ENVIRONMENTAL MANAGEMENT
SAFETY ❖ PERFORMANCE ❖ CLEANUP ❖ CLOSURE

Environmental Management

Legacy Waste Cleanup

Los Alamos National Laboratory

2016 Lifecycle Cost Estimate

Summary

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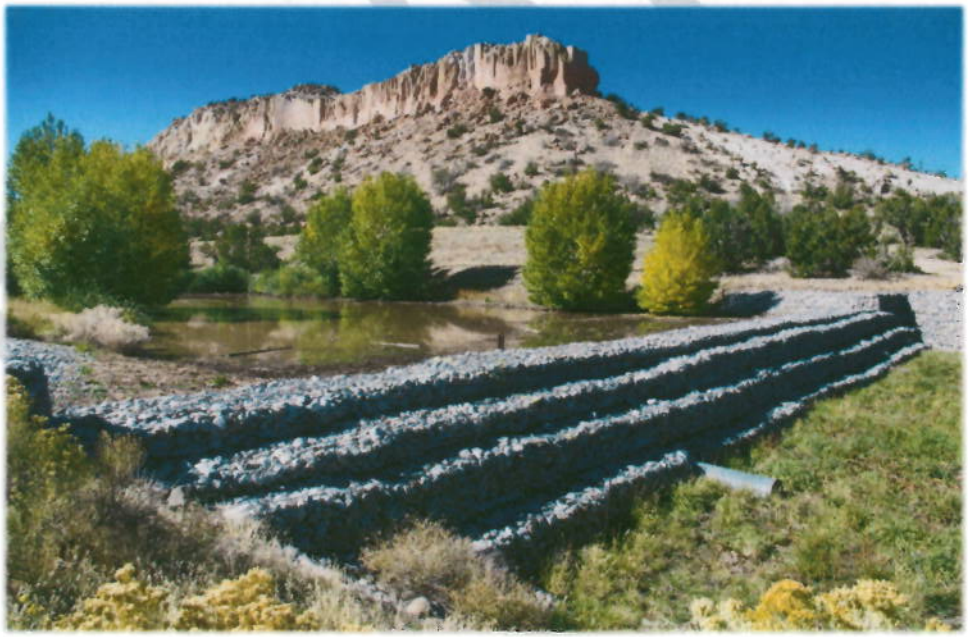


I. Legacy Cleanup at Los Alamos National Laboratory

The Environmental Management Los Alamos Field Office (EM-LA) is dedicated to the cleanup of legacy contamination of radioactive and chemical materials and waste resulting from past practices during the Manhattan Project and Cold War era at Los Alamos National Laboratory (LANL). The EM-LA cleanup scope includes legacy waste remediation and disposition, soil and groundwater remediation, and the demolition, deactivation and disposition of excess buildings and facilities.

The EM investigation and cleanup, where required, of an estimated 2,123 legacy potential release sites and disposal of approximately 10,000 cubic meters of legacy radioactive waste above ground at LANL has been ongoing for over 26 years (1989 to 2016). To date, 1,168 potential release sites have been investigated and cleaned up where required; the remaining 955 potential release sites are covered under this lifecycle cost estimate. An estimated 5,000 cubic meters of legacy waste remains, of which approximately 2,400 cm is retrievably stored below ground.

The regulatory framework for remediating non-radiological contamination has changed over the life of legacy cleanup at LANL, going from U.S. Environment Protection Agency (EPA) lead to the current regulatory authority under the New Mexico Environment Department (NMED). The Department of Energy (DOE) remains the regulatory authority for radiological material. The primary regulatory document governing EM's legacy cleanup scope is the 2016 Compliance on Consent (Consent Order), co-signed by the State of New Mexico and DOE (EM-LA).

II. 2016 Lifecycle Cost Estimate Overview

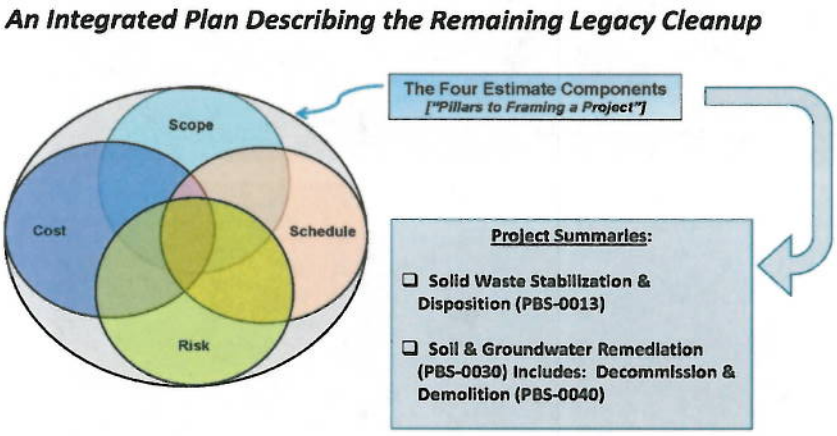
EM-LA utilizes a strategic planning tool known as the Lifecycle Cost Estimate (LCE) to forecast schedule and associated costs of its legacy cleanup mission. The LCE is a living document that requires periodic review and revision to ensure the most up-to-date planning assumptions are utilized when projecting overall schedule for ongoing cleanup work. The LCE is *not* a prioritized list of projects to be executed each year with definitive cost and schedule. That level of detail for the near term (1-5 years) will be developed in coordination with the cleanup contractor and be detailed in the Contract Performance Baseline.

The LCE is built by analyzing four core elements: scope, schedule, risk and cost. These four elements are analyzed individually and collectively to develop a strategic approach to execute the cleanup mission.

Of the four elements, risk is the most critical process because of the uncertainty in what the future holds. Therefore, the likelihood of a project completing on time and on budget is a function of many factors requiring active management. Risk management is the process of conducting risk planning, identification, assessment, analysis, handling or mitigating potential identified risks, and monitoring to control impacts to a project. In the life of a project, these processes interact and overlap with each other. Simply put, a risk is any event not in the schedule, which might cause delay or additional costs. For example; lack of qualified personnel with required expertise is a risk that could impact sequential activities in a project. However, proper anticipation of that issue and implementing a strategy to bring in the specialized experience at the right time will minimize the impacts to the schedule and project.

These core elements are illustrated in Figure 1 below.

Figure 1: Lifecycle Cost Estimate Core Elements



Key Assumptions

As a planning tool, the LCE is only as good as the assumptions on which it is developed. Several key assumptions have therefore been identified. At a macro level, the key assumptions listed below will impact each campaign.

- **Level funding:** Annual funding is projected to remain constant throughout the duration of the cleanup mission.
- **Efficient transition to new EM contract:** A new Los Alamos Legacy Cleanup Contract (LLCC) dedicated solely to EM cleanup at LANL, will become effective in 2018 with assumed cost avoidance of 15% due to future technology development/implementation and efficiency.
- **Alignment to 2016 Consent Order:** The cleanup approach outlined in the LCE, such as the use of campaigns, implements the cleanup priorities and approaches in the 2016 Consent Order.
- **Cleanup remedies identified:** The LCE presumes a final remedy ahead of regulatory approval for purposes of establishing a schedule and estimated costs. Actual final remedies will be identified in coordination with stakeholders/tribal governments.
- **Streamlined processes and systems:** Improvements are expected in the business structure of the LLCC contractor as well as the regulatory process under the 2016 Consent Order.
- **Scope:** The LCE is focused on EM cleanup scope currently identified.

Regulatory

The framework for investigation and remediation of contamination resulting from historical releases of hazardous waste and hazardous constituents at LANL is governed by separate regulatory requirements. The scope of licenses, permits, and agreements include pollution prevention and protection of public health and the environment, as well as nuclear safety, worker protection, hazardous materials transportation, waste management, and emergency planning. Additionally, the EPA requires surface water protection through compliance with the Individual Permit.

2016 Consent Order

The 2016 Consent Order is the state cleanup order regulated under the New Mexico Environment Department (NMED) and is the principal regulatory driver for legacy cleanup. The Consent Order contains requirements for investigation and cleanup as well as enforceable deadlines for achieving desired end-states to include submitting corrective action documents such as investigation work plans, investigation reports, periodic monitoring reports, and corrective measure evaluations. A fundamental approach to executing requirements of the Consent Order is through a Campaign structure which bundles contaminated sites and pursues investigation and remediation as a project. The LCE aligns this approach and this document provides a summary description of those Campaigns.

Radiological Regulatory Authority

Investigation and remediation of radionuclides at LANL is conducted under DOE's authority pursuant to the Atomic Energy Act of 1954 (AEA) as amended and is not subject to requirements under the Consent Order.

