

# From Cleanup to Stewardship

## Appendix E

a Companion Report to *Accelerating Cleanup: Paths to Closure*  
and  
Background Information to Support the Scoping Process  
Required for the 1999 PEIS Settlement Study



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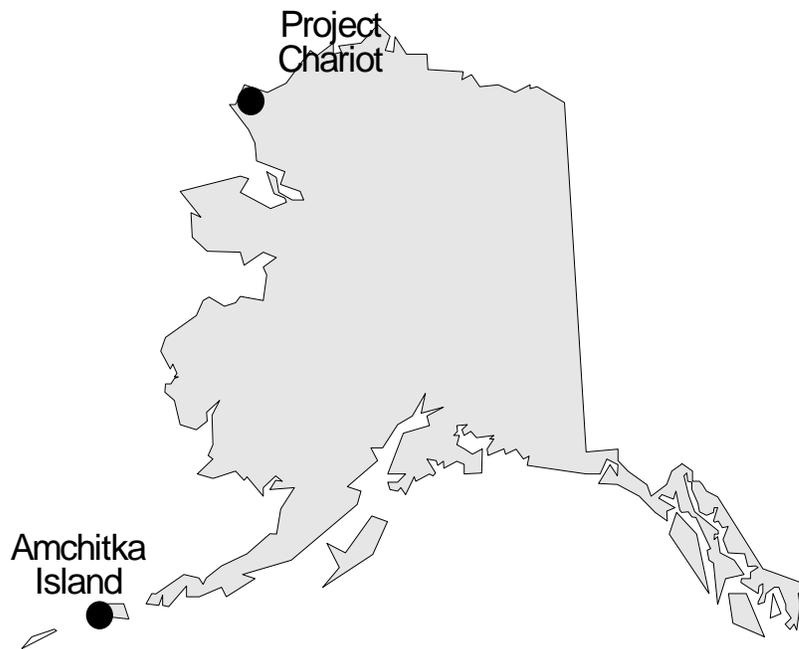
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# Alaska



### **Amchitka Island**

The Amchitka Island Test Site location is administered by the U.S. Department of Energy, Nevada Operations Office (DOE/NV). Amchitka Island is the southernmost island of the Rat Island Group in the Aleutian chain and is about 2,300 kilometers (1,400 miles) southwest of Anchorage. Three nuclear detonations were conducted on the island between 1965 and 1971. Contamination present on the island is a result of activities that began in 1943 when U.S. troops landed on the island to establish an airfield.

DOE expects to complete corrective actions of surface contamination by the year 2001. Contaminated areas, which resulted primarily from drilling activities associated with the underground testing, are located within an existing U.S. Fish and Wildlife Service wildlife refuge (Aleutian National Wildlife Refuge). The anticipated future use for the surface is open space; however, access to the subsurface soil and groundwater is and will continue to be restricted. DOE will not maintain an active presence at this site but will be responsible for maintaining institutional controls over subsurface resources, including contaminated soil and groundwater. Monitoring is currently planned for 100 years, however DOE assumes that monitoring will be conducted in perpetuity. DOE assumes that LTS&M activities will be conducted every two years.

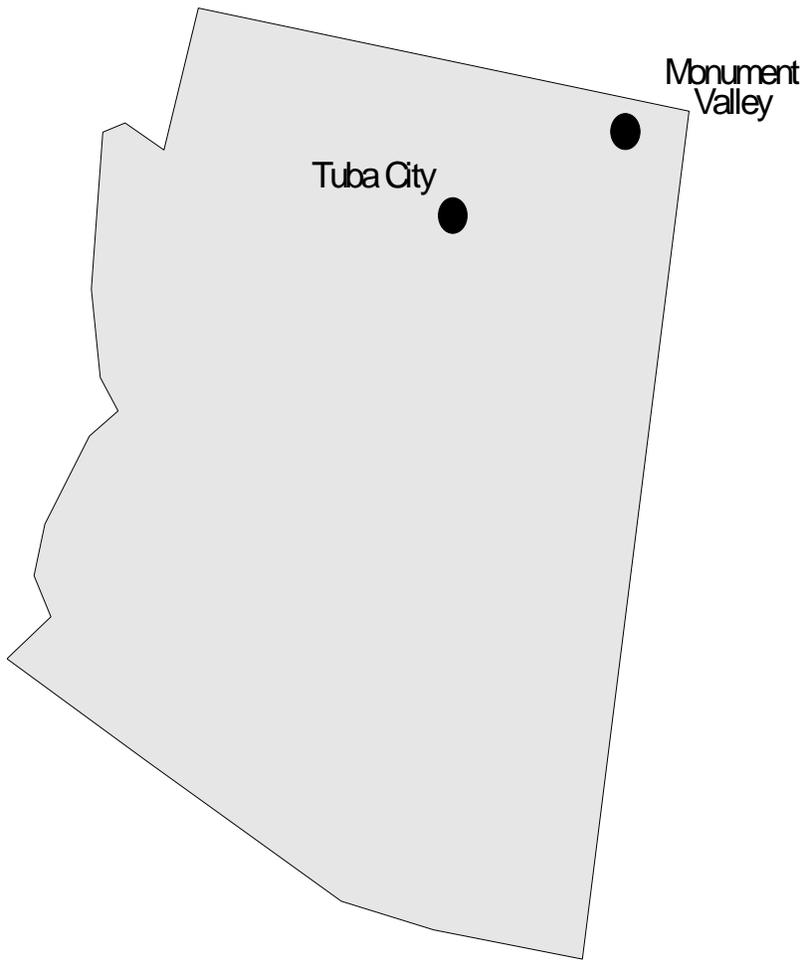
**Soil:** Corrective actions are currently being conducted on surface soil. No surface radiological contamination was found and conditions at the site will allow for reuse with no NRC radiological restrictions. Since corrective actions capable of safely and effectively removing or stabilizing this subsurface radioactive contamination are not identified, contamination will remain in subsurface areas around the shot cavity. Institutional controls, including drilling restrictions, will be maintained to prevent access to this sub-surface contamination.

**Water:** Groundwater contamination associated with the test shot cavities will not be remediated. Tritium, being the most mobile of the radioactive elements found in the groundwater, is the primary constituent of concern. Institutional control will prevent access to this contaminated groundwater. The groundwater will be monitored biannually as planned for 100 years and access will remain restricted.

### **Project Chariot (Cape Thompson)**

The Project Chariot site in Alaska was completed in 1994. The site is not expected to require any stewardship.

# Arizona



## **Monument Valley**

The former Monument Valley mill and tailings site is located on Navajo Nation land 21 kilometers (13 miles) east of Monument Valley Tribal Park, Arizona. The site is located 27 kilometers (17 miles) south of the Mexican Hat site and about 8 kilometers (5 miles) south of the Utah-Arizona border. Tailings were located in two piles covering about 12 hectares (30 acres) of the approximately 37 hectare (90 acre) site. The older heap-leach pile covered about 4 hectares (10 acres). The newer tailings pile was cone-shaped, about 17 meters (55-feet) high, covered about 8 hectares (20 acres) and contained over two-thirds of the tailings at the site. The site also contained the old mill building foundations, contaminated soil, and wind-blown material. The site completed remedial actions in 1994 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA).

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Monument Valley. LTS&M costs for groundwater at the Monument Valley site total \$1 million dollars per year for the period 2000-2020 plus an additional \$2 million startup cost.

**Soil:** Soil was remediated to EPA standards. Approximately 942,000 yd<sup>3</sup> of contaminated material was shipped to the Mexican Hat disposal cell, which is approximately 17 miles from the site.

**Water:** An estimated 1.2 billion gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs at least two times since 1990: net gross alpha, nitrate, radium, and uranium. Groundwater is being remediated through active pumping and chemical treatment, as well as phytoremediation. The site assumes that routine groundwater compliance monitoring will be required after active remediation.

### Tuba City

The Tuba City site is located 9 kilometers (5.5 miles) east of Tuba City in Coconino County, Arizona, and 137 kilometers (85 miles) north of Flagstaff. The site consisted of about 42 hectares (105 acres), of which 9 hectares (22 acres) were covered by the tailings pile. Eighteen hectares (33.5 acres) were former evaporation ponds, and the remaining acres were contaminated by wind-blown material. The Tuba City site is on Navajo Nation lands; however, an appeal over this jurisdiction has been filed by the Hopi Tribe. The site completed remedial actions in 1990 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Tuba City. LTS&M costs for the disposal cell at Tuba City total \$5,000 per year in perpetuity plus an additional \$10,000 for the first ten years for revegetation. Groundwater LTS&M costs total \$2.5 million per year for the period 1999-2019 plus an additional \$5 million in startup costs in 1999.

**Water:** According to the UMTRA groundwater PEIS, approximately 780 million gallons of water have exceeded MCLs for the following contaminants at least two times since 1990: net gross alpha, radium, molybdenum, nitrate, selenium, and uranium. The site assumes that groundwater at Tuba City will undergo active remediation through 2010 in order to meet EPA groundwater standards. The site assumes that routine groundwater compliance monitoring will be required after active remediation has been completed.

The Draft Groundwater Compliance Action Plan for Tuba City notes that the contaminants of concern are: molybdenum, nitrate, selenium, and uranium. High levels of sulfate are also present in the groundwater, and although sulfate is not a constituent included in 40 CFR 192, its concentration in the groundwater is high enough to cause a potential health risk. The following table gives the volumes of contaminated groundwater.

Contaminant	Concentration (mg/L)	Area (ft <sup>2</sup> )	Volume (gallons*)
Nitrate	44	1.6 x 10 <sup>7</sup>	1.7 x 10 <sup>9</sup>
Sulfate	250	8.9 x 10 <sup>6</sup>	1.8 x 10 <sup>9</sup>
Uranium	0.044	4.8 x 10 <sup>6</sup>	7.8 x 10 <sup>8</sup>

\* Based on saturated thickness of 86 ft and porosity of 0.25.

The selected active remediation method for groundwater restoration at the Tuba City site combines a pump and treat alternative that uses an infiltration trench and extraction and injection wells with a treatment alternative that uses distillation. This method uses vertical wells for extraction and a combination of vertical injection wells and an infiltration trench for disposal of

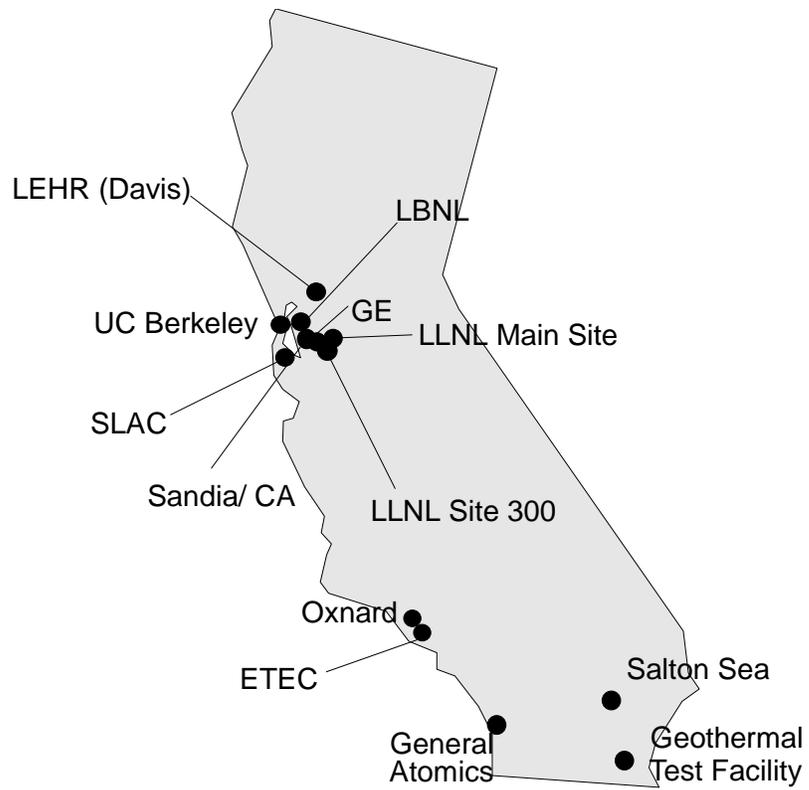
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treated groundwater. The anticipated extraction rate for the selected pumping method is approximately 200 gpm once the system reaches its maximum capacity. Once the groundwater has been extracted, the water will be treated by distillation, also known as mechanical evaporation and recondensation. The site's Draft Ground Water Compliance Action Plan states that active remediation will continue through 2012, while LTS&M activities will extend through 2016.

Contaminant	Cleanup Level	Concentrations in the Plume
Aquifer Restoration Standards (Required by 40 CFR 192)		
Nitrate	10 mg/L as N (44 mg/L as NO <sub>3</sub> )	840 - 1,500 mg/L
Molybdenum	0.10 mg/L	0.01 - 0.58 mg/L
Selenium	0.01 mg/L	0.01 - 0.10 mg/L
Uranium	30 pCi/L (0.044 mg/L) U-234 and U-238	0.3 - 0.6 mg/L
Aquifer Restoration Goals (Requested by Navajo Nation)		
TDS	500 mg/L	3,500 - 10,000 mg/L
Sulfate	250 mg/L	1,700 - 3,500 mg/L
Chloride	250 mg/L	20 - 440 mg/L
pH	6.5 - 8.5	6.3 - 7.6
Corrosivity	noncorrosive	not applicable

**Engineered Units:** A total of 1,100,000 m<sup>3</sup> of contaminated material was stabilized on site in a 50-acre disposal cell. The disposal cell has a radon barrier cover and rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. The disposal cell will require LTS&M to ensure that it continues to meet EPA standards. LTS&M activities at the disposal cell include annual service inspections and a 10 year revegetation program.

# California



## **Energy Technology Engineering Center**

The Energy Technology Engineering Center (ETEC) occupies 36 hectares (90 acres) within the 1,080-hectare (2,700-acre) Santa Susana Field Laboratory (SSFL) located in the Simi Hills of Ventura County, approximately 48 kilometers (30 miles) northwest of downtown Los Angeles. Rocketdyne Propulsion and Power Division of Boeing owns and operates the SSFL.

ETEC is being cleaned up under the RCRA corrective action process. The Office of Environmental Management (EM) plans to complete cleanup by 2006 and turn the site over to Rocketdyne for controlled access, industrial reuse. The site assumes that regulators will grant ETEC regulatory flexibility to allow them to establish risk-based cleanup levels rather than current regulatory standards. Monitoring will be conducted by the Environmental Restoration program until federal and state regulatory agencies grant release of the site for transfer to Boeing/Rocketdyne. DOE assumes that LTS&M activities will be transferred to Boeing/Rocketdyne.

**Soil:** Residual inorganic, PCB, SVOC, mercury, and dioxin contamination will remain in soils. The site assumes that contaminated soils will be remediated to a level allowing for release and industrial reuse. Contaminated soils above a  $1 \times 10^{-5}$  risk level will be excavated and disposed of offsite. The excavated areas will be backfilled with clean material. Based on current information, there is no offsite soil contamination. Surveillance and maintenance activities are expected to be conducted at the facility boundary with deed restrictions used to maintain an industrial use.

**Water:** Residual VOC, SVOC, organic, and tritium contamination will remain in groundwater. The remediation strategy is not yet finalized; however, groundwater pump and treat is currently being implemented. At a minimum, active plume containment will continue through 2006 with target cleanup levels set at the MCL and  $1 \times 10^{-5}$  risk level. It is estimated that groundwater monitoring will be required through 2027 as part of the RCRA compliance and detection monitoring. Current negotiations will determine whether DOE will be responsible for monitoring.

**Engineered Units:** The Building 056 landfill will be closed under RCRA. Approximately 1.5 acres will require cap maintenance and run-off collection, sampling, and monitoring.

**Facilities:** Facilities contaminated with radionuclides and sodium will require decontamination and decommissioning. After D&D, intact facilities will be transferred to Rocketdyne/Boeing for industrial reuse. The Sodium Disposal Facility (SDF) will be remediated and closed under RCRA. The Hazardous Waste Management Facility (HWMF) and the Radioactive Materials Handling Facility (RMHF) both store and treat waste under RCRA permits. RCRA closure of the RMHF and remediation of the surrounding areas will be complete in FY2005. Post-D&D LTS&M of facilities will be conducted until regulators grant release of the site. Anticipated activities include maintaining access controls and ensuring appropriate future uses are maintained.

The site assumes that post-RCRA closure activities will be required for the SDF, HWMF, and RMHF.

### **General Atomics**

General Atomics (GA) occupies approximately 49 hectares (120 acres) on two contiguous sites that are 21 kilometers (13 miles) north of downtown San Diego, California, just southwest of the convergence of Interstates 5 and 805, and approximately 1.6 kilometers (one mile) east of the Pacific Ocean. The two sites are referred to as the Main Site and the Sorrento Valley Area, or collectively as the General Atomics site. The Hot Cell Facility (HCF) is located within the GA Main Site.

Remediation has been completed and the site will be released by the NRC and the State of California for unrestricted use in 1999. DOE and GA are responsible for decontaminating and demolishing (D&D) the HCF on a cost share basis of 76% DOE and 24% GA. General Atomics is the owner/operator of the site and will determine the future use of the HCF site. Once D&D is complete, cleanup objectives have been met, and waste is removed from the site, DOE will have no further responsibility. GA will be responsible for any required post-remediation monitoring.

**Soil:** Contaminated soils associated with the HCF will be remediated to industrial levels. DOE assumes that soil contamination is minor and at shallow depths.

**Water:** Groundwater at the HCF is approximately 300 feet below ground surface. Tests have shown groundwater contamination does not exist beneath the HCF.

**Facilities:** All contamination has been removed and the HCF has been demolished. All waste has been disposed of offsite.

### **General Electric Vallecitos Nuclear Center**

The General Electric (GE) Vallecitos Nuclear Center occupies approximately 640 hectares (1,600 acres) in Pleasanton, Alameda County, California. The site is located approximately 64 kilometers (40 miles) east of San Francisco and approximately 11 kilometers (7 miles) southwest of the City of Livermore.

The GE Vallecitos Nuclear Facility is a privately-owned and operated site. DOE operations at this site radiologically contaminated Hot Cell #4 and the emission spectograph glovebox. These facilities are the only areas at the site where DOE has cleanup responsibility. The Office of Environmental Management (EM) plans to complete cleanup by 2004 and dispose of wastes by 2005. Once cleanup is complete, DOE will have no further liability and will not maintain a

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presence at the site. GE plans to reuse the hot cell to support its commercial operations. No LTS&M is anticipated.

**Soil:** DOE assumes that its activities at the site did not impact surrounding soil and that it will have no responsibility for soil remediation.

**Water:** DOE assumes that its activities at the site did not impact surface water or groundwater and that it will have no responsibility for water remediation.

**Facilities:** DOE will decontaminate Hot Cell #4, located in the radioactive materials laboratory, and certify that the cell is free of TRU contamination. After decontamination, the hot cell will be suitable for commercial use by GE. DOE will decontaminate the emission spectograph and dispose of it offsite. DOE will have no further responsibilities once the hot cell is turned over to GE and the glovebox is disposed of.

### **Geothermal Test Facility**

The East Mesa Geothermal Test Facility (GTF) is an 33-hectare (82-acre), inactive DOE geothermal research facility. The site is located in the Imperial Valley, Imperial County, California, approximately 32 kilometers (20 miles) east of El Centro and 2.4 kilometers (1.5 miles) north of Interstate Highway 8.

Remediation of GTF was completed in 1997. The site has been turned over to the Bureau of Land Management (BLM) and the property will be added to the public land reserve. No LTS&M is required.

**Soil:** Brine pond waste material and surrounding, impacted media was excavated and removed from the 6 acre brine pond. The site was regraded.

**Facilities:** All facilities were demolished. No waste is disposed of onsite.

### **Laboratory for Energy Related Health Research**

The Laboratory for Energy Related Health Research (LEHR), a surplus DOE facility, is located 2.4 kilometers (1.5 miles) south of the main campus of the University of California at Davis (UC-Davis) and is currently undergoing environmental restoration activities. UC-Davis owns the 6-hectare (15-acre) site, which DOE has leased since 1958.

DOE and the UC-Davis have signed a memorandum of agreement (MOA) accepting cleanup responsibility for their respective areas. DOE expects to complete its portion of the site cleanup by 2002. DOE is responsible for remediating domestic septic tanks, southwest burial trenches, dry wells, strontium-90 and radium-226 leach fields, and approximately 3 acres of outdoor dog pens. The land is expected to remain part of the UC-Davis campus and be remediated to industrial use levels, with UC-Davis as landlord. The land use assumption is that UC-Davis will continue to utilize the site as a research facility. Remediation activities conducted by UC-Davis will be ongoing when DOE activities are complete. DOE is uncertain whether regulators will allow for a partial deletion of DOE areas from the NPL when it completes its cleanup responsibilities. DOE assumes that it will conduct CERCLA 5-year reviews through 2006. DOE is working to establish an arrangement with UC-Davis such that the University will perform any necessary S&M activities after site closure. The site-wide annual cost estimate for LTS&M activities is approximately \$100,000 per year for the period 2002-2006.

**Soil:** Material contaminated with radium will be removed from the southwest burial trenches. Radioactive levels in soil will be below 15 Mrem/yr total. Negotiations to determine final soil cleanup levels are ongoing. The site assumes that cleanup levels for each contaminant will be based on risk associated with the planned industrial land use and not on background. On-site landfills, waste holes, and some burial trenches will be remediated by UC-Davis. The site assumes that if residual contamination is left onsite, limited institutional controls, in addition to monitoring and reporting, may be necessary.

**Water:** Under the MOA, UC-Davis is responsible for any necessary groundwater and surface water remediation and stewardship activities. Currently, groundwater is sampled on a quarterly basis.

**Engineered Units:** DOE currently plans to leave no engineered units onsite.

**Facilities:** Four facilities will be decontaminated and released to UC-Davis for unrestricted reuse. Residual radioactive contamination will meet guidelines established in DOE Order 5400.1 and NRC 1.8L for unrestricted use. The RCRA interim-status Mixed Waste Storage Facility will be clean closed and removed from EPA's list by 2002.

### **Lawrence Berkeley National Laboratory**

The 331-hectare (134-acre) Lawrence Berkeley National Laboratory (LBNL) site is located on the western side of the Berkeley Hills adjacent to the Berkeley Campus of the University of California. The site, which the University leases to DOE, is bordered on the north by single family

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residences and on the west by multifamily dwellings, student residence halls, and commercial buildings.

LBNL has an ongoing research mission and will continue to generate hazardous, radioactive, and mixed wastes. The site expects to complete cleanup and disposition of all legacy waste by 2003; however, long-term surveillance, maintenance, and water treatment is planned through 2032. The University of California owns the site and will continue leasing this property to DOE under a series of 50-year lease agreements. Waste handling operations and facilities will continue to be used to support the site's ongoing mission. DOE is currently working with regulators and stakeholders to determine appropriate cleanup levels. The site assumes that cleanup levels will reflect an ongoing industrial use as a research laboratory. Currently, the Environmental Management program is expected to be responsible for conducting long-term stewardship activities. The annual site-wide cost estimate for LTS&M activities is \$853,000 per year in constant 1996 dollars for the period 2004-2035.

**Soil:** In order to meet cleanup levels, contaminated soil will likely be excavated and disposed of or treated in situ. Necessary stewardship activities will be better defined when remediation is complete. Residual contamination is expected to be below risk criteria for the anticipated future use but will likely be above background levels. The site states that post-closure RCRA activities will be required in areas where contamination remains in place.

**Water:** Three major groundwater plumes contaminated with PCE and TCE are being remediated through extraction/treatment systems. Tritiated groundwater will be allowed to naturally attenuate or will be removed and disposed of offsite. Cleanup levels and remediation strategies for tritium contamination have not yet been finalized. Corrective measures studies will be conducted to determine final remediation strategies. Long-term monitoring strategies will be negotiated with the regulatory agencies but are expected to continue through 2032.

**Engineered Units:** Underground tanks will be removed. There are no permanent disposal facilities onsite that will be the responsibility of DOE. All wastes will ultimately be disposed of offsite.

**Facilities:** The waste handling facility will be clean closed under RCRA and will meet applicable requirements of DOE Order 5400.5. After clean closure, this area will be turned over to the landlord for reuse. A new RCRA Hazardous Waste Handling Facility (HWHF) has been constructed to support ongoing management of newly generated waste and is expected to operate through 2070. No stewardship is expected for the waste handling facility since it will be clean closed under RCRA. The new HWHF will continue to accept and manage waste generated by ongoing activities at the site and will eventually be closed under its RCRA permit. Any additional

facilities are not assumed to be the responsibility of the EM program and are outside of the scope of this analysis.

### **Lawrence Livermore National Laboratory - Main Site**

Lawrence Livermore National Laboratory (LLNL) is composed of two sites: Main Site and Site 300. The Main Site, also known as the Livermore Site, is a 260-hectare (642-acre) site located approximately 80 kilometers (50 miles) east of San Francisco and 6.4 kilometers (4 miles) from downtown Livermore. It occupies approximately 2.6 square kilometers (one square mile) of relatively flat terrain in the Livermore Valley. Residential subdivisions were recently built adjacent to the site boundary. They are separated from the site by a wide city roadway.

DOE will complete soil remediation and disposal of all legacy waste by 2006. Soil will be remediated to industrial use levels and the site will continue to operate the groundwater remediation system until agreed-upon cleanup levels are achieved. The Office of Defense Programs, the site landlord, has an ongoing research mission and will continue to operate the site as a controlled access research facility indefinitely. All waste generated by future activities will be disposed of offsite. It is unknown at this time which DOE program will be responsible for conducting stewardship activities. The site-wide annual cost estimate for LTS&M activities at LLNL - Main Site is approximately \$5 million per year for the period 2007-2015. DOE assumes that the site will continue to be used for research and industrial purposes.

**Soil:** The site will remediate VOC contamination using soil vapor extraction, thermally enhanced vapor extraction, or in-situ thermal oxidation. Soil remediation levels will be established so that when contaminants are transported to groundwater, the resulting groundwater contamination will not exceed groundwater cleanup levels established in the ROD. Residual tritium and VOC contamination will remain in approximately 30 acres of the site. Residual soil contamination will not exceed agreed upon risk-based cleanup standards but will exceed background levels.

**Water:** On and offsite groundwater is contaminated with VOCs, including PCE and TCE. The goals of groundwater remediation are to remove contaminant mass, reduce contaminant concentrations, and contain migration. The site will complete construction and begin operation of all groundwater treatment facilities by 2003. These systems will extract contaminated groundwater and use air stripping to remove VOCs. Treated water meeting agreed upon discharge standards is released to recharge basins or seasonal water courses or reused onsite. The site will employ cost-effective source treatment technologies to significantly reduce the time needed to meet cleanup goals. The site will continue to operate pump and treat systems until cleanup levels are achieved. Groundwater in some areas is contaminated with tritium and will be

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remediated through monitored natural attenuation. The site will continue to monitor the concentration and distribution of tritium contamination. The LLNL ROD states that onsite groundwater must be remediated to MCLs.

Following 2006, the only necessary activities are continued operation and maintenance of groundwater remediation system and groundwater monitoring and reporting. These groundwater stewardship activities may be required until 2015 to fully remediate onsite contamination. Under the current ROD, the site will continue to operate and maintain the network of pump and treat systems and monitor groundwater conditions until the 5 ppb MCLs are reached in both on and offsite plumes. Tritium contamination will be monitored to ensure it is not migrating until it has decayed in place.

**Engineered Units:** A LLW tank farm exists at the Area 514 Facility and will continue to be used for processing of program waste after completion of site cleanup.

**Facilities:** The Hazardous Waste Management Division manages four active waste management facilities at the Main Site: Area 514 Facility, Area 612 Facility, the Building 693 Facility, and the Building 233 Facility. All Main Site waste facilities are presently operating under interim status permits issued by the State of California Department of Toxic Substances Control. Construction projects planned to enhance and streamline waste management operations include the Decontamination and Waste Treatment Facility, the Mixed Waste Management Facility, and the Explosive Waste Treatment Facility. Contaminated facilities are all within the security envelope of LLNL. Where required and/or appropriate, access to facilities is controlled to prevent worker exposure to contaminated materials. In addition, facility structures and contamination controls will be maintained to prevent onsite worker exposures and offsite public exposures.

### Lawrence Livermore National Laboratory - Site 300

Lawrence Livermore National Laboratory (LLNL) is composed of two sites: Main Site and Site 300. Site 300 is approximately 24 kilometers (15 miles) southeast of the Laboratory's Main Site. The site occupies approximately 2,860 hectares (7,067 acres) of rugged foothills that straddle Alameda and San Joaquin Counties.

DOE will disposition all legacy waste by 2006. By FY 2006, all Site 300 environmental restoration treatment facilities will be constructed and in operation. Groundwater remediation will continue until agreed-upon cleanup levels are achieved. Future use will be a controlled access combination of industrial and open space/wildlife management. The Office of Defense Programs has an ongoing mission at LLNL and is expected to occupy the site indefinitely. The site-wide ROD will establish specific post-remediation monitoring requirements. The annual site-wide cost estimate for LTS&M activities for Site 300 is approximately \$3 million per year for the period 2007-2030.

**Soil:** The site will remediate VOC contamination using soil vapor extraction. Technologies to remediate uranium, tritium, nitrates, perchlorate, high explosives, PCBs, and DNAPLs will be determined as part of the site-wide ROD process currently planned for completion in FY 2001. The site has closed three high explosive burn pits under RCRA. A multi-component RCRA cap, which includes both a clay/geotextile and a rodent burrowing layer, has been placed over Pit 6. Closed areas will require a minimum of 23 years of LTS&M and cap inspection and repair following closure.

**Water:** Twelve VOC-contaminated groundwater plumes are present onsite. Two of these plumes extend offsite. Several VOC plumes are mixed with co-contaminants such as nitrates and perchlorate. The site has installed several groundwater remediation systems that extract contaminated groundwater and air strip VOCs. Tritium contamination in one area of the site may be left in place to naturally attenuate. Nitrate, perchlorate, and RDX contamination will require remediation. The site will use containment technologies to ensure that additional contaminated groundwater does not migrate offsite. Guard walls have been installed at the site boundary to detect offsite migration of any groundwater exceeding MCLs. The site will continue to operate groundwater treatment systems until cleanup levels currently being negotiated are achieved. Groundwater will require a minimum of 23 years monitoring.

**Engineered Units:** The site will close the two onsite mixed waste landfills under RCRA. The site expects that remediation of the landfills in the Pits 3 and 5 Operable Unit will be limited to enhancement of subsurface and surface water diversion systems. Closed landfills will require a minimum of 23 years of S&M and cap inspections and repair following closure.

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**Facilities:** This site states that an onsite waste treatment and storage facility is operating on Site 300 under a full RCRA Part B permit. This facility includes hazardous waste container storage areas and an explosive waste treatment facility. Currently, no existing closed facilities are part of the EM program.

### **Oxnard Facility**

The Oxnard Facility in California was completed in 1996. The site is not expected to require any stewardship.

### **Salton Sea Test Base**

Salton Sea Test Base in California was completed in 1994. The site is not expected to require any stewardship.

### **Sandia National Laboratories/California**

Sandia National Laboratories/California is located in Alameda County, California, approximately 64 kilometers (40 miles) east of San Francisco. The site occupies approximately 165 hectares (413 acres) of land in the Livermore Valley, and its boundaries start approximately 5 kilometers (3 miles) east of the Livermore City Center.

DOE will complete remediation and associated waste disposal for all 23 release sites by 2001. All legacy waste will be dispositioned by 2006. The Office of Defense Programs (DP) will have an ongoing mission and waste management operations will continue in support of this mission. DOE assumes that if the Department exits the property, some other government agency will maintain control. DOE assumes that the site will remain under control of the federal government in perpetuity. The site states that post remediation compliance monitoring will be completed in 2001. LTS&M activities for the site include groundwater monitoring for organics and metals and maintenance of runoff controls.

**Soil:** Except for the Navy Landfill (which will have restricted access), less than 1 acre will have residual soil contamination. Most remaining contamination is subsurface, and therefore does not present a pathway for contaminants to move to a receptor unless excavation occurs. Generally, only VOCs will be left as residual contaminants and these will remain in the subsurface. The soil remediation strategy has been physical removal or biological degradation. Target cleanup levels have been set at the risk range of  $10E^{-6}$  to  $10E^{-4}$ . The lowest level of cleanup proposed or

projected has been in the  $10E^{-5}$  range. On-site exposure scenarios are industrial; off-site exposure scenarios are agricultural and residential.

**Water:** DOE is monitoring groundwater in several areas. There is no on-site groundwater use and off-site does not need control because of groundwater quality and hydrogeologic conditions. The near surface aquifer is used only for agricultural purposes. This use is expected to continue.

**Engineered Units:** Closure of the Navy Landfill was approved by regulators in FY 1998. This landfill is located in an earthquake zone. The landfill will require monitoring and maintenance.

**Facilities:** DOE will close all excess waste management facilities. Because there is limited space, virtually all facilities will undergo D&D and be available for reuse.

### Stanford Linear Accelerator Center

The 172-hectare (426-acre) Stanford Linear Accelerator Center (SLAC) is a high-energy research facility owned and operated by Stanford University under contract to DOE. The site is located on the San Francisco Peninsula between San Francisco and San Jose, California. The Office of Science, the site landlord, has an ongoing research mission at the site.

Currently, there are no plans to change the current mission of SLAC. The Office of Environmental Management (EM) plans to complete cleanup by 2000. Final cleanup levels will be based on the technical and economic feasibility of remedial alternatives; however, the *Paths to Closure* report assumes that the future use will remain industrial. The site assumes that cleanup levels/objectives will reflect this continued usage. EM has funded cleanup activities through 2000. It is unknown at this time which DOE program will be responsible for LTS&M. Annual costs for LTS&M activities average \$250,000 per year and include semi-annual sampling and analyses, required reporting, and S&M of remedial systems.

