

Environmental Management

Nevada Test Site & Tonopah Test Range

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The Nevada Test Site 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.

LOCALITY MAP

Estimated Site Total								
<i>(Thousands of Current Year Dollars)</i>								
	FY 1996	1997	1998	1999	2000			
Nuclear Material and Facility Stabilization						<i>Grey shaded area reflects annual cost estimates for the first five years of the site BEMR Base Case (as of October 1995) and includes 3% annual inflation, see Readers' Guide.</i>		
Environmental Restoration	48,649	62,591	57,028	58,690	60,370			
Waste Management	32,887	26,735	23,261	20,734	21,146			
Total	81,536	89,326	80,289	79,425	81,516			
1996 Appropriation	65,944			<i>These levels reflect the current estimates for compliance with applicable statutes and agreements (as of March 1996), see Readers' Guide.</i>				
1997 Congressional Request		76,292						
<i>(Five-Year Averages, Thousands of Constant 1996 Dollars)</i>								
	FY 1996-	2005	2010	2015	2020	2025	2030	

	2000							
Nuclear Material and Facility Stabilization		37,660	47,100	43,448	11,825			
Environmental Restoration	54,104	52,727	59,341	60,194	61,183	62,332	62,527	
Waste Management	23,706	15,977	14,397	13,397	13,197	5,902	5,902	
Total	77,810	106,364	120,838	117,039	86,205	68,234	68,429	
	FY 2035	2040	2045	2050	2055	2060	2065	
Nuclear Material and Facility Stabilization								
Environmental Restoration	22,292	3,854	4,138	4,467				
Waste Management	5,902	5,902	5,902	5,902	5,902	5,902	5,902	
Total	28,194	9,756	10,040	10,369	5,902	5,902	5,902	
	FY 2070	2075	2080	2085	2090	2095	2100	Life Cycle*
Nuclear Material and Facility Stabilization								700,166
Environmental Restoration								2,235,796
Waste Management	7,902							708,472
Total	7,902							3,644,434
<i>* Total Life Cycle is the sum of the annual costs in constant FY 1996 dollars.</i>								

FACILITY MISSION

For over 40 years, the primary mission of the Department of Energy, Nevada Operations Office was to conduct field testing of nuclear explosives in connection with the research and development of nuclear weapons. This testing was conducted primarily at the Nevada Test Site, which was established in 1950, when President Truman authorized a continental weapons testing area at the Las Vegas Bombing and Gunnery Range.

In addition to weapons testing, the Nevada Test Site has also hosted secondary missions: neutron and gamma-ray interaction studies; open air reactor, nuclear engine, and nuclear furnace tests; hazardous materials spill response testing; and a variety of other experiments involving radioactive and nonradioactive materials conducted by the Department of Defense.

The Department of Energy, Albuquerque Operations Office and the Department of Defense have historically used the Tonopah Test Range, northwest of the Nevada Test Site, for research and development of ordnance delivery systems, electronic combat training missions, and other activities. For cost and project management efficiency, the Department of Energy has consolidated the management of all Department of Energy environmental restoration activities for the site under the purview of the Department of Energy, Nevada Operations Office. This Baseline Environmental Management Report treats the two sites as one.

[SITE MAP #1](#)

Environmental restoration activities at the site, which began in 1989, focus on characterizing and remediating sites and facilities contaminated as the result of the historic nuclear testing activities. Contaminants include surface and subsurface radionuclides; organic compounds; chromium and other metals; petroleum; and residues from plastics, epoxy, and drilling muds used during test hole drilling and instrumentation. Most of the materials were released as an unavoidable consequence of testing activities. Most of the waste generated was from post-test sampling and construction and/or maintenance operations associated with testing. Disposal of this waste occurred in landfills, underground injection, sumps, and leachfields, as well as offsite disposal. Some residual materials remain in inactive storage tanks. In addition, approximately 1,200 hectares (3,000 acres) of surface and shallow subsurface soils are contaminated as the result of safety shots and plutonium-dispersion tests conducted on the Nevada Test Site and portions of the Tonopah Test Range and Nellis Air Force Range. When atmospheric and shallow cratering tests are included, this number increases to 10,900 hectares (27,000 acres). Areas highlighted in the above map are discussed in the Environmental Restoration program section.

[SITE MAP #2](#)

The Department of Energy, Nevada Operations Office operates a variety of waste facilities at the Nevada Test Site. Low-level radioactive waste originating both from the Nevada Test Site and from other U.S. Department of Energy installations is disposed of onsite. The site also stores the current inventory of transuranic mixed waste from Lawrence Livermore National Laboratory, pending shipment to the Waste Isolation Pilot Plant in Carlsbad, New Mexico. Limited mixed waste disposal for offsite generators will be available on the Nevada Test Site pending completion of the Site-Wide Environmental Impact Statement in FY 1996 and approval from the State of Nevada of the Site Treatment Plan. An expanded mixed waste disposal facility will be constructed when the State of Nevada issues the Resource Conservation and Recovery Act permit application. The site remains an active facility for other Department of Energy programs (the Office of Environmental Management constitutes only 10 percent of the current Department of Energy budget for the Nevada Site Operations Office). This estimate assumes the site will remain an active facility for other Department of Energy activities, and landlord responsibility for the site will remain with the Department of Energy.

REGULATORY ISSUE
FEDERAL FACILITY AGREEMENT AND CONSENT ORDER

The previous Baseline Environmental Management Report reflected the Comprehensive Environmental Response, Compensation, and Liability Act as the central legal driver for cleanup activities. Completion of negotiations with the State of Nevada has resulted in a Federal Facility Agreement and Consent Order that governs Department of Energy environmental management activities in Nevada under the state's Resource Conservation and Recovery Act authority and its hazardous waste and water pollution control laws.

On November 22, 1995, in a letter to the Nevada Operations Office that contained review comments on the FY 1996 Department of Energy/Nevada submittal to the Baseline Environmental Management Report, the state identified key issues regarding information contained within the submittal. These issues are addressed in highlighted portions of this report in "Regulatory Issues" sidebar discussions to assist the reader in understanding the state's position regarding Environmental Management activities within the state.

Because the Nevada Test Site, Tonopah Test Range, and Nellis Air Force Range are under institutional control, risk to workers and the public is considered minimal. However, the site conducts risk assessments and interim removal actions where necessary to ensure the safety of workers and the public.

REGULATORY ISSUE
DISPOSAL OF WASTE GENERATED OFFSITE

"Nevada Test Site land withdrawal orders restrict the use of the site to atomic testing activities. State officials in Nevada have long contended that the U.S. Department of Energy must seek both congressional and State approval to use the site for new activities, such as the disposal of radioactive waste from offsite generators." (Letter from the State of Nevada to Carl Gertz, Acting Assistant Manager for Environmental Restoration and Waste Management Division, November 22, 1995).

FUTURE USE

This Baseline Environmental Management Report assumes the Nevada Test Site will remain under Department of Energy institutional control and maintain its current mix of Industrial, Open Space, and Controlled Access uses. A Site-Wide Environmental Impact Statement is in progress and a formal land-use plan will be developed based on the results of that effort. The Department will also conduct risk assessments, as appropriate, to determine future land uses. Several public briefings have been held to obtain public input, which has provided valuable feedback to the Environmental Impact Statement and the land-use planning process. As the Department completes these activities and makes final decisions, annual updates of the Baseline Environmental Management Report will reflect the accumulated data.

In conjunction with the Nevada Test Site-Wide Environmental Impact Statement, the Nevada Operations Office is developing a Resource Management Plan for the Nevada Test Site to take advantage of the extensive data collection and public participation activities associated with the National Environmental Policy Act. The Department is developing the Resource Management Plan to improve land-use and resource management planning at the Nevada Test Site. This plan will use the data in the Technical Site Information document as a starting point, and will ultimately gather other ongoing management and planning activities under the comprehensive plan. It will identify the criteria for evaluating the compatibility of activities with human health and safety, ongoing missions, existing infrastructures, cultural and natural resources, public values, and other resource issues and constraints.

***REGULATORY ISSUE
FUTURE USE***

"State officials contend that any final strategy to address surface soil contamination at the Nevada Test Site must be developed in the context of future land uses that embrace the concept of how clean is clean for what use. Department officials in Nevada are establishing an approach to embrace this concept by developing a site-wide Resource Management Plan as part of the Nevada Test Site-Wide Environmental Impact Statement" (Letter from the State of Nevada to Carl Gertz, Acting Assistant Manager for Environmental Restoration and Waste Management Division, November 22, 1995).