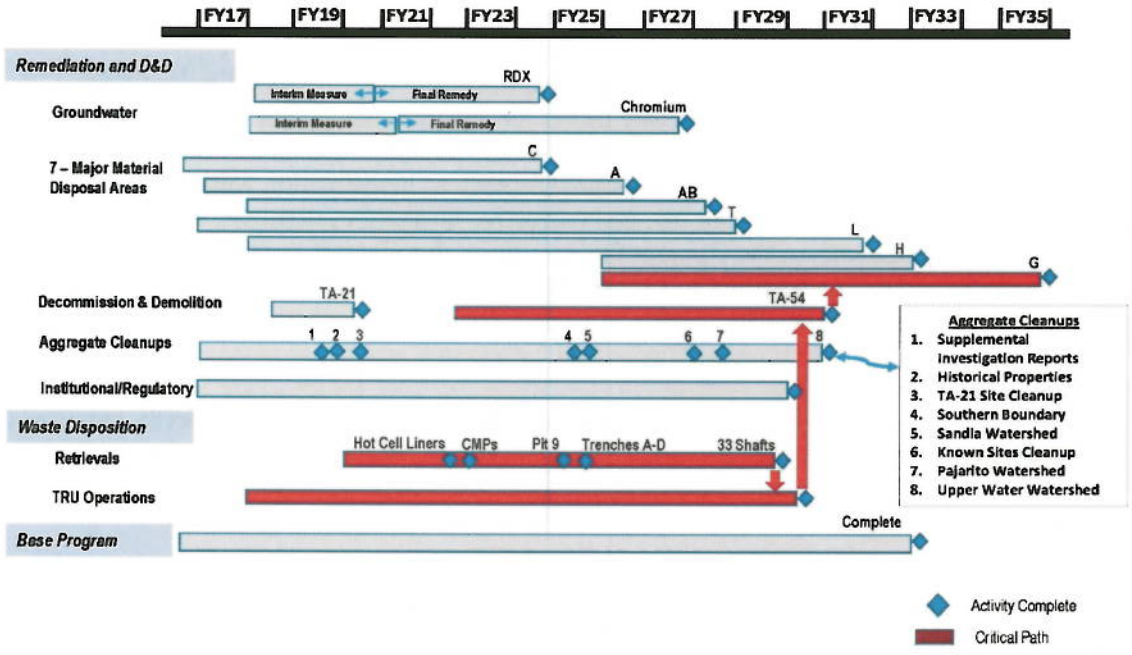
Scheduling Factors

Environmental cleanup efforts at LANL have been ongoing for over 25 years. In developing the LCE, significant factors were identified that impacted duration and successes of the cleanup mission to date.

- **Additional scope:** The discovery of previously unidentified legacy contamination, such as the chromium contamination, has resulted in the reprioritizing cleanup efforts and a reallocation of resources.
- **Decrease in funding levels:** Funding levels in recent years are lower than assumed in prior planning documents.
- **Waste Isolation Pilot Plant (WIPP) shutdown:** The 2014 underground fire and drum deflagration at WIPP have halted shipments of transuranic waste at LANL, resulting in delayed cleanup actions.
- **Prior regulatory framework:** Previous regulatory processes focused extensively on investigations and less so on tangible cleanup results. With pre-field activities completed, substantial progress is scheduled to be achieved towards final end state over the next near-term period.
- **Natural Events:** Two extensive wild fires have caused evacuation of Los Alamos County within the last 16 years. Together with subsequent rainfalls (once in a thousand years) environmental remediation efforts were wiped out requiring rework.

Figure 2 illustrates the overall schedule for the current remaining legacy cleanup mission as of August 2016.

Figure 2: 2016 Lifecycle Cost Estimate Schedule Summary



Cost Summary

The cost in the LCE is derived from a number of factors that are referred to as the "basis of estimate" and/or "means and methods." These analysis as stated above are based on assumptions and risk and support the establishment of a lifecycle planning tool for legacy cleanup. The table below identifies the cost for the Remediation/D&D (decommission and dismantlement), Waste Disposition and the Base Program that supports the execution of the work.

The 2016 Consent Order campaigns are a major component of the legacy cleanup at LANL, and capture the scope defined in the Soil & Groundwater and D&D project elements defined under a nomenclature entitled: "Project Baseline Summaries (PBS)".

> Soil & Water Remediation, PBS-0030: Protect, characterize, and monitor the regional aquifer; Remediate contaminated legacy waste sites on Laboratory and surrounding private- and government-owned lands, including groundwater (GW) and surface water, to levels appropriate for the intended land use; D&D excessed, process-contaminated and non-contaminated facilities that inhibit the timely execution of environmental restoration activities.

EM is also responsible for the disposition of legacy radioactive waste. This waste has been stored primarily in 55-gallon drums above ground in fabric-sprung structures in TA-54 however, there is some radioactive waste below ground that will be retrieved and processed for disposal.

> Waste Stabilization and Disposition, PBS-0013: Retrieve, characterize, and prepare legacy mixed low-level waste (MLLW) and TRU waste for off-site disposal. The project involves drum preparation, certification, and shipment of radioactive waste to a certified and licensed repository such as WIPP. The project contains above ground radioactive waste as well as below ground that will have to be retrieved, characterized, packaged, tested and certified prior to shipping to the appropriate disposal site.

Activity Title	Estimated Cost Range (M)
Remediation/D&D	$1,166.5 – $1,549.6
Waste Disposition	$656.9 - $967.1
Base Program	$1,100 – $1,320
Total	$2,923.4 – $3,836.7

Program Risks

Experience across the DOE has shown that environmental cleanup projects have varying degrees of risk depending on the remediation that is undertaken. Executing a cleanup project requires that both the contractor and the Government identify the risks to the project, develop mitigation strategies and track to ensure schedule and scope are managed appropriately to minimize any impacts. The contractor performing the cleanup identifies and manages their respective risks through their execution of the contract scope of work. The federal team identifies program risks that tend to be outside of the contractor's control. The over-arching program risks in this LCE are described below.

- **Offsite Waste Disposal/Treatment:** Disposal and/or treatment of radioactive waste becomes unavailable causing delays in disposing of legacy waste
    - Examples of disposal sites used in the legacy cleanup program: Waste Control Specialists, Waste Isolation Pilot Plant (WIPP), Nevada Test Site
    - Examples of treatment sites used in the legacy cleanup program: Perma-fix, Waste Control Specialists
- **Litigation**: Funds from yearly appropriations used for cleanup would be diverted to support the litigation efforts, examples are:
    - Natural Resource Damage Assessment
    - Resource Conservation and Recovery Act
    - Consent Order
- **Lack of resources:** Federal staffing levels are not adequate to provide oversight and contract administration actions that direct the contract activities
- **Landlord Management:** Program decisions and unforeseen incidents across multiple organizations (federal, contractor and County) can have direct impacts to the cleanup mission in terms of road closures, agreements, and at times funding commitments
- **Force Majeure:** Major natural disasters have caused delays and rework
    - Examples: Forest Fires, 1,000 year floods, earthquakes
- **New Standards:** Promulgating new regulatory standards in environment, safety or processes can have a direct effect on the scope of work and schedule
    - Environmental, clean up, new Federal, State, or Tribal requirements
- **Terrorism/Criminal Actions**: Deliberate acts of vandalism and/or terrorism including theft can have a direct effect on the scope of work and schedule

Opportunities

The EM Program has great success in developing and employing technologies to expedite and improve the cleanup mission across the DOE. One of EM-LA's operating principles is "Efficiency" and the legacy cleanup at LANL will focus on innovation and creativity to further the cleanup mission. EM-LA will coordinate with the EM's Office of Technology Development to gain support in the use of state-of-the-art technology. In addition to integrating best practices across the DOE complex, EM-LA will work closely with the Technology Development Office to gain knowledge and experience from EM's technology-based international, interagency, and academic interfaces to identify advancing technologies, solutions, materials and processes.

III. Cleanup Campaigns

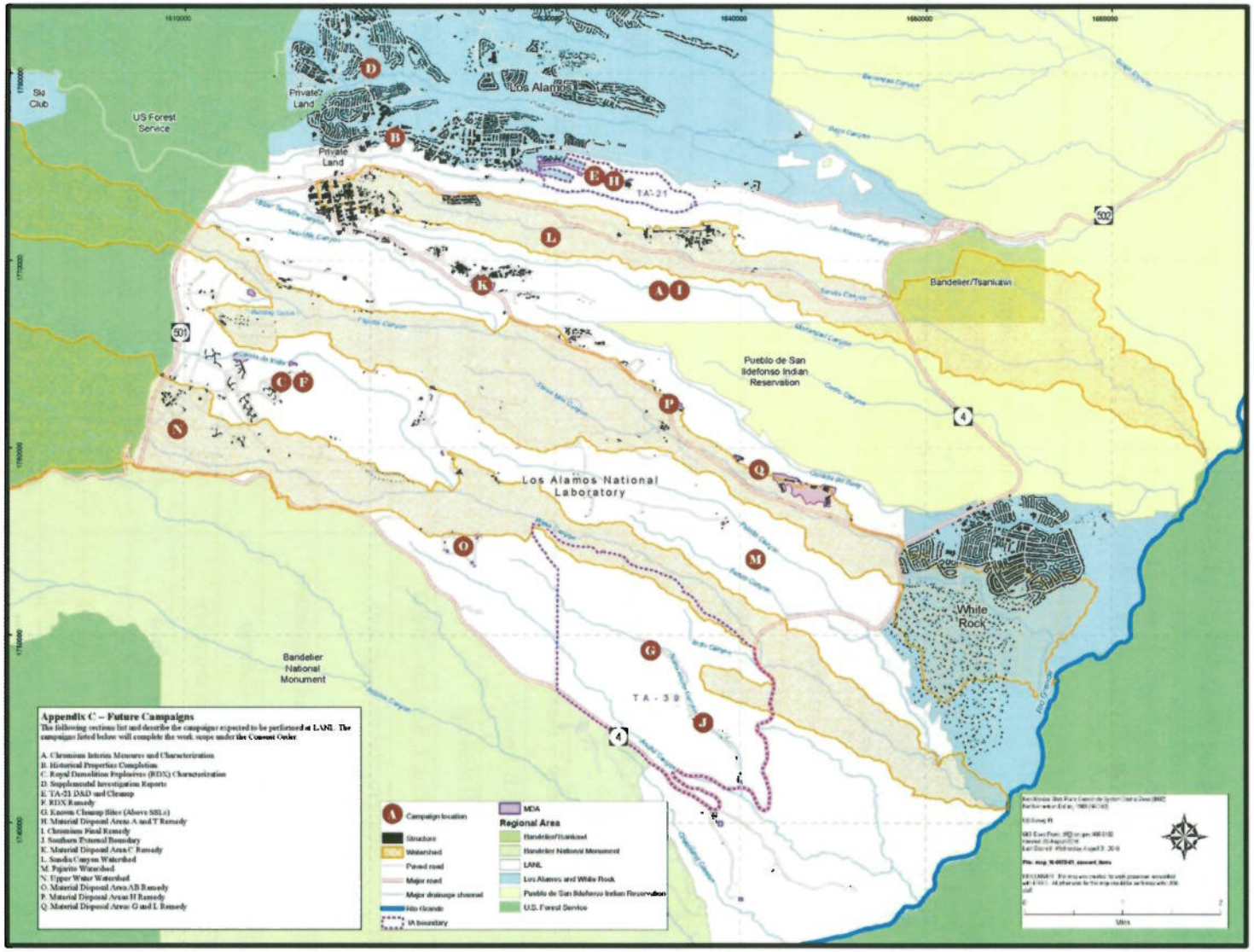
Campaigns in the LCE are scheduled in a prioritized order as agreed upon in the 2016 Consent Order. As one campaign winds down and completes, the next prioritized campaign will commence and continue until completion. However, based on assumed resources, several campaigns will be underway simultaneously. The map on page 11 provides the layout of LANL's technical areas for reference.

