the performance of the remedy, and maintenance of the site including the components of the remedy.

C. *Briefly describe the responsibilities of all the parties involved in the institutional control agreement.*
Final responsibilities for institutional controls are yet to be determined. Five-year review cycles will occur to evaluate the remedy after the EPA certifies completion.

D. *Summarize the funding for institutional controls.*
Funding for institutional controls is yet to be determined.

*STGWG Contact:* Bob Geller, Missouri Department of Natural Resources, (573) 751-3907

Report coordinated by Bob Geller with input from Glen Carlson, Missouri Department of Natural Resources (1998).

## Los Alamos National Laboratory, New Mexico

### I. Introduction

A. *Provide a brief description of the site. Include site's name, location, topography, approximate size, proximity to populated areas, and general topography features.*
The U.S. Department of Energy (DOE) operates Los Alamos National Laboratory or "Laboratory" (LANL). LANL is located in north-central New Mexico, approximately 60 air miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. The 43 square-mile site is on the Pajarito Plateau. The ephemeral and intermittent streams that drain the Plateau have created numerous narrow finger-like mesas, whose tops range in elevation from approximately 7,800 feet on the flank of Jemez Mountains to 6,200 feet at their eastern edge above the Rio Grande Valley. The eastern margin of the plateau stands 300 to 900 feet above the Rio Grande.

The Laboratory shares a boundary with the Pueblo of San Ildefonso Sacred Area.

Since its inception in 1943, the Laboratory's primary mission has been nuclear weapons research and development. Its current central mission is reducing global nuclear danger. Present DOE plans call for continued operation for another 50 years. The Site-Wide Environmental Impact Statement (SWEIS) indicates DOE's preference for:

- Expansion of TA-54/Area G Low-Level Waste Disposal Area; and
- Enhancement of Plutonium Pit Manufacturing.

San Ildefonso Pueblo opposes the disposal area expansion. That disposal site borders the Pueblo's Sacred Area Reservation lands. While the SWEIS considered alternatives which "include (in varying amounts) shipments of LLW for off-site disposal," the SWEIS did not consider closing this disposal area.

B. *Describe the general contamination problem associated with the site. Include the types of contamination present, types of media that have been impacted, and the quantity of waste both before and after remedial actions were taken.*

**Waste.** The Laboratory produces several waste types: Low-level, transuranic, radioactive liquid, chemical and mixed low-level. Chemical waste includes Resource Conservation and Recovery Act (RCRA) hazardous waste and other regulated waste such as asbestos and polychlorinated biphenyls, or PCBs.

- *Low-level waste*. Low-level is disposed of on site at a location known as the Technical Area (TA) 54, Area G. This site has been used for disposal since 1957. The volume of low-level waste disposed to date at Area G is approximately 250,000 cubic meters. There are no plans for future retrieval of these low-level wastes. The Laboratory generates approximately 3,000 to 5,000 cubic meters of low-level waste each year. This is expected to increase to approximately 7,000 to 8,000 cubic meters yearly over the next 5 to 10 years. A volume reduction program is part of present practices. Future options include "on- and off-site disposal." LANL states "some low-level waste cannot go off site; therefore, we will have to continue to dispose of this waste on site."

LLW minimization is driven by the requirement of DOE Order 5820.2-A (DOE 1988), the limited capacity of the on-site disposal facility, and other federal and DOE regulations. A recent analysis of the LLW landfill at TA-54, Area G indicates that at planned disposal rates, the current pits will be filled to capacity during FY 2000. Construction of additional landfill pits depends on receiving authority for new pits in the development area. Such action is strongly opposed by the neighboring San Ildefonso Pueblo and may not be approved for five or more years. Site pollution prevention plans for LANL, Section 3.3.1.

- *Transuranic.* As much as 95 percent of legacy TRU waste at the Laboratory may be mixed TRU waste; that is, waste containing hazardous components as regulated by RCRA. Approximately 8,800 cubic meters of TRU and mixed TRU waste is in interim storage in Area G. Legacy and newly generated waste of this type will be disposed of at the Waste Isolation Pilot Plant (WIPP). DOE expects shipments will begin in 1999, continuing for approximately 17 years at current budget targets.

  The Laboratory generates between 100 and 200 cubic meters of TRU waste (including mixed TRU waste) yearly. Starting in 1997, LANL began to retrieve TRU waste from earthen-covered pads. The Laboratory may retrieve some TRU wastes from pits and shafts in the future. The current retrieval is driven by an agreement with the New Mexico Environment Department.

  As of December 31, 1995, over 11,000 cubic meters of TRU and mixed TRU wastes were stored at the Laboratory. Of this volume, 2,600 cubic meters are considered "buried" TRU and MTRU wastes, and can be removed from inventory waste to be sent to WIPP. The remaining volume is considered retrievably stored, and under consideration for shipment to WIPP. Much of the legacy waste may have to be repackaged for shipment to WIPP, generating significant volumes of secondary waste (both repackaging volume and waste generated by repackaging). Site pollution prevention plan, 1997, Section 3.1.2.

- *Radioactive liquid.* Radioactive liquid waste management involves collection and treatment of radioactive contaminated water-based waste. Separation processes are used to concentrate the radioactive constituents into a solid. The solid is either disposed of as low-level waste at TA-54, Area G, or stored as a transuranic waste at Area G pending shipment to WIPP. The treated waste waters discharge into Mortandad Canyon which drains through San Ildefonso Pueblo lands to the Rio Grande. There is an Environmental Protection Agency national pollutant discharge elimination system (NPDES) permit.

- *Chemical waste.* LANL generates about 750 cubic meters of chemical waste each year. All these wastes are shipped off site for treatment and disposal. Radioactively contaminated asbestos waste is disposed of on site at TA-54, Area G.

- *Mixed low-level waste.* These wastes are radioactive and subject to the Atomic Energy Act, and also meet hazardous waste criteria set forth by RCRA, as well as the New Mexico Hazardous Waste Act. About 500 cubic-meters are in permitted storage in TA-54, Areas G and L. The Laboratory generates between 50 and 75 cubic meters yearly of such waste. The Laboratory plans to ship mixed low-level waste to DOE sites in Idaho and Tennessee that have capabilities for treatment of mixed waste, as well as to commercial waste treatment and disposal facilities located out of state that are permitted to treat/dispose of hazardous waste and licensed to manage radioactive materials.

- *By-product materials.* The waste is not categorized by by-product or source. The total curies is not readily available; about 1 million curies have been disposed at Area G.