NUCLEAR MATERIAL AND FACILITY STABILIZATION

The facility stabilization and maintenance activities commenced at the Nevada Test Site in 1995. However, these activities are currently performed by the Environmental Restoration program. All of the 289 Nevada Test Site facilities identified on the Surplus Facilities Inventory Assessment listing are potential candidates for stabilization and maintenance activities pending future decisions on the missions of the Nevada Test Site. Some of these facilities are buildings and equipment previously used in support of nuclear tests such as explosive magazines, fallout shelters, railroad boxcars, etc. The resulting waste will be managed by the Waste Management program for disposition and is accounted for in their cost estimate. Completion of stabilization and maintenance activities is anticipated by 2012.

Nuclear Material and Facility Stabilization Activities Cost Estimate								
<i>(Five-Year Averages, Thousands of Constant 1996 Dollars)</i>								
	FY 1996- 2000	2005	2010	2015	2020	2025	2030	Life Cycle*
Nuclear Material and Facility		37,660	47,100	43,448	11,825			700,166

Stabilization								
* Total Life Cycle is the sum of the annual costs in constant FY 1996 dollars.								

ENVIRONMENTAL RESTORATION

Within the Nevada Test Site and the Tonopah Test Range approximately 2,400 potential corrective action sites require some level of investigation and possible remediation. Approximately 930 of these sites are related to the underground testing of nuclear weapons; more than 100 resulted from above-ground testing. The remaining sites include waste disposal facilities, leach fields, landfills, storage tanks, injection wells, inactive and abandoned buildings, and associated equipment contaminated by prior operations, spill areas, and hundreds of other small sites where unregulated disposal or storage of waste materials occurred during more than 40 years of operations. The Department has divided the assessment and remediation of these sites into three categories: Industrial Sites, which include all sites used in support of testing operations; Soils Sites, which include all surface and shallow subsurface soil contamination resulting primarily from historic safety shots; and Underground Test Areas, which are sites that were impacted by previous underground testing activities. Activities within the Industrial Sites focus on physical investigation and remediation of the individual sites. Activities within Soils Sites focus on defining appropriate cleanup levels (standards do not exist at this time) and remediating surface soils where risk potentially exists to workers and the public. Activities within Underground Test Areas focus on determining the potential boundaries of contamination and the requirements to monitor the identified boundaries. See the Site Maps for the location of Environmental Restoration program activities at the Nevada Test Site and Tonopah Test Range.

Major Environmental Restoration Activity Milestones	
TASK	COMPLETION DATE Fiscal Year
Industrial Sites	
Assessment	2015
Remedial Action	2035
Decommissioning	2025
Soil Sites	
Assessment	2025
Remedial Action	2030
Underground Test Areas	
Assessment	1996
Remedial Action	2002
Site-Wide	
Long-Term Monitoring	2050

The Department of Energy Albuquerque Operations Office initiated environmental restoration activities at the Tonopah Test Range in the late 1980s. In 1987, the Department conducted a preliminary assessment that was evaluated by Environmental Protection Agency-Region IX in 1988. The Environmental Protection Agency declared the facility to be in a No Further Action Planned status with respect to the Comprehensive Environmental Response, Compensation and Liability Act activities. Corrective actions would, however, continue to be completed according to the requirements of the Resource Conservation and Recovery Act. In 1993, for logistical reasons, the Albuquerque Operations Office agreed to turn over environmental restoration responsibilities for this site to the Nevada Operations Office. Since 1993, the Nevada Operations Office has conducted a comprehensive inventory of potential release sites and has identified approximately 40 sites that will require site characterization activities. Tonopah Test Range is now managed under the Industrial Sites grouping of the Nevada site.

The following figure describes the process used by the Nevada Office to clean up a site. The process, which applies to all areas at the Nevada Test Site, groups all of the sites into Corrective Action Sites and then groups these into Corrective Action Units to facilitate administration. After a Corrective Action Unit has been organized, the process to be used to remediate it is identified. After the office takes several steps mandated by environmental regulations, a closure report is submitted to the State of Nevada certifying the site has been closed properly and actions are complete.

The corrective action strategy portion of the Federal Facility Agreement and Consent Order establishes the methodology by which all other site investigations and corrective actions will take place. In general, the strategy calls for sites to be grouped using various combinations of similarity of site Aowner", functional category, location, and length of time required for corrective action. The groupings enable economies of scale from commonality of work, including approach and logistics during assessment and remediation. Consideration is given to minimizing long-term monitoring when choosing a remediation approach. Sites will use the Streamlined Approach for Environmental Restoration, often referred to as SAFER, when it is applicable and acceptable to the State of Nevada. Sites will consider the probable remediation method when performing and coordinating assessments. To facilitate the estimating process, this report has made two assumptions. The first is that activated metals are considered a source and are estimated in the categories of rubble/debris and low-level radioactive waste. The second assumption is radon is not considered to be a significant source because it is controlled by ventilation in impacted tunnels and exists at near-background levels for surface-based activities.

Technical Approach to Remediation Activities

To determine the expected costs and waste volumes for the potential release sites not yet characterized, parametric modeling and bounding conditions were used to fill in data gaps. For example, the waste volumes assumed to be generated at some facilities were calculated by multiplying the square footage of the facility by contamination factors developed using characterization information to date. Estimates generated for this document do not include active sites and sites not yet transitioned to the Environmental Management program. Such sites include, but are not limited to nuclear shots in the Pacific (including Bikini Atoll), the Liquefied

Gaseous Fuels Test Facility, and contaminated sites remaining under Department of Defense funding.

Waste disposal for onsite environmental restoration activities takes place primarily at the Area 3 and Area 5 Radioactive Waste Management Sites on the Nevada Test Site. All costs for treatment, storage, transportation, and disposal of waste generated by environmental restoration activities at the Nevada Test Site are included within the estimated costs for assessment, remedial action, and decommissioning activities. Bulk low-level waste is disposed of as containerized bulk waste at the Area 3 site. All other low-level waste is disposed of at Area 5. Mixed waste is also disposed of in Area 5, while mixed waste subject to land disposal restrictions is placed on the Transuranic Waste Pad in Area 5 to await treatment. Hazardous waste is shipped offsite to approved commercial disposal facilities. Disposal costs for the Area 3 and Area 5 disposal facilities are \$446 per cubic meter (\$341 per cubic yard) for FY 1996, \$623 per cubic meter (\$475 per cubic yard) for FY 1997 through FY 2021, and then \$2,402 per cubic meter (\$1,833 per cubic yard) through the outyears.

Industrial Sites

The Nevada Test Site Source Groupings include the assessment and remediation of "like-waste units", e.g., tunnel muck piles, tunnel ponds, sumps and injection wells, inactive tanks, leach fields, contaminated waste sites, atmospheric test debris, and miscellaneous other sites. The subject waste units are the result (or byproduct) of past testing and support activities at the Nevada Test Site.

The Tonopah Test Range Source Groupings include the assessment and remediation of contaminated sites on the Tonopah Test Range, such as landfills, storage tanks, bomblet pits, and construction debris areas. Contamination at the subject sites is the result of testing ordnance delivery systems employing mock-ups of nuclear weapons and tests with conventional explosives. Contaminants include chemicals, lead, explosives, unexploded ordnance items, and radioactive and mixed waste.

The Environmental Restoration Sites Inventory involves conducting an inventory of all known release sites (approximately 2,400) and validates information through photographic monitoring and field verification, including surveys using global positioning system techniques. New sites are identified through reviewing archived literature and photographs, visiting sites, and maintaining an established data base to compile all the information on each site. Existing and newly identified sites are assigned to the Industrial Sites, Soil Sites, or Underground Test Areas if remedial action is required. The inventory fulfills the Nevada Test Site Resource Conservation and Recovery Act Part B applicable requirements to list solid waste management units. Over 266 closure reports have been delivered to the state for sites identified in the inventory.

Specific Resource Conservation and Recovery Act Closures provide for closure of eight industrial sites named in the Resource Conservation and Recovery Act Part B Permit Application. These waste units were generally used more recently than Source Groupings Waste Units. Three of the units have been closed: U-3fi Injection Well, Area 23 Landfill trenches, Area 27 Explosive Ordnance Disposal Facility. The remaining five facilities include the Area 6

Decontamination Facility, Area 6 Steam Cleaning Effluent Ponds, Area 23 Building 650 Leach Field, Area 2 Bit Cutter Shop Injection Well, and U-2bu Subsidence Crater. Activities in support of these Resource Conservation and Recovery Act closures include developing and implementing characterization plans, analyzing data, analyzing risk, preparing characterization reports, developing closure strategies, and preparing and implementing Resource Conservation and Recovery Act Closure Plans.