Projected duration and associated costs of 2016 Consent Order campaigns are shown in Table 1.

Table 1: 2016 Consent Order Campaigns

Soil & Groundwater (PBS-0030)				
Item #	**Campaign Title**	***SWMUs/AOCs**	**Estimated Completion Range**	**Estimated Cost (M) Range**
1	Royal Demolition Explosives (RDX) Characterization	2	2022 – 2024	$1.6 - $2.1
2	RDX Final Remedy	0	2024 – 2025	$22.3 - $26.8
3	Chromium Interim Measures	1	2020 –/2022	$38.9 - $50.6
4	Chromium Final Remedy	0	2026 – 2028	$100.3 - $130.0
5	Material Disposal Area (MDA) C Remedy	1	2024 – 2026	$34.6 - $48.7
6	MDA A & T Remedy	30	2028 – 2031	$92.1 - $124.3
7	MDA AB Remedy	12	2027 – 2030	$41.8 - $50.2
8	MDA H Remedy	1	2029 – 2030	$15.3 - $18.3
9	MDA G & L Remedy / D&D	12	2035 – 2040	$237.9 - $356.9
10	Supplemental Investigations Reports	222	2019 – 2019	$0 - $1.0
11	Historic Properties Completion	84	2019 – 2020	$5.3 - $6.4
12	TA-21 D&D and Cleanup	41	2020 – 2022	$45.8 - $54.9
13	Southern External Boundary	60	2025 – 2026	$10.0 - $12.0
14	Sandia Canyon Watershed	49	2024 – 2025	$6.3 - $7.6
15	Known Cleanup Sites	20	2027 - 2028	$34.8 - $41.8
16	Pajarito Watershed	167	2028 – 2030	$20.7 - $24.9
17	Upper Water Watershed	253	2030 – 2031	$33.5 - $40.2
Institutional/Regulatory			2029 – 2032	$425.3–552.9
	Total SWMUs/AOCs	**955**	**Total Cost**	**$1,166.5 – $1,549.6**

*Solid Waste Management Units (SWMUs) and Area of Concern (AOCs)


Ski Club
US Forest Service
Private Land
Los Alamos
Private Land
TA-21
502
Bandelier/Tsankawi
501
Pueblo de San Ildefonso Indian Reservation
4
Los Alamos National Laboratory
White Rock
Bandelier National Monument
TA-39
4
Appendix C – Future Campaigns
The following sections list and describe the campaigns expected to be performed at LANL. The campaigns listed below will complete the work scope under the Consent Order.
A. Chromium Interim Measures and Characterization
B. Historical Properties Completion
C. Royal Demolition Explosives (RDX) Characterization
D. Supplemental Investigation Reports
E. TA-21 D&D and Cleanup
F. RDX Remedy
G. Known Cleanup Sites (Above SSLs)
H. Material Disposal Areas A and T Remedy
I. Chromium Final Remedy
J. Southern External Boundary
K. Material Disposal Area C Remedy
L. Sandia Canyon Watershed
M. Pajarito Watershed
N. Upper Water Watershed
O. Material Disposal Area AB Remedy
P. Material Disposal Area H Remedy
Q. Material Disposal Areas G and L Remedy
Campaign location
Structure
Watershed
Paved road
Major road
Major drainage channel
Rio Grande
IA boundary
MDA
Regional Area
Bandelier/Tsankawi
Bandelier National Monument
LANL
Los Alamos and White Rock
Pueblo de San Ildefonso Indian Reservation
U.S. Forest Service

1. Royal Demolition Explosives (RDX) Characterization Campaign

Scope

Description: Technical Area (TA) 16, located in the southwestern corner of the Laboratory, was established to develop explosive formulations, cast and machine explosive charges, and assemble and test explosive components for the nuclear weapons program. Present-day use of this area is essentially unchanged, although facilities have been upgraded and expanded as explosives and manufacturing technologies advanced. TA-16 is bordered by Bandelier National Monument along State Highway 4 to the south and by the Santa Fe National Forest along State Highway 501 to the west.

The RDX Characterization Campaign includes: 1) potential interim measures or surface activities to prevent further migration of RDX resulting from historical activities and 2) characterization of the intermediate/regional groundwater through well installation, tracer studies and source control necessary to conduct a corrective measures evaluation.

Status: In progress.

Assumptions

Final End State: The end state for this campaign is completion of field investigations and studies to determine a final remedy and the Corrective Measures Evaluation (CME) Report. It is assumed that no interim measures will be conducted in the perched-intermediate or regional groundwater zones prior to submittal of the CME (See RDX Remedy Campaign for final remedy).

Schedule: Early finish –2018; late finish –2019

Cost Range: $1.6M–2.1M

2. RDX Remedy Campaign

Scope

Description: Upon completion of the interim measures campaign, a corrective measures implementation report and will be executed after receiving the statement of basis decision from NMED. Potential corrective measures that may be applied to this problem include pump & treat system that consists of pumping and treatment of contaminated groundwater from extraction wells followed by treatment and land application or injection to the subsurface of the treated water; in-situ bioremediation; and monitored natural attenuation.

Status: Awaiting completion of interim measures (see RDX Characterization Campaign above).

Assumptions

Final End State: The targeted end state for the RDX Remedy Campaign is to obtain a cleanup level within the perched-intermediate groundwater protective of the environment as determined by the actual RDX plume pathway. It is assumed that no cleanup will be required in the regional aquifer.

Schedule: Early finish –2024; late finish –2025

Cost Range: $22.3M–26.8M

3. Chromium Interim Measure and Characterization Campaign

Scope

Description: Hexavalent Chromium (CrVI) is present in the subsurface in the vadose zone (including in perched intermediate groundwater) and regional aquifer beneath Sandia and Mortandad canyons. Investigations identified the probable Cr source was cooling tower effluent released near the head of Sandia Canyon between 1956 and 1972. Chromium was transported down the canyon in surface-water flow with a portion of the releases absorbed into the surface, migrating vertically to the water table.

Interim measures is expected to control the movement of the chromium plume while characterization activities provide the data necessary to determine the final remedy which is presumed to be long-term pump and treat system that removes chromium from the regional aquifer. The characterization work will be conducted to determine whether extraction can achieve active long-term chromium removal from the regional aquifer and if in-situ remediation is an option.

Status: In progress.

Assumptions

Final End State: The end state for the interim measure is twofold; (1) effective control of the chromium plume edge through the operation of limited-duration pumping, treatment, and injection, and, (2) identification of final remedy documented in a corrective measures evaluation.

Schedule: Early finish –2020; late finish –2024

Cost Range: $38.9M–50.6M

4. Chromium Final Remedy Campaign

Scope

Description: Building on the Chromium Interim Measure and Characterization Campaign, DOE will analyze the results and develop a corrective measures implementation upon approval of the statement of basis decision from NMED. The current plan is to develop a pump & treat system that will continue to extract contaminated groundwater and that will flow through treatment units to remove the contamination and inject the clean water back into the aquifer. This remedy will be very similar to the interim measures except at a much higher rate of groundwater extraction. Additionally, the final remedy will likely include an in-situ remediation technology that will assist in reducing the hexavalent chromium into the less toxic form of trivalent chromium.

Status: Awaiting completion of the interim measures and characterization campaign.

Assumptions

Final End State: The end state for the Chromium Final Remedy Campaign is reduction of hexavalent chromium mass and concentrations to levels protective of groundwater. The final remedy is likely to be in operation for an estimated 20 years.

Schedule: Early finish –2026; late finish –2028

Cost Range: $100.3M–130.0M

5. Material Disposal Area C (MDA C) Remedy Campaign

Scope

Description: MDA C is located at Los Alamos National Laboratory's Technical Area 50 (TA-50), is approximately 11 acres in size and consists of 115 subsurface disposal units (7 pits and 108 shafts). MDA C was in operation from 1948 to 1974. A subsurface volatile organic compound (VOC) vapor plume is present in the vadose zone beneath MDA C. The sources of VOC vapors at MDA C are thought to be associated with wastes disposed of in the pits and shafts at the site, with VOCs being a component of the waste rather than a primary waste form.

This campaign includes implementation of a remedy resulting from NMED's statement of basis and selection of a remedy derived from a CME previously submitted. This campaign will include development of a corrective measures implementation plan, implementation of the remedy, and development of the corrective measures report.