**Soil:** Source contamination will be removed from three areas. Contaminants will remain in the soil at the Former Solvent Underground Storage Tank (FSUST) Area at depths of 10 to 20 feet. Additional contaminants will also remain underneath a building adjacent to the site. Restrictions will be placed on the excavation of soils near the FSUST Area. Because of interim actions completed, DOE assumes that no other remediation will be necessary; however, investigations of soil contamination are not yet complete.

**Water:** Investigations of groundwater contamination are not yet complete. A network of wells are monitored on a biannual basis to note trends in contaminant levels and identify new areas of contamination. A groundwater extraction system is planned for the FSUST Area that will be designed to hydraulically contain and prevent contaminant migration. Organic solvents will remain in onsite groundwater in four areas, and long-term sampling and monitoring will be

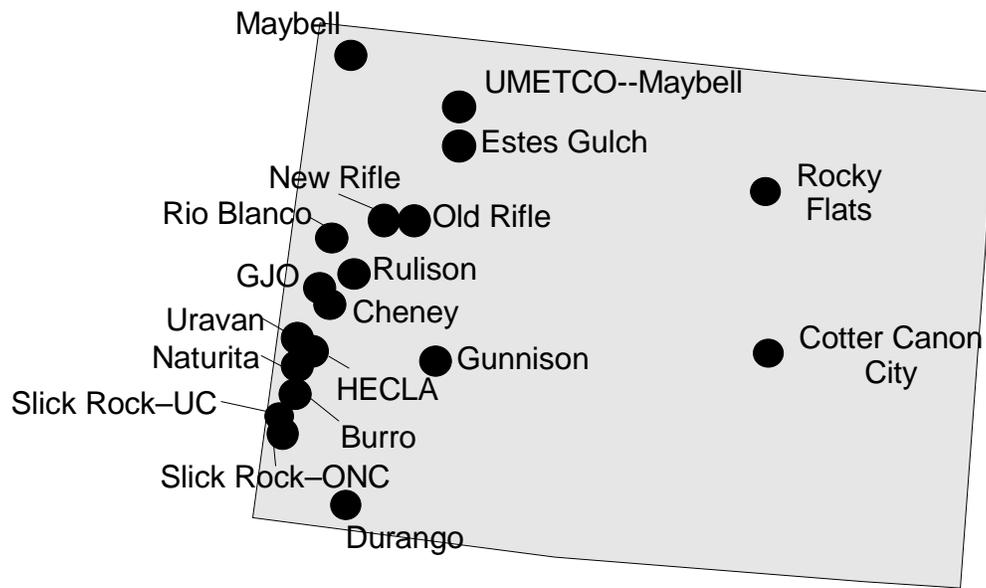
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required for the four groundwater plumes. A long-term sampling and analysis program will be required to ensure that contaminant levels remain within the parameters to be established.

**University of California**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1982, and no stewardship activities are currently anticipated.

# Colorado



### **Burro Canyon Disposal Cell**

The Burro Canyon Disposal Cell accepted contaminated materials from the Slick Rock/Old North Continent Site and the Slick Rock/Union Carbide site. LTS&M costs for the Burro Canyon Disposal Cell are \$5,000 per year in perpetuity.

**Engineered Units:** There are 148,742 m<sup>3</sup> of mill tailings disposed of in this disposal cell. The disposal cell has a radon barrier cover and a rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell.

### **Cheney Cell**

The former Grand Junction mill site (also known as the Climax Millsite) is a 46-hectare (114-acre) site in Mesa County, located in an industrial area of the City of Grand Junction, Colorado, on the north bank of the Colorado River. The site contained one large tailings pile and a remaining mill building. The site completed remedial actions in 1994 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Contaminated materials were transported 17 miles to the Cheney disposal cell. Under UMTRCA provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Cheney cell. LTS&M costs for the Cheney disposal cell total \$3,000 per year in perpetuity. Groundwater LTS&M costs total \$15,000 per year in perpetuity.

**Water:** According to the UMTRA groundwater PEIS, approximately 330 million gallons of water have exceeded MCLs for the following contaminants at least once since 1990: molybdenum, selenium, uranium, and net gross alpha. The site assumes that groundwater at the Grand Junction UMTRA Site has been determined a non-drinking water source and will undergo natural attenuation until the site meets EPA standards (up to 100 years). The site assumes that quarterly groundwater compliance monitoring or institutional controls will be required for the duration of the natural attenuation period.

**Engineered Units:** DOE anticipates that disposal from all sites will be complete and the cell will be closed and the NRC license terminated in 2023. The Cheney Cell contains approximately 4,425,244 yd<sup>3</sup> of uranium mill tailings and contaminated material. GJO will assume responsibility for operation and oversight of the Cheney disposal cell in 1998. Stewardship requirements include LTS&M, security, and environmental monitoring. DOE will also maintain permanent site

records and provide annual status reports to outside agencies and regulators. LTS&M of this disposal cell will continue for up to 1000 years.

### **Cotter, Canon City**

Cotter is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Canon City, Colorado. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2015, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 2,200,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with rock and grass. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Durango**

The former Durango uranium processing site is located just outside the city limits of Durango in southwest Colorado. The site is bordered on the east by the Animas River, on the north by Lightner Creek, and on the southwest by Smelter Mountain. Two tailings piles were located on the 59-hectare (147-acre) site. Prior to cleanup, the two tailings piles contained approximately 2,534,000 yd<sup>3</sup> of contaminated material and covered 4 hectares (10 acres) of the site. The mill site and ore storage area covered about 3.2 hectares (8 acres). The raffinate pond area was located nearly 0.8 kilometers (0.5 miles) southeast of the mill site and covered about 6 hectares

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(15 acres). The site completed remedial actions in 1990 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Durango. LTS&M costs for the disposal cell at Durango total \$7,000 per year in perpetuity plus a one time cost of \$400,000 to decommission the raffinate pond. Groundwater LTS&M costs total \$30,000 per year for the period 2002-2052.

**Soil:** Soil was remediated to EPA standards. Approximately 2,534,000 yd<sup>3</sup> of contaminated material was disposed of in the Bodo Canyon disposal cell, 3.5 miles from the site. Site access is restricted.

**Water:** Approximately 100 million gallons of water exceeded MCLs two or more times since 1990 for the following contaminants: cadmium, chromium, molybdenum, net gross alpha, lead, radium, uranium, and selenium. The site assumes that groundwater at Durango has been determined a non-drinking water source and will undergo natural attenuation until the site meets EPA standards (up to 100 years). GJO will implement institutional controls and conduct annual compliance monitoring until groundwater meets EPA cleanup standards.

**Engineered Units:** The disposal cell has a radon barrier cover and rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. The disposal site comprises approximately 121 acres (49 hectares), with the disposal cell covering approximately 24 hectares (60 acres) and a maximum area of 2,400 x 1,300 feet.

### **Estes Gulch**

Uranium mill tailings from the Old and New Rifle sites were disposed of onsite in a 29-hectare (71-acre) disposal cell, approximately 6 miles from the Old Rifle site in Estes Gulch, Colorado. The site completed remedial actions in 1997 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Estes Gulch. LTS&M costs at the Estes Gulch Disposal Cell total \$5,000 per year in perpetuity.

**Soil:** Soil was remediated to EPA standards.

**Water:** No groundwater remediation or monitoring is necessary. This site has been removed from the UMTRA groundwater project.

**Engineered Units:** The disposal cell accepted uranium mill tailings from the Old and New Rifle sites. Approximately 4,100,00 yd<sup>3</sup> of tailings and contaminated material from the processing sites were relocated, consolidated, and stabilized in the Estes Gulch disposal cell. The disposal cell has a radon barrier cover and rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. LTS&M activities for the disposal cell will include annual surface inspections, minor maintenance such as fence repairs and sign replacements, and quarterly standpipe water level monitoring (until no longer required).

### Grand Junction Office

The Grand Junction Projects Office (GJO) site is located on the southwest side of the City of Grand Junction, Mesa County, in western Colorado. The facility occupies 25.4 hectares (62.7 acres) of land along a bend of the Gunnison River. The site is bounded on the west and south by the river and on the north and east by county, city, and private property.

By the end of 2002, DOE will remove all radiological contamination and waste from the site and release the site for private and other use with an NRC designation of “no radiological restrictions.” Anticipated future land use is a combination of industrial and recreational. Use of groundwater and the subsurface will remain restricted until monitoring verifies that passive remediation has achieved cleanup goals. GJO will lease office space from the new landlord through completion of its mission. GJO will conduct environmental monitoring at the site following remediation. LTS&M costs for groundwater at GJO total \$30,000 per year for the period 1996-2076.

**Soil:** DOE has remediated radiologically contaminated soils to the EPA radium-226 standard of 5 pCi/g for the top six inches of soil and 15 pCi/g for subsurface soil. Contaminants of concern included thorium, uranium, radium, and potassium. Land under facilities that are demolished were decontaminated and released for reuse with no radiological restrictions. Contaminated soil and test pit material was disposed of at the Cheney disposal cell.

**Water:** DOE anticipates that natural attenuation will remediate radiologically contaminated groundwater to clean levels (by approximately 2076). Groundwater monitoring will continue for

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80 years until it is verified that natural attenuation has achieved cleanup goals. Currently, monitoring is conducted once every nine months.

**Facilities:** DOE will decontaminate or demolish buildings contaminated with uranium, radium, and thorium as necessary so that the site can be released for use with no radiological restrictions. Some building debris will be buried with clean soil. Intact buildings will be released for unrestricted use. DOE assumes that supplemental standards will be approved to allow for reuse of three buildings that have extremely low exposure risks. Projected cleanup levels for contaminated facilities are 1,000 dpm/100 cm<sup>2</sup> for removable structures and 5,000 dpm/100 cm<sup>2</sup> for fixed structures.

### **Gunnison Mill**

The Gunnison former mill site is a 25-hectare (61-acre) tract located southwest of the City of Gunnison and adjacent to the Gunnison airport. Tailings covered an area of approximately 16 hectares (39 acres).

The site completed remedial actions in 1995 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Gunnison Mill. LTS&M costs for the disposal cell at the Gunnison Mill site total \$4,000 per year in perpetuity. Groundwater LTS&M costs for the former mill site total \$30,000 per year for the period 2002-2052. In addition, groundwater LTS&M costs for the disposal site total \$25,000 per year in perpetuity.

**Soil:** Soil was remediated to EPA standards.

**Water:** According to the UMTRA groundwater PEIS, approximately 1.9 billion gallons of groundwater have exceeded MCLs for the following contaminants at least two times since 1990: net gross alpha, radium, and uranium. The site assumes that the groundwater at Gunnison Mill site has been determined a non-drinking water source and will undergo natural attenuation until the site meets EPA standards (up to 100 years). The GJO LTS&M project will implement institutional controls and conduct periodic compliance monitoring until groundwater meets EPA cleanup standards. Annual groundwater monitoring for the former mill site will last from 2002-2052 and will continue in perpetuity for the disposal site.

**Engineered Units:** Approximately 719,000 yd<sup>3</sup> of contaminated surface materials were excavated and disposed of in the Gunnison disposal cell, which is approximately 6 miles from the processing site. The Gunnison disposal site is located on 92 acres of land with the tailings

disposal cell covering 29 acres. The disposal cell has a radon barrier cover and rock surface layer for erosion control. According to EPA standards, the cover of the disposal cell must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. LTS&M activities at the site include annual surface inspections, minor maintenance such as fence repair and sign replacement, and annual groundwater monitoring. No significant repairs are anticipated for the disposal cell.

### **HECLA, Durita**

The Hecla site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Durita, Colorado. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2000, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with rock and grass. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Maybell Mill Site**

The Maybell mill and tailings site covers 45 hectares (110 acres) of land located approximately 40 kilometers (25 miles) west of the Town of Craig in Moffat County, northwestern Colorado. The site is 8 kilometers (5 miles) northeast of the town of Maybell. An additional 74 hectares (182 acres) of land contain residual radioactive materials deposited by wind or water erosion from the

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site. Several inactive open pit mines and low-grade uranium mineralization outcrops surround the Maybell site. Some of the mines provided ore for the Maybell mill. This area is currently used as uninhabited open range land used for grazing cattle. The site expected to complete remedial actions in 1998 under the provisions of the Uranium Mill Tailings Recovery Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Maybell. LTS&M costs at the Maybell site total \$5,000 per year in perpetuity.

**Soil:** Soil was remediated to EPA standards.

**Water:** Approximately 230 million gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs at least twice since 1990: arsenic, cadmium, molybdenum, nitrate, net gross alpha, radium, selenium, and uranium. No groundwater remediation or monitoring is expected (other than occasional water level measurements).

**Engineered Units:** The site is planning to stabilize 3,370,000 yd<sup>3</sup> of soil and contaminated material in place in a 66-acre disposal cell. The disposal cell will have a radon barrier and rock surface layer for erosion control. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. LTS&M activities at the disposal cell include annual surface inspections, standpipe water level measurements, and sign replacement (as necessary). No significant repairs are anticipated.

### **Naturita Site**

Naturita is a former mill and tailings site located 3.2 kilometers (2 miles) northwest of the Town of Naturita in Montrose County, Colorado. The site occupies 21 hectares (53 acres) that includes a tailings area, mill facility, and burying station. An additional 34 hectares (85 acres) of land adjacent to the site contain contaminated wind-blown material. The site expected to complete remedial actions in 1998 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA).

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Naturita. LTS&M costs for the Naturita site total \$5,000 per year in perpetuity. Groundwater LTS&M costs total \$30,000 per year for the period 2000-2050.

**Soil:** Soil was remediated to EPA standards. Approximately 547,000 yd<sup>3</sup> of residual radioactive surface materials were transported to the Uravan disposal site for disposal in the Upper Burbank Repository.

**Water:** Approximately 100 million gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs at least twice since 1990: uranium, arsenic, molybdenum, selenium, radium, and net gross alpha. The site assumes that groundwater at the Naturita Site has been determined a non-drinking water source and will undergo natural attenuation until the site meets EPA standards (up to 100 years). The site will conduct annual groundwater monitoring for the period 2000-2050.

### **New Rifle Site**

The two inactive uranium processing sites at Rifle are located in the Colorado River Valley near the City of Rifle. The sites are approximately 3 kilometers (2 miles) apart and are referred to as the Old Rifle and New Rifle sites. The New Rifle site is west of the City of Rifle. The former tailings pile covered about 13 hectares (33 acres) of land and had steep side slopes rising to a height of about 10 meters (33 feet). The site completed remedial actions in 1997 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). It is expected that the State of Colorado will transfer ownership to the city or county for public use with restrictions which will allow DOE access to continue the UMTRA groundwater project.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at New Rifle. LTS&M costs for groundwater at the New Rifle site total \$30,000 per year for the period 2000-2050.

**Soil:** Soil was remediated to EPA standards. Approximately 1,058,875 m<sup>3</sup> of surface materials have been excavated to supplemental standards and shipped to the Estes Gulch site for disposal, which is approximately 6 miles from the site.

**Water:** According to the UMTRA groundwater PEIS, approximately 600 million gallons of groundwater are contaminated with molybdenum, nitrate, selenium, uranium, net gross alpha, radium, antimony, fluoride, strontium, sulfide, vanadium, and zinc. Groundwater at the New Rifle site has been determined a non-drinking water source and will undergo natural attenuation until the site meets EPA standards (up to 100 years). The site will conduct annual groundwater monitoring for the period 2000-2050.

### **Old Rifle Site**

The two inactive uranium processing sites at Rifle are located in the Colorado River Valley near the City of Rifle. The sites are approximately 3 kilometers (2 miles) apart and are referred to as

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the Old Rifle and New Rifle sites. Old Rifle is located just east of the Rifle city limits in Garfield County, Colorado. It is a 9-hectare (22-acre) site where the tailings pile covered approximately 5 hectares (13 acres) of land. The site completed remedial actions in 1997 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). It is expected that the State of Colorado will transfer ownership to the city or county for public use with restrictions, which will allow DOE access to continue the UMTRA groundwater project.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Old Rifle. LTS&M costs for groundwater at the Old Rifle site totals \$15,000 per year for the period 2000-2050.

**Soil:** Soil was remediated to EPA standards. Approximately 201,473 m<sup>3</sup> of contaminated material has been excavated to supplemental standards and shipped to the Estes Gulch site for disposal, which is approximately 6 miles from the site.

**Water:** According to the UMTRA groundwater PEIS, approximately 70 million gallons of groundwater are contaminated with net gross alpha, radium, antimony, strontium, vanadium, and zinc. Groundwater at Old Rifle Site has been determined a non-drinking water source and will undergo natural attenuation until the site meets EPA standards (up to 100 years). The site will conduct annual groundwater monitoring for the period 2000-2050.

### **Project Rio Blanco Site**

The Project Rio Blanco test, which was approximately 36 miles northwest of Rifle, Colorado, consisted of the nearly-simultaneous detonation of three 33 kiloton devices in a 2,130 meter (7,000 feet) well in May, 1973. The tests resulted in radioactive contamination of the deep bedrock around the shot cavities.

The surface of the site will be remediated to levels that allow for an NRC designation of "no radiological restrictions." The anticipated future use for the surface is recreational, however, access to the subsurface and groundwater will be restricted in perpetuity. DOE will conduct characterization and remediation. DOE will not maintain an active presence at this site but will be responsible for maintaining institutional controls in perpetuity for all sub-surface soil in proximity to the test shot cavity and any contaminated groundwater. Monitoring is currently planned for 100 years; however, DOE assumes that monitoring will be conducted in perpetuity. DOE assumes that LTS&M activities will be conducted annually.

**Soil:** Subsurface contamination will be modeled and monitored, though it will remain in the sub-surface areas since remediation technologies capable of effectively removing or stabilizing this

contamination do not currently exist. Institutional controls, including drilling restrictions, will be maintained in perpetuity to prevent access to this sub-surface contamination. DOE has not yet determined if short-term monitoring of surface areas will be necessary.

**Water:** Groundwater contamination associated with the test shot cavities will not be remediated because technologies capable of safely and effectively remediating this contamination do not currently exist. Tritium, the most mobile of the radioactive constituents in groundwater, is considered the primary contaminant of concern. Institutional controls will be maintained to prevent access to or use of this contaminated groundwater. Long-term surveillance and monitoring is planned for at least 100 years. Based on future modeling and monitoring results, subsurface drilling restrictions and institutional controls implemented on known areas of contamination may require an extension to outlying areas to prevent intrusion into potentially contaminated groundwater systems. Drilling for natural gas will continue to be monitored to ensure it does not impact existing contamination in and near the shot cavity. Access to and use of contaminated groundwater will remain restricted in perpetuity. DOE assumes that groundwater monitoring wells will need to be refurbished or replaced approximately every 25 years.

### **Project Rulison Site**

The U.S. Department of Energy (DOE), Nevada Operations Office is responsible for administering the Rulison Test Area Site, which is located 22 kilometers (14 miles) southwest of Rifle, Colorado. In September of 1969, a 43 kiloton nuclear device was detonated at this site 8,416 feet (more than 1.5 miles) below ground surface.

The surface soil at the Rulison Test Area was characterized and remediated in accordance with an agreement established cooperatively by the State of Colorado and DOE. Surface conditions will allow for a NRC no radiological restrictions designation. While access to the subsurface soil and groundwater will be restricted at the site, the surface will be able to be released for recreational purposes. DOE will not maintain an active presence at this site, but will assume responsibility for establishing and maintaining institutional controls. Long-term monitoring of the subsurface and groundwater in the vicinity of the Project Rulison site is assumed and planned for 100 years; however DOE assumes that monitoring will be conducted in perpetuity. DOE will also maintain communication with the owner of the privately held portion of the site regarding all activities.

**Soil:** Contaminated pond sediments were stabilized, excavated, and disposed of in an approved landfill facility. Subsurface contamination around the shot cavity will not be remediated because remediation technologies capable of effectively removing or stabilizing this contamination do not currently exist. In order to prevent access to this subsurface contamination, institutional controls,

such as drilling restrictions, will be established and maintained. Short-term monitoring of surface areas has been conducted for the past two years and will continue until state approval of the closure report.

**Water:** Groundwater contaminants in and around the test shot cavity will not be remediated since safe and cost-effective groundwater technologies have not yet been demonstrated for removing or stabilizing radioactive contaminants. To avoid any potential risk, restricted access to the subsurface will be maintained including restrictions on access to and use of groundwater. Long-term surveillance and monitoring of the Rulison Project Test Area is planned for at least 100 years. Subsurface drilling restrictions and institutional controls implemented on known areas of contamination may require an extension to outlying areas to prevent intrusion into potentially contaminated groundwater systems. Drilling for natural gas will continue to be monitored to ensure it does not impact existing contamination in and near the shot cavity. DOE assumes that groundwater monitoring wells will need to be refurbished or replaced approximately every 25 years.

### **Rocky Flats Environmental Technology Site**

The Rocky Flats Environmental Technology Site is located approximately 26 kilometers (16 miles) northwest of downtown Denver, Colorado, in Jefferson County. The 2,503-hectare (6,185-acre) site is near a large metropolitan area that is currently experiencing rapid growth and development. Approximately 2.1 million people live within an 80-kilometer (50-mile) radius of the site. Current growth trends in the area are projected at 30 percent within the next 20 years. The Federal Government currently owns, and expects to continue to own, the site. The site may be transferred to another entity as cleanup becomes more complete. DOE assumes that it or a successor agency will be responsible for LTS&M.

The site is located at an elevation of approximately 1,800 meters (6,000 feet) on a geological bench called Rocky Flats. This bench flanks the eastern edge of the foothills of the Rocky Mountains, slopes down gradually to the east, and overlooks the Denver metropolitan area. The primary facilities are located on 155 hectares (384 acres) within the Industrial Area of the site. This core area is in the center of the site and contains more than 400 manufacturing, chemical processing, laboratory, and support facilities, which were formerly used to produce nuclear weapons components. Approximately 2,347 hectares (5,800 acres) of the site are preserved as open space. This open space contains few facilities and serves as a buffer zone for the core area.

Under current planning, the site will achieve its interim endstate in 2010. All special nuclear material is expected to be shipped offsite by 2002. The site has a goal to accelerate cleanup and

closure by 2006. Site planning is based in part on the understanding that when the interim endstate is reached, the buffer zone will likely be available for reuse as open space and the industrial zone will likely be available for restricted reuse as open space or for light industrial uses. Nearly 100 acres of the site, including a municipal and hazardous waste landfill and the former production area, will likely be covered with engineered earthen caps. Access to the landfill and the former production area will be restricted.

DOE continues to consider comments from stakeholders on future land uses and final endstates. DOE may conduct additional cleanup and removal actions after the interim endstate is reached; however, no additional remediation activities have been defined. The site states that stewardship requirements have not yet been determined but assumes that monitoring will continue for a minimum of 30 years following site closure. The final site ROD will fully define stewardship requirements. The annual site-wide cost estimate for LTS&M activities is approximately \$10-50 million per year for the period 2011-2015 to be consistent with the (draft) GAO report; a formal cost estimate was not available for the period 2016-2040. This cost estimate is based on current planning and preferred decisions as described in following paragraphs.

**Soil:** Contaminants of concern include radionuclides (uranium, plutonium, and americium), VOCs (TCE and PCE), and heavy metals. The site will remediate radiologically contaminated soils to levels established in the Rocky Flats Cleanup Agreement (RFCA). All soil meeting these levels will be replaced in excavated areas. Residual radiological, organic, and heavy metal contamination below the action level framework will remain in the surface soils of the buffer and industrial zones. The site will regrade and revegetate some impacted areas in these zones. Current planning calls for approximately 100 acres, including the former production area and the solar ponds, to be covered with engineered caps. The site is exploring the use of a capillary break design cap for the production area. Portions of the production area that are not capped will be revegetated. Access to capped areas will remain under restricted access. These areas will require LTS&M.

**Water:** Water is contaminated with VOCs (TCE, PCE, and carbon tetrachloride) and radionuclides (uranium). The site will collect and treat contaminated groundwater as appropriate. Groundwater plumes will only be remediated to protect surface waters. Contaminants that are not mobile will remain in place. The site is making extensive use of passive reactive barrier systems for treatment/containment of contaminants. These systems are expected to remain operational for at least 30 years. To comply with the RFCA, the site will convert the existing pond system to a “flow through” system and eventually to a wetland area. This system will immobilize sediment migration. The site states that surface water will be returned to a naturalized flow-through system after site closure. DOE stewardship activities will include ongoing groundwater management, long-term monitoring of groundwater and surface water quality, and S&M of wetlands. Monitoring is expected to take place for 30 years, and will take place on a monthly to annual basis.

**Engineered Units:** The site will close two onsite landfills, which contain sanitary waste. Engineered caps will be placed over the landfills, approximately 45 acres in size, to ensure no releases. Sections of the original process waste line will remain beneath the surface. Treatment tanks and collection systems for the reactive barrier system will remain onsite. DOE states that this area will be revegetated and cleaned to levels dictated by the RFCA (appropriate for restricted, open space use). The site will leave uncontaminated underground storage tanks in place. The capped landfill will be fenced and will require monitoring and maintenance; however, no specific actions or frequencies have been identified.

**Facilities:** Facilities are contaminated with radionuclides (uranium, plutonium, americium, neptunium, cerium, and curium), metals (beryllium, lead paint, lead chromium, and mercury), PCBs, and asbestos. Local interest in the cleanup, closure, and future uses of the site is high. Open space of some form is the likely end state for the Buffer Zone. The community is still discussing a range of options for the current industrial area, such as open space or light industrial uses. The range of potential uses includes an ecological industrial park, full redeployment as a manufacturing center, office/commercial uses, or a federal laboratory, among other uses. To date, no specific facilities have been identified for reuse. Facilities will be remediated in accordance with DOE Order 5400.5, Radiological Protection of the Public and the Environment. Current planning calls for all facilities to be demolished and rubble to be disposed of appropriately. The site will leave foundations and utilities in place unless removal is necessary to remediate underlying soil. The subsurface utilities between facilities will be capped and left in place.

### **Slick Rock/Old North Continent**

The Slick Rock site is located in the Dolores River Valley, 4.8 kilometers (3 miles) northwest of the old post office at Slick Rock. The site comprises two separate areas that are approximately 1.6 kilometers (1 mile) apart: the 37-hectare (93-acre) Union Carbide site and the 7-hectare (17-acre) North Continent site. DOE's Albuquerque Operations Office assumes that the Nuclear Regulatory Commission (NRC) will complete licensing review by 1999. The site will be returned to its owners upon NRC certification of compliance with Subpart B of the EPA groundwater protection standards. The site completed remedial actions in 1997 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Slick Rock/Old North Continent. Groundwater LTS&M costs for the former mill and tailings site total \$30,000 per year for the period 2002-2052.

**Soil:** Soil was remediated to EPA standards. Approximately 148,742 m<sup>3</sup> of contaminated surface materials from both the Old North Continent and Union Carbide sites were shipped 2 miles from the site to the Burro Canyon disposal cell.

**Water:** Approximately 26 million gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs at least twice since 1990: molybdenum, uranium, nitrate, selenium, net gross alpha, and radium. Site assumptions are that groundwater at Slick Rock/Old North Continent has been determined a non-drinking water source and will undergo natural attenuation until the site meets EPA standards (up to 100 years). The site will conduct annual groundwater monitoring at the former mill site from 2002-2052; however, groundwater monitoring at the disposal cell will not be required.

### **Slick Rock/Union Carbide**

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### **UMETCO, Maybell**

### *From Cleanup to Stewardship*

UMETCO Maybell is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Maybell, Colorado. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2000, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with rock. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **UMETCO, Uravan**

UMETCO Uravan is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Uravan, Colorado. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

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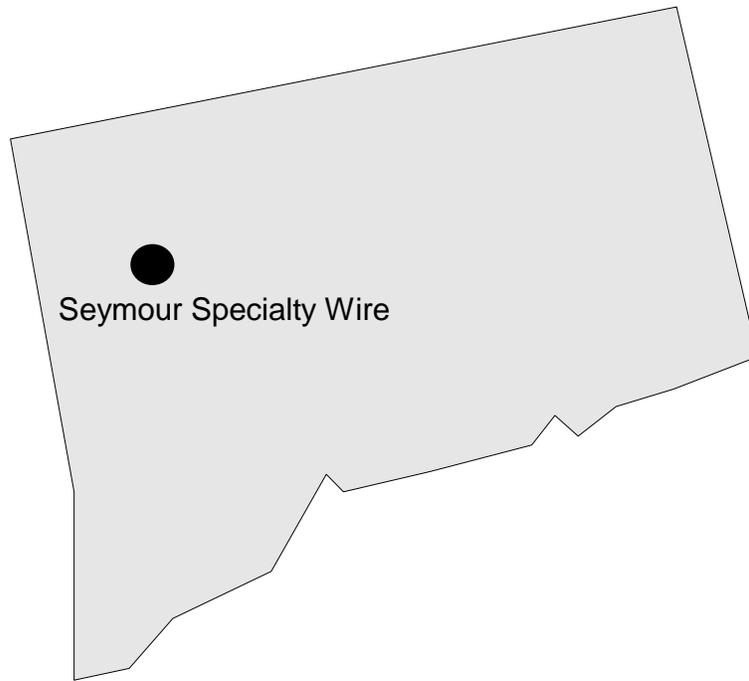
**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The

groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 10,500,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with rock. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

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# Connecticut

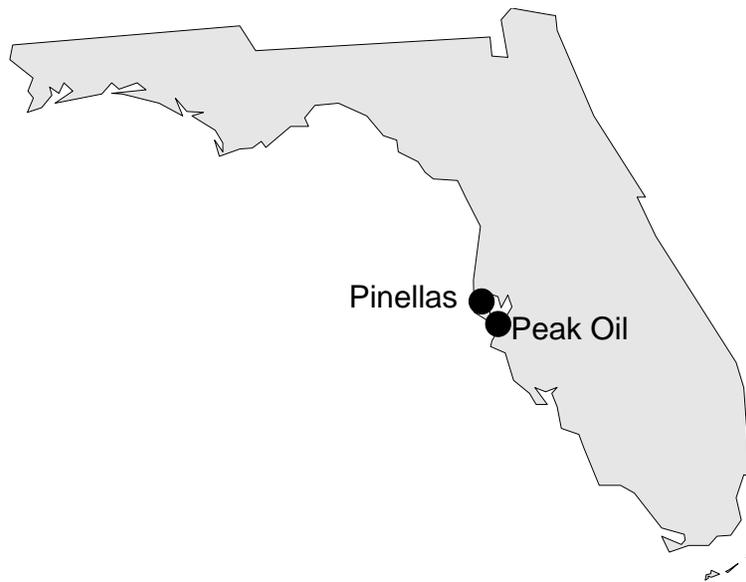


*From Cleanup to Stewardship*

**Seymour Specialty Wire**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1994, and no stewardship activities are currently anticipated.

# Florida



### **Peak Oil**

Peak Oil Participation in Florida was completed in 1995. The site is not expected to require any stewardship.

### **The Pinellas S.T.A.R. Center**

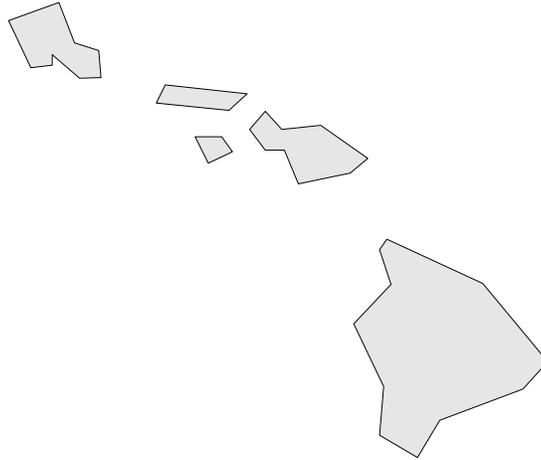
The Pinellas Plant occupies a 40-hectare (100-acre) site, 9.6 kilometers (6 miles) north of St. Petersburg in Pinellas County, Florida. Pinellas County is located on a peninsula bordered on the west by the Gulf of Mexico and on the east and south by Tampa Bay.

DOE sold this site to the Pinellas County Industrial Council (PCIC) in 1995 and completed state and EPA certified surface remediation in 1997. The current landlord will continue to use this land for light industrial operations and office space. DOE will continue groundwater remediation until cleanup levels for an “industrial site with restricted access” are met. DOE transferred liability under CERCLA for former off-site waste disposal to DOE’s Grand Junction Office in October 1997. Once groundwater remediation is complete, DOE will be responsible for any long-term surveillance and maintenance that may be required.

**Water:** DOE is operating a pump and treat system to remediate groundwater with high concentrations of VOCs to meet Clean Water Act and State of Florida maximum concentration levels (MCLs). When site groundwater meets the "industrial with unrestricted access" use classification, DOE will be responsible for any long-term surveillance and maintenance that may be required. DOE expects to complete remediation in 2014. DOE assumes that if these levels cannot be met, the site may apply for a technical impracticability waiver. Under existing remedial activities, DOE personnel will be onsite on a continued basis. DOE will perform annual groundwater monitoring for five years after active remediation has ceased.