The Resource Conservation and Recovery Act Permit governs all work at the Industrial Sites for the next two to three years, except decommissioning, which is currently governed by Department of Energy Orders. All work is governed by requirements of the Federal Facility Agreement and Consent Order, which establishes the methodology by which all site investigation and corrective actions will take place.

ASSESSMENT

Because of the extensive number of sites, most of the Industrial Sites have not been fully characterized to date. However, initial assessment activities indicate contamination problems include surface and subsurface soils that have been impacted by releases from leach fields, sumps, disposal wells, leaking tanks, and other sources of waste. Contaminants may include petroleum hydrocarbons, hazardous waste, low-level radioactive materials, and mixed waste. In general, this report assumes most of the soil contamination related to the units in question is confined to the vadose zone at the Nevada Test Site. However, it is possible that Industrial sites at the Tonopah Test Range have impacted ground water.

Completed activities include work plans for abandoned septic tanks and leach fields, including sampling; completed characterization of the U-3fi Injection Well, the Area 27 Explosive Ordnance Disposal Facility, the Area 6 Bit cutter shop Injection Well, the Tonopah Test Range 5 Points Landfill, the Jr. Hot Cell, and the EPA Farm. The Department completed field verification on 864 sites, surveyed 670 sites, and identified 134 new sites. Outyears beyond FY 2001 are still being prioritized in site baselining activities. This estimate assumes assessment activities will continue through 2015.

REMEDIAL ACTION

Because characterization at Industrial Sites is not complete, definitive remedial action approaches are not available. However, conventional unexploded ordnance will be detonated in place. Any explosive residue will be detonated on range, rendering nonhazardous debris, recyclable debris, or nonhazardous solid waste.

INTERIM REMOVAL AND COMPLETED REMEDIAL ACTIONS TO DATE

Area 23 Hazardous Waste Trenches
Area 27 Explosive Ordnance Disposal Facility
U-3fi Injection Well
Tonopah Test Range Bomblet Pit

Tonopah Test Range 5 Points Landfill Ordnance Removal
 Tonopah Test Range Roller Coaster Sewage Lagoons Ordnance Removal
 Tonopah Test Range Area 9 Landfill Ordnance Removal
 Tonopah Test Range Area 9 Construction Debris Area Ordnance Removal
 Tonopah Test Range Antelope Lake Road Site Ordnance Removal
 Closure or removal of 55 Underground Storage Tanks
 Completion of 71 Environmental Restoration Inventory Sites
 Submission of 266 Closure Reports to the State

Outyear activities beyond FY 2001 are still being prioritized in site baselining activities. This estimate assumes remedial action activities will continue through FY 2035. As discussed in the introduction to the Environmental Restoration section, low-level waste and low-level mixed waste will be disposed onsite and hazardous waste will be shipped offsite. Pollution control activities include well established waste minimization programs. During waste generating operations, the waste is segregated to the extent possible to avoid contaminating clean material and to avoid mixing different contaminants. The Department estimates the waste volumes generated at the Industrial Sites during assessment and remedial action will consist of the following:

Industrial Sites Waste Type and Volume		
WASTE TYPE	MEDIA	VOLUME (cubic meters)
Low-Level Mixed	Liquid	230
	Soil	50
Low-Level	Debris	600
	Liquid	10
	Soil	2,000
Hazardous	Ground water	270
	Liquid	420
	Soil	75,980
Sanitary	Debris	350

DECOMMISSIONING

Industrial sites include facilities no longer needed and contaminated by Department of Energy mission-related activities. Decommissioning activities include the decontamination and decommissioning of these surplus facilities. Decommissioning activities are governed by the terms of the Federal Facility Agreement and Consent Order with the state. Surveillance and monitoring of the identified facilities is ongoing, and initial decommissioning activities were conducted at the sites in 1974 and 1983.

This report assumes the eight surplus facilities already transferred from Defense Programs to Environmental Management will undergo decommissioning. All of the facilities except two were used for nuclear rocket, nuclear engine, nuclear furnace, and associated tests; one was used for

radiological research on intake of radionuclides through the food chain, and the other evaluated the response of missile parts to radiation flux. The facilities include E-MAD, RMAD, Pluto, Super Kukla, Test Cell A, Test Cell C, EPA Farm, and Jr. Hot Cell. This estimate assumes no additional facilities will transition to Environmental Restoration, and that all eight facilities will be demolished.

Characterization of the identified decontamination and decommissioning facilities includes periodic surveillance and maintenance before decommissioning takes place. Characterization activities include documenting building deterioration, planning characterization, collecting and analyzing samples, managing and evaluating data, assessing risks and doses, and preparing assessment reports. The Facility Assessment Report documents and discusses the nature and extent of contamination present in each facility, release criteria calculations and the risk/dose assessment, and findings. Design for each of the facilities specifies the construction and demolition activities necessary to remediate facilities.

Contamination in the facilities is generally limited to portions of buildings specifically used for "hot" work on radioactively impacted machinery, equipment, or experiments. Most of the contamination appears to be radioactivity, although other constituents of concern will be investigated. Some facilities also have asbestos-containing materials in their construction, and at least one facility is known to have poly-chlorinated biphenyl contaminated hydraulic oil. A site-specific work plan is prepared for each characterization effort, and applicable permits are obtained. National Environmental Policy Act determination is made and endangered species clearances obtained. Surveys to comply with the Historic Preservation Act of 1966 are also completed.

Characterization field activities completed to date include Jr. Hot Cell and the EPA Farm. Remediation of Jr. Hot Cell is complete. It included demolition of the facility and waste disposal at the Area 5 Radioactive Waste Management Site. Remediation of the EPA Farm is scheduled for FY 1997 and this report assumes the facility will be demolished. Final determination of the appropriate decommissioning approach for the rest of the facilities awaits completion of scheduled assessment activities; most of the facilities will not begin assessment prior to FY 2000.

This estimate assumes that debris generated by decommissioning will consist of approximately 6,200 cubic meters (8,122 cubic yards) of sanitary waste, and 240 cubic meters (314 cubic yards) of low-level waste.

Soils Sites

The Soils Sites comprise several activities related to the investigation of and necessary corrective remedial actions for contaminated surface and shallow subsurface soils on the Nevada Test Site, Tonopah Test Range, and Nellis Air Force Range. Contamination is the result of historic U.S. Department of Energy, Nevada Operations Office above-ground and near surface nuclear detonations, safety shot tests, rocket engine development, and hydro nuclear testing. Contaminants of concern include americium, plutonium, depleted uranium, and other types of transuranic waste; radionuclides; and fission products. In addition, metals, particularly lead, are

of concern at some sites. Long-term soils remediation strategies have not been finalized with the State and other stakeholders.

The Department conducted safety shots at several locations on the Nellis Air Force Range and Tonopah Test Range (Double Tracks; Clean Slates 1, 2, and 3; and Area 13); at Plutonium Valley in Area 11 of the Nevada Test Site; and the GMX site in Area 5 of the Nevada Test Site. The safety tests did not result in significant nuclear yield, but did disperse contaminants in excess of 40 picocuries per gram, in surficial soils over more than 1,200 hectares (3,000 acres). When 82 atmospheric and near surface tests are included, the acreage contaminated in excess of 40 Pico curies per gram increases to approximately 10,800 hectares (27,000 acres). Most of the increased area is on the Nevada Test Site.

Soils Sites include nine cratering events from underground tests. The events used nuclear devices to excavate large volumes of earth. Contamination from these tests includes subsurface impacts, less than 300 meters (984 feet) deep and impacts to surface soils as the result of material expelled during testing. The nine events include Sedan, Schooner, Ess, Buggy, Cabriolet, Palanquin, Johnnie Boy, Danny Boy, and Uncle.

Hydronuclear tests involve classified data. Therefore, this report cannot address the details of these tests. Most of the tests impacted shallow surface soils to depths of less than 30 meters (98 feet). No surface soil impacts have been identified at this time.

***REGULATORY ISSUE
CLEANUP LEVELS***

"The current cleanup strategy calls for reducing contaminated soils by excavation and disposal in existing subsidence craters. This strategy proposes to increase radionuclide concentration action levels from 40 picocuries per gram to a negotiated 200 picocuries per gram. The State has only concurred that this higher level is acceptable as interim action level. The U.S. Department of Energy, Nevada Operations Office is proposing to establish >Land Withdraw Zone(s)' to provide containment of these contaminants at these levels, which would be preemptive of the future decisions in the Resource Management Planning process." (Letter from the State of Nevada to Carl Gertz, Acting Assistant Manager for Environmental Restoration and Waste Management Division, November 22, 1995).