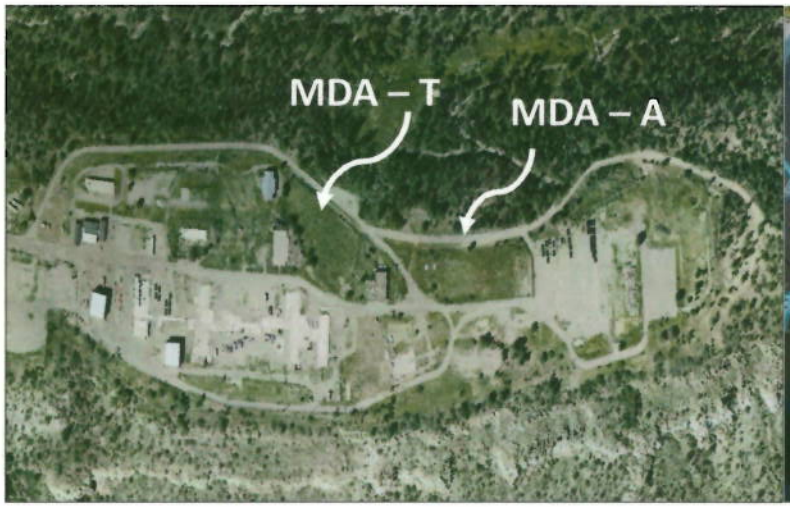
The wastes disposed of in these disposal units contain both hazardous constituents that are regulated by the NMED and radionuclides that are regulated by DOE. The goal of the CME is to recommend a corrective measures alternative in accordance with the requirements of the Consent Order. The corrective measures alternative must also meet requirements for radiation protection under DOE regulations and orders.

Compliance with DOE radiation protection standards may necessitate more stringent technical design requirements than are needed to comply with those under the Consent Order. These technical requirements will be identified during the corrective measures implementation (CMI) phase of the project and incorporated into the design of the final remedy.

Status: Awaiting regulatory approval of the CME.

Assumptions
Final End State: The presumed remedy in the LCE is an engineered cover that allows for the waste to remain in place. The cover will contain monitoring instrumentation to ensure it is performing as designed and keep rodents, plants & trees from creating pathways to the contamination. Groundwater will be a key monitoring component to ensure there is no migration of the contaminants and a soil vapor extraction system will be monitored and maintained. MDA C will be under institutional controls and will require compliance with set requirements from the regulatory authority.
Schedule: Early finish –2024; late finish – 2026
Cost Range: $34.6M–48.7M

6. Material Disposal Areas A and T (MDAs A & T) Remedy Campaign



Scope

Description: MDA A is an inactive subsurface legacy disposal site situated in Technical Area 21 (TA-21) on the eastern end of Laboratory on Delta Prime (DP) Mesa. Portions of MDA A are currently managed as a nuclear facility. The entire 1.25 acre is fenced and radiological controls are in place. Two types of waste streams were disposed of in separate areas at the site. Combustible and noncombustible radioactive solid wastes were disposed of in the central pit and the two eastern trenches, and radioactive (including plutonium) liquid wastes were stored in two underground tanks.

Central Pit and Two Eastern Trenches There is very little documentation that details the types of chemicals and quantities of radionuclides in the pit and trenches. Available historical records are limited and, as with MDA B, this contributes to the need for enhanced safety controls. Radionuclides and possibly hazardous chemicals were disposed of in the eastern trenches from 1945 to 1946, and the combined volume is estimated to be approximately 28,000 ft3. The central pit received contaminated waste debris from 1969 to 1978, and its volume is approximately 500,000 ft3. The trenches and the pit are covered with 6 ft. of clean soil.

Underground Tanks Aqueous plutonium residues were discharged into two 50,000 gallon underground storage tanks from 1945 to 194 7. These two tanks are located on the west end of the site and are covered by 18 in. of soil, an 8-in. reinforced-concrete slab, and 3 to 5 ft. of overburden soil. Each tank is 12 ft. in diameter and 63 ft. in length. Liquid wastes containing plutonium-239/240 and americium-241 were to be stored until improved chemical-recovery methods could be developed. From 197 5 to 1981, much of the liquid fraction of the waste was pumped from the tanks through access holes cut in the concrete and the tops of the tanks. Work was halted when the pumps began to remove sludge, leaving a heel of liquid and sludge in the bottom of each tank. All pipes and access holes were covered in 1985 and backfilled.

MDA T is also located in TA-21 just west of MDA A and is one of the first disposal areas used at LANL. Construction of four absorption beds for disposal of DP-West liquid waste was completed in 1945. Untreated waste from the processing of plutonium at TA-21 was released to the pits from 1945 to 1952. MDA T consists of four absorption beds used to dispose of liquid waste; a retrievable waste storage area;

a series of disposal shafts; an acid holding tank and acid sump; a caisson built at the northwest corner of absorption bed 1 in 1959; an inactive container storage area for alcohol, acetone, and Freon; and two surface spills of radioactive waste. MDA T is a 2.2 acre radiological waste disposal site currently classified as a hazard category 2 nuclear facility due to the radiological inventory in the disposal shafts. It is managed in accordance with a documented safety analysis for surveillance and maintenance at nuclear environmental sites This campaign includes completion of additional characterization of the pit and trench wastes at MDA-A and performance of moisture monitoring at MDA T including installation of instrumentation of boreholes, application of water to berm area, and monitoring of boreholes for moisture to conduct corrective measures evaluations for both MDA A and MDA T. These CMEs will result in NMED's statements of basis and selections of a remedy, and then the campaign will implement the remedies.
Status: Initial investigation has been completed and monitoring continues.

Assumptions
Final End State: This campaign will result in long-term isolation of the contaminant inventory in MDAs A and T to prevent exposure to potential human or ecological receptors. The two 50,000 gallon tanks (General's Tanks) are expected to be exhumed from MDA A, and both the final remedy for both MDAs is expected to include construction of an engineered cover and long-term performance monitoring.
Schedule: Early finish –2028; late finish –2031
Cost Range: $92.1M–124.3M

7. Material Disposal Area AB (MDA AB) Remedy Campaign

Scope

Description: MDA AB is approximately a half-acre radiological waste disposal site currently classified as a hazard category 2 nuclear facility due to the radiological inventory in the disposal shafts. It is managed in accordance with a documented safety analysis for surveillance and maintenance at nuclear environmental sites. Routine inspections are performed semi-annually and the results are documented. Event-driven inspections are performed after significant weather events, off-normal occurrences, etc. and are documented. These inspections result in maintenance work orders to remain compliant with the nuclear safety requirements.

This campaign includes additional characterization of the shaft areas inside and outside of the Nuclear Environmental Site (NES) boundary and completion of the corrective measures evaluation. Following NMED's statement of basis and selection of a remedy, this campaign includes development of a corrective measures implementation plan, implementation of the remedy, and development of the corrective measures report.

Status: Initial investigation has been undertaken.

Assumptions

Final End State: This campaign will result in long-term isolation of the contaminant inventory in MDA AB to prevent exposure to potential human or ecological receptors. The remedy is expected to include construction of an engineered cover and long-term performance monitoring.

Schedule: Early finish – 2027; late finish – 2030

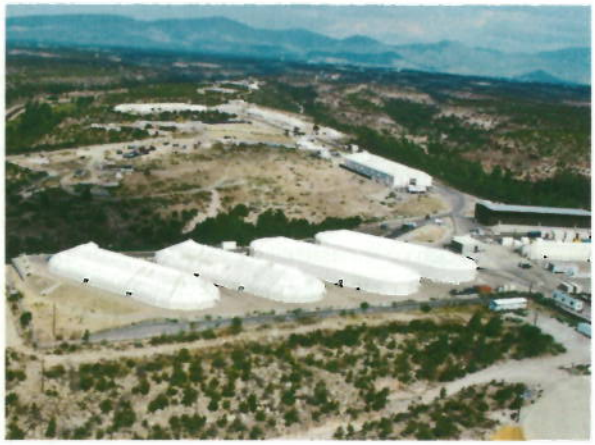
Cost Range: $41.8M–50.2M

8. Material Disposal Area H (MDA H) Remedy Campaign

Scope
Description: MDA H is an approximately 0.3 acre site composed of nine subsurface shafts used for the disposal of security-classified solid-form waste. Waste was disposed in the nine shafts over an approximately 26-year-period. Wastes disposed include lithium hydride, high explosives, metals, radionuclides, classified materials, and volatile organic compounds. The waste disposed of at MDA H may be sensitive to sparks, friction, heat, physical impact, pinching, air, and/or moisture. The CME previously submitted is part of a comprehensive, integrated approach to remediate and close these nine subsurface disposal shafts. Following NMED's statement of basis and selection of a remedy, this campaign includes development of a corrective measures implementation plan, implementation of the remedy, and development of the corrective measures report.
Status: Corrective measures evaluation has been submitted. DOE is awaiting statement of basis decision from the regulator.

Assumptions
Final End State: This campaign will result in long-term isolation of the contaminant inventory in MDA H to prevent exposure to potential human or ecological receptors. The remedy is expected to include construction of an engineered cover and long-term performance monitoring.
Schedule: Early finish – 2029; late finish – 2030
Cost Range: $15.3M–18.3M

9. Material Disposal Areas G and L (MDAs G & L) Remedy Campaign



Scope

Description: MDA L is an approximately 2.58 acre site that is decommissioned (i.e., removed from service) subsurface site established for the disposal of nonradioactive liquid chemical waste. The disposal units at MDA L are covered with asphalt to house ongoing Resource Conservation and Recovery Act–permitted chemical waste storage and mixed-waste storage activities. The subsurface disposal units of MDA L, along with the Area L landfill units, are interspersed across the northern-half of Area L.