- *Waste contained in shafts.* About 200 shafts contain tritium waste, high activity waste, animal tissues, PCB waste, and beryllium.

**Contaminants.** Primary groundwater contaminant at the site is tritium.

**Impacted media.** Affected media include surface and subsurface soils, air, and groundwater. Forest resources on the slopes adjacent to the site have also been impacted via uptake of contaminated groundwater.

The vertical extent of groundwater and soil contamination in the subsurface beneath the disposal site has not been characterized site-wide. Since the pits and shafts are unlined, groundwater contamination 190 feet below the plateau have been identified. The water table is approximately 600 feet below the plateau. Laterally, the disposal area has many naturally occurring rock fractures on the side of the mesa nearest San Ildefonso.

**Quantity of waste before and after remedial actions.** "The most important performance measure will be the volume of TRU waste generated by the major facilities. However, this measure will have to be adjusted for the increased mission requirements for both work off of plutonium residues and response to DNFSB 94-1, and for stockpile stewardship activities, especially pit rebuilding." Site Pollution Prevention Plan for LANL, Section 3.1.8 (LAUR 97-1726).

**II. Decision process.**

A. *State the regulatory process used at the site.*
The Environmental Protection Agency (EPA) issued the Hazardous and Solid Waste Amendments (HSWA) Module to the Laboratory's RCRA operating permit in 1990.

The New Mexico Environment Department (NMED) obtained corrective action authority from EPA on January 2, 1996.

The Federal Facilities Compliance Order/Site Treatment Plan (FFCO/STP-NMAD, 1995) stipulates treatment requirement for MTRU wastes.

A Natural Resources Trustee Council will assess the injuries to Natural Resource uses.

B. *Describe the final decision for closure in the justification for not obtaining clean closure.*
LANL plans to continue operating for the next 50 years. Closure is not presently expected before 2045.

**III. Postclosure**

A. *What was the final land use chosen? Are there restrictions on other resources? How long are these restrictions necessary?*
The site will remain in perpetuity. Portions of the site will have restricted access and land use for the foreseeable future.

B. *What are the specific requirements/actions associated with institutional controls?*
Monitoring of the environment has been expanded at the request of the four Indian Pueblos that have signed ACCORDS with DOE concerning LANL. The ACCORDS promise information and resources for independent analysis by the Pueblo.

Generally, institutional controls are mainly handled by DOE and the Laboratory.

C. *Briefly describe the responsibilities of all the parties involved in the institutional control agreement.*
There is no one institutional control agreement for LANL.

D. *Summarize the funding for institutional controls.*
The DOE provides funding for the present institutional controls at LANL.

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## U.S. DOE Fernald Site, Ohio

### I. Introduction

A. The Fernald site, formerly known as the Feed Materials Production Center, is a 1,050-acre Department of Energy facility located in a rural, residential area 17 miles northwest of Cincinnati. The facility was constructed in the early 1950s and production began in 1952 with National Lead of Ohio (NLO) as the operating contractor.

Uranium metal products for the nation's defense programs were produced at Fernald, including slightly enriched and depleted uranium. Smaller amounts of thorium metal also were produced. Production stopped in July 1989 to focus resources on environmental restoration. In December 1989 the site was added to the U.S. EPA National Priorities List. In 1991 DOE officially ended production and the site was renamed the Fernald Environmental Management Project, or FEMP. In 1992 Fluor Daniel Fernald (formerly FERMCO) assumed contractor responsibility for cleanup of the Fernald site from Westinghouse.

B. *Ground Water:* The Fernald site is located over the Great Miami Aquifer, which is designated a sole source aquifer and considered a valued natural resource. The Southwest Ohio Water Company operates a production wellfield approximately one mile east of the FEMP former production area.

Ground water is contaminated with above background concentrations of uranium approximately one mile south of the site in what is referred to as the south plume. DOE provided bottled water for residents in the south plume area until 1996 when a public drinking water system became operational.

*Waste Pits:* The six waste pits used during past operations contain approximately 475,000 tons of waste, including uranium, thorium and other radioactive and chemical contaminants. The pits range in size from a football field to a baseball diamond, and vary in depth from 13 feet to 30 feet. Two of the pits have a water cover, one has a synthetic cap and the others have a soil cover. The waste pits are either in close proximity to, or in contact with, the Great Miami Aquifer and are contributing to contamination of the ground water.

*Silos:* There are four concrete silos at the FEMP that were constructed to store radioactive materials. Two of them, referred to as the K-65 silos, contain high radium-bearing residues, one contains lower-level dried uranium residues, and one has never been used. To reinforce the K-65 silos, a soil berm was added in the 1960s and enlarged in the early 1980s. In 1991, bentonite clay was injected into the tops of the two K-65 silos to cap the high radium residues and reduce radon emissions from the silos.

*Waste Pits Remedial Action Project (Waste storage area, including six waste pits, clearwell and burn pit):* The waste pit contents will be excavated, thermally dried and shipped by rail to a permitted commercial disposal facility. Significant effort has been put into upgrading on and off-site rail systems.

*On-Site Disposal Facility:* Contaminated soil and debris will be excavated and disposed in the on-site engineered disposal cell. Any waste that exceeds the waste acceptance criteria will be disposed off site. No off-site waste will be allowed in the disposal cell. The first waste placement occurred in December 1997. The OSDF is designed to hold 2.5 million cubic yards of waste.

*Facilities Closure and Demolition Project (Former production area, including all buildings, equipment, inventoried hazardous material and scrap metal piles):* All on site buildings will be decontaminated and dismantled. Debris within the waste acceptance criteria will go in the on-site disposal facility, with higher level materials going off site. Significant progress has been made in the safe shutdown of nuclear materials and the decontamination and dismantlement of production facilities.

*Silos Project (Silos 1-4, including the K-65 silos, their contents and associated piping and soils):* Due to the 1996 failure in the Vitrification Pilot Plant, an Explanation of Significant Difference was completed for Silo 3 and a Record of Decision Amendment will be completed for Silos 1 and 2.

*Soils Characterization and Excavation Project (formerly OU2 and OU5):* Contaminated soils will be excavated and those meeting the waste acceptance criteria will be disposed in the on-site disposal facility. Site preparation activities in the Southern Waste Units were completed in June 1998. Excavation in the first contaminated soils area was completed in 1997.