Nuclear Rocket Engine tests encompass a number of sites in Area 25 where surface soils were contaminated with a wide range of radionuclides released during the tests. Buildings associated with these activities are included under the Industrial Sites activities.

This report assumes the immediate effort will include interim actions to clean up the Double Tracks and Clean Slates 1, 2, and 3 sites. These remedial actions will be in accord with the Federal Facility Agreement and Consent Order. Currently, no cleanup standards exist for these sites; this report assumes a final cleanup level will be negotiated near the 200 Pico curies per gram level. For the long term, this report assumes all areas on the Nevada Test Site will remain under institutional control and will provide for an economically feasible containment of contaminants. It further assumes the cleanup of soils sites, when warranted, will consist of

excavation and transportation to bulk disposal in an appropriate subsidence crater located onsite. This is a critical assumption, since bulk disposal should reduce costs by at least an order of magnitude. The cleanup will comply with State of Nevada and National Emissions Standards for Hazardous Air Pollutants regulations, with particular attention paid to minimizing fugitive dust emissions during excavation of contaminated soil.

ASSESSMENT

Most sites within the Soils Sites have sufficient background data available regarding the sources of contamination, but some of the data is classified and few of the sites have been characterized because of funding constraints. All assessment activities concentrate on determining the type and extent of contamination. Most radiological assessment activities will involve in situ measurements using a wide array of approaches. Some discrete sampling is required to determine the extent of such contamination by wet chemical analysis. Once cleanup levels are established, based on future land use and related risks, cleanup scenarios will be evaluated and documentation will be prepared for negotiating cleanup procedures, if required.

In the past, assessment activities have concentrated on determining the extent of plutonium-contaminated soils and preliminary testing of soil removal technologies. Sites at which plutonium contaminated soil might be excavated have conducted soil stabilization revegetation experiments and an existing Nevada Test Site facility was retrofitted into a Treatability Test Facility at which five bench-scale soil volume reduction tests were conducted.

Current assessment activities include completing the characterization effort in support of an Interim Corrective Action Plan for the Double Tracks site on the Nellis Air Force Range. Assessment efforts over the next few years will concentrate on Clean Slates 1, 2, and 3 sites on the Tonopah Test Range. Outyear activities beyond FY 2001 are still being prioritized in site baselining activities. This estimate assumes that assessment activities will continue through FY 2025.

REMEDIAL ACTION

Surface soil remedies will include in situ identification and removal of hot spot materials located in small selected areas. Larger areas will require the use of mechanical excavation to remove the contaminated materials. Mechanical excavation may use size separators or other physical processes to reduce waste volumes. Subsurface remedies will range from soil excavation to containment strategies. Remedial actions will be based on applicable regulatory standards or proposed cleanup levels, if no standards apply. Proposed levels will be based on pertinent factors, including but not limited to assessment of risk, current and projected land use, resource management, and technical and cost feasibility. Where sufficient information is available, the Department will use the Streamlined Approach for the Environmental Restoration process. Interim removal actions will be performed when risk exists to workers and the public.

The first site scheduled for remediation is the Double Tracks site. It is scheduled for an interim removal action in FY 1996. Outyear activities beyond FY 2001 are still being prioritized in site baselining activities. This estimate assumes remediation will be completed by FY 2030.

The large areas and volumes of contaminated soils potentially result in high disposal costs; therefore, bulk disposal in subsidence craters has been assumed for cost estimates for this report. This report also assumes approximately 1.1 million cubic meters (1.4 million cubic yards) of low-level waste will be generated by remediation of the Soils Sites and disposed of in subsidence craters. The Department is continually evaluating new technologies to find a more cost-effective way to clean up the sites. The search for technologies has thus far focused on volume reduction and cost-effectiveness.

Underground Test Areas

The Nevada Test Site has been the location for approximately 930 underground nuclear tests conducted between 1951 and 1992. These locations test areas have been bounded into six geographic areas that have distinct contaminant source, geologic, and hydrologic characteristics. The six areas include Frenchman Flat, Western Pahute Mesa, Yucca Flat, Central Pahute Mesa, Rainier Mesa/Shoshone Mountain, and Climax Mine.

Frenchman Flat consists of ten sites located in the northern portion of Area 5 and the southern part of Area 11. These test events were conducted in both vertical emplacement holes and mine shafts located in deep alluvium. The deeper geology is not well known.

Western Pahute Mesa consists of 18 sites along the western edge of Area 20. These events were all conducted in vertical emplacement holes. This area is separated from Central Pahute Mesa by the Boxcar Fault and is distinguished by the relative abundance of tritium. Transport of contaminants on and from Western Pahute Mesa involves ground-water flow in both welded and vitric tuffs, both in the rock matrix and in the fracture system.

Yucca Flat consists of 717 sites located in Areas 1, 2, 3, 4, 6, 7, 8, 9, and 10. Events at these sites were conducted in vertical emplacement holes. Contaminant transport in Yucca Flat may involve alluvium, both welded and vitric tuffs, and carbonate rock.

Central Pahute Mesa consists of 64 sites in Areas 19 and 20 on Pahute Mesa. Events at these sites were all conducted in vertical emplacement holes. While distinguished from Western Pahute Mesa only by the presence of the Boxcar Fault, this Corrective Action Unit also contains a relative abundance of tritium. In addition, transport of contaminants and/or from Central Pahute Mesa involve ground-water flow in volcanic rocks and flow in both the rock matrix and the fracture system.

Rainier Mesa/Shoshone Mountain consists of 60 sites where events were all conducted in tunnels. Contaminants from this Corrective Action Unit flow in volcanic rock and fractured media. Climax Mine consists of three sites where events were all conducted in tunnels. Contaminants from the climax Mine Corrective Action Unit flow through fractured granite rock.

The Department is investigating the effects of the underground testing on the ground water and surrounding media in these areas. Investigations are using data collection and analysis to determine whether contaminants have moved appreciable distances from the nuclear explosion locations. Because all of the sites are under institutional control, the Department considers risk to

public health and the environment from the testing activities to be minor at this time. The ambient or background radiological conditions around the site are normal. However, assessment activities will include risk assessment to quantify risk to human health and the environment.

Field activities include the use of new and existing wells for monitoring and testing to help develop transport models. The Department will install some new wells near shot cavities to collect data about the near-field environment. The Department expects to encounter tritium during drilling; therefore, a liquid waste treatment system will be used. Attenuation characteristics provide for little migration of radionuclides other than tritium. Other radionuclides will be included in the source evaluation if tritium migration indicates the need.

There are many uncertainties regarding remedial action of the Underground Test Area. This report assumes that for the foreseeable future the Department will concentrate on the modeling and ground-water monitoring activities to limit the extent of contamination. These actions will be in accord with the Federal Facility Agreement and Consent Order. For the long term, because no known cost-effective technologies exist to extract contamination, or neutralize and stabilize the shot cavities, this report assumes that the sites will be characterized and the ground-water resource withdrawn from future-use considerations. Estimates within this report reflect the necessary modeling and ground-water monitoring to limit the contamination to satisfy the State of Nevada Division of Environmental Protection. The estimates do not include remedial actions or Natural Resource Damage Assessments that might be necessary if contamination exceeds the boundaries agreed upon for closure.

***REGULATORY ISSUE
UNDERGROUND TEST SITES***

"It is an undisputed fact that the underground nuclear testing program contaminated the ground water beneath the Nevada Test Site because approximately one-third of the underground nuclear tests were conducted at or within the ground water. The water beneath the Nevada Test Site is under State of Nevada jurisdiction and accordingly is regulated by the state. State officials believe that, at the present time, it is unreasonable to assume that limited monitoring of the Underground Test Areas will be sufficient to document that there is containment and control over the contaminant plumes. It is also presumptive to conclude, without knowledge or control over the future regional stresses and withdrawals from these groundwater resources, that there will be definitive monitoring results to support a 30-year target date for Underground Test Area closure activities"

"While modeling will be utilized to define the extent of ground-water contamination, it must be able to verify the validity of the models through the acquisition of actual hydrological information. After the model's predictability has been verified, it may then be used to understand the existing complex hydrological regime and to determine the extent of radionuclide contamination and rate of movement of nuclides of concern in the ground water. Such a determination can only be achieved through the installation of a number of deep characterization wells, which may subsequently be able to function as monitoring wells or part of any remedial actions." (Letter from the State of Nevada to Carl Gertz, Acting Assistant Manager for Environmental Restoration and Waste Management

Division, November 22, 1995.)

The estimate assumes these areas will be closed in place, assuming there is no threat to the environment or natural barrier failure, and monitoring will continue for 30 years.