MDA L consists of 1 inactive subsurface disposal pit (Pit A) and 12 inactive disposal shafts. The Area L landfill consists of 3 inactive surface impoundments (B, C, and D) and 22 inactive disposal shafts. A subsurface volatile organic compound (VOC) vapor plume is present in the vadose zone at MDA L. The primary sources of subsurface VOC vapors are the two shaft fields at MDA L, and they appear to be a continuing source of VOC vapors.

MDA G is an approximately 65-acre site located within Area G that comprises all subsurface pits, trenches, and shafts located within the disposal units. The low-level waste disposal units are regulated by DOE. The MDA G CME is part of a comprehensive, integrated approach to remediation and closure of all subsurface units at Area G. The performance assessment and composite analysis for Area G will establish the technical requirements for closure needed to meet the performance objectives for radiological protection of the public from radionuclides disposed of at the site. These technical requirements will be incorporated into the design of the final remedy during the corrective measures implementation phase of the project. Retrievably stored transuranic (TRU) waste will be removed before the implementation of the preferred remedy.

If DOE determines that removal of portions of the retrievable TRU waste is unsafe for workers or is cost prohibitive relative to risk reduction benefits, DOE may propose incorporating this waste into the corrective actions at MDA G through regulatory options available per DOE Order 435.1.

Subsurface volatile organic compound (VOC) vapor plumes are present in the vadose zone at MDA G. The sources of VOC vapors at MDA G are thought to be associated with mixed wastes disposed in the pits and shafts at the site, with VOCs being a component of the waste rather than a primary waste form.

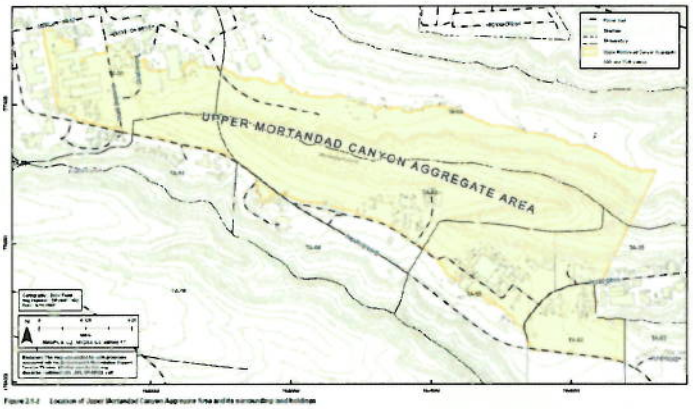
Area G contains structures/facilities that are required to perform waste operations activities such as; gas sampling, x-raying of the containers, repackaging of waste, waste storage, etc. These structures/facilities will be decommissioned and dismantled after retrievable of the transuranic waste is disposed of offsite. Removing the structures/facilities is a precursor to progressing to the final stage in the legacy cleanup program which is implementation of the regulatory approved final remedy.

This campaign will also perform soil vapor extraction (SVE) of volatile organic compounds as an interim measure while an asphalt cover still exists above MDA-L. This interim measure will address a subsurface vapor plume that is relatively shallow and has not yet progressed towards the basalt layer above the water table.

Status: The corrective measures evaluation previously submitted to NMED will be pulled back and resubmitted at a later date. The SVE technology will continue to be monitored and maintained.

Assumptions
Final End State: This campaign will result in long-term isolation of the contaminant inventory in MDAs G and L to prevent exposure to potential human or ecological receptors. The remedy is expected to include construction of an engineered cover, a soil vapor extraction system, and long-term performance monitoring.
Schedule: Early finish – 2035; late finish – 2040
Cost Range: $237.9M–356.9M

10. Supplemental Investigation Reports Campaign



SWMU 03-054(e), point of discharge into Upper Mortandad Canyon

Scope

Description: This campaign includes preparation and submission of ten supplemental investigation reports and, where appropriate, submission of requests for Certificates of Completion (a certificate of completion is issued by NMED for sites that are determined not to need any further investigation or cleanup actions).

Previous investigations were conducted for the ten aggregate areas listed below and the results were reported in Investigation Reports (IR). Following submittal of these IRs, NMED updated its position on defining nature and extent of contamination. Therefore, the data for aggregate areas, where IRs have already been submitted, will be reevaluated to determine if existing data is sufficient to determine the nature and extent of contamination for SWMUs and AOCs in each of the ten aggregate areas and whether each SWMU or AOC poses an unacceptable risk to human health and the environment. The supplemental IRs will present the data and evaluated based on NMEDs new position.

These aggregate areas include the following:

- S-Site Aggregate Area (Submitted)
- Potrillo and Fence Canyons Aggregate Areas (Submitted)
- Threemile Canyon Aggregate Area (Submitted)
- TA-49 inside the Nuclear Environmental Site Boundary (Submitted)
- TA-49 outside the Nuclear Environmental Site Boundary (Submitted)
- Cañon de Valle TA-14
- North Ancho Canyon Aggregate Area
- Lower Sandia Canyon Aggregate Area
- Upper Cañada del Buey Aggregate Area
- Upper Mortandad Canyon Aggregate Area (Submitted)

Status: In progress, one remaining SIR to be submitted in FY2016 and three SIRs planned for FY 2017.

Assumptions

Final End State: This campaign will identify those sites that do not require additional investigation or remediation and are suitable for certificates of completion and those which require Phase II investigations and/or remediation will be folded under the appropriate campaign.
Schedule: Early finish – 2019; late finish – 2019
Cost Range: $0M–1.0M

11. Historical Properties Completion Campaign

Scope

Description: This campaign involves additional investigation and remediation as necessary for: 1) sites located in the historical location of the Laboratory at or adjacent to what is now the Los Alamos Townsite and 2) former Laboratory properties that were transferred and are private properties or that require access through private property.

- Rendija Canyon Aggregate Area triennial ordnance surveys and biennial asphalt survey/removals
- Pueblo Canyon Aggregate Area Phase II submit requests for certificates of completion
- Upper Los Alamos Canyon Aggregate Area cleanups and Phase II IR
- Middle Los Alamos Canyon Aggregate Area PCB cleanup at AOC 02-011(a), ECO-Risk studies, and Phase II IR

Status: In progress.

Assumptions

Final End State: This campaign will result in levels of residual contamination at each SMWU or AOC that do not pose unacceptable human-health or ecological risk for current and foreseeable land use. Cleanup sites on private property are expected to be suitable for unrestricted land use cleanup on DOE property will appropriate for current and foreseeable land use.

Schedule : Early finish – 2019; late finish – 2020

Cost Range: $5.3M–6.4M

12. TA-21 D&D and Cleanup Campaign

Scope

Description: This campaign includes the removal and remediation of buried waste lines and contaminated soils to be performed as part of the DP Site Aggregate Area investigation. Demolition of facilities and slabs are not part of the Consent Order and will be executed under DOE requirements; the facilities to be demolished include the DP West slabs and the Radiological Liquid Waste Treatment Facility, TA-21-257, enabling access to the SWMUs and AOCs.

Status: In progress.

Assumptions

Final End State: This campaign will: a) decommission and dismantle the remaining above ground structures, and, b) will allow completion of investigation and remediation activities for the DP Site Aggregate Area and will result in levels of residual contamination at each SWMU or AOC that do not pose unacceptable human-health or ecological risk for current and foreseeable land use.

Schedule: Early finish – 2020; late finish – 2022

Cost Range: $45.8M–54.9M

13. Southern External Boundary Campaign

Scope

Description: This campaign includes, as appropriate, initial investigations, remediation of media above soil screening levels, risk assessments, and certificates of completion for three aggregate areas. Aggregate Areas have generally been investigated from north to south across the Laboratory. These three areas are in the border area between the Laboratory, Bandelier, and White Rock populated areas.

This campaign shall be conducted in the following areas:

- Chaquehui Canyon Aggregate Area Initial Investigation (43 sites remaining to investigate)
- South Ancho Canyon Aggregate Area Initial Investigation (11 sites remaining to investigate)
- Lower Water/Indio Canyon Aggregate Area Initial Investigation (7 sites remaining to investigate)
- North Ancho Canyon Aggregate Area Phase II (26 sites remain for further investigation)
- Potrillo/Fence Canyon Aggregate Area Phase II (26 sites remain for further investigation)

Status: Scheduled to start FY 2018.

Assumptions

Final End State: This campaign will result in levels of residual contamination that do not pose unacceptable human-health or ecological risk for current and foreseeable land use.

Schedule: Early finish – 2025; late finish – 2026

Cost Range: $10M–12M

14. Sandia Canyon Watershed Campaign

Scope

Description: This campaign includes completion of several investigations that are already in progress in the central portion of the Laboratory for certain Aggregate Areas, it contains approximately 49 SWMUs/AOCs, in the following Aggregate Areas:

- Upper Sandia Canyon Aggregate Areas Phase II Investigations
- Lower Sandia Canyon Aggregate Areas Phase II Investigations
- Upper Mortandad Canyon Aggregate Area Phase II Investigation
- Upper Cañada del Buey Aggregate Area Phase II Investigation

Status: In progress.

Assumptions

Final End State: This campaign will result in levels of residual contamination that do not pose unacceptable human-health or ecological risk for current and foreseeable land use.