*Aquifer Restoration and Waste Water Project (formerly OU5):* The Great Miami Aquifer will be remediated by a combination of treatment, extraction and injection of the ground water. The Advanced Waste Water Treatment Facility was completed in 1994 with additional capacity added in 1998. The South Plume extraction system removal action began pumping in August 1993. Work continues on the South Field extraction system which should be operational in 1998.

## II. Decision Process

A. The CERCLA process was used for characterization and remedy selection for major components of the site. RCRA closure process was used for a number of Hazardous Waste Management Units. An integrated RCRA/CERCLA process was employed for closure of the remainder of the HWMUs.

B. The site will be remediated to risk-based cleanup standards based upon an undeveloped park scenario. A balanced approach was developed for handling waste generated under the cleanup. Low volume, high concentration waste will be shipped off site while large volume, low concentration waste will be disposed in the On-Site Disposal Facility. Approximately 80 percent of the remediation waste will remain on site. The DOE, USEPA, Ohio EPA and stakeholders saw the balanced approach as the most likely to ensure that high concentration wastes left the site, while keeping waste on site that could be safely managed there thus reducing cost and transportation risks.

**III. Postclosure**

A. As stated previously the cleanup levels were based upon an undeveloped park scenario. Approximately 23 acres of the site are being evaluated for commercial viability by the Community Reuse Organization. It is expected the remainder of the site will be dedicated to natural resource restoration as part of a settlement for the State of Ohio's Natural Resource Damage claim against the DOE.

B. No specific requirements other than those described in the individual Operable Unit Records of Decision and the OSDF Operation and Maintenance Plan have been defined at this time. The RODs commit DOE to conducting institutional controls such as access controls, deed restrictions, and alternate water supplies as well as long-term environmental monitoring and maintenance to ensure protectiveness of the remedies.

C. As previously stated no institutional controls agreement exist other than the Record of Decision requirements and the OSDF Operation and Maintenance Plan. It is expected that DOE will be required to maintain the institutional controls and both USEPA and Ohio EPA will enforce their maintenance. Remediation at Fernald is not expected to be completed before 2006 allowing time for further refinement of these issues.

D. No current funding provisions exist other than DOE's obligations to long-term controls and monitoring under the Records of Decision.

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## U.S. DOE Mound Site, Ohio

### I. Introduction

A. The DOE Mound site is located in the city of Miamisburg, Ohio, approximately 10 miles south of Dayton, Ohio. The site is currently owned by the Department of Energy and consists of 306 acres. The two main radioactive processing areas are located on two upland areas known as the Main Hill and the SM/PP Hill. The lowland area is known as the Test Fire Valley. Numerous disposal areas are located in the lowland area. Portions of the site overlie the Great Miami Sole Source Aquifer which is currently under remediation due to volatile organic contamination. The site will be transferred to the Miamisburg Mound Community Improvement Corporation (MMCIC). The MMCIC will then in turn transfer the site as parcels become available during the clean up process and buyers are found.

The plant's construction was completed in 1948. The original mission for the site was to process polonium as part of the Manhattan Project. In January of 1949, the Mound plant began research and operations involving other radionuclides. The research and operations continued through the early 1990s. The plutonium-238 heat sources work and thermoelectric generators development continues to date.

B. Major contaminants in the soil at the site are plutonium-238, thorium-232, uranium-238, actinium-227, tritium, volatile organic compounds (VOCs), and various heavy metal (nickel, chromium, cadmium, etc.). Isolated locations of cobalt-60 and cesium 137 have also been found. The ground water is contaminated with tritium, VOCs, Ni, Cd and Cr.

Fifteen response actions have been identified to date with approximately 40 areas needing additional investigation. These specific areas vary in size from very small (several shovel fulls) to potentially very large (e.g., 152,000 cubic yards). Accurate estimated volumes for pre and post remediation are not available at this time. Estimates may be obtained from the site.

A ground water pump and treat system is currently operating in the lower area (also known as OU1). This system has been augmented with a soil vapor extraction system to shorten the expected pump and treat time. Some of the other ongoing remediation include: Building 21 and Soil Thorium Clean Up; H-Building Hot Spot Removal; SD Building; and Building 35/59 Removal.

In addition to the response actions and further investigation noted above, six buildings planned for remediation are listed below with their known and/or potential contaminants:

*T Building*—polonium, plutonium, tritium and numerous others;
*SW Building*—plutonium, tritium, actinium, thorium and numerous others;
*R Building*—polonium, tritium and numerous others;
*HH Building*—tritium, krypton-85, cobalt-60, uranium-233,-234, -235, -238, thorium and numerous others;

*WD Building*—plutonium-238,-239, tritium, uranium-235, -238, americium-241 and numerous others; and
*Building 38*—plutonium-238.

**II. Decision Process**

A. The Mound Plant was listed on the National Priority List in 1989. DOE entered into a Federal Facility Agreement (FFA) with USEPA and Ohio EPA in 1993 to conduct environmental restoration work under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Under the FFA, DOE must obtain agreement from its regulators that all environmental media and remaining facilities are protective of human health and the environment.

The state and site also signed the Federal Facility Compliance Agreement (FFCA) that requires DOE to determine mixed waste treatment options and develop a schedule to treat/dispose of the waste.

B. DOE and City of Miamisburg agreed that the site will be transformed into an industrial park, and that it will not be used for residential purposes. The decision was based on the ability to use most of the facility for similar industrial activities. Clean up will be remediated to risk based standards based on industrial/commercial land use scenario, i.e., 40-hour work week.

**III. Postclosure**

A. As indicated above, cleanup levels are based on industrial/commercial land use. Additional restrictions on ground water will be included. The transportation of soil designated clean under the industrial use may also be prohibited unless determined to be clean for other uses, e.g. residential. The duration of the restrictions may be location, contaminant level and contaminant specific. For example, tritium has a relatively short half life (12.3 years) and may decay to acceptable levels within a relatively short time (100 years), depending on the original level. Thorium 232 on the other hand has a half life of 14 billion years. Based on the thorium half life, restrictions must be maintained indefinitely.

The land use was selected through various meetings with DOE, City of Miamisburg and regulators. Additional stakeholder outreach activities were also conducted to obtain input from the community.

B. Specific requirements/actions associated with the institutional controls will include: indefinitely monitoring and reporting land use; prohibiting ground water use; monitoring/tracking the transportation and use of soil; providing a funding mechanism for the state regulatory to monitor the property use and sample if necessary and review documents; maintaining access controls; and long-term environmental monitoring and maintenance to ensure protectiveness of the remedies.