ASSESSMENT

This report assumes that Underground Test Area assessment activities will be complete in FY 1996. Most of the extensive data for the Underground Test Areas is classified; therefore, the assessment activities to date have focused primarily on data collection and analysis to determine the potential for contamination of deep aquifers. Installation, testing, and monitoring of wells has been an essential element of the assessment tasks to determine if migration of contaminants has occurred. These activities have addressed the portion of the saturated zone where ground water could be effected, the vadose zone between sources, and the water table.

Assessment activities to date have also included developing a data base to analyze existing and newly acquired data; data management and analysis, including flow and transport modeling; and preliminary risk assessment activities. Thirteen characterization wells have been installed, and 11 existing wells have been modified for characterization.

Present efforts include the completion of regional ground-water flow and solute transport modeling. Future work involves the quantification of risk to human health and the environment based on the ground-water flow and solute transport models, and the completion of the Phase I Report to document the assessment activities.

REMEDIAL ACTION

No cost-effective technologies exist for restoring these sites. Remediation activities that will begin in FY 1996 are limited to developing specific ground-water flow and solute transport modeling for the six areas previously identified. Based on this effort, the Department will establish a regulatory compliance zone. Field activities in each area will provide data collection in the near field environment, including installation of monitoring wells in locations specified by modeling results. The effort will include near-field ground-water flow and solute transport modeling; risk assessment; stakeholder/regulatory concerns; and a monitoring network design.

The Department is currently conducting monitoring activities to assess the extent of contamination and to support modeling efforts to establish protective boundaries around the six areas. A five-year monitoring program will determine if data is consistent with predictions. If monitoring results are satisfactory to the State, the Department will prepare a closure report for approval by the Nevada Division of Environmental Protection. The Department will conduct post-closure monitoring for 30 years. Monitoring will be consistent with the compliance requirements.

Waste generated during remediation activities will take the form of the low-level liquid effluent drilling mud and drill cuttings. The largest volume of waste to be generated is liquid effluent (approximately 7,600 cubic meters [9,956 cubic yards]). Pollution control activities involving

liquid effluents rely on evaporation to reduce waste volume. After evaporation, the low-level waste residual will include 1,150 cubic meters (1,507 cubic yards) of contaminated soils and 1,190 cubic meters (1,559 cubic yards) of contaminated sludge. This report assumes low-level waste will be disposed of at the Area 5 Radioactive Waste Management Site.

Long-Term Surveillance and Monitoring

Post-closure monitoring activities consist of collecting periodic measurements and/or samples from monitoring wells, and effluent streams, as stipulated in each unit's Post-Closure Care Permit. Condition inspection and maintenance of any remedial systems, such as caps or active systems is included in estimates of scheduled activities. Sample analysis and preparation of a report for each monitoring period is also included. The need for, and specifics of post-closure monitoring is determined on a case-by-case basis. Monitoring typically lasts for 30 years for complex Resource Conservation and Recovery Act sites, but the State has approved shorter periods of time.

Estimates in this report differentiate between monitoring to establish the contamination boundaries and monitoring to obtain closure and post-closure monitoring. The cost for the former are included within the costs for assessment and remedial action. The latter are provided for under the costs for long-term surveillance and maintenance. This report assumes the post-closure monitoring (long-term surveillance and maintenance) will continue through FY 2050.

Current post-closure surveillance and monitoring at the Industrial Sites includes quarterly monitoring of the Area 23 Hazardous Waste Trenches and U-3fi Injection Well. At this time, maintenance of these systems consists of an inspection of the condition of the Area 23 closure cap for erosion or other disturbances and monitoring and general integrity of the U-3fi Injection Well unit. Post-closure monitoring of the Soils Sites and Underground Test Area will begin when the site receives the Notice of Completion approval of the final corrective actions.

Environmental Restoration Activities Cost Estimate								
<i>(Five-Year Averages, Thousands of Constant 1996 Dollars)</i>								
	FY 1996- 2000	2005	2010	2015	2020	2025	2030	
Nevada Contaminated Soils								
Assessment	506	1,859	1,859	1,859	1,859	1,859		
Remedial Action	5,339	9,104	12,815	12,771	12,771	12,661	3,788	
Nevada Industrial Sites and Facilities								
Assessment	1,501	4,827	2,367	2,386	37	174		
Remedial Action	6,292	11,988	25,630	25,700	27,900	27,900	38,556	
Facility	756	1,023	1,003	914	1,063	926	110	

Decommissioning								
Nevada Underground Test Areas								
Assessment	560							
Remedial Action	26,739	10,001						
Long-Term Surveil. and Monitoring	164	611	1,576	1,620	1,620	1,730	1,660	
Direct Program Management/Support	12,247	13,315	14,091	14,944	15,933	17,082	18,413	
Total	54,104	52,727	59,341	60,194	61,183	62,332	62,527	
	FY 2035	2040	2045	2050	2055	2060	2065	Life Cycle*
Nevada Contaminated Soils								
Assessment								49,005
Remedial Action								346,245
Nevada Industrial Sites and Facilities								
Assessment								56,458
Remedial Action	14,406							891,860
Facility Decommissioning	110	110	110	110				31,174
Nevada Underground Test Areas								
Assessment								2,800
Remedial Action								183,699
Long-Term Surveil. and Monitoring	1,660	1,660	1,660	1,660				78,105
Direct Program Management/Support	6,116	2,084	2,368	2,697				596,450
Total	22,292	3,854	4,138	4,467				2,235,796
* Total Life Cycle is the sum of the annual costs in constant FY 1996 dollars.								

Direct Program Management/Support

Activities conducted within this work scope provide management support of the Department of Energy, Nevada Operations Office Environmental Management activities that will characterize and remediate environmental conditions on the Nevada Test Site, Tonopah Test Range, and Nellis Air Force Range; as well as offsite locations in five states. The scope of this work also

involves managing the treatment, storage, and disposal facilities and operations under the purview of the Department of Energy, Nevada Operations Office.

The Environmental Restoration Project Support activity provides for administrative and technical project management support; project planning, including Activity Data Sheet development; project control, including Project Tracking System and Performance Measurement System reporting; programmatic Quality Assurance and Self Assessment support; programmatic health and safety support; training; development of programmatic National Environmental Policy Act documentation; waste management coordination; compliance reporting; and public participation support. An Activity Data Sheet entitled *Project Support* captures these activities.

COST SAVINGS

Cost savings for FY 1995 are being achieved through a series of productivity initiatives. These initiatives include contracting initiatives; replacing contractor Full-Time Equivalents with Federal Full-Time Equivalents; reducing infrastructure costs; engaging in a single contractor for remediation; streamlining documents; integrated field activities; and reducing analytical cost and culture resource costs. The FY 1995 cost savings target of \$4.3 million was not fully achieved because of a delay in a contract award. Initiatives are being determined to achieve the FY 1996 target savings of \$7.4 million.

Management of the Federal Facility Agreement with the State of Nevada and oversight of Agreements-in-Principle and grants is covered under an Activity Data Sheet entitled *Agreements*.

This section does not include Program Direction within Environmental Restoration. These activities provide overall management of the entire Department of Energy, Nevada Operations Office Environmental Restoration program. The direct costs of subproject activities capture subproject management costs because those costs are directly attributable and are required to accomplish field activities.

Agreements-in-Principle fund the States of Alaska, Mississippi, and Nevada to provide oversight of the Department of Energy Environmental Restoration activities. The Agreements-in-Principle describe the understandings and commitments between the parties regarding the Department of Energy's provision of technical and financial support for state activities in environmental oversight, monitoring, site access, and emergency response initiatives. Amendments to existing Agreements-in-Principle managed by other Department of Energy offices will address activities in Colorado and New Mexico. Grants provide educational and research opportunities for students and faculty at the University of Nevada at Reno and the University of Nevada at Las Vegas, in support of technical programs being conducted at the Nevada Test Site.

PRODUCTIVITY

Because most sites are in the assessment characterization phase, it is difficult to quantify estimates of productivity savings for the future. There are areas of activities in which

productivity savings can be realized based upon previous experiences and assumptions of the future activities of the project. In revising the estimate for savings, activities were examined for possible efficiencies and reduction in work activities while achieving the desired goals. These areas were identified and rough orders of magnitude estimates were developed.

Areas in which savings could be realized include the learning curve. Multiple closures in Corrective Action Units will yield remedies for future closures. Increased use of management information systems will reduce support and indirect costs. Cost/Risk/Benefit Analyses can be used to evaluate alternative cleanup requirements. The Streamlined Approach for Environmental Restoration method and the Supplier Quality Information Group will eliminate the expense of an independent audit. In addition, negotiation with regulators concerning the required level of cleanup and amount of monitoring needed will help define end goals and provide opportunities to meet these goals at less cost.