# Hawaii

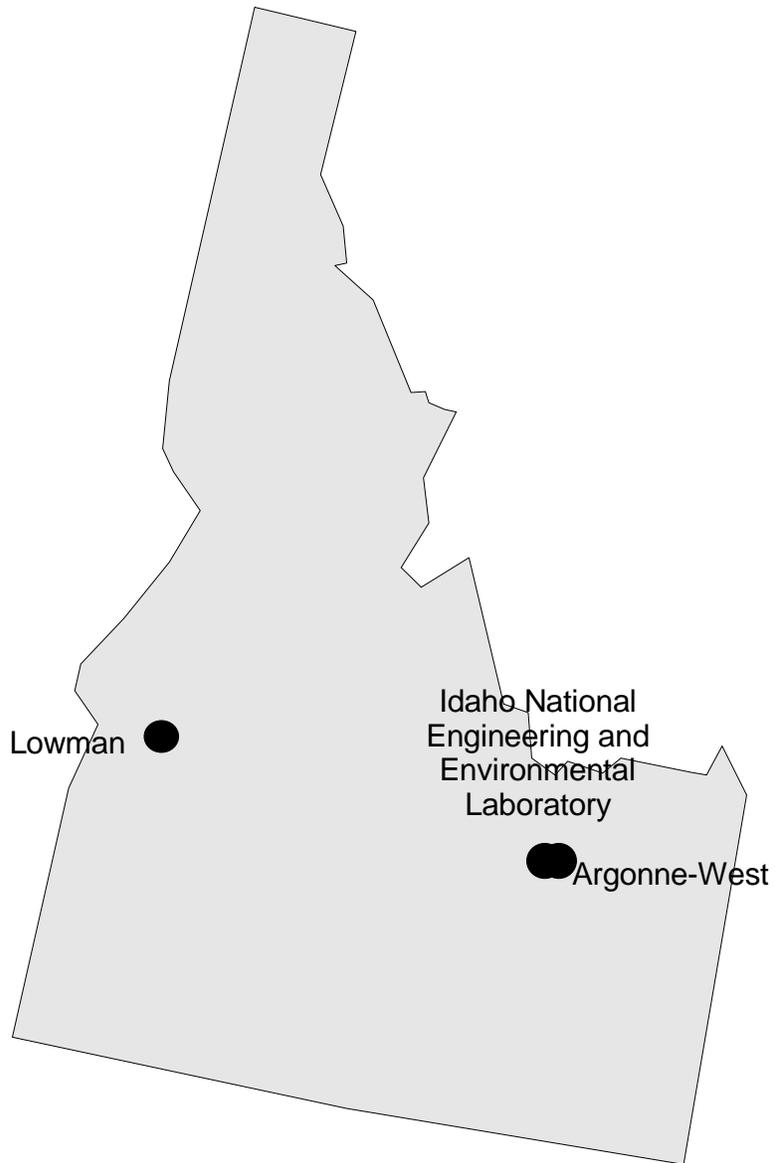
Kaui Test Facility



**Kauai Test Facility**

The Kauai Test Facility in Hawaii was completed in 1995. The site is not expected to require any stewardship.

# Idaho



### **Argonne National Laboratory - West**

Argonne National Laboratory-West (ANL - W) is located on the southeastern portion of the Idaho National Engineering and Environmental Laboratory, approximately 56 kilometers (35 miles) west of Idaho Falls, Idaho. The area administered by the Laboratory is slightly over 2.6 square kilometers (one square mile) and consists of 40 primary buildings.

DOE will complete environmental restoration and release all areas of the site to the Office of Nuclear Energy, the site landlord, for reuse in 2000. Nuclear Energy has an ongoing mission at the site. The land is expected to continue to be used for industrial/commercial operations. Nuclear Energy will be responsible for stewardship, operation of installed groundwater remediation systems, and all future land use issues. The ROD was signed in 1998. DOE assumes that annual S&M will continue for approximately 100 years. The site estimates that the average annual cost for surveillance and maintenance activities will be \$45,000 through 2030.

**Soil:** Soils are contaminated with heavy metals, cobalt, cesium, and uranium. DOE will remediate soil to levels appropriate for industrial use. Heavy metal and radionuclide contamination will remain in scattered soil areas covering a total of approximately 10 acres. Sewage lagoons, sumps, leach pits, burn pits and a debris pile will all be remediated. Remediation is based on revegetating (to prevent erosion) and active phytoremediation. DOE will conduct CERCLA 5-year reviews, soil sampling, and vegetation sampling for 20 years in areas where residual contamination remains in place. As long as DOE maintains a presence on the site, the only institutional controls needed are fences; however, upon DOE's departure, deed restrictions will be needed to maintain an industrial use level.

**Water:** Contaminants of concern include heavy metals, cobalt, cesium, and uranium. The Snake River Aquifer lies beneath the site, which is used for agricultural purposes. Active groundwater remediation will be ongoing for 5 years, and is expected to be phyto-remediation. DOE will monitor groundwater in areas with residual contamination for at least 20 years.

**Facilities:** EM will complete D&D of the Central Liquid Processing Area (CLPA) in 1998 and return this area to the site landlord. The monitoring strategy for the CLPA has not yet been determined, but use of the facility will be restricted if it is not reused by the site. The Experimental Breeder Reactor (EBR) and the Transient Reactor Test Facility (TRTF) are in safe shutdown and will be decommissioned and closed. All other facilities will be used for ongoing site missions. The final disposition of the EBR and TRTF will be determined by the Office of Nuclear Energy.

## **Idaho National Engineering and Environmental Laboratory**

The Idaho National Engineering and Environmental Laboratory (INEEL) occupies 890 square miles in a remote desert area in southern Idaho along the western edge of the Eastern Snake River Plain. There are no permanent residences within its borders, and the nearest major community, the City of Idaho Falls, is located 42 miles to the southeast. The Laboratory consists of 10 major operating areas at the site and several facilities in the City of Idaho Falls. One area has been designated a National Historic Landmark.

DOE will remediate all release sites identified under the INEEL Federal Facility Agreement/Consent Order in accordance with CERCLA regulations. All remediation will be complete by 2050 although several less complicated Waste Area Groups (WAGs) will complete remediation by 2006. By 2044, all facilities will be demolished and disposed of or decontaminated and released for reuse. Facilities will be deactivated to reduce S&M costs pending final D&D. Facilities with an endstate different from the site-wide plan are discussed below. Unexploded ordnance is currently found onsite. In accordance with the INEL Comprehensive Facilities and Land Use Plan, the site will be restored to allow for industrial and open space use. According to this plan, the site will remain under government management and control, and no residential use will be permitted for the next 100 years.

Remediation strategies are being finalized for each operating area. The final ROD for the groundwater under the site will be completed in 2004. Organic contaminants will remain in the Snake River Plain Aquifer, and residual chromium, tritium, mercury, cesium, and cobalt will remain in the perched water table. Due to the presence of unexploded ordnance and groundwater contamination, the site will need future use restrictions. Less than 5% of the surface of the site is expected to require access controls. Anticipated future landuses include grazing and re-use of industrial sites. INEEL has implemented a long-range plan to continue use of the site as a National Multi-Program Engineering and Environmental Laboratory. In order to support this ongoing mission, it is likely that WAGs 1, 2, and 4 will be in continuous use. Groundwater monitoring and maintenance of remediation structures (caps, etc.) and maintenance of flood diversion structures are anticipated. Access restrictions, fences, and signs will be used to protect site boundaries. CERCLA inspection, monitoring, and maintenance will be required for contained/capped areas. Site-wide stewardship activities for facilities that have been deactivated pending final D&D will include: maintaining facility filtered off-gas systems, preventing and cleaning up contaminant releases, and maintaining S&M equipment. Meteorological and seismic monitoring, emergency preparedness, and environmental monitoring are ongoing activities that will continue as long as necessary to support site missions. The site estimates LTS&M activities will cost approximately \$3,511,000 per year through 2070.

### **Test Area North (WAG 1)**

**Soil:** Residual organic, radioactive, and metal contamination will remain in approximately 4 acres of surface soil at WAG 1. Low-level radioactive soils will be excavated and consolidated at the INEEL repository. Institutional controls including fences, signs, and markers will be maintained for residually contaminated soil areas. Monitoring and sampling will be conducted to support the 5-year reviews.

**Water:** Water in this area is contaminated with VOCs. The expected remediation strategy use a combination of pump and treat and bioremediation. The target cleanup levels for groundwater contamination are EPA MCLs. Long-term, site-wide groundwater monitoring will be conducted and institutional controls will be in place until at least 2050; however, specific monitoring activities have not yet been developed.

**Engineered Units:** Buried tanks will be vitrified in place and protected by institutional controls including fences, signs, markers, and periodic sampling to support 5-year reviews. Final remediation and monitoring decisions will be documented in the ROD, scheduled for signature in 1999.

**Facilities:** Endstate and stewardship for facilities will follow the site-wide plan discussed in the overall site summary.

### **Test Reactor Area (WAG 2)**

**Soil:** Soils are contaminated with chromium, tritium, mercury, cesium, and cobalt. Inaccessible soil contamination beneath facilities will be left in place and addressed when the Test Reactor facilities are removed. DOE will implement institutional controls to ensure protection prior to final remediation. Following remediation, residual contamination will remain in surface soils. Some areas will be capped and will be placed under LTS&M.

**Engineered Units:** Most underground storage tanks in this area will be remediated through a voluntary consent order to RCRA closure standards. Tanks or tank systems currently leaking or posing a threat will be remediated through the CERCLA process by in-situ vitrification or grouting.

**Facilities:** Facilities will be addressed according the site-wide plan. DOE assumes that the Test Reactor facilities will continue to operate until at least 2035. Stewardship activities for other facilities in this area will follow the site-wide plan discussed in the overall site summary.

**Idaho Nuclear Technology and Engineering Center (WAG 3)**

**Soil:** Residual organic, radioactive, and metal contamination will remain in sub-surface soils. Surface soils will be remediated to a  $10^{-4}$  risk level or 16pCi/g for cesium. Contaminated soils in the HLW tank farm will be remediated under CERCLA after the tanks are emptied in 2035. Remediation options currently under consideration for soils in the tank farm area include in-situ vitrification, in-situ grouting, spot contamination removal, and capping with vegetative caps. CERCLA 5-year reviews will be required for soils with residual contamination. The site will also conduct surface soil and air monitoring.

**Water:** The primary contaminant of concern from process water injection to the groundwater is iodine-129. The expected remediation strategy is monitoring with a specified action level of 11.4 picoCuries per liter. Monitoring is expected to be conducted annually for the first 30 years and every 5 years for the remaining 70 years of monitoring.

**Engineered Units:** HLW tanks will be emptied and the tank farm will be closed in accordance with RCRA. A cap is likely to be constructed over the tank farm area, although this decision is not final. All liquid HLW will be converted to a more stable solid form for safe storage prior to final disposal at a federal repository. Closure of the tank farm is expected to be completed in 2035. The INEEL CERCLA Disposal Facility (ICDF) will be constructed to consolidate contaminated soils from across the site. The ICDF will contain LLW and MLLW but will be constructed in compliance with RCRA Subtitle C requirements. The ICDF will be closed with a “Hanford barrier” cap and will require annual inspections for 100 years after closure.

**Facilities:** Facilities are contaminated with cesium, strontium, plutonium, uranium, americium, neptunium, mercury, lead, chromium, TCE, and TCA. Eighteen highly contaminated facilities at the Idaho Nuclear Technology and Engineering Center (INTEC) will require restricted access or institutional controls. By 2035, all SNF will be packaged, treated, and sent to a DOE long-term storage repository. Facilities used for SNF, HLW, and TRU treatment or storage will then undergo D&D. The remedial action objectives for facilities are to achieve a cumulative target risk level of  $10^{-4}$ . Deactivated surplus facilities will require full S&M prior to final D&D. The site expects that the final endstate for facilities will be entombed and capping. All 18 highly contaminated facilities in the INTEC will require restricted access, monitoring, and institutional controls prior to and after final dispositioning.

**Central Facilities Area (WAG 4)**

**Soil:** Residual contamination, including strontium, cesium, mercury, lead, and uranium, will remain in approximately 6 acres of soil. Soils will be cleaned up to residential use levels in accordance with the ROD. Specific target cleanup levels are 1.3 mg/kg for mercury, 25 pCi/g for cesium, and 400 mg/kg for lead.

*From Cleanup to Stewardship*

**Water:** Most groundwater monitoring related to the engineered units will take place on a quarterly basis, although monitoring related to SRPA will only be monitored annually.

**Engineered Units:** Three industrial waste landfills covering approximately 35 acres have been closed in place and covered with soil caps. Groundwater monitoring is being conducted on a quarterly basis. Additional monitoring activities will include cap monitoring, soil gas monitoring, inspections for landfill infiltration, and fences to restrict access.

**Facilities:** Endstate and stewardship for facilities will follow the site-wide plan.

**Power Burst Facility/Auxiliary Reactor Area (WAG 5)**

**Soil:** Soils in the area are contaminated with cesium-137. Remediation will include removal with onsite disposal. The cleanup levels will be determined in the ROD, but are assumed to be between 17-23 pCi/g. Contamination may remain in approximately 50 acres of soil in concentrations below the remediation goals. Surveillance and maintenance requirements will be determined in the ROD, but are expected to include annual reviews for the first 5 years, followed by 5-year reviews.

**Water:** Groundwater monitoring is part of the site-wide aquifer protection program.

**Engineered Units:** A landfill, building foundations, and septic tanks will be capped and remain in place. Wastes contained in burial grounds in this area include radioactively contaminated equipment, building materials, and soil.

**Facilities:** Several waste treatment facilities exist in this area. D&D has already removed most contamination from the buildings and no plans exist for further remediation. Buildings in this area are currently in use.

**Experimental Breeder Reactor-I and the Boiling Water Reactor Experiment Area (WAG 6)**

WAG 6 includes the Experimental Breeder Reactor-I and the Boiling Water Reactor Experiment Facility. Both of these were test reactors that have since been decommissioned. Experimental Breeder Reactor-I is now a National Historic Landmark because it was the first nuclear reactor in the world to generate usable amounts of electricity. The area of the Boiling Water Reactor Experiment housed five reactors which operated between 1953 and 1964. These facilities were decommissioned between 1979 and 1992. The buildings and equipment were completely dismantled and removed, and no operations other than monitoring are conducted. Potential contaminants from past operations are organics and inorganics, radionuclides, and metals.

## **Radioactive Waste Management Complex (WAG 7)**

**Soil:** Residual contaminants, including radionuclides, LLW, metal, hazardous waste, and TRU waste, will remain in soil impacted by disposal in the Subsurface Disposal Area (SDA). DOE assumes that interstitial soils and soil below the waste is contaminated. The remedial design is not yet complete or approved, but may include in-situ stabilization as the selected remedy. Long-term maintenance and monitoring of the cap over the SDA will detect any migration of the contaminants from the impacted soil.

**Water:** Current operations include stripping and thermal destruction of vadose zone VOCs.

**Engineered Units:** LLW, MLLW, TRU, MTRU, and hazardous waste were buried in various forms and packages in the 97-acre SDA. TRU waste in trenches and pits may be retrieved, treated, and disposed of. Some waste, including TRU, LLW, and hazardous waste, may remain in place. The RCRA cap constructed over the SDA will require at least 30 years of maintenance and monitoring. Institutional controls and/or surveillance and monitoring activities will be required. By 2054, the 30-year maintenance and monitoring requirement of the site will be completed.

**Facilities:** The Waste Experimental Reduction Facility (WERF) will cease treating MLLW and will be closed in accordance with RCRA. The Advanced Mixed Waste Treatment (AMWT) Project will treat TRU and store MLLW through 2018, when it will undergo D&D and be closed in accordance with RCRA. DOE will operate the LLW disposal facility until 2007 and then open an additional onsite disposal facility or dispose of LLW offsite. Remote-handled LLW will be stored at the RWCM until an acceptable offsite disposal facility is identified. The WERF and AMWT will require RCRA post-closure monitoring, beginning in 2018.

## **Sitewide Monitoring Area Remediation (WAG 10)**

Waste Area Group 10 includes areas in and around INEEL facilities that cannot otherwise be addressed on a waste area group-specific basis and the groundwater under the INEEL. The boundaries of WAG 10 are INEEL boundaries or beyond, as necessary, to encompass real or potential impact from INEEL activities. The Snake River Plain Aquifer underlies the entire site and is a sole source aquifer. The ten Operable Units are composed of known and potential releases from underground storage tanks, disposal ponds, injection wells, septic tanks, buried cables, burial sites, and radioactive contaminated soils. Contaminants of concern included radionuclides, metals, organics, and acids.

The Waste Area Group 10 comprehensive investigation was initiated in 1997. The investigation will include an evaluation of sitewide cumulative risks from all waste area groups. Data collected during all other comprehensive investigations will be considered as part of this final site investigation. A Record of Decision is expected to be signed in 2004, but concurrent discussion with the regulatory agencies may result in the date moving out to match the extensions for WAG 3 (OU3-14, Tank Farm).

### *From Cleanup to Stewardship*

**Soil:** Unexploded ordnance existed at six locations across the INEEL. The ordnance was primarily a result of past activities associated with the former Naval Proving Ground including aerial bombing practice, naval artillery testing, explosives storage bunker testing, and ordnance disposal. In 1993 and 1994, removal actions were conducted at various unexploded ordnance sites to remove or detonate ordnance onsite. During 1997, an additional removal action for unexploded ordnance was conducted. A total of 204 acres was cleared of unexploded ordnance and 30,690 pounds of unexploded ordnance-related scrap were removed.

### **Lowman**

The Lowman mill and tailings site, which covers 15 hectares (37 acres), is located approximately 121 kilometers (75 miles) northeast of Boise, Idaho, in the Boise National Forest. The site is 0.8 kilometers (0.5 miles) northwest of the Town of Lowman. When the remedial action project started, piles of radioactive tailings were scattered over a 2-hectare (5-acre) parcel of the site. Other contaminated areas on the site included the millyard, ore storage area, evaporation ponds, and wind-borne and water-borne contaminated material. The total amount of contaminated material onsite was more than 95,760 m<sup>3</sup>. The disposal site boundary is not fenced; however, access is partially restricted by a gate placed across the access road. The site completed remedial actions in 1992 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Lowman. LTS&M costs for the disposal cell at the Lowman site total \$7,000 per year in perpetuity. Groundwater LTS&M costs total \$9,000 per year for an as yet unspecified amount of time.

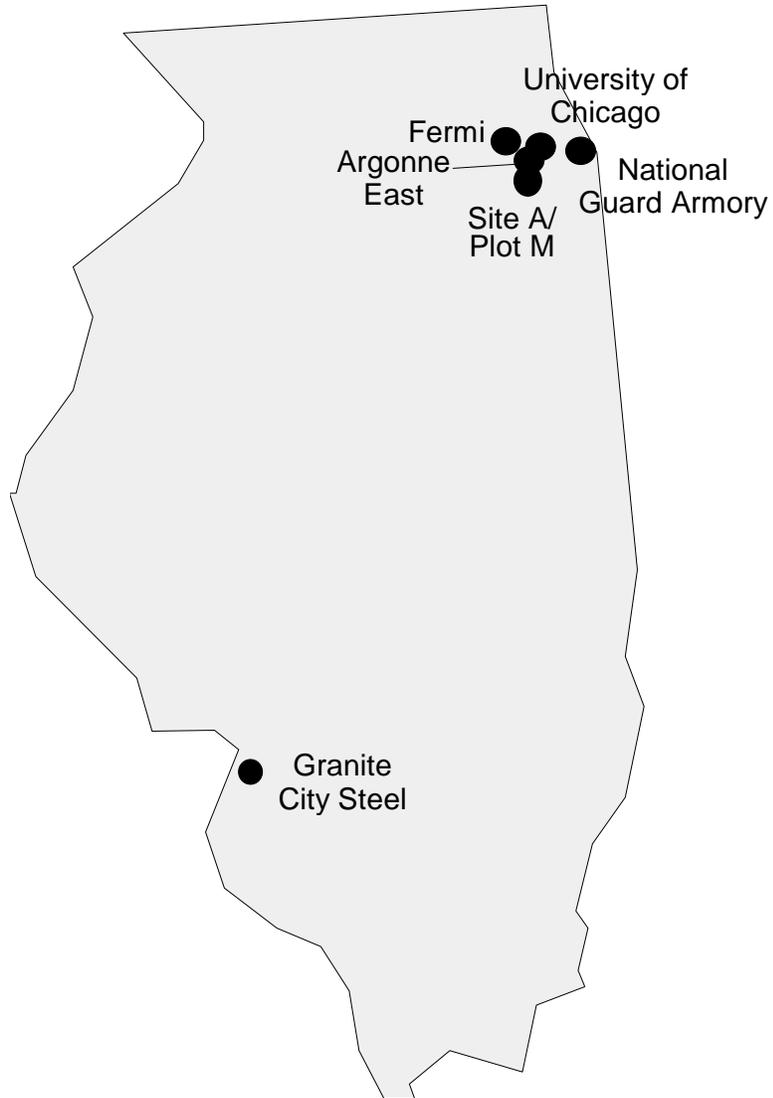
**Soil:** Soil was remediated to EPA standards.

**Water:** Water quality analyses indicate that none of the MCLs have been exceeded at Lowman. No groundwater remediation is expected. Groundwater monitoring was to be conducted annually through 1995. Annual inspections will be performed for the first five years. At that time, GJO will re-evaluate the need for continued monitoring.

**Engineered Units:** Approximately 39,014 m<sup>3</sup> of contaminated material was stabilized on site in a 3.2-hectare (8.2-acre) disposal cell. The disposal cell has a radon barrier cover and rock surface layer for erosion control. According to EPA standards, the cover of the disposal cell must be designed to last 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. LTS&M activities for the disposal cell include annual surface inspections, sign replacement (as necessary), and potential vegetation control.

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# Illinois



## Argonne National Laboratory - East

Argonne National Laboratory-East (ANL-E) occupies a 680-hectare (1,700-acre) tract located approximately 20 kilometers (15 miles) southwest of metropolitan Chicago, Illinois. The laboratory has been involved in research and development activities in support of DOE and its predecessors since 1943. The laboratory continues to conduct basic and applied research to support the development of energy-related technologies. The Office of Science, the site landlord, has an ongoing research mission at ANL-E.

EM has funded environmental restoration activities through FY 2002. It is unknown at this time which DOE program will be responsible for stewardship, funding, and land use issues at the site. Remedial actions are being conducted under the RCRA corrective action process. Corrective action for some release sites will include containment of residual contamination. Facilities will be demolished and disposed of or decontaminated and released for industrial reuse. The Office of Science has an ongoing research mission at the site. Because of its ongoing research mission, the site will remain under institutional control. Annual costs are estimated at \$1,100,000, but may change as final monitoring systems are established.

**Soil:** Soils are contaminated with VOCs, metals, PCBs, and radioisotopes. Contamination is present in deep, sub-surface soils below the french drains and landfill sites. The site will excavate and dispose of contaminated soil or contain contamination in place. Residual contamination is expected to remain in the 300, 570, and 800 areas, as well as other dispersed areas across the site. The site will conduct annual sampling and monitoring where contamination remains in place to ensure that contaminants are not migrating and that caps have retained their integrity.

**Water:** Potential contaminants of concern include VOCs, metals, PCBs, and radioisotopes. DOE has not yet completed assessment of groundwater conditions or definition of remedial strategies. DOE anticipates that some offsite groundwater is contaminated. Sediments in nearby creeks may be contaminated by stormwater runoff but no remediation or use restrictions are expected for surface waters or sediments. Current remedial options include pump and treat, containment, and in situ remediation. If required, the site will continue limited groundwater pumping operations after 2002. Cleanup levels for the site will be consistent with state regulatory limits for groundwater. Current cost estimates run through 2003.

**Engineered Units:** A total of 25-27 acres of engineered units will remain onsite. The 800 Area sanitary landfill, which is along the western border of the site is currently still in use, and will be capped. A composite cap will be placed over the former 319 Area low-level waste landfill and several other former landfills. LTS&M activities will include annual cap maintenance and fences.

**Facilities:** Contaminants of concern include cobalt, uranium, plutonium, americium, lead, beryllium, and cadmium. Eleven facilities continue to operate onsite, five of which have been remediated and turned over to the Office of Science for reuse. The site will decontaminate, decommission, and demolish all six research reactors and the obsolete nuclear support facilities.

### *From Cleanup to Stewardship*

After removal of all radioactive and hazardous contamination, the site will decontaminate and decommission five facilities for reuse. Facilities will be surveyed to ensure they meet release criteria for unrestricted industrial reuse per the Radcon Manual.

### **Fermi National Accelerator Laboratory**

The Fermi National Accelerator Laboratory is located on a 2,720-hectare (6,800-acre) tract in Batavia, Illinois, approximately 48 kilometers (30 miles) west of downtown Chicago. The Laboratory is used to conduct research in high-energy physics.

The Office of Science has an ongoing mission at the site and will continue to generate LLW, hazardous, and other special wastes. Waste management activities at the site were transferred to the Office of Science in 1998. The descriptions of the scope of remedial activities and anticipated endstates were inadequate to effectively evaluate the anticipated long-term surveillance and maintenance needs.

**Soil:** The site expects to complete remediation of PCB-contaminated soil near electrical transformers in 2004.

**Water:** No information was provided on contaminated groundwater.

**Facilities:** No information was provided on the approach for remediating any contaminated facilities.

### **Granite City Steel**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1994, and no stewardship activities are currently anticipated.

### **National Guard Armory**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1989, and no stewardship activities are currently anticipated.

### Site A/ Plot M, Palos Forest Preserve

Site A/Plot M is located within the Palos Forest Preserve in Cook County, Illinois and encompasses approximately 16 hectares (40 acres). The site is located approximately 64 kilometers (40 miles) west of metropolitan Chicago.

This site is owned by the Palos Forest Preserve. Site A contained two experimental reactors and associated research laboratories. Plot M was used for burial of radioactive waste. In 1997, Site A was returned to the Forest Preserve for unimproved recreational use by the public. Plot M was returned to the Forest Preserve in 1956 for the same use. The Grand Junction Office (GJO) conducts ongoing S&M at these sites. Investigations indicate that no further remediation will be necessary. GJO monitors groundwater, surface water, soil, and air to ensure that there is no significant spread of contamination. The need for continuation of S&M activities will be evaluated in 2005. DOE's responsibility for this site will end when it is determined that no further S&M is needed. The current owner, the Cook County Forest Preserve District, is responsible for landlord activities at the site. Annual costs for stewardship are estimated to be \$250,000 in 1998 dollars.

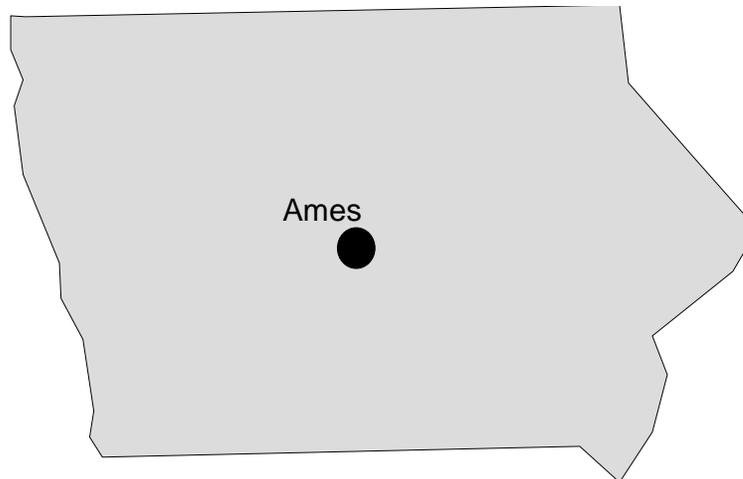
**Soil:** Residual radiological and heavy metal contamination remains in surface soils at Site A. An area approximately 100 feet across and 50 feet deep was excavated between the two reactors. The area was then backfilled, leveled, and landscaped. At Plot M contaminated soils were stabilized and isolated by backfilling after waste burial and encasing the sides and top of the burial zone with concrete. The disposal area was surrounded by concrete walls 8 feet deep and 1.5 feet thick. A 1-foot thick concrete cap was placed over the top of the entire disposal area. The concrete was covered with two feet of soil and seeded with grass. Soil at both areas is currently under LTS&M. In general, the current routine site stewardship activities include an inspection of site conditions, evaluation of erosion, changes in vegetation, changes in local land use, evidence of subsidence, and other environmental parameters that may have an impact on site integrity.

**Water:** Residual radiological and heavy metal contamination remains in surface and groundwater. Groundwater and surface water are currently being monitored and will continue to undergo annual monitoring until at least 2005.

### University of Chicago

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1989, and no stewardship activities are currently anticipated.

# Iowa



## Ames Laboratory

The Ames Laboratory is located on the Iowa State University Campus in the town of Ames, Iowa. The Ames Laboratory was established in the 1940s to develop efficient uranium production processes for the Manhattan Project. The Laboratory has an ongoing mission, although its programs now emphasize research in the preparation, characterization, and evaluation of properties of metals and their alloys. The Office of Science, the site landlord, has an ongoing research mission at the site.

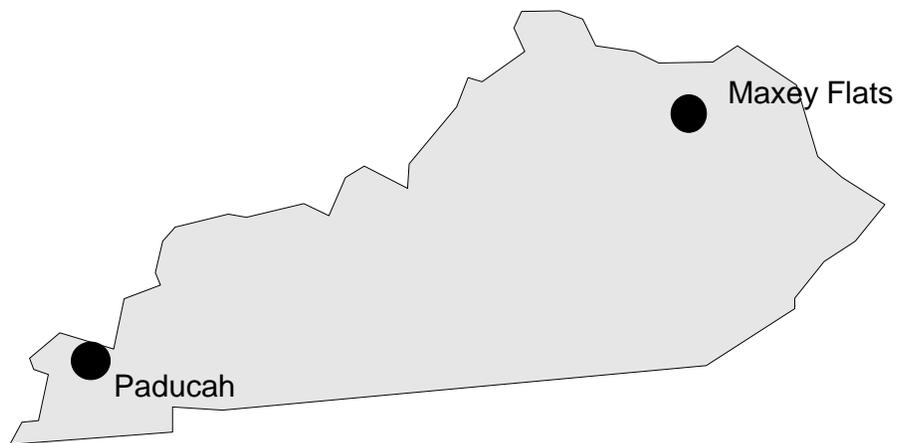
Environmental restoration will be complete in 1999 and the remediated areas from the former chemical disposal site will be transferred to the Iowa State University (ISU) for unrestricted use. EM has funded stewardship activities through 2000. It is unknown at this time which DOE program will be responsible for LTS&M. Iowa regulators may impose land use restrictions. ISU has been contracted to conduct the soil sampling and groundwater monitoring activities at the former disposal area, but DOE is ultimately responsible for all future land use issues and site stewardship at the remaining portions of the site. A lump sum of \$71,000 has been designated for surveillance and maintenance activities for 1997-1999.

**Soil:** In 1995, 2800 ft<sup>2</sup> of radiological and chemical wastes were removed from the unlined pits at the former chemical waste disposal site, which was 7,440 m<sup>2</sup> in size, and disposed of offsite at a commercial facility. Cleanup levels were set at 100 times MCLs and the area was backfilled with clean soil. All newly generated waste at the Ames Laboratory is now treated and disposed of offsite. DOE has provided funding to ISU to conduct soil sampling and analyses at the Chemical Disposal Site. Sampling will be conducted quarterly for the first year and annually the following four years.

**Water:** Contaminants of concern in the water include radionuclides and chemicals. Groundwater will undergo monitoring in accordance with the Supplemental Sampling and Monitoring Plan. Per the plan agreed to by DOE, ISU, and Iowa regulators, ISU will conduct groundwater sampling at the chemical disposal site. Sampling will be conducted quarterly for the first year and annually the following four years.

**Facilities:** Facilities onsite will be used to support the ongoing mission of the laboratory. DOE will be responsible for any decontamination, if necessary, when the facilities are no longer in use.

# Kentucky



### Maxey Flats Disposal Site

The Maxey Flats low-level waste disposal site is located approximately 14 kilometers (9 miles) northwest of Morehead, Kentucky; 104 kilometers (65 miles) northeast of Lexington, Kentucky; and 320 kilometers (200 miles) southeast of Cincinnati, Ohio. The Commonwealth of Kentucky owns the 113-hectare (280-acre) site.

The site will remain a permanent LLW disposal site under controlled access. As a potentially responsible party, DOE is responsible for approximately forty percent of the remediation costs. This responsibility will cease when the interim cap is in place and the initial closure construction support activities are complete. DOE assumes that these activities will be complete by 2002 and that the agency will have no stewardship responsibility for this site. The Commonwealth of Kentucky is responsible for stewardship of the site and for long-term surveillance, maintenance, and monitoring of stabilized waste.

**Soil:** In accordance with the CERCLA ROD, cleanup levels will be achieved through natural stabilization. Stabilized LLW will remain in the subsurface. An interim cap will cover approximately 50 acres of the site. Erosion and runoff controls will be improved. A final cap will be placed over the site 100 years after disposal trenches have subsided and waste has had sufficient time to stabilize. CERCLA 5-year reviews, cap maintenance, and inspections will be required.

**Water:** Primary contaminants of concern are benzene, TCE, toluene, arsenic, lead, and radioactive materials. Surface water control systems will be installed to limit infiltration and to control surface water runoff. Water monitoring equipment, as part of an Infiltration Monitoring System, will be installed in trenches, under the cap, and within wells, to detect potential accumulation of leachate in trenches. Radionuclide and chemical constituent testing of groundwater and surface water will be performed, as appropriate, on a routine basis.

**Facilities:** Stabilized waste may remain in above-ground vaults.

**Engineered Units:** All site structures will be demolished and the site will be regraded.

### **Paducah Gaseous Diffusion Plant**

The Paducah Gaseous Diffusion Plant site encompasses 304 hectares (750 acres) inside a 1,385-hectare (3,422-acre) reservation owned by DOE. The site is located approximately 8 kilometers (5 miles) west of the City of Paducah, Kentucky.

DOE expects that surface remediation will be complete by 2010. Groundwater remediation will continue beyond 2070 due to the long-term persistence of DNAPL (TCE) sources. Future land use will be a combination of controlled access, mixed industrial, open space, and recreational. DOE will remediate each area of the site to cleanup levels appropriate for the anticipated future use. In accordance with the lease agreement between DOE and the U.S. Enrichment Corporation (USEC), USEC will continue to use production facilities to produce enriched uranium. DOE expects that USEC, or a successor organization, will continue enriched uranium production at the site through 2070. Other DOE facilities may be re-industrialized. The industrialized portion of the site is bordered by a security fence. The Kentucky Department of Fish and Wildlife will continue to use areas outside of this fence as part of the West Kentucky Wildlife Management Area (WKWMA) unless the site redesignates the future use of this area. The remainder of the site will serve as a buffer zone around the industrialized area.