Schedule : Early finish –2024; late finish –2025

Cost Range: $6.3M–7.6M

15. Known Cleanup Sites (Above SSLs) Campaign

Scope

Description: This campaign includes soil removal from nineteen sites that previous investigations identified have hazardous contaminants at concentration that exceed the target risk levels of 10-5 lifetime excess cancer risk for carcinogenic contaminants and a hazard index (HI) of 1 for non-carcinogenic contaminants.

The scope includes planning, procurement, readiness, surveys, mobilization, cleanup, waste management, sample collection, sample analysis, data analysis, risk screening, and report preparation activities. The estimated total volume of soil/debris to be removed and the associated waste type is included. Potential waste types include industrial waste, low-level radiological waste, PCB waste and mixed PCB wastes.

The sites to be included in this campaign were selected by reviewing the information contained in existing investigation reports. The objective was to identify those sites where further activity and/or cleanup was recommended. Following the review of existing information, nineteen sites were identified as sites known to require a prioritized cleanup. Eighteen of these sites require soil/debris cleanup totaling 7,178 cubic yards (CY).

Sites:
03-049(a) 6 cubic yards (CY) of PCB waste
03-049(b) 22 CY total; 7 CY industrial, 15 CY mixed PCB
03-049(e) 19 CY industrial
50-006(d) 2,000 CY low level
46-004(q) 111 CY mixed PCB
16-026(b) 17 CY industrial
36-001 2,519 CY total; 519 CY industrial, 1,800 CY low level, 200 CY mixed PCB
15-008(b) 355 CY low level
15-007(c)-00 4 CY low level
36-008 1,430 CY low level
C-36-003 500 CY PCB
14-006 12 CY low level

14-009 15 CY low level
39-002(a) 56 CY mixed PCB
39-007(a) 10 CY low level
39-001(a) 75 CY PCB
39-001(b) 10 CY PCB
53-001(a) 19 CY PCB

15-010(b), a settling tank estimated to contain100 gallons of liquids requiring disposal as an industrial waste.

All sites will be cleaned up to the approved risk-based cleanup criteria to achieve risk reduction at each location. Chemicals of potential concern (COPCs) will be identified to focus the cleanups on the constituents driving the risk. Confirmatory samples will be collected to verify that cleanup objectives have been achieved. Waste samples will be collected to characterize wastes for off-site disposal.

Status: Work planned to start in FY 2017.

Assumptions
Final End State: This campaign will result in levels of residual contamination that do not pose unacceptable human-health or ecological risk for current and foreseeable land use. Remedial actions will consist of removal of soil contaminated above risk-based cleanup levels.
Schedule: Early finish –2027; late finish –2028
Cost Range: $34.8M–41.8M

16. Pajarito Watershed Campaign

Scope

Description: This campaign includes initial investigations in some Aggregate Areas for which investigation has not yet occurred as well as completion of those investigations that are already in progress for other Aggregate Areas in the central portion of the Laboratory. For these areas, this campaign includes remediation, as appropriate, for media above soil screening levels. This campaign includes the following:

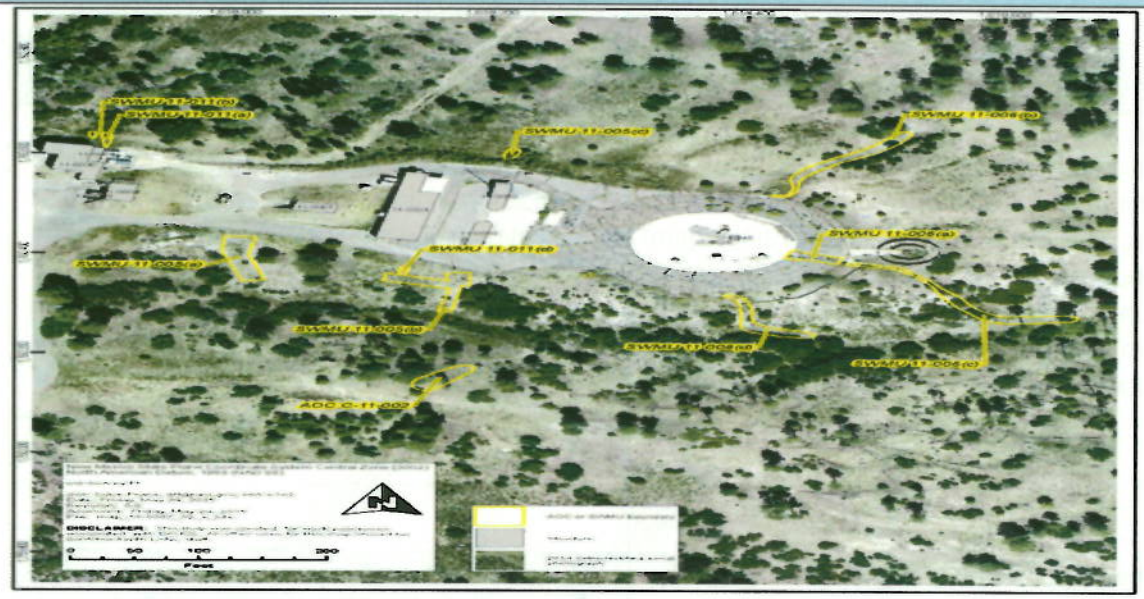
- ***Starmer/Upper Pajarito Canyon Aggregate Area Initial Investigation (77 SWMUs/AOCs)***
  Sites in this aggregate include septic tanks, outfalls, sumps, drain lines, and a number of soil contamination areas associated with burned-in-place, WWII-era HE storage and process buildings at TA-08, -09, -22, -40, and -69. Two 900-ft wells will be installed to provide characterization and long-term monitoring of water quality and water levels at TA-09.
- ***Two-mile Canyon Aggregate Area Initial Investigation (58 SWMUs/AOCs)***
  Sites in this aggregate include industrial wastewater sumps, outfalls, waste lines, sump, storm drainages, a construction debris landfill site, storage areas, tank and associated equipment at TA-03; three inactive firing sites, a storage area, and a decommissioned building at TA-06; and a septic system and scrap burn site at TA-40.
- ***Three-mile Canyon Aggregate Area Phase II Investigation (25 SWMUs/AOCs)***
  Sites in this aggregate include active and inactive firing sites, surface disposal areas, buildings, septic tank outfalls and sumps, and miscellaneous sites such as the radioactive lanthanum site, sandbags, aluminum pipe, a one-time HE burn area, and shafts at TA-12, -15 and -36.
- ***Lower Pajarito Canyon Aggregate Area Initial Investigation (47 SWMUs/AOCs)***
  Sites in this aggregate include firing sites and impact areas, storm drains/drain lines/outfalls, holding tanks and contaminated soil at TA-18.

Status: In progress.

Assumptions

Final End State: This campaign will result in levels of residual contamination that do not pose unacceptable human-health or ecological risk for current and foreseeable land use.
Schedule: Early finish –2028; late finish –2030
Cost Range: $20.7M–24.9M

17. Upper Water Watershed Campaign



Scope

Description: This campaign includes initial investigations in some Aggregate Areas for which investigation has not yet occurred as well as completion of those investigations that are already in progress for other Aggregate Areas. For these areas, this campaign includes remediation, as appropriate, for media above soil screening levels. This campaign includes the following:

- Cañon de Valle TA-15 Initial Investigation (20 SWMUs/AOCs)
- Cañon de Valle TA-16 Initial Investigation (101 SWMUs/AOCs)
- Cañon de Valle TA-14 Phase II Investigation (23 SWMUs/AOCs)
- Upper Water Canyon Aggregate Area Initial Investigation (129 SWMUs/AOCs)
- S-Site Canyon Aggregate Area Phase II Investigation (61 SWMUs/AOCs)

Status: In progress.

Assumptions

Final End State: This campaign will result in levels of residual contamination that do not pose unacceptable human-health or ecological risk for current and foreseeable land use.

Schedule: Early finish –2030; late finish –2031

Cost Range: $33.5M–40.2M

Institutional and Regulatory

Scope
Description: The costs associated with this activity include: equipment, facilities, utilities, grounds & housekeeping, maintenance, roads, and regulatory permits and other related ancillary activities required to support a long term cleanup program at LANL. The material disposal areas because of the radiological inventory are considered nuclear facilities and require implementation and maintenance of nuclear safety requirements. Another component is the regulatory program structure that includes regulatory drivers such as complying with the Individual Permit that requires controls to avoid surface water from migrating contaminants, numerous permits and agreements that allow for work to be performed in flood plains, and processes to allow for integration across LANL to ensure consistency and stronger stewardship.
Status: Ongoing

Assumptions
Final End State: This activity supports the campaigns and will end upon completing the cleanup
Schedule: Early finish –2029; late finish –2032
Cost Range: $425.3M–552.9M

IV. Radioactive Waste Disposition Campaign

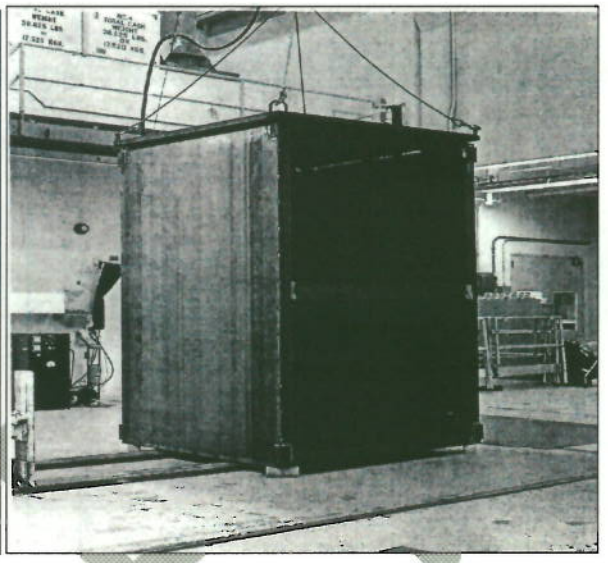
There is also legacy TRU waste that will be retrieved from below ground at TA-54, and will require processing, re-packaging and certification for shipment.