STAKEHOLDER INTERACTIONS

The Nevada Operations Office conducted public participation activities for the Nevada Test Site and Tonapah. Activities consisted of announcement of preliminary 1996 Nevada Operations Office data in Environmental Restoration-Waste Management Update, a publication distributed to over 1,200 interested stakeholders, and a briefing to the Community Advisory Board for Nevada Test Site Programs at the board's November 1995 meeting. Draft copies of the Nevada Operations Office data and narrative submissions were made available to the Board budget committee and others attending the meeting. The State of Nevada provided comments, most of them of a philosophical nature, which were incorporated as sidebar information in the 1996 report. If you would like more information about the report or have questions about the results for these sites, please contact:

Public Participation	Technical Liaison	Public Affairs
Kevin Rohrer (702) 2950197 rohrer@em.nv.doe.gov	Chuck Morgan (702) 295-0938 morgan@em.nv.doe.gov	Nancy Harkess (702) 2954652 harkess@fsmo.nv.doe.gov

WASTE MANAGEMENT

Waste management operations include storing the current inventory of transuranic mixed waste received previously from Lawrence Livermore National Laboratory; developing construction projects to treat, store, and dispose of waste generated by the Nevada Operations Office project; enforcing the Radioactive Waste Acceptance Program waste generator review and audit process; and identifying and storing Nevada Test Site-generated hazardous waste prior to offsite disposal at appropriate commercial facilities. Waste Management manages five types of waste at the Nevada Test Site: transuranic mixed waste, low-level mixed waste, low-level waste, and hazardous waste. Sanitary waste is managed by the site landlord, the Office of Defense Programs.

[WASTE MANAGEMENT MAP](#)

The Nevada Test Site is a major low-level waste disposal facility for other Department of Energy and a few Department of Defense installations. Two principal active waste management sites are located on the Nevada Test Site: the Area 5 Radioactive Waste Management Site and the Area 3 Radioactive Waste Management Site. The Area 5 Radioactive Waste Management Site is located approximately 19 kilometers (12 miles) north of Mercury, Nevada. It consists of 296 hectares (732 acres). Less than 15 percent of the capacity is currently used. The site is currently used for disposal of onsite- and offsite-generated low-level waste and onsite-generated low-level mixed waste, as well as for storage of transuranic waste. At the current rate of land use, the facility can be expected to provide a total disposal capacity of 10,884 cubic meters (14,258 cubic yards) per year for more than 100 years. Some additional land may be required to improve access for transport vehicles, but this is not expected to impact operations for several years.

The Area 3 Radioactive Waste Management Site occupies an area of approximately 50 hectares (125 acres) and is situated about 38 kilometers (23 miles) north of Mercury. Adjacent subsidence craters created from underground nuclear weapons tests, which were conducted at depths well above the ground-water table, are used as waste disposal cells. The subsidence craters have been modified for shallow landfill disposal to accommodate waste disposal activities. The remaining disposal capacity at the Area 3 Radioactive Waste Management Site is 1.8 million cubic meters (2.3 million cubic yards) and should provide sufficient disposal capacity for more than 100 years.

Major Waste Management Activity Milestones	
TASK	COMPLETION DATE Fiscal Year
Road 5-01 Construction	1997
U3AX/BL Closure	1998
Preparations to Ship TRU to Waste Isolation Pilot Plant	2000
Low-Level Waste Operations	2070

Transuranic Mixed Waste

Approximately 610 cubic meters (799 cubic yards) of transuranic mixed waste received from Lawrence Livermore National Laboratory from 1974 to 1990 is currently stored at the Nevada Test Site in the Transuranic Pad Cover Building. Pursuant to an agreement reached with the State of Nevada in 1992, transuranic mixed waste storage is limited to the current inventory. The Department plans to initiate transportation of this waste to the Waste Isolation Pilot Plant in FY 2000 once the waste is certified to meet Waste Isolation Pilot Plant waste acceptance criteria. All costs for transportation and disposal of the waste are included within the Waste Isolation Pilot Plant site summary located in the New Mexico section. This estimate assumes no additional transuranic or transuranic mixed waste will be generated at, or transferred to, the Nevada Test Site.

The 1992 agreement with the State of Nevada was the result of the Finding of Alleged Violation and Order of November 1, 1990, and the Finding of Alleged Violation of June 24, 1991, related to the Transuranic Waste Storage Pad in Area 5 of the Nevada Test Site.

Low-Level Mixed Waste

In 1987, the Department of Energy, Nevada Operations Office was granted interim status under the Resource Conservation and Recovery Act to receive and dispose of low-level mixed waste from the Rocky Flats Plant. This waste is disposed in Pit 3 at the Area 5 Radioactive Waste Management Site. Because of the promulgation of Environmental Protection Agency Land Disposal Restrictions, disposal of low-level mixed waste from the Rocky Flats Plant ceased in May 1990. A revised Resource Conservation and Recovery Act Part B permit application, which included sampling and analysis for Land Disposal Restriction compliance, was submitted to the State of Nevada for review in July 1992. During FY 1994, the Department of Energy, Nevada Operations Office continued to revise the application in response to technical review comments by the Nevada Division of Environmental Protection.

In accordance with the Federal Facility Compliance Act, the Department of Energy, Nevada Operations Office and the Nevada Division of Environmental Protection negotiated the Site Treatment Plan and its associated Compliance Order for low-level mixed waste identified in the Mixed Waste Inventory Report. On March 27, 1996, an agreement was achieved concerning enforceable treatment schedules for these waste streams.

The Mutual Consent Agreement allows any low-level mixed waste generated by the Department of Energy, Nevada Operations Office in the State of Nevada to be stored on the unused portion of the existing Area 5 transuranic mixed waste storage pad. The low-level mixed waste does not have to meet land disposal restrictions prior to being accepted for storage on the Area 5 transuranic mixed waste storage pad. For newly identified mixed waste not specified in the Site Treatment Plan, the Department of Energy is required to develop treatment and disposal alternatives within nine months of placing such waste on the transuranic mixed waste storage pad. In anticipation of potential mixed waste volumes generated from future operational, characterization, and remediation activities conducted within the State of Nevada, the Department submitted a Part B permit application in January 1995 for the construction of a Mixed Waste Storage Facility.

GENERATION AND HANDLING

Currently, there are nine previously generated low-level mixed waste streams located on the Nevada Test Site. They have a combined volume of approximately 290 cubic meters (340 cubic yards), and they are labeled as backlog waste. This life-cycle report assumes that activities at the Nevada Test Site will generate an additional 4,696 cubic meters (6,156 cubic yards) of low-level mixed waste.

TREATMENT

As required by the Federal Facility Compliance Act, the Site Treatment Plan discusses low-level mixed waste at the Nevada Test Site and identifies alternatives for treatment. The Proposed Site Treatment Plan, originally scheduled for completion in February 1995, was delayed until March 1995 as agreed upon by the National Governors' Association and the Department of Energy. Final approval of the Site Treatment Plan by the State of Nevada was originally expected to be

received by October 6, 1995, via a Unilateral Order. The State of Nevada extended final approval of the Site Treatment Plan approximately six months beyond the October 6, 1995 deadline. Once completed, schedules and activities identified in the Site Treatment Plan became enforceable milestones. This report expects periodic negotiations with the state on low-level mixed waste issues as long as mixed waste is listed in the Site Treatment Plan or in the annual updates.

STORAGE

The low-level mixed waste previously generated at the Nevada Test Site is currently being stored on the transuranic pad in accordance with a 1994 Mutual Consent Agreement between the Department of Energy and the Nevada Division of Environmental Protection developed in January 1994 and revised in June 1995. Nine Nevada Test Site backlogged low-level mixed waste streams are currently stored on the transuranic pad having a combined volume of approximately 290 cubic meters (340 cubic yards). In accordance with this agreement, the Department amended its Resource Conservation & Recovery Act Part B Permit application in January 1995, to include construction of a low-level mixed waste storage facility at the Area 5 Radioactive Waste Management Site.

The Cotter Concentrates, originally shipped to the Nevada Test Site in 1987 from the Mound Plant as strategic materials for storage, were formally declared a waste in January 1995. Analytical and characterization data have shown the Cotter Concentrates to be a low-level mixed waste stream. Further characterization efforts resulted in dividing the waste into two populations. Cotter Concentrate - Population A is stored northeast of the Area 5 Radioactive Waste Management Site in the Strategic Materials Storage Yard. This waste stream, which has a volume of approximately 260 cubic meters (341 cubic yards), is stored in accordance with a management plan approved by the State of Nevada in July 1995. Cotter Concentrate - Population B is stored on the transuranic pad and consists of approximately 1.4 cubic meters (1.8 cubic yards).