DOE currently assumes that the Federal Government will maintain stewardship responsibilities in perpetuity. Decisions on the appropriate remedial action for different areas of the site have not yet been finalized. Warning signs, fences, and deed restrictions will prevent access to residual contamination and capped areas in the industrial area. LTS&M will ensure that remedial actions were effective. Specific stewardship requirements/duration will be determined when remediation is complete. DOE expects that stewardship activities will be required beyond 2070. LTS&M costs for 1998 are estimated at \$6 million to \$7 million per year; however, costs are expected to increase over time as additional remedial actions are maintained.

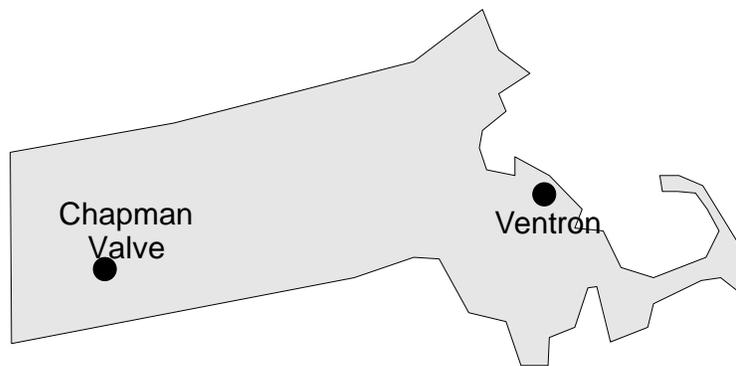
**Soil:** Contaminants of concern in soils at Paducah include TCE, radionuclides, and PCBs. Radionuclides in soils will be remediated to 15-25 mrems. Burial grounds will be closed with radiological contamination remaining in place and covered with a multi-layer cap. Closed burial grounds could require DOE monitoring for hundreds of years. DOE will remediate areas within the security fence and the buffer zone to industrial cleanup levels and areas outside of the fence to recreational levels. At the DOE property boundary, remediation will achieve cleanup levels protective of residential receptors. DOE will monitor conditions at all release sites to ensure regulatory compliance. CERCLA 5-year reviews will be required following remediation in areas where contamination or waste is left in place. Restrictions prohibiting intrusive activities and residential development will control future use of these areas.

**Water:** Surface water and sediments in the industrial zone and the WKWMA are contaminated with PCBs and radionuclides. PCB-contaminated surface waters and sediments will be cleaned-up to 25 ppm in industrial areas and 10 ppm in areas outside of DOE property. DNAPLs caused by TCE and technetium-99 contamination will be a long-term source of groundwater contamination. The response action for this contamination will likely include containment of source areas, mass removal of high-concentration areas, and natural attenuation of the dissolved-phase plume. Two onsite groundwater pump and treat systems will continue to remediate other onsite contamination. TCE and technetium contamination has also been detected in offsite groundwater. DOE is currently containing the high-concentration portions of the offsite plumes and monitoring for potential releases from onsite sources to offsite groundwater. The final remediation strategy for this contamination has not been selected. Offsite groundwater will be remediated to residential cleanup levels. Surface waters will be monitored and warning signs, fences, and deed restrictions will prevent improper use of surface water. Onsite groundwater pumping, treatment, and monitoring will continue. Deed restrictions will prevent improper use of onsite, contaminated groundwater. An offsite network of wells will monitor the migration of offsite plumes and groundwater discharges to surface water. Kentucky requires a 30 year post-closure groundwater monitoring and care period; however, due to the presence of DNAPLs, monitoring will be required for a longer period. DOE will continue to provide an alternate water supply to affected residents as long as offsite DNAPL concentrations in groundwater are above MCLs.

**Engineered Units:** Several landfills in the industrial area will be capped. LLW, TRU, and PCB waste in these disposal units will be left in place. A 60-acre solid waste landfill will be constructed and approximately 121 acres of hazardous and LLW landfills will remain onsite. Under RCRA, landfills will require LTS&M for at least 30 years. CERCLA 5-year reviews will be required. Warning signs, fences, and deed restrictions will remain in place in areas occupied by landfills.

**Facilities:** Facilities are contaminated with radionuclides, PCBs, VOCs, and metals. Selected facilities will be decontaminated, if necessary, and used for ongoing enrichment operations. Deed restrictions or use limitations may be placed on areas with residual contamination. The gaseous diffusion plant will undergo D&D after the plant closes. This cleanup is beyond the scope of current DOE planning. To date, USEC has only transferred two buildings to DOE for final D&D. DOE assumes that buildings that are unsuitable for reuse or pose an unacceptable risk will be placed under LTS&M pending final D&D. All DOE facilities awaiting final D&D will require LTS&M.

# Massachusetts



### Chapman Valve

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1995, and no stewardship activities are currently anticipated.

### Ventron

The Ventron site is a 3-acre, privately-owned site located on Congress Street in Beverly, Massachusetts, at the confluence of the Bass and Danvers Rivers, approximately 15 miles northeast of Boston. The site adjoins a residential area to the north and the Boston and Maine Railroad to the east. From 1942 to 1947, the owner conducted uranium processing activities for the Manhattan Engineer District. Buildings and other manmade structures cover about two-thirds of the site. Cleanup was completed in August 1997 to levels allowing for unrestricted future use. This site was cleaned up as part of the Formerly Utilized Site Remedial Action Program (FUSRAP).

**Soil:** Primary contaminants of concern include uranium-238, radium-226, and thorium-230. In 1997, DOE completed removal and offsite disposal of approximately 9,500 cubic yards of radioactive waste.

**Facilities:** All facilities were decontaminated and released to Morton International. Buildings have been demolished by Morton.

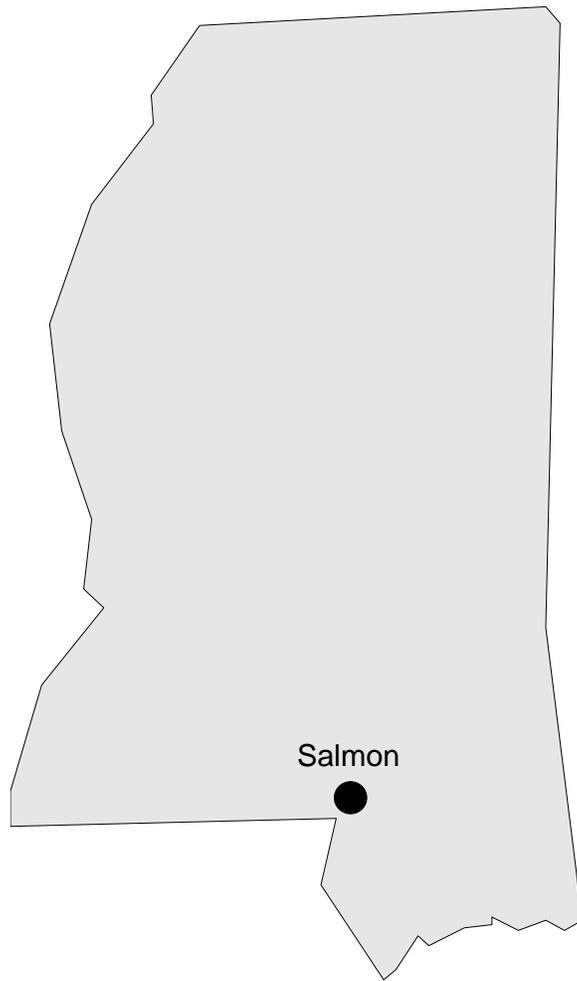
# Michigan



**General Motors**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1995, and no stewardship activities are currently anticipated.

# Mississippi



## Salmon Test Site

The Salmon Site is administered by the Nevada Operations Office. The Salmon Site is located 34 kilometers (21 miles) southwest of Hattiesburg, Mississippi, and was used for the Salmon and Sterling tests, as well as for nonnuclear gas detonations in the Miracle Play program. Following testing, there was a cleanup operation in 1972 that included soil excavation and recovery and decommissioning of the facilities. After the Salmon test in 1964, radioactively contaminated water was injected into the Cook Mountain Limestone at the site for disposal. In addition, radioactively contaminated soil and water were injected into the shot cavity for disposal during site cleanup in 1972. This should not impact the site because the emplacement wells, drill back wells, and injection wells were all sealed with concrete and bentonite with then site was decommissioned.

DOE expects to complete remediation and transfer of the site to the state of Mississippi for use as a wilderness area in 1999. The surface of the site will be remediated to levels that allow for an NRC designation of "no radiological restrictions." The anticipated future use for the surface is recreational; however, access to the subsurface soil and groundwater will be restricted in perpetuity. DOE is conducting characterization and remediation under RCRA in accordance with agreements currently being negotiated with the state. The future owner of the site is currently being determined through legislation. DOE will not maintain an active presence at this site but will be responsible for maintaining institutional controls in perpetuity for all sub-surface soil in proximity to the test shot cavity and any contaminated groundwater. USEPA will be responsible for monitoring these areas. Monitoring is currently planned for 100 years; however, DOE assumes that monitoring will be conducted in perpetuity. DOE also assumes that long-term S&M activities will be conducted annually.

**Soil:** The site will excavate contaminated surface soil or contain contamination in place. Surface areas will be remediated to levels that allow for reuse with no NRC radiological restrictions; however, contamination will remain in sub-surface areas around the shot cavities. Remediation technologies capable of effectively removing or stabilizing this contamination do not currently exist. Institutional controls, including drilling restrictions, will be maintained to prevent access to this sub-surface contamination. DOE has not yet determined if short-term monitoring of surface areas will be necessary. USEPA will monitor sub-surface areas annually for at least 100 years. Institutional controls will remain in place in perpetuity to prevent intrusion into contaminated sub-surface areas.

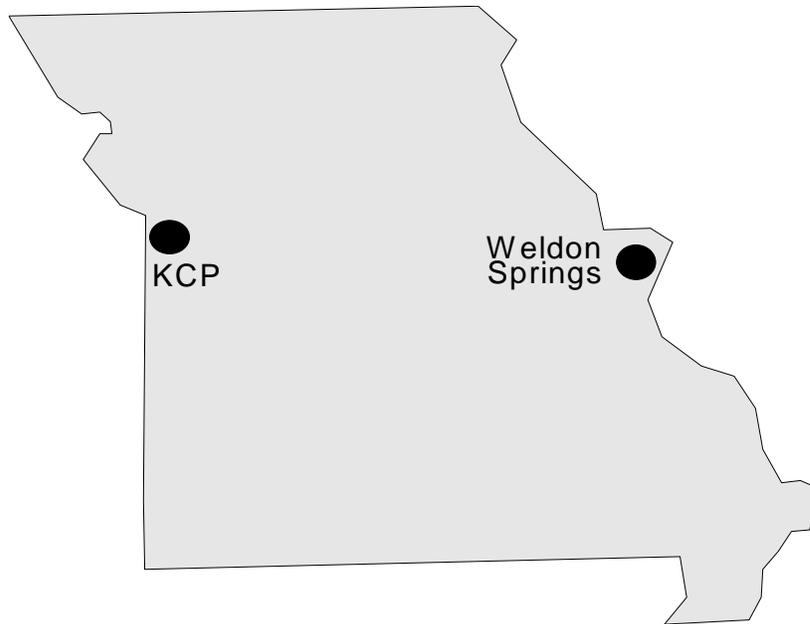
**Water:** Groundwater contamination associated with the test shot cavities will not be remediated because technologies capable of safely and effectively remediating this contamination do not currently exist. Tritium, the most mobile of the radioactive constituents in groundwater, is

*From Cleanup to Stewardship*

considered the primary contaminant of concern. Institutional controls will be maintained to prevent access to or use of this contaminated groundwater. USEPA will monitor contaminated groundwater annually for at least 100 years. DOE assumes that groundwater monitoring wells will need to be refurbished or replaced approximately every 25 years. Access to and use of contaminated groundwater will remain restricted in perpetuity.

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# Missouri



## Kansas City Plant

The Kansas City Plant is part of the Bannister Federal Complex, a 120-hectare (300-acre) site 19.2 kilometers (12 miles) south of downtown Kansas City, Missouri. The Department of Energy occupies 56.4 hectares (141 acres) of this reservation. The complex is zoned by local government for heavy industry. The surrounding area consists of single- and multiple-family residences, commercial establishments, industrial districts, and public-use lands.

The site expects to complete surface remediation in 1999. DP has an ongoing mission and will use facilities and land for office space, warehousing, and light manufacturing. DOE assumes that this land use will continue indefinitely regardless of ownership or occupancy. DOE and EPA have not yet agreed upon soil or groundwater cleanup levels, though groundwater treatment will continue as long as necessary to achieve cleanup levels. Because contamination remains in place, DOE must conduct long-term surveillance and monitoring. It is unknown at this time which DOE program will be responsible for institutional controls, groundwater remediation, and monitoring.

**Soil:** DOE will contain or remove sub-surface VOC and PCB soil contamination in accordance with agreed upon cleanup standards. PCBs will be cleaned up to 10,000 ppm. There is no radiological contamination in the soil. DOE expects that institutional controls will be the selected remedy in areas where soil contamination poses a minimal risk. No capping of contaminated soil areas is planned as the majority of contamination is located underneath the facility. DOE will conduct routine sampling and maintain institutional and procedural controls, including excavation restrictions, to protect workers from inadvertent exposure in areas where residual contamination is present.

**Water:** DOE will extract and treat groundwater contaminated with TCE; 1,2 DCE; and vinyl chloride prior to discharge to the sanitary sewer system. DOE will also install an iron trench system that will passively treat groundwater. DOE will continue groundwater treatment and monitoring until MCLs are not exceeded for three consecutive years or an alternative remedy is approved by regulators. Due to the presence of DNAPLs, the site expects that hundreds of years (400-1200) of groundwater monitoring, and possibly treatment, at the present remediation rate may be necessary to restore the alluvial aquifer. Monitoring wells and groundwater treatment equipment will require surveillance and maintenance throughout this treatment period. There is currently no designated use for the contaminated aquifer and none is predicted as city uses surface water sources for their drinking supply.

**Facilities:** No facilities are currently slated for D&D.

### **Weldon Spring Site Remedial Action Project**

The Weldon Spring Site Remedial Action Project is located approximately 48 kilometers (30 miles) west of St. Louis, Missouri. The site consists of two geographically distinct areas, the 88 hectare (217 acre) Weldon Spring Chemical Plant and the 3.6 hectare (9 acre) Weldon Spring Quarry, which is located about 6.4 kilometers (4 miles) south-southwest of the chemical plant area. Signed Records of Decision (ROD) have been obtained for the surface areas, and a completed ROD for the groundwater is expected in 1999. The site expects to complete remediation in 2002.

A 42-acre disposal cell will remain onsite at the chemical plant area. The Grand Junction Office (GJO) will assume stewardship responsibility for the site with the transition period complete in 2002. The acres not occupied by the disposal facility or required for stewardship responsibilities will be released as appropriate given future land use restrictions. It is expected that a residential-type scenario would apply to future land use for released areas of the chemical plant site. Following completion of chemical plant cleanup activities, an assessment of the residual risks based on actual site conditions will be performed to determine the need for any restrictions. The quarry will be released to the appropriate agency for recreational use. The federal government is obligated to carry out its stewardship responsibility in perpetuity. GJO expects that stewardship activities will cost \$27.9 million from 2003 to 2035. No costs were provided after 2035.

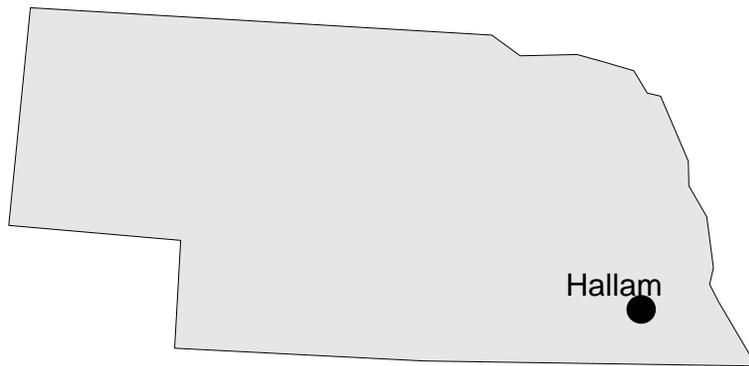
**Soil:** Contaminants of concern at the chemical plant area include uranium, radium, thorium, arsenic, chromium, lead, thallium, PAHs, PCBs, and TNT. Contaminated soils associated with both the Chemical Plant and Quarry Bulk Waste OU are being excavated and disposed of in the onsite disposal facility. Target cleanup levels for the chemical plant area are 120 pCi/g for uranium, 6.2 pCi/g for surface radium and thorium, and 16.2 pCi/g for subsurface radium and thorium. Residual contamination remaining in this area will be managed consistent with a stewardship plan currently under development, however, success in meeting cleanup levels should minimize institutional controls and land use restrictions. The quarry will be drained, restored, and released for recreational use.

**Water:** Groundwater at the chemical plant site is contaminated with radionuclides, nitrates, TCE, and DNT. DOE is expecting to obtain approval in 1999 on a limited-action ROD for groundwater at the chemical plant. There is no current use of the aquifer in this area. Groundwater at the quarry is contaminated with uranium and nitroaromatics. A pilot-scale interceptor trench will be installed and operated to evaluate the need for and effectiveness of groundwater remediation at the quarry area. Routine groundwater monitoring will take place at the chemical plant site, the quarry, and the disposal cell.

**Engineered Units:** A 42-acre, engineered disposal facility is being built in the chemical plant area. This disposal facility contains building debris, stabilized sludge, radiologically contaminated soil, asbestos materials, and small amounts of low level PCB and lead contaminated soils. The disposal cell will have synthetic and clay liners and be capped with a rock cover. Fences will control access to the leachate sump only. Long-term stewardship will be required for the disposal cell, but specific activities have not yet been determined.

**Facilitites:** The 44 buildings that originally comprised the chemical plant have been dismantled and their associated foundations have been removed. Building debris has been disposed of in the onsite disposal facility. Most currently utilized structures at the chemical plant area, such as the Site Water Treatment Plant, will be demolished and placed in the cell prior to closure. Several structures may remain long term and a small leachate treatment facility may occupy the site during the initial stewardship period.

# Nebraska



### **Hallam Nuclear Power Facility**

The Hallam Nuclear Power Facility is located on a small portion of the 260-hectare (640-acre) site of the Sheldon Power Station in Lancaster County, Nebraska, approximately 30 kilometers (19 miles) south of Lincoln, Nebraska and is located on land owned by the Nebraska Public Power District (NPPD). The facility was a sodium cooled graphite moderated nuclear reactor. It was built and operated by the US Atomic Energy Commission between 1962 and 1964. The reactor was decommissioned and dismantled in 1969. There is no known soil or groundwater contamination at the site and no evidence of contamination being released from the facility. Investigations indicate that no further remediation will be necessary. There are no current or planned activities related to assessment, remedial action, stabilization, or additional decommissioning.

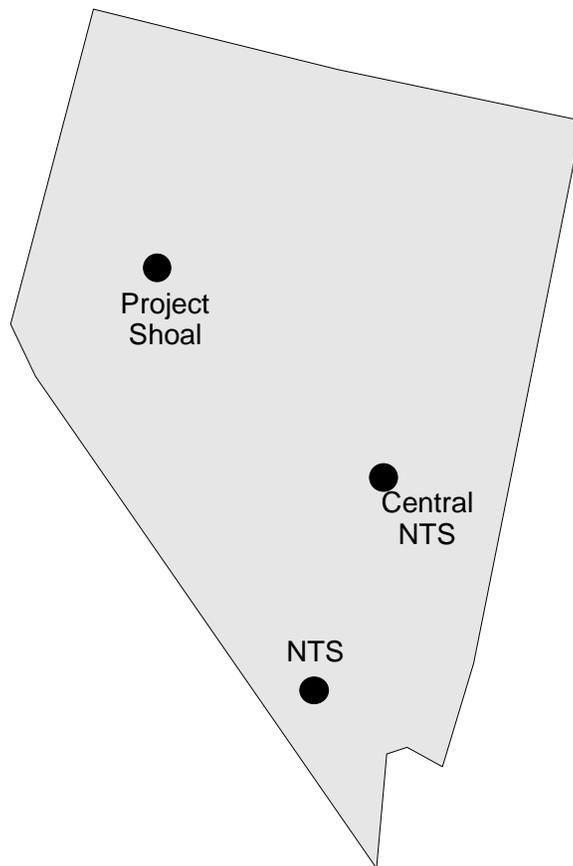
Stewardship responsibility was transferred to the Grand Junction Office in 1998. The facility will remain under controlled access due to known contaminated buried materials. The former reactor site is now a seemingly empty field with 19 monitoring wells. The Grand Junction Office has estimated annual surveillance and maintenance costs at \$14,000 in perpetuity.

**Soil:** There is no known soil contamination at the site.

**Water:** There is no known groundwater contamination at the site. The installation of a shallow groundwater monitoring system was completed in 1995 and is part of the surveillance program for the entombed reactor. Groundwater monitoring is conducted annually. Water level measurements are obtained from all 19 DOE wells. Samples for analysis are obtained from 17 of the DOE wells. The samples are analyzed for gross alpha, gross beta, tritium, gamma spectrometry, and nickel-63. The annual monitoring and surveillance report discusses the results of the groundwater monitoring and summarizes the physical condition of the site. This report also discusses the need for follow-up inspections, monitoring, or maintenance actions, should any be necessary.

**Facilities:** The reactor is entombed onsite. Access to the property is restricted as entry can only be made through the property of a currently used power plant adjacent to the site. At the time the Hallam Nuclear Power Facility's reactor was decommissioned and dismantled, the core and most of the radioactive materials were removed from the site. Multiple radioactive constituents were present within the entombment area when this structure was closed. Potential contaminants remaining within the entombed structure include: nickel, cobalt, iron, manganese, samarium, cesium, strontium, and tritium. DOE does not conduct any active monitoring of the entombed structure.

# Nevada



## **Central Nevada Test Site**

The central Nevada Test Site (CNTS) is located in south central Nevada, 105 kilometers (65 miles) northeast of the City of Tonopah.

Surface characterization of the CNTS has been completed. No surface radiological contamination was found. Conditions will allow for future surface use at the site with a NRC designation of “no radiological restrictions”. The anticipated future use for the surface is open range and recreational; however, access to the subsurface soil and groundwater will be restricted in perpetuity. DOE is conducting characterization and remediation in accordance with the NTS Federal Facility Agreement and Consent Order. DOE will not maintain an active presence at this site, but will be responsible for maintaining institutional controls for all sub-surface soil in proximity to the test shot cavity and any contaminated groundwater. Monitoring is currently planned for 100 years; however, DOE assumes that monitoring will be conducted in perpetuity. DOE assumes that LTS&M activities will be conducted annually.

**Soil:** Surface soil contamination consists of total petroleum hydrocarbon contamination from mud pits which will be remediated or closed in place. Contamination will remain in sub-surface areas around the shot cavities since corrective action technologies capable of effectively removing or stabilizing this contamination do not currently exist. Institutional controls, including drilling restrictions, will be maintained to prevent access to this sub-surface contamination.

**Water:** Tritium, the most mobile of the radioactive constituents in the groundwater, is considered the primary contaminant of concern. Subsurface contaminants in and around the test shot cavities will not be remediated as technologies capable of safely and effectively remediating this contamination do not currently exist. Based on modeling and monitoring results, subsurface drilling restrictions and institutional controls implemented for known areas of contamination may need to be extended to ensure no intrusion into potentially contaminated groundwater. Institutional controls will be maintained to prevent access to or use of contaminated groundwater. Upon establishing a monitoring network, program, and schedule acceptable to DOE, the State of Nevada, and other stakeholders, LTS&M of the CNTS is planned for 100 years.

### **Nevada Test Site (including Tonopah Test Range)**

The Nevada Test Site (NTS) is located approximately 104 kilometers (65 miles) northwest of Las Vegas, Nevada in a sparsely populated region about the size of the State of Rhode Island. The Tonopah Test Range is approximately 240 kilometers (150 miles) northwest of Las Vegas. The site encompasses 3,510 kilometers (1,350 square miles) of desert and mountainous terrain, and is surrounded on three sides by the Nellis Air Force Range, which provides a substantial buffer between the site and public lands.

Dates for modeling and site completion will appear in the 1999 revision of *Paths to Closure*. The federal government will own the land in perpetuity. Future land use decisions for the NTS will be compatible with the Resource Management Plan. Decisions involving resources management, future land use, and private development will be completed in partnership with the interests of the DOE, national laboratories, the U.S. Air Force, the Bureau of Land Management, Tribal Governments, state and local agencies, and stakeholders. Most of the site will be used to support ongoing Defense Program operations and will remain under controlled access. However, some areas in the southwestern portion of the site may be used for economic redevelopment. The site will remediate offsite surface contamination and release these areas for alternate use with sub-surface use restrictions. Sub-surface contamination will remain in place in both on and offsite areas where underground testing was conducted. These areas will be monitored and institutional controls will be maintained by DOE to prohibit access to soil and groundwater contamination in these areas. Institutional control will continue in perpetuity due to the nature and extent of remaining contamination and the potential future need for nuclear testing.

Underground test shots contaminated subsurface soils and groundwater. These areas have been grouped into six corrective action units. The DOE/NV Resource Management Plan was completed in 1998. DOE/NV will negotiate final cleanup levels with state regulators based on future land use decisions. After the first two to three years of monitoring, DOE will transfer this responsibility to EPA. It is unknown at this time which DOE program will be responsible for all other post-remediation S&M. Necessary stewardship activities, particularly those for surface soil, will be more fully defined as cleanup standards are established and corrective actions are completed. Total LTS&M costs are estimated to be \$310.5 million through 2070, or roughly \$4.92 million per year (these estimates are currently being revised to support the 1999 *Paths to Closure*).

**Soil:** Contaminants of concern include americium, plutonium, depleted uranium, and other types of transuranic actinides and fission products. During underground testing, the total amount of contamination released exceeded 200 million curies. The DOE/NV is negotiating a Corrective Action Level with the regulators. Clean-up levels are anticipated to be approximately 200 to

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2000 picocuries. Corrective action of NTS's soils sites will be conducted in areas designated for alternative future uses. Control of the surface areas will be returned to the appropriate agency once the corrective actions are complete. The underground test shot activities will be closed and placed under LTS&M. In areas with subsurface contamination, institutional controls, including restrictions and monitoring will be implemented. Filled disposal pits and trenches will also be closed and capped to the extent possible. Soil remediation will be complete when corrective actions of surface soils to established cleanup levels are completed, disposal of all associated soils and wastes has occurred, and landuse restrictions around residual contaminant boundaries are determined. Plans are currently being developed for a monitoring network, program, and schedule acceptable to DOE, the State of Nevada, and stakeholders; but monitoring is expected to last in perpetuity.

**Water:** Radionuclides are the primary contaminants of concern in groundwater with tritium as the indicator of contaminant mobility. During underground testing, the total amount of contamination released into the groundwater and saturated geologic media exceeded 200 million curies. Natural attenuation is the primary remediation strategy for contaminated groundwater. Restrictions will remain in place to prevent access to and use of contaminated groundwater. The site will monitor groundwater for at least 100 years in areas where significant potential for migration of contaminants exists.

**Engineered Units:** NTS is a major LLW disposal facility for other DOE and a few DoD installations. Two principal active waste management sites are located on the NTS. The Area 3 and Area 5 Radioactive Waste Management Sites (RWMS) are located 23 and 12 miles respectively, north of Mercury, Nevada. Combined the Area 3 and Area 5 RWMSs occupy 852 acres of the NTS, although less than 15% of their capacity is currently used. The sites are currently used for disposal of onsite- and offsite-generated-low-level waste and low-level mixed waste from Nevada, as well as for storage of transuranic waste. Buried waste in Area 3 and Area 5 RWMS measure 1250 curies and 9.8 million curies, respectively. In the Area 3 RWMS, adjacent subsidence craters created from underground nuclear weapons tests, which were conducted at depths well above the groundwater table, are used as waste disposal cells. The subsidence craters have been modified for shallow landfill disposal to accommodate waste disposal activities. Disposal areas will be monitored and routine maintenance conducted to control erosion and maintain flood control capabilities in these areas.

**Facilities:** Defense Programs will continue to use the majority of site facilities (1,500) to support its ongoing mission. Only seven facilities are currently slated for decontamination and decommissioning under the current NV Environmental Management program. The site will monitor stored radioactive materials and residual contamination until facilities undergo final demolition and onsite disposal.

### Project Shoal Test Area

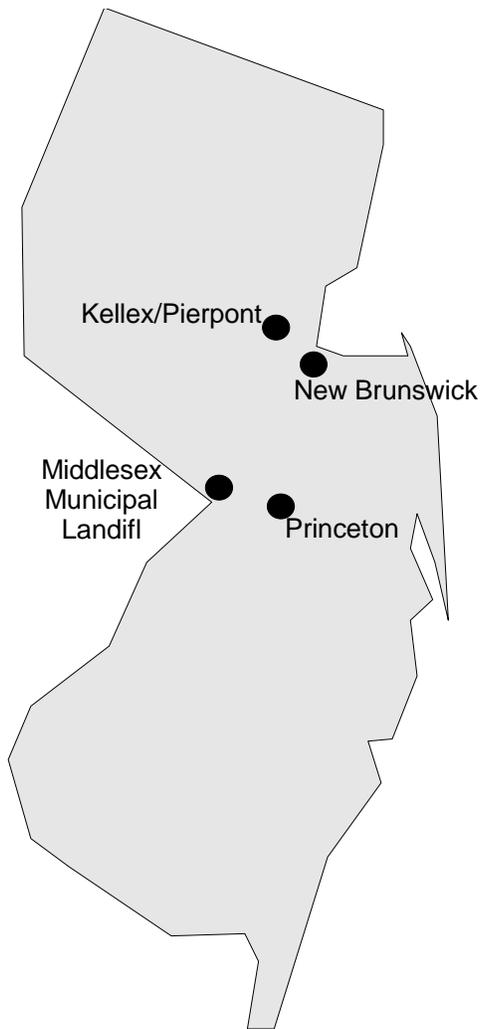
Project Shoal is located approximately 48 kilometers (30 miles) southeast of Fallon, Nevada. In October 1963, a test was conducted to determine the effects of nuclear detonations in granite rock formations. DOE is conducting characterization and remediation in accordance with the site's Federal Facility Agreement and Consent Order. DOE will not maintain an active presence at this site but will be responsible for maintaining institutional controls in perpetuity for all sub-surface soil in proximity to the test shot cavity and any contaminated groundwater.

**Soil:** Corrective actions on surface soils have been completed. No surface radiological contamination was found and conditions at the site allow for reuse with no NRC radiological restrictions. Contamination will remain in sub-surface areas around the shot cavities due to the lack of remediation technologies capable of safely and effectively removing or stabilizing this contamination. Institutional controls, including drilling restrictions, will be maintained to prevent access to sub-surface contamination. It is anticipated that surface areas will be released for use without restriction and/or relinquished to the Bureau of Land Management (BLM) or Navy in upon completion of corrective actions. Institutional controls will remain in place in perpetuity to prevent intrusion into contaminated sub-surface areas.

**Water:** Tritium, the most mobile of the radioactive constituents in the groundwater, is considered the primary contaminant of concern. Groundwater contamination associated with the test shot cavities will not be remediated because technologies capable of effectively remediating this contamination do not currently exist. Access to and use of contaminated groundwater will remain restricted in perpetuity. Monitoring is currently planned for 100 years; however, DOE assumes that monitoring will be conducted in perpetuity. Long-term S&M activities will be conducted annually.

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# New Jersey



### **Kellex/Pierpont**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1982, and no stewardship activities are currently anticipated.

### **Middlesex Municipal Landfill**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1987, and no stewardship activities are currently anticipated.

### **New Brunswick Site**

The New Brunswick Site is a 2.3 hectare (5.6 acre) property in New Brunswick, New Jersey, that is owned by the Department of Energy. Located in an industrialized area less than 3.2 kilometers (2 miles) from downtown New Brunswick, the site is bordered by Jersey Avenue on the north, an Amtrak railway on the south, and industrial development on the east and west. This site once housed a nuclear laboratory for studying nuclear materials. The New Brunswick Site was cleaned up for unrestricted use in 1997. This site was cleaned up as part of the Formerly Utilized Site Remedial Action Program (FUSRAP).

**Soil:** Contaminated soils above radioactive material cleanup guidelines were excavated and shipped offsite. The area was backfilled and re-seeded with ground cover.

### **Princeton Plasma Physics Laboratory**

The Princeton Plasma Physics Laboratory (PPPL) is located on 88.5 acres of property leased from Princeton University on Site C and Site D of the James Forrestal Campus, in Plainsboro Township, Middlesex County, New Jersey.

DOE will complete remediation in 1999 and transfer all areas of the site to the Office of Science in 2000. The Office of Science will serve as the landlord for DOE's continuing mission at the site. Cleanup levels are based on DOE's assumption that current industrial land use will continue. If the mission of the laboratory changes, additional remediation may be necessary. EM has funded remediation through 2000. It is unknown at this time which DOE program will be responsible for stewardship, operation of the groundwater treatment system, and all future land use issues.