Other than a Record of Decision, no mechanism has been identified. Additional mechanisms will be needed to establish a plan, responsibilities, and funding.

C. No institutional control agreement has been developed. We (DOE, USEPA, Miamisburg Mound Community Improvement Corporation (representing the city of Miamisburg), and the state (Ohio EPA and Ohio Department of Health) are currently discussing roles and responsibilities.

D. Funding provisions for implementing and monitoring institutional controls have not been established yet.

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## Canonsburg UMTRA, Pennsylvania

### I. Introduction

A. *Provide a brief description of the site. Include the site's name, location, owners (both current and future), approximate size, proximity to populated areas, and general topography features.*
Canonsburg (UMTRA) site Repository area owned by U.S. government. Remediated area owned by Commonwealth of Pennsylvania. Total area approximately 30 acres located in a populated area, bordered by a stream and railroad tracks in a slight valley.

B. *Describe the general contamination problem(s) associated with the site. Include the types of contamination present, types of media that have been impacted, and the types and quantity of waste both before and after remedial actions were taken. Also, please describe any ongoing remedial actions (groundwater pump and treat, etc.) associated with the site.*
Site was used to manufacture radium, then reprocess uranium. Land/ground most principally affected. Not much impact on groundwater. Approximately 150 vicinity properties also remediated. No present remedial actions, they were completed in 1986.

### II. Decision Process

A. *State the regulatory process (CERCLA, RCRA, Orders, etc.) used at the site.*
PL 95-604 - Uranium Mill Tailings Radiation Control Act

B. *Describe the final decision(s) for closure and the justification for not obtaining clean closure.*
Under UMTRCA, a repository site had to be engineered, and a portion of the site was suitable. The law also specifies cleanup criteria.

### III. Postclosure

A. *What was the final land use chosen? Are there restrictions on other resources? How long are these restrictions necessary? What process was used to select the land use?*
Final land use of most of site is repository called buffer zone. These will remain in U.S. government's hands forever or until UMTRCA is amended to change.

B. *What are the specific requirements/actions associated with the institutional controls? What mechanism is used to ensure long-term operation, monitoring, and institutional controls are maintained?*
UMTRCA specified passive controls, with design basis of 1,000-year stability and that (federal) government would maintain ownership and control.

C. *Briefly describe the responsibilities of all of the parties involved in the institutional control agreement. Please specify the organization(s) responsible for enforcing the institutional control and, if applicable, discuss the role of parties (local governments, future owners, etc.) not involved in the institutional control agreement.*
U.S. overnment to Department of Energy (but maintained by DOE Grand Junction, Colorado office). Feds responsible for maintaining institutional controls.

*D. Provide a summary of any funding provisions (i.e.., who provides funds, how much funding is needed, how often is funding obtained, legal funding drivers, etc.) associated with the long-term operations, monitoring, and institutional controls.*
Remedial action funding was 90 percent federal, 10 percent state, as required under PL 95-604 (UMTRCA). No funding needed since remedial action is completed. Monitoring, etc. done by U.S. DOE (see C above).

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## Oak Ridge Reservation, Tennessee

### I. Introduction

A. The Oak Ridge Reservation (ORR) comprises approximately 34,516 acres owned by the U.S. Department of Energy (DOE). Most of the ORR lies within the city limits of Oak Ridge, Tennessee. Three major installations are located within the ORR: the Y-12 Plant, the East Tennessee Technology Park (ETTP); formerly known as K-25, and the Oak Ridge National Laboratory (ORNL). These installations were constructed in the early to mid-1940s by the Atomic Energy Commission as research, development, and process facilities in support of the Manhattan Project.

The ORR lies 20 miles west of Knoxville Tennessee. The ORR is bounded on the north and east by the city of Oak Ridge and on the south and west by the Clinch River. The Reservation lies within the Valley and Ridge Province, a major subdivision of the Appalachians. The parallel valleys and ridges trend in a northeast-southwest pattern.

B. The DOE installations on the reservation generate solid, hazardous and mixed waste (hazardous waste mixed with radionuclides). Hazardous waste, storage and disposal facilities were created to handle the wastes generated. Major impacts include soils, sediment, surface and ground water.

### II. Decision Process

A. Two federal laws, the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), are the dominant regulatory drivers for environmental management activities on the ORR.

In December 1989, the ORR was placed on the National Priorities List (NPL) as a high priority hazardous waste site requiring remediation. In May 1991 the Tennessee Oversight Agreement (TOA) was signed. This document pledged financial and technical support from DOE , including participation in a tri-party agreement. In January 1992, DOE, the Environmental Protection Agency and the Tennessee Department of Environment and Conservation negotiated the Federal Facility Agreement (FFA) for environmental restoration activities on the ORR. The FFA integrates the corrective action processes of RCRA and CERCLA.

B. Clean closures have not been obtained for many of the waste sites on the Oak Ridge Reservation due to time frames in the CERCLA process. At present some of the sites have undergone dirty closures for the purpose of containing / hindering contaminant migration. Final decisions have not been obtained for many of the sites.

**III. Postclosure**

A. At present no final land use decisions have been made on the ORR. Surveys are underway on DOE property to determine what areas have and have not been impacted by DOE activities.

B. No agreements associated with institutional controls have been implemented at present.

C. No responsibilities for institutional controls among the party leaders have been considered at present.

D. No funding toward institutional controls has been agreed to at this time. However, attached is a response letter which DOE sent to the State concerning the funding of institutional controls.

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# APPENDIX B. LONG-TERM STEWARDSHIP AT THE NEVADA TEST SITE

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Summer 1998

This paper was prepared for the State Tribal Government Working Group (STGWG) committee on Stewardship. STGWG provides advice and input on matters related to the U.S. Department of Energy's (DOE) national Environmental Management Program for the nuclear weapons complex. The paper discusses DOE's long-term stewardship responsibilities at the Nevada Test Site and is available online at www.state.nv.us/nucwaste/nts/steward.htm.