DISPOSAL

The Nevada Test Site is one of the remaining 15 sites out of the original 49 sites the Department is evaluating for disposal of low-level mixed waste. The ultimate identification of low-level mixed waste disposal activities at the Nevada Test Site will follow state and federal regulations for siting and permitting. It will also include public involvement in the decisionmaking process and during preparation of the site-wide Environmental Impact Statement.

The State of Nevada has given the Department approval to dispose low-level mixed waste in Pit 3 of the Area 5 Radioactive Waste Management Site if the waste meets land disposal restrictions. The low-level mixed waste must also meet the characteristics and packaging requirements for disposal under the Nevada Department of Energy Waste Acceptance Criteria (NVO-325, Rev. 1). This estimate assumes approximately 33,263 cubic meters (43,575 cubic yards) of low-level mixed waste will ultimately be disposed at Pit 3. Approximately 4,696 cubic meters (6,152 cubic yards) of this total will be generated at the Nevada Test Site. The remainder will originate from the Rocky Flats Site, which will generate 28,199 cubic meters (36,940 cubic yards), and

Lawrence Livermore National Laboratory, which will generate 372 cubic meters (487 cubic yards).

Low-Level Waste

GENERATION AND HANDLING

Historically, approximately 50 percent of the 481,000 cubic meters (630,110 cubic yards) of low-level waste disposed of at the Nevada Test Site was generated onsite. However, approximately 99 percent of waste received and disposed of in the last five years was from offsite generators. Offsite generated waste was accepted at the Nevada Test Site beginning in FY 1978. In FY 1995, 24,353 cubic meters (31,902 cubic yards) of low-level waste was disposed of at the Nevada Test Site. Of that volume, 62 cubic meters (81 cubic yards) was generated at the Nevada Test Site. The Nevada Test Site is expected to receive an average of 24,000 cubic meters (31,440 cubic yards) of low-level waste per year for the next three years. In FY 1995, the Department limited the total disposal volume at the Nevada Test Site to 26,043 cubic meters (34,116 cubic yards). This self-imposed limit is based on an interpretation of an Order in a lawsuit brought against the Department of Energy by the State of Nevada.

Low-level waste treatment is not currently provided or assumed to be needed during the life cycle of this estimate. Storage costs are avoided because low-level waste is disposed of as soon as it is received.

REGULATORY ISSUE LOW-LEVEL WASTE DISPOSAL

"The Order issued on January 12, 1995 by the U.S. District Court placed no limits on the Department's ability to dispose of low-level waste at the NTS. While the court dismissed claims by the State regarding shipment of low-level waste from the DOE's Fernald site (based on a previous decision under CERCLA) it upheld claims by the State concerning other low-level waste disposal activities at the NTS. [Litigation under this lawsuit continues.]" (Letter from the State of Nevada to Carl Gertz, Acting Assistant Manager for Environmental Restoration and Waste Management Division, November 22, 1995).

DISPOSAL

The low-level waste disposal costs are contingent upon the amount of waste shipped to the Nevada Test Site. The Department of Energy/Nevada Operations Office Waste Management Division does not receive any Headquarters funding for disposal costs of low-level waste at the Nevada Test Site. Instead, the Nevada Operations Office relies on generator fees collected from the waste generators. The Nevada Operations Office plans to maintain this generator fee structure in the future.

The Nevada Test Site accepts and disposes of low-level waste at the Area 3 and Area 5 Radioactive Waste Management Site from approved Department of Energy, Department of

Defense, and other designated facilities across the United States. This estimate assumes that there will be a total of 19 approved generators, and 16 are currently approved. Life-cycle estimate information for 13 of the generators is provided in the following table.

Nevada Offsite Waste Generators			
SITE	VOLUME (cubic meters)	START FY	COMPLETE FY
Energy Technology Engineering Center	2,540	1996	2001
Fernald Environmental Management Project	57,330	1996	2005
Inhalation Toxicology Research Institute	2,877	1996	2070
Kansas City Plant	30	1996	2070
Lawrence Livermore National Laboratory	4,429	1996	2070
Mound Plant	1,390	1996	2012
Oak Ridge K-25 Plant	26,434	1998	2002
Oak Ridge National Laboratory	78,930	1996	2070
Oak Ridge Y-12 Plant	244,506	1999	2070
Pantex Plant	8,355	1996	2070
Reactive Metals, Inc.	29,162	1996	2002
Rocky Flats Environmental Technology Site	32,522	1996	2045
Sandia National Laboratory - New Mexico	45,134	1996	2070
TOTAL	544,715		

At the current rate of land use, the facility can be expected to provide disposal capacity of approximately 3 million cubic meters (4 million cubic yards) in the next 100 years. The Nevada Operations Office conducts site monitoring and characterization activities in support of the low-level waste disposal operations at the Area 3 and 5 Radioactive Waste Management Sites.

The Performance Assessment for the Area 5 Radioactive Waste Management Site was sent to the Department of Energy Performance Assessment Peer Review Panel for approval. The Performance Assessment for the Area 3 Radioactive Waste Management Site is scheduled for completion in March 1998. Performance Assessments are required for low-level waste disposal sites under Department of Energy Order 5820.2A.

The Waste Examination Facility is scheduled to be constructed in FY 1996 and will provide a 140 square meter (1,500 square foot) facility to examine low-level waste containers at the Area 5 Radioactive Waste Management Site. A new primary access road, approximately 5 kilometers (3.1 miles) long, has been designed and is scheduled for construction in FY 1997. The new road will meet all transportation and safety standards. Design of an extensive 500-year flood protection berm is currently proposed for FY 1998, with construction continuing into FY 1999.

Hazardous Waste

Hazardous waste is accumulated at numerous satellite locations on the Nevada Test Site and then transferred to the Area 5 Hazardous Waste Storage Unit. Hazardous waste containers are checked for radioactive contamination by hand-held instrument surveys and swipe sampling. Process knowledge and radiological analyses are used to ensure none of the hazardous waste being released for transport offsite contains radioactive constituents above established limits. Although every operational entity at the Nevada Test Site is a potential satellite generator of hazardous waste, the Department of Defense is the primary generator. Sources include analytical laboratories, paint shops, vehicle maintenance shops, and mining and construction operations.

Waste characterized as hazardous under the Land Disposal Restrictions must be shipped offsite to a Resource Conservation and Recovery Act-permitted facility within one year. The report expects a total of approximately 18,924 cubic meters (24,790 cubic yards) will be shipped to commercial facilities during the life cycle.

All waste shipments are made in accordance with applicable Department of Energy, Department of Transportation, Environmental Protection Agency, state, and local hazardous waste regulations. Generators of the waste pay the shipping costs.

Waste Management Activities Cost Estimate								
<i>(Five-Year Averages, Thousands of Constant 1996 Dollars)</i>								
	FY 1996- 2000	2005	2010	2015	2020	2025	2030	
Transuranic Mixed Waste								
Storage and Handling	200	200						
Low-Level Mixed Waste								
Treatment	2,742	1,402	1,402	1,402	1,402	1,402	1,402	
Disposal	200	150						
Low-Level Waste								
Disposal	14,888	7,800	7,200	6,200	6,000	3,000	3,000	
Hazardous Waste								
Treatment	350	980	350	350	350	350	350	
Storage and Handling	150	150	150	150	150	150	150	
Direct Program Management/Support	5,176	5,295	5,295	5,295	5,295	1,000	1,000	

Total	7,902								708,472
* Total Life Cycle is the sum of the annual costs in constant FY 1996 dollars.									

Direct Program Management/Support

Activities conducted within this work scope support the waste management activities for treatment, storage, and disposal. Activities consist of project planning, including Activity Data Sheet development; project control, including Performance Measurement System and Progress Tracking System reporting; administrative and technical support, including community relations and legal services.

DESCRIPTION OF PERSONNEL

The following table reflects the mix of personnel involved in accomplishing the Environmental Management mission of the sites managed by the Nevada Operations Office. The Federal workforce consists mainly of managers, professionals, engineers, and scientists. The contractor and sub-contractor mix is mostly professionals and labor which plans and conducts the day-to-day activities at the sites.