**Soil:** The site addressed contaminated soils and sediments in accordance with New Jersey state cleanup standards equivalent to an industrial reuse scenario. Contaminated soils were excavated, treated, and disposed of offsite. It is assumed that there will be no residual soil contamination

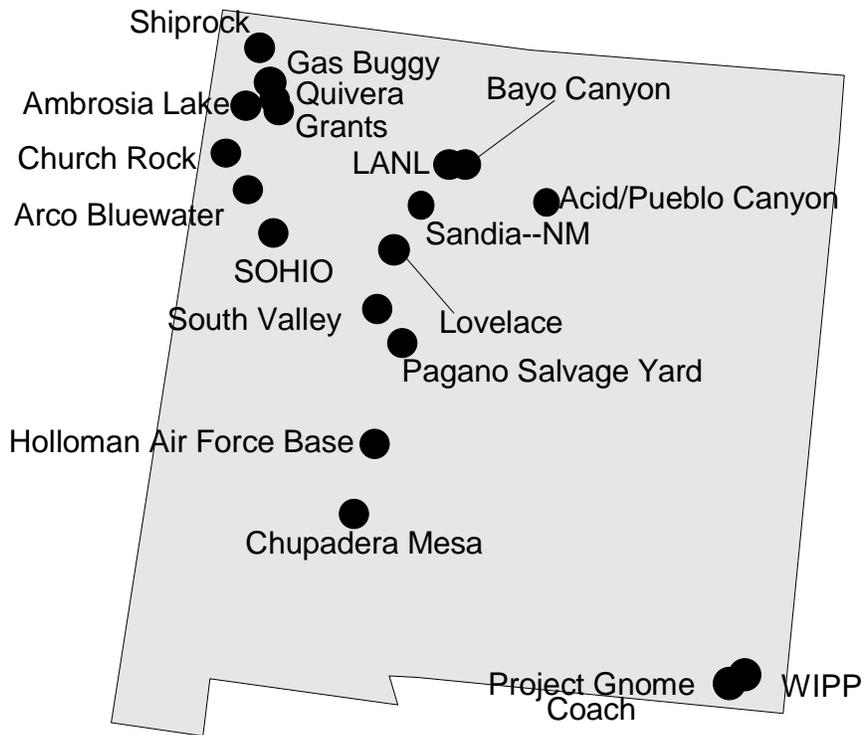
below industrial levels. No LTS&M for soil is expected as long as the site use remains industrial.

**Water:** Leaks from underground storage tanks have resulted in petroleum-related contamination in groundwater. The DOE remediation strategy for VOCs and petroleum is hydraulic control of migration with existing dewatering pumps, monitoring, and natural attenuation. The remedial investigation and the ROD will be submitted to New Jersey regulators at the end of 1998. DOE assumes that because regional groundwater contamination is not clearly attributable to PPPL, active remediation will not be necessary in this area. DOE anticipates monitoring groundwater in support of the aquifer Classification Exception Area (CEA) designation applied in areas where New Jersey groundwater quality standards are not met. EM has funded LTS&M activities through 2000. Activities will continue after that date but it is unclear at this time which DOE organization will be responsible for LTS&M.

**Facilities:** There are no current or planned facility stabilization projects at this site.

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# New Mexico



### **Acid/Pueblo Canyons**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1984, and no stewardship activities are currently anticipated.

### **Ambrosia Lake**

The former Ambrosia Lake mill and tailings site is located in McKinley County in northwest New Mexico approximately 40 kilometers (25 miles) north of Grants and 137 kilometers (85 miles) northwest of Albuquerque. The tailings covered approximately 42 hectares (105 acres). Wind and water erosion spread some of the tailings across a 231-hectare (570-acre) area. Ambrosia Lake completed remedial action in 1995 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Approximately 3 million cubic meters of contaminated material were consolidated in a 35-hectare (88-acre) on-site disposal cell. Under the provisions of UMTRCA, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Ambrosia Lake. LTS&M costs at the Ambrosia Lake site are \$5,000 per year in perpetuity. LTS&M activities at Ambrosia Lake include annual inspections and minor maintenance such as fence repairs and sign replacement.

**Soil:** Soil was remediated to EPA standards.

**Water:** Approximately 320 million gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs at least twice since 1990: molybdenum, nitrate, selenium, radium, and uranium. However, the site is located in a sparsely populated area and groundwater is not suited for drinking water due to its poor yield and quality. Therefore, no groundwater remediation or monitoring will be required. Groundwater cleanup will rely solely on natural attenuation.

**Engineered Units:** Roughly 2,874,000 m<sup>3</sup> of contaminated materials were stabilized on site in an 88-acre disposal cell. The disposal cell has a radon barrier cover and rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. LTS&M activities for the disposal cell include annual surface inspections only. No significant repairs are anticipated.

### Arco, Bluewater

The ARCO Bluewater site is a 1,335 hectare (3,300 acre) site located about 14 kilometers (9 miles) northwest of Grants, New Mexico. The site is fenced in an effort to control livestock grazing and to discourage unauthorized entry. Although several utility rights-of-way exist across the site property, they do not interfere with the long-term stewardship responsibilities at the site.

Uranium mill tailings and contaminated structural materials resulting from the demolition and decommissioning of the mill buildings are encapsulated in several disposal areas at the Bluewater site. The disposal cells were closed in December 1995. The site is an UMTRCA Title II site and was transferred by the NRC to DOE's Grand Junction Office (GJO) on September 25, 1997, for long-term stewardship responsibilities. ARCO made a one-time payment of \$635,165 to the U.S. Treasury on September 24, 1997, as required under UMTRCA, to cover the costs associated with long-term stewardship of the site by DOE. Stewardship costs of the surface features (e.g., engineered units) of the Bluewater site are estimated at \$7,000 per year in perpetuity. Costs associated with groundwater monitoring vary: \$4,000 per year from 1998-2003, and once every three years from 2006-2018. Estimated costs for the remaining years are \$2,000 annually in perpetuity.

**Water:** Groundwater at the site is contaminated with uranium, molybdenum, selenium, and possibly PCBs. The Bluewater site has NRC-approved groundwater limits for uranium, molybdenum, and selenium. Beginning in 1998, GJO will conduct monitoring of six different wells for these contaminants annually for six years, then once every three years in perpetuity. As specified in the site's EPA-issued TSCA permit, annual monitoring for PCBs will occur for 20 years at four wells.

**Engineered Units:** Engineered units at the site contain hazardous and low-level radioactive wastes. The 129-hectare (320-acre) main tailings pile is contaminated with approximately 23 million tons of tailings containing 11,200 curies of radium-226. The 26-hectare (65-acre) carbonate tailings pile is contaminated with approximately 1.3 million tons of tailings containing 1,130 curies of radium-226. The site also includes a former ore stockpile area, two landfills, an asbestos disposal area, an area identified as Disposal Area Number 1, and a TSCA-permitted PCB-byproduct material disposal cell. If any corrective action becomes necessary as a result of the PCB disposal at the Bluewater site, ARCO will be responsible for all costs associated with such an action. LTS&M activities include annual site inspections and minor maintenance, such as fence repairs, sign replacements, and cap maintenance, as necessary.

### Bayo Canyon

This site was part of the Formerly Utilized Site Remedial Action Program (FUSRAP). Cleanup was completed in 1982.

**Soil:** Strontium-90 was left in place in subsurface soil. In-ground markers prohibit digging at the site until 2142 AD.

### **Chupadera Mesa**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1984, and no stewardship activities are currently anticipated.

### **Holloman Air Force Base**

Holloman Air Force Base in New Mexico completed remediation in 1995. The site is not expected to require any stewardship.

### **Homestake, Grants**

The Homestake site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Grants, New Mexico. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2015, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 22,300,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with rock. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

## Los Alamos National Laboratory

Los Alamos National Laboratory and the neighboring residential areas of Los Alamos and White Rock are located predominantly in Los Alamos County, north-central New Mexico, approximately 96 kilometers (60 miles) north-northeast of Albuquerque and 40 kilometers (25 miles) northwest of Santa Fe. The 111.8-square kilometer (43- acres) Laboratory and adjacent communities are situated on the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons containing ephemeral and intermittent streams that run from west to east. Mesa tops range in elevation from approximately 2,379 meters (7,800 feet) on the flank of the Jemez Mountains to approximately 1,891 meters (6,200 feet) at their eastern termination above the Rio Grande. The eastern margin of the plateau stands 91.5 to 274.5 meters (300 to 900 feet) above the Rio Grande. The Department of Energy (DOE) controls the area within the Laboratory's boundaries and has the option of completely restricting access.

DOE will complete RCRA corrective actions, facility decommissioning, and RCRA closures by 2008. The site expects to continue its current missions and complete remediation to cleanup levels suitable for industrial/commercial use. The site will maintain most of its 43-square mile property but is considering transferring up to 4,650 acres to the county and San Idelfonso Pueblo. Land that is released will be remediated to cleanup levels consistent with future land use. EM has funded environmental restoration activities through 2008. It is unknown at this time which DOE program will be responsible for long-term surveillance, maintenance, and funding. DOE also assumes that remediation of any release sites not addressed under the environmental restoration project, including active firing sites, will be the responsibility of an as yet unnamed DOE program. The annual cost estimate for LTS&M activities is approximately \$3,000,000, but does not include the cost of enforcing deed restrictions.

**Soil:** Residual metal, organic, and radiological contamination will remain in soil in some areas. Soils in areas retained by the site will be remediated to industrial or recreational use levels. The site is using EPA's target incremental risk range of  $10^{-4}$  to  $10^{-6}$  to derive cleanup levels for nonradioactive carcinogens and a target hazard index value of 1 for non-carcinogens. Radiological contamination will be remediated to levels equivalent to a 100 mrem/year or less dose limit. Areas of soil contamination will either be covered by a regulator approved engineered barrier, undergo excavation and offsite disposal, or some other form of remediation. Areas with radiological contamination may require surveillance and monitoring indefinitely. Areas with other types of residual contamination may require surveillance and maintenance for at least 30 years. Deed restrictions will remain in place for all areas exceeding residential cleanup levels. DOE will enter a deed notice with the County Clerk's office for areas beyond site boundaries that have residual contamination.

**Water:** Radioactive contaminants have been detected in alluvial groundwater within the site's boundaries. As there is no projected use of this water, DOE does not expect that remediation of this contamination will be required. DOE assumes that no groundwater remediation of the

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regional aquifer will be necessary. If remediation is determined to be necessary in the future, it will take place in accordance with plans approved by the administrative authority. Groundwater will be monitored for the presence and concentrations of contamination, and may last for up to 30 years or longer.

**Engineered Units:** There are approximately two dozen large material disposal areas (MDAs) contaminated with radionuclides, metals, and organics that will need to be addressed. An MDA core document describing the generic technical approach for the remediation of these MDAs will be submitted to the State in early 1999. DOE currently assumes that the majority of these MDAs can be closed with an engineered barrier and long-term surveillance and monitoring. It is estimated that approximately 10% of the waste in these MDAs will have to be excavated and the waste disposed of off-site. DOE will conduct monitoring, surveillance, and maintenance for the vadose zone and groundwater in accordance with plans approved by the administrative authority.

**Facilities:** Facilities are primarily contaminated with radionuclides, high explosives, VOCs, and metals. The site will demolish most of the 54 surplus facilities, although some will be decontaminated for industrial re-use.

### **Lovelace Respiratory Research Institute (formerly ITRI)**

The Lovelace Respiratory Research Institute (LRRI) formerly the Inhalation Toxicology Research Institute (ITRI) is located in north-central New Mexico, approximately 16 kilometers (10 miles) southeast of downtown Albuquerque, New Mexico, on Kirtland Air Force Base. It is bounded on the north, east, and west by Kirtland Air Force Base, and on the south by the Isleta Indian Reservation.

DOE completed remediation of the site to industrial standards in 1996. Surveillance and monitoring, which are necessary to support site closure, will continue until 2006. Although LRRI is privatized, it is located on land that the U.S. Air Force leases to DOE under a cooperative agreement. The cooperative agreement is managed by the Albuquerque Operations Office. This lease continues through 2002 and has an option to renew. The site will continue to manage waste generated from ongoing research activities and customers will be expected to pay for the costs of waste disposal. DOE assumes that regulators will approve closeout and completion of all work done to date, including the proposal to address contaminated groundwater through natural attenuation. Monitoring and surveillance of air, soil, and groundwater at nine remediated sites is required under current closure plans. The Office of Environmental Management (EM) is currently responsible for stewardship activities. EM estimates the cost of monitoring and surveillance will average \$80,000/year, mainly due to groundwater monitoring costs. DOE assumes that no S&M will be required beyond 2006.

**Soil:** Contaminated soil was excavated and disposed of offsite. Soil meets cleanup levels derived

from RESRAD industrial scenarios for strontium and cesium. No legacy waste remains onsite. No monitoring of soils will be required.

**Water:** Contamination in groundwater (nitrates, diesel byproducts) beneath former wastewater lagoons exceeds the cleanup level of 10 ug/L set by the New Mexico Environmental Department. Natural attenuation is expected to reduce contaminant levels below cleanup standards. A bio-venting system has been installed and running (since 1989) to address diesel byproducts in the groundwater. The site will continue to monitor groundwater on a quarterly or bi-annual basis until contaminant concentrations are below cleanup levels for a minimum of 8 consecutive quarters of sampling or until the State approves discontinuation of monitoring.

**Facilities:** DOE owns all onsite facilities and structures. No facilities have been identified for cleanup. Although there have been no investigations to date, contamination of ductwork may be an issue.

### Pagano Salvage Yard

Pagano Salvage Yard in New Mexico was completed in 1992. The site is not expected to require any stewardship.

### Project Gas Buggy

The Project Gas Buggy Test Area is located approximately 88 kilometers (55 miles) east of Farmington, New Mexico. It was used for a single subsurface nuclear test conducted in December 1967. The Gas Buggy site was part of the Plowshare program, which was a series of nuclear and conventional tests conducted by the Atomic Energy Commission to explore peacetime uses of nuclear explosives.

DOE will conduct characterization and corrective actions at the site. The surface of the site will be remediated to levels that allow for an NRC designation of "no radiological restrictions" and it is anticipated that surface areas will be released for use without restriction and/or relinquished to the Bureau of Land Management (BLM). DOE will not maintain an active presence at this site but will be responsible for maintaining institutional controls in perpetuity for all contaminated groundwater and sub-surface soil in proximity to the test shot cavity. Monitoring is currently planned for 100 years; however, DOE assumes that monitoring will be conducted in perpetuity.

**Soil:** Radionuclide contamination in and around shot cavities will not be removed because remediation technologies capable of effectively removing or stabilizing this contamination do not currently exist. Institutional controls, including drilling restrictions, will be maintained to prevent access to this sub-surface contamination.

**Water:** Groundwater contamination associated with the test shot cavities will not be remediated because technologies capable of safely and effectively remediating these radioactive contaminants do not currently exist. Restricted access to the sub-surface, including restrictions on access to and use of groundwater, will be maintained. Based on modeling and monitoring results, subsurface drilling restrictions and institutional controls implemented on known areas of contamination may need to be extended to ensure no intrusion into potentially contaminated groundwater systems. Upon establishing a monitoring network, program, and schedule acceptable to DOE, the State of New Mexico, and other stakeholders, LTS&M of the Project Gas Buggy Test Area is planned for 100 years. DOE assumes that groundwater monitoring wells will need to be refurbished or replaced approximately every 25 years.

### **Project Gnome Coach Test Area**

The Project Gnome Coach test was conducted in bedded salt approximately 50 kilometers (31 miles) southeast of Carlsbad, New Mexico in December 1961. The purpose of the test was to determine the effects and products of a nuclear explosion in a salt medium. Radioactive contamination at the Gnome Coach Test Area is present in the deep bedrock around the shot cavity and the emplacement drift, which was used for disposal of contaminated soil. Contamination resulting from a tracer test conducted after the Gnome test is also present in a shallow aquifer.

DOE will conduct characterization and corrective actions. The surface of the site will be remediated to levels that allow for an NRC designation of "no radiological restrictions" and it is anticipated that surface areas will be released for use without restriction and/or relinquished to the Bureau of Land Management (BLM). DOE will not maintain an active presence at this site but will be responsible for maintaining institutional controls in perpetuity for all sub-surface soil in proximity to the test shot cavity and any contaminated groundwater. Monitoring is currently planned to take place annually for 100 years; however, DOE assumes that monitoring will be conducted in perpetuity.

**Soil:** No corrective actions on subsurface contaminants in and around the test cavity will occur since cost-effective technologies do not currently exist. Restricted access to the subsurface will be maintained. Upon establishing a monitoring network, program, and schedule acceptable to DOE, the State of New Mexico, and other stakeholders, LTS&M of the Project Gnome Coach is planned for 100 years. DOE has not yet determined if short-term monitoring of surface areas will be necessary.

**Water:** There are no groundwater aquifers within the salt formation where the test shot cavity is located. Institutional controls will be maintained to prevent access to or use of groundwater. Based on modeling and monitoring results, subsurface drilling restrictions and institutional controls implemented on known areas of contamination may need to be extended to ensure no

intrusion into potentially contaminated groundwater systems. A monitoring network, program, and schedule acceptable to DOE, the State of New Mexico, and other stakeholders will be established. Annual LTS&M of the Project Gnome Coach Test Area is planned for 100 years, but assumed to be necessary in perpetuity.

### **Quivera, Ambrosia Lake**

The Quivera site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Ambrosia Lake, New Mexico. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2015, at which point, the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 33,200,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with rock. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Sandia National Laboratories/New Mexico**

Sandia National Laboratories/New Mexico is located in Bernalillo County, 10.4 kilometers (6.5 miles) east of downtown Albuquerque. The laboratories consist of five technical areas and several remote areas covering 1,128 hectares (2,820 acres) of the 306.8-square kilometer (118-square mile) Kirtland Air Force Base. The base has a mean elevation of 1,642 meters (5,385 feet). It is situated on two broad mesas bisected by the Tijeras Arroyo and bound by the Manzano Mountains to the east and the Rio Grande to the west.

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DOE will complete remediation of all 187 release sites by 2001. All legacy waste will be dispositioned by 2006. DOE expects that all land, except for the onsite disposal facilities, will be released for reuse by the Office of Defense Programs (DP) which has an ongoing mission at the site. The disposal facilities will remain under restricted access. The remaining land which will be used by DP will be designated as either industrial or recreational. If DOE were to vacate this property, the site assumes that ownership would be transferred to the Air Force or another federal agency. Security and safeguards will remain in place for the whole site. Groundwater monitoring and cap S&M will be incorporated into the site's routine environment, safety, and health (ES&H) program. Annual LTS&M costs for this site are estimated to be \$115,000.

**Soil:** Contaminants of concern include PCBs, metals, and depleted uranium. Residually contaminated soils will be remediated using excavation, recontouring, and revegetation. All identified environmental restoration sites will be remediated by 2001. The site will dispose of waste generated by environmental restoration activities either offsite or onsite in a CAMU disposal cell. If the site's mission is terminated, any areas with contaminant levels that exceed residential standards will remain under federal control or undergo additional remediation.

**Water:** Contamination, including TCE, chromium, and tritium, may remain in the vadose zone and groundwater below the Chemical Waste and Mixed Waste Landfills. DOE assumes that TCE contamination in technical areas I, II, III will not exceed regulatory standards and will not require remediation. DOE will conduct post-remediation LTS&M of the vadose zone and groundwater at the permanent disposal areas from 2001 to 2031. DOE is currently evaluating the need for groundwater monitoring in technical areas I, II, and III. Except for some source term removal at the Chemical Waste Landfill, groundwater contamination will be addressed through long-term monitoring to ensure that contaminant levels remain low.

**Engineered Units:** A chemical waste landfill, a mixed waste landfill, and a CAMU disposal cell (approximately 7-10 acres in size) will remain onsite. The disposal cell will contain the various waste types generated by environmental restoration. Access to these areas will remain restricted. The chemical waste landfill, the mixed waste landfill, and the CAMU disposal cell will remain under long-term institutional control with fences and signs, and will be monitored for at least 30 years, per RCRA requirements. LTS&M activities will include monitoring groundwater and the vadose zone, physical maintenance, and erosion or structural repairs. Institutional controls may be necessary beyond 2031.

**Facilities:** By 2001, DOE will complete closure of excess facilities.

## Shiprock

The former Shiprock site is located on a 93-hectare (230-acre) tract of Navajo Nation land, south of the San Juan River and adjacent to the town of Shiprock, New Mexico. Two piles of tailings covered approximately 29 hectares (72 acres). The former raffinate pond area and a few buildings were located to the west of the piles. The site completed remedial actions in 1986 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Shiprock. LTS&M costs for the disposal cell at Shiprock total \$19,000 per year in perpetuity. Groundwater LTS&M costs total \$2 million per year for the period 2001-2021, with a one-time startup cost of \$3 million in 2001.

**Soil:** Soil was remediated to EPA standards.

**Water:** Approximately 160 million gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs: cadmium, net gross alpha, nitrate, radium, selenium, and uranium. The site is using a combination of active remediation by flow manipulation and no action to remediate contaminated groundwater. The site expects to complete groundwater remediation by 2021.

**Engineered Units:** Approximately 1,600,00 yd<sup>3</sup> of contaminated materials were stabilized on site in a 72-acre disposal cell. The disposal cell has a radon barrier cover and surface layer of rock for erosion control. According to EPA standards, the cover of the disposal cell must be designed to remain effective for 200 to 1,000 years. GJO is responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. LTS&M activities for the disposal cell include annual inspections, vegetation control via herbicide application, and fence repairs and sign replacement (as needed).

## SOHIO, L-Bar

SOHIO L-Bar is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in New Mexico. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then

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determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2000, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 2,100,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with soil and rock. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **South Valley Superfund Site**

The South Valley Superfund site is located in the South Valley of Albuquerque, New Mexico and is situated near the Rio Grande in an industrial portion of the city. Seven Potentially Responsible Parties (PRP) are currently engaged in characterization and remedial activities ranging from soil remediation to ground-water cleanup. The Department of Energy is a PRP because of the Atomic Energy Commission's ownership of an industrial facility in the South Valley from 1951-1967. The Department of Energy is acting under an agreement with General Electric Company to reimburse 43.2 percent of the cost for remediation.

The site completed surface remediation in 1996. Groundwater remediation will continue for the next 10-30 years. DOE and the U.S. Air Force entered into a settlement agreement with General Electric (GE) to reimburse GE for environmental restoration conducted in accordance with a 1988 CERCLA ROD. DOE is responsible for 43 percent of all remediation costs. Currently, DOE's financial responsibilities include remediation and stewardship activities limited to monitoring and maintenance. DOE's portion of the costs is approximately \$500,000/year. DOE has recently reached a PRP buy-out settlement with GE. The settlement lasts until 2003, at which time negotiations will resume for a permanent buy-out. DOE assumes that it will reach a buy-out agreement with GE limiting its liability through April 2003. Negotiations will commence in 2003 to reach an agreement to permanently terminate the Department's liability. The site states that if

DOE reaches a buy-out agreement with GE eliminating its liability, the Department will have no stewardship responsibility for the site.

**Soil:** DOE remediated soil to cleanup levels in accordance with applicable CERCLA regulations and State of New Mexico cleanup standards. Soil cleanup goals were determined using the *Summers* method and EPA's *Organic Leaching Model*. The site-specific cleanup goals were designed to protect the shallow groundwater from further deterioration as a primary goal. Approximately 1 acre possesses residual soil contamination, but the site is not restricted as this contamination is below standards. No monitoring or other stewardship is required for soil other than a one time confirmation sampling event that will follow completion of shallow ground water remediation.

**Water:** Groundwater contamination continues to threaten local drinking water supplies and private wells. Contaminants of concern include TCE, DCE, DCA, and PCE. Two groundwater pump and treat remediation systems (shallow and deep zone) are operating to remove the solvent contamination from the groundwater and prevent contaminant migration. GE is currently operating a pump and treat system. This system is scheduled to operate through 2010, but is expected to continue 10-30 years or until eight quarters of groundwater sampling indicate that all cleanup levels have been achieved or a waiver of technical impracticability is approved by the EPA. As one of the PRPs, DOE has helped pay for a replacement groundwater well for the City of Albuquerque.

### UNC, Church Rock

The UNC, Church Rock site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in New Mexico. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2001, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 3,500,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

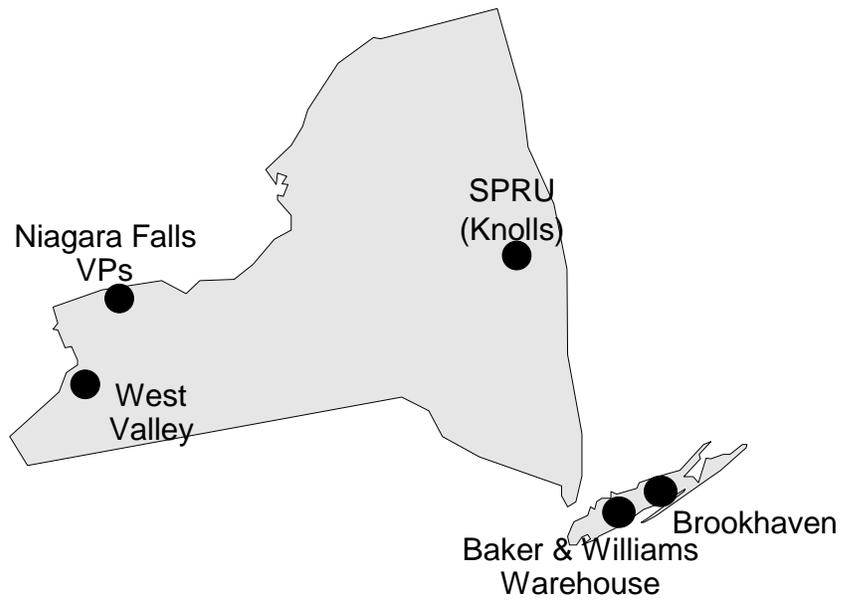
### **Waste Isolation Pilot Plant**

The Waste Isolation Pilot Plant (WIPP) is designed to permanently dispose of transuranic (TRU) waste generated by defense-related activities. Located in southeastern New Mexico, 26 miles east of Carlsbad, project facilities include disposal rooms excavated 2,150 feet underground in an ancient, stable salt formation. TRU waste consists primarily of tools, gloves, clothing and other such items contaminated with trace amounts of radioactive elements, mostly plutonium. WIPP received approval from the Environmental Protection Agency (EPA) to dispose of defense-generated TRU waste, and accepted its first shipment of waste on March 26, 1999.

WIPP is neither a “cleanup” nor “closure” site. It is the only TRU waste disposal site in the world. TRU waste management activities are projected to be completed by FY 2039. It is expected that DOE will have disposed of 175,600 cubic meters of TRU waste in WIPP. Starting in FY 2039, a reduced Federal staff will maintain records of WIPP and the active institutional controls associated with the land withdrawal. Warning signs will be posted to warn of the presence of radioactive waste. Active institutional controls over the site will be maintained for 100 years, including preventative groundwater monitoring. Following completion of the project, access will be restricted to the underground areas and the surface area will be unrestricted for recreational and agricultural uses with the exception of the 124 acres which constitute the exclusive-use passive institutional control area.

The estimated EM life-cycle cost of Carlsbad Area Office’s TRU waste management and disposal activities is \$7.7 billion (constant 1998 dollars) through FY 2070 and an additional \$6 billion for institutional controls after 2070. The average annual stewardship costs are estimated at \$57,200,000. The overall completion date for disposal operations at WIPP is 2033, with dismantling and decommissioning taking another five years and active institutional controls continuing for 100 years thereafter.

# New York



### **Baker and Williams Warehouses**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1993, and no stewardship activities are currently anticipated.

### **Brookhaven National Laboratory**

Brookhaven National Laboratory is located on approximately 906 hectares (2,265 acres) of land, and is located on Long Island in Upton, New York, approximately 120 kilometers (75 miles) from New York City.

Environmental Management has funded environmental restoration activities through 2006. The site will transfer remediated areas of the site to an as yet undetermined DOE program for reuse and/or long-term monitoring. The Office of Science, the site landlord, has an ongoing research mission. Because of groundwater contamination, DOE has provided public water hook-ups to residents with groundwater wells within a designated area south/east of the site. Final RODs addressing soil, surface water, and groundwater contamination are not complete, as of June 1999, and remediation strategies are not finalized. Site-wide monitoring will continue through 2031. The site estimates LTS&M costs to be a total of \$18,900,000 or approximately \$727,000 per year.

**Soil:** Cesium contamination is driving remediation at the site. Other contaminants of concern include strontium, cobalt, and VOCs. The site will remediate VOC contaminated soil, including contamination associated with an oil and waste solvent spill, using air sparging and soil vapor extraction. Glass/chemical/animal hole pits and cesspools have been excavated and waste will be disposed of offsite. Radiologically contaminated soils from several areas across the site will be excavated and disposed of offsite. Cleanup levels will be between 23-67 pCi/g. Dispersed areas of contamination will remain across the site. Institutional controls are expected for the next 100 years with additional deed and use restrictions implemented at site closure.

**Water:** Plumes of chemically contaminated (VOCs) groundwater have migrated offsite. Contaminants of concern include ethylene dibromide, tritium, cesium, and strontium. Groundwater systems will be operational in 2006. DOE has placed extraction wells at site boundaries to capture and treat groundwater contaminated with VOCs to MCLs using air sparging. The site states that all groundwater remediation and monitoring activities will be complete by 2031. DOE is currently evaluating remediation options for heavy metal contamination in the sediments of the Peconic River. Prior to contamination, this sole-source

aquifer provided water to Long Island. DOE has provided public water hookups to local residents.

**Engineered Units:** Three closed, capped landfills will remain onsite in the former and current landfill areas at the southern portion of the site. These landfills contain sanitary, hazardous, and radiological waste and were capped with multi-layer caps in 1995 and 1996. One area is currently being proposed for recreational use. LTS&M activities will include routine inspections (weekly to annually) to check fences, and locks, and quarterly to annual monitoring.

**Facilities:** The old Hazardous Waste Management Facility area will be demolished and debris will be disposed of offsite. The Brookhaven Graphite Research Reactor was shutdown in 1969 and fuel elements have been removed. Radioactive contamination in the reactor is expected to be in the external air ducts, buried radioactive waste piping, and the transfer tubing. The reactor will be decontaminated and disassembled, or entombed in place. Final disposition for the reactor has not yet been determined however, D&D activities have been initiated in 1999.

### **Niagara Falls Storage Site Vicinity Properties**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1987, and no stewardship activities are currently anticipated.

### **Separations Process Research Unit**

The Separations Process Research Unit Facility (SPRU) is located approximately 3.2 kilometers (2 miles) east of the City of Schenectady in the northeastern part of Schenectady County in New York State. The facility occupies approximately 80 hectares (200 acres) of the northwest corner of the 1,640-hectare (4,100-acre) Knolls Atomic Power Laboratory.

DOE operated the SPRU at the Knolls Site of the Knolls Atomic Power Laboratory (KAPL) until the early 1950s. The Office of Environmental Management (EM) plans to complete cleanup by 2014. The site will be released back to KAPL for reuse without any radiological restrictions. The final endstate will be determined by the Office of Naval Reactors. The Office of Naval Reactors will resume full responsibility for the site following cleanup. The annual site-wide cost estimate for pre-decommissioning S&M is approximately \$500,000 per year for the period 2000-2004.

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**Soil:** Soil impacted with plutonium, americium, uranium, strontium, and cesium surrounding SPRU will be remediated to industrial use levels. Impacted soil will be excavated and the areas will be backfilled with clean fill, including concrete debris from demolished structures. These areas will be covered with top soil to grade. Soil will meet criteria established and negotiated between EPA, the State of New York, and DOE.

**Water:** The site assumes that there is no groundwater contamination.

**Engineered Units:** Two landfills and three waste disposal areas will be remediated.

**Facilities:** SPRU and all ancillary facilities will be decontaminated and demolished. S&M of deactivated facilities will continue until D&D.

### **West Valley Demonstration Project**

The West Valley Demonstration Project (WVDP) is located on a 1,320-hectare (3,300-acre) tract approximately 48 kilometers (30 miles) south of Buffalo, New York. This site is also the location of the Western New York Nuclear Services Center. The WVDP occupies approximately 93 hectares (230 acres) of this property, which is owned by the State of New York. DOE manages the WVDP oversight responsibilities through its onsite Project Office, which is managed by the Ohio Field Office.

The site and facilities are owned by the State of New York and licensed by the Nuclear Regulatory Commission (NRC); however, during conduct of the WVDP, the NRC license is in abeyance and DOE has exclusive use and possession of the Project premises for the purpose of completing the activities specified in the WVDP of 1980. DOE and New York State have entered into a Cooperative Agreement for carrying out the Project. Plans for completing the Project and transferring operational responsibility for the facilities to the New York Energy Research Development Authority (NYSERDA) for surveillance and long-term maintenance or closure are incomplete. DOE and the State of New York are still negotiating final financial responsibilities. The final Environmental Impact Statement (EIS), entitled "WVDP Completion by DOE and Long-Term Management of Facilities or Site Closure by New York," is not yet complete. DOE expects that the Record of Decision (ROD) will be published in 2000 and, therefore, a final remediation strategy and completion date have not yet been developed. The draft EIS states that LTS&M and/or the use of institutional controls may be required. DOE recognizes that an agreement with the owner, New York State, for conducting LTS&M will need to be achieved.