## Contents



## Introduction

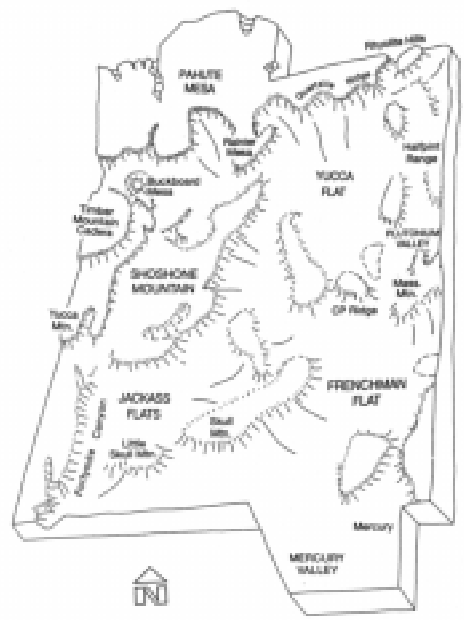
The Nevada Test Site (NTS) is a U.S. Department of Energy (DOE) installation occupying approximately 1,350 square miles (882,332 acres) in southeastern Nye County, Nevada. NTS is larger than the State of Rhode Island. Site features includes deserts, playas, and mountainous terrain (see figure 1). NTS was established in 1951 as the nation's proving ground for testing and development of nuclear weapons. Between 1951 and 1992, the federal government conducted just over 900 nuclear tests at the site; 100 of these tests were conducted above ground.

The site is situated about 65 miles (105 km) northwest of Las Vegas, Nevada. Las Vegas is home to 1.2 million residents and is one of the fastest growing metropolitan areas in the country. With visitor counts now exceeding 30 million annually, Las Vegas is also one of the world's most active resort destinations.

The NTS occupies public lands that are administratively held by the Department of Interior, Bureau of Land Management (BLM). This means the lands are "owned" by the public, not the federal government. Nonetheless, the lands are under temporary use restrictions because they were "loaned" by BLM to the Atomic Energy Commission (now DOE) vis-a-vis four separate Public Land Orders.

In addition to these Public Land Orders, the United State Air Force, through a DOE/Air Force Memorandum of Understanding (MOU), loaned the area known as Pahute Mesa to DOE. The MOU grants DOE unconditional use and operational control[1] of Pahute Mesa. The mesa is contiguous to the northern border of the NTS. The lands encompassing Pahute Mesa and NTS total 1,350 square miles and are "access controlled" by DOE and withdrawn from settlement, sale, location, or entry under the mining and mineral leasing laws. Although these lands are, in fact, public lands, under the current federal management structure and with few exceptions, they are restricted from all forms of public uses.

**Figure 1. Nevada Test Site Topography**




Yucca Mountain, which is the only site being evaluated as a potential geological repository for high-level radioactive waste and spent nuclear fuel, is located on the southwestern corner of the NTS in a location known as "Area 25" or Jackass Flats. Yucca Mountain actually occupies lands under the jurisdiction of DOE, the United States Air Force, and the BLM. That portion of Yucca Mountain that occupies public lands is controlled by DOE under a temporary right-of-way permit issued by the BLM. Under the Nuclear Waste Policy Act as amended, Yucca Mountain is managed by DOE's Office of Civilian Radioactive Waste Management.

## Contamination At NTS

Contaminated soils and groundwater at NTS resulted from years of nuclear testing and from various research and development projects and radioactive waste disposal programs. The types of activities that led to the existing contamination could be categorized as follows:

- Atmospheric Nuclear Testing
- Underground Nuclear Testing
- Safety Tests and Cratering Events
- Nuclear Rocket Development and other R&D Programs
- Disposal of Radioactive Waste (in shallow land fills, subsidence craters, and in greater confinement disposal shafts)

1. See Memorandum of Understanding between the Department of the Air Force Tactical Air Command Tactical Fighter Weapons Center and the Department of Energy, Nevada Operations Office, July 1982 (E-AI08-82NV10283).

### *Atmospheric Testing*

Prior to the 1963 Limited Test Ban Treaty, a total of 100 atmospheric nuclear tests were conducted at NTS. The tests were detonated at ground level, from towers, balloons, and by airdrops. According to DOE, the greatest disturbance typically occurred when an air-dropped weapon penetrated the ground surface to a shallow depth before detonation. Such a test—with an estimated yield of 100 kilotons and up—would result in a crater about 120 feet deep and 720 feet in diameter. Because NTS was used for both *atmospheric* and *underground* nuclear testing, DOE has stated that it is not possible to fully define the level of residual contamination that remains from the atmospheric testing program.[2] Nevertheless, the number of curies generated from above ground testing was estimated at about 6 billion. Obviously, most of the fission products and other short-lived nuclides released from above ground testing were dispersed into the atmosphere and have since decayed away. DOE does acknowledge, however, that longer-lived radionuclides remain in the soil and physical structures at the site. The primary radioactive isotopes that remain from above ground testing include americium, plutonium, cobalt, cesium, strontium, and europium.

### *Underground Testing*

Beginning in June 1957 and ending in September 1992, DOE (and its predecessor agencies) conducted over 800 underground nuclear tests at the NTS. The tests had yields ranging from zero to 1,000 kilotons. Underground testing left an estimated source term of 300 million curies in the environmental media (soil and groundwater). Because an estimated 38 percent of the tests were conducted under or within 75 meters (246 ft.) of the water table, the groundwater beneath the site now contains an estimated 120 million curies of radioactivity.[3]

There were four basic types of underground tests: shallow, borehole, deep vertical, and tunnel tests. Collectively, these tests caused significant disruption to the geologic media. They resulted in hundreds of subsidence craters and caused contamination of the subsurface geologic media, surface soils, and groundwater over an estimated 300 square mile area. In terms of absolute volume, Nevada officials contend that the NTS contains more contaminated media than any other site in the DOE weapons complex.[4]

### *Nuclear Safety Tests and Cratering Events*

DOE conducted numerous “safety” experiments at the NTS and, while these experiments did not produced nuclear explosions, they did create significant surface contamination. These tests were conducted to determine the behavior of nuclear weapons in conventional explosive accident scenarios during handling, storage, and transport operations. Safety tests were also conducted to determine the size and distribution of plutonium particles that might result from fires and conventional explosive accidents involving nuclear weapons. Some of experi-

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2. See *Final Environmental Impact Statement for the Nevada Test Site* and Off-Site Locations in the State of Nevada, page 4-96.

3. Ibid, page 4-85.

4. The DOE Weapons Complex is generally described as consisting of 15 major nuclear materials development and manufacturing facilities located in 10 different states. The complex produced nuclear weapons through a series of integrated manufacturing activities that included mining, milling and refining uranium, isotope separation of uranium, fuel and target fabrication for production reactors, reactor operations, chemical separation of plutonium, component fabrication, weapons assembly, and weapons testing.

ments were also performed to determine the biological uptake of plutonium by various species of animals and plants.