Table 2 identifies the projected duration and associated costs of the TRU waste activities.

Table 2: Radioactive Waste Campaign

Solid Waste Stabilization and Disposition (PBS-0013)			
Item #	**Activity Title**	**Estimated Duration**	**Estimated Cost (M)**
1	1. Hot Cell Liners 2. TRU with Tritium Packages 3. 17th RH Canister	2022 – 2024	$4.8–7.2
2	Corrugated Metal Pipes	2022 – 2023	$7.3–9.5
3	Pit 9	2025 – 2027	$25.8–33.5
4	Trenches A-D	2025 – 2029	$17.8–26.7
5	33 Shafts	2028 – 2033	$48.2–144.6
6	Waste Processing & Shipping	2018 – 2033	$553.0–745.6
		Total	**$656.9 - $967.1**

1. Hot Cell Liners/Other



Scope
Description: Retrieval of waste from shafts contain 5 Hot Cell Liners, 5 Tritium Packages, and a single waste package referred to as the 17th RH Canister. These vertical lined shafts extend above grade, have concrete caps or steel plates covering the top of the staff and were augured vertically into the mesa in Area G at TA-54. A corrugated metal liner was then inserted in the hole and gravel was placed in the bottom. Concrete caps were placed on top of the shafts containing the Tritium Packages and the 17th RH Canister and steel plates were placed atop the shafts containing the Hot Cell Liners.
Status: Preliminary evaluations have begun but retrieval has not commenced.

Assumptions
Final End State: Retrieval of the hot cell and associated material will allow for the area to be integrated into the final remedy for Area G.
Schedule: Early finish – 2022; late finish – 2024
Cost Range: $4.8M–7.2M

2. Corrugated Metal Pipes

Scope

Description: Galvanized metal pipes, known as CMPs, of approximately 20-foot length and 30-inches diameter with continuous welded seams and non-radioactive concrete plugs of approximately 12-inches thick poured into the ends. The CMPs waste unit category consists of a total of 158 corrugated metal pipes filled with cement from a batch treatment process that mixed Portland cement with several liquid waste streams containing americium and plutonium at the Technical Area (TA) 21.

The CMPs were filled with cemented waste from late 1975 to 1978 and maintained in a vertical configuration in a pit at MDA T. The CMPs were retrieved from storage, decontaminated, painted, and transported to TA-54 in 1986. The 158 CMPs were placed in two horizontal rows end-to-end and stacked two high. After all of the CMPs were placed, they were covered with plywood and tarps and about six feet of soil.

Status: Preliminary evaluations have begun but retrieval has not commenced.

Assumptions

Final End State: Retrieval of the CMPs will allow for the area to be integrated into the final remedy for Area G.

Schedule: Early finish – 2022; late finish – 2024

Cost Range: $7.3M–9.5M

3. Pit 9

Scope

Description: Pit 9 TRU waste category consists of approximately 3,882 metal drums, 191 fiberglass-reinforced plywood (FRP) boxes, and six other containers stored on an asphalt pad in an underground pit located in the north-central portion of Area G. Waste containers were placed into Pit 9 from November 1974 through November 1979. In general, FRP boxes were stacked along the perimeter of the asphalt pad and drums were stacked in the center of the FRP boxes.

The stack of waste containers is divided up into four cells of approximately equal size, with crushed tuff placed between the cells to serve as a firebreak. One cell was constructed with an access shaft that allows inspection of 48 drums stored in the pit. After waste was placed into a cell, the entire stack of waste within the cell was covered with plywood, plastic sheeting, and crushed tuff to the original grade of the pit. Additional cover was placed over portions of the pit once filled.

Status: Preliminary evaluations have begun but retrieval has not commenced.

Assumptions

Final End State: Retrieval of the TRU in Pit 9 will allow for the area to be integrated into the final remedy for Area G.

Schedule: Early finish – 2025; late finish – 2026

Cost Range: $25.8M – $33.5M

4. Trenches A-D

Scope

Description: Trenches A-D, located in the south-central portion of TA-54 and oriented northwest-southeast, contain arrays of sealed concrete casks with a capacity to hold two 30-gal drums stacked one above the other. The four trenches have a total of 420 concrete casks, but only 357 casks were used to store TRU waste.

Status: Preliminary evaluations have begun but retrieval has not commenced.

Assumptions

Final End State: Retrieval of the trenches will allow for the area to be integrated into the final remedy for Area G.

Schedule: Early finish – 2025; late finish – 2028

Cost Range: $17.8M–26.7M

5. 33 Shafts

Scope

Description: TRU wastes from 1979 to 1987 is contained in 33 lined shafts, located in the eastern portion of Area G. Radioactivity in these shafts is significant, requiring remote handling, but the total volume of waste amounts to only a few cubic meters. The 33 Remote Handled-TRU shafts are each about three feet in diameter and 18 feet deep, containing 13 feet long by 8.5 inch diameter ¼-inch thick carbon steel pipe liner, with a steel plate welded to the bottom and a steel cap attached to the top. These liners in turn contain a total of about 290 one-gallon steel and plastic cans that were gravity-dropped into the pipes at the time of emplacement.

Recent field inspections revealed 23 of the 33 pipes have been encased in concrete, which complicates retrieval, transportation, and planned nuclear processing operations for off-site disposal.

Status: Preliminary evaluations have begun but retrieval has not commenced.

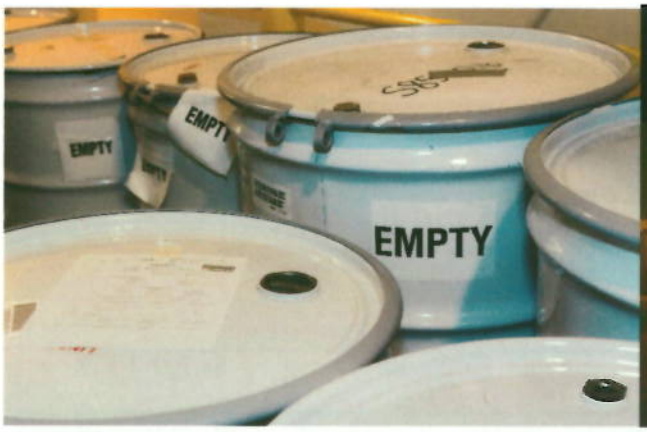
Assumptions

Final End State: The remaining shafts will be sampled, remediated and this area is expected to be integrated into the Area G final remedy.

Schedule: Early finish – 2028; late finish – 2033

Cost Range: $48.2M–144.6M

6. TRU Processing and Shipping



Scope

Description: Scope included in this activity covers above-ground work needed to ultimately ship waste to the appropriate disposal facility, such as WIPP and includes: nuclear safety requirements, procedures, trained operators for various operating lines such as sorting and segregating, emergency preparedness activities, infrastructure and maintenance, control systems and processes to account for the waste, acceptable knowledge processes that have received more scrutiny after the WIPP accident, readiness reviews to ensure operations are ready and safe, testing and evaluation processes to ensure containers meet the WIPP Waste Acceptance Criteria, and continued calibration and certification to ensure the equipment operates at the appropriate level.

Additionally, Area G conducts mixed low level waste (MLLW) and low level waste (LLW) disposal operations, properly treating as required and disposing at approved low level landfills.

This Activity also includes Government Furnished Items such as containers, lids, bags, etc., procured by the Government and provided to the contractor for packaging waste for shipment to the disposal site.

Status: Ongoing.

Assumptions

Final End State: Completed processing and removal of radioactive waste enabling long-term isolation of remaining contaminant inventory in MDA G to prevent exposure to the environment.

Schedule: Early finish – 2030; late finish – 2035

Cost Range: $553.0–745.6M

V. Base Program

The following activities support the planning and execution of the legacy cleanup projects.

The campaigns identified in the 2016 Consent Order and the TRU waste campaigns require an organizational structure and infrastructure to perform the necessary operations and to ensure facilities are ready and maintained in a safe and compliant condition. The associated costs of the base operation and infrastructure are listed in Table 3 below.

Table 3: Base Program

Item	Activity Title	Estimated Duration	Estimated Cost (M)
1	Base Program	2032 – 2035	$1,100–1,320
		Total	**$1,100–1,320**

The costs associated with this activity include program structure, policies, procedures, systems and a business framework to run a large operation that intersects with multiple functions within LANL. The base program is responsible for implementing and managing safety and health programs as well as establishing a human capital organization to support the workforce. The base program is also responsible for developing procurements to advance the cleanup mission and supporting "steady-state" monitoring & maintenance of completed sites.