**Soil:** Because the EIS/ROD has not been issued, the final endstate has yet to be determined.

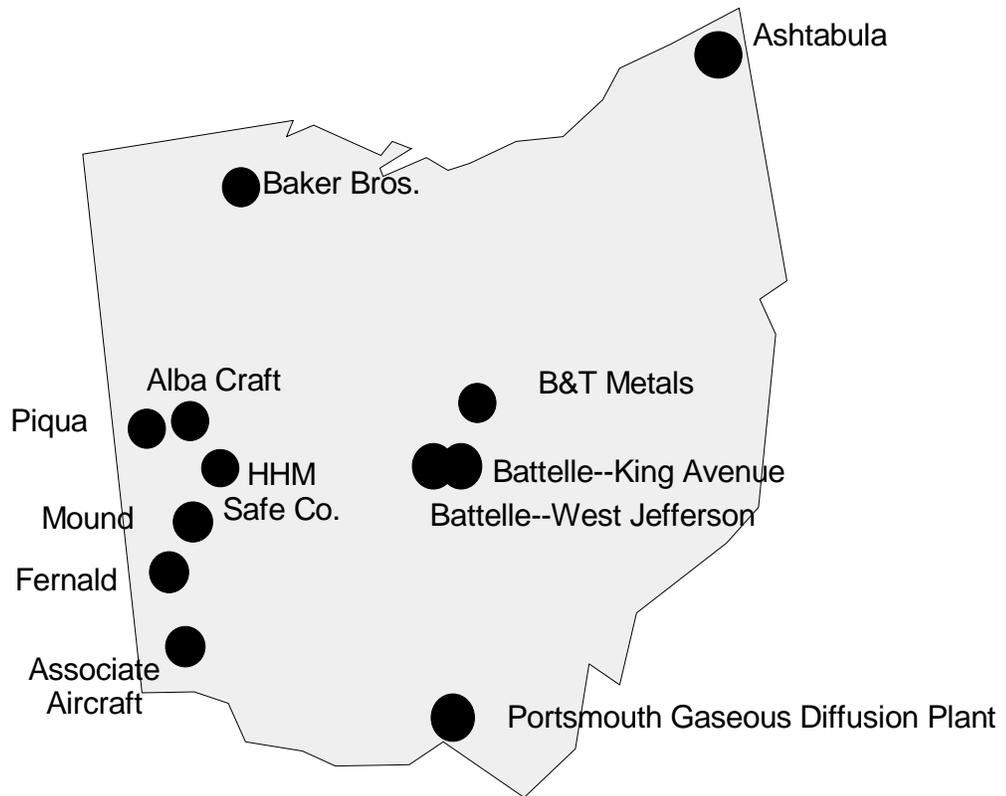
**Water:** Contaminants of concern regarding surface waters and groundwater are primarily radioactive. The three key elements are strontium-90, cesium-137, and tritium. However, because the EIS/ROD has not been issued, the final endstate has yet to be determined.

**Engineered Units:** DOE will remove the HLW from the storage tanks to the extent that it is technically feasible prior to decommissioning the tanks in accordance with NRC guidelines and criteria. HLW is being vitrified and stored onsite pending shipment to a federal repository. DOE will dispose of LLW and TRU waste resulting from HLW vitrification. The final disposition for LLW will be identified in the site EIS/ROD. HLW, 125 SNF bundles in the fuel pool, and TRU waste per the DOE definition will be transferred offsite for disposal. However, because the EIS/ROD has not been issued, the final endstate has yet to be determined.

**Facilities:** All facilities are owned by the State of New York. Facilities used for HLW storage and vitrification will undergo D&D in accordance with NRC criteria. NRC will prescribe D&D criteria as part of the EIS process.

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# Ohio



### **Alba Craft**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1995, and no stewardship activities are currently anticipated.

### **Ashtabula Site**

The Ashtabula Site (formerly known as Reactive Metals, Inc.) is located in northern Ashtabula County, Ohio, about 5 kilometers (three miles) northeast of the center of the City of Ashtabula and approximately one mile south of Lake Erie. The current areal extent of the Ashtabula Remediation Project is 9.9 hectares (24.5 acres), with 8.9 hectares (22 acres) being owned by the RMI Titanium Company (RMI). The plant is in a sparsely populated and highly industrialized area. Several chemical production and metal conversion plants are located nearby.

Areas used by DOE will be remediated and released to RMI by 2006; however, DOE is working with RMI to accelerate cleanup to complete the release by 2005. Following completion of environmental restoration activities the site will support any possible future use with no controls necessary. RMI will be responsible for making all future land use decisions. Once NRC verifies that the site meets agreed-upon criteria for radioactive contaminants, the NRC license will be terminated and the site will be released to RMI for use without radiological restrictions. DOE will not maintain a presence at the site after cleanup standards are met.

**Soil:** Uranium is the primary soil contaminant, with technetium-99 and TCE also contaminating the soil. All radiologically contaminated soil that exceeds the NRC soil cleanup levels will be excavated. NRC promulgated cleanup levels are a condition for termination of RMI's license. A portion of the excavated soil will be remediated using soil washing and chemical extraction and backfilled onsite. The remainder of this soil will be disposed of offsite as LLW. EPA has designated an area formerly occupied by an evaporation pond as a corrective action management unit (CAMU). Vapor stripping will remove TCE from the soil; which will then be used as clean fill.

**Water:** Groundwater contaminants include uranium, technetium-99, and TCE that moved downward and outward from the former evaporation pond. Contamination is being remediated as part of the CAMU. Uranium and technetium-99 will be removed via conventional waste water treatment techniques. TCE will be extracted using vapor stripping and then captured by filtering. EPA will approve closure of the CAMU when contaminant levels for TCE and technetium-99 achieve the levels agreed to in the Corrective Measures Study. DOE/RMI is currently testing the application of wick drain technology. If the technology is effective no surveillance or monitoring

will be needed. However, if the technology is proven ineffective long-term surveillance and monitoring will be required until 2016.

**Facilities:** DOE will decontaminate and demolish twenty-one facilities and dispose of all debris and legacy waste offsite. The remaining six facilities will require some decontamination prior to being released for unrestricted use.

### **Associate Aircraft**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1995, and no stewardship activities are currently anticipated.

### **B&T Metals**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1996, and no stewardship activities are currently anticipated.

### **Baker Brothers**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1996, and no stewardship activities are currently anticipated.

### **Battelle Columbus Laboratories - King Avenue**

The Battelle Columbus Laboratories Decommissioning Project, near Columbus, Ohio, consists of 15 buildings and includes two geographically distinct sites: King Avenue and West Jefferson. The King Avenue site consists of nine affected buildings, located within the City of Columbus. The affected area under control of the project covers approximately 2.4 hectares (6 acres) and is bounded by Ohio State University, a high-density residential area, and the Olentangy River. It includes several commercial and light industrial areas within 0.8 kilometers (0.5 miles) of the facility.

DOE will decontaminate the facilities used to perform work for the Federal Government at this site and release them to Battelle for reuse without NRC radiological restrictions. DOE will complete restoration payments to Battelle by 2003. After DOE has fulfilled its remediation

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responsibility and completed restoration payments to Battelle, its liability under the existing contract will be terminated. Battelle, as facility owner, is responsible for all future land use decisions and stewardship responsibilities.

**Soil:** Soil contamination associated with facilities will be cleaned up to levels allowing for reuse without NRC radiological restrictions. All waste generated by soil remediation will be disposed of offsite. All waste streams, primarily uranium and thorium, will be disposed of offsite.

**Facilities:** DOE will decontaminate the nine facilities used to perform work for the Federal Government at this site and return them to Battelle for reuse without NRC radiological restrictions.

### **Battelle Columbus Laboratories - West Jefferson**

The Battelle Columbus Laboratories Decommissioning Project, near Columbus, Ohio, consists of 15 buildings and includes two geographically distinct sites: King Avenue and West Jefferson. There are six buildings located at the West Jefferson site, which occupies approximately 440 hectares (1,100 acres). This rural site, located near West Jefferson, Ohio, is approximately 8 kilometers (5 miles) west of Columbus.

DOE will decontaminate the facilities and land used to perform work for the Federal Government at this site and release this property to Battelle for reuse without NRC radiological restrictions. Completion of cleanup at the site will terminate DOE's liability under contract W-7405-ENG-92. Battelle, as facility owner, is responsible for future land use decisions and stewardship activities.

**Soil:** Approximately 11.5 acres of soil surrounding the facilities is impacted, including underground drain lines. Soil contamination associated with facilities will be cleaned up to levels allowing for reuse without NRC radiological restrictions. It is estimated that over 268,000 cubic feet of LLW-contaminated soil and over 8,000 cubic feet of LLW (non-soil) will be excavated. All waste generated by soil remediation will be disposed of offsite.

**Facilities:** The three facilities used to support Federal Government work, including one hot cell building, will be decontaminated and demolished. The site will be regraded and returned to Battelle for reuse without NRC radiological restrictions. Remote controlled operations will be necessary to decontaminate highly radioactive areas in the hot cells. All contaminated equipment and material generated by decontamination of the facilities will be disposed of at an offsite location (DOE or commercial).

## Fernald Environmental Management Project

The U.S. Department of Energy's Fernald Environmental Management Project (FEMP) is located on a 420-hectare (1,050-acre) tract that overlaps the boundary between Hamilton and Butler Counties near the southwest corner of Ohio. The site is approximately 27 kilometers (17 miles) northwest of Cincinnati. The Great Miami River flows nearby in a southerly direction, approximately 1.6 kilometers (one mile) east of the site. Paddy's Run, a small stream, runs southward along the western boundary of the site. The Fernald site is physically located over the Great Miami Aquifer. The former production facilities and supporting infrastructure comprise approximately 54 hectares (136 acres) of the 420-hectare (1,050-acre) site.

The site is expected to complete remediation by 2008; however, DOE is working with its contractors in an effort to accelerate cleanup and achieve closure by 2005. Access to the On-Site Disposal Facility (OSDF), which will occupy 138 acres, will remain restricted. The remainder of the site is expected to achieve final cleanup levels which could support a variety of land uses; however, the decision to limit use to ecological restoration and recreational use was made based on the DOE's Natural Resource Damages Act (NRDA) obligations and stakeholder input. An Environmental Assessment (EA) has been prepared which proposed ecological restoration for the entire site, with the exception of the land occupied by the OSDF and 23 acres set aside for potential future commercial development. The EA was reviewed and accepted by the public and stakeholders. Residential and agricultural uses will not be considered for any portion of the site consistent with the recommendations of the Fernald Citizens Advisory Board. Industrial uses may be considered for the 23 acres of potential economic development land; however, a separate EA would be generated for public comment regarding any proposed use of this acreage. The DOE, or a successor federal agency, will maintain stewardship responsibility for the site. Institutional controls and monitoring of the OSDF will remain in perpetuity.

**Soil:** The site will remediate all contaminated soils to cleanup levels appropriate to future land use. If the soil meets the Waste Acceptance Criteria (WAC) for the OSDF, then it will be disposed of onsite. If the soil fails to meet the WAC, it is either treated to meet the WAC or disposed of offsite. Primary contaminants of concern are uranium-238, radium-226, and technetium-99. The site is currently assuming that land will be remediated to final remediation levels. Institutional controls will be implemented to prevent improper land use.

**Water:** An estimated 96 acres of the perched aquifer below the site was impacted by contaminant migration. More than 2,000 acres of the aquifer, including offsite areas, are contaminated with uranium and other hazardous substances. An innovative groundwater remediation system will remove contamination from groundwater prior to discharge to the Great Miami River. This remediation system is expected to remediate uranium levels to 20 ppb. Groundwater monitoring

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associated with the OSDF will likely continue through the 30-year post-closure period but may be needed in perpetuity. The CERCLA remedy is reviewed every five years following remediation, and the actual duration of the groundwater monitoring will be determined during these reviews.

**Engineered Units:** DOE will construct the 138-acre OSDF under CERCLA regulatory authority. This facility will have a capacity of 2.5 million cubic yards and will accept hazardous and radioactive waste that meets the WAC . The waste disposal facility has a maximum waste acceptance criteria of 346 pCi/g of U-238 or 1,030 ppm total uranium. A combination of synthetic and natural materials will be used to line and cap the cells of this disposal facility. Access to this area will be restricted in perpetuity. The site will implement institutional controls and conduct groundwater monitoring at the disposal facility in perpetuity. CERCLA reviews will be conducted no less than every five years to ensure compliance. Reviews will continue until determined to be unnecessary to ensure protection.

**Facilities:** All facilities will be dismantled and debris and equipment will be placed in the onsite CERCLA disposal facility described above. The site will remove below grade structures as part of soil remediation. The majority of facilities will be decontaminated and demolished (D&D) by 2006; however, D&D of Silos 1 and 2 of the Treatment Facility and the Advanced Wastewater Treatment Facility will be conducted after 2009. DOE is currently working with its contractors in an effort to accelerate cleanup and achieve closure by 2005. DOE assumes that nuclear materials, including 5,600 drums of thorium, will be moved offsite and the site will be declared a non-nuclear site.

### **Herring-Hall Marvin Safe Company**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1995, and no stewardship activities are currently anticipated.

### **Mound Plant/Miamisburg Environmental Management Project**

The Mound Plant is located in Miamisburg, Ohio, approximately 16 kilometers (10 miles) south-southwest of Dayton, Ohio. Most of the 124-hectare (306-acre) site overlooks the city from a ridge that extends toward downtown Miamisburg from the southern city limits. Mound Road, on the east side of the plant, is lined by residences and provides access to the plant's main gate. A Conrail freight line runs along Mound's western border, and the old Miami-Erie Canal bed runs west of the track. Approximately half a mile farther west from Mound is the Great Miami River.

By 2004, DOE will transfer the site to the Miamisburg Mound Community Improvement Corporation (MMCIC) for reuse as a commercial/industrial complex with the exception of the Office of Nuclear Energy (NE) facilities currently identified for conducting ongoing NE mission activities. NE will be responsible for landlord costs and eventual safe shutdown and D&D of those facilities. The remainder of the site will be remediated to achieve EPA industrial land use standards. Institutional controls in the form of deed restrictions will be placed on the transferred property to maintain industrial land use and prevent an unacceptable risk to human health or the environment. Pursuant to CERCLA 120, DOE or its successors will retain the right and responsibility to monitor, maintain, and enforce these institutional controls as required by the Record of Decision (ROD). This responsibility includes the duty to conduct annual assessments of compliance with the deed restrictions and the duty to enforce the deed restrictions if any non-compliance is detected. The costs associated with monitoring and enforcing the land use and property deed restrictions are currently estimated to be \$5,000 per year.

**Soil:** The site will excavate soil with radiological contamination (plutonium, thorium) and dispose of this material offsite as LLW. TCE and PCE-contaminated soil will be treated in the bioremediation unit onsite, through in-situ vacuum extraction. Soil will be remediated to EPA industrial use levels. Approximately 11 acres may have residual sub-surface contamination at depths greater than 20 feet following remediation. All soil cleanup activities will be complete by 2004.

**Water:** DOE will remediate onsite groundwater to industrial use levels and offsite groundwater to residential use levels; however, some residual, diffuse sources may continue. VOC contaminated groundwater will be remediated by 2004.

**Facilities:** Facilities will either be decontaminated and demolished (D&D) or decontaminated and transitioned (D&T) to the MMCIC for reuse. DOE and the regulators must determine that buildings are protective of human health and the environment prior to transfer to the MMCIC.

### **Piqua Nuclear Power Facility**

The Piqua Nuclear Power Facility is located on the bank of the Great Miami River in the town of Piqua, Ohio, approximately 55 kilometers (34 miles) north of Dayton.

The Piqua Nuclear Power Facility contained a 45.5-megawatt (thermal) organically cooled and moderated reactor built and operated as a demonstration project by the AEC between 1963 and 1966. The reactor was dismantled and decommissioned between 1967 and 1969. There is currently no known contamination in evidence at the site outside of the containment structure.

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Surveillance and monitoring activities conducted to date indicate that no further remediation will be necessary. The GJO Project Office has been responsible for LTS&M activities since 1998. Future use of the site is limited to controlled access. Stewardship costs are estimated at \$23,000 annually for the next 15 years.

**Soil:** There is no known soil contamination at the site.

**Water:** There is currently no groundwater contamination at the site.

**Facilities:** The reactor fuel, coolant, and most of the radioactive materials were removed from the site. The reactor vessel and the spaces between the vessel and cavity liner were filled with dry quartz sand. Iron, cobalt, carbon, and beryllium remain within this containment structure. The former structure is currently under S&M. DOE will be responsible for conducting any necessary remediation should releases be detected.

### **Portsmouth Gaseous Diffusion Plant**

The Portsmouth Gaseous Diffusion Plant is located in south central Ohio, approximately 32 kilometers (20 miles) north of Portsmouth, Ohio, and 112 kilometers (70 miles) south of Columbus, Ohio. The site is situated on a 1,483-hectare (3,708-acre) federal reservation approximately 6.5 kilometers (4 miles) south of the Village of Piketon.

The site plans to complete remediation of waste sites in 2035, but the estimated completion date with full enhanced performance is 2005. Groundwater treatment will continue until 2053. The Federal Government is obligated to oversee this land and intact facilities in perpetuity. Future use of the site will be a combination of mixed industrial and recreational use. A portion of the land will be used for open space and recreation. Environmental assessments have not been completed and decisions on land use and corrective actions have not yet been finalized. The US Enrichment Corporation (USEC), or a successor organization, will continue to use the gaseous diffusion plant to produce low enriched uranium for commercial use for the foreseeable future. Other DOE facilities appropriate for reuse may be re-industrialized. Regulatory driven reduction in LTS&M activities will begin in 2030, and LTS&M activities will reach their steady state by 2050. Specific stewardship requirements and duration will be fully defined when remedial actions are complete. Costs for LTS&M activities have not yet been determined; however, DOE estimates the range of costs to be between \$1 million and \$10 million per year. The Federal Government will be responsible for stewardship in perpetuity.

**Soil:** Contaminants of concern in the soil at Portsmouth include PAHs, PCBs, metals, and radionuclides. Specific soil cleanup targets have not yet been established but will be based on risk calculations. PCBs will be cleaned to 10 mg/kg and radiological contaminants will be remediated to ALARA levels. Well-defined areas of soil contamination will be removed. Burial grounds will be closed and contamination will remain in place. These areas will be hydrologically isolated with engineered, multi-layer caps. LTS&M activities associated with these caps are groundwater monitoring and maintenance of protective caps. Under RCRA, a minimum of thirty years of post-closure LTS&M will be required for capped soil areas. Deed restrictions will be put in place in areas where contamination remains. The site states that remedial action units will require LTS&M until final D&D.

**Water:** Contaminants of concern for groundwater include VOCs, radionuclides, and metals. There are four groundwater plumes that are confined to DOE property. The site strategy for contaminated groundwater is to remove/isolate all sources, remediate through in-situ technologies, and utilize passive treatment when necessary to contain plumes on site. Active groundwater treatment will continue until 2050 and passive groundwater treatment and monitoring will continue until 2055. Passive treatment utilizes chemical breakdowns of solvents through reactive media by employing natural flow. Groundwater treatment systems will be abandoned in place following completion of remediation. DOE will remediate surface water to meet cleanup levels consistent with its prescribed classification.

**Engineered Units:** Seven landfills containing sanitary, hazardous, or LLW will be hydrologically isolated with engineered, multi-layer caps and will remain onsite. These landfills occupy approximately 35 acres of the site and will require 30 years of post-closure groundwater monitoring and cap maintenance, with frequencies ranging from monthly to annually.

**Facilities:** Contaminants of concern associated with facilities at Portsmouth include PCBs, radionuclides, and metals. Selected facilities will be used for ongoing enrichment operations. Facilities that pose an unacceptable risk or are unsuitable for reuse will be demolished. After closure, the gaseous diffusion plant and the waste storage facility will undergo D&D. This cleanup is beyond the scope of current DOE planning. Facilities will remain under LTS&M until operations cease and the plant undergoes final D&D. Deed restrictions will be put in place for areas where contamination will remain in place. In addition, walk-throughs of facilities will be performed to assess structural integrities.

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# Oregon



### **Albany Research Center**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1993, and no stewardship activities are currently anticipated.

### **Lakeview**

The former Lakeview mill and tailings site is located in south-central Oregon, approximately 26 kilometers (16 miles) north of the California-Oregon border and 155 kilometers (96 miles) east of Klamath Falls, Oregon. The tailings pile covered approximately 12 hectares (30 acres) of the 104-hectare (258-acre) site. Six evaporation ponds occupied another 26 hectares (64 acres). The site completed surface remedial actions in 1989 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under the provisions of UMTRCA, public access to the disposal cell will be restricted indefinitely.

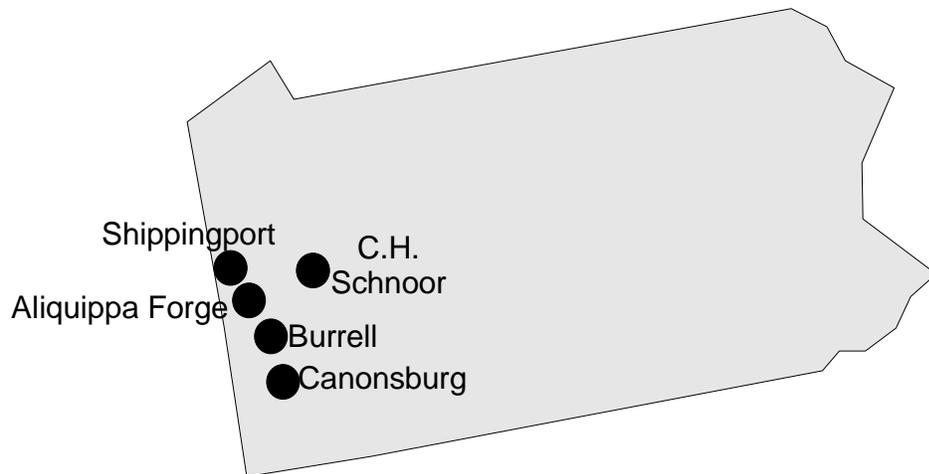
DOE's Grand Junction Office (GJO) is responsible for LTS&M at Lakeview. LTS&M costs for the disposal cell at the Lakeview site total \$12,000 per year in perpetuity. Groundwater LTS&M costs at the former mill site total \$30,000 per year for the period 2003-2008 and \$12,000 per year at the disposal site for the period 1998-2003.

**Soil:** Soil was remediated to EPA standards.

**Water:** Approximately 1.2 billion gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs at least once: molybdenum, radium, arsenic, and net gross alpha. No groundwater remediation is expected at Lakeview; however, annual groundwater monitoring at the former mill site will last from 2003-2008. Annual groundwater monitoring at the disposal site will occur from 1998-2003, after which monitoring will take place once every five years.

**Engineered Units:** Approximately 926,000 yd<sup>3</sup> of contaminated materials were stabilized at the 116-acre disposal cell at Collins Ranch, which is 7 miles from the original site. The disposal cell has a radon barrier and rock surface layer for erosion control. According to EPA standards, the disposal cell must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. LTS&M activities include annual surface inspections and minor maintenance such as fence repairs and sign replacement. There is potential for a one-time significant "erosion protection expense" that is not reflected in the above costs.

# Pennsylvania



### **Aliquippa Forge**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1994, and no stewardship activities are currently anticipated.

### **Burrell**

The Burrell Site is located in southwestern Pennsylvania, 1.6 km (1 mile) east of the Borough of Blairsville, Indiana County. The Burrell site is bordered on the south by the Conemaugh River and on the north by the Consolidated Rail Corporation railroad tracks. The site covers approximately 29 hectares (72 acres). In the late 1950s, Canonsburg shipped 11,600 tons of residual radioactive materials 50 miles to the Burrell site to be used as fill under railroad tracks. Remedial actions under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA) were completed at Burrell in 1987. In 1994, the disposal cell was accepted under the NRC general license. Previously, the site was considered a vicinity property to the Cannonsburg site, but due to the large quantity of contaminated materials and the distance between the sites, it was agreed that a separate NRC license for the disposal cell was appropriate. Under these provisions, public access to the disposal cell will be restricted indefinitely. The Grand Junction Office (GJO) is responsible for LTS&M at Burrell.

**Water:** Annual groundwater monitoring will continue in perpetuity at the Burrell Vicinity Property.

**Engineered Units:** The Burrell disposal cell is 49 acres in size, and contains 86,000 tons of residual radioactive material. It has a radon barrier cover and a rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M and access restrictions. LTS&M activities associated with the disposal cells include annual surface inspections, annual grass mowing, periodic vegetation control, and annual groundwater compliance monitoring.

### **C.H. Schnoor**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1995, and no stewardship activities are currently anticipated.

## Canonsburg

The Canonsburg site is within the Borough of Canonsburg, Washington County, in southwestern Pennsylvania, approximately 32 kilometers (20 miles) southwest of downtown Pittsburgh. The 7.5-hectare (18.6-acre) site lies between Chartiers Creek and the Conrail railroad tracks. The site contained more than 285,836 m<sup>3</sup> of contaminated materia, some of which were shipped to the Burrell site 50 miles away. Remedial actions under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA) were completed in 1995. Under these provisions, public access to the disposal cell will be restricted indefinitely. Restricted access is maintained by perimeter fences.

The Grand Junction Office (GJO) is responsible for LTS&M at Canonsburg. LTS&M costs for both Cannonsburg and Burrell total \$18,000 per year in perpetuity. LTS&M costs for groundwater total \$30,000 for the first five years then \$15,000 per year in perpetuity.

**Soil:** Soil was remediated to EPA standards.

**Water:** Approximately 5.3 million gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs at least twice since 1990: uranium and net gross alpha. The site assumes that no groundwater remediation is expected and expects natural attenuation to reduce contaminant levels below cleanup standards. Annual groundwater monitoring will continue for five years.

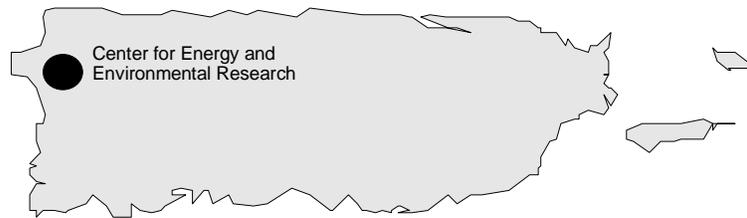
**Engineered Units:** Approximately 54,019 yd<sup>3</sup> of contaminated material generated at Cannonsburg were stabilized in two separate disposal cells, Canonsburg and Burrell. The Canonsburg disposal cell is 30 acres in size. It has a radon barrier cover and a rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO is responsible for conducting LTS&M and ensuring access restrictions are maintained. LTS&M activities associated with the disposal cells include annual surface inspections, annual grass mowing, and periodic vegetation control.

## **Shippingport**

The Shippingport Site is located approximately 32 km (20 miles) northwest of Pittsburgh, PA on the Ohio River. On December 2, 1957, Shippingport became the first large-scale nuclear power plant to attain a chain reaction. Shippingport was constructed to demonstrate the feasibility of producing useful energy from the atom for civilian application and to advance civilian power reactor technology. In 1977, Shippingport began operating on a thorium-uranium 233 core to demonstrate the feasibility of breeding in a water-cooled reactor; that is, producing more reactor fuel than was consumed.

Shippingport was shut down on October 1, 1982, for end-of-life testing, defueling, and devaluation of core performance. Congress assigned the decontamination and decommissioning of the reactor to DOE, and in 1989, Shippingport became the first nuclear plant in the world to be decommissioned to “greenfield” condition. The reactor vessel was shipped to a low-level waste disposal facility at the Hanford Site in Richland, Washington. No long-term stewardship activities are expected at this site.

# Puerto Rico

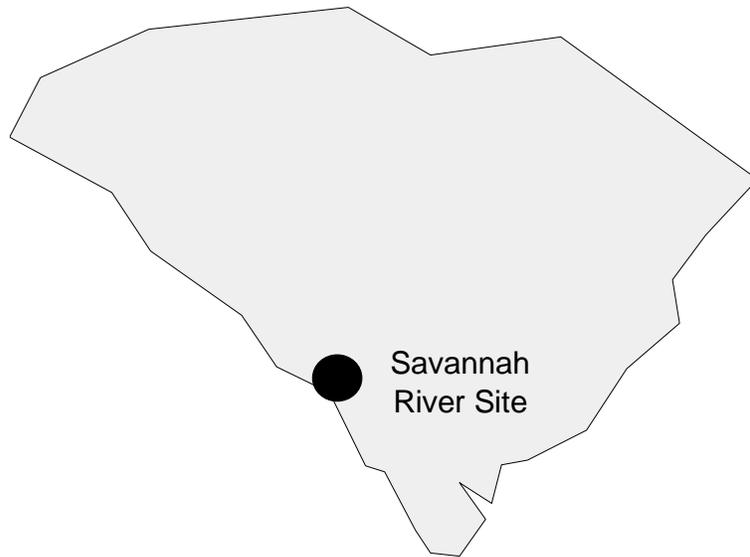


### **Center for Energy and Environmental Research**

The Center for Energy and Environment Research, located in the Commonwealth of Puerto Rico, consists of three sites and a decommissioned research reactor. The three sites total approximately 70 hectares (176 acres). These sites include the Mayaguez Site, the El Verde Research Area, and the Rio Piedras Site. The Mayaguez Site is located in western Puerto Rico, approximately 1.6 kilometers (1 mile) east of Mayaguez Bay. This site spans roughly 8 hectares (20 acres) and is situated adjacent to the University of Puerto Rico College of Agriculture and Mechanical Arts and the U.S. Department of Agriculture Experiment Station, northeast of the Mayaguez city limits. The El Verde Site encompasses approximately 63 hectares (156 acres), located in the Luqillo Forest approximately 23 kilometers (14 miles) southeast of San Juan in northeastern Puerto Rico. The Rio Piedras Site is located approximately 3.2 kilometers (2 miles) south of San Juan and consists of a biomedical facility. The Boiling Nuclear Superheat Research Reactor is an unrelated program located in Rincon, approximately 21 kilometers (13 miles) northwest of Mayaguez. The program consists of a defueled and entombed reactor and associated buildings.

Environmental restoration activities at CEER are complete. The Boiling Nuclear Superheat Research Reactor has been entombed, and all of the underground storage tanks containing fuel oil have been removed from the site. Surveillance and annual inspection reports of the Boiling Nuclear Superheat Research Reactor will continue through approximately 2136.

# South Carolina



## **Savannah River Site**

The Savannah River Site (SRS) is located in west-central South Carolina and is bordered on the south west by the Savannah River. The closest major population centers are Aiken, South Carolina, and Augusta, Georgia. The SRS comprises approximately 198,336 acres (310 square miles) but its production facilities occupy less than 10 percent of the total site area. The site's primary mission was the production of strategic isotopes used in the development and production of nuclear weapons for national defense. After the Cold War, the mission of the site changed but the site remains a major defense installation. The site maintains and currently operates facilities to process and purify plutonium and uranium, primarily for safety and stabilization purposes.

According to the March 1998 Future Use Plan, SRS will remain under federal government ownership under its current boundaries in perpetuity. DOE-EM will be the site landlord until 2038, after which site landlord responsibilities will be transferred to an unidentified federal government entity. The future uses of the site are not expected to change significantly from their current uses. The SRS Future Use Plan anticipates that the SRS will operate as a controlled access facility under its current boundaries and will require institutional controls in perpetuity. All areas with institutional controls will require federal oversight until the property is transferred with appropriate deed restrictions.

The most intensive future industrial and waste management uses of the site will occur in the Industrial Zone, close to the center of the site, with less intensive research and development, technology development, and other uses in the Industrial Support Zone, and limited controlled access for recreational activities in the Restricted Public Use Zone. Residential land use will not be allowed in any of the SRS land use zones at any time in the future. Site infrastructure, security, and other institutional controls will be maintained in all zones in perpetuity.

As of 1998 there were 128 identified surplus facilities at SRS. An additional 120 facilities may be surplus within the next five years. There are approximately 2,800 buildings at SRS. Of the 477 release sites that were identified as of 1997, 159 have been classified as remediated or as requiring no further action. Approximately 8,300 acres of groundwater plumes containing 600 billion gallons of contaminated groundwater have been identified at SRS. Final remedial action endstates for unremediated release sites and major surplus facilities at SRS have not yet been specified because Records of Decision (RODs) covering all release sites have not yet been signed and comprehensive remediation and D&D plans for the site have not been planned.

The site anticipates that DOE EM remediation activities and LTS&M activities for remediated release sites will be completed by 2038; however, LTS&M activities for remediated release sites, engineered units, and surplus facilities will become the responsibility of the new site landlord after

2038. A summary of LTS&M and stewardship issues for each of the six watersheds and their associated areas in the Industrial and Industrial Support Zones follows:

### **Flood Plain Swamp**

This watershed encompasses the D Area, TNX Area, A Area, B Area, and West M Area, all located in the Industrial Support Zone. Both M Area and West M Area border on the Restricted Public Use Zone. M Area and portions of D Area and West M Area were used for the disposal of debris, oil, and chemicals. The TNX Area was used to conduct pilot tests and for disposal of debris, oil, and chemicals. The area is contaminated with metals, VOCs, and radionuclides.

**Soil:** Contaminants of concern in the flood plain swamp area include metals, radionuclides, and VOCs. Preliminary evaluation of release sites in these areas has not yet been completed, and specific soil remediation strategies and technologies have therefore not been identified. It is anticipated that the remedy for buried waste, structures, and soil contamination in Flood Plain Swamp will focus on in place treatment or immobilization, rather than excavation and disposal. Cleanup levels will be determined with the regulators and with public concurrence during the remedial process and will be based on ARARs and risk-based concentration limits. Soil contamination, buried waste, and buried structures (e.g., pipelines) remaining in place will be contained through natural or synthetic capping.

**Water:** Contaminants of concern in groundwater include chlorinated VOCs, metals, and radionuclides such as tritium, cesium, uranium, and strontium. The groundwater strategy is a combination of ex-situ and in-situ treatments with target cleanup levels equal to the maximum concentration limits (MCLs). The duration of this treatment will be determined by the rate of remediation.

**Engineered Units:** All legacy low-level radioactive wastes from these areas are anticipated to be disposed in onsite vaults located in other areas of the site. Waste units closed in place in this area will contain residual metals, VOCs, and radionuclides. There is also a waste oil facility in the D Area, for which there are no current remediation plans.

**Facilities:** Facilities are contaminated with radionuclides and heavy metals. A final endstate for major surplus facilities in this area has not been determined, although no plans to reuse the facilities have been made other than the proposed reuse of the TNX Area for pilot plant research projects. Facilities are likely to remain in a radiologically contaminated state. At a minimum, the D-Area heavy water facilities and the M-Area fuel fabrication facilities will require restricted access and institutional controls. Deactivated major surplus facilities in D Area and M Area will be monitored through 2070 or until final D&D and final disposition of the surplus facilities. In the

interim, deactivated facilities will be maintained in accordance with DOE Order 430.1A, Life Cycle Asset Management. Access to deactivated facilities will be controlled, and they will undergo environmental monitoring. To prevent the spread of contamination, M Area facilities will undergo limited stabilization and deactivation.