The "safety" experiments were conducted at five locations on the Nellis Air Force Range and at two locations on the NTS (see figure 4-1, located at Internet web site www.state.nv.us/nucwaste/nts/steward.htm). According to DOE, the depth of contamination at these soil sites may vary, but probably are one foot or less at any given site.[5] DOE has estimated that these safety experiments contaminated about 2,885 acres with plutonium at levels in excess of 40 pico curies per gram.

In addition to safety experiments, DOE conducted nine cratering events as part of the "Plowshare" program. These events used nuclear devices to excavate large volumes of earth. The materials from these nuclear detonations were literally expelled to the surface. In terms of cumulative effects, the contamination from above ground testing along with the safety shots and cratering events left an estimated 27,000 acres (42 square miles) of surface soils contaminated at levels in excess of 40 pico curies per gram. The primary isotopes of concern are plutonium, uranium, and americium with lesser amounts of cesium, strontium, and europium.[6]

### *Nuclear Rocket Development*

In the mid-1950s, the federal government initiated a nuclear rocket testing program at the NTS. Test cells, roads, and assembly facilities were constructed at NTS Area 25, now the site of the Yucca Mountain site characterization project. Surface soils at these facilities were contaminated with radionuclides released during engine tests, and the buildings were contaminated during assembly and disassembly of the rocket motors. Some of the contaminated equipment and other materials were disposed of in nearby landfills including unknown amounts of processed reactor fuel. Leach fields in the area were also used for disposal of liquid wastes.

### *Radioactive Waste Disposal*

NTS currently functions as a major low-level waste disposal facility for both onsite and off-sited generated defense low-level waste. Two active waste management sites are located on NTS: the Area 5 and Area 3 sites. The Area 5 site occupies 723 acres (more than one square mile) and is located in Frenchman Flat about 12 miles north of Mercury, Nevada. Mercury is the base camp for the NTS. The Area 3 site occupies 125 acres and is located 23 miles north of Mercury in Yucca Flat. Yucca Flat was used extensively for both atmospheric and underground nuclear testing.

Established in 1961, the Area 5 disposal site is a traditional "engineered" shallow land fill disposal facility. It is used for disposal of onsite and offsite-generated low-level waste and onsite-generated low-level mixed waste, as well as for storage of transuranic waste (TRU waste). Since the late 1980s, NTS ceased accepting TRU waste and mixed waste for storage. (Although some TRU and mixed waste was disposed of at the site, the State never officially accepted the waste for disposal.) There are 612 cubic meters ($m^3$) of TRU waste held in temporary storage at the site, of which $53.4m^3$ is classified TRU. The TRU waste is destined for disposal at DOE's Waste Isolation Pilot Plant in New Mexico.

5. See *Federal Facility Agreement and Consent Order [FFACO]*, Appendix VI, page 4.1.

6. Ibid., page 4-106

The waste disposal facilities at Area 5 consists of 17 landfill cells, a storage building for the TRU waste, and 13 Greater Confinement Disposal (GCD) boreholes. The landfill cells (pits and trenches) contain over 500,000 curies of radioactivity. The GCD boreholes contain low-level waste, some transuranic waste, transuranic mixed waste, and classified low-level waste. The boreholes are 120 feet deep and hold about 300m$^3$ of waste containing 9.3 million curies of radioactivity. In all, the Area 5 site probably contains about 20 million cubic feet of low-level waste.

The Area 3 disposal site is used for bulk and packaged low-level waste. The site is comprised of four subsidence craters with areas between the craters excavated to make two oval-shaped landfill units. Conventional landfill methods are used to dispose of waste in the craters. As of 1991, approximately half of the radioactive waste disposed in the Area 3 and 5 disposal sites was defined as atmospheric testing debris generated from cleanup of surface contamination on NTS. While disposal of low-level waste generated from soil cleanup activities on NTS and the Nellis Range is an ongoing activity, during recent years about 90 percent of waste disposed of at NTS is shipped to the site by off-site waste generators. On average, each year NTS receives about 750,000 ft$^3$ of low-level waste from 17 approved waste generators.

### *Industrial Sites*

In addition to contamination caused by the detonation of nuclear devices and waste disposal operations, a significant amount of contamination in the form of muck piles, ponds, sumps, injection wells, inactive tanks, leach fields, waste site, etc. are present on the NTS. These sites remain as by-products of nuclear testing, various research and development programs, and related support activities. These chemical and radioactive contaminated areas, which number in excess of 2,000, are referred to as industrial sites.

## Decision Process—Remediation Of Contaminated Sites

The regulatory process established for DOE's Environmental Management (EM) program at the NTS is detailed in the State/DOE Federal Facility Agreement and Consent Order (FFACO). In that agreement, DOE asserts it authority for conducting EM program activities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Atomic Energy Act, and Executive Order 12580, "Superfund Implementation."

In addition, both DOE and the State acknowledge that the FFACO is subject to other authorities including the Solid Waste Disposal Act, which includes both the Resource Conservation and Recovery Act and the Hazardous and Solid Waste Act; the Nevada Revised Statutes, including the Nevada Water Pollution Control Law, the Nevada Hazardous Waste Law, the Nevada Administrative Code, the Nevada Administrative Procedure Act; and all other applicable provisions of state and federal law. Furthermore, as part of the FFACO, the State of Nevada has stipulated that it retains all of its hazardous waste and clean water authorities and legal rights delegated by the U.S. Environmental Protection Agency and under its own laws and regulations as well. As for DOE, the FFACO stipulates that the agency does not waive any claim of jurisdiction over matters that may be reserved to it by law, including the Atomic Energy Act.

## Site Investigation, Characterization And Closure Process

Achieving site closure(s) of contaminated sites on the NTS[7] is accomplished through a regulatory scheme defined under the above referenced Federal Facilities Agreement and Consent Order (FFACO). This agreement contains a detailed process or "Corrective Action Strategy" for planning, implementing, and completing environmental corrective actions. The process is designed to produce decision(s) for closure of contaminated sites (see figure 1-2, located at Internet web site www.state.nv.us/nucwaste/nts/steward.htm). In general, site closure activities at the NTS are being pursued to address the following subproject areas:

- Off-Site Corrective Action Units (Project Shoal and the Central Nevada Test Area underground nuclear test sites)
- Soils Media Corrective Action Units (including sites on the Tonopah Test Range and Nellis Air Force Range Complex)
- Underground Test Areas Corrective Action Units (nuclear shot cavities)
- Industrial Sites Corrective Action Units (includes Defense Nuclear Agency sites and decontamination and decommissioning projects)

### *Off-Site Corrective Action Units*

For the Off-Site Corrective Action Units, DOE has committed to characterize and remediate surface soils at levels that would be acceptable for multiple use activities. The underground shot cavities would be restricted, however, and DOE and/or the Bureau of Land Management would retain in perpetuity institutional control of the subsurface contamination. It should be mentioned that surface contamination at these two off-site underground nuclear test areas is limited to nonradioactive constituents such as heavy metals, fuel oils, etc. Hence, closure in place of certain limited nonradioactive contaminated areas is being considered under the FFACO.