Full-Time Equivalents Composition Table*

LABOR CATEGORY	FEDERAL FTEs			CONTRACTOR FTEs						TOTAL FTEs		
				DIRECT			INDIRECT					
	1996	1997	1998	1996	1997	1998	1996	1997	1998	1996	1997	1998
General Managers, Exec., FL Supv.	5	5	5	25.5	25	25	11	10	10	41.5	40	40
Gen. Admin. Sec. and Clerical	4	4	4	51	50.5	50.5	18.7	17.7	17.7	73.7	72.2	72.2
Admin. and Other Professionals	9	8	8	51.4	51.2	51.2	27.1	27	27	87.5	86.2	86.2
Engineers	18	18	18	27.4	27.3	27.3	10.1	7.2	7.2	55.5	52.5	52.5
Scientists	25	25	25	128.6	128.6	128.6	27.4	24.4	24.4	182	178	178
Technicians	0	0	0	36.5	36	36	10.9	9.9	9.9	47.4	45.9	45.9
Crafts	0	0	0	18.3	18.3	18.3	6.4	4	4	24.7	22.3	22.3
Laborers and Other Gen. Workers	0	0	0	16.8	16.8	16.8	9.7	9.7	9.7	26.5	26.5	26.5
Operators	0	0	0	13.6	13.6	13.6	10.4	10.4	10.4	24	24	24
TOTAL	61	60	60	370.1	367.3	367.3	131.7	120.3	120.3	562.8	547.6	547.6

* The Projections for Full-Time Equivalent employees are based on FY 1996 planning baselines (see Reader's Guide).

Site Management Structure

The management structure of Nevada is divided into four major suborganizations (Assistant Manager for Operations; Assistant Manager for Environment, Safety & Health; Assistant Manager for Environmental Management; and Assistant Manager for Administration) and several matrix suborganizations (for example, Office of Chief Counsel, Office of Chief Financial Officer, Office of External Affairs, etc.). In turn, Nevada is supported by numerous contractors who operate under contracts of a diverse nature (for example, management and operating, architectural/engineering services, etc.), and type (for example, cost plus award fee, cost plus fixed fee, etc.). Currently, the majority of the contractor support to Nevada is provided by Bechtel Nevada, which took over operations in January 1996.

CONTRACTING OPPORTUNITIES

If you would like more information about performing work for the Department of Energy's Environmental Management program at this site, please contact:

Major Procurements

Joanne M. Bradbury
 Director
 Contracts Division
 United States Department of Energy
 Nevada Operations Office
 P.O. Box 98518
 Las Vegas, NV 89193-8518
 p: (702) 295-1040
 f: (702) 295-5305

Small Business Procurements

Darby Dietrich
 Contracts Division
 United States Department of Energy
 Nevada Operations Office
 P.O. Box 98518
 Las Vegas, NV 89193-8518
 p: (702) 295-1560
 f: (702) 295-5305

Future Full-Time Equivalent Needs

The consolidation of the previous management and operating contractors (that is, three into one) into the Bechtel Nevada contract is expected to result in a significant reduction in Full-Time Equivalents in the near term, and a gradual reduction of Full-Time Equivalents in the long term, tailored to match the accomplishment of the Nevada projects and programmatic activities.

FUNDING ESTIMATE

The following tables present estimated funding information for the Nevada Test Site.

Defense Funding Estimate								
<i>(Five-Year Averages, Thousands of Constant 1996 Dollars)</i>								
	FY 1996- 2000	2005	2010	2015	2020	2025	2030	
Nuclear Material and Facility Stabilization		36,067	45,108	41,610	11,325			
Environmental Restoration	54,104	52,727	59,341	60,194	61,183	62,332	62,527	
Waste Management	23,706	15,977	14,397	13,397	13,197	5,902	5,902	
Total	77,810	104,771	118,846	115,201	85,705	68,234	68,429	
	FY 2035	2040	2045	2050	2055	2060	2065	

Nuclear Material and Facility Stabilization								
Environmental Restoration	22,292	3,854	4,138	4,467				
Waste Management	5,902	5,902	5,902	5,902	5,902	5,902	5,902	
Total	28,194	9,756	10,040	10,369	5,902	5,902	5,902	
	FY 2070	2075	2080	2085	2090	2095	2100	Life Cycle*
Nuclear Material and Facility Stabilization								670,549
Environmental Restoration								2,235,796
Waste Management	7,902							708,472
Total	7,902							3,614,817

* Total Life Cycle is the sum of the annual costs in constant FY 1996 dollars.

Nondefense Funding Estimate								
<i>(Five-Year Averages, Thousands of Constant 1996 Dollars)</i>								
	FY 1996-2000	2005	2010	2015	2020	2025	2030	Life Cycle*
Nuclear Material and Facility Stabilization		1,593	1,992	1,838	500			29,617

* Total Life Cycle is the sum of the annual costs in constant FY 1996 dollars.

COMPARISON WITH PREVIOUS ESTIMATE

The 1996 life-cycle cost estimate for the Environmental Management program at the Nevada Test Site and Tonopah Test Range is \$3.6 billion, about 8 percent more than the 1995 estimate of \$3.5 billion. Overall, the 1996 estimate is comparable to the 1995 estimate. The pre-FY 1996 costs have been adjusted to reflect actual costs through 1995 and an annual escalation factor of 3 percent has been applied to the 1996 estimate. The 1996 estimate includes about \$10 million in costs associated with Environmental Restoration program activities at the Tonopah Test Range; these costs were reported under the Nevada Offsites section of the 1995 report. Cost estimates

associated with Environmental Restoration program activities increased almost 50 percent in the FY 1996 estimate. Cost estimates for the Nuclear Materials and Facility Stabilization program increased by about 80 percent, but this increase was offset by a 37 percent reduction in projected Waste Management program costs. The following sections compare the 1995 and 1996 cost estimates for the Nuclear Material and Facility Stabilization program, the Environmental Restoration program, and the Waste Management program at the Nevada Test Site.

Comparison Table					
Activity	FY 1995 Life Cycle	FY 1995 Only ¹	FY 1996 Life Cycle	Change in Dollars	Change in Percent
Thousands of Dollars					
Nuclear Mat. & Fac. Stab.	386,413	-	700,166	313,753	81
Environmental Restoration	1,557,449	31,784	2,235,796	710,131	47
Waste Management	1,142,309	21,098	708,472	412,739	37
Landlord	-	-	-	-	-
Program Management ²	364,216	14,605	-	-	-
Site Total	3,450,388	67,487	3,644,434	261,533	8
<p>1 The FY 1995 life-cycle and annual costs are provided to determine the corrected FY 1995 cost.</p> <p>2 Program Management was reported in an independent cost table last year, but is reported as a line item in the relevant program (Nuclear Material and Facility Stabilization, Environmental Restoration, and Waste Management) activity cost estimate tables for the FY 1996 Baseline Report.</p>					

Nuclear Material and Facility Stabilization

The 1996 life-cycle cost estimate for the Nuclear Material and Facility Stabilization program is \$700 million, an increase of about \$314 million from the 1995 estimate. Although parametric modeling was again used in developing the 1996 estimate, the estimate assumes an increase in the scope of program activities.

Environmental Restoration

The 1996 life-cycle cost estimate for the Environmental Restoration program is \$2.2 billion, which is an increase of approximately 47 percent over the FY 1995 report. The increase in costs associated with major Environmental Program activities, that is, Contaminated Soils, Industrial Sites, Underground Test Areas, and Surveillance and Monitoring, are primarily associated with redefinitions of program scope, schedule revisions, and more refined cost estimating techniques. However, in contrast to the FY 1995 report, the Tonopah Test Range was included in the Nevada Test Site for the FY 1996 report. Applicable program management costs have also been added.

Waste Management

The 1996 life-cycle cost estimate for the Waste Management program is \$708 million, about \$413 million less than the 1995 estimate. A comparison of this year's Baseline Environmental Management Report estimates with those of the FY 1995 Baseline Environmental Management Report indicates considerable differences in waste management activities resulting in these estimated reductions in life-cycle costs. For comparison, an analysis was conducted using the same criteria as last year. Under treatment activities, the construction of a Transuranic Waste Examination Facility will be built in FY 1996. The construction of the liquid waste treatment system has been postponed while project needs are being reviewed and reevaluated. Under storage activities, the construction of an expanded hazardous waste storage pad was put on hold indefinitely because the Nevada Division of Environmental Protection issued a revision to the Hazardous Waste Permit on May 1, 1995. The revision extended the storage of hazardous waste on the existing pad from 90 days to one year. The construction of a mixed waste storage pad scheduled for FY 1996 was put on hold because of the lack of identified need. The disposal activities at the Nevada Test Site also show a decline in shipments of low-level waste to the Nevada Test Site in the outyears.