### **Four Mile Branch**

This watershed encompasses E, S, Z, C, N, F, and H Areas and the Burial Ground Complex, all of which are located in the Industrial Zone. E Area and the Burial Ground Complex have been used as disposal sites for hazardous and radioactive wastes. Portions of this watershed located in the Industrial Zone have been identified as areas that could be developed for future waste management or industrial use. Some specific missions have been identified in the SR-ACPC and other SRS documents, including production of MOX Fuel and production and purification of tritium. Periodic monitoring and institutional controls will be implemented and deed restrictions will be required in the event that the property is transferred to other ownership.

**Soil:** Contaminants of concern in Four Mile Branch include heavy metals, radionuclides, and VOCs. Preliminary evaluations of release sites in these areas have not yet been completed and specific remediation strategies and technologies for remediation of these release sites have not been identified. It is anticipated that the remedy for buried waste and soil contamination at Four Mile Branch will focus on in place treatment or immobilization, rather than excavation and disposal. Specific remediation technologies will be determined during the remedial process for each of the sites with concurrence from the regulators and the public. The final endstate for the old radioactive waste burial ground at the Burial Ground Complex assumes the area will be capped. Cleanup levels will be determined during the remedial process and will be based on ARARs and risk-based concentration limits.

**Water:** Contaminants of concern in groundwater in the Four Mile Branch watershed include tritium and other radionuclides, metals, VOCs, and nitrates. The remediation strategy includes a pump and treat and reinjection system, including reverse osmosis, pre-filtration, and secondary wastewater treatment. The duration of pumping and reinjection is dependent upon hydrogeology and decay rates. It is anticipated that groundwater use will be restricted indefinitely. Groundwater monitoring will take place, although the duration and frequency is currently undetermined.

**Engineered Units:** Fifty-one HLW tanks, 2 saltstone disposal vaults, and 22 solvent tanks will remain in this area. The final endstate for the HLW Tanks is scheduled for 2024. To achieve the final endstate, all waste heels will be removed from the tanks, piping will be capped and sealed, and the tanks will be washed and filled with grout and left in place. The saltstone disposal vaults

will be covered with native soil and a cap will be installed consisting of layers of clay, gravel, geotextile fabric, and other materials. For the 22 old solvent tanks in this area, the liquid and sludge will be removed from these tanks, where feasible, and dispositioned according to agreements with the regulators. It is expected that the tanks will be filled with grout, capped, and left in place. It is anticipated that the units closed in this area will require institutional controls and LTS&M in perpetuity. Environmental monitoring will be required; however, the duration of this monitoring is undetermined at this time and dependent on facility operations.

**Facilities:** Facilities in this watershed are contaminated with radionuclides, heavy metals, VOCs, and asbestos. Several of the facilities are being considered for fissile materials disposition and future nuclear missions. Deactivation of the 247-F Naval Fuels Facility was completed in 1997, and the facility is currently undergoing LTS&M pending a decision on final D&D and final disposition. All processing equipment at the DWPF will be deactivated, the sand filter will be isolated and capped, and the DWPF waste treatment plant will be closed after vitrification of all waste is complete. The former nuclear processing facilities (F and H Canyons, 235-F building, HB-line, and C Reactor buildings) are anticipated to be deactivated between 2007 and 2015 and maintained in a LTS&M condition while awaiting a decision on D&D. F and H Canyon facilities will be maintained in a LTS&M condition while awaiting a decision on D&D in accordance with the Phased Canyon Strategy signed by the Secretary of Energy on July 17, 1997, and in accordance with DOE Order 430.1. The F and H Canyon facilities will be operated to stabilize nuclear materials. All of the facilities are likely to remain in a contaminated state. During deactivation and while awaiting a decision concerning final D&D, facilities in these areas will undergo surveillance, maintenance, and monitoring activities. Interim S&M activities include implementation of the guidelines of DOE Order 430.1A; surveillance of facility conditions; monitoring and controlling contamination; providing a safe method for entry into the facilities; and ensuring the structural integrity of the facilities. All of the former nuclear processing facilities will require restricted access and institutional controls. SRS assumes that these deactivated facilities will be subject to LTS&M through 2070, or until a decision is made concerning final D&D and final disposition of the facilities.

### **Lower Three Runs**

This watershed encompasses the R, L, P, and K Reactor Areas and Par Pond. The reactor areas are located in the Industrial Zone, and the Par Pond is located in the Industrial Support Zone. Release sites at the reactor areas were used for the disposal of radioactive and chemical wastes, and the Par Pond received sludge from the Central Shops (N Area) Sludge Lagoon. Environmental Restoration activities in these areas, including LTS&M activities, are scheduled to continue through 2038. It is anticipated that the reactor areas will be deactivated by 2013.

### *From Cleanup to Stewardship*

**Soil:** Contaminants of concern in the Lower Three Runs watershed include radionuclides (e.g., strontium, cesium, cobalt, and tritium), metals (including arsenic, chromium, and lead), and VOCs (e.g., TCE and PCE). The P and R Areas Burning/Rubble Pits were closed in 1981. The remediation strategy for contaminated soils and buried waste anticipates that contaminated soils, wastes, and structures may be treated or immobilized onsite, left in place, and subject to LTS&M. Cleanup levels will be determined during the remedial process for each of the sites and will be based on ARARs and risk-based concentration limits.

**Water:** Groundwater in these areas is contaminated with VOCs, heavy metals, cesium, uranium, and strontium. The duration of remediation will be determined by the rate of remediation. Contamination in Par Pond, Savannah River Swamp, and L Lake cannot be remediated without causing ecological damage. Restrictions on surface and groundwater use are anticipated to be required indefinitely. Monitoring activities and their duration will be determined when the remedial process is determined and with the concurrence of the regulators and the public.

**Engineered Units:** There are no landfills, vaults, or tank farms in this area. In-place waste units will be closed. LTS&M activities will be defined as the remedial process is selected.

**Facilities:** All of the reactors are potentially contaminated with PCBs, asbestos, and long-lived radionuclides. It is expected that long-lived radionuclides are present in these facilities, however, until characterization activities are completed, the nature and extent of the contamination is indefinite. Deactivation of the reactors in the K, L, P, and R Areas will be complete by 2012, and the Receiving Basin for Offsite Fuels (RBOF) will be remediated to meet the guidelines of DOE Order 430.1A. SRS has not prepared a definitive plan for D&D of the Production Reactors or the RBOF. The current plan is for “deactivation” of these facilities, rather than complete D&D. Neither the technologies nor the final approach to D&D of any of the major nuclear facilities is known at this time. Cleanup levels will be determined as deactivation plans are prepared. Each of the reactors will require some sort of restricted access or institutional controls, as determined by the deactivation plan. The reactors and the RBOF will be monitored and subject to LTS&M through 2070 or until D&D and final disposition. All LTS&M activities and their frequencies will be established by required Safety Basis documentation prepared at the completion of deactivation.

### **Pen Branch**

This area encompasses N, L, K, and G Areas. The N, L, and K Areas are located in the Industrial Zone. G Area is located in both the Industrial and Industrial Support Zones. Release sites in these areas were used for disposal of chemicals, metals, pesticides, organic chemicals, and contaminated wastewater.

**Soil:** Soils are contaminated with metals, VOCs, and radionuclides. The anticipated soil remediation strategy for SRS is that contaminated soil and buried waste will be treated or stabilized in place. Contamination remaining in place will be contained through natural or synthetic capping. Institutional controls and inspections will be implemented and deed restrictions will be required in the event that the property is transferred to other ownership.

**Water:** The groundwater in this watershed is contaminated with tritium and other radionuclides, VOCs, metals, and sulfate. The groundwater treatment strategy for this watershed with the exception of tritium contamination, is a combination of in-situ and ex-situ treatment. Tritium contamination in these areas is anticipated to be remediated through natural attenuation. Contaminated water will be remediated to MCLs. Restriction of groundwater use in these areas is anticipated to be required indefinitely.

**Engineered Units:** Waste units will be closed in-place. Closure of the units in this watershed will be designed on a unit-specific basis. LTS&M activities will be determined as remedial activities take place.

**Facilities:** The reactors in K Area and L Area will be deactivated as described in the Lower Three Runs section. The reactors will be monitored through 2070 or until D&D and final disposition.

### **Steel Creek**

This area encompasses portions of the L and P Areas, which are located in the Industrial Zone. The L Area seepage basin accepted small quantities of oils and organic chemicals of unknown use and origin. Undocumented amounts of radioactivity were released to the seepage basin through infrequent repair work. The L Area seepage basin was also used for disposal of the L Reactor's disassembly basin purge water. The burning/rubble pit in P Area was used for the disposal of organic chemicals of unknown use and origin, waste oils, and other wastes.

**Soil:** Contaminants of concern in this area include radionuclides, metals, and VOCs. The anticipated soil remediation strategy for the SRS is that contaminated soil and buried waste will be treated or stabilized in place. Contamination remaining in place will be contained through natural or synthetic capping. Institutional controls and inspections will be implemented and deed restrictions will be required in the event that the property is transferred to other ownership.

**Water:** Groundwater in this watershed is contaminated with tritium and other radionuclides, VOCs, heavy metals, and sulfates. The groundwater treatment strategy for this watershed is a combination of ex-situ and in-situ treatment. Tritium contamination in this watershed is anticipated to be remediated by natural attenuation. Restrictions on the use of groundwater in this

### *From Cleanup to Stewardship*

watershed are expected to be required indefinitely. The duration of remedial actions will be determined once remediation is taking place. LTS&M activities are expected, but the frequency and duration are currently unknown.

**Engineered Units:** Existing in-place waste units will be closed. The closure strategy for the units in this watershed has not yet been determined. LTS&M is expected, but the frequency and duration are not known at this time.

**Facilities:** The reactors in L Area and P Area will be deactivated as described in the Lower Three Runs section. The reactors will be monitored quarterly through 2070 or until D&D and final disposition.

### **Upper Three Runs**

This area encompasses the A, B, M Areas, and parts of E, F, and H Areas. The A, M, and B Areas are located in the Industrial Support Zone and the E, F, and H Areas are located in the Industrial Zone. The A and M Areas are adjacent to the Restricted Public Use Zone. Site operations in these Areas resulted in the disposal of waste in seepage and settling basins, unlined pits, waste piles, burial grounds, and underground process lines and storage tanks. F Area and H Area were used for plutonium separation, and H Area also processed tritium and uranium.

**Soil:** Contaminants of concern in Upper Three Runs areas include trichloroethylene, perchloroethylene, arsenic, cadmium, chromium, lithium, mercury, PCBs, aluminum, radionuclides, and lead. The remediation strategy for contaminated soils in this watershed includes soil vapor extraction, soil excavation, and capping of residual contamination. The number of units or acres to be capped in this watershed has not been determined. Cleanup levels will be incorporated into RCRA and/or CERCLA documents and will be based on ARARs and risk-based criteria. Soil monitoring, waste unit restrictions, and institutional controls and inspections will be implemented. Deed restrictions will be required in the event that the property is transferred to other ownership.

**Water:** Contaminants of concern in this watershed include VOCs (e.g. TCE and PCE), tritium, and metals (arsenic, cadmium, chromium, lithium, mercury, and lead). The groundwater remediation strategy for this watershed includes air stripping, in-situ chemical oxidation, underground steam stripping, and monitored natural attenuation. The duration and frequency of treatment is not yet determined.

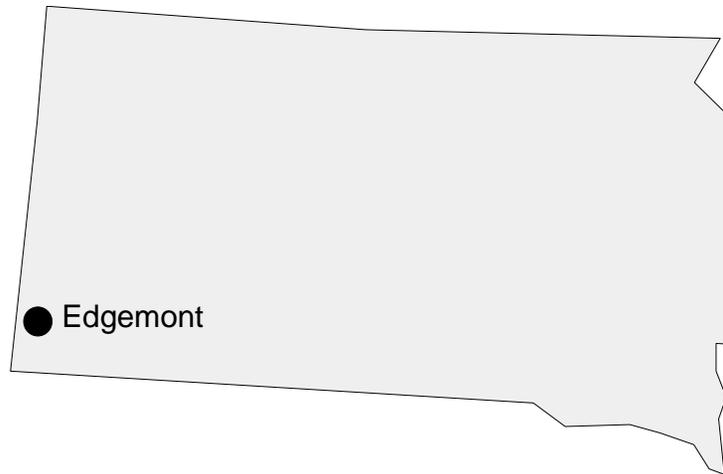
**Engineered Units:** Remediation of the tank farms and Saltstone facility in the H and F Areas is covered in the Four Mile Branch section. There are several hazardous waste disposal sites, a

closed sanitary waste landfill and radioactive burial grounds in the B Area. E Area has several facilities that were used or are currently used as disposal sites for hazardous and radioactive wastes. Wastes associated with these active and closed waste management facilities will remain onsite after stabilization and capping. The sanitary and non-radioactive waste landfill has been capped. The hazardous waste disposal units will either be closed with RCRA caps or other unit-specific engineered designs. No remedial decisions have been made for the burial grounds

**Facilities:** The remediation strategy and anticipated long-term stewardship requirement for contaminated facilities in this watershed are discussed in the Four Mile Branch section.

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# South Dakota



### **Edgemont Vicinity Properties**

The Edgemont Vicinity Properties disposal site is located approximately 3.2 kilometers (2 miles) south of the Tennessee Valley Authority (TVA) mill facility in Edgemont, South Dakota. The cell occupies approximately 40 hectares (100 acres) of the 145-hectare (360-acre) site. The disposal cell was closed in June 1996.

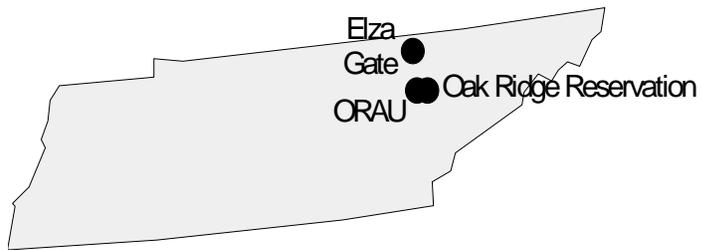
Remediation of this site consisted of demolishing site structures, excavating onsite contamination, and relocating mill tailings and contaminated structural materials into the disposal cell.

Radioactive material associated with the DOE cleanup of the Edgemont Vicinity Property was also disposed of in the cell. The mill site is an UMTRCA Title II site that was transferred by the NRC to DOE on June 27, 1996, for long-term stewardship. The disposal site is fenced and revegetated with native grasses. TVA made a one-time payment of \$581,610 to the U.S.

Treasury on June 26, 1996, as required under UMTRCA, to cover the costs associated with long-term stewardship of the site. Costs for LTS&M of the Edgemont Vicinity Property are estimated at \$7,000 per year in perpetuity.

**Engineered Units:** The disposal cell contains 4 million tons of low-level, radioactive tailings containing approximately 527 curies of radium-226. LTS&M activities include annual site inspections and minor maintenance, such as fence repairs, sign replacements, and cap maintenance, as necessary.

# Tennessee



### **Elza Gate**

This site was part of the Formerly Utilized Site Remedial Action Program. Cleanup was completed in 1992, and no stewardship activities are currently anticipated.

### **Oak Ridge Associated Universities**

The Oak Ridge Associated Universities Program and the Oak Ridge Institute for Science and Education consist of two primary sites, the South Campus Facility and the Freels Bend Area, located within the Oak Ridge Reservation. The South Campus Facility encompasses approximately 25 buildings and 52 hectares (130 acres) of pastureland, and is bounded by Bethel Valley Road, State Highway 62, Haw Ridge, and the Clinch River. The Freels Bend Area is located approximately 3.2 kilometers (2 miles) southwest of the South Campus Facility. This area is also located within the Oak Ridge Reservation and is bounded on three sides by the Clinch River.

Oak Ridge Associated Universities is not discussed in the Paths to Closure Report because remediation at the site is complete. The Office of Science is expected to remain the site landlord. All waste were shipped to Oak Ridge National Laboratories for disposal.

**Water:** In the South Campus Facility, groundwater contaminated with trichloroethylene will be addressed through monitored natural attenuation. Groundwater will require sampling every two years through 2025 to monitor natural attenuation.

**Engineered Units:** Three animal burial landfills will remain onsite in the Freels Bend Area. ORISE STU was decommissioned.

### **Oak Ridge Reservation**

The Oak Ridge Reservation (ORR) includes the Oak Ridge National Lab (ORNL), the East Tennessee Technology Park (ETTP; formerly called K-25), and the Oak Ridge Y-12 Plant. By 2013, the site expects that surface remediation will be complete and all groundwater remediation systems will be operational. Cleanup levels for the ORR will be capable of supporting the following uses: 4% controlled access, 21% restricted industrial, and 75% open space/recreational. Actual land use determinations will be made with full concurrence of all DOE programs and will be based on the Comprehensive Integrated Plan published in May 1998. Onsite contaminated groundwater will be placed under use restrictions.

At ORNL, burial grounds and other areas where contamination remains in place will be capped

and hydraulically isolated. Institutional controls will remain in place to control future use. Portions of this area will remain under restricted access. The Office of Science has an ongoing mission at ORNL.

A portion of the ETTP will be remediated to industrial levels, and serve as an industrial park utilized by private businesses. Contaminated areas within the reindustrialized area will be contained or consolidated and access to certain areas will remain restricted. Other areas of the ETTP will be appropriate for recreational use with restrictions. Oak Ridge expects that tenants using facilities in the reindustrialized area will take responsibility for some landlord activities. DOE will maintain responsibility for legacy contamination and other pre-existing conditions in this area.

DP has an ongoing mission at the Y-12 Plant and will use facilities to support manufacturing, storage, and other industrial uses. The site will cap and hydrologically isolate burial grounds and other areas where contamination or waste remains in place. The site will restrict access to areas used for secure storage of nuclear materials and waste. Oak Ridge is currently evaluating the possibility of constructing the Environmental Management Waste Management Facility (EMWMF) in the Y-12 area to serve as a permanent onsite disposal facility. The TDEC Division of Superfund is currently determining the endstate status at the privately-owned offsite areas impacted by ORR activities. Groundwater, both on and offsite, has been impacted by the site's activities, and DNAPLs are present in several areas. The Y-12 Long-Term Surveillance and Monitoring project will conduct stewardship activities for this area. S&M requirements will be fully defined after remediation activities are complete.

Oak Ridge has not yet obtained regulatory approval on the five major watershed RODs, which will finalize the program objectives and specific remediation activities. In addition, the decision to build the EMWMF has not yet been finalized. The Oak Ridge Environmental Management Site Specific Advisory Board is still soliciting recommendations from the public on appropriate end uses for the contaminated portions of the ORR. Therefore, endstates and their corresponding cleanup levels are still being determined for several areas. Oak Ridge assumes that the watershed RODs will be signed by 2000. Oak Ridge is currently in the process of re-baselining the entire program, which will determine the endstates for cleanup.

Because waste and contamination will remain onsite, stewardship, including monitoring and institutional controls, will likely be required for hundreds of years. For planning purposes, Oak Ridge currently assumes that stewardship will be required through 2070. Current cost estimates for the entire site range from \$15 million to \$20 million per year. Current plans are for Environmental Management to be responsible for stewardship activities related to decontamination and decommissioning, but not stewardship of uncontaminated lands. The Federal Government will maintain responsibility for site-wide groundwater monitoring and treatment in perpetuity. In addition, the site will continue to monitor offsite water bodies until contaminants have attenuated to protective levels. The Site Specific Advisory Board End Use Working Group made recommendations in July of 1998 on the long-term stewardship strategy for

the contaminated portions of the ORR. Specific stewardship requirements and duration will be determined as remediation is completed and end state decisions are finalized. Long-term S&M requirements will be established in the monitoring plan developed for each project.

### **Oak Ridge National Lab**

**Soil:** Soil at ORNL is contaminated with mercury, cesium, strontium, cobalt, and tritium. Sediments in the Melton Valley area are also known to contain transuranic radionuclides and PCBs. The site will excavate and treat contaminated soil and dispose of this material in the EMWMF (if constructed) at Y-12. Some contaminated soil and sediments, including those in the White Oak floodplain, may be stabilized in place. The site will cap radioactive burial grounds and hydraulically isolate these areas using slurry walls, french drains, and seep collection and pump systems. The site will address pits and trenches used for liquid LLW disposal using in-situ vitrification and hydraulic isolation. Contaminated sediments in settling basins will be removed or stabilized in place. Other contaminated soils will be removed and disposed of appropriately. In areas where contamination remains in place, the site will implement institutional controls to ensure protection. The site will periodically inspect the caps used to contain the burial grounds and LLW pits and trenches. Cap maintenance and repair will likely be required. The site will maintain institutional controls, including drilling restrictions, to control future use of areas where contamination remains in place. Access to burial/disposal areas will remain restricted. Current planning assumes a contiguous area of restriction in Melton Valley around all disposal areas and general restrictions on deep disturbances at ORNL.

**Water:** Contaminants driving the remediation include hazardous organics, radionuclides, and metals. After contaminated sediments in the White Oak lake, creek, and embayment are consolidated and stabilized in the lake bed and embayment, the site will backfill the lake and re-route the stream through a clean channel on top of the lake bed. The contaminated groundwater plume associated with Corehole 8 will be intercepted and treated. The site will also intercept and treat contaminated groundwater migrating from disposal areas. The site will maintain the existing infrastructure (e.g., sumps, drains) in this area. The site will maintain sumps and drains and continue groundwater treatment and monitoring indefinitely. Water from the french drains in Melton Valley and the waste treatment plant in Bethel Valley will require treatment. Groundwater will be monitored using hydrofracture grout wells and upgraded injection wells. The Federal Government will be responsible in perpetuity for ensuring that contaminated groundwater does not migrate offsite. Groundwater use will remain restricted. The site will monitor both on and offsite sediment and surface water. Restrictions on sediment dredging and fish consumption will be maintained.

**Engineered Units:** The site will excavate surface impoundment sediments. After removing sludge and scouring walls and floors, the site will stabilize gunite tanks in place. The old hydrofracture tanks will also be emptied, left in place, covered with compacted soil, and revegetated. An active landfill built in 1975 that is used for construction materials will remain onsite. Inactive landfills known to contain radioactive solid wastes also exist onsite. Approximately 200-250 acres of land

will require some form of cap and use restrictions. Tanks will be covered with compacted soil and revegetated.

**Facilities:** The site will dismantle or demolish most facilities and dispose of contaminated materials in the EMWFM (if constructed). Uncontaminated materials will be grouted below grade. Five reactors will be decommissioned. The Bulk Shielding (BSR) and the Tower Shielding (TSR) reactors will be deactivated but not decommissioned. The TSR is being privatized and will be used for commercial purposes. The BSR will be demolished, along with all other facilities except the Graphite Reactor. The site will also maintain the Oak Ridge Graphite Reactor building, as a National Historic Monument. No contaminated buildings will be maintained for reuse. Deactivated facilities will require S&M pending final D&D. Current S&M activities for facilities in safe shutdown include monitoring contamination, maintaining fire protection, and ensuring the structural integrity of the roofs and equipment. The site states that facilities will not require S&M after D&D. The Oak Ridge Graphite Reactor will require regular maintenance. Final D&D is expected to be complete in 2010.

#### **East Tennessee Technology Park (ETTP)**

**Soil:** The site will excavate and dispose of contaminated soil outside of the reindustrialized area that does not meet recreational cleanup levels. The site will achieve industrial cleanup levels in the reindustrialized area “within the fence” by removing shallow contaminated soils (less than two feet deep). In general, the site will cap and hydraulically isolate burial grounds. Approximately 1,000 acres will remain impacted and require use restrictions. In some areas, however, buried waste will be excavated so that the area can be released for unrestricted surface access. RCRA post-closure monitoring and CERCLA five year compliance monitoring will be required in areas where contamination remains in place. The site will inspect and maintain the caps used to cover the burial grounds. Periodic reseeded and regrading of vegetative covers will be required. The impacted areas, including those around the main plant will require use restrictions. Restrictions on excavation and groundwater use will also continue.

**Water:** Contaminants include PCBs, organics, and long-lived radionuclides. The site will maintain the existing infrastructure (e.g., sumps, drains) in this area to collect a portion of contaminated groundwater. The ETTP wastewater treatment facility will also continue to operate. French drains, reactive barriers and other collection systems will be used to contain and/or intercept contaminated groundwater. The site will treat extracted groundwater to achieve industrial use levels. The site will maintain sumps and drains and continue to operate the groundwater remediation system and the ETTP wastewater treatment facility. The Federal Government will be responsible in perpetuity for ensuring that contaminated groundwater does not migrate offsite. Groundwater use will remain restricted. The site assumes that it will continue to monitor the wells in this area until at least 2016. The anticipated costs for groundwater monitoring are approximately \$500,000 to \$1,000,000 annually although specific requirements have not been established.

**Engineered Units:** Approximately 50 acres of burial grounds, containing a wide range of classified material and equipment with radiological contamination, will remain in place. LTS&M activities will include cap maintenance and groundwater monitoring.

**Facilities:** Facilities currently shutdown contain large quantities of contaminants. These facilities will be managed in place until contaminants can be removed and treated, stored, or disposed. In many facilities, the contamination has become fixed on equipment and structures, requiring handling as hazardous or low-level radioactive waste. The site will demolish RCRA waste treatment facilities and remove all hazardous substances. Selected facilities will be decontaminated for reuse. The site expects that all facilities suitable for reuse by private entities will be leased by 2006. Other facilities will be decontaminated and demolished to slab grade. No below-grade demolition will be conducted. Some below grade contamination will be capped with clean soil. Released facilities will require deed restrictions to ensure proper future use. Deed restrictions, monitoring, and excavation restrictions will continue after final D&D.

## **Y-12 Plant**

**Soil:** Soils are contaminated with metals, radionuclides, VOCs, nitrates, and PCBs. The site will cover 10 acres in the Upper East Fork Poplar Creek area and an additional 10 to 20 acres in the Bear Creek burial ground area with multi-layer caps. The site will grade these areas for surface water control and install downgradient trenches to intercept contaminated groundwater and leachate. Buried waste will be removed from several areas. Contaminated soil will be excavated and disposed of in the EMWMF (if constructed), treated and backfilled, or consolidated and capped. The site will use grouting and trenches with reactive media to control contaminant migration from burial grounds and other areas where contamination or waste remains in place. RCRA post-closure monitoring of capped areas will be required. The site will maintain institutional controls, conduct CERCLA five-year reviews, inspections, monitoring, and reporting for all areas where contamination remains in place.

**Water:** The contaminants driving the remediation include VOCs, metals, radionuclides, and PCBs. A DNAPL plume in the east end of the site is likely contributing to offsite contamination. The site may use a pump and treat system to address this contamination and monitor the area to ensure the effectiveness of this action. Pump and treat systems may also be used to address deeper onsite groundwater plumes. Shallow groundwater will be intercepted by trenches and treated prior to discharge into Bear Creek. The site is considering installing a permanent system to address mercury contaminated shallow groundwater. Contaminants will remain in the sediments of both the on and offsite portions of the Clinch River. Poplar Creek, the Watts Bar system, and the Lower East Fork Poplar Creek are also contaminated. Because no effective technologies are available, this contamination will not be addressed by remediation, but will be left in place to naturally attenuate over time (20-100 years). The site will collect and treat surface water streams contaminating the creek. Contaminated sediments, contributing to offsite mercury contamination, will be removed from the storm sewer. Groundwater remediation will be conducted to meet

specific containment goals. The site assumes that remediation, sampling, data collection, and S&M of treatment systems will be conducted through 2070. Groundwater use will remain restricted. In areas where industrial use is allowed, institutional controls will be implemented to control groundwater use. The surface water bodies will be designated as recreational with restrictions. Dredging restrictions, fish consumption advisories, and warning signs will remain in place.

**Engineered Units:** The site is considering constructing the EMWMF in the Bear Creak area. This facility would include a permanent disposal cell for LLW, RCRA hazardous waste, TSCA-regulated waste, and mixed waste generated by CERCLA actions. The cell would be constructed above grade with leachate collection and monitoring systems. In the Chestnut Creek area, three RCRA landfills will be closed. Storage tanks will be emptied, then removed or filled with grout and left in place. Other facilities and burial grounds contain sanitary waste, LLW, and mixed wastes. If constructed, the EMWMF will require post-closure institutional controls, S&M, inspection, and repair in perpetuity. Existing RCRA landfills will require a minimum of 30-years of post-closure care.

**Facilities:** Buildings will either be left in place or decontaminated and removed. Other facilities will most likely be decontaminated and removed. Facilities will undergo LTS&M until they can be decontaminated for reuse or until the decommissioning and demolition process is complete. These activities generally involved regular observation of the structure to ensure that safety and security are maintained at a level appropriate for the status and eventual disposition of the facility. Nuclear materials will be stored in some areas and access will be restricted. Security and surveillance of nuclear materials and waste in secure storage will be required.

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# Texas



### **Chevron, Panna Maria**

Chevron Panna Maria is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Texas. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2000, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 6,500,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with grass and soil. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Conoco, Conquista**

Conoco, Conquista is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Texas. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2001, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The

groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 8,750,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with grass and soil. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Exxon, Ray Point**

The Exxon, Ray Point site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Ray Point, Texas. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2000, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 400,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with grass and soil. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Falls City**

The former Falls City mill and tailings site is located in Karnes County, 74 kilometers (46 miles) southeast of San Antonio and approximately 13 kilometers (8 miles) southwest of Falls City, Texas, and covers 240 hectares (593 acres) on two parcels of land. The site completed remedial

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actions in 1994 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Falls City. LTS&M costs for the disposal cell at the Falls City site total \$10,000 per year in perpetuity. Groundwater LTS&M costs total \$30,000 per year for five years.

**Soil:** Soil was remediated to EPA standards or was placed in the disposal cell.

**Water:** Approximately 1.2 billion gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceed MCLs at least twice since 1990: arsenic, cadmium, chromium, lead, mercury, molybdenum, net gross alpha, nitrate, radium, selenium, and uranium. No groundwater remediation is expected; however, groundwater must be monitored for five years.

**Engineered Units:** Approximately 1,756,867 m<sup>3</sup> of contaminated material was stabilized on site in a 127-acre disposal cell. The disposal cell has a radon barrier cover and rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO will responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. LTS&M activities for the disposal cell include annual surface inspections, removal of woody vegetation from the rock armor as necessary, and annual hay harvesting from the grass covered areas.

### **Pantex Plant**

Pantex Plant is located in the Texas panhandle, approximately 27 kilometers (17 miles) northeast of downtown Amarillo. The site consists of approximately 6,500 hectares (16,000 acres).

DOE's objective is to have all release sites remediated, or in remediation, by the end of 2000. The Office of Defense Programs (DP), the site landlord, has an ongoing production mission. Waste management operations will continue in support of this mission. DOE assumes that future land use will remain industrial, but that the entire site will be under controlled access. In addition to its RCRA status, the Pantex Plant is an NPL site. DOE is currently negotiating a tri-party Federal Facilities Agreement (FFA) with EPA and the Texas Natural Resource Conservation Commission. DOE assumes that release sites closed in accordance with its RCRA permit will require no additional remediation under CERCLA. EM has funded LTS&M activities through 2002. It is unknown at this time which DOE program will assume responsibility for long-term

surveillance, maintenance, groundwater remediation, and monitoring. Stewardship requirements will be fully defined as remedial actions are completed. The estimated annual cost for conducting surveillance, maintenance, and monitoring activities is \$2,000,000.

**Soil:** Soils are contaminated with high explosives, residual radionuclides, and VOCs. DOE will remediate soil to industrial risk levels identified in the Texas Risk Reduction Standards Guidance, which are at least as stringent as EPA standards, and in some cases, more stringent.

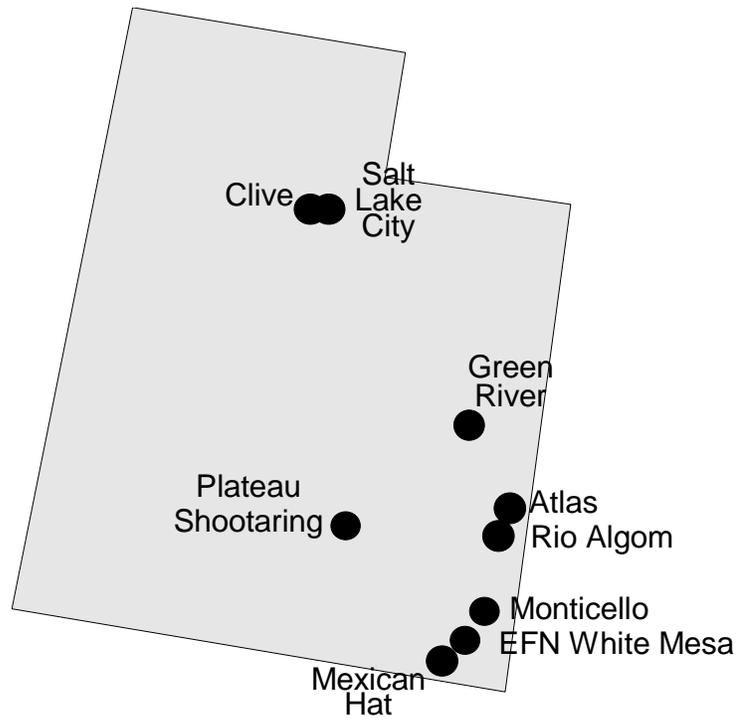
**Water:** Contaminants driving water remediation are VOCs, metals, and high explosives. There is no anticipated use of the groundwater, and the DOE is supplying residents with alternate water supplies. Groundwater will undergo pump and treat to cleanup levels identified in the Texas Risk Reduction Standards Guidance, which are 26 ppb for RDX and 5 ppb for HMX. DOE assumes that the groundwater pump and treat system will continue to operate until 2015. The duration of this activity will be reevaluated periodically. Because the long-term efficiency and capability of this system is uncertain, DOE recognizes that additional time could be required to fully remediate the contaminated plume. Semi-annual groundwater monitoring will be necessary for an unspecified period of time.