### *Soils Media Corrective Action Units*

The closure process for contaminated surface soils is somewhat circuitous and will likely vary for sites on and off the NTS. For example, DOE has committed to characterize and remediate radioactive contaminated surface soil plumes that straddle or lie outside the NTS boundaries such as sites on the Tonopah Test Range (TTR) and Nellis Air Force Range. These sites would be remediated and then made available for alternative "controlled" uses. Cleanup levels would generally respond to future military missions and DOE related research and development activities.

Ongoing negotiations between the State, the Department of Defense, and DOE indicate these soil contamination areas would be remediated to a dose receptor limit of 25 millirems. According to the NTS EIS [p.4-96], these areas total about 1,670 acres. State officials recognize that "clean closure" of these sites would be cost prohibitive and generally impractical given both current and expected land uses.

The U.S. Air Force is proposing an indefinite public land withdrawal for the TTR and the Nellis Range, and while only a small fraction of the 3.1 million acres that encompasses these

7. The FFACO encompasses not only NTS proper, but also parts of the Tonopah Test Range and Nellis Air Force Range, the Project Shoal Area, and the Central Nevada Test Area located in northern and central Nevada.

ranges is contaminated, restricted public access to both ranges is maintained. Under federal law (P.L. 99-606), the Air Force must obtain congressional approval for the renewal of the Nellis Range by the year 2001.

For the majority of contaminated soils located *within* the NTS boundary, DOE is planning only a characterization and long-term monitoring program. The contaminated soils in Yucca Flat, for example, will not be remediated because Yucca Flat has been set aside to support the readiness program for nuclear testing. Maintaining a defense readiness posture for nuclear testing is still the primary mission at the NTS. Accordingly, institutional control for most of the contaminated soils on NTS proper is assumed by DOE to be "in perpetuity" at the existing boundaries. Thus, it appears that "clean closure" of most of the contaminated soils on NTS would be cost prohibitive and generally impractical given both current and expected land uses. It should be noted, however, State officials may require some form of containment of surface contamination even though DOE is planning to retain restricted access to the NTS for the foreseeable future.

### *Underground Test Areas (UGTA) Corrective Action Units*

For the underground test areas, DOE has stated that the subsurface contamination around the nuclear test cavities *will not* be remediated since cost-effective groundwater technologies have not been developed to remove or stabilize radioactive contaminants.[8] Nevertheless, given the uncertainties about the size and potential movement of groundwater contamination (principally tritium), DOE has committed to a subsurface monitoring program of UGTA sites for a period of at least 100 years. In addition, to restrict access to contaminated groundwater, DOE is planning to institute an in perpetuity institutional control of the contaminated subsurface. Regardless of these planned activities, State regulatory officials will be evaluating the need for active containment of contaminated groundwater once the hydro-geologic conditions at the site are understood.

### *Industrial Sites Corrective Action Units*

The remediation/closure process for contaminated industrial sites is based on a prioritization scheme that is largely dependent on a site's future use potential. In NTS Area 25, for example, the land is being developed in part to support certain nondefense "commercial" reuse activities. In other parts of NTS, like Yucca Flat, industrial sites would be remediate to support the readiness program for nuclear testing. In general, industrial sites that show a potential for health risks as a result of direct exposure, inhalation, and/or resuspension of contaminants will be remediated to support negotiated facility/land-use scenarios. While in some cases sites may be clean-closed, given expected restricted access and limited land-uses, most of the industrial sites on NTS will likely be remediated to negotiated levels that are acceptable for reducing risks to human health and the environment.

## Postclosure And Land-Use

It is clear that less stringent cleanup standards will result in a greater need for long-term stewardship. Since complete cleanup of the NTS is not considered cost effective or practical in the near term, the federal government will be required to maintain a long-term surveil-

8. See U.S. Department of Energy, *Accelerating Cleanup, Paths to Closure*, Nevada Operations Office, June 1998, page 1-7)

lance and maintenance program at the site for the foreseeable future. Hence, State officials contend that a long-term stewardship program for the NTS is inescapable.

To address the question of "how clean is clean for what use," DOE is developing a comprehensive Resource Management Plan (RMP) for the NTS. Development of the RMP was undertaken as part of the recently completed NTS Site-Wide Environmental Impact Statement (EIS). DOE also made a legal commitment in the NTS-EIS Record of Decision to complete the RMP. In part, the RMP will address site closure of contaminated sites, at least in terms of major land-use categories. The plan will likely address the designation of alternative land-use areas such as "land-use zones" set aside for nuclear testing, radioactive waste management, alternative nondefense uses, and open space.

The RMP process at NTS is, in part, being developed to comply with DOE's policy for strengthening stewardship. The policy is known as the Land and Facility Use Policy (see DOE P 430.1, dated 7/96). This policy emphasizes principles of ecosystem management and sustainable development and is functionally implemented through DOE's Order on Life Cycle Asset Management (see DOE O 430.1, dated 8/95). While this Order requires DOE to develop a "comprehensive land-use planning process with stakeholder involvement," its primary focus is on life cycle asset management as opposed to stewardship. The order addresses a host of facility specific issues such as use of energy and utilities, infrastructure requirements, physical asset acquisition, and asset maintenance and disposition. The order is silent, however, on the relationship between comprehensive planning at the facility level and DOE's long-term stewardship responsibilities for chemical and radioactive contaminated sites.

In reference to the NTS, it is unclear what role, if any, the RMP process will play in terms of site-specific decisions for cleanup and closure of contaminated areas. It is also unclear what role the RMP will play for long-term stewardship responsibilities such as controlling access to the site, monitoring surface and groundwater contamination, and implementing methods for preserving knowledge about the location and content of contaminated areas.