To support the campaigns, a minimum level of infrastructure is required to protect records; maintain a core of key personnel; meet contracting, financial, and project control requirements; ensure efficient and cost-effective operations; plan and prioritize work; keep stakeholders/tribal governments informed; interact with the regulatory agencies; protect the public by securing, maintaining, and monitoring contaminated sites; and ensure worker safety. Activities included as part of base program are described below:

Operations Support

- Health and safety includes review and integration of subcontractor H&S programs
- Field services, regulatory compliance, health and safety (H&S), quality assurance (QA), training, and document production
- Surveillance and maintenance of the material disposal areas (MDAs) and nuclear environmental sites (NES). Provides for general regulatory compliance integration and operations, policy and guidance, and deliverable
- Coordination and integration across LANL (contractors and federal organizations) on environmental regulatory issues to ensure consistency with regulatory approaches and strategies employed
- Quality Assurance requirements integrated across DOE Order 414.1, Quality Assurance; Coded of Federal Requirements (10 CFR Part 830 Subpart A, Quality Assurance Requirements); contractor Quality Assurance Policies and procedures; and, Hazardous Waste Permit (Hazardous and Solid Waste Amendments, 1984) Module VIII of the LANL RCRA Permit
- Nuclear Safety: Requirements of 10 CFR 830, Nuclear Safety Management, Subpart B Safety Basis, the material disposal areas (MDA) and/or other Nuclear Environmental Sites (NES) have been categorized on the basis of existing radionuclide inventory data (sites that are categorized as

nuclear hazard category 2 or 3 require a Documented Safety Analysis and are updated and maintained and NES are inspected and maintained)
- Online training and tracking will be used to notify, disseminate, quiz, track and verify project personnel training to federal (DOE Order 5820.2A, 29 CFR 1910.120) and company
- Publication support includes technical writing, compositing, production, and distribution of all documents such as; NMED Consent Order deliverables, non-Order deliverables, safety basis documents, quality-assurance (QA) documents, procedures, and correspondence

Environmental Information Management

- Manage and coordinate the overall technical business processes, including sample planning, field data collection, sample management, field and laboratory data upload, data editing, auto data validation, GIS database and information, and tabular and map reporting (use of cloud based and locally hosted data systems)
- Environmental Information Management (EIM) database to organize, manage, and report sampling, analytical and subsurface data in the external Cloud based data system (EIM's is a widely used database; capability includes analytical chemistry data management, including auto validation, Electronic Data Deliverable error checking and multiple format uploads, and customizable valid values, etc.)
- Intellus New Mexico (Intellus), a cloud based environmental database application, (http://www.intellusnm.com/.), is fully searchable data website managed and processed in EIM, (regulations and permits require LANL to make environmental analytical results available in a publicly accessible database)
- Activities to plan sampling events, process and ship samples, maintain sample data, and evaluate environmental analytical data – highly rigorous and tight quality controls process to ensure sample integrity
- Analytical contracts: Originate and maintain contracts with a wide variety of commercial analytical chemistry laboratories to analyze samples according to EPA and standard methods for compliance with state, EPA and DOE requirements

Technical Support

- Geographic Information Systems (GIS): Spatial data maintenance (data updates, backups, etc.), software upgrades, system troubleshooting and repair, GIS user accounts, and system/data migration to institutional GIS servers and consultation to ensure system meets requirements and to properly migrate spatial data and standards into institutional system
- Human Health and Ecological Risk Assessment program that supports: consistent approach to human health and ecological risk assessments translate to more reliable data interpretation, quicker review cycles, improved contractor oversight, and cost effective technical approach methodology
- Integrate with local and regional non-DOE land management entities and private property owners to ensure that projects and other actions are tracked with regards to their proximity to SWMUs and AOCs where contamination from former Laboratory activities may result in worker exposure and/or compliance issues (examples: Los Alamos County meetings, US Forest Service, National Park Service, and private property owners)
- Subcontract Closeout activities such as: collection of subcontractor costs invoiced, warranties, etc

Document Control and Records Management:

- The Document Control and Records Management includes the development, implementation, and management of a comprehensive records program to support the documents and records requirements

- The Records Processing Facility implements widely-accepted and established standards for managing records in a legally defensible manner to ensure that can actively search for records pertinent to cleanup projects and programs programmatic interests, as well as Freedom of Information (FOIA) requests
- A configuration control procedure program, which includes development support, execution of the review and comment process, distribution, and maintenance of plans, procedures, and guidance documents that implement state, federal, DOE, and Quality Assurance requirements
- Managing engineering information, including change documents, including distribution
- Development and administration of the information systems used an Electronic Document Management System (EDMS), records management system, subcontractor submittal management system, and correspondence control system
- Identification and processing of records that are required for submission to the Electronic Public Reading Room to meet RCRA permit and Individual Permit requirements
- Management of file plans and retention schedules

Regulatory Compliance Support:

- Regulatory Data effort includes activities to accomplish distinct tasks related to the SWMUs and AOCs located at the LANL
- Maintain and continue to refine high level RCRA Corrective Action strategy
- Integrate regulatory compliance across programs
- Track and report on regulatory vulnerabilities and strategy compliance
- Maintain an interface on environmental regulatory issues with primary administrative authority (NMED and with additional authorities as appropriate).
- Management, upkeep, and updates of the SWMU/AOC Database and provide responses to information requests
- Provide environmental safety and health support as needed to specific institutional environmental compliance programs, including, but not limited to: the Storm Water Pollution Prevention Program, National Pollutant Discharge Elimination System Program, and Spill Prevention Control and Countermeasure programs; the Laboratory's Aboveground Storage Tank program, including tank inventories; development of groundwater discharge plans; Clean Air Act programs including Titles V, VI, and VII and Radiation National Emission Standards for Hazardous Air Pollutants, Cultural Resources Programs and compliance with the National Environmental Policy Act.
- Respond to audit findings, prepare Corrective Action Plans, and document non-conformances and provide subject matter expert guidance to operations for compliance with environmental requirements identified during the Permits Requirements Identification process.
- Maintain a programmatic inspection program including qualification standards for the Resource Conservation and Regulatory Act process. Develop, implement, and maintain effluent controls, environmental monitoring, and surveillances.

IT/Computer Support:

- Provide desktop user support to allow users to be productive on a day-to-day basis. This effort includes installing software and configuring systems, and helping users with problems and questions.
- Provide hardware and network support to users. This effort includes hardware maintenance, repair, and replacement, maintenance of internal and external web servers, upgrades, system security and performance monitoring, routine and ongoing daily support for file servers, file storage organization, permission or access rights administration, user IDs and passwords, tape backups, data archives, email support and administration, traffic monitoring, diagnostics, ongoing upgrades of infrastructure, conceptual planning and overall administration.

Program Management:

- Program oversight to ensure successful and efficient implementation of corrective action process
- Interface with LANL contractors to ensure to avoid conflicts and re-work
- Interface with DOE sponsors, including meetings, progress reporting, and performance measure development and reporting, and issue resolution
- Providing strategic direction to the project, including setting project priorities, goals, and defining roles and responsibilities
- Managing and controlling the project budget ensuring that financial management and project controls meet DOE requirements
- Ensuring that projects function in a manner protective of human health and safety and of the environment and remain compliant with all applicable regulations
- Ensuring security of LANL is not compromised
- Daily coordination of personnel transactions, such as approvals, attendance, authorities, travel requests, personnel actions, responding to audits and assessments, space concerns, and facilities maintenance
- Daily management and oversight of the project office function, including personnel management, and maintenance of project office workflow
- Daily production of memorandums and letters from project staff as well as copying, emailing, distributing lab-wide bulletins, and transmitting messages
- Oversight of the planning and maintenance of the baseline elements for program management and technical support
- Monthly tracking of schedule and cost performance status, earned value analysis, including integration of financial data and schedule data from projects

Waste Disposition Minimum Safe Operations:

- Provide for TA-54 Operations Center/WCRRF Operations Center support operations at Area G, Area L, RANT and WCRRF. The operations center must be staffed during waste processing and handling operations and is responsible for controlling access into the facilities. The operations' centers coordinate traffic through the facilities and are the check-in point for visitors into the facilities, emergency notifications, weather impacts, maintenance personnel, and general day to day facilitation of events and work scope.
- Perform nuclear safety/safety basis activities, to include: coordinate the development and maintenance of facility safety envelope (including: defining and documenting facility capability limits and operating limits; maintaining overall facility and operation limits agreements; and determining those procedures requiring consistent application in order to remain within facility operating limits.
- Establish and maintain a facility or operation specific radiation protection program for environmental and waste management operations (EWMO) that meets the requirements of 10 CFR 835.
- Perform engineering to plan and execute upgrades, modifications, and improvements as necessary to maintain existing facility capabilities and associated structures, systems, and components.
- Maintain a nuclear criticality safety program to preclude inadvertent nuclear criticality at the TA-54 Area G, WCRRF and RANT nuclear facilities. This ensures that general Limits and controls are applied to operations involving fissionable materials to ensure subcritical (safe) configurations under all normal and credible upset conditions.
- Develop and maintain an Emergency Management program at the facility level in accordance with DOE Order 151.1C. DOE Order 151.1C defines the NNSA's requirements and components necessary for emergency planning and preparedness, to include a drill and exercise program, development of facility run sheets and hazards assessments, development of emergency plans and procedures and ensuring preparedness functions for the EWMO facilities.

- Planned maintenance in order to ensure safe, fully operational facilities. Failure of mission critical structures, systems and components can place buildings in an unsafe state and will restrict or stop operational activities and require those facilities to be vacated.

VI. Summary

The 2016 Lifecycle Cost Estimate projects completion of the legacy cleanup by FY 2035 to 2040 with a cost range of $2.9 billion to $3.8 billion. The updated LCE is based on realistic expectations of annual funding for the remaining work, as well as increased efficiencies expected under the planned Los Alamos Legacy Cleanup Contract, which is expected to take effect in October 2017.

The LCE details the scheduling of campaigns, including those already underway, such as Decommissioning & Demolition activities at Technical Area 21 and the Chromium Interim Measure. The last major activity identified in the LCE is the final remediation remedy for Area G.

The LCE will be reviewed annually and amended as needed upon agreement on cleanup work priorities between the EM-LA and NMED. The LCE will also be updated after the award of the Los Alamos Legacy Cleanup Contract to ensure alignment between the contractor's Performance Baseline and DOE's strategic planning tools.