**Engineered Units:** There are two landfill areas on the site. One accepts Class 3 non-hazardous waste. The Corrective Measures Study is expected to recommend engineered RCRA caps for the landfills. Landfills will require post-closure monitoring and cap inspections and maintenance.

**Facilities:** DOE will place excess facilities in caretaker status pending future D&D. There are over 250 DP facilities, some of which are significantly contaminated with explosives. A large portion of these facilities may be excessed in the next 10 years.

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# Utah



### **Atlas, Moab**

Atlas is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Moab, Utah. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2005, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 10,600,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **EFN, White Mesa**

The White Mesa site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Utah. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2015, at which point the Grand Junction Office

will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 3,500,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### Green River

The former Green River mill and tailings site covers approximately 3.6 hectares (9 acres) and is located in the east-central portion of Utah in Grand County. The site is 1.6 kilometers (1 mile) southeast of the City of Green River and 113 kilometers (70 miles) west of the Utah-Colorado border. The U.S. Army's White Sands Missile Range Utah Launch Complex uses most of the vacant land south and east of the site. The site completed surface remedial actions in 1989 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Green River. LTS&M costs for the disposal cell at the Green River site total \$4,000 per year in perpetuity. Groundwater LTS&M costs total \$20,000 per year until 2001 and \$30,000 per year for the period 2001-2006.

**Soil:** Soil was remediated to EPA standards.

**Water:** Approximately 180 million gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs: chromium, molybdenum, net gross alpha, nitrate, selenium, and uranium. No groundwater remediation is expected; however, quarterly groundwater monitoring is expected until 2006.

**Engineered Units:** Approximately 382,000 yd<sup>3</sup> of contaminated material was placed in a 6-acre, on-site disposal cell. The disposal cell has a radon barrier cover and a rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal cell. LTS&M activities for the disposal cell include annual surface inspections and minor maintenance such as fence repairs and sign replacement. No significant repairs are expected for the disposal cell.

## **Mexican Hat**

The former Mexican Hat mill and tailings site covered approximately 95 hectares (235 acres) and is located on Navajo Nation land at Halchita, Utah, about 2.4 kilometers (1.5 miles) southwest of Mexican Hat, Utah. Before remedial action, the site contained two adjacent tailings piles. One covered 10 hectares (25 acres) and the other covered 19 hectares (48 acres). The site also contained seven mill buildings and associated debris, a concrete pad, contaminated soil, and wind-blown material. The site completed remedial actions in 1995 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Mexican Hat. LTS&M costs for the disposal cell at the Mexican Hat site total \$5,000 per year in perpetuity. Groundwater LTS&M costs total \$40,000 per year for the period 1999-2004.

**Soil:** Soil was remediated to EPA standards.

**Water:** Approximately 110 million gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded MCLs: nitrate, molybdenum, selenium, uranium, net gross alpha, arsenic, chromium, and radium. No groundwater remediation is expected; however, groundwater monitoring of springs and seeps will be conducted from 1999-2004.

**Engineered Units:** The final disposal cell covers approximately 72 acres and contains approximately 3,800,000 yd<sup>3</sup> of contaminated material. The disposal cell includes a radon cover and rock surface layer to control erosion and will remain on site. According to EPA standards, the cover of the disposal cell must be designed to remain effective for 200 to 1,000 years. GJO will be responsible for conducting LTS&M, access restrictions, and institutional controls. LTS&M activities for the disposal cell include annual surface inspections and vegetation control.

## **Monticello Mill Site and Vicinity Properties**

The Grand Junction Office (GJO), located in Grand Junction, Colorado, is responsible for remediating the Monticello Projects, which include the Monticello Mill Tailings site and the Monticello Vicinity Properties. These sites, which are included on the National Priorities List (NPL), are located near the City of Monticello in San Juan County, Utah. The Monticello Mill Tailings site comprises three operable units: the mill site, a 44-hectare (108-acre) tract located along Montezuma Creek, south of the City of Monticello; 29 peripheral properties located north

and south of the mill site; and the surface (Montezuma Creek) and ground water located beneath and extending beyond the mill site. The Monticello Vicinity Properties encompass 410 vicinity properties in six sections located in and around the Town of Monticello.

DOE will complete surface remediation of the Monticello Mill site and vicinity properties by 2001. Depending on the remedies selected, groundwater and surface water remediation may continue beyond 2006. The mill site will not be deleted from the NPL until surface and groundwater meets negotiated cleanup levels. Areas that meet the radium-226 standards established in 40 CFR 192 will be released with NRC's "no radiological restriction" status. DOE, EPA, and the State of Utah are currently determining final land use restrictions for areas where supplemental standards have been applied. DOE expects that the land it owns on the mill site will be deeded to the City of Monticello for recreational use. DOE will maintain control of a permanent disposal cell located on the DOE-owned portion of the peripheral property. DOE assumes that it will reach agreement with EPA and the State of Utah on cleanup levels and remedies for surface water, sediments, and groundwater by 2008. DOE is also working with the Site Specific Advisory Board to reach concurrence on a future land use plan. Because contamination will remain on the mill site, vicinity, and peripheral properties, DOE must conduct LTS&M. The GJO LTS&M program will assume stewardship responsibility following remediation. In addition to LTS&M of the permanent repository, this program will be responsible for post-remediation CERCLA inspection of the repository, mill site, vicinity and peripheral properties, and any NPL deletion activities conducted after 2001 (e.g., groundwater remediation). The LTS&M Plan, which is not yet complete, will fully define stewardship duration, activities, and final land use restrictions.

**Soil:** Soils are contaminated with radium, uranium, and heavy metals. EPA and the State have approved supplemental standards for some vicinity and peripheral properties where residual tailings contamination will remain below risk-based levels. All other areas of the mill site and vicinity and peripheral properties will be remediated to the radium-226 standards established in 40 CFR 192. Tailings and tailings-contaminated soil will be excavated and placed in the permanent repository on DOE-owned peripheral property. The mill site will be backfilled with clean material from onsite. DOE is responsible for LTS&M of areas where supplemental limits have been applied. DOE will monitor vicinity and peripheral properties where tailings contamination remains to evaluate migration of contaminated soils. No residential development will be allowed in these areas. Deed restrictions will be applied to control future use. Other LTS&M activities will include evaluating offsite migration and monitoring potential contamination in construction areas.

**Water:** Contaminants of concern include metals (molybdenum, selenium, cobalt, copper, lead, vanadium, zinc, and arsenic) and radionuclides (radium, gross alpha, and uranium). DOE will

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remediate contaminated sediments and surface water in Montezuma Creek Canyon to acceptable risk-based standards negotiated with EPA and the State of Utah. DOE is also responsible for remediation of contaminated groundwater downgradient of and beneath the site. DOE, EPA, and the State of Utah have not yet concurred on cleanup levels or remedies for contaminated surface water or groundwater. The LTS&M program will be responsible for ongoing implementation of the remedy selected for groundwater downgradient of and beneath the site. This remedy may include monitoring only or active remediation and monitoring. GJO will also address any potential contamination of groundwater beneath the repository if action leakage rates are exceeded. Use of groundwater will be restricted until water quality meets acceptable levels. Groundwater will be monitored through the use of wells and surface water will be monitored by taking grab samples in Montezuma Creek. Monitoring will be conducted until negotiated remediation levels are met. The aquifer classification is dictated by the State of Utah. Anticipated future uses will be either residential or agricultural.

**Engineered Units:** A permanent repository for tailings and tailings contaminated soil will remain on a DOE-owned peripheral property. A cover, which includes clean backfill from the mill site and an HDPE liner, will control radon emissions, infiltration of precipitation, and erosion. Native vegetation will be established over most of the surface area of the cover with only a few acres requiring rock. The disposal cell has a RCRA-equivalent liner and an evaporation pond. DOE assumes that the GJO LTS&M program will decommission this pond in 2009. DOE will maintain permanent control of the disposal cell. GJO will conduct LTS&M of the repository and the evaporation pond. Inspections will ensure erosion stability of the repository cover and the success of re-vegetation. GJO will monitor leachate to ensure that the repository performance achieves regulatory standards. GJO is also responsible for D&D of the evaporation pond. Initially, visits will be made frequently, perhaps monthly. After a few years, monitoring frequency will decrease substantially. Access will be controlled with fences and periodic visits will be required to ensure fencing remains intact.

### **Plateau, Shootaring**

The Plateau site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Shootaring, Utah. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing

maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site is expected to be transferred to the Department in 2015, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Rio Algom, Lisbon Valley**

Rio Algom is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Utah. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2010, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 3,900,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

## **Salt Lake City**

The 52-hectare (128-acre) Salt Lake City site is located about 6.4 kilometers (4 miles) south-southwest of the center of Salt Lake City. An ore-processing mill and ore storage and transportation facilities were located on 3.2 hectares (8 acres) on the eastern portion of the site. Tailings occupied the remaining 49 hectares (120 acres) with piles up to 5 meters (16 feet) high. The site completed remedial actions in 1989 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA).

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Salt Lake City. LTS&M costs for the disposal cell at Salt Lake City total \$5,000 per year in perpetuity. Groundwater LTS&M costs for the former mill site total \$30,000 per year for the period 1999-2004.

**Soil:** Soil was remediated to EPA standards. Approximately 826,008 m<sup>3</sup> of contaminated materials were excavated and shipped to the South Clive disposal cell 85 miles from the site.

**Water:** According to the UMTRA groundwater PEIS, approximately 350 million gallons of groundwater are contaminated. The following chemicals have exceeded the MCLs at least twice since 1990: arsenic, molybdenum, net gross alpha, and uranium. No groundwater remediation is expected. Annual groundwater monitoring will be conducted at the former mill site from 1999-2004; however, monitoring of the disposal site will not be required.

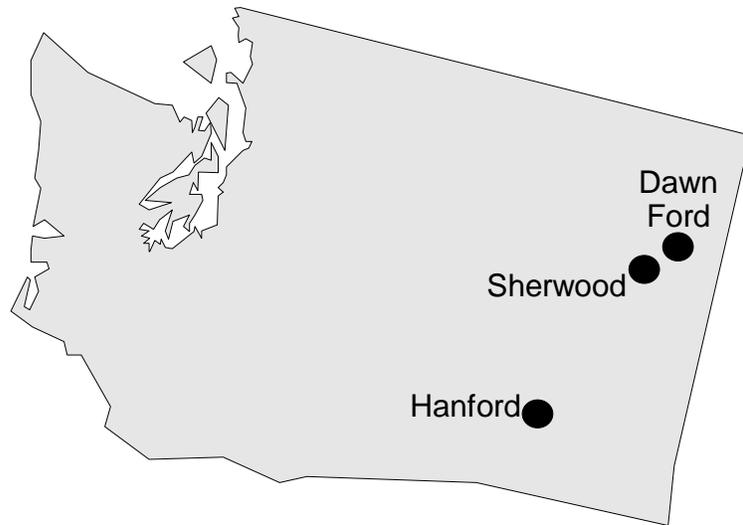
## **Salt Lake City, Clive**

The Clive disposal site is in Tooele County, Utah, approximately 81 miles west of Salt Lake City. The Great Salt Lake Desert lies to the west of the site, and to the east is the Cedar Mountains mountain range. Mill tailings and associated contaminated materials were relocated from the South Salt Lake City mining site to the Clive disposal cell in 1988. The NRC licensed the disposal site in 1997. Remedial action was conducted by the State of Utah under the direction of the UMTRA surface project.

**Water:** The existing groundwater is classified as limited use because of poor ambient water quality; therefore, groundwater monitoring is not required. No stewardship is expected.

**Engineered Units:** The disposal cell covers 22 hectares (54 acres) and contains 2,600,000 cubic meters of tailings and other radioactive materials. The cell is unlined; however, the excavation subgrade was scarified and compacted before fill placement. The tailings were covered with an engineered cap of clay and rock, which serves as a radon and infiltration barrier. The disposal cell is surrounded by fences to control access. The cell will require annual monitoring.

# Washington



### **Dawn, Ford**

Dawn is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Ford, Washington. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2019, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 3,100,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Hanford Site**

The Hanford Site occupies approximately 1,450 square kilometers (560 square miles) of shrub-steppe ecosystem in the southeastern part of the State of Washington. The site is the location of archeological sites dating back more than 10,000 years. The Columbia River, which runs through the northern portion and forms the Hanford Site's eastern boundary, sustains numerous fish and wildlife species and is the source of irrigation and drinking water to many Pacific Northwest communities. The river is also important to Native Americans in the region for its cultural values, and to environmentalists and many recreationalists as one of the last free-flowing stretches of the Columbia River. The City of Richland is located at the south border of the site, and the cities of Kennewick and Pasco are located less than 24 kilometers (15 miles) southeast of the site. Approximately 100,000 people occupy these three cities.

DOE plans to complete remediation of the site by 2046, although portions of the site have

completed remediation already and other sections will be completed before 2046. All special nuclear materials, spent nuclear fuel, and HLW will be sent offsite. LLW, MLLW, and other contaminants will remain onsite. The federal government is expected to maintain ownership of most of the site once cleanup is complete. DOE will consider releasing portions of the property for reuse when they are no longer needed to support ongoing missions. Currently, part of the 3000 Area has been transitioned to the Port of Benton, and the U.S. Fish and Wildlife Service and the Washington Department of Fish and Wildlife manage the North Slope Area and the Fitzner/Eberhardt Arid Lands Ecology Reserve. DOE is considering transferring excess land within the 1100 Area to the City of Richland. Specific land use decisions cannot be made until the Hanford Remedial Action EIS and Comprehensive Land Use Plan are completed.

The Environmental Management program is expected to act as the steward for all areas of the site retained by the federal government in perpetuity. The site will restrict access to areas used for radioactive waste disposal and buffer zones for as long as necessary to ensure protection. Remote sensory technologies will be implemented to minimize entries into hazardous facilities. The site will maintain contaminated soil sites by controlling vegetation growth and removing contaminated vegetation. The site will conduct routine surveys and monitoring to ensure that areas remain properly vegetated. The Effluent and Environmental Monitoring Program will continue to monitor air and liquid effluent and surface radiation. The Landlord Project will be responsible for maintaining and upgrading the necessary site infrastructure. Major facility repairs will be conducted every 5 years and roofs will be replaced every 20 years. The site will determine institutional controls and S&M requirements for specific areas as remediation is completed and waste sites are certified as complete under either CERCLA or RCRA. The annual cost for LTS&M varies drastically; in early years, it is expected to be approximately \$600 million, but as facilities and wastes are placed in final disposition, it is expected to decrease to \$51 million.

**Site-Wide Water:** Groundwater cleanup levels and remediation strategies consistent with future land use will be established in the CERCLA or RCRA process conducted for individual waste sites. DOE is currently assessing the type and extent of contamination so that the ROD can be completed. The site is continuing to consider input from the public and the stakeholders. Currently, approximately 85 square miles of groundwater exceeds drinking water standards. Groundwater is contaminated with strontium, carbon tetrachloride, uranium, technetium, iodine, and cesium. A portion of this contaminated groundwater has reached the Columbia River. Although the final groundwater remedy has not been selected, the site anticipates remediating strontium to drinking level standards of 8 pci/L. Prior to implementation of the final remediation strategy, the site will monitor groundwater and intercept or contain contamination in order to protect the Columbia River and to prevent offsite migration. Institutional controls will remain in place indefinitely to restrict groundwater use. Semi-annual monitoring will continue for at least 30 years after closure of the last facilities. Acceptable future uses of the aquifer have not yet been

determined. Although alternate drinking water sources are not currently provided, if the tritium plume continues to encroach, alternate sources may need to be provided for those few on-site sources that use this aquifer as a drinking water source.

## **HANFORD 100 AREA**

The 100 Area will remain under restricted access. Institutional controls will be implemented to protect ecological, cultural, and Native American resources.

**Soil:** The site will excavate approximately 3 million yd<sup>3</sup> of contaminated soil and solid waste from this area. The site states that the initial ROD for this area establishes residential cleanup standards for soil. For radionuclides, the residual contaminant concentrations specified in the ROD are equivalent to a 15 mrem/year dose level. This material will be disposed of in the Environmental Restoration Disposal Facility (ERDF), located in the 200 Area. Institutional controls will be implemented to protect ecological, cultural, and Native American resources.

**Water:** Discussed in site-wide summary.

**Engineered Units:** No engineered units will remain onsite at the 100 Area.

**Facilities:** Primary contaminants of concern include radionuclides, lead, and asbestos. The site will stabilize the nine 100 Area Reactors, the N-fuel basin, and the K basins, and maintain these facilities in interim safe storage (ISS) for up to 75 years. Eventually each reactor core will be removed in one piece and buried in the 200 Area. The footprint for the reactors in ISS will be reduced to the containment structure around the graphite stack. For the N-fuel basin and the KE/KW basins, the footprint reduction during ISS mode will include the fuel storage basins. The final ISS configuration of the KE/KW basin will be similar to the N-Reactor fuel basin, with all sludge and water removed and shield cover blocks placed over the empty fuel pool. The final disposition of the reactors after the ISS phase has not yet been determined. The B-Reactor, which will not be placed in ISS, will be retained in-tact as a museum. For facilities in ISS, the site will conduct repairs every five years to maintain facilities in a safe condition pending final D&D. Interim S&M will be required for at least 75 years while reactors are awaiting final disposition. During this interim phase, the reactor doors will be welded shut. Every five years, the doors will be opened, and personnel will check the stability of the building, the roof, conduct a radiological survey, and then re-weld the doors. Cleanup of each facility will be to radiological control levels.

**HANFORD 200 AREA**

For the purposes of this report, the description of this area also addresses the Central Core Area. The Central Core Area will be used by the federal government in perpetuity. The federal government will continue to use the 200 Area for management and disposal of nuclear materials. Several permanent disposal facilities, including the Environmental Restoration Disposal Facility (ERDF) and a RCRA compliant burial ground system, will remain in place. The site assumes that some portions of the 200 Area will be leased for public or private reuse. Cleanup levels have not yet been established.

**Soil:** Contaminants of concern include long-lived radionuclides and carbon tetrachloride. Other contaminants include organics and inorganics. Buried waste, including LLW and MLLW, and associated soil contamination will remain in place. The site will place surface barriers over contaminated soil, waste sites, and burial grounds inside the 200 Area fence line and excavate and dispose of contaminated soil outside the fence line. Characterization of soil contamination in this Area is ongoing. Target cleanup levels will be the Model Toxic Control Act (MTCA) C standards for non-radioactive substances, and 15 mrem per year for radioactive substances. The site will restrict access to radioactive waste disposal areas and buffer zones through the use of signs and fences for as long as necessary to ensure protection. Capped soil areas within the fence line will require periodic LTS&M. Institutional controls will be implemented to protect ecological, cultural, and Native American resources.

**Water:** Discussed in site-wide summary.

**Engineered Units:** Many engineered units will remain in the 200 Area after site remediation is complete including: 177 single- and double-shelled HLW tanks and structures; the Environmental Restoration Disposal Facility (ERDF); RCRA-compliant burial grounds; mixed waste disposal trenches; and a sanitary waste landfill. These units will contain HLW residues; waste generated from CERCLA remediation; solid LLW; MLLW; and sanitary waste, respectively. The site will retrieve waste from the 177 single- and double-shell tanks located throughout the site. Residual waste, in-tank equipment, tank structures and any underlying or adjacent contaminated soil will be treated as necessary and disposed of in place. Tanks will be closed in a RCRA compliant manner. In order to ensure safe storage prior to final disposition, the site will stabilize tanks and mitigate tank safety issues. The site will vitrify the HLW fraction of the tank waste and store the sealed HLW canisters in the Canister Storage Building, pending shipment to an offsite geological repository.

The site will dispose of waste generated by remediation of CERCLA sites in the ERDF which is a large-scale RCRA compliant landfill with a Subtitle C liner and leachate collection system. The

### *From Cleanup to Stewardship*

ERDF is an evolving landfill that will include several disposal cells at the time of closure. The site anticipates that it will close these permanent waste disposal facilities by 2046. The site will dispose of solid LLW from on- and offsite in the 200 Area RCRA-compliant burial ground and disposal system. This unit will be closed with a RCRA-compliant engineered cap. Solid MLLW will be disposed of in the mixed waste disposal trenches.

A sanitary solid waste landfill will remain in the Central Core Area. The site will close this landfill by 2007. The closed burial grounds, MLLW trenches, and the ERDF will require RCRA post-closure inspection and monitoring for a minimum of 30 years. The site states that tank farms will require post-closure monitoring through at least 2050. The site anticipates the use of institutional controls, such as deed restrictions, fences, active surveillance, and other entry control.

**Facilities:** The Plutonium Finishing Plant (PFP) complex will continue to store chemically reactive plutonium until approximately 2028. Once this material is shipped offsite, the site will complete deactivation of the PFP. For planning purposes, the site currently assumes that 200 Area canyon facilities will be demolished, buried in place, and covered by a barrier. In addition to HLW canisters, the site will store all SNF in the Canister Storage Building (CSB) for approximately 40 years pending shipment to an offsite geologic repository. The CSB will be deactivated once all SNF and HLW is dispositioned. The site will eventually either dismantle or entomb all 200 Area facilities although the final disposition has not yet been determined. The site will monitor the HLW canisters and SNF stored in the CSB in accordance with DOE requirements pending ultimate disposition in offsite facilities. Plutonium and other SNM stored in the PFP will also require active stewardship pending final disposition. In addition to S&M, safeguards and security will be maintained.

### **HANFORD 300/400 AREA**

The 300 Area includes the majority of the waste sites in the area that the Hanford Site Strategic Plan refers to as the South 600 Area. For the purposes of this report, the description of this area also includes the 400 Area and the 1100 Area. DOE is seeking regulatory approval to remediate 300 Area waste sites, materials, and facilities to an interim end state that allows for limited, restricted industrial use. Under this plan, facilities will be deactivated then demolished or refurbished to support ongoing research or economic redevelopment. The federal government will retain ownership but will lease some land and facilities for public and private reuse. The final end state for the 300 Area will be determined by the ongoing CERCLA process. The 1100 area has been remediated and removed from the National Priorities List and is being considered for industrial re-use by the tri-cities area.

**Soil:** The primary soil contaminants are uranium and cobalt-60, but TRU, metals, and solvents

may also be present. The site will excavate approximately 700,000 yd<sup>3</sup> of contaminated soil and buried waste above cleanup levels from the 300 Area. This area includes multiple burial grounds. This material will be disposed of in the ERDF, located in the 200 Area. To date, the top 10-12 feet of uranium contaminated soils have been excavated, and the excavated areas have been revegetated. 1100 Area soils will be cleaned to unlimited surface use. Cleanup levels for radioactive substances in the 300 area are 15 mrem per year, and for non-radioactive substances, the State of Washington's MTCAC values for dangerous constituents. Groundwater and subsurface use will remain restricted in these areas. Deed restrictions will be necessary to control use due to the industrial use cleanup scenario. Institutional controls will be implemented to protect ecological, cultural, and Native American resources.

**Water:** Discussed in site-wide summary.

**Engineered Units:** The unneeded waste management facilities will be closed in accordance with RCRA. The tank farms and trenches will require RCRA post-closure surveillance and maintenance for at least 30 years. Access to these units will be restricted for as long as necessary to protect human health.

**Facilities:** The site will decontaminate some facilities to achieve an interim endstate that allows for limited restricted industrial reuse. The site will maintain the Fast Flux Test Facility and the Fuels and Materials Examination Facility, located in the 400 Area, in "hot standby" pending a decision on whether these facilities will be used to support ongoing missions. The Office of Nuclear Energy will assume responsibility for both of these facilities in 1999. The term "hot standby" refers to maintaining a facility in a state where it can be brought back into production service with minimal time and effort.

### **WNI, Sherwood**

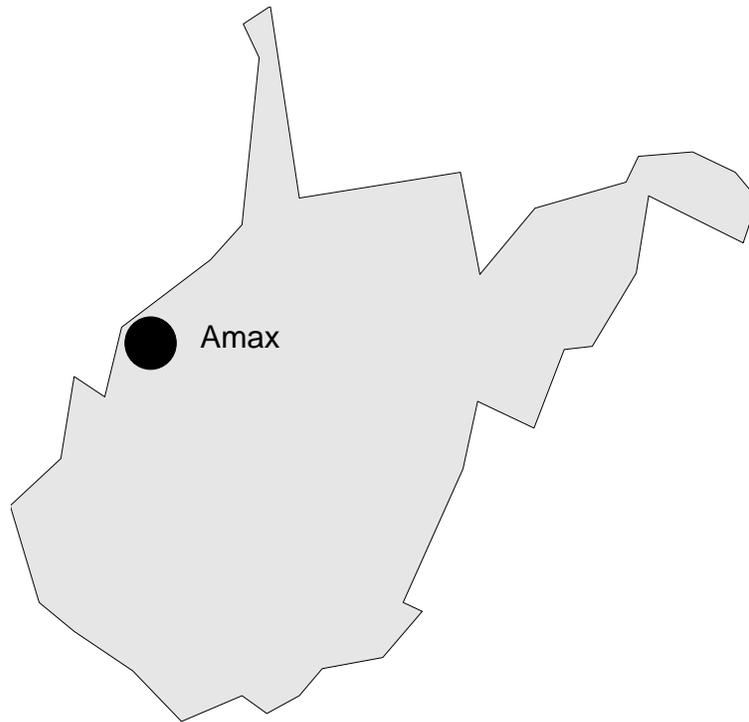
The WNI, Sherwood site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Washington. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 1999. Upon transfer, the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 2,900,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cover the site with vegetation. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

# West Virginia



## **AMAX**

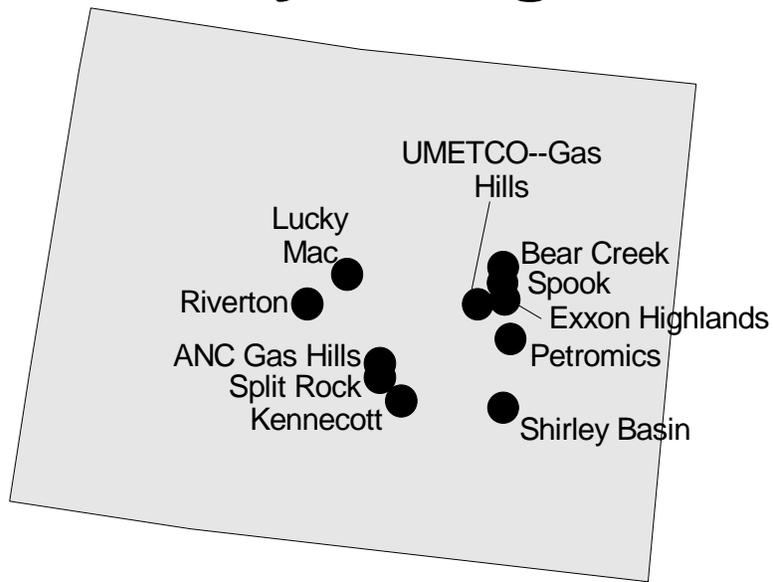
The AMAX, Parkersburg site is a 6-hectare (15-acre) former mill facility located in Parkersburg, West Virginia. Between 1957 and 1974, the site produced zirconium and hafnium metal sponges from zircon ore. An onsite disposal cell covers approximately 5 hectares (12 acres).

Remediation of the site was completed in 1983 and consisted of demolishing site structures and burying contaminated structural materials, radioactive soils, and pyrophoric materials on site. The site is classified as a Section 151(c) site under the Nuclear Waste Policy Act of 1982 (NWPA). The site was transferred from AMAX to DOE on March 4, 1994. DOE's Grand Junction Office is the current landlord at the site and is responsible all long-term stewardship activities associated with the site. AMAX made a one-time payment of \$230,000 to the U.S. Treasury in January 1994, as required under NWPA, to cover the costs associated with long-term stewardship of the site. Stewardship costs for engineered units at the Parkersburg site are estimated at \$6,000 per year in perpetuity. Additionally, groundwater monitoring, which will occur once every five years, is estimated to cost \$3,500 per occurrence.

**Water:** Groundwater at the site is potentially contaminated with metals, rare earth elements, radium, and uranium. Four of the six wells on the Parkersburg site are used for water level measurements only. The remaining two wells are used to sample for the contaminants of concern. To date, no groundwater contamination has been detected at the site. Groundwater monitoring will continue to occur once every five years for an, as yet, undermined amount of time.

**Engineered Units:** Engineered units at the site contain low-level radioactive waste. The 5-hectare (12-acre) disposal cell contains contaminated structural materials, radioactive soils, and pyrophoric materials. The cell is capped with clay and covered with grass to prevent erosion. LTS&M activities include annual site inspections and minor maintenance, such as fence repairs, sign replacements, and cap maintenance, as necessary.

# Wyoming



### **ANC, Gas Hills**

ANC is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Gas Hills, Wyoming. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2001, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 5,800,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with rock. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Exxon, Highlands**

Exxon Highlands is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Highlands, Wyoming. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2002, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 11,400,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with soil and grass. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Kennecott, Sweetwater**

The Kennecott site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Sweetwater, Wyoming. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2015, at which the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 2,300,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Pathfinder, Lucky MAC**

The Pathfinder Lucky MAC site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Wyoming. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2005. Upon transfer the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 11,700,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Pathfinder, Shirley Basin**

The Pathfinder Shirley Basin site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Wyoming. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2004. Upon transfer, the Grand Junction Office

will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 8,200,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Petromics, Shirley Basin**

Petromics Shirley Basin is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Shirley Basin, Wyoming. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2002, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 6,300,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with soil and rock. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

## **Riverton**

The Riverton mill site and tailings pile covered 88 hectares (218 acres) located 4 kilometers (2.5 miles) southwest of the center of Riverton on the north side of State Highway 789 in Fremont County, Wyoming. Before remedial action, the tailings pile occupied about 29 hectares (72 acres) at an average depth of 1.2 meters (4 feet). The privately-owned land upon which the site is located is within the boundaries of the Wind River Indian Reservation, which is occupied by the Shoshone and Arapaho Tribes. The site completed remedial actions in 1989 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA).

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Riverton. LTS&M costs for groundwater at the Riverton site total \$30,000 per year for the period 1999-2049.

**Soil:** Soil was remediated to EPA standards. Approximately 546,506 m<sup>3</sup> of contaminated materials were excavated and shipped to a disposal cell 45 miles from the site, where it was stabilized in an active uranium tailings pile.

**Water:** Approximately 500 million gallons of groundwater are contaminated. According to the UMTRA groundwater PEIS, chromium has exceeded the MCL once, and molybdenum, net gross alpha, selenium, radium, and uranium have exceeded the MCLs multiple times. The site assumes that groundwater at Riverton has been determined a non-drinking water source and will undergo natural attenuation until the site meets EPA standards (up to 100 years). The site will conduct annual groundwater monitoring for the period 1999-2049.

## **Spook**

The former Spook mill and tailings site is located approximately 77 kilometers (48 miles) northeast of Casper, Wyoming, in Converse County, and 51 kilometers (32 miles) northeast of Glenrock, Wyoming. The site covers approximately 22 hectares (55 acres). The residual radioactive materials occupied about 2 hectares (5 acres), mostly in an open pit mine that was 30 meters (100 feet) deep at its deepest point. The site completed remedial actions in 1989 under the provisions of the Uranium Mill Tailings Radiation Control Act (UMTRCA). Under these provisions, public access to the disposal cell will be restricted indefinitely.

DOE's Grand Junction Office (GJO) is responsible for LTS&M at Spook. LTS&M costs for Spook are \$4,000 per year in perpetuity.

**Soil:** Soil was remediated to EPA standards.

**Water:** Approximately 1 billion gallons of water are contaminated. According to the UMTRA groundwater PEIS, the following contaminants have exceeded regulatory limits or MCLs: uranium, selenium, cadmium, chromium, molybdenum, net gross alpha, nitrate, radium, and silver. No groundwater remediation or monitoring is anticipated for the site.

### **UMETCO, Gas Hills**

UMETCO, Gas Hills is an Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Gas Hills, Wyoming. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2002, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 8,700,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cap the cell with rock. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

### **Union Pacific, Bear Creek**

The Union Pacific, Bear Creek site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Wyoming. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to

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the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2000. Upon transfer, the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 4,700,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.

**Engineered Units:** Approximately 583,692 m<sup>3</sup> of contaminated material was stabilized in an on-site, open pit mine. The pit mine was covered with a radon barrier cover and rock surface layer to control erosion. According to EPA standards, the cover must be designed to remain effective for 200 to 1,000 years. GJO is responsible for conducting LTS&M, access restrictions, and institutional controls at the disposal. LTS&M activities at the disposal cell include annual surface inspections, vegetation control, and sign replacements (as necessary). No significant repairs are anticipated.

### **WNI, Split Rock**

The WNI, Split Rock site is a Uranium Mill Tailings Remedial Action (UMTRA) Title II site located in Wyoming. UMTRA Title II sites are privately owned and operated sites that were active when the Uranium Mill Tailings Radiation Control Act was passed in 1978. The majority of the mining and milling conducted at these sites was for private sale, but a portion was sold to the U.S. Government. To terminate the site's Nuclear Regulatory Commission (NRC) license, the owner must conduct NRC-approved reclamation of any on-site radioactive waste. NRC then determines if the site will be transferred to DOE for custody and care. In order for the site to be transferred to DOE, the site owner must demonstrate full funding for inspections and ongoing maintenance. Therefore, there will be no additional cost to the government if a site is transferred for long-term care.

This site will be transferred to the Department in 2001, at which point the Grand Junction Office will be responsible for providing stewardship for the groundwater and disposal cell.

**Water:** Groundwater is contaminated by radionuclides, including radium and uranium. The groundwater will require annual monitoring for an unspecified timeframe to ensure the effectiveness of the remedy.

**Engineered Units:** Approximately 7,700,000 tons of uranium mill tailings are expected to be disposed of in an engineered disposal cell. Current plans are to cover the site with rock. The disposal cell will be surrounded by a fence to control access, and will require annual monitoring to ensure the integrity of the cap.