## Institutional Controls

The granting of the Public Land Orders that established the NTS[9] occurred prior to enactment of the Federal Land Management Policy Act (FLMPA). FLMPA is the BLM's authorizing legislation that sets the mission of "multiple use" for the management of public lands. Under FLMPA, the BLM is required to review the status of all pre-FLMPA public land orders to assess their continuing need and/or purpose of use. Accordingly, in 1983 BLM conducted a FLMPA "land withdrawal review" of the NTS. In the review, BLM proposed the concept of an in perpetuity withdrawal for the site with a follow-up review set at 100 years. State officials believe this proposal was actually proposed by DOE defense programs. At the time of the review, nuclear testing was an ongoing activity at the NTS (on average DOE was detonating one device per month).

The State of Nevada conducted a formal evaluation of the withdrawal review and suggested that an in perpetuity withdrawal of public lands was inappropriate. In any event and for

9. The four (4) Public Land Orders for the NTS were executed in 1952, 1958, 1961, and 1965.

reasons that remain unclear, the NTS withdrawal review was never completed, and to this day, no formal administrative action has been taken to complete the FLMPA review process. In essence, the DOE and BLM are "out of compliance" with the requirements of FLMPA. This situation was further complicated by a lawsuit filed against DOE in June 1994 by Nevada's Attorney General. The lawsuit was filed to force DOE to complete a Site-Wide Environmental Impact Statement for the NTS, as well as assess the Department's low-level waste (LLW) disposal operations at the site.

The lawsuit asserted that DOE did not have the authority to operate a LLW disposal program at the NTS, given the use restrictions contained in the Public Land Orders for the site. State officials acquiesced, however, concerning *on-site* disposal of waste where such wastes were directly traceable to atomic testing. Atomic testing is the stated land-use described in the Public Land Orders that established the NTS. In general, the State argued that DOE had exceeded its authority concerning the importation of LLW waste from out-of-state "off-site waste generators". The State further argued that waste disposal was never considered as a "land-use" activity under the Public Land Orders. In addition, DOE had never assessed, disclosed, or developed alternatives for the NTS disposal operation, as required per the National Environmental Policy Act (NEPA). In other words, the required environmental analysis per federal NEPA regulations was never even considered to support the federal decision that established the NTS LLW disposal program.

After the State's lawsuit was filed, DOE initiated the development of a Site-Wide EIS that lead to the eventual settlement of the suit. Among other issues, the settlement agreement requires DOE to initiate a consultation process with the BLM to resolve the FLMPA land withdrawal review. At this writing, State officials have not been privy to DOE/BLM consultation discussions about the withdrawal review. Moreover, in the *Paths to Closure* site specific document for the NTS published in 1998, DOE is proposing an "in perpetuity (forever) ownership" of the site; however, the document is silent on the withdrawal review issue. As some point in the future, DOE will be required to address the legal and/or administrative issues surrounding the ownership and thus the institutional control of NTS. It remains an open question on whether or not specific federal legislation will be needed to resolve the withdrawal issue.

## Conclusion

From the State of Nevada's perspective, DOE's proposal to acquire in perpetuity control of certain selected areas at NTS is probably appropriate, given the amount of soil and groundwater contamination at the site. However, State officials contend that DOE must control the potential migration of contaminants to un-impacted groundwater resources. State officials have made it clear that acquiring water rights for the purpose of allowing the spread of groundwater contamination would not be an acceptable containment strategy because State law in Nevada allows the acquisition of water rights only for a beneficial use. State officials will continue to evaluate the need to impose natural resource damage assessments as means to safeguard groundwater resources in the region.

In terms of DOE's stewardship responsibilities, it is unclear what role existing administrative and/or legal processes, such as the NTS- RMP, the withdrawal review process, and the Paths to Closure "planning process" will have on the future of NTS. Clearly, controlling access to the site, monitoring surface and groundwater contamination, and implementing methods for preserving knowledge about the location and contents of contaminated areas will be need for the foreseeable future.

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# Appendix C. History of the State and Tribal Government Working Group

In April 1989, 10 governors wrote a letter to then-Secretary of Energy James Watkins to express their concerns regarding the management, cleanup, and disposal of radioactive and hazardous chemical wastes at Department of Energy (DOE) facilities within or adjacent to their states' boundaries.

The governors called for "decisive federal action to establish a comprehensive national program for the cleanup of all DOE defense and research facilities ... and for the stable long-term funding required to support such a program." Moreover, they committed themselves to work constructively with DOE to meet these goals.

In May 1989, then-Secretary of Energy Watkins invited each governor to appoint a representative to participate in the planning process for the department's Five-Year Plan through participation in a State and Tribal Government Working Group (STGWG). The secretary also invited representatives from the Yakama Indian Nation, the Shoshone-Bannock Tribes, the National Governors' Association, the National Conference of State Legislatures, and the National Association of Attorneys General to participate. STGWG first met in June 1989.

As of January 1999, STGWG includes representatives of the following states, tribes, and associations:

California
Colorado
Confederated Tribes of the Umatilla Indian Reservation (CTUIR)
Georgia
Idaho
Illinois
Isleta Pueblo
Kentucky
Missouri
National Association of Attorneys General (NAAG)
National Conference of State Legislatures (NCSL)
National Governors' Association (NGA)
Navajo Nation
Nevada
New Mexico
New York
Nez Perce Tribe
Ohio
Oregon
Pueblo de San Ildefonso

Santa Clara Pueblo
Seneca Nation of Indians
Shoshone-Bannock Tribes
South Carolina
Tennessee
Texas
Washington
Yakama Indian Nation

The Department of Energy provides funding for a single representative from each affected state and tribe to participate in the meetings of the STGWG. In addition, DOE funds technical, administrative, and facilitation support to this body. The department is funding STGWG support and participation through a cooperative agreement with the National Conference of State Legislatures (NCSL).

When a new state, tribe or association wishes to join STGWG, they contact DOE with a statement of interest and how they are affected by a DOE facility. In some cases, DOE may invite an entity to appoint a representative to be a STGWG member.

## Members Of The STGWG Stewardship Committee

Peter Chestnut, Pueblo de San Ildefonso
Ann Dold, INEEL Oversight Program
Robert Geller, Missouri Dept. of Natural Resources
Russell Jim, Yakama Indian Nation
Dan Miller, NAAG
Armand Minthorn, CTUIR
Cheryl Runyon, NCSL
Tuss Taylor, Kentucky Dept. for Environmental Protection
John Walker, Nevada Division of Environmental Protection
Tom Winston, Ohio EPA

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